

**DMIC Integrated Industrial Township Greater Noida Limited
National Competitive Bidding (NCB)**

**REQUEST FOR QUALIFICATION (RFQ) CUM
REQUEST FOR PROPOSAL (RFP)**



(Ref No: DMIC IITGNL/2020-21/70)

**APPOINTMENT OF MASTER SYSTEM INTEGRATOR (MSI)
FOR
SUPPLY, IMPLEMENTATION, INTEGRATION, OPERATIONS AND MAINTENANCE
OF SMART CITY ICT COMPONENTS
AT INTEGRATED INDUSTRIAL TOWNSHIP (IIT), GREATER NOIDA**

VOLUME III : TERMS OF REFERENCE

August 2020

**DMIC Integrated Industrial Township Greater Noida Limited
(DMIC IITGNL)**

11th Floor, Tower-1, Plot No.-1, Knowledge Park-IV,
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Abbreviations

Abbreviations	Definition
AAA	Authentication, Authorization and Accounting
ABPAS	Automated Building Plan Approval System
ABS	Acrylonitrile Butadiene Styrene
ACD	Automatic Call Distribution
ACL	Access Control List
ACS	Access Control System
ADF	Automatic Document Feeder
ADFS	Active Directory Federation Services
AES	Advanced Encryption Standard
AGC	Automatic Gain Control
AGP	Accelerated Graphics Port
AMC	Annual Maintenance Contract
AMD	Advanced Micro Devices
AMI	Advanced Metering Infrastructure
AMR	Automatic Meter Reading
ANI	Automatic Number Identification
ANPR	Automatic Number Plate Recognition
ANSI	American National Standards Institute
API	Application Program Interface
ARP	Address Resolution Protocol
ARV	Annual Ratable Value
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
ASTM	American Society for Testing and Materials
ATCC	Automatic Traffic Counting & Classification System
ATI	Advanced Technology Institute
ATM	Automated Teller Machine
ATP	Acceptance Testing Procedure
ATS	Annual Technical Support
AVC	Advanced Video Coding
AVI	Audio Video Interleave
AWCS	Automated Waste Collection System
AWG	American Wire Gauge
BCP	Business Continuity Plan
BEE	Bureau of Energy Efficiency

Abbreviations	Definition
BFD	Bidirectional Forwarding Detection
BGP	Border Gateway Protocol
BIFMA	Business and Institutional Furniture Manufacturers Association
BIM	Building Information Modelling
BIS	Bureau of Indian Standards
BLF	Busy Lamp Field
BMP	Bitmap
BMS	Building Management System
BOOTP	Bootstrap Protocol
BPAS	Building Plan Approval System
BPDU	Bridge Protocol Data Unit
BPM	Business Process Management
BPPS	Billion Packets Per Second
BRS	Business Requirement Specifications
BSSID	Basic Service Set Identifier
BYOD	Bring Your Own Device
CAD	Computer Aided Dispatch
CAIDI	Customer Average Interruption Duration Index
CAPI	Cryptographic Application Programming Interface
CATV	Cable TV
CBR	Constant Bit Rate
CCA	Certifying Authorities
CCTV	Closed Circuit Television
CDMA	Code-Division Multiple Access
CDRW	Compact Disc Re-Writable
CEO	Chief Executive Officer
CFC	Citizen Facilitation Centre
CFM	Connectivity Fault Maintenance
CIF	Common Intermediate Format
CIFS	Common Internet File Service
CIOC	City's Integrated Operations Centre
CIP	Construction in Progress
CLI	Caller Line Identification
CMDB	Configuration Management Database

Abbreviations	Definition
CMOS	Complementary Metal-Oxide Semiconductor
CMS	Content Management System
CNG	Compressed Natural Gas
COTS	Commercially Available Off-The-Shelf
CPU	Central Processing Unit
CRCA	Cold Rolled Close Annealed
CRI	Colour Rendering Index
CRL	Certificate Revocation List
CRM	Customer Relationships Management
CRS	Cold Rolled Steel
CSA	Canadian Standards Association
CSC	Carrier Supporting Carrier
CSP	Cloud Service Provider
CSR	Corporate Social Responsibility
CSS	Cascading Style Sheets
CST	Central Sales Tax
CSV	Comma Separated Values
CTI	Computer-Telephony Integration
DARPG	Department of Administrative Reforms and Public Grievances
DCMS	Display Content Management System
DCR	Development Control Regulations
DDC	Direct Digital Controllers
DDE	Dynamic Data Exchange
DDOS	Distributed Denial of Service
DDS	Digital Display Screen
DDSV	Demographic Data Standards and Verification Procedure
DFC	Dedicated Freight Corridor
DFDL	Data Format Description Language
DHCP	Dynamic Host Configuration Protocol
DIN	Deutsches Institut für Normung
DIY	Do It Yourself
DLP	Defect Liability Period
DLPTM	Digital Light Processing
DMIC	Delhi Mumbai Industrial Corridor
DMICDC	Delhi Mumbai Industrial Corridor Development Corporation

Abbreviations	Definition
DMS	Document Management System
DMZ	Demilitarized Zone
DNGIR	Dadri-Noida-Ghaziabad Investment Region
DNIS	Dialed Number Identification Service
DNS	Domain Name Service
DNSSEC	Domain Name System Security Extensions
DOB	Date of Birth
DOS	Days of Service
DOT	Department of Telecommunication
DPC	Dynamic Plot Control
DPR	Detailed Project Report
DRC	Disaster Recovery Centre
DRDC	Disaster Recovery Data Centre
DSC	Digital Signature Certificates
DSCP	Differentiated Services Code Point
DSM	Digital Surface Model
DVD	Digital Video Disc
DVI	Digital Visual Interface
EAI	Enterprise Application Integration
EAL	Evaluation Assurance Level
ECB	Emergency Call Box
ECBC	Energy Conservation Building Code
ECC	Error Connecting Code
EGIF	e- Government Interoperability Framework
EIA	Electronic Industries Alliance
EIRP	Effective Isotropic Radiated Power
EMC	Electromagnetic Compatibility
EMD	Earnest Money Deposit
EMI	Electromagnetic Interference
EMS	Enterprise Management System
EPABX	Electronic Private Automatic Branch Exchange
EPC	Engineering, Procurement and Construction
ERP	Enterprise Resource Planning
ESB	Enterprise Service Bus

Abbreviations	Definition
ESI	Employees' State Insurance
ESQL	Embedded/ Extended Structured Query Language
ESS	Employee self-service
EXP	Experimental Bits
FAQ	Frequently Asked Questions
FAR	Floor Area Ratio
FAT	Factory Acceptance Test
FCC	File Client Cache
FCOE	Fibre Channel over Ethernet
FCR	First Call resolution
FDMS	Fibre Distribution Management System
FHD	Full High Definition
FMS	File Management System
FOB	Free on Board
FOC	FIBRE OPTIC CABLE
FOP	Formatting Objects Processor
FOSC	Fibre Optic Splice Closure
FRACS	Facial Recognition Based Access Control System
FRP	Fiberglass-Reinforced Polymer
FRR	False Rejection Rate
FRS	Functional Requirements Specifications
FSI	Floor Space Index
FTP	File Transfer Protocol
FTTX	Fibre-to-the-X
GAIL	Gas Authority of India Limited
GARP	Generic Attribute Registration Protocol
GDP	Gross Domestic Product
GIS	Geographic Information System
GNIDA	Greater Noida Industrial Development Authority
GPI	General Purpose Interface
GPRS	General Packet Radio Service
GPS	Global Positioning System
GRV	Goods Received Voucher
GSM	Global System for Mobile Communication
GST	Goods and Service Tax

Abbreviations	Definition
HBA	Host Bus Adapter
HDD	Horizontal Directional Drilling
HDMI	High-Definition Multimedia Interface
HDPE	High-Density Polyethylene
HEVC	High Efficiency Video Coding
HHC	Hand Held Computers
HID	Host Intrusion Detection
HIPS	Host Intrusion Prevention System
HMI	Human Machine Interface
HRA	House Rent Allowance
HRM	Human Resource Management
HSM	Hardware Security Module
HSRP	Hot Standby Router Protocol
HTML	Hyper Text Markup Language
HTTP	Hyper Text Transfer Protocol
HTTPS	Hyper Text Transfer Protocol Secure
HUF	Hindu Undivided Family
HVAC	Heating, Ventilation and Air Conditioning
IAM	Identity and Access Management
IAT	Installation Acceptance Test
IBM	International Business Machines
ICB	International Competitive Bidding
ICEA	Insulated Cable Engineers Association
ICMP	Internet Control Message Protocol
ICSA	International Computer Security Association
ICT	Information & Communications Technology
IDS	Intrusion Detection System
IEC	International Electro-technical Commission
IEEE	Institute of Electrical and Electronics Engineers
IERC	European Research Cluster
IES	Illuminating Engineering Society
IETF	Internet Engineering Task Force
IFEG	Interoperability Framework for e-Governance
IFML	Interaction Flow Modeling Language

Abbreviations	Definition
IGBT	Insulated-Gate Bipolar Transistor
IGMP	The Internet Group Management Protocol
IIT	Integrated Industrial Township
IITGNL	Integrated Industrial Township Greater Noida Limited
IKE	Internet Key Exchange
IMAP	Internet Mail Access Protocol
IMD	India Meteorological Department
IOC	Integrated Operations Centre
IOPS	input/output operations per second
IOS	iPhone Operating System
IOT	Internet of Things
IPFIX	Internet Protocol Flow Information Export
IPI	Infrastructure Provider Category I
IPS	Intrusion Prevention System
IRC	Indian Roads Congress
IRIG	Inter-Range Instrumentation Group
ISAKMP	Internet Security Association and Key Management Protocol
ISBT	Inter State Bus Terminals
ISCII	Indian Script Code for Information Interchange
ISDN	Integrated Services Digital Network
ISI	Indian Standards Institute
ISM	IIT Software Modules
ISO	International Organization for Standardization
ISP	Internet Service Provider
ITIL	Information Technology Infrastructure Library
ITU	International Telecommunication Union
IVR	Interactive voice response
IVRS	Interactive Voice Response System
JCA	Java EE Connector Architecture
JCE	Java Cryptography Extension
JMS	Java Message Service
JPEG	Joint Photographic Experts Group
JPG	Joint Photographic Expert Group
JSON	JavaScript Object Notation

Abbreviations	Definition
JSR	Java Specification Request
JTC	Joint Technical Committee
KML	Keyhole Markup Language
KMZ	Keyhole Markup language Zipped
KPI	Key Performance Indicator
KVM	Keyboard, Video and Mouse
LACP	Link Aggregation Control Protocol
LAG	Link Aggregation Group
LAN	Local Area Network
LCD	Liquid Crystal Display
LCV	Light Commercial Vehicle
LDAP	Lightweight Directory Access Protocol
LDPE	Low Density Poly Ethylene
LED	Light Emitting Diode
LLDP	Link Layer Discovery Protocol
LMS	Land Management System
LNA	Low Noise Amplifier
LOD	Levels of Detail
LSPM	light source and power meter
LSZH	Low Smoke Zero Halogen
LTSC	Learning Technology Standards Committee
LULC	Land use land cover
MAC	Media Access Control
MAIFI	Momentary Average Interruption Frequency Index
MAV	Multi Axle Vehicle
MCB	Miniature Circuit Breaker
MCU	Multipoint Control Unit
MDM	Mobile Device Management
MEP	Mechanical, Electrical and Plumbing
METS	Metadata Encoding and Transmission Standard
MGCP	Media Gateway Control Protocol
MIB	Management Information Bases
MIS	Management Information System

Abbreviations	Definition
MJPEG	Motion Joint Photographic Experts Group
MLD	Multicast Listener Discovery
MOM	Minutes of Meeting
MOP	Manual of Office Procedure
MOV	Metallic Oxide Varistor
MPEG	Moving Picture Experts Group
MPLS	Multi-Protocol Label Switching
MRI	Meter Reading Instruments
MSDP	Multicast Source Discovery Protocol
MSI	Master Systems Integrator
MTBF	Mean Time Between Failures
MTR	Main Telecom Room
MTTR	Mean Time To Repair
NABL	National Accreditation Board for Laboratories
NAC	Network Access Control
NAS	Network-attached storage
NBC	National Building Code
NDPP	Network Devices Protection Profile
NDSAP	National Data Sharing and Accessibility Policy
NEC	National Electric Code
NEFT	National Electronic Funds Transfer
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Prevention Association
NFS	Network File System
NGFW	Next-generation firewall
NIC	Network Interface Card
NICDIT	National Industrial Corridor Development and Implementation Trust
NLP	Natural Language Processing
NLSAS	Near Line SAS
NMS	Network Management System
NOC	Network Operations Centre
NSF	nonstop forwarding
NTP	Network Time Protocol
NTS	Network Time Server

Abbreviations	Definition
NWT	Non Water Tight
OAIS	Open Archival Information Systems
OAM	Operation, Administration, and Maintenance
OBD	On-board diagnostics
OCEF	Optical Cable Entrance Facility
OCR	Optical Character Recognition
OCSP	Online Certificate Status Protocol
ODBC	Open Database Connectivity
OEM	Original Equipment Manufacturer
OFC	Optic Fibre Cable
OGC	Open Geo-Spatial
OHT	Overhead Water Tank
OIC	Open Interconnect Consortium
OLE	Object Linking and Embedding
OMG	Object Modeling Group
ONVIF	Open Network Video Interface Forum
OPC	OLE for Process Control
OPS	Open Pluggable Specification
OSPF	Open Shortest Path First
OTDR	Optical Time Domain Reflectometer
OTP	One Time Password
PAT	Prototype Acceptance Test
PBAX	Private Automatic Branch Exchange
PBG	Performance Bank Guarantee
PBR	Policy-Based Routing
PCI	Peripheral Component Interconnect
PCM	Pulse Code Modulation
PDF	Portable Document Format
PDFA	PDF for Archival
PDU	Protocol Data Unit
PEAP	Protected Extensible Authentication Protocol
PGT	Post Graduate Teacher
PHP	Personal Home Page
PID	Preservation Information Documentation
PIM	Protocol-Independent Multicast

Abbreviations	Definition
PIN	Personal Identification Number
PIO	Public Information Officer
PIT	Pre-Installation Testing
PKCS	Public Key Cryptographic Standards
PLB	Permanently Lubricated
PMD	Polarization Mode Dispersion
POE	Power Over Ethernet
POP	Point of Presence
PPM	Parts Per Million
PPP	Public Private Partnership
PRI	Primary Rate Interface
PSTN	Public Switched Telephone Network
PTZ	Pan Tilt Zoom
PVC	Polyvinyl Chloride
QCIF	Quarter Common Intermediate Format
QOS	Quality of Service
QSFP	Quad Small Form-factor Pluggable
RAID	Redundant Array of Independent Disks
RAM	Random Access Memory
RBAC	Role Based access control
RCA	Root Cause Analysis
RCC	Reinforced Cement Concrete
RDBMS	Relational Database Management System
RDP	Remote Desktop Protocol
RFC	Request for Comments
RFID	Radio Frequency Identification
RFP	Request for Proposal
RFQ	Request for Qualification
RHEL	Red Hat Enterprise Linux
RIP	Routing Information Protocol
RMON	Remote Monitoring
RMU	Ring Main Unit
ROHS	Restriction of Hazardous Substances

Abbreviations	Definition
ROLL	Routing Over Low power and Lossy
ROM	Read Only Memory
ROW	Right of Way
RPL	Routing Protocol for Low power and Lossy Networks
RPM	Revolutions Per Minute
RPO	Recovery Point Objective
RRE	Remote Reader Electronics
RSPAN	Remote Switched Port Analyzer
RSVP	Resource Reservation Protocol
RTA	Regional Transport Authority
RTC	Real Time Clock
RTF	Rich Text Format
RTGS	Real Time Gross Settlement
RTI	Right to Information
RTO	Regional Transport Office
RTP	Real-time Transport Protocol
RTSP	Rapid Spanning Tree Protocol
RWD	Responsive Web Design
SAAS	Software as a Service
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
SAN	Storage area network
SAP	Systems, Applications, Products
SAS	Statistical Analysis System
SAT	Systems Acceptance Test
SATA	Serial Advanced Technology Attachment
SCADA	Supervisory Control and Data Acquisition
SCCP	Skinny Client Control Protocol
SCP	Security Certified Program/ Smart City Platform
SCSI	Small Computer System Interface
SDHC	Secure Digital High Capacity
SDK	Software Development Kit
SDLC	System Development Life Cycle
SFAT	Software Factory Acceptance Test

Abbreviations	Definition
SFP	Small Form-factor Pluggable
SFTP	secure file transfer protocol
SIEM	Security Information and Event Management
SIF	Standard Interchange Format
SIM	Subscriber Identity Module
SIP	Session Initiation Protocol
SIT	Systems Integration Testing
SLA	Service Level Agreement
SLES	SUSE Linux Enterprise Server
SMS	Short Message Service
SMTP	Simple Mail Transfer Protocol
SNMP	Simple Network Management Protocol
SOA	Service-Oriented Architecture
SOAP	Simple Object Access Protocol
SOP	Standard Operating Procedure
SPAN	Switched Port Analyzer
SPV	Special Purpose Vehicle
SQL	Software Queueing Language
SRS	Software Requirement Specifications
SSD	Solid-State Drive
SSH	Secure Shell
SSID	Service Set Identifier
SSL	Secure Sockets Layer
SSM	Source-Specific Mode
SSO	Single Sign-On
STP	Spanning Tree Protocol
SUSE	Software and System-Entwicklung
SWIFT	Society for Worldwide Interbank Financial Telecommunication
TACACS	Terminal Access Controller Access Control System
TAT	Turnaround time
TCP	Transmission Control Protocol
TDM	Time Division Multiplexing

Abbreviations	Definition
TDS	Tax Deducted at Source
TEC	Telecommunication Engineering Centre
TFTP	Trivial File Transfer Protocol
TGT	Trained Graduate Teacher
TIA	Telecommunications Industry Association
TIFF	Tagged Image File Format
TLS	Transport Layer Security
TPS	Transactions Per Second
TRAI	Telecom Regulatory Authority of India
TRD	Test Results Documentation
TSN	Time since new
TSO	Time since overhaul
TSP	Telecom Service Provider
UAN	Universal Account Number
UAT	User Acceptance Testing
UDP	User Datagram Protocol
UHD	Ultra-High-Definition
UID	Unique Identity Number
UNIX	Uniplexed Information Computing System
UPC	Ultra-Physical Contact
UPI	Unified Payment Interface
UPS	Uninterruptible Power Supply
URL	Uniform Resource Locator
URPF	Unicast Reverse Path Forwarding
USB	Universal Serial Bus
USN	Ubiquitous Sensor Networks
USSD	Unstructured Supplementary Service Data
UTC	Universal Time Coordinated
UTP	Unshielded Twisted Pair
UUU	Usable, User-Centric and Universally Accessible
VAC	Volt AC
VAT	Value Added Tax
VBR	Variable Bit-Rate
VCCI	Voluntary Control Council for Interference

Abbreviations	Definition
VDM	Video Display Module
VDW	Voice Directed Warehousing
VGA	Video Graphics Array
VLAN	Virtual Local Area Network
VLBS	Virtual Load Balancer Services
VMD	Variable Message Display
VMS	Video Management System
VOIP	Voice Over Internet Protocol
VPLS	Virtual Private Lan Service
VPN	Virtual Private Network
VPWS	Virtual Private Wire Service
VRF	Virtual Routing And Forwarding
VRRP	Virtual Router Redundancy Protocol
WAN	Wide Area Network
WBS	Work Breakdown Structures
WCCD	World Council On City Data
WEEE	Waste Electrical And Electronic Equipment
WFQ	Weighted Fair Queuing
WIP	Work In Progress
WIPS	Wireless Intrusion Prevention System
WPAN	Wireless Personal Area Networks
WRED	Weighted Random Early Detection
WRR	Weighted Round Robin
WSDL	Web Services Description Language
WSRP	Web Services For Remote Portlets
XFP	10 Gigabit Small Form Factor Pluggable
XLPE	Cross Linked Polyethylene Insulation
XML	Extensible Markup Language
XSL	Extensible Stylesheet Language

1 Introduction

1.1 Overview

The Government of India has envisaged the development of Delhi Mumbai Industrial Corridor (DMIC) along the alignment of proposed Multi-modal High Axle Load Dedicated Freight Corridor (DFC) between Delhi and Mumbai, covering an overall length of 1,483 km and passing through six (6) states. To tap the development of the proposed freight corridor, a band spanning 150 km on both sides of the freight corridor has been identified as the 'Influence Region' and is proposed to be developed as DMIC. Hence, under the Influence Region, Delhi Mumbai Industrial Corridor Development Corporation (DMICDC) plans to develop the Integrated Industrial Township (IIT) as a greenfield smart city, which also forms part of the Dadri-Noida-Ghaziabad Investment Region (DNGIR). A Special Purpose Vehicle (SPV) in the name of DMIC Integrated Industrial Township Greater Noida Limited (DMIC IITGNL) has been established between National Industrial Corridor Development and Implementation Trust (NICDIT) and Greater Noida Industrial Development Authority (GNIDA) to implement, promote and facilitate the development of Integrated Industrial Township (IIT) project.

Gol's national Programme "Make-In-India" has the mandate to promote the manufacturing sector in a comprehensive manner. The programme aims to facilitate investment, foster innovation, enhance skill development, protect intellectual property, and build best-in-class manufacturing infrastructure in India. Overall, the contribution of manufacturing sector to the GDP of India is still lower as compared to that of other fast developing economies of countries like Thailand, China, Indonesia and Malaysia. Through this "Make-In-India" Programme, Gol aims to enhance the contribution of manufacturing sector to the country's GDP and aims to surpass the contribution realized in other developing economics. DMICDC with the development of DMIC project plays a key role in realizing this Gol's vision of Make-In-India.

IIT is being developed as a greenfield industrial township and is spread across an area of approximately 3.02 Sq. Km. To implement IIT, DMIC IITGNL has undertaken an approach that includes holistic planning with a focus on providing state-of-the-art infrastructure. Further, DMIC IITGNL also wants to position Information and Communications Technology (ICT) as the underlying enabler to integrate various functions of the city development and operations, and for better management of the city infrastructure. The objective of the ICT infrastructure is to help build a smart, sustainable, socially and technologically attractive modern city that will stimulate socio-economic development for citizens, while providing a high quality of life. Integrated Industrial Township (IIT) would be characterized as a one of its kind industrial city that will use ICT as an underlying enabler to integrate multiple dimensions including governance, safety and security, social infrastructure, economic growth, utilities, among others, with efficient management of city infrastructure.

1.2 Project Background

Integrated Industrial Township is situated at close proximity of just 11 km from Pari Chowk, Greater Noida. It is also linked with the Eastern Peripheral Expressway service roads and will soon be linked with Boraki metro station through a 60m road, currently under construction. IIT also abuts the Delhi-Howrah railway line, with Ajayabpur Railway Station located near the north and eastern peripheral of the township, and Dadri Railway Station located at a distance of 9.5 km from the project site. The Boraki Railway Station is also situated at a distance of 4 km, with an existing railway station at 1km from the central commercial core. The nearest airports to the township are the Meerut domestic airport and the IGI airport in Delhi. Thus, strong connectivity through road, rail and airways serve as a critical factor in boosting industrial growth at IIT, making it a potential hub for attracting investors and industries from across the globe.

Further, the region is one of the leading IT/ ITeS hub of India, which marks one of the highest software exports from the region in India. The Meerut-Muzaffarnagar belt is also a rapidly growing industrial area with huge concentration of industries involved in the manufacturing of agriculture, brewery, textile, chemicals, metal products etc. The proposed Investment Region (IR) at Dadri-Noida-Ghaziabad, herein referred to as the Integrated Industrial Township (IIT), would be located in close proximity to the Rewari-Dadri alignment of Dedicated Freight Corridor (DFC). The nearest hotspots of urban development include Delhi and Gurgaon, which also happen to be an indistinguishable part of the IT and Automobiles industry of India.

With the overall vision of developing IIT as a smart greenfield industrial city, DMIC IITGNL also has a focus on mixed-use development that includes residential, commercial, public-amenities along with social infrastructure beyond the industrial land use. The overall vision of the project includes implementation of state-of-the-art infrastructure that will be highly reliable, available and integrated over technology. IIT aims to drive the expansion of Greater Noida as a major industrial hub with an aim to attract and retain a highly skilled workforce and generate over 50,000 jobs along with housing about 30,000 people including the industrial workforce and their families.

The paradigm shift towards modern cities includes a strong need to have integrated and connected infrastructure with a focus on citizen-centric services. The overall vision of IIT includes positioning of Information & Communications Technology (ICT) as the key enabler to integrate various functions of the city development and operations, provide advanced and affordable services to the citizens along with efficient governance and management of the city operations. ICT will enable creation of a sustainable eco-system of the government, industries/businesses, social infrastructure with an overall citizen-centric development. It will enable DMIC IITGNL to be an efficient and tech-savvy organization that will truly leverage ICT for its operations and decision making. ICT will cultivate the development of a digital and connected city which ultimately helps in promoting and sustaining economic growth and development. An illustration of the systems that are envisaged as part of the project is presented in Exhibit 1 below:

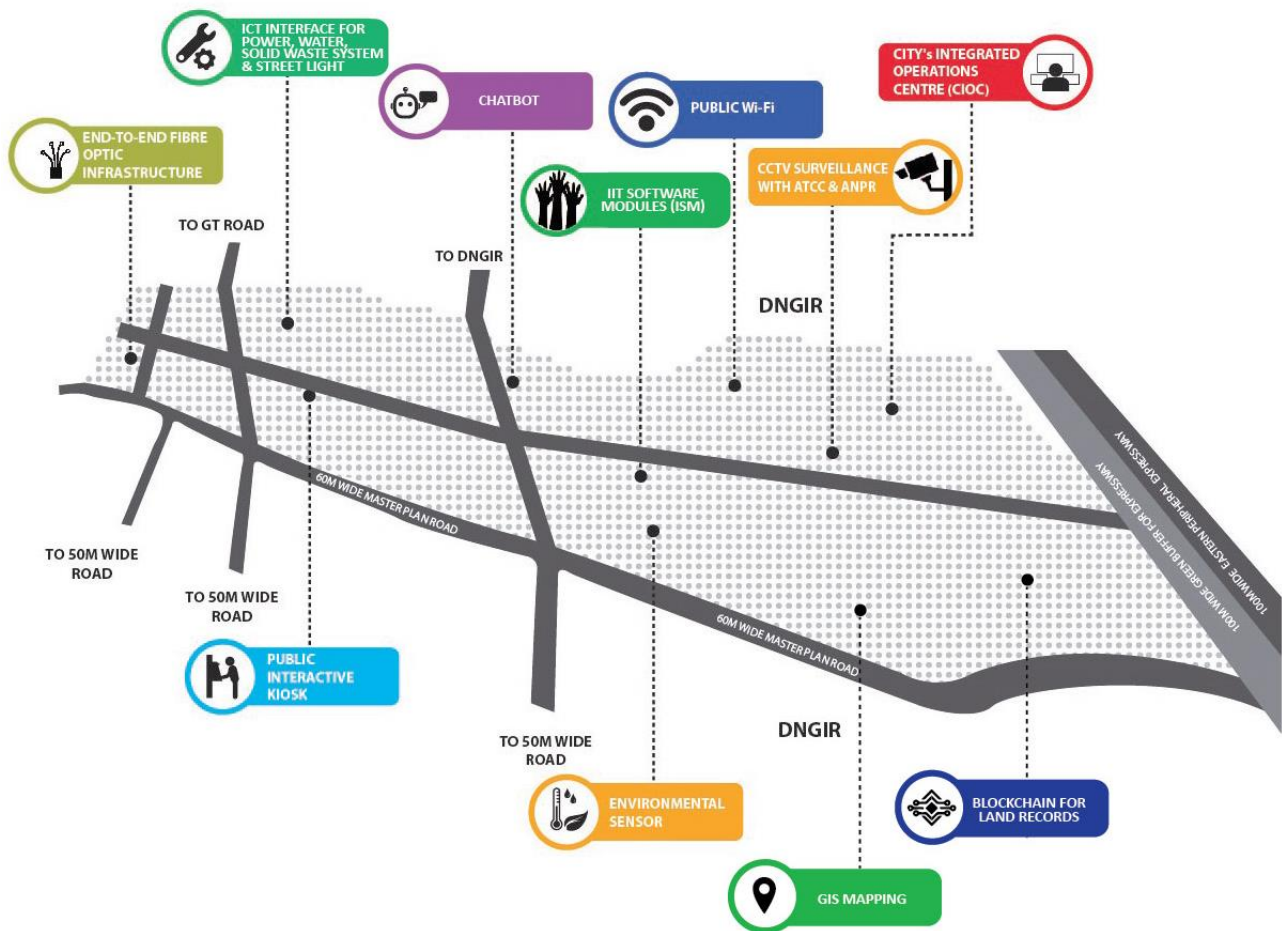


Exhibit 1: Smart City ICT Components

This RFQ cum RFP (Bidding document) is for the appointment of a Master System Integrator that shall be responsible for supply, implementation, integration, operations and maintenance of smart city ICT components for IIT. The MSI shall be responsible for complete turnkey of the system including the design, supply, installation, testing, integration, commissioning, operation and maintenance of the components that are being provided as part of this project.

The Client has appointed an ICT consultant for IIT, who will be the representative for DMIC IITGNL on this Project. In addition, EPC Contractors have been appointed for the civil trunk infrastructure, utilities work and the implementation of the Project and Electrical contractor have been appointed for setting up electrical sub-stations along with building Ring Main Units (RMUs) in each plot for power distribution. Ring Main Unit Rooms (RMU) are provided at majority of plot locations and shall be the fibre infrastructure entry point inside the plot. Also, this shall cater to current and future requirements of splice, active and passive device placement for the plots and field equipment's wherever required. RMU room will co-locate equipment of electrical contractor and the ICT equipment installed by MSI. The MSI shall ensure no damage is done to the electrical equipment installed inside the RMU room.

As part of the current status of the project, implementation of the civil and utility infrastructure including roads, sewer, water, power, street lighting, civil trench etc. is in advanced stage of completion. In parallel, scope of work of the Electrical Contractor is also nearing its completion. In addition, currently e-Land Management System (e-LMS) SI is also implementing e-LMS for DMIC IITGNL. It is important to note that MSI will have to work in close coordination with EPC Contractor, Electrical Contractor and e-LMS SI for the implementation of the Project.

2 Project Overview and Components

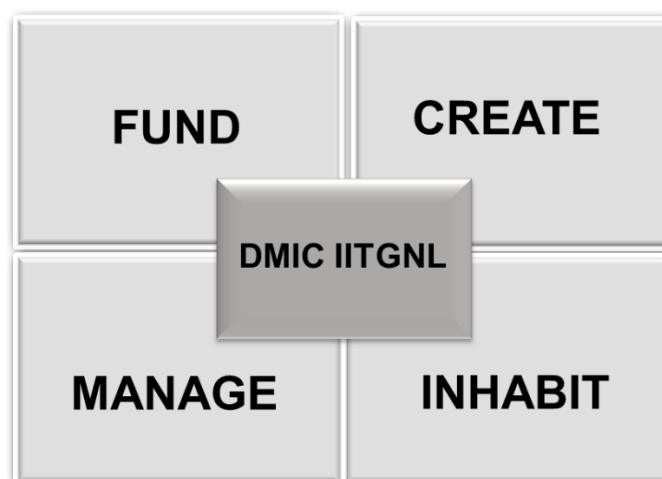
DMIC IITGNL intends to implement a greenfield industrial smart city called IIT. As one of the key initiatives for realizing this vision, DMIC IITGNL plans to implement a state-of-the-art ICT infrastructure along with various components for IIT as part of this Project. At the centre of the Project is the City's Integrated Operations Centre (CIOC) which will be the nerve centre for the city. All applications and sensors installed as part of IIT will be integrated at the CIOC and will be monitored/controlled from this common location. The CIOC will interface with all end-devices and applications including at field level and at the user level. It will be the location from where the city will be operated and managed in terms of the infrastructure, critical systems and operations. All components will be integrated at the CIOC using either wired or wireless communications. The wired communications i.e. field devices and sensors will be connected over a dedicated fibre optic based infrastructure which will be deployed throughout the Project area. The fibre optic infrastructure will be used to meet both DMIC IITGNL needs and non-DMIC IITGNL needs such as tenants of DMIC IITGNL. It is desired that with this Project, an overall Fibre-to-the-X (FTTX) architecture is implemented for all field device connectivity and for connectivity to every plot. The public Wi-Fi network will be deployed throughout the public areas of IIT and will result in providing accessible, affordable and available broadband connectivity for the citizens. Further, citizen can access the city applications such as e-governance through city Wi-Fi service or DMIC IITGNL's public interactive kiosks or the respective connectivity from the respective Internet Service Provider.

A smart city also includes the concept of safe city. DMIC IITGNL also plans to implement proactive CCTV surveillance system that will be used to monitor the city and its assets. In addition, Automatic Traffic Counters and Classifiers (ATCC) will be implemented at all entry and exit points of Project location to monitor traffic flows and other parameters. Automatic Number Plate Recognition (ANPR) cameras will also be implemented to monitor the number plates of vehicles travelling inside IIT in order to notify relevant authorities in case a hot-listed vehicle travels through the city premises. Environmental sensors will also be implemented at strategic locations for monitoring various parameters such as pollutant levels which will enable DMIC IITGNL to continuously track the environmental impact of the city.

At the core of DMIC IITGNL, multiple software applications are envisaged which will lead the software led transformation for DMIC IITGNL. These applications will be called as IIT Software Modules (ISM). ISM shall aim to provide 100% of citizen services online. ISM shall also serve as the backbone for DMIC IITGNL operations and will be primarily be used for managing the city services. A full scale GIS mapping is also envisaged for IIT. It is expected that GIS will form the foundation over which multiple application shall visualize city information and operations. Additionally, blockchain solution for land records is also included in the scope to add an extra level of security and integrity to the land record data.

Additionally, as part of the Project, it is envisaged that various systems implemented by 'Others' such as Electric SCADA and Metering, Water SCADA and Metering, Automated Waste Collection System and Streetlight system will be integrated at CIOC for cohesive monitoring. As part of the scope, all applications, with the exception to video data, shall be hosted on cloud.

Being a greenfield site, DMIC IITGNL will need to go through the business cycle of Funding, Creating, Inhabiting and Managing the city as depicted in the below diagram. Note that part of this cycle is already underway, and the details are only provided to help in providing background understanding of the Project.



Fund: The initial priority is funding the city infrastructure from various internal and external sources based on investment plans, which in turn are based on various projects and their funding needs. FUND function will also need facility to manage various sources of funds and their utilization on various projects. The internal sources of funds will be mainly from allocation of land. However internal sources of funds will become active only after land allocation starts. In addition, there could be various projects that could be taken in Public-Private-Partnership (PPP) mode. These projects will be jointly funded and as such will need to be monitored from that aspect. A time scale plan of investment and sources of funds will need to be created to manage the funds and their utilization. The key functions of funding the city is:

- Budget and Grant Management;
- Allocation of Land and Revenue Management;
- Public Private Partnership Management;
- Investment Planning.

Create: Once the city is funded, various planned projects need to be executed. This function is broadly termed as “Creating” the city. The manner in which the creation of city is conceptualized and executed will determine the pace of progress in attracting industrialists/entrepreneurs to invest in the city. The projects need to be executed in a manner that IIT is created as a world class industrial city meeting the broad objectives of DMIC IITGNL.

Main use of funds in creating the city will be in land development, infrastructure creation like network, water, electricity facilities, and other city infrastructure, civic facilities like parks, clubs, social infrastructure, street lights etc. The city needs to be created in a manner that industrialist and citizens alike choose it over other investment and residential options. The key elements of creating the city are:

- Build Infrastructure for city development:
 - Telecom and other ICT infrastructure;
 - Power;
 - Water;
 - Water Treatment;
 - Waste Management;
 - Land Allocation and Road infrastructure;
 - Progress tracking for all the above projects.
- Land allocation for Commercial, Education, Residential establishment;
- Create Social Infrastructure.

The key business objective for DMIC IITGNL in this phase are:

- Manage the grants and funds allocated by the stakeholders;
- Control the budgets and monitor the projects for building the trunk infrastructure;
- Generate funds by attracting private partners and businesses to invest in land and facilities.

Inhabit: Once basic infrastructure is in place and plans are afoot to create the city, efforts need to be started for attracting and retaining industrialists and citizens to the city. Facilitation centre needs to be created to answer queries of prospects. In parallel, tie up with various private and government agencies are required to be done to cover all the functions required to run the city. All civic amenities need to be in place and in working condition. A showcase to the current state and progress chart is required to be made available to all prospects. DMIC IITGNL is also vested with municipal powers and availability of municipal functions will be key in attracting citizens. Various functions in making the city inhabitable are:

- Attract and retain entrepreneurs;
- Provide unique ID to entrepreneurs and citizens;
- Facilitate Citizens and Residents;
- Enable Commercial/ Social/ Health facilities, as applicable;
- Provision of services like Fire, Police, Traffic;
- Operate city and its Infrastructure;
- Provide Civic amenities and utilities;
- Provide Municipal Functions under purview of DMIC IITGNL.

Manage: Even before first citizens and industrialists inhabit the city, robust practices of managing the city needs to be provisioned. Inhabitants, citizens and industrialists alike will be able to request for any service through multiple channels like kiosks at suitable places, telephone, walk in to customer centre, mails or through interactive mobile application. The centralized city command and control centre will have the tracking feature to know issues proactively in any segment of city infrastructure. Once city is operational, there will be provision required to carry out minor works encompassing electrical, telecom, water, waste water, roads, parks, streetlights, social infrastructure of the city. SCADA based systems and alarms will be used to proactively monitor water and electricity distribution network among other utilities. Citizen engaging services will be channelized through the use of Public Wi-Fi infrastructure. Various functions under managing the city are as under:

- Monitor key performance indicators;
- Operate and Manage Infrastructure Services;
- Command and Contact Centre Driven services delivery mechanism;
- Self-service Kiosks for enhanced user experience;
- Service Level Management;
- Escalation Management with vendors;
- Minor works Management;
- Revenue and Expense Management;
- Billing for services such as water, power and telecom as applicable.

Key Stakeholders in the System

The key stakeholders that shall be the direct/indirect users of the system are:

- DMIC IITGNL employees;
- Citizens residing in the city as well as industrial workforce;
- Any outsourced employees, managing the various city functions as applicable;
- Third Party Vendors;

- Other Government Departments/Organizations;
- Industrialists and Investors.

A summary of the Project components that shall be implemented by the MSI as part of this Project are presented below:

Table 1: Summary of the Project components

COMPONENT	PROJECT REQUIREMENT
Fibre Optic Infrastructure	End-to-end fibre optic infrastructure (passive and active) to meet all the current and future needs of the Project with an overall architecture of Fibre-to-the-X (FTTX) for a connected city using various Points-of-Presence (PoP) facilities.
Public Wi-Fi	Public Wi-Fi to make broadband services more accessible, affordable and available for citizens and workforce across IIT.
CCTV Surveillance System including Automatic Traffic Counter and Classifier (ATCC) and Automatic Number Plate Recognition (ANPR)	<ul style="list-style-type: none"> • CCTV surveillance system for proactive monitoring of strategic areas and infrastructure across. • Automatic Traffic Counters and Classifiers (ATCC) for monitoring flow and type of traffic at all entry/exit points of IIT. • Automatic Number Plate Recognition (ANPR) cameras to monitor the number plates of vehicles travelling inside IIT. • Variable Message Displays (VMD) to display important city information to citizens via digital screens.
IIT Software Modules (ISM)	<p>IIT Software Modules (ISM) will comprise of implementation of various citizen engaging and customer facing initiatives with a target of 100% of DMIC IITGNL's services being available online.</p> <p>ISM also includes a robust state-of-the-art back-office systems for planning and managing DMIC IITGNL's city operations more efficiently. ISM system shall enable DMIC IITGNL to have efficient business processes that can be managed in an integrated manner.</p> <p>As part of the ISM, Blockchain platform shall enable DMIC IITGNL with increased level of data security, redundancy and integrity in context to the land records.</p>
Public Interactive Kiosk	Integrated and interactive Public Interactive kiosks for citizen services and emergency communications with integrated Wi-Fi and CCTV across various public areas.
Environmental Sensors	Implementation of environmental sensors at strategic locations in IIT for monitoring of various parameters such as temperature, humidity, wind speed, rainfall and pollutants.
Other In Facility System	<p>This includes Building Management System and Access Control System. Building management system for monitoring, control and automation of critical infrastructure at CIOC. Access control system for controlled access with integrated biometric functionality for both CIOC and POP rooms.</p> <p>Facial Recognition Based Access Control System (FRACS) shall be used for entry/exit of CIOC/DMIC IITGNL staff members and visitors.</p>
IT and other common Infrastructure	This includes implementation of complete IT Infrastructure to be provided as part of this Project such as Operator Workstations, Communication Cabinets with Racks, Cloud Service, Servers, UPS, Data Security Solutions and Databases etc.
City's Integrated Operations Centre (CIOC)	All city infrastructure and systems deployed as part of IIT will be integrated at CIOC for central monitoring, control and integrated operations

Overall, the expectation from this Project is that:

- The solution architecture should be open, interoperable, integrated and scalable;
- Adherence to the model framework of cyber security requirements set for Smart City (K-15016/61/2016-SC-1, Government of India, and Ministry of Urban Development) and any amendments thereof;
- The overall architecture shall support:
 - Expandability: Open ended; allows upgrading to take advantage of continued evolution in transportation information and control systems;
 - Interoperability: Machine independent; allows the largest-possible markets for deployment;
 - Compatibility: Non-interference; various devices within the same system must be able to operate without interfering with the operation of other devices;
 - Interchangeability: Vendor independent; devices from different vendors that perform the same functions may be interchanged;
 - Open: Non-proprietary; promotes rapid development of new technologies and acceptance by consumers;
 - Scalable: Flexible; standards recognize local conditions with a wide range of ICT devices and communication channel capabilities. Legacy systems are accommodated to the extent possible;
 - State-of-the-art: Use of the best available standards to avoid locking in obsolescent technologies.

Along with the implementation of the above mentioned components by the MSI, the MSI shall also be responsible for end-to-end coordination and integration with the following components (provided by Others). This has been further expanded in the detailed scope of work section of this RFQ cum RFP.

Table 2: End-to-end coordination and integration of the Components

COMPONENT	PROJECT REQUIREMENT
Triple Play Voice, Video and Data Services	DMIC IITGNL plans to lease out dedicated backbone and distribution fibre optic infrastructure to the Telecom Service Providers (TSPs) as part of this Project. This fibre optic infrastructure will be implemented by the MSI and will be used by the TSPs. DMIC IITGNL will essentially provide 'dark fibre' to the TSPs and will provide TSPs dedicated space for co-locating their respective equipment at PoP rooms. MSI shall coordinate with various TSPs to incorporate their requirements in terms of dark fibre infrastructure.
ICT interface with Power, Water and Street Lighting Infrastructure for Internet of Things (IoT)	At present, EPC Contractor is in advanced stage of implementing the civil and utilities trunk infrastructure. The water and street lighting infrastructure is being provided by the EPC Contractor. Electrical Contractor is responsible for Power SCADA network. The integration of these SCADA enabled utilities at the CIOC and complete coordination with the EPC Contractor and Electrical Contractor shall be the responsibility of this MSI.
ICT Trench for Fibre Optic Infrastructure	EPC Contractor shall be providing the ICT trench for the fibre optic infrastructure at majority of the places for backbone and distribution network. Details of this trench have been provided as part of this RFQ cum RFP. The MSI shall use this ICT trench for the fibre optic infrastructure and coordinate with the EPC Contractor as needed. EPC Contractor will also be laying its own fibre optic network in the ICT trench to connect utilities. MSI shall ensure that no damage is done to the fibre optic network installed of EPC Contractor in the ICT Trench.
ICT interface with Automated Waste Collection System	MSI shall be responsible for integrating Automated Waste Collection System at the CIOC. This also includes coordination and integration with the EPC Contractor.

COMPONENT	PROJECT REQUIREMENT
Power Discom	DMIC IITGNL is in final stages of appointing the Power Discom for electricity distribution at IIT. MSI shall work in close coordination with Power Discom for integrated SCADA at CIOC and fibre optic infrastructure installation inside Ring Main Unit (RMUs) Rooms.
e-Land Management System	DMIC IITGNL has implemented an e-Land Management System (e-LMS) which is being used for land allotment and management. The MSI shall be responsible for complete integration with this e-Land Management System.

2.1 Project Phasing

The Project and its components shall be implemented in a phased manner which will broadly be in-line with both the Client requirements and the on-site civil infrastructure. As the respective on-site civil infrastructure is in advanced stage of completion, the Project plan shall be flexible to accommodate the implementation of these modules before time. Some Project components may be implemented in parallel under different phases. The order of implementation may be subject to revisions based on Project priorities and discussions with the Client. The percentage mentioned against an individual Project component is the percentage of total quantity of the respective component being implemented.

Note that the Bidder shall refer to all the sections of the RFQ cum RFP and the Bill of Quantities (BoQ) for exact quantities and requirements for implementation of the Project components.

Table3: Proposed Project Timelines based on Service Prioritization

PHASE	TIMELINE	PROJECT COMPONENTS
Phase 1	D + 6 months	<ul style="list-style-type: none"> • Modules of IIT Software Modules (ISM) <ul style="list-style-type: none"> ➤ File Management System ➤ GIS Survey + WebGIS ➤ Finance & Accounting ➤ HR + Administration and Payroll ➤ Building Plan Approval System (Industrial Plots) ➤ Revamping of DMIC IITGNL corporate website ➤ Digital Signature ➤ Chatbot ➤ Secretarial Functions ➤ E-Mail solution and Messenger • Setting up of Cloud hosting infrastructure along with security architecture • Setting up of EMS for SLA monitoring • Setting up for DMIC IITGNL Office IT infrastructure • Fibre Connectivity from feasible tapping point till Existing Operational Plots • Implementation of Environmental Sensors • Setting of Testing Control Centre
Phase 2	D + 8 months	<ul style="list-style-type: none"> • Fibre Connectivity – 50% Implementation • Completion of all interior components and fit-outs for CIOC. • Completion of PoP • Modules of IIT Software Modules (ISM): <ul style="list-style-type: none"> ➤ CRM ➤ Grievance Redressal System ➤ Portal for Citizen and Officers

PHASE	TIMELINE	PROJECT COMPONENTS
		<ul style="list-style-type: none"> ➤ Mobile applications ➤ Operations, Maintenance & Asset Life Cycle Management ➤ Purchasing and Inventory Management ➤ Water Billing ➤ 3D Modelling • Implementation of Smart City Platform
Phase 3	D + 10 month	<ul style="list-style-type: none"> • Fibre Connectivity – 75% implementation • Public Wi-Fi Connectivity – 50% implementation • CCTV including ANPR and ATCC – 50% implementation • CIOC - 100% implementation • 100% completion of IIT Software Modules (ISM)
Phase 4	D + 12 months	<ul style="list-style-type: none"> • Fibre Connectivity – 100% implementation • Public Wi-Fi Connectivity – 100% implementation • CCTV including ANPR and ATCC – 100% implementation • Public Interactive Kiosks - 100% implementation • 100% completion of City's Contact Centre • 100% integration of System provided by third party systems (power, water, AWCS, streetlight) at CIOC • 100% completion of any other components
Operational Acceptance Phase	D + 15 months	<ul style="list-style-type: none"> • Bug Fixing and rectification of any deficiency observed in all the above phases. • Stabilization of the Project. • Burn-in test of 15 Days. • Handover of Final As-Builts, Training manuals, Maintenance manuals, User manuals etc.
Comprehensive Maintenance / AMC Phase	D + 75 months	<ul style="list-style-type: none"> • Defect Liability Period/Warranty Phase. • Post Warranty Service Phase.
<ul style="list-style-type: none"> • Note – every phase will have activities involved for integration amongst various ICT components and integration with EPC Contractor, Electrical Contractor and other SCADA works • EMS for SLA monitoring shall integrate modules as soon as they become operational. • Here, D is Effective date 		

2.2 Business, Functional and Technical Requirements

2.2.1 Fibre Optic Infrastructure

An underlying enabler of a smart city is a highly reliable and available fibre optic infrastructure. DMIC IITGNL will be one of the first city of its kind that will have an end-to-end fibre optic infrastructure with an overall FTT-X architecture for all its services. This infrastructure will be used for both DMIC IITGNL and non-DMIC IITGNL services including DMIC IITGNL tenants. It is expected that overall, fibre optic infrastructure will be used for connectivity to all 'things' being implemented as part of DMIC IITGNL area and will be the underlying enabler for connectivity. The end-to-end fibre optic infrastructure shall be provided as per the following:

- A total of two 2 PoP facilities (Primary PoP and Secondary PoP) shall be provided for co-location of equipment and fibre optic termination for both DMIC IITGNL and Non-DMIC IITGNL (including TSP) needs.
- Among these two (2) PoP facilities, a dedicated fibre optic infrastructure shall be provided in ring architecture. This fibre optic infrastructure shall be dedicated for backbone communications of the Project.
- From each of these PoP facilities, there will be a dedicated fibre optic infrastructure required for distribution communications of the Project. This distribution communications will be used to provide connectivity to DMIC IITGNL field devices and for connectivity to plots. This shall be provided in a dual homed ring configuration.
- The last layer for communications will be the access layer i.e. connectivity to every plot and field device that will be provided from the distribution network. This is further divided into three (3) scenarios:
 - **For DMIC IITGNL plots** – access communications include connectivity from the distribution communications trench until the Main Telecom Room (MTR) of the building. This includes fibre optic civil infrastructure and network cabling.
 - **For Non-DMIC IITGNL plots** – access communications also include connectivity from the distribution communications trench until the MTR of the building. However, in this case, the MSI will only provide fibre optic civil infrastructure (ducts) from the nearest ICT trench to just until inside the respective plot's Ring Main Unit (RMU) room.
 - **For field device** – access communications to all DMIC IITGNL field devices.

The DMIC IITGNL network is envisaged to have the following key attributes:

- **Reliability, Availability and Resiliency:** DMIC IITGNL network shall have a high degree of reliability, availability and resiliency, even in the event of failed links, equipment failure, and overloaded conditions with a self-healing architecture. In addition to this, the failure of a single link or piece of equipment should not impact the overall network performance;
- **Scalability:** The network shall be scalable that can grow to include new user groups and can support new applications without impacting the level of service delivered to existing users;
- **Manageability and Sustainability:** Once designed and developed, the DMIC IITGNL available network staff must be able to manage and support the network in order that it functions effectively and efficiently;
- **Affordable and accessible:** The services utilizing the DMIC IITGNL network (TSP) will be affordable and within reach of the target consumers;
- **Publicly Available:** DMIC IITGNL network shall be publicly available to encourage Digital India and Internet penetration; and
- **Generate Revenue:** IIT network shall be able to generate revenue for DMIC IITGNL so that it is sustainable and profitable.

2.2.1.1 Backbone Ring Architecture

The backbone architecture will be Layer 3 based which shall be designed for a ring configuration for the fibre optic network. This ring will be created using redundant PoPs and geographically redundant paths wherever available. The backbone will be designed between Primary Point of Presence (PoP) and one (1) secondary PoP. Primary PoP will be housed in Admin Building which will also accommodate City Integrated Operations Centre (CIOC).

The backbone cable shall not be field spliced and further will connect only both the PoPs. In addition to this, any field devices shall not be connected through backbone cable. Backbone ring architecture shall be connected via a dual homed ring connectivity with path level redundancy. 24 count fibre cable shall be utilized for backbone connectivity.

2.2.1.2 Distribution Ring Architecture

The distribution architecture shall be Layer 2 based which shall be designed for a ring configuration for the fibre optic network. This ring shall be created using redundant PoPs and geographically redundant paths wherever available. The distribution fibre shall further be used to connect a particular 'zone' from a respective PoP location. This zone shall include distribution connectivity to both plots and end-devices.

The distribution network will provide end-to-end connectivity to the field devices and plots. The distribution network will be divided into the following parts:

- For DMIC IITGNL field devices;
- For DMIC IITGNL plots; and
- For Non-DMIC IITGNL plots.

It is planned to lay down 4x24 count fibre cable for TSPs and 1x48 count fibre cable for field devices and plot connectivity.

2.2.1.3 Access Ring Architecture

The access ring shall branch out from distribution ring using 6 count fibre cable to provide connectivity to field switch in ring architecture which shall further provide connectivity to the field devices,

2.2.1.4 Last Mile Connectivity

The last mile connectivity will be provided through field switches to the field devices, which shall be strategically placed throughout the geography of the project site to provide maximum coverage for surveillance, Wi-Fi hotspots, traffic monitoring and other field devices.

2.2.1.5 Point of Presence (POP)

Point-of-Presence (PoP) rooms are where all city services (DMIC IITGNL and non-DMIC IITGNL) shall originate/terminate. This space will be shared between DMIC IITGNL services and tenants including Telecom Service Providers (TSPs) among others. There will be one (1) primary PoP and one (1) secondary PoP proposed at geographically distributed locations across IIT. The PoPs shall have dedicated space for each of the tenant and DMIC IITGNL services.

The PoPs shall be categorized and sized as follows:

- One (1) Primary PoP which shall be in the Admin Building. Rack room or Server Room at Admin Building will act as the PoP for co-location of DMIC IITGNL equipment. A separate area for TSPs will also be allocated in Admin Building for co-location of TSP equipment at Primary PoP.
- One (1) Secondary PoPs: Approximate area of 1000 sq. ft. (Building Area) will be for Secondary PoP.

Note that it is expected that the PoP will not just cater to IIT's needs today but also future growth in terms of space requirements and support tenant co-locations.

2.2.1.6 Telecom Services

Various telecom services including voice, video, data and cellular will be provided as part of IIT. The voice, video and data services for every plot will be provided by respective telecom service providers using the DMIC IITGNL fibre optic infrastructure at IIT. Each TSP shall get a dedicated 24 count fibre optic throughout IIT. This 24 count fibre optic cable shall be laid inside dedicated HDPE duct infrastructure and will be provided between PoP locations and end-to-end across IIT. The TSPs will be provided dedicated space inside each PoP for their respective actives, passives and services. For all plots, except selected DMIC IITGNL plots, the HDPE duct infrastructure will be terminated inside RMU rooms. For DMIC IITGNL plots, the conduits will be terminated

close to the Main Telecom Room (MTR) or any other termination point. However, all other actives and passives required for plot connectivity shall be provided by respective TSPs.

2.2.1.7 High Level Network Architecture

As part of the DMIC IITGNL Project, a layered topology for DMIC IITGNL network architecture have been proposed.

Overall Network Topology

As depicted in the below network architecture diagram, the architecture has been divided into following layers:

- **Core layer:** Core layer consists of Core routers, Core switches and Firewall placed at the primary PoP. The distribution layer shall be ultimately connected with core network/layer;
- **Distribution Layer:** Distribution layer consists of distribution switches placed at the Primary and secondary PoP's. Distribution layer shall be connected with core and access network/layer in dual homed ring architecture. (i.e. Primary PoP to Secondary PoP and Secondary PoP to Primary PoP);
- **Access Layer:** Access layer consists of access switches placed in the field. The access layer shall be connected with distribution layer in a ring architecture and linear connectivity with last mile devices like Camera, Wi-Fi access points etc.; and
- **Last Mile Layer:** In this layer, field devices shall be connected with Access layer switch in linear connectivity.

It is proposed that Core layer shall have a capacity of (100G) for catering current and future requirement of the Project., Similarly, Distribution ring shall have capacity of (40G), Access ring shall have a capacity of (10G) and last mile connectivity to the field devices shall have a capacity of (1G).

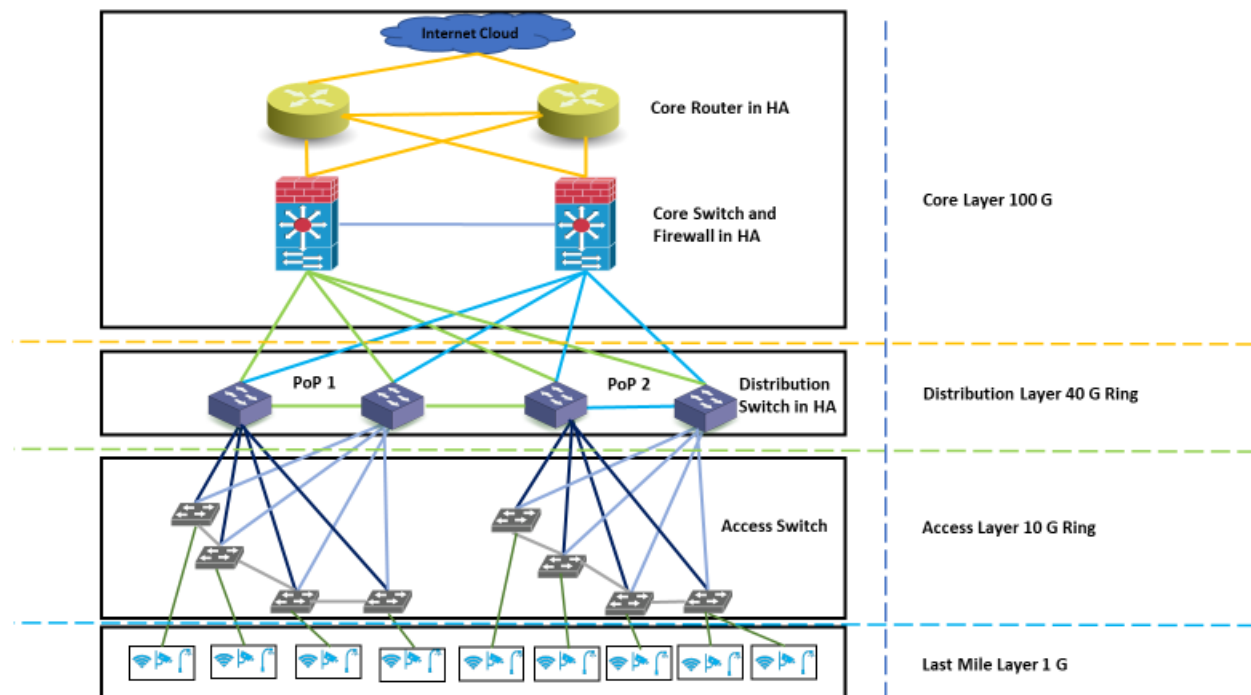


Exhibit 2: Overall Network Architecture

Core Layer

Core layer consist of two core routers in High Availability (HA) which shall communicate with internet cloud through uplink. Towards downlink, these routers shall communicate to the Firewall and Core switch. These core switches shall communicate to the distribution switch present at respective PoP locations.

Distribution Layer

Distribution layer consist of two minimum 24 fibre enabled port distribution switch at each PoP location connected in ring topology. These switches shall aggregate all the traffic that is coming from access network and push it into core network for further processing. There shall be two switches at each PoP in HA. Distribution ring shall have a capacity of 40G to cater current and future requirements.

Access Layer

Access layer consist of multiple field 8 port industrial grade switch having fibre enable uplink. These switches will be placed strategically throughout the project site area, so that connectivity to the field devices can be provided. Each node (switch) will be connected to its adjacent node to form a ring network, and these switches will also communicate with the distribution switch, thus forming redundant ring topology. Access ring shall have a capacity of 10G. Access layer switches will also be installed at rotaries and other project areas inside cabinets in order to connect field devices. Access switches will also be installed inside RMU rooms as per requirement and feasibility of the Project.

Field Devices

Field devices shall consist of CCTVs, Wi-Fi Access Points, Variable Message Displays, Environmental sensors, Public Interactive Kiosks and any other device as applicable. These devices will be connected to the field switch. A ring of 1G will be formed by connecting adjacent field switches with each other.

BR - 1 Business Requirements

BR 1.1	End-to-end city-wide fibre connectivity is required as a part of the project to support the smart city functions and enhance the quality of services for the citizens.
BR 1.2	DMIC IITGNL shall own all end-to end fibre infrastructure including trench, duct, fibre, splices, and other accessories and will become a dark fibre provider for all IIT right of way.
BR 1.3	The fibre optic infrastructure shall be utilized by DMIC IITGNL as well as other city agencies (upon approval of DMIC IITGNL) as a common ICT infrastructure.
BR 1.4	Overall network shall be divided into three (3) parts: core (Backbone), distribution and access networks. DMIC IITGNL to provide end-to-end backbone and distribution networks for all purposes along with access network for field devices. For access networks to plot, depending on the plot type, it will be a combination of DMIC IITGNL and respective plot developer that will provide this network.
BR 1.5	There will be two (2) Point of Presence (PoP) rooms that will be the co-location and aggregation facilities for an integrated high-speed network backbone. The PoP rooms will be the co-location spaces for both DMIC IITGNL network and non-DMIC IITGNL network (leased to various tenants). Each of these PoPs shall be connected over a dedicated high-speed backbone network that will support a carrier grade, ring based architecture. Each of the PoPs will provide dedicated connectivity using the distribution layer and serve a particular 'zone'. A 'zone' has a group of devices and plots that will ultimately be connected using the distribution and access network. Connecting the distribution layer, there will be the access layer i.e. the access network that will provide connectivity to the respective end-devices and plots.
BR 1.6	RMU (Ring Main Unit) room, Manholes and handholes shall be placed at strategic locations for the fibre optic infrastructure throughout the DMIC IITGNL RoW. These RMU rooms and manholes shall be used for placing the Fibre Optic Splice Enclosure (FOSC) while the handholes shall be used for pulling of fibre if required. These manholes and handholes will be under MSI's scope of work.
BR 1.7	Ring Main Unit (RMU) rooms are provided at majority of plot locations and shall be the fibre infrastructure entry point inside the plot. Also, this shall cater to current and future requirements of splice, active and passive device placement for the plots and field equipment's wherever required.
BR 1.8	Manholes shall be provided at splice location (where ever required) which shall cater to current and future splice requirements.
BR 1.9	Handholes shall be provided at all corners of a junction and where a 180-degree bend occurs for the duct (in the scenario of open trench), subject to the site conditions.

BR 1.10	DMIC IITGNL shall provide Point of Presence (PoP) rooms to the TSPs and other tenants and lease out space to them.
BR 1.11	For the TSPs, and other tenants, only the 'bare-shell' infrastructure (including at least one light point and room DB) in the PoP shall be provided as a part of this Project. The TSP's/tenants shall be responsible for using this 'bare-shell' infrastructure space and provide all their required actives inside their dedicated space.
BR 1.12	The overall network architecture shall support a ring for backbone and distribution communication network. Maximum number of rings per pair of fibre shall depend on the detail design. All rings shall be dual home-based architecture.
BR 1.13	DMIC IITGNL network shall be reliable, interoperable, open standards based, available and resilient. It shall be scalable, manageable, supporting segregation of traffic and sustainable. It shall also generate revenue for DMIC IITGNL.
BR 1.14	All backbone electronics shall be sized with sufficient capacity to support the redundancy and future traffic growth in order to complete traffic rerouting on the backbone in event of a fibre or switch failure without impacting overall network performance.
BR 1.15	For distribution architecture, all IIT plots will have redundant entry and exit fibre paths for connectivity until the plot levels with redundant FOSCs and single switch at the telecom room of the building.
BR 1.16	For distribution architecture, all non-DMIC IITGNL plots will have single entry and exit fibre path for connectivity until the plot level with single FOSC at plot RMU room.
BR 1.17	As DMIC IITGNL is being developed as one of the first greenfield industrial smart cities, high priority is placed on the city's ICT infrastructure to be a key enabler in providing modern triple play services to the citizens. As part of the ICT infrastructure, DMIC IITGNL will provide the entire passive infrastructure i.e. dark fibre infrastructure for TSPs and other tenants for both backbone and distribution network.
BR 1.18	All splicing for distribution network of TSPs and other tenants shall be the responsibility of the respective TSPs and tenants under the supervision of DMIC IITGNL.
BR 1.19	DMIC IITGNL needs to be registered with DoT as Infrastructure Provider Category I (IPI) to establish and maintain the assets such as Dark Fibres, Right of Way, Duct Space and Tower for the purpose to grant on lease/rent/sale basis.

FR - 1 Functional Requirements

FIBRE OPTIC CIVIL INFRASTRUCTURE- TRENCH/ DUCT/ HANDHOLE/ MANHOLE	
FR 1.1	The backbone and distribution trench for 80m, 60m, 45m, 30m Right-of-Way (RoW) – In this case, there shall be a concrete encased trench that will be provided by the EPC Contractor along the road.
FR 1.2	The ICT trench (500mm x 600mm) for the fibre optic infrastructure for backbone and distribution network shall be provided by EPC Contractor. The MSI shall use this ICT trench for the fibre optic infrastructure and coordinate with the EPC Contractor.
FR 1.3	The access trench/ path shall be provided by MSI for plot and connectivity to every field device (wherever required).
FR 1.4	The manholes and handholes including those required inside the IIT plots shall be provided by the MSI.
FR 1.5	The handholes shall be sized per minimum 0.5m x 0.5m x 0.5m (l x w x d) inside clear space.
FR 1.6	The manhole shall be sized per minimum 1.2m x 1m x 1m (l x w x d) inside clear space.
FR 1.7	The fibre optic cable shall be installed inside dedicated Permanently Lubricated (PLB) High Density Polyethylene (HDPE) smooth wall configuration ducts inside the trench. These HDPE ducts shall be sized to provide sufficient future growth capacity for DMIC IITGNL.
FR 1.8	HDPE duct shall be laid throughout IIT using both the concrete encased trench and open trench (wherever required).

FR 1.9	The HDPE duct shall be suitable for underground fibre optic cable installation by blowing as well as conventional pulling.
FR 1.10	The HDPE duct shall be suitable for laying in RCC trench, trenches by directly burying, and laying through trenchless digging i.e. Horizontal Directional Drilling (HDD).
FR 1.11	MSI shall be responsible for laying minimum of 2 Nos. of 110 mm (2 x 110mm) HDPE duct for connecting RMU room, Admin building, PoP rooms or any other building with ICT concrete trench for laying fibre optic infrastructure. Minimum count of 2 Nos. of 110 mm HDPE duct may vary at certain location during the design validation stage.
FR 1.12	There are three (3) types of ducts for fibre optic laying to fulfil the end-to-end connectivity of the ICT infrastructure: <ul style="list-style-type: none"> 10 times 1x40mm (OD) HDPE ducts for backbone, distribution and access infrastructure; 1x40mm (OD) HDPE duct for last mile connectivity. 2x110mm (OD) HDPE duct for access connectivity between ICT Trench and RMU room and PoPs.
FR 1.13	The tentative colour allocation for the backbone/distribution ducts are: <ul style="list-style-type: none"> 4x40mm aqua colour for TSP; 1x40mm orange for Field and Plot devices; 2x40mm blue for backbone; 3x40mm slate for future expansion; and 1x40mm green for last mile connectivity.
FR 1.14	All HDPE ducts shall be colour coded as per EIA/TIA 598 standard.
FR 1.15	For access infrastructure to plots, there shall be two (2) scenarios: <ul style="list-style-type: none"> For DMIC IITGNL plots, there will be dedicated connectivity required between the RMU room and respective plot's Main Telecom Room (MTR). This connectivity will be provided using the 1x40mm HDPE duct configuration. In case of non-availability of dedicated connectivity, the MSI shall provide access connectivity (access route) till MTR of DMIC IITGNL plot. For non-DMIC IITGNL plots, there will be dedicated connectivity required between the RMU room and respective plot's Main Telecom Room (MTR). This connectivity will be provided using the 1x40mm HDPE duct configuration and this shall be the responsibility of plot owner
FR 1.16	For field device connectivity, each device shall have dedicated 1x40mm HDPE duct for last mile network.
FR 1.17	The duct shall have in-built crush and rodent protection chemical at outer sheath of every duct.
FR 1.18	HDPE Duct should have "DMIC IITGNL" marked at every 1 mtrs.
FR 1.19	For Utility Plots, Manhole, Handhole and open trench along with FOSC etc. will be in the scope of MSI.
OPTICAL FIBRE CABLE	
FR 1.20	The DMIC IITGNL fibre optic network shall have an overall Fibre-to-the-X (FTTX) architecture.
FR 1.21	End-to-end fibre optic infrastructure shall include only single mode Optical Fibre Cable (OFC), loose tube, non-metallic (Dielectric) armoured cable configuration rated for outdoor & underground installations.
FR 1.22	All fibre optic cable shall be ordered in standard tube and colour configuration based on EIA/TIA 598.
FR 1.23	Each of the PoP rooms shall be connected over a dedicated 24 count fibre optic cable. This cable shall only be used for backbone communications and will not be field spliced. It will only be terminated at the PoP and will have redundant entry and exit paths to both the PoPs for inside plot (Wherever available). This 24 count fibre optic cable shall be provided in six (6) separate tubes i.e. 4 count per tube.
FR 1.24	For distribution to plots and field devices, a dedicated 48 count fibre optic cable will be provided end-to-end in the respective zone. For DMIC IITGNL field equipment, it is expected that a lot of the field devices will be co-located i.e. leverage the same field infrastructure for mounting and use the same

	<p>network switch. It is expected that the field devices like Wi-Fi and CCTV will share the same poles and will be connected over a ring architecture.</p> <p>All 48-count distribution fibre shall be ordered with fibre in eight (8) tubes with 6 count per tube.</p>
FR 1.25	For the TSPs and other tenants, a dedicated 24 count fibre optic cable shall be provided for each tenant. This will be provided with fibre in six (6) tubes i.e. 4 count per tube.
FR 1.26	<ul style="list-style-type: none"> For DMIC IITGNL plots, access network shall have dedicated 12 count fibre optic cable from the manhole/RMU room to the respective MTR. This will be ordered with 4 count per tube configuration. For non-DMIC IITGNL plots, access network of fibre cable including FOSC and cable shall be provided either by the Telecom Service Providers or the Plot Holder between MTR of the plot and the IIT RMU room/manhole. For DMIC IITGNL device connectivity, access network shall be provided via dedicated six (6) count fibre optic cable per network switch.
UTP COPPER CABLE AND ACCESSORIES	
FR 1.27	Outdoor-rated Unshielded Twisted Pair (UTP) Communications Category (CAT) 6 Cable to provide Ethernet connectivity between network switches and end devices such as CCTV, Wi-Fi, etc. located within 90 m from the switch location.
FR 1.28	The UTP cable shall be outdoor-rated UTP CAT 6 cable.
FR 1.29	Wherever installed, the UTP cables shall be supplied with either in-built surge suppressor or shall have additional surge suppressors.
FR 1.30	Each conductor of the UTP cable shall be insulated with a coloured high density polyethylene jacket with varying twisted length to minimize crosstalk.
FR 1.31	Additional accessories to include CAT 6/7 Patch Cords required for data communications connections, CAT6/7 Patch Panels for cable termination and Surge Suppressors for protection from voltage spikes as per the design requirements.
FR 1.32	The UTP patch panels shall be sized to support the design requirements as per the RFQ cum RFP. At least 50% of the capacity of the patch panel ports shall be left as spare.
FR 1.33	The surge arrestor shall be such that they do not interfere with normal communications.
FR 1.34	The termination shall protect the cable terminations from water and mechanical damage and shall be resistant to salt corrosion.
FR 1.35	Any provided patch panel or wall plate shall provide mechanical support for all connections enclosed and shall maintain insulation between them.
FR 1.36	All cable entries shall be provided with appropriate cable pathway.
FIBRE OPTIC ACCESSORIES	
FR 1.37	<p>Optical Connectors:</p> <p>Optical connectors shall be used to terminate optical fibre for their interconnection and distribution.</p>
FR 1.38	<p>Fibre Patch cords:</p> <p>Fibre Patch cords shall be used to connect Fibre Termination Panel to the network switch.</p>
Fibre Distribution Management System (FDMS)/Optical Cable Entrance Facility (OCEF) and Fibre Termination Panels	
FR 1.39	OCEF/FDMS shall be installed at the PoPs and shall be used to manage all fibre entry/exit inside all POPs.
FR 1.40	The OCEF/FDMS shall be equipped with splice trays to accommodate the requirement of this Project.
FR 1.41	The OCEF/FDMS shall have built in slots to secure fibre and management clips to hold spools of slack fibre.
FR 1.42	The OCEF/FDMS shall have identification labels inside the door.

Fibre Optic Patch Panel	
FR 1.43	Fibre Optic Patch Panels shall be installed at termination location at PoP, DMIC IITGNL plots and at every field switch location installed on the pole or cabinet.
FR 1.44	The Patch panels shall be capable of supporting SC/ST/LC type ports for backbone, distribution and access network.
FR 1.45	The Patch panels shall have the capacity for terminating the number of fibre as required per the requirements of the Project plus additional 20% spare for future.
FIBRE ASSET MANAGEMENT	
FR 1.46	With implementation of a fibre optic network, there is a requirement to create a fibre asset management system for management of the infrastructure.
FR 1.47	The fibre asset management system shall be a purposeful-built tool that will allow mapping of all fibre counts in terms of count colour, number and allocation (entity or device) among other variables.
FR 1.48	Fibre asset management system shall be configurable and easy to operate and update. It is expected that post any implementation of the fibre optic infrastructure, this asset management system shall be updated on an on-going basis.
ACTIVE ELECTRONICS (SWITCHES, MEDIA CONVERTERS)	
FR 1.49	Access layer shall be created using Industrial grade access switch, POE/POE+ enabled (as per detailed solution designed by MSI). These switches shall be installed at the field for connectivity to field devices and shall have minimum 1 Gbps backhaul fibre support.
FR 1.50	Distribution layer shall be created using, distribution switches installed per POP for connectivity to field access switches. This switch shall also connect with core network for backbone connectivity between PoPs and Core Network (core router and core switch) and shall have 40 Gbps backhaul fibre support.
FR 1.51	Any attenuators required as part of the overall solution shall be provided by the MSI. Note that all fibre optic SFPs shall be ordered to support minimum 10 km distance for distribution and combination of 10km and minimum 25 km or more for backbone depending on the distance requirements. This shall be validated by the MSI during the design stage.
FR 1.52	Core router for connectivity to the outside world i.e. for worldwide web services and for connectivity to the cloud service provider.
FR 1.53	The overall architecture of the system is such that there will be a ring configuration between all PoPs i.e. for Layer 3 switches
FR 1.54	The switches from any one vendor shall be interoperable with other brands.
FR 1.55	Communications Media Converter to be installed, if required, on a per device basis where the distance between the IP enabled device and the respective switch is greater than 90m.
FR 1.56	The Communications Media Converter shall enable fibre to copper and copper to fibre media conversion for IP enabled devices. MSI may also use an Ethernet extender as an alternative to the Media converter based on prior permission from DMIC IITGNL.
FR 1.57	All the active devices shall enable security features in the network switches to disallow any unauthorized access to the port / network.
ENTERPRISE MANAGEMENT SYSTEM (EMS)	
FR 1.58	<p>The proposed solution shall provide at a minimum the following functions:</p> <ul style="list-style-type: none"> • Configuration Management; • Fault Management; • Incident, Problem and Change Management; • Asset Management; • Remote Control; • SLA Management & Monitoring;

	<ul style="list-style-type: none"> • Performance Management; • Monitoring Backup and Management; • Event Management; • Server, Storage and other Infrastructure Management; • Monitor Network Components of the LAN & WAN; • Network Link Monitoring; • Monitoring cloud hosting, as applicable. • Helpdesk Monitoring, Management And Reporting; And • Traffic analysis.
FR 1.59	The proposed solution shall facilitate the retrieval, storage, analysis and display of status information from all network devices attached to the system that are SNMP and/or ICMP capable.
FR 1.60	The proposed solution shall provide the ability to view the network and its associated IP SNMP/ICMP enabled devices including switches and other IP devices connected over the network. It shall support a minimum of 1000 end points at day 1 and shall be scalable up to 5000 end points to cater future requirements.
FR 1.61	The proposed solution should include all hardware and software required to configure, control and monitor the network connected SNMP/ICMP based devices.
FR 1.62	The proposed solution shall be able to support the proposed hardware and software components (IT and Non-IT) deployed over the tenure of the Contract. The EMS shall be capable of providing early warning signals to the Helpdesk Agents on the performance issues, and future infrastructure capacity augmentation. The EMS shall also support single pane / dashboard with visibility across multiple areas of applications for monitoring.
FR 1.63	The proposed solution shall provide discovery & inventory of physical network devices and other IP devices.
FR 1.64	The proposed solution shall be able to generate utilization of physical as well as virtual servers.
FR 1.65	The proposed system shall be able to perform real-time or scheduled capture of device configurations.
FR 1.66	The proposed system shall also provide features to capture, view & upload network device configuration.
FR 1.67	The proposed system shall be able to auto-discover the network including the network elements.
FR 1.68	The proposed system shall employ Graphical User Interface that allows users to manage the network through a multilevel window. (i.e. Network and Sub networks Maps window).
FR 1.69	The proposed system shall include the ability to download software loads, activate new software loads, or get information about the active software load).
FR 1.70	The help desk shall be a web enabled management system with SMS and email based alert system for the Helpdesk Call management and SLA reporting.
FR 1.71	Help desk facility shall be provided through Toll-free lines, landlines, helpdesk tool, E-mail, direct walk-in etc.
FR 1.72	The Help desk shall log user calls related to system and assign an incident/ call ID number. Severity shall be assigned to each call as per the SLAs.
FR 1.73	Help desk shall track each incident / call to resolution. Escalate the calls, to the appropriate levels, if necessary as per the escalation matrix agreed upon with Authority/authorized entity.
FR 1.74	Help desk shall analyze the incident / call statistics and provide monthly reports.
POINT OF PRESENCE (POP)	
FR 1.75	PoP facilities are co-location spaces for both DMIC IITGNL and non - DMIC IITGNL infrastructure.
FR 1.76	Each PoP shall typically serve approximately 1 to 2 sq.km area.

FR 1.77	All POPs shall be telecommunications grade facilities built for 24x7 operations. They should support a raised floor based design.
FR 1.78	Primary PoP will serve as a primary hosting & backup for the support of all DMIC IITGNL applications that require local servers, and data storage (example CCTV) along with networking equipment and fibre terminations. It will also serve as the termination point for distribution fibre networks as well as nodes on the core backbone communications ring that supports intra-PoP communication. In addition, it will also be the telecom point of entrance to DMIC IITGNL and will house the respective service providers' equipment.
FR 1.79	Secondary PoP will serve as the termination point for distribution fibre networks as well as nodes on the core backbone communications ring that supports intra-PoP communication. In addition, it will also serve as the telecom and cellular service providers' plus other tenant co-location facility and may also serve as their entry point to DMIC IITGNL. In addition, it will also be the telecom and cellular service providers' point of entrance DMIC IITGNL and will house the respective service providers' equipment.
FR 1.80	Secondary POP building shall have separate partitioned rooms for minimum 5 tenants including DMIC IITGNL & separate electrical room.
FR 1.81	Separate access for DMIC IITGNL, TSP's and other tenants shall be required in the building. Bare shell infrastructure will be provided to all tenants within the POPs.
FR 1.82	Each PoP area shall have Security surveillance using fixed CCTV that record entry and exit to prevent unauthorized entry as well as access control functionality along with electronic door locks.
RODENT REPELENT SYSTEM	
FR 1.83	The entry of rodents and other unwanted pests shall be controlled using non-chemical, non-toxic devices. Ultrasonic pest repellents shall be provided in the false flooring and ceiling to repel the pests without killing them. However, periodic pest control using chemical spray shall be conducted once in a quarter as a contingency measure to effectively fight pests.

TR - 1 Technical Requirements

HDPE DUCT	
TR 1.1	At a minimum the HDPE duct shall meet or exceed the applicable industry standards as listed below: <ul style="list-style-type: none"> • TEC specification as well as IS:4984- 1995 for HDPE duct (For hydraulic characteristic only); • ISO standards (ISO 9001, ISO 14000); • ASTM D1693, D790, D1712, D4565, D2240, D638, D648, F2160, G154; • IS 2530, 4984, 7328, 9938, 12235(Part-9), 14151(Part-1); • TEC specifications; and • Other standards as detailed in this specification.
TR 1.2	The HDPE ducts shall be installed end-to-end across IIT. They will be used for backbone, distribution and access communications.
TR 1.3	The HDPE ducts shall be ordered in different configurations and colours as detailed in the functional requirements. These colours shall be maintained throughout the useful life of the duct.
TR 1.4	The 40 mm (OD) with 3.5mm+/-0.2 mm wall thickness coildable HDPE ducts shall be of smooth configuration and shall be suitable for outdoor underground installations.
TR 1.5	All HDPE ducts shall be continuous. Where the duct reel ends, the HDPE ducts shall be joined using approved industry standard couplers. Where couplers are used, they shall be single piece HDPE coupler which shall be used to provide water proof and air proof secure fit in accordance with the manufacturer's recommended procedure for joining ducts.
TR 1.6	The duct sweeps shall not exceed 180 degrees for the sum total of duct sweeps for a section of duct between duct termination points.

TR 1.7	The duct shall be free from visual defects like blisters, shrink holes, flaking, scratches groove lines & roughness.
TR 1.8	The duct shall have in-built crush and rodent protection.
TR 1.9	Minimum Bending Diameter shall be at least 15 times of outer diameter (OD) of the duct or as per standard manufacturer recommendations.
TR 1.10	Bending Performance: There shall be no damage when mounted on a mandrel of duct diameter for 30 minutes.
TR 1.11	In the HDPE Duct, the coextruded inner layer of solid permanent lubricant shall be integral part with HDPE and white in colour, clearly visible in cross section of duct. The inner lubricant material shall be of friction reducing, polymeric material & should be min. 10% of wall thickness. The lubricant materials shall have no toxic or dermatic hazards for safe handling.
TR 1.12	The coil shall be at least 500 meters in length. During supply, Coil shall be covered with suitable rapping material to avoid the physical and printing damages.
TR 1.13	<p>The HDPE ducts shall be supplied in reels or coils after sealing both ends by end caps. The following markings shall be provided on each packing:</p> <ul style="list-style-type: none"> • Code of product; • Name of Manufacturer; • Date of manufacturing; • Length of PLB HDPE duct; • Dimension of Outer diameter and Inner diameter; and • Client's name.
TR 1.14	<p>All the duct shall be clearly marked with indelible ink at intervals of 1 meters with the following data which is not less than 5 mm high. Neither the colour of the duct nor the marking printed inscribed on it shall change or fade away throughout the life time of the duct. The details of marking on duct shall be approved by DMIC IITGNL before commencement of manufacturing:</p> <ul style="list-style-type: none"> • DMIC IITGNL with logo; • Manufacture's name or trade mark; • Year and month of manufacturing; • Type of PLB HDPE duct and size; and • Running length marking.
Laying of PLB HDPE Duct in Open Trench (wherever applicable, if any, as per site requirement)	
TR 1.15	HDPE ducts shall be laid in open trench for access to plots/devices.
TR 1.16	The duct trench shall be dug as per route plan (indicating the various dimensions and other details of the trench) approved by the DMIC IITGNL for each type of soil type.
TR 1.17	Due care and precaution during excavation shall be taken to avoid possible damage of any other underground plans/facilities in the proposed underground PLB HDPE Duct route and shall indemnify DMIC IITGNL for all damages and shall be solely responsible for all the damages and losses.
TR 1.18	The minimum depth at which the duct shall be laid will be in compliance with DOT norms and telecom best practices.
TR 1.19	No blasting is permitted near permanent work or dwellings. Blasting shall be so made that pits are as close to the designed dimensions as practicable.
TR 1.20	The width of trench at the top and bottom shall be adequate for proper installation of PLB HDPE ducts with required quantities.
TR 1.21	The trench depth shall be measured from the bottom of the trench. Trench shall be located at the lowest point of lower area, if possible.

TR 1.22	In case of uneven ground, the MSI ensure that the bottom of the trench is not uneven, the MSI shall maintain minimum depth of the trench as per specifications and may be required to increase the depth at some locations and provide a suitable gradient in the trench.
TR 1.23	The backfilling and compacting of trench in layers of 200 mm, restoration of road, nalla, pavements etc. after the completion of laying work.
TR 1.24	Provided that the PLB HDPE ducts has been properly laid and jointed in the trench, and the back filling operation shall follow as closely as practicable.
TR 1.25	The back filling operation shall be performed in such a manner as to provide firm support under and above the PLB HDPE duct and to avoid bend or deformation of the PLB HDPE duct, when the PLB HDPE duct gets loaded with the back filled earth.
TR 1.26	Where in any location the back filling is unevenly centred over the trench due to carelessness or any other cause, it shall be redressed at the MSI's expenses.
TR 1.27	No debris shall be allowed in backfill at any time.
TR 1.28	At locations where the backfill material contains hard rocks, rock fragments and other hard materials which may cause damage to the pipe and where rock has been excavated from the trench and it is intended to refill the trench, the trench shall be initially filled. De-rocked loose earth above the top of the duct shall be screened through a suitable mesh if so required and backfilling only thereafter be completed and finished with excavated material.
TR 1.29	In case of road crossing via micro trenching and its restoration shall be under the scope of MSI.
Laying of PLB HDPE Duct in RCC Trench	
TR 1.30	RCC Trench shall be provided by the EPC Contractor. MSI shall lay the HDPE duct for fibre inside this RCC Trench end-to-end.
TR 1.31	Any core cutting required to exit / enter this RCC trench for ICT requirements shall be provided by the MSI.
TR 1.32	There shall be a total of Ten (10) HDPE ducts which shall be installed in ICT trench. Out of these Ten (10) HDPE ducts, the Duct shall be installed in a bundle of Two (2) for 10 HDPE ducts holding through cable tie at every minimum 2 mtr. of distance.
Other Installation Requirements	
TR 1.33	During transportation and storing at the site duct, it is necessary to seal the ends of the duct with proper End caps against water penetration or other impurities.
TR 1.34	When installing duct in an open trench from a drum, it should be uncoiled from the bottom and not from the top of the drum.
TR 1.35	The MSI shall be responsible for any core cutting required in the concrete trench for cable entry/exit
TR 1.36	The MSI shall be responsible for providing connectivity between ICT trench and RMU room, Admin building, PoP rooms or any other building through 110 mm HDPE Duct. Last mile access connectivity between ICT trench till respective RMU rooms, PoPs, Admin building shall be under MSI scope.
TR 1.37	The fill ratio of the duct shall be in compliance with the National Electric Code (NEC) standard NFPA 70, ANSI/TIA 568 and ANSI/TIA 569.
TR 1.38	When placing multiple ducts in a single trench simultaneously, it is important not to cross or twist the ducts inside the trench, when installing large quantities of ducts, it is possible to stack them one on top of the other in addition to side by side.
TR 1.39	Positioning of the ducts must be designed in the planning stage to ensure clarity between ducts placement.
TR 1.40	When placement of the duct is completed, and connections of the duct ends are deferred to a later stage, it is advised to overlap duct ends by one meter from each side.

TR 1.41	Both ends of the duct must be properly sealed with end plug to prevent water, dust or any other foreign particle from entering into the duct.
TR 1.42	Pump out water, if any, from the trench before placement of duct.
TR 1.43	Whenever tree roots are found in the trench make sure to lay the ducts under the tree roots and not the above.
TR 1.44	Place the duct along the trench as straight as possible.
TR 1.45	Tightly close the ends of the ducts with self-tightening End Plug so that no dirt, dust or moisture into the duct.
TR 1.46	No spacer will be used however the duct should be tied together with cable tie at an interval of 2 meter positively so as to keep them together.
TR 1.47	<p>Installation of Plastic Couplers:</p> <ul style="list-style-type: none"> • Cut the duct at the same place where they overlap. Cutting should be done in such a way that the duct end matches with each other perfectly because it is very important for the coupling joints to be airtight. • Proper pipe shears or cutters must be used for smooth cutting. Do not use a hacksaw to cut the duct. • Deburr both the inside and the outside edges of the duct with a deburring tool. • Apply a small amount of proper lubricant (liquid detergent) for better installation of plastic couplers. • Tighten the plastic coupler with C-Spanner.
TR 1.48	<p>End Plug:</p> <ul style="list-style-type: none"> • Close the ends of duct with end plugs so that moisture, dirt and dust do not enter inside the duct. • It seals the duct ends completely and prevents air, moisture from entering the duct, ever when it is laid underground. • Further interior surface of empty ducts also remains clean even after several years. • Inspect the Neoprene Rubber for various defects such as pin holes, cuts, etc. In case of any such defect, replace the rubber gasket with a new one.
TR 1.49	<p>Warning Tape: (Only for Open trench Scenario)</p> <ul style="list-style-type: none"> • This warning tape shall be provided above the telecom duct throughout the route (for open trench only) at a depth of 50% of total trench depth. • Warning tape should be made of HDPE or LDPE (Low Density Poly Ethylene) and other inert material and shall be either bright yellow or orange in colour. • The thickness of tape shall be 1 mm and minimum width 150 mm with life of 25 years. • Neither the colour of tape nor the marking printed inscribed on it shall change or fade away throughout the life time of tape. • The tape should contain a printed message in English "WARNING DMIC IITGNL OFC".
TR 1.50	<p>Duct Route Indicators:</p> <ul style="list-style-type: none"> • Prefabricated or Precast RCC duct route Indicators are needed to be placed on the Duct Route for open trench. • The route indicator shall be made of RCC material. It shall have embedded on both sides "DMIC IITGNL OFC". • The route indicator shall be provided based on standard DOT practices. • Route indicators shall be fixed at every 50 meter interval in city area and at both ends of the road crossing for open trench only. • Route Indicator shall be installed at three route layer Viz. Core/Distribution /Access.

Testing: Following testing specific to HDPE duct shall be met. For other testing requirements, refer to the testing section.	
TR 1.51	<p>Factory Testing Requirements:</p> <ul style="list-style-type: none"> • Factory acceptance tests shall be conducted on randomly selected final assemblies of all equipment to be supplied. Visual inspection shall be carried out on 100% basis for all the equipment/items offered. Factory acceptance testing shall be carried out on PLB HDPE and accessories. • From each batch PLB-HDPE duct presented by the MSI for Factory acceptance testing, the DMIC IITGNL shall select random sample (s). • The following tests shall be carried out during Factory Acceptance Testing (FAT): <ul style="list-style-type: none"> ➤ Visual Inspection; ➤ Dimension Check; ➤ Hydraulic Characteristics; ➤ Reversion Test; ➤ Tensile Strength and Elongation Test; ➤ Environmental Stress Crack Test; ➤ Impact Strength Test; ➤ Crush Resistance; ➤ Mandrel Test; ➤ Ovality Test; ➤ Coil Set Test; ➤ Internal Co-efficient of Friction; ➤ Ash content; ➤ Colour fading; ➤ Optical Fibre Cable Blowing Test; ➤ Air Pressure test on plastic coupler and ➤ Ageing test on accessories. • Dimensional test shall be carried out on 10% sample of the respective lot. • In case any of the selected samples fail, the failed sampled is rejected and additional 20% samples shall be selected randomly and tested. In case any sample from the additional 20% also fails, the entire batch or OEM may be rejected.
TR 1.52	<p>Duct Integrity Test Procedure: After laying the Duct network, HDPE ducts shall be tested for proper laying, crush, deformity and pressure testing. The MSI shall have to remove the obstruction/deformity of any kind before handing over of the Duct network to client.</p>
Following tests are to be carried out on the laid HDPE duct:	
TR 1.53	<p>Duct Cleaning (Sponge Test):</p> <ul style="list-style-type: none"> • Compressed air should be blown through the duct in order to remove any dirt and water that has accumulated inside the duct with the help of suitable capacity Air Compressor. • A short blast of air about 2-3 bar shall be blown through the duct for about 2 minutes. • Sponge will be blown through the duct to thoroughly clean the duct from inside.
TR 1.54	<p>Crush and Deformity Test:</p> <ul style="list-style-type: none"> • This test is to be done to check the integrity of the duct. • During installation, while backfilling process there is a possibility of flattening, twisting or kinking of the duct. • This is also possible if the duct has not been uncoiled properly and is laid improperly.

	<ul style="list-style-type: none"> Place the wooden shuttle in the duct. Note: Shuttle should be 80% of inner diameter of the duct and 150 mm in length. Connect the Compressor pipe fitting to the duct. Place the flexible wire grip to the downstream end of the duct. Connect the air hose supply to the compressor and the equipment. Open the discharge valve of the compressor and blow the shuttle through the duct. Note: The shuttle will pass through at a very high speed and must be trapped in flexible wire grip to avoid accident and injury.
TR 1.55	<ul style="list-style-type: none"> Mandrel/Shuttle Test – A mandrel/shuttle of at least 90% of the inside diameter size shall be passed through the duct to test the clear pathway of the duct.
TR 1.56	<p>Pressure Testing:</p> <ul style="list-style-type: none"> This test is carried out to detect leakage in duct, if any. Seal one end of the duct with End Coupler and then through End Coupler with valve, feed the compressed air into the duct. Raise the pressure up to 5 Bar and then observe. After observing for 30 minutes, pressure drop of up to a max. 0.5 Bar is permissible.
110 MM (OD) HDPE DUCT (PE100)	
TR 1.57	<p>At a minimum the 110 mm (OD) HDPE duct shall meet or exceed the applicable industry standards as listed below:</p> <ul style="list-style-type: none"> Reference Standard for Testing Is : 4984-2016 With Latest Amendment
TR 1.58	The internal and external surface of the 110 mm HDPE duct shall be smooth, clean and free from grooving and other defects.
TR 1.59	All 110 mm HDPE ducts shall be of black or grey colour.
TR 1.60	<p>The 110 mm HDPE duct shall have the outdoor diameter as below:</p> <ul style="list-style-type: none"> Min. 110.0 mm; Max. 110.7 mm.
TR 1.61	The 110 mm HDPE duct shall have the ovality as a maximum of 2.2 mm.
TR 1.62	The wall thickness of 110 mm HDPE duct shall be min. 5.3 mm to max. 6.0 mm as a minimum.
Physical Properties	
TR 1.63	The reversion test of 110 mm HDPE duct shall not be greater than $\pm 3\%$.
TR 1.64	The carbon black content of 110 mm HDPE duct shall be as a minimum $2.5 \pm 0.5 \%$
TR 1.65	Dispersion of carbon black shall be satisfactory of 110 mm HDPE duct.
TR 1.66	MFR of 110 mm HDPE duct shall not deviate from the MFR of the resin by more than 30 percent.
TR 1.67	Oxidation Induction Time (OIT) of 110 mm HDPE duct Shall be not less than 20 min.
TR 1.68	The 110 mm HDPE duct shall have density (base) of 930 to 960 kg/m ³ .
TR 1.69	The 110 mm HDPE duct shall have elongation at break of ≥ 350 Percent.
Mechanical Properties	
TR 1.70	<p>Hydraulic Characteristics Test Duration:</p> <ul style="list-style-type: none"> 48 hrs. Test Temp: 80°C Induced Stress: 5.7 MPa Shall show no signs of localized swelling, leakage or weeping and shall not burst during the prescribed test period.
TR 1.71	<p>Hydraulic Characteristics Test Duration:</p> <ul style="list-style-type: none"> 165 hrs. Test Temp: 80°C Induced Stress: 5.4 MPa

	<ul style="list-style-type: none"> Shall show no signs of localized swelling, leakage or weeping and shall not burst during the prescribed test period.
MANHOLE	
TR 1.72	Manholes shall be placed at strategic location finalised as per the approved OFC network drawing prepared by MSI.
TR 1.73	MSI shall be responsible to prepare the manhole drawing & take the approval from client, before starting execution at site.
TR 1.74	Manhole(s) shall be capable of withstanding the required load based on the actual site conditions.
TR 1.75	The top of manhole should be flushed with the ground level.
TR 1.76	The manholes shall be placed on properly compacted surface to ensure uniform distribution of soil pressure on floor.
TR 1.77	Manhole shall be pre cast RCC square type with minimum wall thickness of 100mm and shall include 6mm diameter or more steel reinforcement.
TR 1.78	The bottom of manhole shall be baseless with minimum 50mm thick (Plain Cement Concrete) PCC and minimum internal clearance shall be 1200mm (L) x 1200mm (W) x 1000mm (D).
TR 1.79	The manhole shall have suitable excess from cable trench and sufficient holes/ cutouts in all walls for PLB HDPE duct entries and exits.
TR 1.80	All PLB HDPE duct entries, cable entries and holes/ cutouts shall be properly sealed. The holes shall be not more than 6mm larger than the outer diameter of conduit (sleeve). Seal conduit ends inside all manholes with at least 50mm thick duct caulking after fibre is installed. Seal vacant conduit with a manufacturer end plug and attach detectable pull tape.
TR 1.81	Seal conduit ends inside all manholes with at least 50mm thick duct caulking after fibre is installed. Seal vacant conduit with a manufacturer end plug and attach detectable pull tape.
TR 1.82	The manhole cover shall be heavy duty water tight FRC type. However, for easy handling purpose, the cover shall be constructed with suitable arrangement for lifting.
TR 1.83	All covers shall be manufactured with the markings "DMIC IITGNL OFC MANHOLE" in the logo area of the cover, in 25 mm recessed letters.
TR 1.84	Requisite brackets along with cable hangers for placing cable and splice box inside the manhole shall be provided and made of junk free material. The splice box shall be mounted vertically on the wall of the manhole.
TR 1.85	Manholes shall have capabilities to absorb water as per ASTM 570 or applicable BIS standards.
TR 1.86	All manholes shall have grounding halo installed that wraps the manhole and is connected to the ground rod. The halo shall be tin coated, copper ribbon that shall be anchored to concrete approximately 457mm to 610mm apart. The halo shall be bonded to ground rod with non-insulated 6 AWG solid copper conductor.
HANDHOLE	
TR 1.87	Handholes shall be placed at strategic location finalised as per the approved OFC network drawing prepared by MSI.
TR 1.88	The handholes shall be sized per minimum 0.5m x 0.5m x 0.5m (l x w x d) inside clear space.
TR 1.89	<p>The product shall meet or exceed the following American Society for Testing and Materials (ASTM) Standards:</p> <ul style="list-style-type: none"> ASTM C 857-95: Standard Practice for Minimum. Structural Design Loading for Underground Precast. Concrete Utility Structures; ASTM C 109: Standard Test Method for Compressive Strength of Hydraulic Cement Mortars; ASTM C 580: Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concrete;

	<ul style="list-style-type: none">ASTM C 496: Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens;ASTM C 543: Standard Specification for Pressure Vessel Plates, Alloy Steel, Quenched and Tempered Nickel-Chromium-Molybdenum andASTM C 1028: Standard Test Method for Determining the Static Coefficient of Friction.																								
TR 1.90	Handholes shall be made of medium duty HDPE with Polymer Concrete Lid.																								
TR 1.91	Boxes, rings and lids should sustain a minimum vertical test load of 33,500 lb (AASHTO HS 20 loading) as a stand-alone unit, over a 10-inch x 20-inch square steel plate centred on the cover and body in accordance with ASTM C 857-95 design load A-16.																								
TR 1.92	<table><tr><td colspan="3">The boxes, rings and lids shall meet the physical and chemical requirements listed in Table.</td></tr><tr><td colspan="3">Physical and Chemical Properties of Handhole components</td></tr><tr><td>Property</td><td>ASTM</td><td>Test Value</td></tr><tr><td>Compressive Strength</td><td>C 109</td><td>11,000 psi</td></tr><tr><td>Flexural Strength</td><td>C 580</td><td>1,800 psi</td></tr><tr><td>Tensile Strength</td><td>C 496</td><td>1,700 psi</td></tr><tr><td>Effects of Acids</td><td>D 543</td><td>Very Resistant</td></tr><tr><td>Effects of Alkalis</td><td>D 543</td><td>Very Resistant</td></tr></table>	The boxes, rings and lids shall meet the physical and chemical requirements listed in Table.			Physical and Chemical Properties of Handhole components			Property	ASTM	Test Value	Compressive Strength	C 109	11,000 psi	Flexural Strength	C 580	1,800 psi	Tensile Strength	C 496	1,700 psi	Effects of Acids	D 543	Very Resistant	Effects of Alkalis	D 543	Very Resistant
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TR 1.93	Holes for keeping service loops of duct shall be of suitable height and direction as per the Project requirements.																								
TR 1.94	Furnish lids that have a non-skid surface for pedestrian traffic with a minimum coefficient of friction of 0.50 in accordance with ASTM C 1028 without the use of coatings.																								
TR 1.95	All lids shall be manufactured with the markings “DMIC IITGNL” in the logo area of the lid, in 25 mm recessed letters.																								
TR 1.96	Lid access points shall have recessed reinforced steel pull slots to allow for the removal of the cover with a hook or lever. Replace the lid if damage occurs to the pulling point.																								
TR 1.97	Bolts used on handholes and lids shall be stainless steel, recessed hex head bolts with washer.																								
TR 1.98	The top of handhole shall be flushed with the ground level.																								
TR 1.99	All PLB HDPE duct entries, cable entries and holes shall be properly sealed.																								
TR 1.100	Seal duct ends inside all handholes with at least 50mm thick duct caulking after fibre is installed. Seal vacant duct with a manufacturer end plug and attach detectable pull tape.																								
TR 1.101	Handholes shall have capabilities to absorb water as per ASTM 570 standards. They shall be provided with sump holes or open bottom for water drainage.																								
TR 1.102	The handholes shall be installed with a minimum of 101mm layer of small rock in the bottom to prevent mud and wildlife (rodents) from intruding the handholes. The gravel shall help facilitate drainage.																								
TR 1.103	No handholes shall be installed under direct traffic load and shall be only suitable for installation at boulevards or areas where there is pedestrian movement.																								
TR 1.104	<div>The HDPE manholes shall have following markings provided on each unit:<ul style="list-style-type: none">Code of product;Name of Manufacturer;Date of manufacturing; andNamed as ‘DMIC IITGNL OFC HANDHOLE’.</div>																								
OPTICAL FIBRE CABLE (OFC) OR FIBRE OPTIC CABLE (FOC)																									
The Single mode optical fibre shall meet or exceed the following industry standards:																									
TR 1.105	ITU-T G.652-D Characteristics of a single-mode optical fibre and cable.																								

TR 1.106	ANSI/ICEA S-87-640-1999 - Standard for Optical Fibre Outside Plant.
TR 1.107	All applicable TIA/EIA standards for single mode fibre cable and those listed in these technical requirements.
TR 1.108	The fibre optic cable shall be single mode, loose tube dielectric armoured (glass yarn armouring) cable which shall be ordered in different fibre count and tube configuration as detailed in the functional requirements.
TR 1.109	The single mode optical fibre shall enable dual operating wavelengths at 1310nm and 1550nm nominal. The optical fibre shall be non-dispersion shifted.
TR 1.110	Single mode fibre shall have attenuation not greater than 0.36 dB/km at 1310 nm and 0.25 dB/km at 1550 nm.
TR 1.111	Single mode fibre shall have attenuation not greater than 0.36 dB/km at 1310 nm and 0.25 dB/km at 1550 nm.
TR 1.112	The single mode optical cable shall have the cladding diameter = 125.0µm ±1.0 and Mode Field diameter = 9.0µm ± 0.4.
TR 1.113	The single mode optical cable shall have polarization mode dispersion (PMD) coefficient ≤ 0.2 at 1310nm.
TR 1.114	Fibre attenuation measurements shall be made in the factory in accordance with EIA-455-78A for single-mode fibre. The spectral width of the source used to measure attenuation shall be less than 10 nm.
TR 1.115	When Optical Time Domain Reflectometer (OTDR) is used, measurements shall be made from both directions and the results shall be averaged.
TR 1.116	The attenuation of the single mode fibre shall be distributed uniformly throughout its length such that there are no point discontinuities in excess of 0.1 dB at 1310 nm or 1550nm wavelength. Fibre shall have no voids, air bubbles, or streaks in them. Factory splicing is not permitted. Attenuation Uniformity shall be measured in accordance with EIA-455-59.
TR 1.117	The Chromatic Dispersion of single mode fibre shall be measured in accordance with EIA-455-175 or EIA-455-168.
TR 1.118	The cut-off wavelength of cabled fibre shall be less than 1260 nm. The wavelength shall be measured according to EIA-455-170.
TR 1.119	The single mode fibre optic cable shall be dielectric armoured cable that shall be suitable for outdoor installations, with protection against crush and rodents.
TR 1.120	The minimum bending radius of the fibre optic cable shall be at least 15 times the diameter of the cable or better (static) and shall be at least 10 times the diameter of the cable or better (dynamic).
TR 1.121	Fibre optic cable shall be able to withstand a pulling tension of at least 2700N without any resulting damage.
TR 1.122	The optical fibre coating and/or buffer shall consist of materials that are environmentally stable in order to reduce long term effects of stress corrosion caused by moisture absorption. The coating shall be suitable for removal by industry standard mechanical stripping methods. No chemicals shall be required to strip the coating and/or buffer material.
TR 1.123	Colour coding of individual tubes and fibre shall be in accordance with EIA-598. The fibre colour coding shall be visible throughout the life of the cable. Colour concentrates or inks used to colour the optical fibre shall be heat stable and shall not be capable of permeating through the protective fibre coating causing transmission degradation of the optical fibre.
TR 1.124	All cable shall be supplied on wooden reels, with both ends of the cable accessible for testing. Each reel shall be clearly labelled with the cable code, length, and date of manufacture. All reels shall be protected with solid (2x4) wooden lagging, intended for export shipment.
TR 1.125	Material used in optical fibre cables must not support galvanic action. The core cladding shall be all glass that is predominately silica (SiO ₂). Phosphorus, if used as a dopant in the optical fibre, shall be limited to a minimum to reduce the potential effects on fibre attenuation due to hydroxyl ions.

TR 1.126	All fibre optic cables shall be spliced inside dedicated manholes as per the Project requirements. It is the scope of the MSI to provide any additional protection required to the fibre optic cable inside manhole as needed to meet the Project requirements.
TR 1.127	Cable Code and Length Marking shall comply with Telcordia GR-20 standards. This shall include sequentially numbered length markings in meters imprinted on the jacket, and this length marking shall not be reset to zero along the cable length.
TR 1.128	<p>Packing List supplied with each drum shall have at least following information:</p> <ul style="list-style-type: none"> • Drum No.; • Type of cable; • Physical length of cable; • No. of Fibre; • length of each fibre as measured by OTDR; • The cable factor- ratio of fibre/cable length; • Attenuation of each fibre at 1310 & 1550nm. • Users/consignee's name; • Manufacturers Name, Month, Year & Batch No.; • Cable ID; and • Group refractive index of Fibre.
TR 1.129	<p>All the cable shall be clearly marked with indelible ink at intervals of 1 meters with the following data:</p> <ul style="list-style-type: none"> • Manufacturer cable and ID code; • Year of manufacturer (cable); • Customer Name "DMIC IITGNL"; • Number of fibres and • SM (single mode).
TR 1.130	Dry water-blocking materials like water swellable tape shall be applied over the cable core to prevent the ingress of water, and movement along the cable sheath.
TR 1.131	Fillers may be included in the cable core to lend symmetry to the cable cross-section where needed. The buffer tubes shall be enclosed in a cable sheath as specified in this section.
TR 1.132	The cabled optical fibre shall maintain mechanical and optical integrity through an operational temperature range of 0°C to +70°C.
TR 1.133	The change in attenuation for single-mode fibre shall not be greater than 0.05 dB/km at 1310 nm and 1550 nm at the operational temperatures' limits.
TR 1.134	<p>Temperature cycling measurements shall be made in accordance with EIA-455-3A as per below:</p> <ul style="list-style-type: none"> • Storage Temperature: 0°C to 60°C; • Installation Temperature: 0°C to 55°C; and • Operating Temperature: 0°C to 70°C.
TR 1.135	The cable shall maintain its mechanical and optical performance for an in-service period exceeding 25 years. The MSI shall provide documentation proof to validate this.
TR 1.136	Lightning withstand current shall comply with Telcordia GR-20 standards.
TR 1.137	A sheath slitting cord is required for each sheath.
Installation Requirements:	
TR 1.138	The outer jacket of the cable shall be fungus inert and shall be suitable for long term exposure to sunlight and weather.

TR 1.139	Each cable shall be reeled in such a way that both ends of the cable are readily accessible for testing, without any need for unreeling. The inner end of the cable shall be properly secured to prevent whipping when the end of the reel is reached. A minimum of 3 m of the inner end of the cable shall be accessible for optical testing. The inner end must be securely fastened or protected against shipping or installation damage.
TR 1.140	A 10 m slack per cable in every RMU/Trench/Manhole shall be placed along the fibre optic cable route as per DMIC IITGNL requirement.
TR 1.141	Each length of cable shall be wound on a separate cable reel.
TR 1.142	Suitable mechanical pulling aids shall be deployed to ensure that the maximum pulling tension is not exceeded at any time during the installation.
TR 1.143	Tags shall be installed at all cable end points (manholes, etc.).
TR 1.144	The cable shall be neatly dressed, labelled and organized.
Testing: Following testing specific to fibre optic cable shall be met.	
TR 1.145	<ul style="list-style-type: none"> • Prior to shipment, Factory-controlled tests shall be performed to verify compliance of the above stated specifications. • Each cable reel shall be shipped with test results indicating the length of the cable reel and the attenuation at 1310 nm and 1550 nm for each fibre, as applicable. A copy of these test results shall also be provided to DMIC IITGNL or their designate. • Any test that reveals the materials or equipment does not meet the stated specifications shall constitute failure. • Visual inspection shall be carried out on 100% basis for all the equipment/items offered. • Dimensional test shall be carried out on 10% sample of the respective lot. • Drip test shall be carried out • In case any of the selected samples fail, the failed sampled is rejected and additional 20% samples shall be selected randomly and tested. In case any sample from the additional 20% also fails, the entire batch or OEM may be rejected.
TR 1.146	Pre-Installation Testing Requirements: <ul style="list-style-type: none"> • Once delivered to the MSI, the MSI shall, prior to installation, conduct a reel test. • Inspecting for any physical damage of the reel or cable. • Measure using an OTDR, the attenuation at 1310nm and 1550nm for one fibre from each buffer tube from both ends of the cable
TR 1.147	Post-Installation Testing Requirements: <ul style="list-style-type: none"> • Inspecting for any physical damage of the exposed portions of cable. • Measure using an OTDR, the attenuation at 1310 nm and 1550 nm for every fibre from each buffer tube from both ends of the cable. This includes all connectorized and un-connectorized links with intermediate cable butt splices as applicable. • LSPM test shall be carried out for this specification • Inspecting for proper slack loops inside manholes.
TR 1.148	Mechanical Testing Requirements: The cable shall meet the following test requirements without physical damage to the cable and/or cable components and without degradation of optical transmission.
TR 1.149	Crush and Impact Test (Outdoor Cable): A crush and impact test shall be carried out on a sample of cable approximately 10 m in length according to the method stated in EIA-455-41, and EIA-455-25A /IEC 794. Optical loss measurements are to be made at the 1550 nm nominal wavelength. A permanent or temporary increase in the attenuation loss value greater than 1.0 dB/test-fibre-km shall constitute failure.

TR 1.150	Twist and Flexibility Test: A twist and flexibility test shall be carried out on a sample of cable approximately 5 m in length according to the methods stated in EIA-455-85/IEC 794, and EIA-455-104. Optical loss measurements are to be made at the 1550 nm nominal wavelength. A permanent or temporary increase in the attenuation loss value greater than 1.0 dB/test fibre-km shall constitute failure.
TR 1.151	Water Ingress Test: A water ingress test shall be carried out on a sample of cable according to the requirements of EIA-455-82A/IEC 794. No water shall leak through the open end of the 3.0m test sample.
TR 1.152	Certificates and Proof of Factory Testing: The bandwidth and attenuation of every fibre in each cable shall be tested in the factory. Single mode measurements shall be taken at 1310 nm and 1550 nm. These factory test results shall be provided with the cable. One copy shall be attached to the cable reel, inside the lagging, prior to shipment, and one copy shall be sent to DMIC IITGNL's Project management office.
TR 1.153	General: <ul style="list-style-type: none"> • Inner & Outer sheath diameter need to define. • FRP diameter need to define. • Kink test, cable bend test, temperature cycle test & Drip test need to add in Factory acceptance test. • Cable diameter need to define.
UTP COPPER CABLE AND ACCESSORIES	
TR 1.154	The cable shall comprise of four (4) uniformly twisted insulated conductor pairs. Each pair shall have different colour insulation for identification and the two cores of any one pair shall also have different coloured insulation for the identification of a specific core.
TR 1.155	A non-hygroscopic dielectric tape shall be wrapped around the insulated pairs.
TR 1.156	A tight fitting black polyethylene jacket shall be extruded over the shield.
TR 1.157	Conductors shall be twisted to form pairs with an average mutual capacitance of less than 56 nF/km with a far end crosstalk loss of 69 dB/km or better.
TR 1.158	The cable shall have a water repellent filled core and shall have a sunlight and weather resistant jacket of polyethylene (e.g. XLPE). MSI shall propose solution to meet the requirements of the RFQ cum RFP for fulfilling this particular requirement.
TR 1.159	The cable shall have a guaranteed transmission performance up to 250 MHz.
TR 1.160	The cable shall have characteristic impedance of 100 ± 15 (Ohms).
TR 1.161	Materials used in the cable shall not support galvanic action.
COPPER PATCH CORDS	
TR 1.162	Patch cords fabricated from UTP cable shall be of suitable length to connect field devices with the switch/ FTP. Patch cords shall be sized to minimize excess cable interconnecting equipment, with cables routed and dressed to maintain a neat appearance.
TR 1.163	Patch cords shall be terminated with 8-pin 8-conductor "RJ-45" style connectors.
TR 1.164	Pre-fabricated patch cords shall be supplied in individual packages.
TR 1.165	All cabling and connectors shall be in accordance with ANSI/TIA/EIA-568-B.
COPPER PATCH PANEL	
TR 1.166	The copper communication cable shall be terminated at the associated patch panel or field device.

TR 1.167	The patch panels shall be sized to support the design requirements.
TR 1.168	The standard termination is to be according to ANSI/TIA/EIA-568A.
TR 1.169	The termination shall protect the cable terminations from water and mechanical damage and shall be resistant to salt corrosion.
TR 1.170	All material of the termination and associated mounting accessories shall be non-reactive and the complete assembly shall not support galvanic cell action.
TR 1.171	All cable entries shall be provided with appropriate cable pathway.
TR 1.172	Any provided patch panel or wall plate shall provide mechanical support for all connections enclosed and shall maintain insulation between them.
TR 1.173	Connectors shall be sealed water resistant, and shall accommodate the #23 AWG gauge solid conductors. Insulation displacement terminal lugs are permitted.
SURGE SUPPRESSOR	
TR 1.174	Wherever installed, the UTP cables shall be supplied with either in-built surge arrestor or shall have additional surge suppressors.
TR 1.175	Wherever required, Surge suppressors shall be provided and mounted on the active pairs. Two levels of protection shall be provided: <ul style="list-style-type: none"> The first protection level shall be a three electrode gas tube discharge protector module. This is only required for cables that leave the cabinet location. The second level of protection shall be a back-to-back Zener diode arrangement and Metallic Oxide Varistor (MOV). The protection shall be compatible with the first level of protection.
TR 1.176	The surge suppressors shall be such that they do not interfere with normal communications.
FIBRE OPTIC SPLICE CLOSURE (FOSC)	
TR 1.177	Be capable of accepting minimum six (6) cables in a butt splice configuration. Any additional cables shall be supported using standard accessories provided by the manufacturer.
TR 1.178	Fibre Optic Splice Closures shall be IP 68 rating.
TR 1.179	Be re-enterable without the use of additional parts or special materials.
TR 1.180	Not require special tools to enter or assemble.
TR 1.181	Be constructed of non-corrosive materials.
TR 1.182	Have a life expectancy of at least 25 years.
TR 1.183	Be capable of storing up to 3.0m lengths of expressed buffer tubes.
TR 1.184	Accommodate splice organizers which accept heat-shrink fusion protectors or splice protection packs.
TR 1.185	Have provisions for storing Fibre splices and un-spliced Fibre/buffer tubes.
TR 1.186	Be non-filled (no encapsulating material) to prevent water intrusion.
TR 1.187	Meet all performance standards over the operating temperature range of 0°C to +60°C.
TR 1.188	Be capable of preventing a 3.0m water head from intruding into the splice compartment for a period of 7 days, and a 2.0m water head for an indefinite period of time.
OPTICAL CONNECTORS	
TR 1.189	The optical connectors shall comply with Telcordia GR-326-CORE, NWT, American Society for Testing and Materials (ASTM), Telecommunications Industry Association (TIA), as well as Underwriters Laboratories for flammability tests.

TR 1.190	<p>Optical connectors shall conform to the following standards at a minimum:</p> <ul style="list-style-type: none"> • Small form factor SC and ST/LC; • UPC type; • Push-on/pull-off interconnection, dry contact, physical contact; • Suitable for single-mode installations; • Simple polishing tools for infield installation; • Available in duplex styles; • Connector strain relief limits cable bending radius; • Adapters available to mate with other connectors; • Insertion Loss < 0.2 dB; • Return Loss > -55dB; • Repeatability <= 0.1 dB; • Thermal Shock <= 0.1 dB; • Temperature Cycling <= 0.1 dB 0°C to +60°C (40 Cycles); and • Humidity Cycling <= 0.1 dB +60°C (10-95 percent).
FIBRE PATCH CORDS	
TR 1.191	<p>Patch cord material shall conform to the following standards at a minimum:</p> <ul style="list-style-type: none"> • All optical fibre patch leads shall comprise of Single-mode; • Jacket should be LSZH; • Zirconia ceramic ferrule connectors; and • Cable: 9/125, SM OS2 Strength member: Aramid Yarn, Length: (as per site requirement)
FIBRE DISTRIBUTION AND MANAGEMENT SYSTEM (FDMS)/OPTICAL CABLE ENTRANCE FACILITY (OCEF)	
TR 1.192	1U Rack mount module shall provide management of optical fibres of a cable, with flexibility and reliability. It shall provide management of fibres in a consistent and structured manner. It should also facilitate reconfiguration and testing of fibres, cables and network.
TR 1.193	Communication equipment is to be placed at an indoor location. The location would have multiple cables converging and hence requires a system to handle the large number of fibres. These cables shall be routed through race ways either from the bottom (under floor) or overhead.
TR 1.194	The 1U Rack mount module shall be able to accommodate all types of optical fibre cable structures, adopting different construction practices. i.e. the Unitube, Multi loose tube design, Intrusion Proof Cable Design, besides Aerial & other Underground optical Fibres cables
TR 1.195	The 1U Rack mount module provide positive Fibre management i.e. facilities to carry out the expansion, reconfiguration & maintenance etc. without disturbing or affecting the existing fibres already in use or inflicting any damage to pig tails, patch cords, optical fibres, optical fibre cables, fibre splices during normal cable and element handling. It shall provide well engineered bend radius control throughout the system
TR 1.196	The 1U Rack mount module provides slack storage space for Loose tube Fibre
TR 1.197	The 1U Rack mount module shall have provision for slack management for storing the extra length of optical Fibres & pigtails, which shall not experience bend below the critical bend radius.
TR 1.198	The module shall be easily opened and closed without any degradation
TR 1.199	The shelves should have slides upon which the Splice Tray Assembly & Patch Panel is placed
TR 1.200	Fully loaded configuration along with pigtails and adaptors
TR 1.201	Identification mechanism of incoming and outgoing cables/pigtails/patch cords and adaptors shall be provided.

TR 1.202	The system shall be suitable for Optical Fibre Cables having single mode fibres (individual Fibre & Ribbon Fibre) as per ITU-T Rec. G.652D etc for transmission at wavelengths of 1310nm and 1550nm; and for up-up gradation at 1625 nm wavelength without modification.
TR 1.203	<p>The components of module include splicing cum patching shelves, shall be provided as per the requirement at all fibre terminations.</p> <ul style="list-style-type: none"> • Number of ports minimum 24. • Stackable splice tray. • Cable entry from rear or sides. Radius controlled cable routing. • Front Access to cable connectors. • Powder coated Cold Rolled Steel CRS • Dimensions: <ul style="list-style-type: none"> ➤ Width: 485 mm \pm 2 %; ➤ Depth: 300 mm \pm 2 %; and ➤ Height: 44 mm \pm 2%.
TR 1.204	It shall be possible to fix the fibre splicing cum patching shelf on the 19" rack, with mounting screws and nuts.
TR 1.205	Splice Trays shall be easily flipped at an angle of 90 degrees based on the hinge clip.
TR 1.206	The single fibre Splice Tray shall be able to accommodate minimum of 24 Fibres. This Splice Tray shall assemble with other hinging Splice Trays.
TR 1.207	The fastening arrangements for entry of the fibres into the splice Tray shall be suited to secondary coated fibres and primary coated fibres in tubes, without there being any risk of bending loss or damage to the fibres or the secondary tubes.
TR 1.208	It shall be possible to take any individual fibre out of the splice tray for repair during normal operation, without damaging the remaining fibres.
TR 1.209	The splicing Tray shall be non-metallic and made of ABS Blend material
TR 1.210	Single mode Fibres conforming to G652D and etc for transmission at 1310 nm and 1550nm wavelengths and for up-gradation at 1625 nm wavelength without any modification
TR 1.211	It shall be possible to fix the fibre splicing cum patching shelf on the 19" rack, with mounting screws and nuts.
FIBRE OPTIC PATCH PANELS / FIBRE TERMINATION PANEL	
TR 1.212	The Patch panels shall adhere to Telecordia GR-449 Core or equivalent specifications.
TR 1.213	The Patch panels shall be capable of supporting SC/ST/LC type ports.
TR 1.214	The Patch panels shall include the mounting hardware for EIA/TIA standard racks as per rack requirements.
TR 1.215	The Patch panels shall provide a minimum of four cable entry points.
TR 1.216	The Patch panels shall support rings to maintain minimum fibre bending radius, and to prevent accidental physical damage.
TR 1.217	The Patch panels shall provide physical protection for the individual fibres.
TR 1.218	The Patch panels shall provide terminating facilities for fibre optic connectors, including the through adapter.
TR 1.219	The Patch panels shall provide a lockable compartment in which fusion splice trays are housed which is separate from the fibre patching area.
TR 1.220	The Patch panels shall provide bulkhead mounting hardware for a variety of connectors but shall be equipped with SC/ST/LC connectors unless otherwise noted.

COMMUNICATIONS CABINETS WITH RACKS	
TR 1.221	Please refer to the Communication Cabinets with Racks specifications mentioned under IT Infrastructure specification Section 2.2.8.3
ACTIVE ELECTRONICS / ETHERNET SWITCHES AND ROUTERS	
Ethernet Switch – Layer 2	
The Layer 2 Ethernet switch includes two types of switches –Type I-Industrial grade switch at field and Type II - Non-industrial grade switch at PoP facility.	
Type I - Industrial Grade Field Switch	
TR 1.222	The Industrial Grade Switch installed at the field shall have at least eight (8) 1000BaseTX ports with two 1 G fibre ports scalable up to 10G in future for backhaul (uplink) connectivity. The PoE/PoE+ feature may also be provided via industrial grade PoE/PoE+ injectors for these switches.
TR 1.223	The copper ports shall support PoE / PoE+.
TR 1.224	The industrial grade switches shall support a MAC table size of up to 8000 addresses.
TR 1.225	The industrial grade switches shall at a minimum carry IP30 rating.
TR 1.226	The industrial grade switches shall support: <ul style="list-style-type: none"> • IEEE 802.3, 802.3ad, 802.3u, 802.3ab, 802.3z, 802.3x protocols; • IEEE 802.1D for STP, 802.1w for Rapid STP, 802.1s for Multiple Spanning Tree Protocols; • IEEE 802.1q for VLAN tagging, 802.1p for CoS, 802.1X for Authentication and 802.3ad for port trunk LACP; and • Broadcast storm protection, RADIUS, SSL/SSH security.
TR 1.227	The industrial grade switches shall support: <ul style="list-style-type: none"> • IPv4/v6, SNMP v1/v2/v3, LLDP, Server/Client, DHCP, TFTP, Telnet, IGMP v1/v2 as a minimum.
TR 1.228	All switches installed on-field shall be capable of working in the harsh environmental conditions with immunity to EMI and heavy electrical surges. They shall support: <ul style="list-style-type: none"> • EN-60950-1 or Equivalent; and • FCC Part 15 Class A. All standards to be latest as per Manufacturer's certifications.
TR 1.229	The switches shall be powered by 12/24/48VDC input as per the design requirements with integrated redundant power supply. The terminal blocks for the power supply options shall support reliable, maintenance-free connections. Any power conversions required shall be in the scope of the MSI.
TR 1.230	The industrial grade switches shall support operating temperature range of 0°C to +60°C (without any fans) with ambient relative humidity of 5-95%, non-condensing.
DISTRIBUTION SWITCH AT POP	
Architecture:	
TR 1.231	Modular architecture or standalone fixed switch with required interfaces from day one.
TR 1.232	Shall have redundant power supply and fans
TR 1.233	shall have line rate performance
TR 1.234	Shall have minimum 600 Gbps of switching throughput.
TR 1.235	Shall have up to 900 Mbps of switching capacity (Minimum packet size 64 byte) Mbps of switching throughput
TR 1.236	Switch should be supplied with minimum 6 x 40 G fibre port from day 1
TR 1.237	Switch should be supplied with minimum 24 x 1/10G SFP fibre port

TR 1.238	SFP/SFP+/XFP/QSFP/Optical modules to be provided as per the solution design by MSI
Performance:	
TR 1.239	Switch should support 110K IPv4 Routing entry
TR 1.240	Switch should support IPv6 56K Routing entry
TR 1.241	Switch should support 16K Multicast Routing entry
TR 1.242	Switch should support 32K MAC addresses
Resiliency:	
TR 1.243	Shall have the capability to extend the control plane across multiple active switches making it a virtual switching fabric, enabling interconnected switches to perform as single Layer-2 switch and Layer-3 switch or should support MC-LAG for high availability
TR 1.244	IEEE 802.1D Spanning Tree Protocol, IEEE 802.1w Rapid Spanning Tree Protocol and IEEE 802.1s Multiple Spanning Tree Protocol
TR 1.245	IEEE 802.3ad Link Aggregation Control Protocol (LACP)
TR 1.246	Virtual Router Redundancy Protocol (VRRP) to allow a group of routers to dynamically back each other up to create highly available routed environments
TR 1.247	Graceful restart for OSPF, IS-IS and BGP protocols
TR 1.248	Bidirectional Forwarding Detection (BFD) for OSPF, IS-IS and BGP protocols
Layer 2 Features:	
TR 1.249	Shall support up to 4,000 port or IEEE 802.1Q-based VLANs
TR 1.250	Shall support GARP VLAN Registration Protocol or equivalent feature to allow automatic learning and dynamic assignment of VLANs
TR 1.251	Shall have the capability to monitor link connectivity and shut down ports at both ends if uni-directional traffic is detected, preventing loops
TR 1.252	Shall support IEEE 802.1ad QinQ
TR 1.253	Shall support Jumbo frames on GbE and 10-GbE ports
TR 1.254	Internet Group Management Protocol (IGMP)
TR 1.255	Multicast Listener Discovery (MLD) snooping
TR 1.256	IEEE 802.1AB Link Layer Discovery Protocol (LLDP)
Layer 3 Features (any additional licenses required shall be included):	
TR 1.257	Static Routing for IPv4 and IPv6
TR 1.258	RIP for IPv4 (RIPv1/v2) and IPv6 (RIPng)
TR 1.259	OSPF for IPv4 (OSPFv2) and IPv6 (OSPFv3)
TR 1.260	IS-IS for IPv4 and IPv6 (IS-ISv6)
TR 1.261	Border Gateway Protocol 4 with support for IPv6 addressing
TR 1.262	Policy-based routing
TR 1.263	Unicast Reverse Path Forwarding (uRPF)
TR 1.264	Dynamic Host Configuration Protocol (DHCP) client, Relay and server
TR 1.265	Sparse Mode (PIM-SM), and Source-Specific Mode (PIM-SSM) for IPv4 and IPv6 multicast applications

QoS and Security Features:	
TR 1.266	Access Control Lists for both IPv4 and IPv6 for filtering traffic to prevent unauthorized users from accessing the network
TR 1.267	Port-based rate limiting and access control list (ACL) based rate limiting
TR 1.268	Congestion avoidance using Weighted Random Early Detection (WRED) or equivalent.
TR 1.269	Powerful QoS feature supporting strict priority (SP) queuing, weighted round robin (WRR) and weighted fair queuing (WFQ) /equivalent or equivalent.
TR 1.270	IEEE 802.1x to provide port-based user authentication with multiple 802.1x authentication sessions per port
TR 1.271	Media access control (MAC) authentication to provide simple authentication based on a user's MAC address
TR 1.272	Dynamic Host Configuration Protocol (DHCP) snooping for security
Management Features:	
TR 1.273	Configuration through the CLI, console, Telnet, SSH and Web Management
TR 1.274	SNMPv1, v2, and v3 and Remote monitoring (RMON) support
TR 1.275	Should support Streaming Telemetry, Netflow/Sflow/Jflow, SPAN, RSPAN or equivalent
TR 1.276	Management security through multiple privilege levels with password protection
TR 1.277	FTP, TFTP, and SFTP/SCP support
TR 1.278	Port mirroring to duplicate port traffic (ingress and egress) to a local or remote monitoring port.
TR 1.279	RADIUS/TACACS+ for switch security access administration
TR 1.280	Network Time Protocol (NTP) or equivalent support
TR 1.281	Shall have Ethernet OAM (IEEE 802.3ah) management capability
Environmental Features:	
TR 1.282	Shall provide support for RoHS/ WEEE
TR 1.283	Shall be capable of supporting both AC and DC Power inputs
TR 1.284	Operating temperature of 0°C to 40°C
TR 1.285	Safety and Emission standards including UL 60950-1; IEC 60950-1; VCCI Class A; EN 55022 Class A
Additional Requirement:	
TR 1.286	Switch should support IPv4 & IPv6 from day1.
TR 1.287	System should be tested and certified for EAL 2 or above or NDPP certified at time of delivery
Ethernet Switch & Router – Layer 3	
CORE SWITCH	
Architecture:	
TR 1.288	Modular architecture, minimum four slots for interface modules. Should have dedicated slot for CPU redundancy (required from day 1). There should not be any interface on CPU card.
TR 1.289	Switch should have Redundant Fabric and Control plane
TR 1.290	Switch should have redundant CPUs working in active-active or active -passive mode from day 1. Switch dual supervisor configuration must allow nonstop forwarding (NSF) with a stateful switchover (SSO) when a supervisor-level failure occurs.
TR 1.291	The Switch should support non-blocking architecture, all proposed line cards must provide wire speed line rate performance

TR 1.292	The switch should not have any single point of failure like supervisor, switching fabric power supplies and fans
TR 1.293	Shall provide distributed Layer-2 (switching) and Layer-3 forwarding (Routing) on all line cards (any additional hardware required for the same shall be proposed)
TR 1.294	Shall have minimum 320 Gbps of switching capacity per slot with total switch throughput of 1.2 Tbps full duplex
TR 1.295	Shall have up to 1.6 BPPS of switching throughput (Minimum packet size 64 byte) for both IPV4 And IPV6
TR 1.296	Switch should be supplied with minimum 10 x 40 G fibre port
TR 1.297	Switch should be supplied with minimum 12 x 1 G Fibre port
TR 1.298	Switch should be supplied with minimum 12 x 10G fibre ports
TR 1.299	SFP/SFP+/XFP/QSFP/Optical modules to be provided as per the solution design by MSI
TR 1.300	Shall be 19" Rack Mountable
Resiliency:	
TR 1.301	Shall have the capability to extend the control plane across multiple active switches making it a virtual switching fabric, enabling interconnected switches to perform as single Layer-2 switch and Layer-3 switch or should support MC-LAG for high availability
TR 1.302	Switch should support in line hot insertion and removal of different parts like modules/power supplies/fan tray etc. This should not require rebooting of the switch or create disruption in the working/functionality of the switch
TR 1.303	Should support uninterrupted forwarding operation to ensure high-availability during primary controller failure
TR 1.304	IEEE 802.1D Spanning Tree Protocol, IEEE 802.1w Rapid Spanning Tree Protocol and IEEE 802.1s Multiple Spanning Tree Protocol
TR 1.305	IEEE 802.3ad Link Aggregation Control Protocol (LACP)
TR 1.306	Virtual Router Redundancy Protocol (VRRP) to allow a group of routers to dynamically back each other up to create highly available routed environments
TR 1.307	Graceful restart for OSPF, IS-IS and BGP protocols
TR 1.308	Bidirectional Forwarding Detection (BFD) for OSPF, IS-IS and BGP protocols
Layer 2 Features:	
TR 1.309	Shall support up to 4,000 port or IEEE 802.1Q-based VLANs
TR 1.310	Shall support GARP VLAN Registration Protocol or equivalent feature to allow automatic learning and dynamic assignment of VLANs
TR 1.311	Switch should support minimum 32K no. of MAC addresses
TR 1.312	Shall support IEEE 802.1ad QinQ
TR 1.313	Shall support Jumbo frames on GbE and 10-GbE ports
TR 1.314	Internet Group Management Protocol (IGMP)
TR 1.315	Multicast Listener Discovery (MLD) snooping
TR 1.316	IEEE 802.1AB Link Layer Discovery Protocol (LLDP)
TR 1.317	Multicast VLAN to allow multiple VLANs to receive the same IPv4 or IPv6 multicast traffic
Performance Requirement:	
TR 1.318	Switch should support minimum 1000 VRF instances with route leaking functionality

TR 1.319	should support MPLS and VPN's
TR 1.320	The switch should have 500K IPV4 and 500K IPv6 Routes
TR 1.321	The switch should support 16k multicast routes
Layer 3 Features (any additional licenses required shall be included):	
TR 1.322	Static Routing for IPv4 and IPv6
TR 1.323	RIP for IPv4 (RIPv1/v2) and IPv6 (RIPng)
TR 1.324	OSPF for IPv4 (OSPFv2) and IPv6 (OSPFv3)
TR 1.325	IS-IS for IPv4 and IPv6 (IS-ISv6)
TR 1.326	Border Gateway Protocol 4 with support for IPv6 addressing
TR 1.327	Policy-based routing
TR 1.328	Unicast Reverse Path Forwarding (uRPF)
TR 1.329	Dynamic Host Configuration Protocol (DHCP) client, Relay and server
TR 1.330	PIM Dense Mode (PIM-DM), Sparse Mode (PIM-SM), and Source-Specific Mode (PIM-SSM) for IPv4 and IPv6 multicast applications
QoS and Security Features:	
TR 1.331	Access Control Lists for both IPv4 and IPv6 for filtering traffic to prevent unauthorized users from accessing the network
TR 1.332	Port-based rate limiting and access control list (ACL) based rate limiting
TR 1.333	Congestion avoidance using Weighted Random Early Detection (WRED)
TR 1.334	Powerful QoS feature supporting strict priority (SP) queuing, weighted round robin (WRR) and weighted fair queuing (WFQ) /equivalent
TR 1.335	IEEE 802.1x to provide port-based user authentication with multiple 802.1x authentication sessions per port
TR 1.336	Media access control (MAC) authentication to provide simple authentication based on a user's MAC address
TR 1.337	Dynamic Host Configuration Protocol (DHCP) snooping for security
TR 1.338	Switch should support for Role Based access control (RBAC) for restricting host level network access as per policy defined
Management Features:	
TR 1.339	Configuration through the CLI, console, Telnet, SSH and Web Management
TR 1.340	SNMPv1, v2, and v3 and Remote monitoring (RMON) support
TR 1.341	sFlow (RFC 3176) or equivalent for traffic analysis
TR 1.342	Management security through multiple privilege levels with password protection
TR 1.343	FTP, TFTP, and SFTP/SCP support
TR 1.344	Port mirroring to duplicate port traffic (ingress and egress) to a local or remote monitoring port.
TR 1.345	RADIUS/TACACS+ for switch security access administration
TR 1.346	Network Time Protocol (NTP) or equivalent support
TR 1.347	Shall have Ethernet OAM (IEEE 802.3ah) management capability
Environmental Features:	
TR 1.348	Shall provide support for RoHS/ WEEE regulations

TR 1.349	The switch should not have any single point of failure like supervisor, switching fabric power supplies and fans
TR 1.350	Operating temperature of 0°C to 40°C
TR 1.351	Safety and Emission standards including UL 60950-1; IEC 60950-1; VCCI Class A; EN 55022 Class A
Additional Requirement:	
TR 1.352	Switch should support IPv4 & IPv6 from day1.
TR 1.353	System should be tested and certified for EAL 2 or above or NDPP or NDcPP certified at time of delivery
TR 1.354	All relevant licenses for all the features and scale should be quoted along with switch
CORE ROUTER	
Architecture:	
TR 1.355	Should be chassis based & modular architecture for scalability.
TR 1.356	Should support redundant CPU for high availability.
TR 1.357	Should have power supply redundancy. There should not be any impact on the router performance in case one of the power supplies fails.
TR 1.358	All interface modules, power supplies should be hot swappable for high availability.
TR 1.359	Shall support modular power supply and more power supply is added as an when required.
TR 1.360	Router should be provided with 1+1 route processor, 1+1 or 1+N switch fabric and 1+1 or 1+N power supply redundancy.
TR 1.361	The router shall support following type of interfaces – 100GE, 40GE, 10GE, 1GE interfaces.
TR 1.362	Chassis should be 19" rack mountable type.
TR 1.363	The operating system of the router shall have a microkernel- based architecture.
TR 1.364	The modular operating system shall run all critical functions like various routing protocol, forwarding plane and management functions in separate memory protected modules. Failure of one module shall not impact operations of rest of the OS.
TR 1.365	Router should support two free slots for future expansion.
TR 1.366	Should be supplied with necessary power cards, data cables, connectors, CD's, manuals, bracket accessories, wire managers and other appropriate accessories.
Performance:	
TR 1.367	Router shall support minimum non-blocking capacity of 800 GbpS & 1.2 BPPS
TR 1.368	The router should have capability of minimum 2 million IPv4 and 2 Mil IPv6 routes
TR 1.369	The router should support minimum 64K MAC address, minimum 64K Pseudowires
TR 1.370	Router should have 16K multicast routes.
High Availability:	
TR 1.371	Shall support Non-Stop forwarding for fast re-convergence of routing protocols (BGP, OSPF)
TR 1.372	Shall support SyncE (1588)
TR 1.373	Shall support link aggregation using LACP as per IEEE 802.3ad
TR 1.374	Boot options like booting from TFTP server, Network node & Flash Memory
TR 1.375	Should have IPv4 Routing, Border Gateway Protocol, and Open Shortest Path First [OSPF]), Hot Standby Router Protocol (HSRP)/Virtual Router Redundancy Protocol (VRRP), IPv6 Routing, and BGP Prefix Independent Convergence
TR 1.376	Should have Multicast routing protocols IGMPv1, v2, v3, PIM- SM (RFC2362) and PIM-SSM, MSDP, IGMP v2 snooping

TR 1.377	Should have DHCPv6 and OSPFv3 for IPv6, 6PE & 6VPE
TR 1.378	Shall support MPLS Provider/Provider Edge functionality. MPLS VPN, MPLS mVPN (Multicast VPN), Carrier Supporting Carrier (CSC), DiffServ Tunnel Modes, MPLS TE (Fast re-route), DiffServ-Aware TE, Inter-AS VPN, Resource Reservation Protocol (RSVP), VPLS, VPWS, Ethernet over MPLS, CESoPSN and SAToP as per RFC 4553
TR 1.379	Router shall support MPLS OAM, Ethernet OAM protocols - CFM (IEEE 802.1ag), Link OAM (IEEE 802.3ah) and ITU Y.1731
TR 1.380	The routers shall support both L2 and L3 services on all interfaces
TR 1.381	Configuration Roll Back to recover the mis-configured router to last good configuration
QoS Features:	
Shall support the following:	
TR 1.382	Traffic Classification using various parameters like source physical interfaces, source/destination IP subnet, protocol types (IP/TCP/UDP), source/destination ports, IP Precedence, 802.1p, MPLS EXP, DSCP
TR 1.383	Shall support Strict Priority Queuing or Low Latency Queuing to support real time application like Voice and Video with minimum delay and jitter
TR 1.384	Congestion Management: WRED, Priority queuing, Class based weighted fair queuing
TR 1.385	Platform must support hierarchical shaping, scheduling, and policing for the control upstream and downstream traffic
TR 1.386	Ability to configure hierarchical queues in hardware for IP QoS at the egress to the edge. Minimum 8k hardware queues per port. It should be provided from day 1
TR 1.387	Support Access Control List to filter traffic based on Source & Destination IP Subnet, Source & Destination Port, Protocol Type (IP, UDP, TCP, ICMP etc) and Port Range etc.
TR 1.388	Time based & Dynamic ACLs for controlled forwarding based on time of day for offices
TR 1.389	Support per-user Authentication, Authorization and Accounting through RADIUS or TACACS
TR 1.390	The routers shall provide hardware accelerated IETF Netflow- v9/J-Flow/equivalent feature. This feature shall be available for all interfaces provisioned on the router with hardware acceleration
TR 1.391	MD-5 route authentication for RIP, OSPF and BGP
TR 1.392	Shall support multi-level of access
TR 1.393	URPF, DHCP snooping, control plane policing
TR 1.394	SNMPv3 authentication, SSHv2
TR 1.395	Multiple privilege level authentications for console and telnet access through Local database or through an external AAA Server
Debug, Alarms & Diagnostics:	
TR 1.396	Support for monitoring of Traffic flows for Network planning and Security purposes
TR 1.397	Display of input and output error statistics on all interfaces
TR 1.398	Display of Input and Output data rate statistics on all interfaces
TR 1.399	Display of Dynamic ARP table
TR 1.400	Telnet, Trace-route, Ping and extended Ping
TR 1.401	Router shall support System & Event logging functions as well as forwarding of these logs onto a separate Server for log management
TR 1.402	Router shall have Debugging features to display and analyse various types of packets

Accounting:	
TR 1.403	The router should have following accounting features:
TR 1.404	Packet & Byte Counts
TR 1.405	Start Time Stamp & End Time Stamps
TR 1.406	Network Time Protocol
TR 1.407	Input & Output interface ports
TR 1.408	Type of service, TCP Flags & Protocol
TR 1.409	Source & Destination IP addresses
TR 1.410	Source & Destination TCP/UDP ports
Management:	
TR 1.411	Shall support latest version of Secure Shell for secure connectivity
TR 1.412	Embedded RMON support for four groups – history, statistics, alarms and events
TR 1.413	Should have to support Out of band management through Console / external modem for remote management
TR 1.414	Event and System logging: Event and system history logging functions shall be available. The Router shall generate system alarms on events. Facility to put selective logging of events onto a separate hardware here the analysis of log shall be available
Interface from Day 1:	
TR 1.415	The Gigabit Ethernet ports must support IEEE defined SX (850nm), LX/LH (1310nm), and ZX (1550nm) pluggable optics. Removal or insertion of the pluggable optics must not affect any other traffic flow anywhere in the router
TR 1.416	Minimum 6 x 40G fibre port from day 1 and scalable 6 X 100G in future.
TR 1.417	Minimum 12 x 10G fibre port from day 1
TR 1.418	Minimum 12 X 1Gig fibre port from day 1
TR 1.419	SFP/SFP+/XFP/QSFP/Optical modules to be provided as per the solution design by MSI
Environmental:	
TR 1.420	Operating temperature: 5 to 40 degrees
TR 1.421	Humidity – 10% to 90% Non-Condensing
L2 SWITCH (Server/Workstation Connectivity Ethernet Switch – Minimum 24 Ports)	
Architecture:	
TR 1.422	Shall be 1RU, 19" Rack Mountable
TR 1.423	24 RJ-45 autosensing 10/100/1000 ports
TR 1.424	Shall support minimum 4 x 1 G fibre port scalable up to 10G
TR 1.425	1 RJ-45 serial console port
TR 1.426	Switch should have minimum 2 GB RAM and 2 GB Flash.
TR 1.427	Switch shall have minimum 128 Gbps of switching fabric and 95.23 Mbps of forwarding rate.
TR 1.428	SFP/SFP+/XFP/QSFP/Optical modules to be provided as per the solution design by MSI
Resiliency:	
TR 1.429	Switch should support internal field replaceable unit redundant power supply from day 1.
TR 1.430	IEEE 802.1D Spanning Tree Protocol, IEEE 802.1w Rapid Spanning Tree Protocol and IEEE 802.1s Multiple Spanning Tree Protocol

TR 1.431	IEEE 802.3ad Link Aggregation Control Protocol (LACP)
Layer 2 Features:	
TR 1.432	Shall support up to 4,000 IEEE 802.1Q-based VLANs
TR 1.433	Shall support GARP VLAN Registration Protocol or equivalent feature to allow automatic learning and dynamic assignment of VLANs
TR 1.434	Shall support IEEE 802.1ad QinQ
TR 1.435	Shall support Jumbo frames on GbE ports
TR 1.436	Internet Group Management Protocol (IGMP)
TR 1.437	Multicast Listener Discovery (MLD) snooping
TR 1.438	IEEE 802.1AB Link Layer Discovery Protocol (LLDP)
TR 1.439	Shall support Voice VLAN feature to automatically assigns VLAN and priority to devices like IP phones
TR 1.440	Switch must have the capabilities to enable automatic configuration of switch ports as devices connect to the switch for the device type.
TR 1.441	Switch shall have 1K or more multicast routes.
TR 1.442	Switch should support atleast 16K flow entries
TR 1.443	Switch should support 128 or more STP Instances.
TR 1.444	Switch shall have minimum 16K MAC Addresses and 4000 active VLAN.
TR 1.445	Should support minimum 11K IPv4 routes or more
Layer 3 Features (any additional licenses required shall be included):	
TR 1.446	Static Routing for IPv4
TR 1.447	Static Routing for IPv6
TR 1.448	Dynamic Host Configuration Protocol (DHCP) client and Relay
TR 1.449	Proxy ARP to allow normal ARP operation between subnets
QoS and Security Features:	
TR 1.450	Access Control Lists for Layer 2 to Layer 4 traffic filtering
TR 1.451	Shall support global ACL, VLAN ACL, port ACL, and IPv6 ACL
TR 1.452	Powerful QoS feature supporting strict priority (SP) queuing, weighted round robin (WRR) / SP+WRR or equivalent
TR 1.453	should support QOS on all interfaces
TR 1.454	IEEE 802.1x to provide port-based user authentication with multiple 802.1x authentication sessions per port
TR 1.455	Should support Media access control (MAC) authentication to provide simple authentication based on a user's MAC address
TR 1.456	Dynamic Host Configuration Protocol (DHCP) snooping for security
TR 1.457	Port security and port isolation
TR 1.458	STP BPDU port protection to prevent forged BPDU attacks
TR 1.459	STP Root Guard to protect the root bridge from malicious attacks or configuration mistakes IP Source guard to prevent IP spoofing attacks
TR 1.460	IP Source guard to prevent IP spoofing attacks
TR 1.461	Dynamic ARP protection blocking ARP broadcasts from unauthorized hosts

Management Features:	
TR 1.462	Configuration through the CLI, console, Telnet, SSH and Web Management
TR 1.463	SNMPv1, v2, and v3 and Remote monitoring (RMON) support
TR 1.464	sFlow (RFC 3176) or equivalent for traffic analysis
TR 1.465	Management security through multiple privilege levels
TR 1.466	FTP, TFTP, and SFTP/SCP support
TR 1.467	Port mirroring to mirror ingress/egress ACL-selected traffic from a switch port or VLAN to a local or remote switch port
TR 1.468	RADIUS/TACACS+ for switch security access administration
TR 1.469	Network Time Protocol (NTP) or equivalent support
Environmental Features:	
TR 1.470	Shall provide support for RoHS and WEEE regulations
TR 1.471	Shall have features to improve energy efficiency like variable-speed fans, shutoff unused ports etc
TR 1.472	Operating temperature of 0°C to 45°C
TR 1.473	Safety and Emission standards including UL 60950-1; IEC 60950-1; VCCI Class A; EN 55022 Class A
Additional Requirement:	
TR 1.474	System should be tested and certified for EAL 2 or above or NDPP certified at the time of delivery
ENTERPRISE MANAGEMENT SYSTEM (EMS)	
Availability - Monitoring, Management and Reporting	
TR 1.475	The proposed system shall support multiple types of discovery like IP range discovery – including built-in support for IPv6, Seed router based discovery and discovery whenever new devices are added with capability to exclude specific devices.
TR 1.476	The proposed system shall support exclusion of specific IP addresses or IP address ranges.
TR 1.477	The discovery shall be able to identify and model of the ICT asset.
TR 1.478	The proposed solution shall provide a detailed asset report, organized by proper naming of all devices, listing all ports for all devices. The proposed system shall provide sufficient reports that identify unused ports in the managed network infrastructure that can be reclaimed and reallocated.
TR 1.479	The proposed solution shall determine device availability and shall exclude outages from the availability calculation with an option to indicate the reason.
TR 1.480	The proposed solution shall provide out of the box root cause analysis.
TR 1.481	The proposed solution shall have an integrated user-friendly application.
TR 1.482	The proposed solution shall include all required licenses.
TR 1.483	The proposed solution shall provide real-time monitoring of the entire network infrastructure and shall allow users to easily navigate with graphical interface and easy to use network management tools.
TR 1.484	The proposed solution shall provide at a minimum, event alert via the existing Microsoft Exchange Server email or pop-up alarm or export to CSV.
TR 1.485	The proposed solution shall automatically generate reports on a daily, weekly and monthly basis in formats including graphs, bar charts, distribution and summary. The system shall be capable of printing out reports and also exporting the reports to other systems or web servers.
TR 1.486	The proposed solution shall display a simple map of the whole network as a tree and shall have the option of direct selection of objects. The system shall provide a navigation tree to display the current

	alarm status of each subnet. All the system shall support PAN/ ZOOM feature and shall have all the devices visible in one window along with the provision for these two features.
TR 1.487	The proposed solution shall provide polling agents to upload status, changes or alerts of the local devices attached with the Ethernet enabling devices.
TR 1.488	The proposed solution shall provide real time Management Information Bases (MIBs) displays and shall provide the MIB variable data in tabular or graphical format. The MIB displays shall provide various expressions like utilization, percentage errors and volume.
TR 1.489	The proposed solution shall provide features for security and accountability and shall generate a log file for any user access to configuration or platform changes.
TR 1.490	The proposed solution shall be capable of managing any SNMP/ICMP device from any vendor.
TR 1.491	The proposed solution shall support SNMPV1, SNMPV2C and SNMPV3 and shall automatically discover and poll SNMP and ICMP devices.
TR 1.492	SNMP traps for all IP enabled devices shall be provided by the respective product manufacturers.
TR 1.493	The proposed solution shall allow notifications to be automatically sent to phones, offsite workstations, etc. for efficient response.
TR 1.494	The proposed solution shall monitor as a minimum the base station units and the subscriber station units along with other IP enabled equipment that is being provided as part of this Project.
TR 1.495	The proposed solution shall allow for providing different levels of security access i.e. viewing, logging and managing.
TR 1.496	The proposed solution shall allow for display different colours for the links including red, green, orange, yellow to show the status of the links and the connected devices.
TR 1.497	The operation of the NMS shall be tested while the backbone network is under 30% network utilization.
TR 1.498	The proposed solution must provide an interface for IT helpdesk personnel to create guest credentials.
TR 1.499	The proposed solution shall be supplied with a server with Windows or Linux based OS (latest) or later.
Service Level - Monitoring, Management and Reporting	
TR 1.500	The proposed service management system shall provide a detailed service dashboard view indicating the health of each of the component and services provisioned as well as the SLAs
TR 1.501	The system shall provide an outage summary that gives a high level health indication for each service as well as the details and root cause of any outage.
TR 1.502	The system shall be capable of managing IT and Non-IT resources in terms of the business services they support, specify and monitor service obligations, and associate users/Departments/ Organizations with the services they rely on and related Service/Operational Level Agreements. Presently, services shall include E-mail, Internet Access, Intranet and other services hosted.
TR 1.503	SLA violation alarms shall be generated to notify whenever an agreement is violated or is in danger of being violated. These alarms shall be automatically shared with the authorized people.
TR 1.504	The system shall provide the capability to designate planned maintenance periods for services and take into consideration maintenance periods defined at the IT resources level. In addition the capability to exempt any service outage from impacting an SLA shall be available.
TR 1.505	The reports supported shall include one that monitors service availability (including Mean Time to Repair (MTTR), Mean Time between Failure (MTBF), and Maximum Outage Time thresholds) and the other that monitors service transaction response time.
TR 1.506	The system shall provide a historical reporting facility that shall allow for the generation of on-demand and scheduled reports of Service related metrics with capabilities for customization of the report presentation.

Application Performance - Monitoring, Management and Reporting	
TR 1.507	The proposed solution shall proactively monitor all user transactions for any web-application hosted; detect failed transactions; gather evidence necessary for triage and diagnosis of problems that affect user experiences and prevent completion of critical business processes.
TR 1.508	The proposed solution shall determine if the cause of performance issues is inside the application, in connected back-end systems or at the network layer.
TR 1.509	The proposed solution shall correlate performance data from HTTP Servers (external requests) with internal application performance data.
TR 1.510	The proposed solution shall see response times based on different call parameters. For example, the proposed solution shall be able to provide CPU utilization metrics.
TR 1.511	The proposed solution shall allow data to be seen only by those with a need to know and limit access by user roles.
TR 1.512	The solution shall be deployable as an appliance or physical or virtual server based system acting as an active/passive listener on the network thus inducing zero overhead on the network and application layer.
TR 1.513	The proposed solution shall be able to provide the ability to detect and alert which exact end users experience HTTP error codes such as 404 errors or errors coming from the web application.
TR 1.514	The proposed system shall be able to detect user impacting defects and anomalies and reports them in real-time for Slow Response Time, Fast Response time, Low Throughput, Partial Response, Missing component within transaction.
TR 1.515	The proposed system shall be able to instantly identify whether performance problems like slow response times are within or outside the Data centre without having to rely on network monitoring tools.
Systems and Database Performance - Monitoring, Management and Reporting	
TR 1.516	The proposed system shall addresses management challenges by providing centralized management across physical and virtual systems.
TR 1.517	The proposed system shall be able to monitor various operating system parameters such as processors, memory, files, processes, file systems, etc. where applicable, using operators on the servers to be monitored.
TR 1.518	It shall be possible to configure the operating system monitoring operators to monitor based on user-defined thresholds for warning/critical states and escalate events to event console of enterprise management system.
TR 1.519	It shall also be able to monitor various operating system parameters depending on the operating system being monitored yet offer a similar interface for viewing the operators and setting thresholds.
TR 1.520	The proposed solution shall support monitoring Processors, File Systems, Log Files, System Processes, and Memory etc.
TR 1.521	The proposed tool shall provide Process and NT Service Monitoring wherein if critical application processes or services fail, administrators are immediately alerted and processes and services are automatically re-started.
TR 1.522	The proposed tool shall be able to provide Log File Monitoring which enables administrator to watch system logs and text log files by specifying messages to watch for. When matching messages gets logged, the proposed tool shall notify administrators and enable to take action like sending an email.
TR 1.523	The proposed database performance management system shall integrate network, server & database performance management systems and provide the unified view of the performance state in a single console.
TR 1.524	It shall be able to automate monitoring, data collection and analysis of performance from single point.
TR 1.525	It shall also provide the ability to set thresholds and send notifications when an event occurs, enabling Database Administrators (DBAs) to quickly trace and resolve performance-related bottlenecks.

TR 1.526	Role based Access — Enables role-based management by defining access privileges according to the role of the user.
TR 1.527	The proposed Virtual Performance Management system shall integrate latest virtualization technologies.
Helpdesk - Monitoring, Management and Reporting	
TR 1.528	The proposed helpdesk system shall provide flexibility of logging, viewing, updating and closing incident manually via web interface.
TR 1.529	The proposed helpdesk system shall support ITIL processes like request management, problem management, configuration management and change order management with out-of-the-box templates for various ITIL service support processes.
TR 1.530	Each incident shall be able to associate multiple activity logs entries via manual update or automatic update from other enterprise management tools.
TR 1.531	The proposed helpdesk system shall be able to provide flexibility of incident assignment based on the workload, category, location etc.
TR 1.532	Each escalation policy shall allow easy definition on multiple escalation levels and notification to different personnel via window GUI/console with no or minimum programming.
TR 1.533	The proposed helpdesk system shall provide grouping access on different security knowledge articles for different group of users.
TR 1.534	The proposed helpdesk system shall have an updateable knowledge base for technical analysis and further help end-users to search solutions for previously solved issues.
TR 1.535	The proposed helpdesk system shall support tracking of SLA (Service Level Agreements) for call requests within the help desk through service types.
TR 1.536	The proposed helpdesk system shall be capable of assigning call requests to tech al staff manually as well as automatically based on predefined rules, and shall support notification and escalation over email, web etc.
TR 1.537	The proposed helpdesk system shall integrate tightly with the knowledge tools and CMDB and shall be accessible from the same login window.
TR 1.538	It shall allow IT team to create solution & make them available on the end – user login window for the most common requests.
Traffic Analysis through EMS	
TR 1.539	The traffic analysis system shall be from same OEM providing Network Fault & Performance Management System.
TR 1.540	The tool shall support Flow monitoring and traffic analysis for NetFlow, J-Flow, sFlow, Netstream, IPFIX technologies.
TR 1.541	The solution shall provide a central web based integration point across any of the flow protocols and shall be able to report from a single console.
TR 1.542	The solution shall be of passive type and should not cause any performance overheads.
Incident Management and Root Cause Analysis Reporting	
TR 1.543	An information security incident is an event (or chain of events) that compromises the confidentiality, integrity or availability of information. All information security incidents that affect the information or systems of the enterprise (including malicious attacks, abuse / misuse of systems by staff, loss of power / communications services and errors by users or computer staff) shall be dealt with in accordance with a documented information security incident management policy.
TR 1.544	Incidents shall be categorized and prioritized. While prioritizing incidents the impact and urgency of the incident shall be taken into consideration.
TR 1.545	It shall be ensured that the incident database is integrated with Known Error Database (KeDB), Configuration Management Database (CMDB). These details shall be accessible to relevant personnel as and when needed.

TR 1.546	Testing shall be performed to ensure that recovery action is complete and that the service has been fully restored.
TR 1.547	When the incident has been resolved, it shall be ensured that the service desk records of the resolution steps are updated and confirm that the action taken has been agreed to by the end user. Also, unresolved incidents (known errors and workarounds) shall be recorded and reported to provide information for effective problem management.
TR 1.548	Information security incidents and weaknesses associated with information systems shall be communicated in a manner allowing timely corrective action to be taken.
Change and Configuration Management	
TR 1.549	Change management provides information on changes and enables better control of changes to reduce errors and disruption in services.
TR 1.550	All changes shall be initiated using change management process; and a Request for Change (RFC) shall be created. All requests for change shall be evaluated to determine the impact on business processes and IT services, and to assess whether change shall adversely affect the operational environment and introduce unacceptable risk.
TR 1.551	All changes are logged, prioritized, categorized, assessed, authorized, planned and scheduled to track and report all changes. All the logs should be immutable.
TR 1.552	Ensure review of changes for effectiveness and take actions agreed with interested parties. Requests for change shall be analyzed at planned intervals to detect trends. The results and conclusions drawn from the analysis shall be recorded and reviewed to identify opportunities for improvement.
TR 1.553	The roles and responsibilities of the management shall include review and approval of the implementation of change management policies, processes and procedures.
TR 1.554	A configuration management database shall be established which stores unique information about each type Configuration Item CI or group of CI.
TR 1.555	The Configuration Management Database (CMDB) shall be managed such that it ensures its reliability and accuracy including control of update access.
TR 1.556	The degree of control shall maintain the integrity of services and service components taking into consideration the service requirements and the risks associated with the CI.
TR 1.557	Corrective actions shall be taken for any deficiencies identified in the audit and shall be reported to the management and process owners.
TR 1.558	Information from the CMDB shall be provided to the change management process and the changes to the CI shall be traceable and auditable.
TR 1.559	A configuration baseline of the attached CI shall be taken before deployment of a release into the live environment. It shall be stored in the safe environment with appropriate access control.
TR 1.560	Master copies of CI shall be recorded in the CMDB and shall be stored in secure physical or electronic libraries which shall be referenced in the configuration records. This shall be applicable to documentations, license information, software and hardware configuration images.
POINT OF PRESENCE (POP)	
TR 1.561	<p>PoP design shall at a minimum meet the following reference standards:</p> <ul style="list-style-type: none"> • NBC (National Building Code), 2005; • DoT guidelines for arrangement & installation of telecommunication equipment inside & outside building; and • TEC norms for basic infrastructure of internal & external communication network.
TR 1.562	<p>General:</p> <ul style="list-style-type: none"> • The PoPs shall include both primary and secondary PoP facilities. These facilities shall act as co-location spaces for both DMIC IITGNL and non-DMIC IITGNL (tenants) needs;

	<ul style="list-style-type: none"> • The Primary PoP will also act in a Secondary PoP capacity as a termination point for distribution fibre that connects to the plots located within its immediate vicinity; • All TSPs including cellular service providers along with other tenants shall terminate their equipment inside the PoPs. It is expected that at one of the PoPs, the TSPs will terminate their fibre from outside IIT; • All DMIC IITGNL owned fibre optic infrastructure shall originate and terminate at the PoPs with dual entry-exit redundant paths; • The PoPs shall have sufficient space for UPS for DMIC IITGNL infrastructure. The TSPs shall be given only bare shell space with partition i.e. dedicated space. The TSPs shall be responsible for any additional active infrastructure required inside their respective space; • DMIC IITGNL space shall have provision of raised flooring for access of communication/emergency electrical supply (UPS supply) as per the standard practice of arrangement for equipment racks; • Each room shall have provision of electrical and In-Out cable access of outdoor unit for air conditioning of required capacity with 100% redundancy as per TEC norms; and • All PoP rooms shall have an industry standard rodent repellent system.
TR 1.563	<p>Building Construction:</p> <ul style="list-style-type: none"> • Air filtration efficiency in accordance with ASHRAE 52.1 telecom industry standards; • HVAC shall be designed in such a way that the operating temperature is maintained at average 23 degrees C with spot minimum of 18 degrees C and spot maximum of 26 degrees C. Humidity shall be in the range of 40-60% RH. This shall be applicable for the DMIC IITGNL area only and include full redundancy; • All PoPs shall include industry standard fire detection systems. In addition, the DMIC IITGNL room at each PoP shall also include gas suppression systems; • All cabling and pathways within the PoPs shall be fire stopped only; and • Average lux level across all spaces (internal) in PoP rooms shall be 300. Only LED lights shall be used to meet the lighting requirements of the PoP facility.
TR 1.564	<p>Electrical:</p> <ul style="list-style-type: none"> • PoP rooms shall have redundant electrical feeds for power. This shall be coordinated with the DMIC IITGNL. In-coming power shall be tapped by the MSI from the nearest tapping point. Associated electrical panel at the PoP shall also be provided by the MSI; • Each suite/tenant shall have separated metered power, supplied from the main electrical panel located in the DMIC IITGNL suite (tenant to provide their own meter), while for DMIC IITGNL, MSI shall provide this meter; • All electrical wiring, switch, sockets, etc. used for internal/ external building electrification shall be certified by Indian standards under grade-A and fulfil the requirement of ECBC guidelines; • Separate wiring shall be laid for UPS supply and wiring shall be interface at distribution board/ Panel board with main supply; • In case of tray, separate tray shall be provided for electrical cable/wiring; and • Air conditioning points rating shall be confirmed as per the required capacity of room.
TR 1.565	<p>Communication:</p> <ul style="list-style-type: none"> • MSI shall provide the access of OFC and RF cables for cellular tower to each TSP room and other tenant rooms as per the design requirements; • MSI shall provide the dedicated duct/ tray inside the building for entire communication network; • All duct/ tray shall be properly sealed to protect water, dust etc. from outside and have suitable opening wherever required to operation & maintenance; • Duct/ tray layout plan shall be furnished by MSI and submit to DMIC IITGNL for their review & approval; and • MSI shall follow the recommendation of DMIC IITGNL and local telecom authority to freeze the location & height of communication points.

2.2.2 Public Wi-Fi

2.2.2.1 Overview

Public Wi-Fi shall be one of the key service offerings by DMIC IITGNL to its citizens; an initiative aimed to enable mobile broadband to be affordable, accessible and available for citizens. The Wi-Fi infrastructure shall comprise of a combination of Wi-Fi Access Points (APs), mounting infrastructure, and associated active and passive infrastructure including fibre/ copper based network.

For DMIC IITGNL, end-to-end Public Wi-Fi services will be provided across various public spaces (including public right of ways) and other strategic locations for enabling mobile broadband communications for its citizens. The target bandwidth proposed as per access point is 1 Gbps throughout IIT city. For implementing Public Wi-Fi network, following are the two (2) types of infrastructure being proposed for Wi-Fi Access Points:

- **Co-located on Poles:** The Wi-Fi access points will be set-up at strategic areas and will be co-located on Poles (supplied by MSI). Same poles will also be used to co-locate surveillance cameras.
- **Integrated at Public Interactive Kiosk:** Wi-Fi access points will be integrated at the Public Interactive kiosks that will be installed at the strategic locations across IIT such as DMIC IITGNL Admin office, public spaces like parks, bus stops etc.

The ultimate objective of these services is to provide end-to-end Wi-Fi services to citizens and to enhance the online services as part of the IIT project. In addition to this, it will also act as an enabler for Digital India for the DMIC IITGNL.

In order to provide connectivity, Wi-Fi access points will be connected to the nearest PoP through a dedicated switch and further using the fibre optic infrastructure until the PoP location respectively. All the Wi-Fi access points shall be PoE/PoE+ based. In case, Wi-Fi access point is mounted on street light poles due to project constraints, coordination will be done with EPC Contractor to ensure the poles will have holes for mounting this infrastructure at the required location.

2.2.2.2 Architecture

The approach for Wi-Fi is that DMIC IITGNL will invest in building the Wi-Fi infrastructure including access points and associated hardware, software will provide fibre to each of the access points for backhaul purposes. However, the MSI will have a neutral operator responsible for operating the Wi-Fi network and will also be responsible for providing the raw bandwidth for the Wi-Fi network. This neutral operator will act as an operator of operators, i.e. tenant-based model who in-turn will offer Wi-Fi services from various telecom service providers. Additional value-add services such as music, videos, games etc. over this Wi-Fi LAN network can be offered and Wi-Fi can also be used for 3G/4G offloading.

The Wi-Fi APs and Public Interactive Kiosks will be connected using dedicated fibre optic infrastructure. Each of the Wi-Fi APs will have dedicated fibre counts that will connect back to the nearest PoP. For redundancy, the AP shall use wireless frequency for creating a mesh to ensure continuous communications in case of a fibre link not being available.

Wi-Fi network shall also include a Wi-Fi management software and application with a secure login procedure. The Public Wi-Fi network shall also support mobility i.e. people driving or walking within IIT will be able to access the Wi-Fi network on the move for within the coverage area as per the project requirements.

The overall concept of operations for public Wi-Fi is such that DMIC IITGNL will provide Wi-Fi as a service to its citizens. It will allow citizens to use Wi-Fi for various e-governance applications, use Wi-Fi with a one-time login, coupon-based login or premium plan. The summary of the overall concept of operations in terms of different services being offered via the public Wi-Fi network are:

- One-time login – Each session will last for 30 minutes or 100MB (whichever happens first) post which the user will have to go through the login process again; and
- DMIC IITGNL city services, i.e. e-governance and m-governance – All e-governance and m-governance services to be offered to citizens and DMIC IITGNL employees using the Wi-Fi LAN at no cost to the citizens for any amount of time

- Plans – Various coupons will be available for using the public Wi-Fi services. These coupons will be made available at strategic locations across IIT including Public Interactive Kiosk. Further, they can also be available via SMS service. In addition, there will be premium plans available to the citizens for:
 - Purchasing a premium plan session at one time that lasts more than 30 minutes or 100 MB and/or at a faster speed. This plan shall be applicable throughout IIT; and
 - Extended dwelling plan – It is expected that the Wi-Fi operator is neutral and allows multiple Internet Service Providers (ISPs) to offer their services using this Wi-Fi network. As part of the Project, it is expected that there will be some ISPs who also offer wired broadband services. Therefore, there will be an option for the user to extend the wired broadband service plan at the dwelling to public Wi-Fi service by paying a premium over the base plan that is being used by the user.

The overall indicative process flow for the Public Wi-Fi network has been presented as part of the Exhibit 3 below.

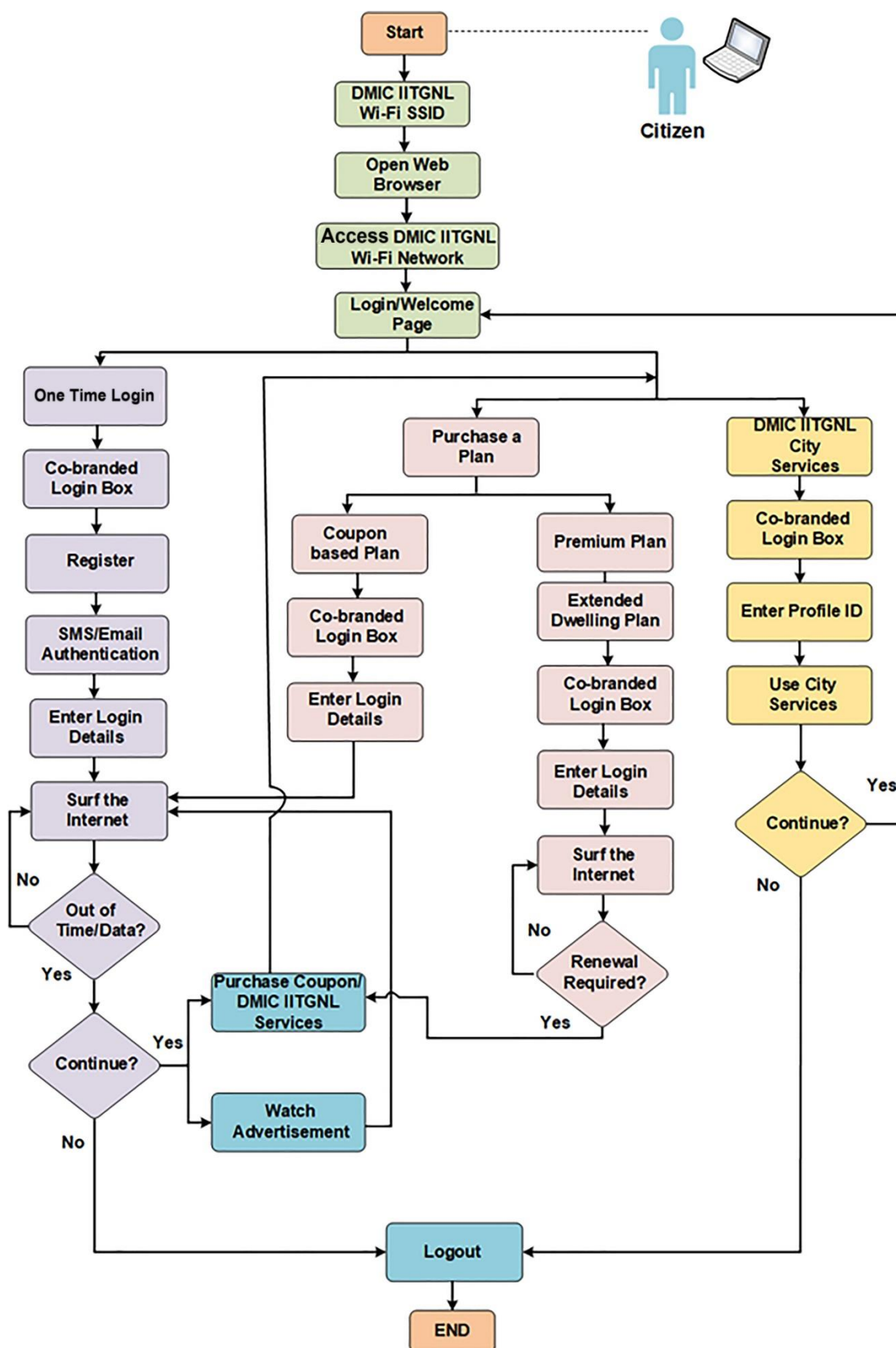


Exhibit 3: Process Flow for Public Wi-Fi Network

BR - 2 Business Requirements

BR 2.1	Wi-Fi shall be one of the key service offerings by DMIC IITGNL to its citizens.
BR 2.2	Wi-Fi is an initiative aimed to enable the mobile broadband to be affordable, accessible and available for the citizens.
BR 2.3	Wi-Fi shall be used for offering e-Governance services for the citizens and m-governance services to DMIC IITGNL workforce. For municipal functions and e-Governance services, the Wi-Fi services shall be free of charge.
BR 2.4	Wi-Fi shall be provided at no cost to the user for 30 minutes or 100 MB (whichever happens earlier) at 4 Mbps download per user per session. 4 Mbps download speed can be increased to 8 Mbps as per Client discretion. Post this, custom plans can be created for the user based on consultations with the Client.
BR 2.5	Wi-Fi services shall be provided using a neutral operator i.e. an operator who supports multiple ISPs (tenant based model) to offer their services through the DMIC IITGNL infrastructure. Further, 3G/4G offload can also be supported using city Wi-Fi network.
BR 2.6	Beyond the free Wi-Fi services for citizens, the MSI, may monetize the Wi-Fi services without impacting the overall user experience and in consultation with the Client. The MSI may retain all monetization derived from the public Wi-Fi services. In return, MSI shall offer discount in its financial proposal during bidding stage.
BR 2.7	Wi-Fi services shall support the extended dwelling plan option i.e. extend a user's personal broadband connection across IIT.
BR 2.8	MSI at his own cost may offer Wi-Fi as a service to any plot holder within the plot or building after getting consensus with the Client.
BR 2.9	Wi-Fi services shall be offered in compliance with the regulations and policies from both TRAI and DOT.
BR 2.10	Wi-Fi Operator shall be a Licensed ISP in India who shall be able to meet all requirements for operations of network.
BR 2.11	Wi-Fi network shall be integrated with payment gateway (provided by DMIC IITGNL) and coupon based system for payments by the users for browsing.
BR 2.12	Contention ratio shall be assumed as 200:1 for the Wi-Fi services.
POLES FOR FIELD DEVICES	
BR 2.13	Poles should be used for mounting ICT field device at variable height as per the site condition.

FR - 2 Functional Requirements

GENERAL	
FR 2.1	<p>Wi-Fi Network shall comprise of the following components:</p> <ul style="list-style-type: none"> • Access Points (APs) including the mounting infrastructure • Wireless Controllers • Wi-Fi Management System • Associated active and passive infrastructure
FR 2.2	Wi-Fi shall have a secure, seamless and redundant network. It shall support industry standard based two (2) step authentication procedure.
FR 2.3	Wi-Fi services shall be provided across public spaces and other strategic locations in consultations with the Client.

FR 2.4	The target bandwidth proposed per end-user is 4 Mbps throughout the City, extendable up to 8 Mbps, on a per session basis for the 30 minutes or 100 MB per session that will be given to the user at no cost.
FR 2.5	The system shall be designed for scalability and allow future expansions in terms of subsequent project phases, increased user density and geographical coverage.
FR 2.6	The Wi-Fi transition from one access point to another shall be seamless. Users must be able to use same login details even if they move from one Wi-Fi zone to another.
FR 2.7	All DMIC IITGNL promotions can use the Wi-Fi network without any cost.
FR 2.8	Advertising streams shall be planned and implemented carefully. Because of the advertising, there shall not be a scenario where the citizen is unable to login to the network for a long time and gets annoyed.
FR 2.9	It is expected that the time taken by the user to login and use the Internet from the time he sees the initial page shall be less than 3 minutes.
ACCESS POINT	
FR 2.10	For the implementation of a city Wi-Fi network, the following are the two (2) types of infrastructure being proposed for Wi-Fi Access Points: <ul style="list-style-type: none"> Outdoor Rated Access Point (AP) co-located on Poles (to be supplied by MSI): This setup shall be used across public right-of-way areas. Integrated with Public Interactive Kiosk: Wi-Fi access points shall be integrated at the Public Interactive Kiosks installed at the strategic locations within the plots.
FR 2.11	The access points shall be capable of managing and configuring remotely through a wireless controller.
FR 2.12	Wi-Fi access point shall support dual frequencies (in compliance with DoT and TRAI regulations) including both 2.4 GHz and 5 GHz spectrum. It shall support wireless mesh configuration for redundancy of the network in case of a fibre link being unavailable.
FR 2.13	User can create a profile which will be authenticated using his mobile number (SMS) and email. Further, user can also login using his city application credentials.
FR 2.14	Access Point and Public Interactive Kiosks shall be connected using dedicated fibre optic infrastructure for backhaul to Point of Presence (PoP).
FR 2.15	The Wi-Fi access point shall be controller based that can be managed by using Wi-Fi controller at City's Integrated Operations Centre (CIOC).
FR 2.16	The Wi-Fi access point shall be configurable using a Wireless Management system. The software shall include profile configuration, built-in diagnostic, alignment tools, network mapping, network monitoring and maintenance and highly developed security features.
Wi-Fi CONTROLLER	
FR 2.17	Wi-Fi network shall include Wi-Fi controller to monitor, manage, and control access points from the CIOC.
FR 2.18	The controller shall ensure seamless roaming within DMIC IITGNL.
FR 2.19	The controllers should communicate back and forth with the centralized security system and network management system in real time.
FR 2.20	The controller shall have inbuilt wireless intrusion protection capabilities.
Wi-Fi MANAGEMENT SYSTEM	
FR 2.21	The Wi-Fi shall also include a Wi-Fi management software and application with a secure login procedure.

FR 2.22	Wi-Fi Management System shall be a centralized system to monitor, analyze, and configure wireless network in automatic fashion. It shall be an authentication and management system for the city Wi-Fi network and shall be installed at the CIOC.
FR 2.23	The system shall be capable of providing Access Point groups with the highest quality network resource allocation by analysing the past 24 hours of RF network static optimizing the network for the next day.
FR 2.24	GUI: The system shall have a configurable graphical user interface (GUI) to provide user friendly experience for policy management, and day to day administration functions.
FR 2.25	Database: The system shall have a centralized database and subscriber management system.
FR 2.26	The Wi-Fi network shall support multiple BSSIDs as needed to support the overall concept of operations including support for multiple operators.
FR 2.27	Fully redundant Authentication, Authorization, and Accounting (AAA) services with OTP shall be provided to support city wide services.
FR 2.28	The Wi-Fi network shall include a billing software that shall automatically generate the revenue from all the services being offered using this network. This billing software will have transparent interface with DMIC IITGNL's systems.
FR 2.29	The Wi-Fi Management System shall integrate with SMS gateway and WhatsApp gateway for sending SMS and OTPs to Wi-Fi users. The SMS gateway and WhatsApp gateway procurement shall be the responsibility of the MSI. SMS gateway that support maximum character length for text Message shall be procured.
USER LOGIN AUTHENTICATION PLANS	
FR 2.30	Beyond the 30 minutes or 100 MB limit, the user shall have to go through the process of logging in again. At this stage, the MSI may offer custom plans to the users.
FR 2.31	Industry standard two (2) step authentication shall be required for all sessions.
FR 2.32	iOS and Android applications to be given for seamless connectivity to network-Auto-detect/ Auto-login.
FR 2.33	The user shall have the option of either logging in by viewing advertising or can obtain a coupon for the session for a nominal cost.
FR 2.34	Premium plans shall be offered to the users on daily, weekly or monthly subscriptions basis. Also, there shall be plans for the residential or industrial users who can pay a small premium to use their dwelling Wi-Fi service across the Integrated Industrial Township.
FR 2.35	Users shall have an option to enable/ disable connection to public Wi-Fi.
FR 2.36	Users shall also get prompts and alerts for excess data usage.
FR 2.37	Multiple payment gateway integration required allowing the users to make the payments using online/ offline mode, including prepaid mobile balance & e-wallet applications and coupon based.
FR 2.38	DMIC IITGNL shall be able to generate MIS report to view overall usage, collections and other usage statistics over a defined time period.
ENCRYPTION AND SECURITY	
FR 2.39	The Wi-Fi network shall have built-in encryption mechanism to encrypt all communications and data transfer over the Wi-Fi for all the users of Wi-Fi.
FR 2.40	Wi-Fi network shall not connect to rogue networks. It shall be segmented for public and utility networks by using VPNs or separate networks in the wired core so that any traffic from the Internet users is not routed into any other sensor network and vice-versa.
FR 2.41	Wi-Fi network shall support Protected Extensible Authentication Protocol (PEAP) protocol.
FR 2.42	Wi-Fi network shall have a wireless network content filtering tool for filtering of malicious content on the internet such as pornography sites, rogue sites, torrents etc.

FR 2.43	The Wi-Fi Network shall allow users to roam securely from one access point to another, within or across subnets, without any perceptible delay security during re-association.
FR 2.44	The Wi-Fi Network shall support BSSID based IEEE 802.1x authentication and accounting.
FR 2.45	The Wi-Fi network shall support MAC based authentication to provide simple authentication based on users MAC address.
POLES FOR FIELD DEVICES	
FR 2.46	Location of poles shall be finalized as per approved road cross section or as suggested by Client at site.
FR 2.47	The minimum life requirement of pole structure shall be 25 years (metal parts).
FR 2.48	The MSI should not use any banned/restricted material as per Indian Regulations.
FR 2.49	All cabling, cooling/heating etc. should be via/inside the pole and it should not be visible from outside due to aesthetic and security reasons.
FR 2.50	The poles shall be aesthetically and visually appealing.
FR 2.51	Poles shall be equipped with safety devices and lightening protection kits etc.
FR 2.52	Poles should have the required load bearing capacity to accommodate applicable ICT equipment such as Wi-Fi Access Points, Fixed Cameras, PTZ Cameras and any other equipment.

TR - 2 Technical Requirements

GENERAL	
TR 2.1	The Wi-Fi access points shall be co-located with other field equipment at the poles and mounted on the Public Interactive Kiosks.
TR 2.2	The Wi-Fi central hardware and software shall be installed at the PoP or CIOC.
TR 2.3	<ul style="list-style-type: none"> Organization IEEE: <ul style="list-style-type: none"> ➤ IEEE 802.11a/b/g/n/ac; Organization European Standard (EN): <ul style="list-style-type: none"> ➤ EN50121-1 EMC or UL/IEC/EN 60950; Organization Underwriters Laboratory and IEC; Department of Telecommunications guidelines; Telecom Regulatory Authority of India guidelines.
ACCESS POINT	
TR 2.4	The Wi-Fi access point shall be Outdoor rated, dual radio, 802.11ac Wave II, 5-GHz and 2.4-GHz. It shall support operations in 802.11a/b/g/n/ac.
TR 2.5	The Wi-Fi access point shall be supplied with omni-directional antennas as needed to meet the design requirements of the Project. It shall support multiple unique antenna patterns. The antennas shall have antenna gain required to support the coverage requirements of the Project.
TR 2.6	The Wi-Fi access point shall have a built-in spectrum analyser capable of part-time or dedicated spectrum analysis to identify sources of RF interference either built-in or as part of the overall solution.
TR 2.7	The Wi-Fi access point shall be controller based that can be managed by using Wi-Fi controller at CIOC.
TR 2.8	The Wi-Fi access point shall be configurable using a Wireless Management system. The software shall include profile configuration, built-in diagnostic, alignment tools, network mapping, network monitoring and maintenance and highly developed security features.

TR 2.9	The Wi-Fi access point shall provide the fastest and highest throughput with lowest latency even in the most challenging RF environment.
TR 2.10	The Wi-Fi access point shall support dual frequency as authorized by DoT.
TR 2.11	The total transmitted power (EIRP) of the Wi-Fi access points shall be in compliance with the regulations of the Department of Telecom (DoT), India.
TR 2.12	The Wi-Fi access point shall have multiple SSIDs with QoS and security policies.
TR 2.13	The Wi-Fi access point shall allow setting up of configurable speeds per user and configurable number of users. It shall support up to 200 concurrent users at any time.
TR 2.14	The Wi-Fi access point shall support reliable multicast video to maintain video quality.
TR 2.15	The Wi-Fi access point shall also support additional features for DMIC IITGNL staff members as needed using a separate secure SSID. Each AP shall support at least 16 different BSSIDs.
TR 2.16	The Wi-Fi access point shall support 20 MHz, 40 MHz, and 80 MHz channelization.
TR 2.17	The Wi-Fi access point shall be IEEE 802.3af/at Power over Ethernet (POE)/POE+ compliant.
TR 2.18	The Wi-Fi access point shall support: <ul style="list-style-type: none"> • Minimum One PoE+ autosensing port 10/100/1000BASE-T Ethernet network interface (RJ-45). • Power over Ethernet (PoE) or Power over Ethernet+ (PoE+).
TR 2.19	The Wi-Fi access point shall have LED based visual indicator for: <ul style="list-style-type: none"> • Power/System status • Link status
TR 2.20	The Wi-Fi access point shall be capable of working at a temperature range of 0°C to 55°C and at a humidity of 5% to 95%, non-condensing.
TR 2.21	The Wi-Fi access point shall be IP67 compliant.
TR 2.22	The Wi-Fi access point must support IPv4 and IPv6.
TR 2.23	The Wi-Fi access point shall support telnet and/or SSH login/ console for troubleshooting.
TR 2.24	The Wi-Fi access point shall be reliable ensuring fast, dependable bandwidth and industry standard encryption for security.
TR 2.25	The Wi-Fi access point shall independently be configurable to handle security, mesh, WIPS (either in-built or part of overall solution), RF Management, QoS, roaming, local forwarding without the need for a controller so as to increase performance of the WLAN network.
TR 2.26	The Wi-Fi access point shall be supplied with OEM mounting kit and shall support pole mounting option.
Wi-Fi CONTROLLER	
TR 2.27	The controller shall support 802.11a/b/g/n/ac.
TR 2.28	Each controller shall support 500 access point nodes at a minimum and shall be scalable as and when required up to 1000 access point per controller.
TR 2.29	The Controller shall support redundancy feature i.e. Active: Active and Active: Standby features. Same licence shall be shared by the controllers.
TR 2.30	The controller shall support centralized or distributed traffic forwarding architecture.
TR 2.31	The controller shall ensure a high throughput even in the most challenging RF environment.
TR 2.32	The controller shall be highly available with minimum downtime.
TR 2.33	The controller shall ensure seamless roaming.

TR 2.34	The controllers shall communicate back and forth with the Enterprise Management System (EMS) in real time.
TR 2.35	The controller shall have inbuilt wireless intrusion protection capabilities.
TR 2.36	The controller shall have ability to map SSID to VLAN and it shall ensure VLAN reliability by proactively determining and adjusting to changing RF conditions.
TR 2.37	The controller shall support automatic radio channel adjustment for intelligent channel switching and real-time interference detection.
TR 2.38	The controller shall support user load balancing to balance the number of users across multiple APs to optimize AP and user throughput.
TR 2.39	The controller shall be capable of managing authentication, encryption, VPN connections, IPv4 and IPv6 Layer 3 services.
TR 2.40	The controller shall have redundant power supplies to maintain uninterrupted network operations.
TR 2.41	The controller shall meet the following power specifications: <ul style="list-style-type: none"> AC input voltage: 100 VAC to 240 VAC AC input frequency: 50-60 Hz
TR 2.42	The controller shall support two (2) dual-media ports: 2 x 10 Gigabit Ethernet interface or more.
TR 2.43	The controller shall meet the following environmental specifications: <ul style="list-style-type: none"> Operating temperature range: 10°C to 40°C Operating humidity of 10% to 80% non-condensing
TR 2.44	The Wi-Fi controller shall be reliable ensuring fast, dependable bandwidth and industry standard encryption for security.
TR 2.45	The controller shall be rack mountable.
Wi-Fi MANAGEMENT SYSTEM	
TR 2.46	Wi-Fi management system shall be a centralized system to monitor, analyse, and configure wireless network in automatic fashion. It shall be an authentication and management system for the public Wi-Fi network and shall be installed at CIOC. It shall support plug-and-play environment with zero configuration.
TR 2.47	GUI: The system shall have a configurable graphical user interface (GUI) to provide user friendly experience for policy management, and day to day administration functions.
TR 2.48	Database: The system shall have a centralized database and subscriber management system.
TR 2.49	The system shall be capable of providing Access Point groups with the highest quality network resource allocation by analysing the past 24 hours of RF network statistics, and proactively optimizing the network for the next day.
TR 2.50	It shall be integrated with tool for monitoring and managing radio frequency (RF) dynamics within the wireless network, to include the following functions and benefits: <ul style="list-style-type: none"> Accurate location information for all wireless users and devices Up-to-date heat maps and channel maps for RF diagnostics Visual display of errors and alerts
TR 2.51	The system shall be capable of restricting bandwidth to a user/ users as per the policies.
TR 2.52	The system shall be both IPv4 and IPv6 compliant.
TR 2.53	The system shall be capable of logging and creating real time reports for users per access point and controller the bandwidth usage.
TR 2.54	The system shall be capable of displaying a list of managed devices and access points associated to

	the Wi-Fi controller.
TR 2.55	Subscriber services: The system shall provide the users with a self-service portal to enable the new users to register, subscribe, seek information on tariff and billing, update user profile, and make payment through the portal.
TR 2.56	The System shall be able to provide the master rights / admin access to DMIC IITGNL.
TR 2.57	The Wi-Fi Management System shall have the capability to prepare log files of all the websites which are browsed. Log files should be available for particular access points and MAC IDs also. These log trails are required for audit purposes in case of terrorism activities.
TR 2.58	Post authentication, user information such as, mobile number, host name, MAC address shall be stored in data base for audit purpose. Log files of this data shall be available.
TR 2.59	The Wi-Fi Management System shall support the capability to detect the number of users per Access point.
TR 2.60	The Wi-Fi Management System should have the capability to auto-archive / back up log files.
TR 2.61	Option for One Time Password (OTP) based access shall be available for users to access Wi-Fi network.
SERVER	
TR 2.62	The system shall support a centralized servers for user authentication, authorization and accounting.
TR 2.63	The server shall have an integrated embedded management solution to monitor the server for ongoing management, service alerting, reporting and remote management.
TR 2.64	Wi-Fi Management system shall be hosted on cloud solution.
POLES FOR FIELD DEVICES	
TR 2.65	Pole shall be octagonal/conical/circular with the minimum height of 6 mtr.
TR 2.66	The pole shall be constructed for carrying capacity of proposed loading of the field devices including related IT equipment mounted and the design forces as listed in IS: 875 (Part-III) 1987 "Code of Practice for Design loads for Structures".
TR 2.67	The poles shall be hot dip galvanised as per IS: 2629 / IS: 2633 / IS: 4759 standards with average coating thickness of 70 micron. The galvanizing shall be done in single dipping.
TR 2.68	The poles shall have base plate and necessary knockout provision to mount field devices at various height.
TR 2.69	The poles shall be bolted on a pre-cast foundation with a set of four foundation bolts for greater rigidity. Pole foundation and other civil work shall be in MSI scope.
TR 2.70	Pole foundation shall have provisioning of at least two 40mm diameter duct for incoming & outgoing of IT & power cables.
TR 2.71	All pole shafts shall be provided with the rigid flange plate of suitable thickness with provision for fixing 4 foundation bolts. This base plate shall be fillet welded to the pole shaft at two locations i.e. from inside and outside.
TR 2.72	Pole material shall confirm to the below standards: <ul style="list-style-type: none"> • Poles shaft: Conforming to grade S355JO (for conical)/ St 35 grade (for Octagonal); • Base Plate: Fe 410 conforming to IS:226 / IS:2062; and • Foundation Bolts: EN 8 Grade (for conical)/ 6.8 Gr. As per IS:1367 (for Octagonal)
TR 2.73	All electrical and IT wiring/cabling including any other accessories to complete the job is part of MSI scope of work.
TR 2.74	The MSI shall provide the design criteria for structural calculations based on:

	<ul style="list-style-type: none"> • Wind load and, if derived from wind tunnel test, method and details of test; • Seismic load where required; • Dead load; and • Stress analysis for reinforced concrete of the foundation.
TR 2.75	An earthing system, to the provisions of internationally accepted standard shall be provided at each pole.
TR 2.76	The poles shall be aesthetically and visually appealing. They shall be as per the latest industry standard products being offered on other similar projects.
TR 2.77	MSI shall submit at least 3 sample of poles for approval.
TR 2.78	Pole shall have aesthetically appealing and decorative LED lights for display purposes.

2.2.3 City Surveillance with Automatic Traffic Counters and Classifiers (ATCC) and Automatic Number Plate Recognition (ANPR) Cameras

2.2.3.1 Overview

The vision of DMIC IITGNL is to position it as 'safe' smart city where paramount emphasis is kept on safety of citizens and law enforcement. As part of this vision, IP based video surveillance system are proposed to be implemented across all strategic locations throughout IIT project area. City surveillance along with analytics will enable proactive response to city events. The locations comprise of the following as a minimum:

- Roads;
- Intersections/ Junctions;
- Public spaces/ buildings; and
- Around critical facilities like City Integrated Operations Centre (CIOC), Point of Presence rooms (PoP), Administrative Building etc.

Depending upon the objective to be served by a camera, they shall be of different configurations. Along with CCTV cameras (i.e. Fixed and PTZ), Automatic Traffic Counters and Classifiers (ATCC) and Automatic Number Plate Recognition (ANPR) cameras shall also be installed at city junctions and all the entry/ exit points of Integrated Industrial Township (IIT). The ATCC shall be capable of automatically counting and classifying all types of vehicles under all lighting and weather conditions. Automatic Number Plate Recognition (ANPR) cameras shall enable functionalities such as number plate detection, information retrieval and storage, analytics etc. Further, by efficiently leveraging the end-to-end fibre optic network across IIT, the entire city surveillance network shall be designed and developed in a manner to ensure minimal points of failure. In addition, Variable Message Displays (VMDs) shall also be installed at strategic locations to provide necessary information to citizens such as environmental data, traffic information, necessary advisories etc. CCTV surveillance system shall support both edge analytics or central video analytics, ensuring the accomplishment of following objectives:

- Monitor;
- Recognize; and
- Detect.

To ensure that intelligent surveillance be performed by the CCTV surveillance cameras across IIT, the camera equipment shall be housed in a robust housing capable of withstanding extremely adverse weather conditions prominent in the project area. The camera equipment housing shall also ensure that it remains protected from any sort of damage, tampering, theft, vandalism etc.

The video feeds received from all the cameras shall be directed to the City's Integrated Operations Centre (CIOC) for viewing and analytics. CIOC shall consist of local server and storage equipment for storing all these video feeds.

2.2.3.2 Architecture

As the CCTVs shall be co-located with other field equipment at the poles, the same switch (as used for other equipment) shall be used to backhaul data to the CIOC via dedicated ring based fibre optic infrastructure. The CCTVs will be installed on poles and shall leverage UPS provided in Junction box as the secondary source of power for operations. For connectivity, CCTVs will be connected to the nearest RMU room/ field cabinet / junction box via dedicated Layer-2 industrial grade switch. From the RMU room/ field cabinet / junction box, the feed will be transferred to the PoP via DMIC IITGNL owned dedicated backbone fibre network. From this location the feed will be sent to the CIOC. At the CIOC location, there will be dedicated infrastructure like Local Server for Storage and Video Management System that will be connected to the CCTV surveillance system for real-time recording, storage and analysis purposes.

The real-time interaction between, and integration with the different ICT systems across the city along with relevant authorities shall result in the overall development of an interactive response management system. Cross-systems integration of city surveillance system with other smart city ICT elements in real-time shall ease the DMIC IITGNL staff to ensure enhanced and proactive security to both its citizens as well as the industrial workforce of IIT. Cameras pre-installed at various sites by EPC Contractor including Solid Waste Management sites, Sub-Stations, of the city shall also be integrated with the CIOC. Therefore, with such 'smart' surveillance

systems being planned for implementation across IIT, the MSI shall ensure efficient, integrated and intelligent operations of the city surveillance system. A brief architecture illustrating the overall operations of city surveillance system has been given in the Exhibit 4 below:

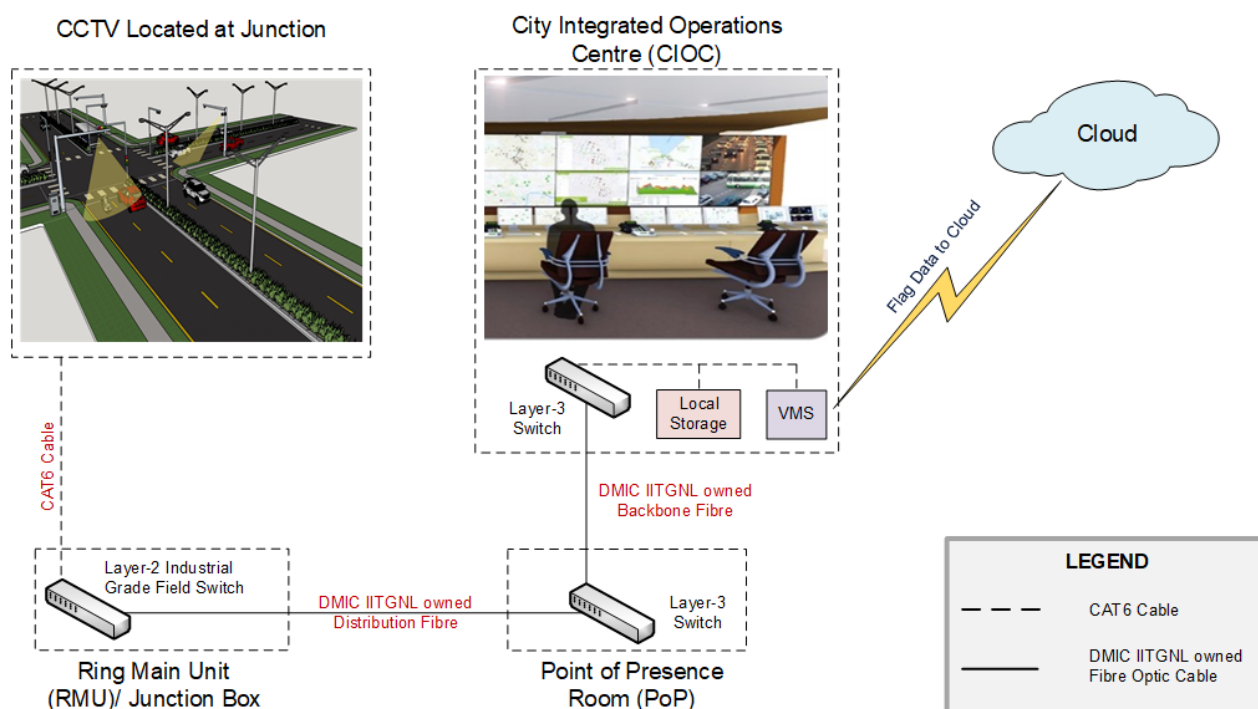


Exhibit 4: Conceptual System Architecture for City Surveillance System

BR - 3 Business Requirements

BR 3.1	City surveillance system shall provide a secure and safe environment for the citizens by using intelligent video analytics and integrated platform forming part of decision support system.
BR 3.2	City Surveillance System shall support edge analytics or central analytics for pro-active monitoring.
BR 3.3	City Surveillance System shall enable real time recording of the video.
BR 3.4	ATCC camera shall include capability to detect, count and classify traffic at all entry and exit locations for the purpose of managing traffic incidents.
BR 3.5	ANPR camera shall include capability to detect the registration plates of the vehicle for the purpose of monitoring traffic and enforcement related activities.
BR 3.6	ATCC and ANPR cameras shall be located at separate gantry as per applicable site requirements.
BR 3.7	ATCC and ANPR shall be integrated with the CIOC to monitor and provide live feed to the videowall installed at CIOC.
BR 3.8	CCTVs shall be co-located with Wi-Fi access points on poles and shall leverage the same switch as the Wi-Fi access points.
BR 3.9	CCTVs shall be integrated with the City's Integrated Operation Centre to provide direct live feed to view and monitor activities around the City.
BR 3.10	The Variable Message Display (VMD) shall be installed at strategic locations as per the site requirements. It shall be integrated with the following ICT Components envisaged for the city: <ul style="list-style-type: none"> Environment Sensors City Surveillance Transportation and Traffic data

FR - 3 Functional Requirements

GENERAL	
FR 3.1	<p>City Surveillance System shall consist of:</p> <ul style="list-style-type: none"> • Fixed Cameras; • PTZ Cameras; • Automatic Traffic Counter and Classifier (ATCC) with Application; • Automatic Number Plate Recognition (ANPR) with Application; • Local Storage and Servers; • Variable Message Display; • Video Management System (VMS) including central software application; • Camera Accessories i.e. Power Supplies, Cable, Connectors and associated accessories for an integrated system
FR 3.2	The cameras implemented as part of this Project shall be rated for operations in outdoor environment (for outdoor installations) and depending on the objective/application, shall be of different configurations including PTZ or fixed or ANPR or ATCC cameras.
FR 3.3	All the Cameras shall be IP based.
FR 3.4	Cameras shall have an integral receiver/driver that shall be capable of controlling pan-tilt, zoom and focus locally and also remotely from the CIOC.
FR 3.5	The video feeds received from all the cameras shall be directed to the City's Integrated Operations Centre (CIOC) for viewing and analytics. CIOC shall consist of local server and storage equipment for storing all these video feeds.
FR 3.6	All cameras shall support real-time video content analysis.
FR 3.7	All CCTV cameras shall be installed on poles except for Public Interactive Kiosks where they shall be integrated.
FR 3.8	<p>Indicative list of capabilities that IIT city surveillance system are as follows:</p> <ul style="list-style-type: none"> • Real-time monitoring of City • Event based monitoring of City • Providing secured access to video at any time from any network location • Situation/Rule based alerts including early warnings for prevention and avoidance of unwanted incidents • Automated response based on events including communication of alerts to relevant authorities like Fire, Hospitals, etc. for swift response in case of emergencies • Access to historic video data for investigative purposes • Real time traffic counting and classification for managing traffic incidents

CAMERAS WITH BUILT-IN VIDEO ANALYTICS	
FR 3.9	<p>The surveillance system shall support following Built-in-Analytics for the Cameras and using central analytics:</p> <ul style="list-style-type: none"> • Auto Tracker: To detect and track movement in the field of view. • Adaptive Motion Detection: To detect and track object that enter a scene and then triggers an alarm when the object enters a user-defined zone. • Abandoned Object: To detect objects placed within a defined zone and triggers an alarm if the object remains in the zone longer than the user-defined time allows. • Camera Sabotage: Triggers an alarm if the lens is obstructed. • Directional Motion: Generates an alarm in a high traffic area when a person or object moves in a specified direction. • Object/ People Counting: To count the number of objects/ people that enter a defined zone. • Object Removal: To triggers an alarm if the object is removed from a user-defined zone. • Intrusion Detection: Detect intrusion.
FR 3.10	<p>Event (alarm) Handling:</p> <ul style="list-style-type: none"> • The camera shall be capable of recording an event as pre and post event images to on-board SD Media Card and on local storage. Events may be triggered using camera motion detection or from an external device input such as a relay. • When triggered from an external input or the camera's motion detector, the camera shall be capable of sending JPEG images via e-mail and/or sequences of images to an FTP server or on-board compact flash and local storage. • A relay output shall be available upon the activation of the camera's motion detector or external relay input. The relay output may also be manually activated from the live view screen.
RECORDING AND STORAGE	
FR 3.11	<p>The storage solution proposed is that the video feeds would be available for 30 days. After 30 days, the video feeds would be overwritten or archived unless it is flagged or marked by the Police or DMIC IITGNL for investigation or any other purpose. The video feeds of all relevant cameras capturing the incident in question would be stored until the Police or DMIC IITGNL deem it good for deletion.</p>
FR 3.12	<p>For incidents that are flagged by the Police, DMIC IITGNL or any court order, the video of the relevant portion from all relevant cameras should be stored/archived separately for investigation purposes and a committee at Authority can decide when this video feed can be deleted. All flagged data shall be stored on cloud for the Project duration.</p>
FR 3.13	<p>The Recording Servers / System, once configured, shall run independently of the Video Management system and continue to operate in the event that the Management system is off-line.</p>
FR 3.14	<p>The system shall support the use of separate networks, VLANs or switches for connecting the cameras to the recording servers to provide physical network separation from the clients and facilitate the use of static IP addresses for the devices.</p>
FR 3.15	<p>The system shall support H.264 or better, MPEG-4 and MJPEG compression formats for all IP cameras connected to the system.</p>
FR 3.16	<p>The system should not limit amount of storage to be allocated for each connected device.</p>
FR 3.17	<p>The system shall allow for the frame rate, bit rate and resolution of each camera to be configured independently for recording. The system shall allow the user to configure groups of cameras with the same frame rate, bit rate and resolution for efficient set-up of multiple cameras simultaneously.</p>
FR 3.18	<p>Bandwidth optimization - The Recording Server / System shall offer different codec (H.264, MJPEG, MPEG-4, etc.) and frame rate (CIF, 4CIF, QCIF) options for managing the bandwidth utilization for live viewing on the Client systems.</p>

FR 3.19	From the Client systems, the user shall have the option of having video images continually streamed or only updated on motion to conserve bandwidth between the Client systems and the Recording Server.
FR 3.20	The Recording Server / System shall support Camera devices from various manufacturers.
FR 3.21	The Recording Server / System shall support the PTZ protocols of the supported devices listed by the camera OEMs.
FR 3.22	Failover Support - The system shall support automatic failover for Recording Servers. This functionality shall be accomplished by Failover Server as a standby unit that shall take over in the event that one of a group of designated Recording Servers fails. The system shall support multiple Failover Servers for a group of Recording Servers. Failover server shall be hosted at geographically redundant location i.e. Secondary PoP.
FR 3.23	SNMP Support - The system shall support Simple Network Management Protocol (SNMP) in order for third-party software systems to monitor.
VIDEO MANAGEMENT SYSTEM (VMS)	
FR 3.24	Central software application to be installed at the CIOC shall be able to run on any PC based on standard operating systems.
FR 3.25	Video Management System (VMS) shall be non-proprietary and open-ended.
FR 3.26	Central Application Server shall allow user to view live video stream.
FR 3.27	Software shall consist of a single client application and the client software shall not be dependent on, require any connection to, a central management or configuration server for security reasons.
FR 3.28	The system shall support a distributed architecture with no single point of failure.
FR 3.29	Video shall normally stream direct from recording server to client due to security reason.
FR 3.30	A client or any other operator shall ask "permission" to connect to a camera.
FR 3.31	There shall be no single management server. System management shall be distributed throughout the system.
FR 3.32	Recording failover management shall be standard without need for additional license.
FR 3.33	It should be possible to record to multiple recorders at the same time.
FR 3.34	DMIC IITGNL's workstations must remain "connected" to all recording devices simultaneously.
FR 3.35	VMS/Camera shall allow the overlay of time and date and site information on live video panes, either on all panes, or selected pane only.
FR 3.36	VMS shall be ONVIF compliant.
FR 3.37	Users shall be able to display any camera view (virtual pre-set).
FR 3.38	VMS shall allow users to review the hidden/privacy zone in live video if the user has the appropriate permission.
FR 3.39	Administrators shall be able to configure hidden/privacy zone on fixed cameras.
FR 3.40	VMS shall allow the display of analytics on video.
FR 3.41	Users shall be able to take a snapshot of one image or all images currently displayed and save as a bitmap or JPEG image to a configurable location. This should include zoomed images.
FR 3.42	Users shall be able to replay currently viewed live video by a single mouse click for replays from 10, 15 or 30 seconds before current time or from alarm time.
FR 3.43	In the event of the video connection failing, the Video Management System shall display a clear error message with the option to also display the last video frame received.

FR 3.44	Option to view Surrounding Cameras: the system shall enable the operators to configure camera feed and based on group/ sub-group details, its surrounding camera should be automatically displayed on separate pane based on alarms.
FR 3.45	Event Counting: The Video Management System shall allow users to view a count of analytics events on the video pane while video is being displayed. The System shall allow users to reset the event count for a camera.
FR 3.46	<p>PTZ Control:</p> <ul style="list-style-type: none"> • All PTZ control shall be user-restricted. • Users shall be able to configure named preset positions. • Users shall be able to configure named custom commands. Commands can be per PTZ type or per camera, as required. • Users shall be able to simultaneously pan and tilt a PTZ camera displayed in a video pane in any direction and at varying speed by moving the PC mouse on the video pane. • Users shall be able to zoom a PTZ camera in or out using the PC mouse. • Users shall be able to simultaneously pan, tilt and zoom a PTZ camera displayed in a video pane or monitor using a joy stick on one of the supported CCTV keyboards. • Users shall be able to move a PTZ camera to a preset position using the on screen PTZ controls or a CCTV keyboard. • Users shall be able to hold onto connections to PTZ cameras to prevent other users taking control if not moved (overrides the 5 second timeout.). • Users shall be able to take control of a PTZ camera if user has a higher priority than the user currently moving it (overrides PTZ hold.). • Inform user when can't take control of a PTZ camera because another user with a higher priority is controlling it.
FR 3.47	<p>Timeline and Calendar:</p> <ul style="list-style-type: none"> • Users shall be able to view the recorded video footage for a camera along a timeline. They shall be able to expand and contract the timeline to show a larger or smaller time range and to scroll the timeline backwards and forwards to show different time periods. • For a camera, users shall be able to see summary information about how much recording footage is available from local storage. • Users shall be able to change the playback from local storage associated with a camera. • The Video Management System shall provide one-button click controls to go to the beginning or the end of available recording footage. • The Video Management System shall provide a calendar control to allow navigation to any year / month /day in the recording library. • The Video Management System shall provide a go to "today" control for getting current recording footage. • The Video Management System shall provide a go to "hour / minute / second" control. • The Video Management System shall display alarms related to the selected camera along the timeline including summary counts of the number of alarms in each time period. • The Video Management System shall display video bookmarks along the timeline. Bookmarks can either be those from a selected camera or from current bookmark query as displayed in the bookmark list.
FR 3.48	<p>Playback on PC Screen or Video Wall:</p> <ul style="list-style-type: none"> • The Video Management System shall play back video recorded in MJPEG, MPEG4 and H.264 formats.

	<ul style="list-style-type: none"> The Video Management System shall play back video from up to 25 cameras at once in a single video window. The Video Management System shall play back each camera separately or synchronize to playback from the same time. Users shall be able to digitally zoom up to 1000% and scroll replayed video. Users shall be able to display analytics on video.
FR 3.49	<p>Bookmarks:</p> <ul style="list-style-type: none"> Users shall be able to add a bookmark to a recording for a camera at a specified time. Users shall be able to find bookmarks by a text string within the bookmark. Users shall be able to produce reports of bookmarks and export to RTF or CSV formats. Users shall be able to delete one or more bookmarks. The Video Management System shall ensure that bookmarks are held alongside recordings on the local storage, not on a user's PC.
FR 3.50	<p>Incident Export:</p> <ul style="list-style-type: none"> Users shall be able to export video clips from a selected camera or cameras within a site to a named incident. Time to export shall be no more than 30 seconds per hour of video recorded. Users shall be able to queue video exports to be performed as a background process. The Video Management System shall show progress and estimated time to completion in an export status window. The Video Management System shall automatically digitally sign video clips on export. Users shall be able to protect the original recordings to preserve the evidence. Users shall be able to play back incidents with all the playback operations provided by the full Video Management System application. The Video Management System shall provide the option to include date and time on each frame of the recording when it is exported. Administrators shall have the ability to restrict the location that users may export video files to.
FR 3.51	Users shall be able to configure the recording schedule for cameras on local storage.
FR 3.52	Users shall be able to specify whether the recording should be protected when an alarm or event occurs (from a specified time before the alarm / event.).
FR 3.53	Users shall be able to copy recording schedules from one camera to other cameras on the same or another local storage.
FR 3.54	Users shall be able to find recordings within a specified time period.
FR 3.55	The Video Management System shall automatically failover when a primary local storage is down. In addition, users shall have the option to manually failover, for example to allow for routine maintenance of a primary local storage.
FR 3.56	The Video Management System shall support alarm inputs from 3rd party systems.
FR 3.57	Users shall be able to sort the alarm information in various ways by clicking on column headings.
FR 3.58	Users shall be able to specify a priority for each alarm camera (1-10.).
FR 3.59	The Video Management System shall clearly mark black screen monitoring viewing windows as being distinct from normal live view windows through background colour and icon.
FR 3.60	When an alarm happens, the Video Management System shall be able to show live video from a camera on one pane and beside it show a looped replay/sequencing from just before the alarm to just after or as alternative, live to playback switching shall be supported.

FR 3.61	The users shall be able to display a map showing the location of the alarm.
FR 3.62	Users shall be able to view pending alarms in a list ordered by priority and time.
FR 3.63	Users shall be able to filter the alarm list to show alarms only from specific areas (sites and zones.).
FR 3.64	The Video Management System shall be able to display alarm procedure document for the alarm.
FR 3.65	The Video Management System shall allow users to acknowledge alarms, entering alarm response text as required.
FR 3.66	Users shall be able to find historical alarms matching specified criteria: <ul style="list-style-type: none"> • Alarm type • Alarm state (new, acknowledged, cleared) • From site(s) • From alarm zones(s) • User(s) who acknowledged or cleared • Time range
FR 3.67	The Video Management System shall be able to escalate alarms to other user groups if the alarm is not acknowledged within a pre-defined time period.
FR 3.68	Users shall be able to produce reports of historical alarms and events and export to RTF or CSV formats.
FR 3.69	The Video Management System shall ensure that alarms are held on an alarm server, not on a user's PC.
FR 3.70	The Video Management System (VMS) shall support integration with external data sources.
FR 3.71	The Video Management System shall notify users of problems with local storage. The notifications will be those supported by each local storage.
FR 3.72	Users shall be able to view the current status of local storage with visual indicators showing whether each item is OK or indicates problems: <ul style="list-style-type: none"> • Total disk space • Minimum free disk space • Used disk space (total – free) • Percentage space used (used disk space / total disk space) • Any additional features supported by the local storage.
FR 3.73	Users shall be able to view reports for local storage/VMS and display the following information: <ul style="list-style-type: none"> • Start time of first recording • End time of last recording • Total size of all recording • Total duration of all recordings
FR 3.74	Users shall be able to configure named user groups. A group can be granted administrator rights: <ul style="list-style-type: none"> • Full (can configure everything) • Restricted (can configure everything except users and groups) • No configuration rights (limited user functions only)
FR 3.75	The Video Management System shall allow users to log out and log in without closing the application.
FR 3.76	The Video Management System shall have an option to require all users to re-enter their password when logging out or automatically logout based upon time-out.
FR 3.77	Users shall be able to change their own password (if given write permission to the site database).

FR 3.78	Administrator users shall be able to lockout all other users preventing them from viewing or recording video from a selected camera or all cameras in a selected site.
FR 3.79	The Video Management System shall allow configuration of IP Video System devices via their web configuration interface.
FR 3.80	Administrators shall be able to upgrade the firmware on IP Video System devices - multiple devices can be upgraded in one go through the system.
FR 3.81	Administrators shall be able to create a hierarchy of sites and sub-sites for organizing cameras and other items by location.
FR 3.82	Users shall be able to create sequences and salvos within the sites, set up 24/7 recording for each camera and enable video loss and network loss alarms.
FR 3.83	Users shall be able to add cameras, monitors, alarm panels, alarm servers and local storage to sites by dragging and dropping, selecting from a list or manually entering the IP Address and name.
FR 3.84	Users shall be able to enter a localized display name for cameras, monitors and local storage which overrides the name stored on the device.
FR 3.85	The Video Management System shall enable a copy of the configuration database to be cached locally on each user workstation to ensure continuity of operation when a connection to the central database is not available.
FR 3.86	The Video Management System shall support a configuration database that is divided into multiple 'segments', e.g. one segment for each site. The Video Management System shall allow each segment to be configured and accessed independently.
FR 3.87	When the configuration database is divided into segments, the Video Management System shall allow all sites to monitored e.g. from a central monitoring facility.
FR 3.88	Users shall be able to create one or more maps for each site by importing an image for the background. The following image formats shall be supported: <ul style="list-style-type: none"> • Bitmap (BMP) • JPEG (JPG) • Portable Network Graphics (PNG) • AutoCAD drawings (DWG) • GIS
FR 3.89	Users shall be able to add links to other maps.
FR 3.90	Users shall be able to reposition items by drag and drop or entering specific coordinates on a map.
FR 3.91	Users shall be able to add cameras to map.
FR 3.92	Users shall be able to specify the field of view for each camera on a map.
FR 3.93	Users shall be able to specify the amount of detail displayed on map for each object including icons, matrix numbers and labels.
FR 3.94	Colour schemes on a map shall be configurable to make text and fields-of-view more visible.
FR 3.95	The map shall be fully scalable with zoom and pan supported under mouse control.
FR 3.96	Users shall be able to displays the previous maps viewed (back, forward).
FR 3.97	Users shall be able to link to any map from any map.
FR 3.98	Users shall be able to display live video from any camera on a map.
FR 3.99	Activated alarms shall be visually represented on the map.

FR 3.100	The Video Management System shall provide a restricted access version of the video viewing and replay application, which prevents all users from modifying the audit log configuration even if they have an administrator login.
AUTOMATIC NUMBER PLATE RECOGNITION (ANPR) SYSTEM	
FR 3.101	The ANPR System recognise the number plates of these vehicles which is then passed on to various other sub-systems for further analytics.
FR 3.102	The ANPR System shall be featured to identify the hot listed vehicles & vehicles for post incident analysis by Police such as security matters, accident detection etc.
FR 3.103	The ANPR system shall capture vehicle license plate from front or from rear depending on the proposed solution and ensuring the performance parameters are met.
FR 3.104	The ANPR sub-system is also used for identifying hot-listed vehicles for ensuring law & order in IIT.
FR 3.105	The ANPR sub-system shall be used for satisfying various add-on use- cases such as travel time estimations, estimating O-D patterns in the city, stolen vehicle identification etc.
FR 3.106	ANPR system is used to identify and recognise vehicles by their registered number plates.
FR 3.107	The ANPR shall be deployed at various potential locations across IIT viz. entry/exit points, strategic intersections, mid-blocks, sensitive zones etc.
FR 3.108	ANPR system shall capture and read each and every vehicle number plate that passes through its field of view in multiple lanes and stores the number in the database.
FR 3.109	The ANPR system shall continuously record all footage in its field of view which is to be stored at CIOC.
FR 3.110	The ANPR system shall be able to detect and recognize all the legible English alpha numeric License plates in all standard fonts and formats of all vehicle classes irrespective of the type and size of the vehicle.
FR 3.111	Apart from standard printed and High Security license plates, the system shall be able to recognize all legible hand painted straight font alpha numeric number plates in standard formats found on Indian license plates found on Indian roads.
FR 3.112	The system processing shall be in real time i.e. the recognition of license plate number should happen instantaneously (within three seconds of capture). Processing can happen at site or upon receipt of violation package at CIOC.
FR 3.113	The system shall be able to process and read number plates of vehicles with speeds up to 120 km/h with the minimum accuracy requirement specified in this sub-section.
FR 3.114	The system shall be very robust to variation in License Plates in terms of font, size, contrast and colour and work with good accuracy but should always be well above the minimum accuracy defined in this sub-section.
FR 3.115	The ANPR shall be able to process and read the number plates at any time of the day and night, in all weather conditions.
FR 3.116	<p>The ANPR sub-system shall have the following minimum accuracy levels irrespective of any other reason at the installed location for each of the vehicles in the field of view during any time of the day or night:</p> <ul style="list-style-type: none"> • at a minimum of 95% vehicle detection accuracy. • the system should have a conversion accuracy of more than 85% for the detected vehicles for ANPR for standard format legible license plates during day time. Accuracy for night time can be 60%. • the system should have a conversion accuracy of more than 70% for the detected vehicles for ANPR for non- standard format legible license plates – during day time. Accuracy for night time can be 50%.
FR 3.117	<p>The following are the minimum details of the infracting vehicle to be captured:</p> <ul style="list-style-type: none"> • Location Name and ID along with Latitude and Longitude

	<ul style="list-style-type: none"> • Date & Time of the instance • Vehicle Number plate (Captured & Processed) • Image of the vehicle • Direction of Travel • Speed of the vehicle
FR 3.118	<p>ANPR system shall be integrated with the RTA and VAHAN database to extract the registered details of the vehicles based on the captured number plate and the details should be stored in a repository including the following details as applicable:</p> <ul style="list-style-type: none"> • Vehicle Registration Plate Number • Date of Registration • Name of the Person of which the Vehicle is registered to • DOB of the Person of which the vehicle is registered to • Date of Renewal • Location of Issuing Registration Authority Office • Class of Vehicle • Vehicle Colour • Vehicle Insurance No. (historic and Active) • Insurance Validity Date • Vehicle Fitness No. • Fitness Validity Date • Vehicle Permit No. • Permit Validity Date • Load permit • History of Violations
FR 3.119	ANPR shall work with various analytics as defined in this section for identifying and capturing various traffic related incidents & for proposing remedial action.
FR 3.120	The ANPR sub-system shall be able to connect to external sources/ 3rd party databases and check each captured ANPR vehicle numbers against these sources to detect any hot-listed vehicle.
FR 3.121	The ANPR system shall immediately send a configurable high-alert to the pre-designated people with details of the hot-listed vehicle and all other captured details.
FR 3.122	The ANPR system shall automatically send the high alert to the CIOC for next course of action.
FR 3.123	The CIOC internally alerts other subsystem to continuously track the vehicle at every junction, notifying the nearest patrolling vehicle and other intercepting teams. ANPR application shall also be used for add on use cases such as travel time estimations, estimating O-D patterns in the city, stolen vehicle identification etc.
FR 3.124	Court Evidence Standard Procedure – The ANPR system should provide tamper proof the Colour video & image evidences of hot listed vehicles to be submitted in the court.
FR 3.125	The tamper-proof video extract shall be provided as a supporting evidence (for submission in a court of law) to each infracting vehicle and the video length shall be t-5 to t+5 seconds where t being the instant at which the infraction occurred. The video output should be in colour in any industry standard format such as MJPEG, MP4, AVI, MOV etc. or better.,) with visually readable license plate number.
AUTOMATIC TRAFFIC COUNTERS & CLASSIFIERS (ATCC) SYSTEM	
FR 3.126	The ATCC system shall be deployed on city road primarily on city's entry and exit points in IIT. The objective of the sub-system is to collect traffic data at major points. The system shall perform data collection, data storage, file management and report generation functions for collected vehicle information.
FR 3.127	The data from ATCC shall be used by various Government and private organizations (as per DMIC IITGNL discretion) to understand the existing traffic volume trends & patterns.

FR 3.128	The real-time traffic data can be shared with 3rd party map solution providers and online navigation systems as per the discretion of DMIC IITGNL.
FR 3.129	<p>The ATCC Sub-system shall support the following four use-cases with other Sub-systems provided by 3rd parties as a minimum and shall support development and deployment of any other use-case for up to 18 months from the Go-Live date.</p> <ul style="list-style-type: none"> • Use case 1: Passing Congestion Information to control centre. • Use case 2: Using Traffic Data Archive for future planning/ Design/ Analysis purposes.
FR 3.130	The ATCC System shall use any proven non-intrusive technology for counting and classifying the vehicles in a real-time under live traffic conditions.
FR 3.131	The field view of ATCC on a road stretch shall be able to cover from end to end of the traffic lane irrespective of the number of lanes on the particular road stretch.
FR 3.132	The number of ATCC sensors required to achieve a multi-lane road stretch shall be arrived by the MSI based on the physical surveys of site and technology being provided and other criteria.
FR 3.133	The ATCC System at any point of time, shall provide a minimum of 5 classification levels viz. 2-wheeler, 3 Wheeler/Auto Rickshaws, Car/ Jeep, LCV, Bus/Truck/MAV at any given point in time.
FR 3.134	<p>The ATCC system shall meet the following accuracy levels under free flowing traffic conditions when compared with actual data collected using other means at each location of all the installed locations (minimum accuracy requirements):</p> <ul style="list-style-type: none"> • Counting of vehicles: > 95% • Classification of vehicles (w.r.t. each class): > 90%
FR 3.135	System shall insert sequence numbers for vehicle records.
FR 3.136	The ATCC shall have built in algorithms to distinguish and classify non- linear traffic patterns and occlusion of traffic.
FR 3.137	ATCC sensors shall capture the traffic data 24x7 lane wise, leg wise and transfer the traffic data to control centre through fibre backbone in real time.
FR 3.138	There shall be an operator at control centre to operate the ATCC application on ATCC workstation.
FR 3.139	The data of ATCC shall also be available in open data source which can further be used in other applications.
FR 3.140	The overall system shall work in an integrated fashion whereby data from the ATCC shall be continuously recorded, processed and transferred to control centre.
FR 3.141	The algorithm (software) shall be capable of adding configuration parameters for each of the vehicle classes based on the RTA standards and field conditions to achieve maximum accuracy
FR 3.142	ATCC shall be able to process simultaneous and parallel passages of the vehicles at that location at a given point of time.
FR 3.143	Even though multiple sensors are required based on the number of actual lanes, the ATCC should provide processed data at each location lane wise and leg wise.
FR 3.144	The ATCC shall count and classify vehicles travelling in any or both the directions at a given location as per the requirement based on the field conditions.
FR 3.145	The ATCC shall be able to count and classify the vehicles with minimum accuracy requirements for vehicles travelling between 10 kmph to 150 kmph speeds.
FR 3.146	<p>The ATCC sub-system should be capable of capturing at a minimum the following primary data points for each vehicle at any point of time:</p> <ul style="list-style-type: none"> • Unique ID • Vehicle Count • Start Time • End Time

	<ul style="list-style-type: none"> • Leg/ road Location • Classification • Headway • Occupancy • Vehicle Length • Speed
FR 3.147	The ATCC sub-system shall be capable of computing unlimited Derived fields/ data sets based on several mathematical computations on the primary data points collected. In general, all computations required for deriving several Traffic Engineering measures shall be supported by the ATCC reporting module.
FR 3.148	The ATCC sub-system provider shall work closely with client for modifying/ configuring standard existing reports and data formats to suit client requirements. The vendor shall support client in developing any/ all reports and formats required by the agency for a period of at least 18 months from the system go-live date.
FR 3.149	The ATCC Sub-system shall be capable of sharing the data with any other sub-system in a real-time as per the requirement
FR 3.150	The ATCC provider shall work closely with various other sub-system providers to share the required data in acceptable format to the other sub- system providers. As a minimum data exchange in XML, HTML and JSON formats shall be supported
FR 3.151	The ATCC system shall have an operations monitoring dashboard, located at the control centre & shall be monitored by the operator.
FR 3.152	On this dashboard there shall be a schematic layout of the ATCC showing all the connected nodes on the GUI.
FR 3.153	The various nodes when connected & disconnected shall be represented in different colour schema on the GUI of the control centre operator.
FR 3.154	If any particular node is disconnected from the control room, the same shall raise an alarm to the control centre operator GUI & appropriate action shall be taken to rectify the same.
FR 3.155	The monitoring dashboard shall allow the control centre operator to click on any node & view the details of “operator” logged in, time duration since logged in, summary of operations performed, disable/enable ATCC.
FR 3.156	If operator or any other user from control centre disable/enable /operate any active device remotely, the same shall be captured in Control Centre activity report with all details including but not limited to date, time, device, action performed etc.
FR 3.157	The monitoring dashboard shall show the status (connected/disconnected, faulty/working) of all logical devices (ATCC system) connected to a particular node when clicking on a node from the monitoring dashboard GUI.
FR 3.158	In case of any fault in the devices connected to a node, or connectivity failure with a node, a pop-up message shall appear on the monitoring dashboard workstation. The operator has to acknowledge the pop-up message & report the type of fault to the maintenance team & shall record the details to the assigned team/individual into the system.
FR 3.159	Fault assignment to the maintenance team shall be managed and controlled by the system software only. Once a fault is assigned by the Control Centre operator or authorized user to the maintenance team, the same shall be displayed in the maintenance module and once fault is closed/resolved by the maintenance team it shall be updated automatically (in case of active devices) or else updated manually in the software application/maintenance module.

FR 3.160	The access to monitoring dashboard shall be specific to the privilege of the user which can be defined in the system & shall be specific to a group/part of node locations.
FR 3.161	ATCC system shall be installed on the gantry along with the ANPR cameras.
FR 3.162	ATCC Controller or Local Processing Unit shall have capability to store at least 1 month data for field level.
FR 3.163	The field equipment including the sensor shall be capable of operating independent of other layers. This is to say that the sensor shall be capable of storing the data as well as event messages locally irrespective of the status of the communication link for a defined period (1 month). Whenever the communication link is restored, the offline data shall be sent to the Control Centre automatically. However, it shall be possible to transfer the data manually by copying the same from the DL to a thumb drive / lap top and restoring the same into the control centre database. As soon as the link is restored, the locally stored entries which were not transferred due to link failure shall automatically be sent to control centre and a mechanism shall be used to ignore duplicate entries of manually transferred data at control centre level.
FR 3.164	There shall be no double count in case of lane crossover / straddling. Anti-coincidence technique shall be used to avoid such incidents of single vehicle activating two or more lane sensors. It shall however send the raw data as well as the processed information, wherever anti-coincidence is utilized.
FR 3.165	The vehicle count shall not be missed even when multiple vehicles cross different lanes at simultaneous instances.
FR 3.166	ATCC Controller/Server or Local Processing Unit shall be vandal or tampering proof.
VARIABLE MESSAGE DISPLAY (VMD)	
FR 3.167	VMDs shall be used to display digital messages, advisories, broadcast or contextual notifications, advertisements to the public at IIT. VMD shall be provided with mounting pole and other accessories and the same shall be in the scope of MSI.
FR 3.168	The Central Control software shall allow controlling multiple Variable Message Display from one console.
FR 3.169	The VMD shall come in various sizes to be placed at different location as per site requirements.
FR 3.170	The software shall be capable of programming to display all types of message having alphanumeric character in English and Hindi and combination of text with pictograms signs.
FR 3.171	The system shall be capable of controlling and displaying multiple font types with flexible size and picture sizes suitable as per the size of the display.
FR 3.172	The system shall be capable of controlling brightness & contrast through software.
FR 3.173	The system shall be capable to continuously monitor the operation of the Variable Message sign board, implemented control commands and communicate information to the Traffic Monitoring Centre via communication network.
FR 3.174	The system shall be capable of providing multilevel event log with time & date stamp.
FR 3.175	The system shall be role based defined solution. Various users shall access the system using single sign on access.
FR 3.176	The system shall use open standards and protocols to the extent possible.
FR 3.177	The system shall have the facility to export reports to excel and PDF formats.
FR 3.178	All VMD shall be connected/configured to Traffic Monitoring system for remote monitoring through network for two-way communication between VMD and CIOC to check system failure, power failure & link breakage.

FR 3.179	VMD shall be installed at identified strategic locations. The location of VMD shall be on the key junctions (mostly on the sides without obstructing the traffic) and other strategic locations with large foot fall. The VMD software application will allow user to publish general informative message, specific messages, traffic advisories and also advertisements.
FR 3.180	VMD shall enable DMIC IITGNL/ Police to communicate effectively with citizens and also improve response while dealing with exigency situations. These shall also be used to regulate the traffic situations across the city by communicating right messages at the right time.
FR 3.181	The system shall be capable to display warnings, traffic advice, route guidance and emergency messages to citizens in real time.
FR 3.182	The VMD shall display text and graphic messages using Light Emitting Diode (LED) arrays.
FR 3.183	The System shall able to display failure status of any LED at the CIOC.
FR 3.184	The CIOC workstation shall communicate with the VMD controller through the network. It shall send out command data to the variable message display controller and to confirm normal operation of the signboard. In return, the CIOC workstation shall receive status data from the VMD controller.
FR 3.185	VMD controllers shall continuously monitor the operation of the VMD via the provided communication network.
FR 3.186	The system shall be capable of setting an individual VMD or group of VMD's to display either one of the pre-set messages or symbols entered into the computer via the control computer keyboard or by another means.
FR 3.187	The system shall be capable of being programmed to display an individual message to a VMD or a group of VMD's at a pre-set date and time.
FR 3.188	A sequence of a minimum of 10 messages/pictures/ pre-decided sign or group of signs shall be possible to assign for individual VMD or group of VMD's
FR 3.189	It shall also store information about the time log of message displayed on each VMD. The information stored shall contain the identification number of the VMD, content of the message, date and time at which displayed message/picture starts and ends.
FR 3.190	The central control workstation shall perform regular tests (pre-set basis) for each individual VMD. Data communication shall be provided with sufficient security check to avoid unauthorized access.
FR 3.191	The software shall integrate with the environmental station for automatically displaying information from environmental sensors.

TR - 3 Technical Requirements

FIXED & PTZ CAMERA, LENSES AND MOUNTS	
TR 3.1	The camera control shall comply with the latest release of Open Network Video Interface Forum (ONVIF) standards.
TR 3.2	The camera shall include an integral receiver/driver/ encoder. The receiver/driver shall be capable of controlling pan-tilt, zoom and focus locally and remotely from the control centre
TR 3.3	The camera shall incorporate AGC circuitry to provide for compensation at low light levels.
TR 3.4	The lens shall be integrated with the camera.
TR 3.5	Video output resolution shall be as per respective camera lens specifications.
TR 3.6	The camera shall be capable to produce minimum 15 frames per second (fps).
TR 3.7	The camera shall provide automatic white balance, automatic exposure, automatic gain control, electronic shutter, and backlight compensation.

TR 3.8	The camera shall be a true day/night cameras with mechanical IR cut filter.
TR 3.9	The camera shall be capable of providing a high contrast colour picture with a full video output at a minimum illumination as mentioned in the specifications.
TR 3.10	All cameras shall capture high definition video, compress the video using H.265 or better technique and transmit real-time using fibre optic based communications system.
TR 3.11	The cameras shall capture audio and compress using G.711 technique and transmit real-time using fibre optic based communications system.
TR 3.12	All cameras shall support on-board real-time video content analysis.
TR 3.13	All cameras shall support both Constant Bit-Rate (CBR) and Variable Bit-Rate (VBR) options.
TR 3.14	The camera shall support up to 2 video profiles as a minimum, each providing independent configuration of bitrate, frame rate and resolution.
TR 3.15	The camera shall support on-board storage via micro SDHC/ SDXC slot and card with a minimum capacity of 128 GB.
TR 3.16	All cameras shall have integral in-built adaptive IR technology. For fixed cameras, the IR shall support a range of at least 50 m and for PTZ it shall support a range of at least 100m moving with zoom (adaptive).
TR 3.17	<p>For Fixed Cameras:</p> <ul style="list-style-type: none"> The fixed camera shall provide a minimum focal length range of 2.8 - 12 mm or better compensated with a minimum 12x digital zoom and shall be remotely controllable from the camera control transmitter at Primary Control Centre. The fixed camera shall capture video using 1/2.8" progressive scan CMOS or better. Fixed Camera resolution shall be 2 Megapixels or better.
TR 3.18	<p>For PTZ Cameras:</p> <ul style="list-style-type: none"> Camera shall have capabilities of PAN of 360° continuous. Camera shall have capabilities of Tilt of 90 deg. with Auto Flip. Lens of 6mm-129mm with minimum 30X optical and 12X digital zoom. PTZ camera shall capture video using minimum 1/2.8" type CMOS sensor or better. It shall support resolution of 2 Megapixels or better. Camera shall support tilt of 100° either side. The tilt capability shall include both the horizontal (level view) and vertical (downward view) position. If the camera travels beyond straight down, automatic image flip circuitry shall prevent the display of an inverted image. The pan and tilt mechanism shall be an integral part of the camera. Pan speed shall be up to 160°/s and Tilt speed up to 100°/ sec.
TR 3.19	There shall be a minimum of 100 assignable automatic preset positions.
TR 3.20	There shall be 4 or more definable privacy zones as per project requirements.
TR 3.21	All cameras shall provide effective 24/7 imaging performance for CCTV surveillance applications.
TR 3.22	All cameras shall provide user control, with remote configuration for functions including streaming and compression settings, exposure, white balance, flicker control, picture size, cropping/privacy, brightness, sharpness, saturation, day-night switching point, frame rate, image rotation, snapshot, dynamic bandwidth allocation and motion detection.
STORAGE SOLUTION	
TR 3.23	The storage solution shall be supplied as part of the Project. For storage, please refer to the specifications in Section 2.2.8.5 (On Premise Storage).
TR 3.24	Bandwidth optimization - The Recording Server / System shall offer different codec (H.264, MJPEG, MPEG-4, etc.) and frame rate (4CIF or better) options for managing the bandwidth utilization for live

	viewing at CIOC.
AUTOMATIC TRAFFIC COUNTERS & CLASSIFIERS (ATCC) SYSTEM	
TR 3.25	The Automatic Traffic Counter and Classifier System (ATCC) shall have the capability of vehicle presence detection & classification at free flow roads.
TRAFFIC DATA COLLECTION	
TR 3.26	The system shall also be cost effective solution for traffic data collection and traffic flow monitoring on highways and inter-urban roads.
TR 3.27	It shall be used for temporary or permanent application both.
TR 3.28	There shall be single download tool to download the integrated traffic data and traffic events from multiple sensors.
TR 3.29	The system shall have the facility to monitor the traffic data, events and viewing maps through the graphical user interface, it is possible to create maps in order to have an overview of all installed sensor systems. By double clicking on a camera, to get live streaming video from the selected sensor. There shall be an event stack which can groups all the traffic data & traffic events.
TR 3.30	The system shall have the capability to capture vehicle count (per lane and per vehicle class).
TR 3.31	The system shall have the capability to capture vehicle speed (per lane and per vehicle class).
TR 3.32	The system shall have the capability to capture vehicle occupancy (per lane).
TR 3.33	The system shall have the capability to capture vehicle Headway (per lane).
TR 3.34	The system shall have the capability to capture vehicle different classification (two-wheeler, three-wheeler, car, bus, trucks etc.).
SENSOR SYSTEM COMPONENTS	
TR 3.35	The system shall cover up to minimum 4 lanes.
TR 3.36	The system shall have the capability to connect minimum 4 sensor at a time.
TR 3.37	The electronic in ATCC Controller/Server or Local Processing Unit shall be din rail mountable and shall have tamper proof and customized lock and key facility.
TR 3.38	<p>The system shall have the following features:</p> <ul style="list-style-type: none"> • Controller area network bus design for option to add sensor interface boards. • On-board Ethernet interface • RS-232 interface • Remote administration via Telnet or web-based program • Remote file download
TR 3.39	The system shall have the capability to connect with local computer using a password protection system.
TR 3.40	The local computer software shall have the compatibility of system configuration, viewing, recording, data collecting & monitoring.
TR 3.41	System shall have non-volatile local storage for vehicle information to prevent data loss during power outages.
TR 3.42	System components shall contain necessary electrical protection to prevent damage from electrical surges, spikes and the effects of lightning.
CENTRAL APPLICATION	
TR 3.43	The software shall be able to run on any PC based on industry standard OS.
TR 3.44	The software shall support ONVIF compliant cameras and devices.
TR 3.45	The software shall show live video from IP Cameras and Video Transmitters in MJPEG, MPEG4 and H.264 formats.

TR 3.46	The software shall support cameras with resolutions ranging from Standard Definition, High Definition (HD) and up to 5 Megapixel.
TR 3.47	The software shall show video across 4 displays per workstation - each display can have up to 25 viewing panes.
TR 3.48	The software shall allow configuration of the video and audio stream settings for each user, depending on the support hardware.
TR 3.49	Users shall be able to change the video pane layout in each of the 4 screens independently: <ul style="list-style-type: none"> • Grid layouts: 1x1, 2x2, 3x3, 4x4, 5x5 • Widescreen layouts: 2x3, 3x4, 4x6 • Hotspot layouts based on 3x3, 4x3, 4x4, 5x5 larger pane in top, left • Hotspot layouts based on 4x3, 4x4, 5x5 larger panes in centre
TR 3.50	Users shall be able to change the aspect ratio in each of the 4 video windows independently in order to display Standard Definition or High Definition video. Choose between: <ul style="list-style-type: none"> • Widescreen (16:9) • Standard (4:3)
TR 3.51	Users shall be able to move any image from one display screen to another via drag-and-drop.
TR 3.52	Users shall be able to digitally zoom up to 1000% and also digitally scroll live video from any camera using the mouse wheel.
TR 3.53	The software shall allow the display of objects detected via analytics on the video (up to 10 at once).
TR 3.54	Users shall be able to view stream statistics on all current video streams, including the following information: <ul style="list-style-type: none"> • Frame rate • Resolution (SIF, 2SIF, 4SIF, 720p, 1080p, 5MP) • Current bit-rate
VARIABLE MESSAGE DISPLAY (VMD)	
TR 3.55	The Variable Message Display (VMD) shall be installed at various strategic location as per discussion with the Client.
TR 3.56	The minimum dimension of the VMD shall be 3m in length, 1.5m height and 0.2m in depth.
TR 3.57	The LED in the display board shall support full color as per IRC/EN 12966 standard.
TR 3.58	VMD shall automatically provide different luminance levels as per requirement but shall also be controllable from the CIOC using software.
TR 3.59	VMD shall also be capable of automatically dimming the board based on ambient light levels required.
TR 3.60	The VMD shall be equipped with photoelectric sensor that shall be present on the front and rear of the board to measure ambient light levels.
TR 3.61	The shall be capable of performing easily even if exposed to direct sunlight.
TR 3.62	The pixel pitch of VMD shall be minimum 12 mm or better.
TR 3.63	The VMD shall support R3 class contrast ratio and B6+ class beam width as per IRC/EN 12966 standard.
TR 3.64	The IP rating shall be minimum IP 65 for front and IP 54 for back.
TR 3.65	VMD shall support synchronized Dot to Dot display
TR 3.66	It shall be capable of displaying real time message generated from CIOC.
TR 3.67	The display shall be designed in such a way to avoid reflection and shall be UV resistant.

TR 3.68	The viewing distance shall be 150 m or more at the character size of 240 mm from the moving vehicle.
TR 3.69	VMD shall have self-diagnostic feature to test for correct operation.
TR 3.70	The display driver boards shall be able to test the status of all display cells in the sign even when diodes are not illuminated
TR 3.71	The system shall be able to generate alarm at CIOC in case of any LED pixel failure
TR 3.72	The refresh frequency for the VMD shall be 90 Hz. The flicker rate shall be minimum and not detectable by the naked eye.
TR 3.73	The system should be capable of working in ambient temperature range of 0°C to +55°C and humidity shall be between 10% to 95%.
TR 3.74	The embedded VMD controller shall be capable to store at least 100 messages and symbols/pictograms to allow display to run in isolated mode on a redefined structures/timing in case of connectivity failure.
TR 3.75	The VMD shall support communication by Ethernet or Fibre Optic cable or 3G/4G.
TR 3.76	The VMD body shall be made of at least 2 mm Aluminium or Non-corrosive, water resistant or better material. The frame of the VMS should be black & powder coated.
POLES FOR FIELD DEVICES	
TR 3.77	Please refer to the Poles specifications mentioned under Public Wi-Fi specification Section 2.2.2
GENERAL FOR SURVEILLANCE SYSTEMS	
TR 3.78	All CCTV cameras shall support Power over Ethernet (PoE or PoE+).
TR 3.79	The camera shall use an Ethernet 10/100Base-TX network interface with RJ45 connector.
TR 3.80	The camera and the associated equipment shall support communication protocols IPv4, IPv6, TCP, UDP, HTTP, HTTPS, DHCP, IGMP, ICMP, SNMP, FTP, NTP, RTSP, and RTP as a minimum.
TR 3.81	The camera shall incorporate a built-in web server, built-in FTP server, and a built-in FTP client.
TR 3.82	<p>The cameras shall have, at a minimum, the following configurable features:</p> <ul style="list-style-type: none"> • Image resolution • Frame rate • Image quality adjustments (brightness and contrast) • Source and destination IP address settings • UDP port number • Bandwidth limits • Unicast and multicast settings and support for two (2) simultaneous unicast streams.
TR 3.83	The cameras shall support at the minimum two individually configured video streams. The cameras shall be capable of two simultaneous streams with one of the streams being in H.264 or better format.
TR 3.84	All cameras shall have an operating temperature range of 0°C to +55°C at humidity: 5% - 90% RH.
TR 3.85	The environmental housing shall be of suitable size and provide a temperature controlled atmosphere for the camera, lens and receiver-driver/ encoder.
TR 3.86	The housing shall allow for easy disconnect of all external cables.
TR 3.87	The housing, mounting arm and the dome camera installed assembly shall be suited to withstand wind gusts of 150 km/h.
TR 3.88	The housing for CCTV shall meet the IP66 or better and IK 10 for protection.
TR 3.89	The cameras shall have a Mean Time Between Failure (MTBF) of at least 100,000 hours.

2.2.4 IIT Software Modules (ISM)

As part of the IIT Software Modules (ISM), multiple modules will be provided for both citizen facing and DMIC IITGNL specific requirements. The ISM broadly includes citizen facing applications that will become the point of interface for the Investors/Citizens at IIT and back-office systems which will effectively be the backbone for DMIC IITGNL that will enable efficient and integrated operations and maintenance of the city. The applications will be made available over different mediums including citizen application, portal and website. All software modules will be closely integrated and will become the main system used by DMIC IITGNL for city governance and operations.

ISM shall be required to be implemented to automate the internal business functions at DMIC IITGNL. The ultimate goal of ISM is to create one holistic system which allows DMIC IITGNL to be lean and efficient in their business processes and functions and provide 100% online services to the citizens. Since IIT is a greenfield industrial smart city, most of the key functionalities available in standard software shall be configured meeting the business requirements in key functions of DMIC IITGNL.

Main system components for ISM:

- DMIC IITGNL Corporate Website – there is an existing website www.iitgnl.com which will be revamped as part of this Project;
- Customer Facing Systems: Multi-Channel Communication Centre for citizens, Portal, e-governance functions such as RTI, Grievance, m-Governance Functions, Social Governance, Web based GIS layer, Public Interactive Kiosk and Mobile Applications, Management Information System along with KPI and Dashboards;
- Back office Systems: Comprising of Finance and Accounts, Purchasing, budgeting, contract management system, Asset Management, water connection, Billing, Maintenance, Projects, Stores, HR, Administration and Payroll; Legal, Secretarial and a File management system
- Framework for integrating various applications; and
- Foundation Layer: A SOA based integration solution, document management system, will be an integral part of the overall solution.

Benefits to the Investors/Citizen

- The citizen benefits because there is transparency, efficiency and integrity in his dealings with DMIC IITGNL, furthermore, there is ease in information access;
- Convergence of services and delivery mechanism and extending outreach;
- The service delivery is faster to the citizens;
- Online visibility on water and electricity consumption with a one day time lag;
- Payment of Land related maintenance charges, Water bills, Power bills is online;
- Reducing the cost of citizen like travel cost, wages cost etc.;
- Reducing the time in availing the services like travelling, waiting time;
- Online status of application Redressing citizen Grievance within a stipulated time frame;
- Access to all Citizen and Business related services at IIT;
- Access to information easily with service delivery counters within reach;
- High Level of Convenience;
- Facility of payment at convenient points and extended hours;
- Negligible Queuing; and
- Minimizing the number of customer visits.

The list of systems which are envisaged to be developed are:

S. NO	PROPOSED MODULES
1	File management system
2	GIS
2.1	Survey
2.2	Base maps
2.3	Web GIS
2.4	3D Modelling
3	Website
4	Chatbot
5	Citizen Facilitation Centre (CFC)
6	Customer Relationship Management (CRM)
7	Portal for citizens (Investors) and officers
8	Revenue Management
9	Finance and Management Accounting
10	Purchasing and Inventory Management
11	Contract Management
12	Operations, Maintenance & Asset Life Cycle Management
13	Project and Works Management
14	HR, Administration and Payroll
15	Water Utility Management and Billing
16	Citizen grievance management
17	RTI
18	Legal Cell
19	Secretarial and Meeting Scheduler
20	Visitor Management System
21	e-Mail solution along with Messenger
22	Enhancement and integration with e-Land management system
23	Automated Building Plan Approval System (ABPAS)
24	Dashboards
25	Dongle based e-Signature Solution
26	Mobile applications for each module
27	SOA based integration framework for applications
28	Blockchain for Land Records

At the core of the stakeholder's service experience will be portal which will be a gateway to DMIC IITGNL. The Portal will have an intuitive user interface for rendering various services and providing role-based access to various systems in use at IIT.

The key objective will be to:

- Provide Single Window services to citizens and Investors on anytime, anywhere basis;

- Provide a single and integrated view of DMIC IITGNL information system; and
- Provide a single application form for all services (utility) required.

Broadly the Portal is required to provide the following features:

- Access to proposed modules and existing Land Management, and any other system;
- Management Reports and KPI Dashboard; and
- Ability to request any service.

Provision of a robust citizen and occupant multi-channel interface will be one of the unique propositions of DMIC IITGNL as a greenfield smart industrial city. Customers can register complaints or request for various services by several channels - on the web enabled interface, kiosks, mobile, on phone (connection to centralized help desk), walk in to help desk, send mails to centralized help desk mail id.

A chatbot solution will eliminate the human effort from the Client's end in managing the potential investors and related investor management activities and processes. Further, the proposed modules shall ease the operations of financial and other back-office systems for DMIC IITGNL. Award of land will be carried out using e-land management system which is currently under implementation. Customer master details, property ID, schedule of billing etc., will be interfaced from e-Land Management system to ISM. Collection made from customer will be updated back into e-Land Management system.

In any of the above cases, the citizen query / data has to interact with the system to be processed. It is expected that in any situation the query shall be directed to the portal and the data input by the citizen or the operator at the facilitation centre.

Each type of stakeholder shall have different needs and the portal has to facilitate all requirements.

The ISM services shall be designed and developed in a manner that it caters to the needs of both the citizens as well as DMIC IITGNL. ISM shall ease the manner in which G2C, G2B, B2G and G2G interactions occur, improving the overall transparency of the system. Customer Relationship Management module will be linked with city portal and utilized for citizen's interaction centre, serving as single-window interface for citizen-centric requirements. Business Intelligence (BI) will entitle DMIC IITGNL (City's Cockpit) and CIOC to comprehensive analytics for operations, display, prognosis etc. for different city functions.

All the assets in IIT whether underground, over ground or over-head will be mapped in GIS. Any request by any occupant will provide the GIS coordinates of the assets. The asset mapping scheme will assist in identifying the request with relevant team, responsible for resolution. The request will be directed to relevant team responsible for the service type.

The modules should provide out of the box integration amongst themselves and further for ease of use, the modules would be Process Integrated with File Management System, Land Management System (existing), Payment Systems, Banks (payment gateway), GIS, Portal, SCADA systems, Customer Facilitation Centre, Kiosks and E- Gov systems.

The proposed system will need to be integrated with e-Land Management system, currently under implementation. The integration needs to be SOA services based. Award of land will be carried out using e-land management system. Customer master details, property ID, schedule of billing will be interfaced from e-Land Management system to other modules. Collection made from customer will be updated back into e-Land Management system. Land allocation, lease details will be interfaced from e-Land Management system into ISM. Lease expiry notifications reminders for payments etc. will be triggered from ISM. Temporary connections for utilities will be provided by e-Land Management system from the perspective of permitting. They will need to be interfaced with proposed modules for future billing purposes.

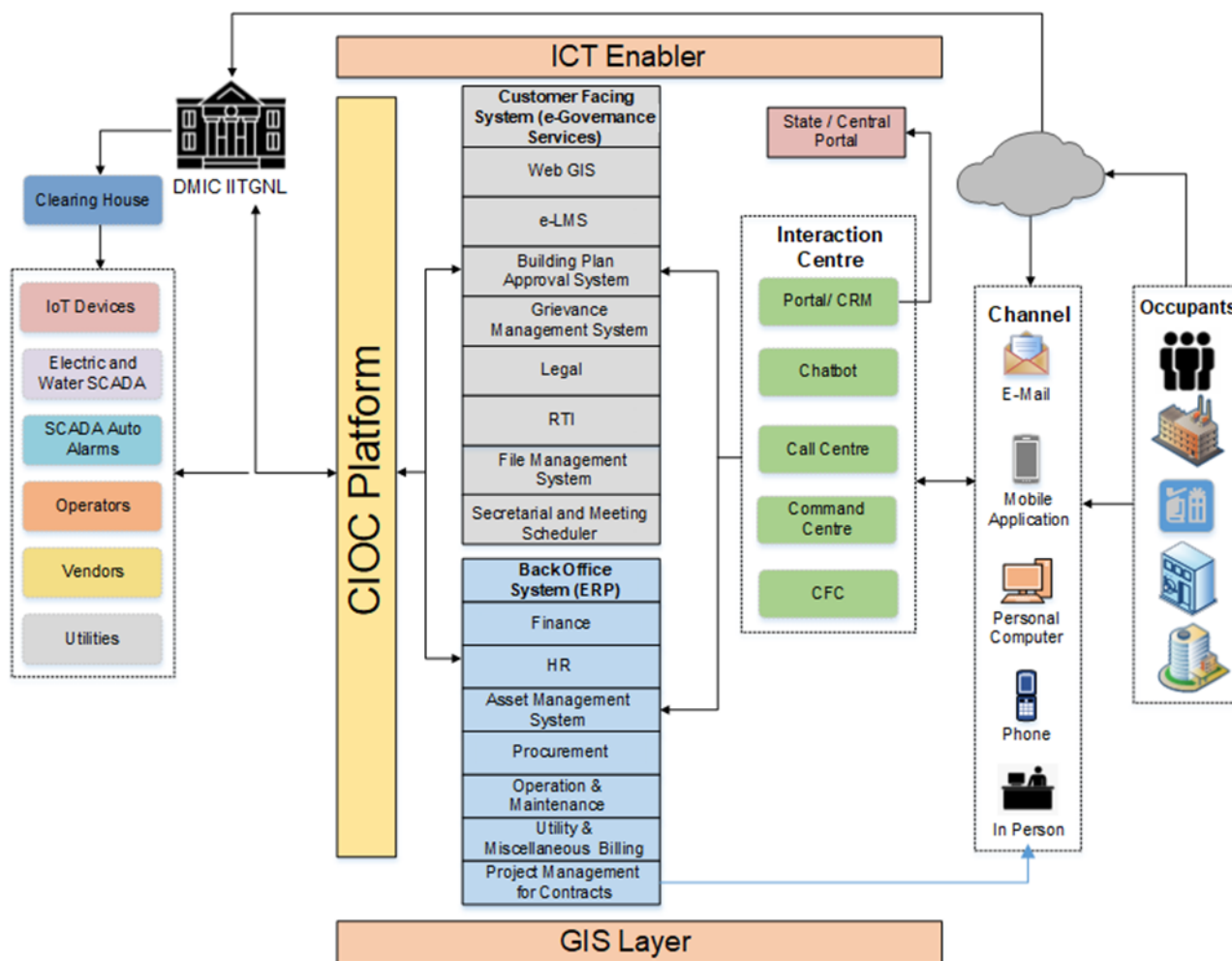


Exhibit 5: Conceptual Architecture of IIT Software Modules (ISM)

The business cycle will begin with budgeting and investment planning. Fund/ grant management will be an integral part of budgeting. After budget is approved then the same will be allocated towards projects or towards the operating expenditure. Project management functionality will be required to track budgets, procure against budget, process payments and manage project cash flows. Procurement will be done using e-procurement functionality. The system shall be pre-integrated with projects, procurement and financial modules. Maintenance of assets is going to be one of the major activities, whether inhouse or through an outsourced agency appointed for maintenance.

DMIC IITGNL is likely to have approximately 50 employees. HR and Payroll system should cater to the Human Resource Management of DMIC IITGNL employees.

Fixed asset and depreciation accounting shall be available as standard. Since the smart city will be built as population grows, fixed assets should go through the cycle of construction in progress before they are placed in service. All statutory financial requirements shall be met through the system.

DMIC IITGNL Land Allocations:

- DMIC IITGNL would allocate land for the following purposes:
- Industrial Plots;
- Commercial and Institutional plots;
- Residential Plots;
- Green spaces;
- Roads;
- DMIC IITGNL administrative blocks and office; and
- Utilities buildings.

For facilitating the allotment of various plots, an e-Land Management System (e-LMS) is being implemented by DMIC IITGNL. Allocation of Land is a priority for DMIC IITGNL at present as it is a means of funding further investments required to build the world class infrastructure.

The properties in DMIC IITGNL should be mapped individually on to the proposed modules such that unique property IDs are allocated. Roads would be a linear asset and the system should provide the necessary functionality to logically represent a linear asset. Requirement of linear asset representation would also be felt in the electric cables, gas pipelines, telecom fibre. A GIS interface would be integral to the solution.

All payments would be accounted for in the finance module where the customer account would also be maintained. A bidirectional interface may be required between the LMS and the proposed modules.

Assets in DMIC IITGNL Premises

Following types of assets would be installed in DMIC IITGNL:

- Electricity substations, transformers, switches, circuit breakers, feeder lines and other electric network assets necessary for supply of power to DMIC IITGNL users. IoT equipment may also be installed to generate automatic alarms;
- Water pumping stations, storage tanks, purification plants, water mains, valves and other water network assets necessary for supply of clean water to DMIC IITGNL users. IoT equipment may also be installed to generate automatic alarms;
- Waste water drains, man-holes other waste-water network assets necessary for providing sewage facilities to DMIC IITGNL users. IoT equipment may also be installed to generate automatic alarms;
- The solid waste management system and associated assets
- Storm water drains and rain harvesting pipes and equipment;
- Telecom network of fibre, cables and switches;
- Street lights, traffic lights and other traffic management/road management equipment (future);
- Solid waste bins and sewage treatment equipment and plant; and
- Vehicles and other fixed assets like furniture, buildings, office equipment.

DMIC IITGNL – Managing and Inhabiting IIT

A centralized command and control facility will maintain and monitor city utilities to help achieve operational efficiencies across resource use and workforce.

The proposed modules will power-drive the operational excellence at DMIC IITGNL, through the implementation of state of art best business practices. The salient functionality requirements would include:

- GIS Mapping of the city to support Land allocations business processes. Subsequently ensure prompt collection of annual taxes, required to fund the city operations;
- Logically representing the assets as mentioned above, as and when they are created or acquired and ensure that the preventive, reactive and break down maintenance activities are efficiently processed. The quality of life will be dependent on service delivery for, regular sewage collection/disposal, working street lights, clogged drains, stable power supply, adequate quality water supply, uninterrupted Internet services and well-kept parks/ playground promoting leisure activities & physical exercise;
- Online interface with facilitation of the Energy Data Management/Procurement solution to optimize expenses incurred on procurement and supply of electric power;
- Water: customer services which are in action round the clock at the click of a mouse, addressing grievances and providing a customer statement of bills due, payments made and outstanding amounts. The businesses and cities should be able to benefit from the electronic payment means;
- Projects/Capex Expenditure: Infrastructure development will be an ongoing process and the city needs to cater for the growth in economic activity and population. The system should ensure achievement of objectives by facilitating monitoring and control of projects;
- DMIC IITGNL Corporate Functions: best practice implementation for Budgeting, Finance, Procurement & Stores, HR & Payroll Management;

- E-Governance applications accessible to investors, citizens and officers via the portal and the Customer facilitation centre;
- A robust document and file management system;
- This will all be integrated to the proposed GIS application.

BR - 4 Business Requirement

IIT SOFTWARE MODULES (ISM)	
BR 4.1	DMIC IITGNL shall have a state-of-the-art back office system which shall automate and digitise various DMIC IITGNL functions and business processes.
BR 4.2	DMIC IITGNL shall have a comprehensive suite of customer facing applications which shall provide convenient, anytime, anywhere citizen and employee services with an aim of 100% online and paperless delivery of services.
BR 4.3	IIT Software Modules (ISM) shall provide a holistic and integrated solution to meet the needs of both DMIC IITGNL and citizens.
BR 4.4	ISM shall enhance transparency, accessibility and efficiency of DMIC IITGNL functions in an integrated manner.
BR 4.5	ISM shall provide significant improvement in Government to Customer (G2C), Government to Employee (G2E), Government to Business (G2B) & Government-to-Government (G2G) interfaces and services.
BR 4.6	ISM shall streamline, standardize electronic information gathering and access.
BR 4.7	ISM shall facilitate information reuse, across and within various departments of DMIC IITGNL.
BR 4.8	ISM shall reduce system maintenance and training requirements by adopting standard systems and processes for DMIC IITGNL.
BR 4.9	ISM shall provide electronic delivery of services to meet citizen expectations and requirements. Intent is to create efficiencies in the internal working of DMIC IITGNL and provide user friendly interfaces, so that the citizens shall have a trouble free user experience.
BR 4.10	ISM shall have continued compliance with Government frameworks including NeGP and Government of Uttar Pradesh e-Governance policy, legal regulations and standards.
BR 4.11	Customer facing applications solution shall at least comply with the published e-Governance standards, frameworks, policies and guidelines available on http://egovstandards.gov.in (updated from time-to-time).
BR 4.12	ISM solution shall be modular and customizable to meet the requirements of the Project.
BR 4.13	ISM solution shall have the capability for printing of all bills generated by any ISM module.
BR 4.14	Some of the functionality defined in the ISM and Smart City Platform may overlap. It is the MSI's responsibility to optimize the functionality as part of his overall solution for the Project.
BR 4.15	Audit trail and logs for all changes in IIT software modules including databases shall be provided to the ISM admin user for traceability purposes.
BR 4.16	There shall be no option of deleting system logs, tickets, audit trails etc. from system back end and database. However, the capability to change status of logs, tickets to inactive, cancelled should be available. Any alteration or deletion for data at the backend database level should be with explicit consent of the Client. Further, a log of such alteration/deletion should be maintained
BR 4.17	Authorization functionality in ISM is required at Process or Task Level to enable an DMIC IITGNL user to perform tasks which span across one or more IIT software modules and/or systems. For example, a user in Finance may require access/authorizations to perform tasks which relating to functionality in Inventory Module.
BR 4.18	The solution shall also include SMS gateway, e-Mail gateway and WhatsApp gateway. The solution shall integrate with SMS, e-Mail and WhatsApp gateway wherever such an event is required to be

	triggered. Stages at which SMS/WhatsApp/e-Mail to stakeholders are to be triggered shall be decided by the Client in consultation with the MSI.
BR 4.19	iOS and Android Mobile application for applications that are required as part of this solution shall be implemented. However, the exact list of applications for which mobile application shall be developed shall be decided by the Client.
BR 4.20	ISM shall have dashboards shall be capable of receiving input data from different systems, subsystems and software applications on a real-time basis.
BR 4.21	ISM Dashboards developed for IIT shall serve as a unified platform to display Management Information System (MIS) details of all operational modules.
BR 4.22	While multiple modules and applications shall have individual detailed dashboards, one unified and common dashboard shall be implemented which shall integrate data from all Project modules to provide a single platform for monitoring purposes.
BR 4.23	As part of the Dashboard requirements, an indicative list for monitoring requirements has been provided as part of the Functional Requirements. However, MSI shall discuss and finalize with Client all monitoring and reporting capabilities at the Dashboards during the Project implementation.
BR 4.24	The solution shall generate different types of reports (in MS Excel, PDF or CSV format) for each respective module. The exact reports which will be generated shall be decided by the Client.
BR 4.25	ISM shall generate a unique ID whenever a transaction or process flow is triggered for audit / traceability purposes.
BR 4.26	The ISM modules may be integrated with one or more Payment Gateways and eCMS services of one or more banks as desired by DMIC IITGNL.
CHATBOT SOLUTION	
BR 4.27	<p>The main objectives of the Chatbot are as per following:</p> <ul style="list-style-type: none"> • Address queries of potential investors specific to the city; • Ease the land allotment and management process; • Leverage the data repository to streamline the marketing and outreach process for land allotment; • Assist citizens in availing e-governance services; • Act as a marketing tool; • Enable proactive emergency response management; and • Provide information to city services like maps, events, news etc.
BR 4.28	<p>The Chatbot will use the following channels for interaction:</p> <ul style="list-style-type: none"> • Corporate website; • Social media accounts like Facebook and Twitter (as applicable); • City portal; • e-LMS portal; and • Mobile application.
BR 4.29	Chatbot shall have a modular, scalable and reliable architecture to provide quick and accurate responses to the users.
BR 4.30	Chatbot shall have the ability to engage with customers in a user-friendly manner.
BR 4.31	Chatbot shall be able to interact with third party messengers like Facebook Messenger etc. through API(s), as applicable.
BR 4.32	Chatbot shall be used for offering e-Governance services to the citizens.
BR 4.33	Chatbot shall act as an independent point of contact to the city Administration officials, citizens and investors.

BR 4.34	Chatbot shall retain all the conversation in order to understand the nature of questions asked by the user so that it can respond accordingly. For this, Chatbot shall utilize the concept of Natural Language Processing (NLP) to learn the kind of queries the users are asking.
BLOCKCHAIN FOR LAND RECORDS	
BR 4.35	The Blockchain network shall be offered as a managed cloud based service for the land records of DMIC IITGNL. The land records data shall be obtained from the existing e-LMS of the Client. The MSI shall be responsible for integrating blockchain solution with the e-LMS and provide any required updates in the e-LMS.
BR 4.36	The Blockchain platform shall enable DMIC IITGNL with added level of data security, redundancy and integrity in context to the land records.

FR - 4 Functional Requirement

2.2.4.1 Workflow and File Management System

A robust work flow framework and document management system is to be implemented at DMIC IITGNL. The Workflow Management system shall have the ability to set the workflow for each department & for each module where it is needed.

Functional Requirements

WORK FLOW MANAGEMENT	
FR 4.1	Workflow Management system: There will be a workflow management system which will enable admin to set the workflow for each department & for each service for e-Governance where it is needed. System will be flexible enough to change the number of approval level from n to N+M and there will be facility to decrease the number of approval level if required. One admin login at the Sr. Level official of DMIC IITGNL (or any other department) for each department would be required to configure/Change/Delete workflow for each department if required. System shall provide configurable workflow up to N level. This Sr. Level may be Executive Engineer E.E or S.E of particular department. Purpose for this login will be to do workflow configuration department wise.
FR 4.2	The Business Process Management (BPM)/Workflow Management System will have the capabilities of graphically modelling the processes or workflows, in built Form designer, process simulator, configurable Business Activity Monitoring tool (Dashboards).
FR 4.3	The system shall support multiple databases.
FR 4.4	The system shall enable process designers to design multiple sub-processes. This includes mapping of the existing process instance to the newly created process instance as per mapping defined in the route.
FR 4.5	Workflow Management System shall integrate with respective ISM modules for all file movement related activities.
FR 4.6	The system will have the parametric facility for workflow-based approvals/maker & checker/immediate.
FR 4.7	Apart from the web portal applications, the proposed workflow platform will provide rule engine and report designer functionalities for the processing of back office processes, master data management. The system must be modular and easily configurable to accommodate DMIC IITGNL's future changes including integration with any application.
FR 4.8	The system will have facility assign a task to multiple department users.
FR 4.9	User wise remark and decision will be stored.
FR 4.10	Every user will get approval remarks by previous users.
FR 4.11	On Approval, the application will be forwarded to next user assigned in the workflow. On Rejection, the application will be sent back to the previous user.
FR 4.12	On Hold, the application will remain with the same user.
FR 4.13	The Approval by, Approval Date will auto fetch from user/employee login details.
FR 4.14	The system will have the facility to show application details to the user before taking a decision.
FILE MANAGEMENT SYSTEM / DOCUMENT MANAGEMENT SYSTEM	
FR 4.15	Facility to scan and upload: <ul style="list-style-type: none"> • Paper documents; • Photos; • Email communication; and • Any other document;

FR 4.16	The system shall have a native iOS and Android based mobile/tablet app for easy access of the information (document) while users are on the move.
FR 4.17	Facility of associating a note-sheet with the file enabling users to comment and review.
FR 4.18	Facility of attaching documents and folders in work items.
FR 4.19	Facility to act upon, forward, return or complete Work-items.
FR 4.20	Redacting (blacking-out or whiting-out) images and text to preserve confidentiality.
FR 4.21	Stamping images with words such as FAXED or CONFIDENTIAL, or with signatures denoting approval or denial.
FR 4.22	Attaching sticky notes that contain additional comments.
FR 4.23	Ability to support Printing, faxing and e-mailing documents.
FR 4.24	The system shall support versioning of contents, user should be able to access previous and next versions.
FR 4.25	Shall support for storage of any type of contents such as JPG, TIFF, PDF, MS office files, audio, video, auto cad files etc.
FR 4.26	Shall have a comprehensive access control functions, depending on the user role & access levels.
FR 4.27	System shall provide audit trails and certificate of destruction.
FR 4.28	The system shall provide spell-checking functionality. The language of the dictionary must be able to be changed for content authors producing content in other languages.
FR 4.29	The system should have an Interface for uploading the scanned copies of documents / letters.
FR 4.30	The system shall provide facility to view all letters/documents
FR 4.31	Scanning: System should have scanning capability and allow attaching the scanned documents
FR 4.32	The system shall provide an advanced search interface for tracing & searching a correspondence (DAKs) based on dates, subject, pending with, completed by, pending since etc.
FR 4.33	The system shall provide facility to users to append their notes, which shall be automatically stamped with user name, date and time.
FR 4.34	The system shall have an In-built Web based Text Editor with basic functionalities such as bold, alignment, font, color etc. for writing the notes.
FR 4.35	Module should include DAK/ File Management with features like online DAK/File register etc.
FR 4.36	The system should support green note sheet type of functionality similar to government functioning.
FR 4.37	Mechanism for effective and efficient search for all the old records.
FR 4.38	Appropriate storage structure for the files.
FR 4.39	Provision for marking files as; Urgent, Most Urgent etc.
FR 4.40	Integration of the file management system with other software modules
FR 4.41	Similarly, files put up for RTI, Grievance, Court matters to be highlighted accordingly.
FR 4.42	Employee-wise MIS report on total number of files generated, number of files disposed or pending during specific period, which may be helpful for proper distribution of work.
FR 4.43	Reports on average days taken for disposal of files, un-disposed files pending since average no. of days which may present performance of the employee.
FR 4.44	Alerting the employee on marking of new files by blinking indicator on screen as well as through SMS only for Urgent & Most Urgent marked files.
FR 4.45	Alerting the employee time to time for non-disposal of files within permitted time limit.

FR 4.46	The system shall have a facility to create/open a new electronic file as well as a Part File, which can be merged with the main file at a later stage.
FR 4.47	The system shall have a facility to save the file in the desired folder in the system as per the user rights.
FR 4.48	Numbering for the file will be auto-generated as per the department format and will allow for restarting the numbering at beginning of every fiscal year.
FR 4.49	The system will mandatorily capture information like File Subject, Department etc. while creating the file.
FR 4.50	The system shall generate a Barcode number on successful creation of a file. This barcode can be pasted into a physical file for tracking, in case physical file is also used.
FR 4.51	The documents which are added to the files also can be individually indexed/ tagged for easy search.
FR 4.52	The system will have a facility to search a file based on multiple parameters like file number, file subject etc.
FR 4.53	System will allow categorization of files like subject files, special files, administrative files, project files etc.
FR 4.54	System shall have an in-built text editor for entering the notes. The editor will have basic functionalities such as highlighting a part of note, underlining, making bold, creating paragraphs, having bullet numbering, creating tables etc.
FR 4.55	The note editor will support adding notes in English.
FR 4.56	The system shall have a draft folder to save Office Notes that are created by officer, which can be edited/appended/reviewed before making it the final note in the file.
FR 4.57	The system shall provide security on notes, so that Noting/comments once written signed and forwarded shall not be amendable/editable by any user including originator.
FR 4.58	The system shall provide facility of securing the notes or making a noting confidential and allow only selected authorized officers to view the secured notes.
FR 4.59	The system shall have the workflow capability to route the file for approval electronically. The routing can be either serial or parallel routing or can integrate with work-flow management system.
FR 4.60	The system shall have facility of creating Fixed File Routes or ad-hoc routes as the case may be.
FR 4.61	The system will allow attaching other related files in the workflow for easy reference, while in workflow.
FR 4.62	The system has facility to “refer” the file to an outside user who is not a part of Fixed File Route for getting their inputs.
FR 4.63	If need be, the system shall allow transferring of file from a User’s Inbox to another user by authorized officers.
FR 4.64	Once the workflow is initiated, the system will automatically intimate the respective users by email/SMS for their action once the file is in their inbox.
FR 4.65	The system shall allow fixing the timelines for completing of task by each user. The system will intimate the user by email/SMS on reaching the threshold time for completing the task. The system will allow defining escalation actions, if the task is not completed in time like email, automatically moving the file to alternate officer etc.
FR 4.66	The system shall allow the officer to keep a file “On-Hold” by specifying the reason for hold.
FR 4.67	The system shall provide a facility to track the file by authorized users at any point of time.
FR 4.68	The system shall allow maintaining information & tracking of Physical Files also if need be.
FR 4.69	The system shall allow various process/file reports including drill-down reports as needed from time to time.
FR 4.70	Maintenance of e-Registers – personal, divisional, and departmental.

FR 4.71	The system will provide Smart search interfaces for quick access correspondences & files.
FR 4.72	The system will provide BARCODE/RFID Integration and Social and Mobile Extensions to enhance responsiveness and accessibility.
FR 4.73	The system will provide Inter-divisional interface allowing sharing of files, papers, etc.
FR 4.74	The system shall provide all required reports around file movement and tracking.
FR 4.75	The system shall support the functionality for digital signatures.
FR 4.76	The system should have a mobile app compatible with android and iOS for all functionality
Letter & Correspondence Management	
FR 4.77	The system shall have a facility to directly capture the physical/hard copy letters received by the department in the system. It will enable capturing basic information like Date of Receipt, Subject of letter, who has sent the letter, Date on letter etc. before exporting to the Letter/Correspondence Management System.
FR 4.78	The system shall have a facility to add emails directly to the Letter Management System.
FR 4.79	The system shall allow capturing the letter using mobile device like Smartphone/ Tablet and add directly to the Letter Management System.
FR 4.80	The system will allow Auto-Numbering of the letters registered, which can be easily tracked at any point in time.
FR 4.81	The system shall have a facility to route the correspondences Letter to the user whom it is addressed to.
FR 4.82	The System shall allow the recipient of the letter to view the same and do annotations.
FR 4.83	The system shall allow the recipient to take different actions on the letter like o Filing the Letter to an existing/New electronic File o Forwarding the same to other users for action o Forwarding the same to multiple users together for action.
FR 4.84	The system shall have a facility to prepare responses and attach with the correspondences Letter workflow if a response is to be given to the letter.
FR 4.85	The system shall have a facility to track a correspondence at any point in time.
FR 4.86	The system shall provide advanced search facility for searching a correspondence /Letter based on multiple criteria like dates, subject, pending with, completed by, pending since etc.
FR 4.87	The system will have inbuilt inbox for receiving correspondence.
FR 4.88	The system will have electronic management and tracking of correspondence encompassing tasks such as diary entry, indexing, noting, cross-referencing, search/ retrieval etc.
FR 4.89	The system will have interoperability between departments/agencies allowing stakeholders to collaborate and share files, documents, etc.
FR 4.90	Capability of maintenance of e-registers for individuals, divisions, and departments
FR 4.91	The system will have BARCODE integration for file and correspondences (DAK) tracking.
FR 4.92	The system will have file-viewer to enable electronic view of physical files.
FR 4.93	Note-sheet view of files with support for formatting and linking reference notes.
FR 4.94	The system will have provision to capture user details and timestamp along with every note.
FR 4.95	The system will have end-to-end audit trail.
FR 4.96	The system should have a mobile app compatible with android and iOS for all functionality
FR 4.97	The system should provide option for integrating Grievance, Legal and RTI correspondences received via DAK – In or sent out via DAK – Out to be integrated with respective modules.

2.2.4.2 GIS

Overview

GIS provides an endless range of capabilities to provide visualization, analysis, understanding and insight into city activities, both current and planned. GIS provides the capabilities of usually separate technology systems, all enabled through one single platform.

The GIS work will include preparation of base-map, overlaying the existing CAD layers on it and conducting a survey for viewing the city in 2D as well as 3D. The detailing has to be comprehensive and detailed up to roads, plots and other common infrastructure etc. The data will be further published in Web-GIS for online viewing and analytical purposes. The Web-GIS functionality should allow for zoom in/out, searching, and retrieving information capabilities;

Objective

- Intent is to generate an intelligent system that can use spatial data for decision making under services like issuance of licenses, solid waste management, land maintenance charges, grievances & complaints, service requests, etc.;
- Creation of a geo-database shall provide an interface to the present and future business applications planned to be implemented by DMIC IITGNL;
- GIS system will enable editing and publishing all the assets under DMIC IITGNL for better information management, accurate estimation and tracking; and
- Various applications (pertaining to different services like issuance of construction permit, trade licenses, permits, city assets and solid waste management) shall be able to utilize the spatial database to process other relevant data in order to provide useful and scientifically and mathematically accurate information.

Scope

- Development of Map using high-resolution imagery extracted either through Drone Survey or LiDAR survey. MSI shall be responsible to obtain any permits or regulatory clearances from the respective agencies as required to undertake this work.
- Conversion of Non-Geo referenced/ CAD layer available with DMIC IITGNL into the GIS layers which can be overlaid on the Base map;
- Conducting surveys for data collection which is currently not available with DMIC IITGNL; in 2D and 3D format;
- Geo-referencing and Geo-Coding the Data for with reference to the Base Map.
- Launching the acquired 2D and 3D GIS data layers into the Web-GIS portal; and
- Development of Web-GIS Modules for ISM, tracking and monitoring various systems/assets and Data analytics.

Functional Requirements

FR 4.98	<p>Preparation of Base map:</p> <p>It is necessary to have a high-resolution imagery Drone imagery with latitudes, longitudes and elevations for creation of the base map of the study area.</p> <p>Process of survey:</p> <p>Step1: Flying the drone over the entire study area</p> <p>Step2: Capture multiple images during the flight</p> <p>Step 3: Stitching the image using the software</p> <p>Step 4: Create 3D mesh/Digital Surface Model/ Digital elevation Model</p> <p>Image processing Desktop Software Specification</p> <p>Following requirements must be considered while carrying out Drone survey</p>
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	Components	Description
	Coverage area	Approximate 1 Sq. Km (tile size)
	Pixel size /Resolution	2 cm – 3 cm or better
	Flight Height	Not more than 300 ft.
	Camera Sensor	20 megapixels and above
	Photography condition	Ground must be free of fog, haze, dust and weather condition should be analysed based on prediction from IMD
	Overlapping	80 % forward overlap and 70 % side overlap
	<ul style="list-style-type: none"> Should support for image files over 5 GB in size Able to process Drone images to create ortho Mosaic, DSM and point cloud Able to compress the ortho image without any visual-loss for creating application Workflow based model to run change analysis like new buildings, new floors in existing buildings using images, lidar points Able to push the results to Microsoft tools for creating reports Able to use point cloud data to create contour map Should have Machine Learning and Deep Learning operators to run on images 	
FR 4.99	<p>Digitizing/ Geo-referencing of Available data:</p> <p>Creation of Shape files/Conversion of Vector Data into shape files: DMIC IITGNL has already prepared a master plan which has Roads with classifications of ROW, Plot boundaries with land use, utilities etc. with all the attributes related to them in the CAD format.</p> <p>If the existing layers are not exactly overlaying on the Base map, the Master plan has to be replicated on GIS using GIS digitization techniques.</p> <p>Validation of the data:</p> <ul style="list-style-type: none"> Any missing data from the master plan Missing attributes, if any have to be re-created Scale has to be accurate. Any deviations in the scale would indicate that the data is not correctly digitized and has to be re-digitized with respect to the scale of Base map The data has to be projected in the co-ordinate system so that it fits well in its perfect position The minor digitization errors in terms of road curves, overshooting and undershooting of roads has to be corrected. Missing roads and other geographical features available in the base map have to be vectorised by digitization. Solution should support conversion from plain CAD features as Intelligent GIS features with all attributes Solution should have facilities to digitize with reference to the base Model Solution should support extensive Geographic coordinate system and re-projection capabilities. 	
FR 4.100	<p>Surveys of Additional data not available with the client using LiDAR</p> <p>Additional data in terms of buildings, water utilities, electrical utilities, ICT utilities, chambers, poles, trees, structures and other physical and geographical features shall be captured using 3D Point Cloud LiDAR data with the use of LIDAR Scanner available in the market. The captured data must be store in GIS compatible format with appropriate naming. The 3D LIDAR survey shall be done after every 6 months or 1 year to a total of 5 surveys over the Contract duration (including AMC Phase) as per Client requirements to visualize the actual development on site.</p> <p>LiDAR data must be captured to cover the above-ground level details i.e. Poles, utility chambers, existing ROWS, footpaths, feeder pillars etc.</p>	

	<p>Note: Quality check of the data in terms of correctness, scalability and level of detailing is necessary for to get things into right place during implementation.</p> <ul style="list-style-type: none"> • Solution should allow referencing a Point cloud data and allow to perform the digitization. • complete mapping unit for Image, LiDAR and DSM mapping process features and results in semi- or full automated mode document assets, centralize data management roles and permissions for team work • Access to any mobile content measurements and save in GIS Layers, can overlay vector data in Panorama and 3D
FR 4.101	<p>The proposed Geospatial layers (as applicable) for different city functions will be as follows but not limited to:</p> <ul style="list-style-type: none"> • Study area Boundary • Environs • Control Points • Railway Line • Drainage • Digitized Cadastral Map with RoR • Masterplan • Sector Plan • Plots • Existing land use • Street Map existing/Proposed • Water Network <ul style="list-style-type: none"> ➤ Water Supply Line existing/Proposed ➤ Pumping Station ➤ Valves (Type wise) existing and Proposed ➤ Underground reservoir ➤ OHT ➤ Flow Meters ➤ Smart Meters ➤ Public Tap ➤ Elevation data ➤ SCADA • Sewage network <ul style="list-style-type: none"> ➤ Sewage network ➤ Recycled Water ➤ Manholes ➤ Culverts ➤ STPs ➤ Pumping station ➤ Public Toilets with Dimensions ➤ Elevation • Storm Water Drain <ul style="list-style-type: none"> ➤ Drainage Network ➤ Inlets ➤ Outlets ➤ Elevation • Solid waste Management

	<ul style="list-style-type: none"> ➤ As per finalized network of Automated Waste Collection System (AWCS) ➤ Suction Duct ➤ Processing Plant ➤ Community Bins • Transport <ul style="list-style-type: none"> ➤ National Highway ➤ State Highway ➤ Road Hierarchy ➤ Village Roads ➤ Road divider ➤ Road Junctions ➤ Foot path ➤ Traffic Signals ➤ Bus Stops (Existing & Proposed, ISBT) ➤ Location of the Proposed PBS Points ➤ Cycle Tracks (Proposed & Existing) ➤ Railway Property Boundary ➤ Railway Track (Broad Gauge) ➤ Proposed Metro Lines ➤ Proposed Metro Stations ➤ Flyover ➤ Under Bridge / Underpass / Subway ➤ Railway Bridge ➤ Culvert ➤ Parking Spots (Paid & Unpaid) • Gas Network <ul style="list-style-type: none"> ➤ Gas Supply Line ➤ Valves ➤ Elevation • Electricity <ul style="list-style-type: none"> ➤ HT Lines ➤ LT Lines ➤ Substations ➤ Transformers ➤ Streetlight <p>All the GIS data, attribute, projections, spatial references etc. should be as per the Project specific standards to be finalized in consultation with the Client.</p>
3D BIM from 3D Point Cloud data	
FR 4.102	<p>All the data available or generated has be in 2D as well as 3D vector and Raster format. The system should be capable of Generating 3D point clouds with realistic colours, walk through, 3D models etc. to get the real feel of the site. These scenes are to be organized in different Levels of Detail (LOD) and derived from 2D operational data managed by a department or agency within a local government. The 3D scenes shall act as foundation for 3D workflows and applications; and provide a consistent 3D geographic context of the study area.</p>
BIM GIS Workflow Integration	
FR 4.103	<ul style="list-style-type: none"> • GIS shall act as a system of record for BIM models, as required.

	<ul style="list-style-type: none"> • The BIM generated should be geo-referenced and capable of integrating with the GIS Base map, ICT Master Plan and Enterprise GIS. • The Desktop Product shall be capable of directly reading the 3D Drawing created in any BIM software as Building Scene to allows a user to encapsulate the semantics, geometry, and attribute detail of any BIM model • Produce visualizations of models and further refine potential designs. • Generate images and animations with life-like detail and high-end photo-realistic renderings with no need for additional software.
Web-GIS Integration	
FR 4.104	<p>All the data collected through the steps mentioned above has to be pushed into the Web-GIS portal</p> <p>The data should include</p> <ul style="list-style-type: none"> • High resolution base-map (Drone survey) • Master plan (Geo-referenced) • 3D BIM (Generated from 3D point cloud scanning) <p>All the data layers should be perfectly overlaid on the base map in their appropriate positions.</p> <ul style="list-style-type: none"> • Solution should be a powerful cloud-based 3D visualization platform designed for project communication and interaction in urban planning and infrastructure projects. • Based on a high-performance streaming technology it serves unlimited size 3D models to web and mobile • Easy access to information for more efficient information flow and better decision making. • Powerful 3D tools with a user-friendly intuitive interface for a variety of use cases. • A comprehensive platform for communicating complex project information to project team, operations staff, contractors or in a city also stakeholders, citizens. • GIS Projects should be easily be published as interactive 3D illustrations online, a modern way of communicating to stakeholder, citizens or project teams. • Sharing information and being transparent throughout the development process. • Solution should have an option to create a project with an URL and/or embedded code that can be inserted into any website or shared via social media and other communication channels. • GIS Portal should be accessible from PCs, Tablets and mobile phones
FR 4.105	<ul style="list-style-type: none"> • The system shall have capability to perform attribute or spatial queries on data from selected sources; • The system shall support Mobile platform like iOS, Android; • The system shall allow downloading, modification of the raster/vector data of this projects only after the client authorisation; • The system shall support server side Geo-processing; without any permanent changes to the original data. • The application shall have standard and modern map navigation tools of pan and zoom; • The application shall support client requests to print the spatial data; • The system shall be able to support industry-standard data types, industry-standard data formats, unlimited file size or database size, unlimited number of files or tables, and unlimited number of users; • The system shall support geocoding and reverse geocoding; • System shall have the capability to of integrating data from third party services like Bing, Map-My-India, Here, Open street etc. • The system shall have the facility wherein the user can opt to view in 2D or 3D environment; • The system shall support & be compatible with KML/KMZ google maps, Bing maps, CAD data, shapefiles, Raster files, ODBC sources etc. The System shall support hierarchical legends, and watermarks;

	<ul style="list-style-type: none"> • The application shall allow users to view the data with different symbology styles like differentiating feature records based on attributes or types, dynamic label generation with conflict detection, and translucency of all raster data and area colour fill; • The system shall allow the user to find Address using GIS as a base; • The system shall be able to consume real-time enterprise published spatial data. It shall be able to consume the third-party published OGC (Open Geo-Spatial) web-services. • GIS base maps shall be installed on work stations/Laptops. GIS maps and data replication shall happen from central system remotely in real time. • Spatial data shall be accessible and available to be leveraged across multiple applications and not just limited to Web GIS application. • System shall be capable of integrating the spatial & non-spatial data of this project into a Web with Tools, Analytical capabilities & Dashboards for viewers. • System shall be capable of updating of the relevant ICT data into GIS, as and when implemented on site. • System shall be capable of handling the data dynamically and capable of viewing the real time information. • System shall have a separate user interfaces with differentiated viewing requirements for Multiple user groups through discussions and approvals from the client. There shall be at least one interface which has full control of entire system. It should enable the client to open a new incident and to associate the incident with its geographic location automatically, via GIS display; Developing GIS modules for better incidence viewing, response management, escalation to the multiple levels and incident closure. • It should support securing applications within multiple tenants, to be secured by API Key tokens. • GIS desktop system should be based on native 64 bit and multithreaded architecture and should support parallel processing. Web GIS system should run as a native 64-bit application and support windows/Linux/IOS 64-bit operating system. • Desktop system must convert between 2D and 3D in the click of button & link 2D and 3D views. One can view 2D & 3D view simultaneously in the display area and can compare the geography. Moving and panning geography in one view (2D or 3D) should automatically change the respective view of other view (2D or 3D). • It must provide Artificial intelligence, machine learning & deep learning toolsets. • GIS system should have a portal for administration that allows administrators to add, update, manage and maintain city GIS data and user management, Content Sharing and capability to build various GIS applications. • Server application should record the hourly usage based on Tenants(users) and reports this information in Admin console for better monitoring and performance optimization of services • Should be capable of GIS Content Management (like, management of content locations and marks relevant content as Authoritative) and Organization User Management (e.g. User can manage all aspects of inviting and managing User, including adding to groups and resetting passwords) for Managing content for different projects and role-based access management. The Proposed geospatial solution should support multi tenancy, • GIS Server Software should have the feature to create web widgets using template or wizard out of the box. • The proposed geospatial solution should support below features for creation of dashboards out of the box without the need of any customisation: <ul style="list-style-type: none"> a. Bar Charts b. Line Charts c. Row Charts d. Compound charts e. Pie charts / Donut charts (both as a charting widget and on map as cluster symbols) f. Scatter chart g. Temporal charts (Time of day, day of week, Date, Temporal heat map)
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	<p>h. Data table</p> <p>i. 2D and 3D view (capability to extrude polygons based on any attribute parameters In a 3D widget)</p> <ul style="list-style-type: none"> • These dashboards must dynamically updates based on the data updating from browser, mobile, desktop users • Enterprise Web GIS server should have facility to publish and view 3D data • GIS system must support BIM & KML (KMZ) interoperability support. LiDAR data & classification and editing. • GIS system must support animation to 3D views and able to export videos • The software shall be capable of integrating with other IOT devices and applications through APIs • Data security shall be ensured. • Shall provide complete geoprocessing capability and records • GIS Desktop software shall be able to connect to multiple RDBMS's simultaneously without middleware. Should have capability to import Standard GIS data to spatial RDBMS table. • Should provide complete web-based single gateway portal out of the box as an organizational GIS platform to Create, Access, Analyse, Manage, and Share and disseminate geo-spatial content amongst users. In other words, it should provide a map centric web portal platform for managing the organization's geospatial content. Should have a facility of user management to create an account, and grant/ revoke user rights for viewing, publishing or administrator rights to any users across the network. • There should be one licensing policy for the entire solution stack, and no additional license liability based on number of users using dashboard applications or thick editing applications. • The proposed geospatial solution should be able to connect natively into the spatial RDBMS without the need of any pre-processing or Middleware licenses • Should have a facility to share published GIS content with other users and only authorized users can view or modify the shared content. Web GIS system should have out of the box capability to change the web pages appearance, and to select services, base maps, templates, galleries and available groups to be used • It should provide a web publishing wizard out of the box so that registered users can publish websites, create GIS applications without the need of programming. Users should be able to insert search tags to assist authorized users to search and locate geographic information, web maps, and web GIS applications create and shared by other users. The search results should be helpful to determine the usefulness of each item and find related items • Web GIS solution must be available with out of the box industry specific templates, apps and maps that can be configured as per the needs of city. These maps, apps and templates must be based on the industry specific best practices around the globe that can be localized as per city needs for foundational applications without any requirement of customization. • The system must have capability to process the geo processing on the web out of the box where users can use multiple geospatial tools to build a model on desktop and able to publish the processing service on the web that define the inputs and outputs criteria to come out for the desired analytic results. • The web application developed by GIS system must be web responsive in nature and must automatically fits to the size of tablets, workstations or smart phones. GIS system must support and provide capability to work offline that one can download maps for use when device go offline. Users must be able to display maps get routes & directions, edit and sync data, perform analysis with search & query.
FR 4.106	<p>Major views for publishing are as per below:</p> <ul style="list-style-type: none"> • Public view: for common people who may view the vacant and occupied plots with all its attributes: dimensions, distance from roads and neighbouring plots, current land use and market value. • Second related view will be for Industrial or Citizen Residents. The query can be initiated using the relevant credentials for access. In this view, ownership and tax details can be visible.

	<ul style="list-style-type: none"> The detailed view will be for internal or outsourced employee users. Here depending on authorisation level, data may be displayed. The editing rights of spatial and non-spatial data are with the outsourced employees.
Web-GIS Development tools	
FR 4.107	<ul style="list-style-type: none"> Developing the Web-GIS modules for visualisation, interpretation, selection of data menu, and integrate the incident management system with the same as per the examples below. The modules will have to be developed based on the client requirement, workflows, must be user-friendly and ensure ease of doing business. For e.g. if there is an incident related to power cut or water cut, it should be popped-up on the Web-GIS online interface for the location of incidence. Further, the incident should be escalated to the concerned department with 3 levels of time bound escalations through SMS/mobile app or any other update technology used for speedy escalation. Upon fixing of incident, all the incident affected people/ informers of incidents should be intimated. Along with the escalation process, the incident time, type, location and time required for fixing should be stored in the GIS database for the analytical purposes. The GIS modules shall be equipped with the analytical tools which will readily display the Dashboards with graphical analysis of data being generated and stored in the GIS database to view weekly, monthly and yearly trends. The usability of Web-GIS shall be through both i.e. Desktop based application and Mobile based application (Android & IOS).
Integration of Web-GIS with City and ISM Applications	
FR 4.108	<p>The list is to be discussed with DMIC IITGNL and applicability decided. The ICT components required to be integrated with the Web-GIS portal for city applications are as follows (but not limited to):</p> <ol style="list-style-type: none"> City Applications <ul style="list-style-type: none"> Web-GIS Integration with Automatic number plate detection (ANPR) The Web-GIS should be integrated with the ANPR module to identify the number and type of traffic violations caused in the particular ward and populate it on the dashboard. Web-GIS integration with Automated Traffic counter and classifier (ATCC) Web-GIS should be integrated with the ATCC module to identify the location based traffic congestion; and inform the authorities to take necessary actions. It should populate the junction wise traffic data on the dashboards. Smart City Platform: GIS shall be the underlying layer over which multiple city services shall be visualized at the Smart City Platform. Wi-Fi Management System: To visualize access point specific information over a GIS map.
FR 4.109	<p>DMIC IITGNL employees/outsourced employees shall require following integration with ISM (the list below is indicative and not comprehensive):</p> <ul style="list-style-type: none"> File Management system Web site CRM Portal Dashboards Land management system Land maintenance related charges Inventory Management Operations, Maintenance and Asset Lifecycle management - water, roads, drain, sewage, fibre etc. Utility payments Grievance redressal Blockchain for land records

FR 4.110	<ul style="list-style-type: none"> • Web-GIS integration to the website: Web-GIS should be integrated with the official web-site of IIT-GNL and a link should be provided from the web-site to access web-GIS map application and vis-a-versa. This functionality should be applicable for both desktop and mobile viewing. • Web-GIS integration with the Customer relationship management (CRM): The Web-GIS system has to be integrated with the CRM system to provide the CFC agent a GIS view of the property whilst registering a service request and/or grievance. • Web-GIS Integration with Dashboard: The Dashboard should have the capability to integrate with the Web-GIS data to visualize Ward level information on a GIS Map and generate maps and graphs. <p>The functional details of ISM are mentioned in the other sections.</p>
E-Land Management system (e-LMS)	
FR 4.111	<p>DMIC IITGNL is implementing an electronic Land Management System (e-LMS) that will allow its potential clients to apply for land using an online system. This system will enable key IIT-GNL officials to review and process the land applications online. The system supports end-to-end functionality of land management including:</p> <ul style="list-style-type: none"> • Getting registered on the land portal; • Applying for land; • Online application review including permitting with online approvals; • Automated notifications on application progress; and • Online payment for registration etc. <p>The e-LMS is divided into four (4) broad phases –</p> <ul style="list-style-type: none"> • Phase 1 where the applicant registration and profile building is undertaken with the applicant submitting his application for land; • Phase 2 where DMIC IITGNL officials review the application against predefined criteria and shortlist potential applicants for land allotment after which the shortlisted applicants are called for a meeting. Post this meeting, if land is allotted to an applicant, lease agreement is generated automatically; • Phase 3 where the applicant applies for necessary permits including water, power, etc. and DMIC IITGNL reviews, processes and approves these permits; and • Phase 4 where the architect and applicant apply for building plan related approvals and DMIC IITGNL reviews, processes and approves the same. Ultimately, through the e-LMS, a unique plot ID shall be generated for the applicant which will then be integrated with the ISM system. <p>This e-LMS shall be integrated with GIS and web GIS being developed as part of this Project.</p>
FR 4.112	<p>A map application should display all the Spatial data layers in the e-LMS</p> <ul style="list-style-type: none"> • Plots • Roads • Urban Infrastructure • Land uses • Utilities • Geographical barriers <p>And any other component which can be spatially located in the spaces and applicable to the project.</p>
FR 4.113	<p>The attribute of the spatial data layers i.e.</p> <ul style="list-style-type: none"> • Sector Numbers • Plot Numbers • Plot sizes • Plot ownerships

	<ul style="list-style-type: none"> • Road widths • Base FSI <p>And all the other aspect as per the DC rules should be integrated with the E-LMS map applications. The info should be displayed while hovering over the plot.</p>
FR 4.114	The Web-GIS map application should allow e-LMS to fetch the data from attributes and Vis-a versa for 2 way integration.
FR 4.115	Plot Open Master is a sub module in e- LMS which is used by the authorities to 'round-wise' open plots for allotment. The Web-GIS map application should integrate with the Plot open master and should be able to allow the selection and processing only for the chosen plots
FR 4.116	The Web-GIS map application should enable the user to choose the desired plot from the open plots and apply for it. Once the user applies for it, all the info related to the plot should be auto-populated in the application form.
FR 4.117	The e-LMS should be able to fetch the data from the Web-GIS map application for providing necessary permission for plot allotment, building permission and all other permissions in the elms. The required info from the map should be auto-populated in the permission form to avoid errors.
FR 4.118	Web-GIS map application should have a layer for "allotted plots" on map. This layer shall highlight all the plots which are allotted.
FR 4.119	Web-GIS map application should fetch all permission documents, payment receipts and corresponding details (date of document etc.) as plot attributes. Respective applicant/ Authority, based on usage rights, shall be able to view the details by clicking on the plot.
FR 4.120	<p>A map application should display all the Spatial data layers in the e-LMS</p> <ul style="list-style-type: none"> • Plots • Roads • Urban Infrastructure • Land uses • Utilities • Geographical barriers <p>And any other component which can be spatially located in the spaces and applicable to the project.</p>
FR 4.121	<p>The attribute of the spatial data layers i.e.</p> <ul style="list-style-type: none"> • Sector Numbers • Plot Numbers • Plot sizes • Plot ownerships • Road widths • Base FSI <p>And all the other aspect as per the DC rules should be integrated with the e-LMS map applications. The info should be displayed while hovering over the plot.</p>
FR 4.122	The Web-GIS map application should allow e-LMS to fetch the data from attributes and Vis-a versa for 2 way integration.
Plot Control Sheet	
FR 4.123	<p>Dynamic Plot Control (DPC) sheet module is developed in Web GIS as per the shape files (.shp) provided for a land parcel (Integrated Industrial Township). The idea of dynamic plot control sheet is such that in case there are any changes in the GIS base information including attributes, the dynamic plot control sheet gets updated automatically using this feature to reflect the new information;</p> <p>Setback Calculation:</p>

	<p>Setbacks are the margins from the plot/ area's boundary whose width are defined as per the DC Rules of DMIC IITGNL.</p> <p>Generation of Plot Control sheet: An automated process to generate a ".pdf" format the plot control sheet of the desired selected area.</p> <p>The Attributes of the plot control sheet should be as per below but not limited to</p> <ul style="list-style-type: none"> • Plot No • Plot Area • Land use • FSI • Front Setback • Side and rear setback • Plot access • Any other information as per requirement of DMIC IITGNL.
Utility Asset Management Module	
FR 4.124	<p>The GIS shall integrate with asset data of roads, water supply lines, sewage lines, storm water drains, electricity lines. The attribute shall include the following:</p> <ul style="list-style-type: none"> • The location details • The geometry details • The engineering details • The attached property details <p>Usability:</p> <p>From user perspective</p> <ul style="list-style-type: none"> • The user drops the pin at the location of issue • The issue gets popped up in the control room and message goes to the Engineer • Time bound escalation process for resolution • Ticket closing message to the stakeholders <p>For Admin purposes</p> <ul style="list-style-type: none"> • Pop up for periodic maintenances and repairs of the utility • Pop-ups for periodic replacements • Impact analysis in-case of any component getting switched off • Overloading/ fluctuation alarms.
FR 4.125	Existing data of assets will be provided by Client. MSI is expected to update, integrate and maintain the same.
Right Of Way (ROW) Permit	
FR 4.126	<p>The ROW module should be developed for identification of potential areas where the roads have to be excavated for laying and maintenance of the utilities. The entire process has to have a following flow:</p> <p>Admin Purposes</p> <ul style="list-style-type: none"> • Location of ROW permit applied for • Area affected by the excavation work • Impact of excavation on other utilities in the service area. <p>If the permission is granted</p> <ul style="list-style-type: none"> • Time management in excavation and re-instatement • Monitoring the status of work • If the excavation is being done on the road and going to affect the traffic, necessary information to be displayed automatically on the video-wall and users to be directed to the alternative routes. • Check of all the equipment's to be intact before re-instatement.

	<ul style="list-style-type: none"> Pushing the ROW excavation, utility management and re-instatement report into the back end for analysis and spatial records.
Land related charges	
FR 4.127	<p>The attribute data with the property must store (but not limited to) data such as:</p> <ul style="list-style-type: none"> Property location geographic Property location address Status (vacant / sold) Current use Lease details Charges details Utility details
FR 4.128	<p>The user should be able to:</p> <ul style="list-style-type: none"> Search by Property Index Number Land related charges link should be integrated and will have option to direct: <ul style="list-style-type: none"> Land related charges-> Search on online receipt Land related charges-> Search Ledger Land related charges-> Pay online GIS Application to Land related charges Module Property Lease Holder can be selected on the basis of: <ul style="list-style-type: none"> Administrative boundary Property Index Number Land related charges range selection Period Selection Who has paid, not paid. On the basis of above search criteria, the selected Property data should be extracted: <ul style="list-style-type: none"> Details of Lease Holder like Name, Address, PIN Details of Arrears <p>There should be a link in land related charges module for GIS View to drive into GIS Application to View/Analyse the property geographical locational details i.e. address, Plot Area, constructed area, etc.</p>
GIS Application integration to Asset Management	
FR 4.129	<ul style="list-style-type: none"> Searching sector wise GIS layers: <ul style="list-style-type: none"> Built-up area for any property maintenance and Rent Land use land cover (LULC) area for Vacant land Transportation for any road maintenance Sewage and Drainage for Maintenance Public Lighting for maintenance The Vacant Land will be linked with Asset Management-Asset Report-Asset Category-Market Value This will be integrated with rent & maintenance Query can be generated on project layer for Rent: Rent Type, Rental amount, Renewal date & Land: Market Value The Building properties will be integrated with- Asset Management Property Index Number

	➤ Fibre optic infrastructure and Wi-Fi network
Utility Payments	
FR 4.130	<ul style="list-style-type: none"> Utility payments link shall be available. it should integrate and be directed to the following module: <ul style="list-style-type: none"> ➤ Water Charges-> Search Connection Page ➤ Water Charges-> Search online receipts ➤ Water Charges-> Search Ledger ➤ Water Charges-> Pay online Page To select the consumer on the basis of: <ul style="list-style-type: none"> ➤ Property Index Number ➤ Service No. ➤ Property Lease Holder ➤ House No.
FR 4.131	<p>On the basis of above search criteria selected Property will integrate with utility payments Module (database) and highlight the search output (Spatial Highlights) in GIS application and dues report will be populated in a tabular Grid consisting of:</p> <ul style="list-style-type: none"> Details of Property Lease Holder like Name, Address, PIN Details of Arrears
GIS integration with grievance management	
FR 4.132	The public grievance can be made addressed through ISM application as well as through GIS. In grievance, the citizens are expected to mention their complete address details. And accordingly, the grievance registration will be highlighted on the map.
FR 4.133	<p>There shall be facility to mark the grievance to be addressed to which department.</p> <p>The grievance type shall be mentioned from options available: regarding service, bill payment, delay, incident etc. There will be grievance subtypes also.</p>
FR 4.134	<p>The grievance status shall be searchable by department as well as public:</p> <ul style="list-style-type: none"> By plot number By ticket number By grievance type By grievance subtype
FR 4.135	<p>There shall be facility available to view the status of grievance resolving:</p> <ul style="list-style-type: none"> Solved Unsolved Under Process <p>There shall be facility of escalation to higher level after a defined time period</p>

2.2.4.3 Enhancement of Website

The DMIC IITGNL corporate web site is the face of organisation and will be accessed by citizens, investors and corporates alike. It should provide factual and attractive information to investors. The corporate web site should clearly communicate a sense of 'identity' at first glance.

Functional Requirements

WEBSITE	
FR 4.136	The website is expected to be revamped to world class standards and follow Government of India guidelines for websites
FR 4.137	The website has to include the chatbot functionality as given in this document
FR 4.138	Home Page: A clean, visually compelling home page that quickly conveys to the visitor IIT and what the DMIC IITGNL does.
FR 4.139	<p>It would include (not limited to):</p> <ul style="list-style-type: none"> • About IIT; • Message from the CEO; • Investment opportunities; • Transportation information; • Weather information; • Link to the portal; • Tenders; • Key statistics; • Chatbot; • City Information; • GIS map; • Links to Facebook, twitter etc. with integration of social governance; • Photo Gallery; • Online Services listing; • FAQs; • Feedback; • Contact Us; • Log in; • Website visit counter; • Search; and • News & Updates.
FR 4.140	Corporate Branding: Clearly communicates a sense of 'identity' at first glance.
FR 4.141	Visual appeal: The site must have an attractive mix of text, images, audio and video.
FR 4.142	Fast Loading Pages: Optimization of web pages for a faster browsing experience with compatibility with key industry browsers and platforms.
FR 4.143	Responsive Design: The site must be mobile-optimized through responsive design methods. Therefore, it should detect that a mobile device is being used and present the user with the mobile version first. The user should be able to switch to the desktop version.
FR 4.144	Simple and clear navigation: The site should be easy to navigate. Information should be grouped and presented in a logical manner and require no more than three levels of "drill down" for the user to find the desired information thus creating a clean, clear, easy and satisfying user experience. This should include drop down menus, so that the visitor can easily find what they are looking for with a few clicks of the mouse.

FR 4.145	<p>Search Tools: Provide search capabilities using key words or phrasing that will provide access to content from throughout the site. Additionally, make it possible to download historical and recent data whereby the user can define his/her preference.</p> <p>Select a platform that allows users to search content of the website easily and quickly without the need for extremely high speed devices (desktop, laptop and mobile) and high speed internet access.</p>
FR 4.146	<p>Links: Links should be placed within the website to allow individuals to contact institutions affiliated with the DMIC IITGNL and access to the portal as well the respective Ministries (<i>can be called Useful Links</i>).</p>
FR 4.147	<p>Easy access to Key performance indicators: Seamless integration with DMIC IITGNL's dashboard data to provide continuously updated graphs and charts. This will be decided with DMIC IITGNL input & consent.</p>
FR 4.148	<p>News/Update feed: Constant and dynamic update feed on site home page. Displays announcements and notifications for new content additions on front page of site.</p>
FR 4.149	<p>Calendar: A dynamic calendar that displays events as well as filters for searching/ sorting events.</p>
FR 4.150	<p>Contact Form: Provides a web-based contact form with anti-spam controls.</p>
FR 4.151	<p>Automated e-mails: automatically send follow-up emails to our stakeholders (subscribers) if they visited a specific web page or completed some specific task (e.g. survey) on the website.</p>
FR 4.152	<p>Social Media Engagement Tools: New tools to improve interaction with social media</p>
FR 4.153	<p>Blog: The site should have a Blog section to facilitate discussions on various topics.</p>
FR 4.154	<p>Career: The site should have a career section which should accept online job application that would be fed directly into the HRM system.</p>
FR 4.155	<p>Language Options: The website ought to be easily translated into other languages – English, Hindi.</p>
FR 4.156	<p>DMIC IITGNL Website app: The site should allow for the download of a DMIC IITGNL website app. The app should be compatible with Android and iPhones.</p>
FR 4.157	<p>Compatibility: Site must be compatible with Google Chrome, Microsoft® Internet Explorer 11.0 or higher, Microsoft Edge, Mozilla Firefox, and Safari 5.1 or higher.</p>
FR 4.158	<p>Mobile Access: Site must be “responsively designed” to accommodate mobile users. This must include accommodations for slower, cellular internet connections. This includes compatibility with iOS, Android and other industry standard platforms.</p>
FR 4.159	<p>Settings: Website must not require plug-ins as a default.</p>
FR 4.160	<p>Performance: Site must be able to handle multimedia (video) with high performance.</p>
FR 4.161	<p>HTML Compliance: Full compliance with HTML 5.0 or higher.</p>
FR 4.162	<p>Parallel sites: After ‘Go Live’ there should be two (2) sites running parallel, one for testing purposes and the other for production. All maintenance should be carried out in the test environment and be approved before migrating to the live environment.</p>
FR 4.163	<p>Website visit counter functionality should be available on website.</p>
Design and Construction	
FR 4.164	<p>Easy Maintenance: Site should be easy to maintain, site should not require significant investment of time to keep site up and working with quick and easy fixes site should be easy to update with new content.</p>
FR 4.165	<p>Work closely with the DMIC IITGNL at each stage of the design to identify user needs and corresponding user interface requirements, workflows, and functionalities.</p>
FR 4.166	<p>Ensure integration of all elements including content, information format, compatibility with software platforms used by DMIC IITGNL and standards for content management.</p>
FR 4.167	<p>Select a platform that allows easy integration of multimedia products and user-friendly administrator interface.</p>

FR 4.168	Create wireframes, storyboards and prototypes to propose options for implementation. Provide three (3) template designs for review in order to select a concept. Concepts should reflect the DMIC IITGNL's corporate identity, nature and purpose.
FR 4.169	Develop corresponding user interface components (web templates, style sheets, scripts, images, dashboards, social media interfaces) as needed.
FR 4.170	Use simple, cost-effective techniques to test designs with representatives of target audience prior to launch of site.
FR 4.171	Submit the final concept to DMIC IITGNL for review prior to 'going live.'
FR 4.172	Secure the existing website prior to transitioning to the new platform.
FR 4.173	Keep a full backup of the website through the duration of the project.
FR 4.174	DMIC IITGNL will own and host the new site design and will be provided with a full backup copy of the site design and code at the closing of the project.
FR 4.175	Content Migration - The complete migration of the new website to existing DMIC IITGNL URL. Deployment of new content.
FR 4.176	The website must have an app (for Android & iOS) reflecting all website content.
FR 4.177	GIS map to be published on the DMIC IITGNL website with linkages to apply for land.

2.2.4.4 Chatbot Solution

To assist the potential investors, business units and the citizens of Integrated Industrial Township, Greater Noida, a state-of-the-art and holistic chatbot solution shall be deployed across different platforms. The primary objective behind the implementation of Chatbot solution would be to automate interactions with minimal in-human intervention. This in turn will also improve the overall efficiency of the system.

Functional Requirements

GENERAL	
FR 4.178	<p>The key elements of Chatbot architecture shall be:</p> <ul style="list-style-type: none"> • Front-end interface: that communicates with the user relying on various messaging channels; • Natural Language Processing (NLP): a component of Artificial Intelligence (AI) which shall form the part of the backend operating algorithm. Having the ability to interpret speech and text as given by users, NLP shall understand, learn and responds accordingly; • Machine Learning (ML): It shall provide machine level logic to train the bot for identifying the nature of speech, sentiments, idioms etc., hence making the bot smart and produce outputs accordingly; and • Database: Chatbots shall connect to any database at the backend from where it fetches the results to be provided to the user.
FR 4.179	Chatbot shall be operational for 24 x 7 for 365 days a year.
FR 4.180	Chatbot shall be able to maintain a conversation with the user in user-friendly manner.
FR 4.181	The Chatbot shall allow the user(s) to resume their conversation within a predefined time duration.
FR 4.182	The users shall be able to reset their conversation with the Chatbot interface manually.
FR 4.183	Chatbot shall be able to mimic conversation with user text format.
FR 4.184	Chatbot shall respond to the incidents created by it as per the predefined response time.
FR 4.185	Chatbot shall be able to provide correct and accurate results as requested by the user.
FR 4.186	Chatbot shall be attractive, well-designed bot and shall provide text formatting, high-quality links and high-resolution pictures at the time of replying to user.

MACHINE LEARNING	
FR 4.187	Chatbot shall use National Language Processing (NLP) to understand the users' inputs and shall reply accordingly.
FR 4.188	Chatbot shall be integrated with a National Language Processing (NLP) library to minimize the grammatical errors.
FR 4.189	Chatbot shall be able to learn the responses of questions asked by the user in the past and shall store them for future functioning.
FR 4.190	Chatbot shall inherit its capabilities from Artificial Intelligence (AI) and Cognitive Computing.
FR 4.191	Chatbot shall use a text recognition API to understand the input specified by user.
FR 4.192	Chatbot shall be fed with conversation logs to understand what type of questions require what type of answers.
INTENT DETECTION	
FR 4.193	Chatbot shall assume 'utterance' to be anything received as input from the user.
FR 4.194	Chatbot shall be able to detect user's intent from the utterance received by the user.
FR 4.195	Chatbot shall be able to detect the entity(ies) from the utterance received by the user.
FR 4.196	The Chatbot shall be able to detect user intents programmed manually in the system through machine learning algorithms and AI techniques.
FR 4.197	The AI and Machine Learning algorithms shall enable the Chatbot interface to navigate the user to the appropriate link(s) and/or city services through intent detection mechanisms.
FR 4.198	The Chatbot shall be able to subsequently detect multiple entities in utterances or messages received as input by the user(s).
FR 4.199	The Chatbot interface shall be able to detect the synonyms of entity(ies) input by the user(s).
USER INTERFACE	
FR 4.200	Chatbot shall respond to any input it receives in the following languages as a minimum: <ul style="list-style-type: none"> English; and Hindi.
FR 4.201	Chatbot shall have improved efficiency with round the clock customer service.
FR 4.202	Chatbot shall be able to reply to the data asked by the user in form of text message.
FR 4.203	Chatbot shall be able to ask for more simplified input, if it doesn't understand the provided input by user.
FR 4.204	Chatbot shall be able to adapt their behaviour based on user interactions.
FR 4.205	Chatbot shall have robust reporting system and dashboard to provide detailed insights of bot's performance.
INTERACTION MANAGEMENT	
FR 4.206	Chatbot interface shall be enabled to publicize city's features and services to investors and citizens.
FR 4.207	Investors and Citizens shall be able to interact with the Chatbot solution through the following social media channels as a minimum (as applicable): <ul style="list-style-type: none"> Facebook; and Twitter.
FR 4.208	Investors and Citizens shall be able to interact with the Chatbot solution through the following platforms of the city as a minimum: <ul style="list-style-type: none"> Website; Mobile App;

	<ul style="list-style-type: none"> e-Land management system platform; Portal; and Grievance platform.
FR 4.209	<p>The Chatbot shall be able to categorize the user messages into the following categories as a minimum:</p> <ul style="list-style-type: none"> Transaction issues; FAQs; Complaints; Feedback; Application filing; and Land allotment queries.
FR 4.210	Chatbot shall be able to respond to users within the predefined response time duration.
FR 4.211	Chatbot shall be able to provide direct access links to citizens and investors for selected city services.
FR 4.212	Chatbot shall be able to notify concerned officials for user messages which require human intervention.
FR 4.213	Chatbot shall also provide dynamic replies to investors and citizens by integrating with proposed ISM such as status of grievance complaint, water connection request etc.
FR 4.214	Once the user puts their credentials into the portal, chatbot shall be able to directly to pick up the respective credentials and shall also be able to integrate with the user's database to provide dynamic replies based on user queries.
FR 4.215	Chatbot shall integrate with the e-mail gateway for the purpose of automatic emails to investors, businesses and citizens.
INTEGRATION	
FR 4.216	<p>Chatbot shall help users guide to following portals/ websites as a minimum:</p> <ul style="list-style-type: none"> Website; City Services Portal; Land management system platform; Grievance redressal platform; and City GIS.
FR 4.217	Chatbot shall be integrated to various social media sites like Facebook, Twitter etc. as a minimum.
FR 4.218	Chatbot shall integrate with proposed ISM system to provide user specific responses.
FR 4.219	Overall Chatbot module shall be integrated with the proposed ISM and CRM solution.
FR 4.220	The Smart City Platform shall be able to visualize the analytics generated as part of the CRM dashboard through required API integration.
FR 4.221	Chatbot shall integrate with e-mail gateways for automatic email generation.
FR 4.222	Chatbot shall integrate with SMS and WhatsApp gateway to trigger any necessary information via SMS, WhatsApp such as OTP, status report etc.

2.2.4.5 Citizen Facilitation Centre (CFC)

Functional Requirements

CITIZEN FACILITATION CENTRE (CFC)	
FR 4.223	The Citizen Facilitation Centre would be manned by trained employees of DMIC IITGNL.

FR 4.224	<p>The proposed solution is required to have a CRM system which will be integrated with a standard computer telephony cum IVRS to help the CFC agent to identify the caller name. The CFC Agent will have a separate login to the CRM system with the required role-based authorizations to:</p> <ul style="list-style-type: none"> assist the citizens/investors with information, status update, usage of system, register service requests and/or complaints; service walk-in citizens/investors by operating the CRM on their behalf for providing information, registering service requests and/or complaints; service communication on e-mail, postal service letters, via web and electronic messages like web/what's app; Receive or upload documents of citizens/investors and issue electronic/paper confirmation of receipt; and Promote DMIC IITGNL as a destination and assist potential investors in applying for plots.
FR 4.225	The CFC software must have complete audit trails of log in id, time, transactions of each operator.
FR 4.226	The employees shall log into the CRM and conduct the business required for the citizen.
FR 4.227	The CFC may be used to verify and upload documents.
FR 4.228	Facility to lodge New Complaints, Check Status etc.
FR 4.229	The CFC must have printing options for duplicate bills, receipts, ledgers, etc.
FR 4.230	The CFC must have means of maintaining virtual sessions per registered user/investor. The registered user/investor would need to be authenticated before allowing access to his/her account related information

2.2.4.6 Customer Relationship Management (CRM)

Functional Requirements

CUSTOMER RELATIONSHIP MANAGEMENT	
General	
FR 4.231	The CRM platform shall be customized as per industry standard best practices as per Client requirements in order to ensure seamless flow of operations across the system. CFC and Helpdesk/Contact Centre agents will be using the CRM for Investor/Citizen related interactions.
FR 4.232	The CRM shall be able to gather information (bi-directional multichannel interface data flow) from different channels based on project requirements and project modules. System should also allow users to make entries associated with CRM with audit trails.
FR 4.233	The CRM shall be able to respond to all the identified incidents, requests and queries within a predefined time period.
FR 4.234	The CRM shall provide the best possible answer to the user(s) interacting through the Chatbot interface.
FR 4.235	The CRM will maintain a full record of past interactions with the investor/citizen to enable better service delivery and customer satisfaction. Call/query chronology in log files for each user/interaction should be maintained for traceability purposes.
FR 4.236	The CRM System will be internet enabled to provide a round the clock self-facility for all functions and services to the investor/citizen
FR 4.237	The CRM system will be integrated to the GIS system to provide the CFC agent a GIS view of the property whilst registering a service request and/or grievance
FR 4.238	The CRM system will have the facility of scripting based on call type to prompt the CFC agent to ask the right questions and be more efficient. The system must provide the end-user the functionality to modify the scripts and/or create new scripts as per the business needs of DMIC IITGNL

FR 4.239	CRM system must maintain a full audit trail of the actions of CFC agent. Chronology or all actions taken on a particular call/query should be available as part of logs.
FR 4.240	<p>Auto Routing of calls/service requests/grievances – whilst registering any call/service request/grievance the Name of Caller, Mobile No/E Mail Contact, Property Address, Call Type and a Nature of the call must be recorded by the CFC agent. The system must minimize the key strokes required to service any call by an investor/citizen. Automatic Routing of such calls should be based on Call Type.</p> <p>The CRM must generate an acknowledgement with a reference number for a successfully submitted service request, grievance request or any other request for service as per DMIC IITGNL service offerings.</p> <p>The CRM should provide a facility to end users to easily add a new call type and/or service offering.</p>
FR 4.241	<p>Application Submission: the CRM system should provide a prompt to the CFC agent to ensure that all the required documents are submitted. In case of online submission, the self-service menu should ensure that only complete applications are submitted.</p> <p>The CRM must generate an acknowledgement with a reference no for a successfully submitted application</p>
FR 4.242	The CRM is required to be integrated with Software modules. Smart City Platform, GIS and any other software application module as required by DMIC IITGNL.
FR 4.243	CRM shall also have web and application based appointment/scheduler capability for the CFC agent. User shall have the capability to schedule a meeting with CFC agent with an agenda from the portal or mobile application. Based on the time slot availability, the CRM shall give options of the available time slots to user to select from.
FR 4.244	The Scheduler/Appointment capability shall also be available for walk-in users via a tablet at CFC. The walk-in users shall be given a time slot as per CFC availability.
FR 4.245	CRM shall send automatic mails and messages in order to remind and follow-up with investors, citizens and stakeholders regarding necessary actions as per the defined standard operating procedures. Such as, in case a bill is due or some document is due.
FR 4.246	There must be no option to delete tickets. They may be classified as Active or non-active or cancelled.
FR 4.247	The CRM must be web-enabled and shall have an app (for Android & iOS) which will be accessed through the portal.
FR 4.248	The CRM in combination with Chatbot should be able to help DMIC IITGNL officials to track a sales interaction from first contact with a potential investor to sale of land. These would include (but not limited to) Contact Management, Marketing Campaign Management, Lead Management, Sales Management etc.
Citizen Help Desk (via CRM)	
FR 4.249	<p>Facility to check citizen data relating to:</p> <ul style="list-style-type: none"> • Bill Dues; • Application Status; • Payment Status; • Complaint status; and • Renewal Status.
FR 4.250	<p>The CRM System will provide the required functionality to enable the CFC Agent to collect payments and issue a receipt for:</p> <ul style="list-style-type: none"> • Collection of taxes and service charges with and providing rebates on early payments; • Issue of Duplicate Bill; and • make a booking for rental of DMIC IITGNL facilities.
FR 4.251	The CRM system should provide a facility for receiving and/or making payments by means of debit card, credit, net-banking, cheques, demand drafts or any other means as required by DMIC IITGNL.

	An automatic acknowledgement/receipt/advice should be generated by means of SMS, email and/or print out.
FR 4.252	<p>The CRM system must be able to integrate with respective modules to deliver specific outputs, such as:</p> <ul style="list-style-type: none"> • Issue of transfer certificate; • Issue of property extract; and • Issue of duplicate bill. <p>The CFC Agent delivers the services to the investor/citizen as per the rules & guidelines of the concerned department, which retains all ownership of such transactions and services delivered.</p>
FR 4.253	<p>The CRM system will provide the following functionality relating to land maintenance charges to the CFC Agent:</p> <ul style="list-style-type: none"> • Citizen/Investor Service: Self-Assessment of Property by Citizen/Investor for periodic charges and/or taxes; • Issue a Land maintenance charges Assessment Certificate; • Citizen/Investor Service; • Submission of land maintenance charges in subsequent years with changes or without any changes in the property details like structure, usage etc.; • Capture details of multiple lease holders; • Mutation (change of lease holder) through heredity or by lease of property; • Issue of Property Extract; • Handle listing of multiple usage types within a property; • Handling rebates, specific standardized rules, and considering various factors while calculating ARV of the property; • Capturing floor wise details in case of buildings; and • Authorization of Self-Assessment, subsequent assessments filed by the Citizen/Investor and making changes if any by DMIC IITGNL.
FR 4.254	Informing Citizen/Investor about the changes done in form of a Notice.
FR 4.255	Facilitating Citizen to file an objection against the Notice.
FR 4.256	<p>Fixing a Hearing: The CRM system will have the functionality to fix a Hearing (RTI module), in response to an objection by a citizen and issuing an intimation to the concerned persons and/or organisation electronically and/or in letter format.</p> <p>The CRM system should be integrated seamlessly with the Document Management System Case Management System and/or any other system relevant for providing full functionality required for Fixing a Hearing</p>
DMIC IITGNL Users	
FR 4.257	The CRM system must provide statistics and/or dashboard of pending calls as per call types with automatic escalations when SLAs are breached for a service request, grievance or any other request
FR 4.258	The CRM system must allow the end user to setup and/or modify SLA's for any request or grievance
FR 4.259	The CRM system shall have online integration with the ISM and/or Other Business Applications as per needs of DMIC IITGNL
FR 4.260	The CRM should have workflow capability to route the service request / grievance/complaint to the concerned person/department as per business needs of DMIC IITGNL. The said routing should be configurable without any software source code change.
User Interface	
FR 4.261	The CRM shall enable System Admin staff to control access to ticket information by other city Administrative officials.

FR 4.262	The CRM platform shall enable authorized city administrative officials to add/ delete/ update the query (ies) and response(s) as per the conversation log between the user(s) and the Chatbot interface.
FR 4.263	The CRM platform shall enable the Chatbot to provide customized responses depending upon the channel of conversation with the user(s).
Ticket Generation & Management	
FR 4.264	The CRM shall be able to generate tickets against any incident, requests and queries received from the user(s).
FR 4.265	The CRM shall be able to route the tickets generated to the concerned city administrative officials immediately after its generation.
FR 4.266	The CRM shall be able to update the status of tickets on a periodic basis.
FR 4.267	User(s) shall be able to check the status of their ticket(s) as and when they wish to do so by different mediums such as portal, IVRS and chatbot.
FR 4.268	The CRM platform shall have the capability to auto-escalate any ticket(s) which stand open post the predefined resolution time. The CRM shall also be able to notify the Admin staff about the status of ticket(s) on a periodic basis.
Reporting and Analytics	
FR 4.269	The CRM shall have report generation and analytics capabilities.
FR 4.270	A real-time dashboard for CRM shall enable city administrative officials to monitor, address and control the Chatbot input message(s) and other communication channel(s) such as e-mails, IVRS, phone calls etc. in order to develop a holistic system.
FR 4.271	The real-time dashboard shall enable city administrative officials to analyze the efficiency of CRM module.
FR 4.272	City administrative officials shall be enabled to filter out the attributes prior to generating reports and analytics (predictive and prescriptive).
FR 4.273	The CRM platform shall enable generation and export of reports in Excel, PDF and CSV formats as a minimum.

2.2.4.7 Portal

Functional Requirements

DMIC IITGNL PORTAL	
FR 4.274	It shall be a state-of-the-art portal based on industry standard best practices.
FR 4.275	The term “Portal” or “Portal Server” are used interchangeably in this section would mean a portal server software product. Used elsewhere in the document with reference to websites, applications and/or modules would mean individual websites, applications and/or modules that are hosted on this portal server product.
FR 4.276	Portal server product should be an enterprise edition software from a reputable OEM and not a free community edition of an open source software.
FR 4.277	Portal server should provide framework to provide Security, Mobility, Identity based content delivery, collaboration and Enterprise system integration
FR 4.278	The portal server should by default provide components that facilitate capabilities to access functionalities like email, calendar, file storage etc. All applications hosted on portal server would be able to use these common services
FR 4.279	Portal server should at a minimum provide the following common functionalities that would be used by all applications hosted on it.
FR 4.280	Ability to provide secure, encrypted and authorised access between enterprise resources and end user browser

FR 4.281	Ability to aggregate various web enabled enterprise application
FR 4.282	Portal server should have mechanism to authenticate users before allowing access specific to the concerned user. All application hosted on the portal should be able to subscribe to this mechanism
FR 4.283	The identity management capability of Portal must be able to control different set of users spanning a variety of different roles across the organization and sometimes outside the organization while accessing content, applications and services.
FR 4.284	The portal server must provide ability to configure user identity management via various data store - like internal storage, external database, LDAP and/or Active directory
FR 4.285	Portal server must provide capabilities to manage content. The Portal server should provide Content Management System (CMS) capabilities. It should provide a hierarchical content store that supports structured and unstructured content, images, content templates, and versions.
FR 4.286	Must provide for role-based access to different functionalities of CMS. This would include but not limited to - create, edit, delete, lock content categories and content. Should also facilitate maintaining of different version of the content
FR 4.287	The CMS module must provide for workflows to create, manage and publish content.
FR 4.288	The CMS module should have the provision to create, edit, delete workflows relating to CMS
FR 4.289	The CMS module should have a search functionality to perform role-based search for the content.
FR 4.290	The portal should provide search server capabilities. The search server should provide interface to the end user to search for a resource in the database
FR 4.291	The search server should have configuration tool to configure locations to discover, convert and/or display summary information.
FR 4.292	The search server should provide support for federated search whereby a single search can be delegated to multiple search engines like (but not limited to) Google, LDAP/Active Directory, RDBMS etc.
FR 4.293	Federated search results to displayed on a web page. The results to be role based
FR 4.294	The Portal and Mobile App shall be in Hindi, English and shall be user friendly.
FR 4.295	DMIC IITGNL Portal and Mobile Application shall be single window service to stakeholders with a single and integrated view of DMIC IITGNL information system.
FR 4.296	Users may access the portal directly or via the web site to avail of services.
FR 4.297	<p>Broadly, Portal is required to provide the following features:</p> <ul style="list-style-type: none"> • Role based access to core systems like ISM, Land Management system, GIS system and any other system; • Link to E Government Services – Grievance; redressal, RTI, Legal case management, etc.; • Link to web based GIS system; • Link to E-Auction system for land; • Management Reports and KPI Dashboard; and • Provision to request any service.
FR 4.298	<p>The portal will be accessed by:</p> <ul style="list-style-type: none"> • Public & corporates; • Citizen – residents; • Industrial units; • Commercial establishments; • Education establishment, as applicable; • Health establishment, as applicable; • DMIC IITGNL employees; • Any outsourced employees;

	<ul style="list-style-type: none"> • Government bodies; and • Third party vendors.
FR 4.299	Each type of stakeholder shall have different needs and authorisations and the portal must facilitate all requirements. The portal must be secure and all internal users will have access to the MZ areas of the cloud and any user accessing the portal from the internal shall have access to only the DMZ areas.
FR 4.300	The various users shall be authenticated from the common LDAP server (and / or active directory) for which the roles will get assigned from the server. Depending on their roles and responsibilities, the respective users shall be taken to their respective home page. The layer shall visually integrate the applications in place with single-sign-on implemented. LDAP roaming profile shall ensure seamless mobility of the user.
FR 4.301	Public and corporates: shall access the portal for information on DMIC IITGNL and hence the portal must be comprehensive enough to provide detailed and attractive information. They shall have access to the web GIS view of DMIC IITGNL, showing occupied and vacant land parcels among other parameters. They shall also have access to information on industries, residential properties, education & health facilities, setting up a business and links to the land management system. In addition, KPIs, as decided by DMIC IITGNL, shall also be visible to them.
FR 4.302	<p>Citizens who are residents:</p> <ul style="list-style-type: none"> • will have access to all the above and more. • The citizen can apply for certificates by clicking on the 'apply for certificates' link. This shall take the user to the e-Gov section for certificates. Similarly, the user may click on the RTI, Grievances or pay utility bills link by clicking 'apply for services'. <p>The citizen will need to interact with DMIC IITGNL for any of the following reasons (but not limited to):</p> <ul style="list-style-type: none"> • Information; • Consolidated application for utilities; • Grievance / Complaints regarding municipal services; • Primary education and medical needs (planned and maybe outsourced); • Allotment of Trade Licenses (direct or indirect); • Assessment & payment of taxes: Land related maintenance charges, and other government taxes as applicable; • Utility Payment: Payments relating to electricity, water bills; • Application & issue of Certificates; • RTI; • Scan the portal for sections on real estate availability for purchase or rental (integrated with Land Management System); • Job opportunities; and • All the above should be tiles on the landing page.
FR 4.303	Industrial units shall use all the above. In addition, they will also have a section with a pre-decided format wherein they must upload key performance data every month or on a defined frequency. This will pertain to production, employment, tax paid, etc.
FR 4.304	Commercial establishments will have access to the data as citizens; with additions of links to the trade licenses of the e-Gov modules. They shall also have an MIS format to upload data for monthly MIS requirements.
FR 4.305	<p>Education institutions, as applicable, will have access to data as above and in the future, will have a link from the portal for the citizen. They shall also upload MIS data such as (but not limited to):</p> <ul style="list-style-type: none"> • Building self or rented and how much is area; • Whether it has playground, lab facility, and library; • Mid-day meals; • Classrooms with infrastructure; • Electricity;

	<ul style="list-style-type: none"> • Water supply; • Toilet availability; • Gender wise students in each class; • Teachers in the school with details (TGT PGT etc. and), Educational qualification, permanent or contractual, number of years of experience • School dropout rates; and • Passing students percentage. <p>It is required to create log-in category for educational institutions and formats for periodic upload of this data and flag delays in upload of the same.</p> <p>Further, there may be a need to integrate advanced technology such as virtual classroom with the e-governance services of DMIC IITGNL. The technology infrastructure required at the school level for the remote classroom shall be provided by the respective education institute but the necessary integration with e-governance shall be a part of the Project. In addition, the education institute will also integrate with the citizen portal and periodically update information on citizens attending the school by sharing this information in a prescribed format to DMIC IITGNL.</p>
FR 4.306	<p>Health centres, as applicable, will have access to data as above and in the future, will have a link from the portal for the citizen. They shall also upload MIS data such as:</p> <ul style="list-style-type: none"> • Patient Analysis; • Utilization Reports for Nurses / Doctors; • Occupancy reports; • Patient Feedback Analysis; • Generation of Daily/Monthly/Quarterly reports; • Generation of reports required for Governmental bodies; • Special Disease report; and • Birth & death intimation. <p>It is required to create log-in category for health centres and formats for periodic upload of this data and flag delays in upload of the same.</p> <p>Further, there may be a need to integrate advanced technology such as remote doctor, telepresence, appointment booking, availability of doctor, disease related information, etc with the e-governance services of DMIC IITGNL. The technology infrastructure required at the health centre shall be provided by the respective institute but the necessary integration with e-governance shall be a part of the Project. In addition, the health centre shall periodically update any information for the citizen by sharing this information in a prescribed format with DMIC IITGNL. Functionality to get required data from health centres should be available.</p>
FR 4.307	<p>DMIC IITGNL employees shall have access to the portal with respect to their work requirement. They shall access internal IIT Software Modules for all approval and reporting purposes based on the clearances inherent in the role and hierarchy. The portal may be accessed for registering a complaint, issuing a certificate, verifying status of projects, updating GIS databases and other work flow requirements.</p>
FR 4.308	<p>Any Outsourced employees: They shall have access to operation and maintenance functions as required. Events shall be triggered on application for utilities, initiation of projects or receipt of complaints and passed on to the concerned employees.</p>
FR 4.309	<p>DMIC IITGNL and Outsourced employees shall have access to ISM. They shall also have access to the detailed desktop and web version of the GIS map to be able to respond to the event and update the database.</p>
FR 4.310	<p>Each user shall have a customisable landing page and shall have access to only the portlets as per his role and rights.</p>
FR 4.311	<p>The portal shall be mirrored on a mobile app (iOS & Android).</p>
FR 4.312	<p>Through service Portal, any user can seek service, status check on service request, lodging incident/complaint, getting information, providing suggestions.</p>

FR 4.313	<p>The user shall contact DMIC IITGNL by following means:</p> <ul style="list-style-type: none"> • In person through Citizen Facilitation Centre (Control centre); • Web portal; • Mobile Application; • E-mail; • Web Portal; • Surface mail; and • Public Interactive kiosks. <p>In any of the above cases, the citizen query / data must interact with the ISM / LMS / Other system to be processed. It is expected that in any situation the query shall be directed to the portal and the data input by the citizen or the operator at the facilitation centre.</p>
FR 4.314	Login options of different user groups shall be provided.
FR 4.315	The mobile version (Android & iOS) shall mirror the portal and be adapted for optimum viewing on multiple operating systems and device sizes.
FR 4.316	The Portal platform shall support deployment on all three platforms - Linux, UNIX and Windows.
FR 4.317	The Portal platform shall provide support for portal standards such as JSR 168, WSRP 2.0 and JSR-170.
FR 4.318	Support for Web-based administration that can monitor data and events, monitor portal components such as HTTP server, Portal Cache, Portal Repository etc. and maintain portal configuration files.
FR 4.319	Support for centralized, web-based user provisioning ensuring single definition of users, roles, groups and access rights.
FR 4.320	System shall have search capabilities that support powerful and comprehensive full-text searching, metadata searching or people search.
FR 4.321	It shall support multiple databases like Oracle, SQL Server, DB2, Informix etc. without requirement of any additional software.
FR 4.322	Shall manage portal content using web content management from common content management repository through out-of-the-box integration.
FR 4.323	The portal solution shall allow the users themselves to personalize their user interface.
FR 4.324	The portal solution shall provide several layers of caching infrastructure to provide content to users. Access to content shall be cached to reduce the load and increase performance.
FR 4.325	Portal shall support a stand-alone, service-oriented architecture.
FR 4.326	Support for out of the box integration with content management system for web content management and publishing on the portal.
FR 4.327	The administration tools shall provide granular control and delegation of administration tasks for custom role-based management.
FR 4.328	Portal shall deliver content based on user attributes or preferences.
FR 4.329	Support for unified Single Sign On for internal integrated applications.
FR 4.330	Support for personalization of home page using drag & drop functionality.
FR 4.331	Support for display of the user's work list information.
FR 4.332	Support for personalized notifications and alerts.
FR 4.333	The portal solution shall provide analytics console for accessing portal metrics. The analytics console shall be available as an integrated application so that the product is easy to learn and easy to deploy.
FR 4.334	The portal solution shall provide secure and controlled access to the analytics console. Only portal administrators shall be able to access the console without exposing data that might be sensitive or private.

FR 4.335	Portal shall provide comprehensive tracking and graphical display of portal/community traffic, searched keywords, quick system response time, document downloads, user turnover, visit duration, etc.
FR 4.336	Portal shall provide support for discussion forums.
FR 4.337	Leverages a common management console to manage all distinct applications/modules and monitor performance.
FR 4.338	Provides ability to perform Advanced Search based on multiple metadata.
FR 4.339	Ability to display search keywords in bold within title and excerpt of search result page.
FR 4.340	Ability to perform search across web content, files on a file server, databases, IMAP email, document repositories and applications.
FR 4.341	Search results are based on user's security role and display what the user is authorized to access.
FR 4.342	Ability to integrate with LDAP/AD based security.
FR 4.343	Support for analytics on Search performed such as reports on most popular searches, documents not found etc. Based on this, administrator can boost document relevancy and customize search results.
FR 4.344	Enterprise wide Portal shall enable content publishing within portal framework.
FR 4.345	Portal shall provide Template driven portal development to simplify portal creation process.
FR 4.346	The portal shall implement security features, such as password complexity, automatic blocking (temporary/permanent) of user logins after given number of unsuccessful login attempts (should be parameterized), controlled access to content stored on the portal and logging of security incidents using Identity management solution.
FR 4.347	Reporting and Monitoring shall be inbuilt and provided as part of Portal inherent capability.
FR 4.348	Inherent Portal analytics shall be able to capture page traffic, portlet traffic, content usage, services and response times.
FR 4.349	Analytics console with inbuilt UI framework for Analytics reports, graphs and charts.
FR 4.350	Shall support a single content management repository for both structured and unstructured content.
FR 4.351	Search results are based on user's security role and display what the user is authorized to access.
FR 4.352	<p>Home Page:</p> <ul style="list-style-type: none"> • The portal shall consist of several portlets; • Each application shall have a portlet; • Users can customise their landing pages with portlets as per their roles and responsibility; • Each portlet shall be a dashboard for the application and shall display control information; • Each portlet shall have drill down capabilities; • Messages to the user shall be displayed prominently; • Officer and investor users shall thus have different sets of portlets; • City information, RTI, grievance, GIS, news, weather may be common; • All the above should be tiles on the landing page. This will lead the user to detailed sections on each of the above; • The portal should have a mobile app compatible with android and iOS for all functionality; and • The portal must be integrated with the UP government – UDYOG BANDHU.

2.2.4.8 Revenue Management

Functional Requirements

REVENUE MANAGEMENT	
FR 4.353	Delivery of all services and/or functionality related to Revenue Management would integrated with CRM system
FR 4.354	Land Leasing: Creation of a leasing order for land leases and subsequently raising an invoice to the customer, including collection of payment. System should allow payments via instalments. Integration is required with e-LMS and GIS.
FR 4.355	The system must track incoming payment for each instalment for Land/Plot allocation and maintain an auditable trace of such payments at the plot level. Additionally, the system shall provide functionality to follow up on pending payments by generating reports for DMIC IITGNL and send/generate reminder notices in the form of paper printouts and/or emails.
FR 4.356	Functionality for registering an occupier of a property as a customer directly in the ISM or through online integration with the e-LMS, with modify and inquire functionality. It should be possible for DMIC IITGNL users to segregate such customers based on customer type. This master record should be able to store all customer details as required by DMIC IITGNL with an auditable trace and time stamp. Further, at the master record level the system should allow assignment of authorizations to individuals for creation, modification and inquiry functionality.
FR 4.357	The system should allow for change or transfer of occupier and/or owner, of lease for any property or plot with a traceable record of the history of such occupiers/owners.
FR 4.358	The system must generate a report on customers who have been allocated land with an option to report only on active customers.
FR 4.359	<p>Following Functionality is required relating to Land maintenance charges:</p> <ul style="list-style-type: none"> • Creation of a sales order for land maintenance charges for each leased plot as well as periodic billing with functionality for generating periodic bills; • DMIC IITGNL to modify the land maintenance charges with history being maintained of the old rates; • Land maintenance rate may vary from plot to plot and/ or customer to customer; • Billing frequency and Land maintenance charges may vary from plot to plot and/ or customer to customer; • Option for one-time payment and accounting over the lease period of annual charges with allocation over the lease period or annual collection of charges over the remaining period of the Land Lease. Option to pay a combination of lump sum and annual charges should be available. • System should allow payment of early payment discounts; • System should provide functionality for auto-generated reminder letter for unpaid land maintenance charges bills with automatic calculation and levy over interest and/or penalty; • Tracking of payments received against land maintenance charges bills; and • Interfacing (real time) would be required with the e-LMS and GIS.
FR 4.360	<p>Surcharges and Rebates on components of Land maintenance charges must be configurable. These could either be based on percentages or fixed amounts.</p> <p>In certain cases, rebates or subsidies are given to specific customers and the system must cater to this functionality requirement.</p> <p>The system must also allow revision upwards or downwards of surcharges and rebates with an old record history.</p>
FR 4.361	<p>Govt. Taxes and Levies: rates must be configurable and the system must automatically calculate the applicable amounts and apply them on the bills and if necessary, show them as separate line items.</p> <p>The system must also allow revision upwards or downwards of such taxes and levies with an old record history.</p>

FR 4.362	<p>Submission of Property Tax/Service Charge (as applicable) in subsequent years with changes or without changes in property details like structure, usage etc.:</p> <ul style="list-style-type: none"> • Capture details of multiple lease holders • Handle listing of multiple usage types within a property; • Handling rebates, specific standardized rules, and considering various factors while calculating ARV (Annual Ratable Value) of the property • Capturing floor wise details in case of buildings
FR 4.363	Functionality of Self-Assessment, subsequent assessments filed by the Citizen and making changes if any by DMIC IITGNL.
FR 4.364	Functionality for revising land maintenance charges about issuing a notice to the lease holder informing him/her about the revision of rates. In case of joint lease, functionality should provide for issuing notices to multiple parties. The address of these parties may not be the same as the property address and the system must be capable of storing these multiple address as per business requirement.
FR 4.365	Functionality for occupants/lease holders to file an objection against the revision notice.
FR 4.366	Yearly land maintenance bill generation – handling arrears, penalty/interest, advance and self-assessment payments. There may be more than one component in the land maintenance bill like GST. The amounts against these components should be indicated clearly as separate line items.
FR 4.367	Collection of tax payments with automatic bifurcation in predefined proportion or as per priority defined with handling of rebates for early payments.
FR 4.368	Functionality for mutation (change in lease holder) of property through heredity or by sale of property.
FR 4.369	Functionality for occupants/lease holders to file an objection against the mutation.
FR 4.370	Revaluation of Property upon survey/ identification of change in property by DMIC IITGNL.
FR 4.371	Day to Day Property Tax/Service Charge related functionality and reports as per business requirement including interactive reports catering to what if scenarios.
FR 4.372	Integration of Property Tax/Service Charge billing and collection status with GIS for visual display.
FR 4.373	<p>Miscellaneous Revenues:</p> <ul style="list-style-type: none"> • Functionality to account for miscellaneous revenues from digital services, or rental for usage of community halls etc.; • Advertisement Hoardings: Creation of a sales contract for a specified period and its consequential billing from advertisement hoardings; • Registration of media agencies as customers; • Functionality for booking an advertisement; • Functionality for setting up new hoarding and display of advertisement; • Functionality for renewal of advertisement contract; and • Any other sources of revenue as specified by DMIC IITGNL.
FR 4.374	IIT users must be able to carry out processes on the system like Contract Entry, Billing, Collection, Issue Renewal Notices, Contract Renewal, Suspension and Cancellation.
FR 4.375	Rechargeable Work: creation of a sales order and raising an invoice for work done which is chargeable to a customer. The system must allow functionality to set and revise the charge out rates, surcharges/rebates and Govt Taxes/Levies as per functionality provided for GST. These rates must automatically reflect in the sales orders and invoices referred above.
FR 4.376	<p>Usage of Telecom Fibre Network: creation of a sales order, raising an invoice record and follow-up payments for usage of fibre by telecom services providers:</p> <ul style="list-style-type: none"> • On fixed rental basis or; • Percentage of revenue basis;

	<ul style="list-style-type: none"> For the Option 2, integration would be required with the systems of the Telecom Service Provider (TSP) for capturing the revenue for the period; and Functionality should be available to DMIC IITGNL for raising invoices automatically.
FR 4.377	Parking Lots: Creation of a sales order and subsequent billing from parking lots.
FR 4.378	Reports as per business requirements of DMIC IITGNL relating to Revenue from GST, Land Sales, Telecom Fibre Usage etc.
FR 4.379	Mutation Functionality: system should not allow or prevent mutation of ownership unless all dues applicable to the Plot are cleared. Workflow may also be required to cater to multiple levels of approval.
FR 4.380	System should provide functionality for visibility of actual revenues/payments at customer level by maintaining a customer account with a unique customer id. Functionality should be provided to the users for revenue planning at customer or product (or service level).
FR 4.381	System should provide functionality for revenue forecasting as well as revenue management at a level of detail as required by DMIC IITGNL. Additionally, roll up and drill down functionality for the revenue line items.
FR 4.382	As per DMIC IITGNL requirement, for all revenue line items by customer type, like rechargeable work, rent, lease, customer services and any other charges etc., the system should provide functionality to define and modify the applicable rates, surcharges/levies and applicable Govt taxes/levies. The system must provide functionality to maintain all business-related data in one master record, with a trace of the history records. Such data must automatically reflect in the sales orders and invoices as per the effective dates in the master record.
FR 4.383	Deferred revenue: Functionality is required for selective deferment of revenue of certain components. As an illustrative example Revenue related to Land Premium is required to be deferred as per DMIC IITGNL revenue recognition policies whereas other components of revenue like Annual Lease Income, Location Fees, Building Plan Approval Fees need not be deferred
FR 4.384	Revenue Recognition: Functionality is required for ensuring DMIC IITGNL compliance as accounting principles of IND AS and as per the revenue recognition policy of DMIC IITGNL
FR 4.385	Future changes to Revenue Recognition: system is required to provide flexibility to cater to future changes in Revenue Recognition guidelines.

2.2.4.9 Finance and Management Accounting

Functional Requirements

FINANCE & MANAGEMENT ACCOUNTING	
General Ledger	
FR 4.386	Compliance: Compliance is required for Ind AS (Indian Accounting Standards) as notified by Ministry of Corporate Affairs.
FR 4.387	Functionality to define and/or modify chart of accounts for DMIC IITGNL
FR 4.388	A robust journal with complete traceability of financial transactions. Entry deletion must not be allowed. Reversal functionality must be provided for reversing transactions and the same needs to be authorized. Maker-Checker concept should be followed.
FR 4.389	Posting of Transactions and Opening & Closing Periods.
FR 4.390	Facility to create draft transactions with auditable transaction numbering feature.
FR 4.391	Automatic transaction posting feature.
FR 4.392	Feature to open and close financial periods. System should allow entries in next financial year even when earlier financial year is not closed (should the transaction date not be in the future)
FR 4.393	Feature for adjustment periods in addition to the normal 12 periods for posting transactions in any financial year.

FR 4.394	Feature to allow soft close and hard close of financial periods.
FR 4.395	Restrict transaction posting only to open periods.
FR 4.396	Capability to drill down into transaction details (entry level) from period balances and/or financial statements.
FR 4.397	Facility to have hierarchical account structure. This should be flexible as per the needs of DMIC IITGNL.
FR 4.398	Automatic generation of trial balance.
FR 4.399	Provide functionality for the user to define the format and contents of financial statements.
FR 4.400	Provide multiple reports as required by users for monitoring and control purposes.
FR 4.401	Functionality for Payments and Auto Bank Reconciliation: <ul style="list-style-type: none"> To prepare Cash management forecast Prepare reconciliation statement for Bank transactions
FR 4.402	<p>The system will have Investment management functions, which covers Opening Receivables Investment, Regular Investment, Renewal of Investment and Withdrawal of Investment transactions-master integration.</p> <ul style="list-style-type: none"> The system will Help to make decisions about financial investments and borrowings with information about cash shortages and surpluses in the short term All conventional investment instruments such as fixed term deposits, commercial papers, and securities will be covered by the system. The processing of the instruments will be fully supported from trading through back office to accounting The system will generate alerts for user regarding investment maturity details. Details of investment made from DMIC IITGNL Fund, various Earmarked Funds and Specific Grants will be recorded in the Investment Register. On disposal of investment of the Organization, the profit earned, or loss incurred on disposal of investment will be recorded as income or expenditure in the Income and Expenditure Statement. The system will allow user to search on investment number, type, date, and amount and investment bank name. Interest on investments will be recognized as and when due. At period-ends, interest will be accrued proportionately. Dividend on investments will be recognized on actual receipt.
FR 4.403	DMIC IITGNL maintains Fixed/Term Deposit accounts with various banks/financial institutions. The system must provide functionality at FD level for variable rates of interest and variable periods of simple and/or compound interest calculation to ensure reconciliation of maturity values between DMIC IITGNL and the corresponding Bank/Financial Institution. Lastly, the system should provide functionality for pre-mature closure of an FD. System shall give alerts/reminders prior to expiry of any FD.
FR 4.404	Functionality is required to record and automatically monitor expiry dates of Bank Guarantees submitted to DMIC IITGNL. Functionality for the user to set-up Timely alerts as per DMIC IITGNL requirements are required as well as ready access to Scanned Copies of BGs by means of integration of the ISM and File Management Systems
FR 4.405	Functionality for incoming electronic payment and transfer of funds including net banking, credit cards or any other payment mechanism. Applicable for domestic (INR). The functionality should include, accounting for TDS deduction on payments by Payer as well as functionality for tracking/follow-up with Payers for TDS certificates.
FR 4.406	Functionality for outgoing electronic payment and transfer of funds and transfer of funds including net banking, credit cards or any other payment mechanism. The system should have the functionality for creating a payment proposal for which approvals can be taken by means of a work flow or on a print out in paper form.
FR 4.407	Functionality to process cash and cheque payments with automatic handling of outstation cheques.

FR 4.408	Functionality for creating recurring accounting entries which are required to be posted on a periodic basis for example in the case of employer contribution to ESI, PF etc.
FR 4.409	Functionality of Tax Deduction at Source (TDS) on all outgoing payments as stipulated by Income Tax. Subsequently, facilitating DMIC IITGNL in discharging this tax liability by automating the processes for creation of challans, calculating & depositing the tax deducted in the Government Treasury and preparing/filing the returns with the Income Tax Dept. The system should provide functionality for the variable rates of TDS as applicable for the type of goods/service and/or the type beneficiary (Individual, Proprietary Concern, HUF, Pvt Limited Company etc.)
FR 4.410	<p>Functionality to prepare the challans and make outgoing payments (NEFT, Cheque etc.) in a time manner to discharge all the statutory liabilities of DMIC IITGNL. An auditable record of such payments/challans needs to be maintained for records examples of such statutory liabilities are:</p> <ul style="list-style-type: none"> • Provident Fund / Family Provident Fund • Employee State Insurance • GST • Income Tax <p>System is required to have the functionality for providing authorizations at task level to various individuals or positions who are made responsible for performing either singly or jointly one or more of the above functions</p>
FR 4.411	Functionality to disburse and record the payments to employee related to payroll, reimbursements, loans and advances (including cash advances) etc.
FR 4.412	e-LMS shall be integrated with Finance module for billing and transaction related requirements pertaining to land sales. Functionality to integrate the challan deposited in the bank for payment by investors with Finance and LMS.
FR 4.413	Functionality for re-grouping of GL balances according to pre-defined rules for statutory reporting; system should provide necessary information for preparing year end schedules for audit purposes.
FR 4.414	The system should be able to generate a payment acknowledgement as and when required.
FR 4.415	System should have functionality to transactions related to employees; should have functionality to maintain account for each employee. Employees should be able to submit their travel expenses reimbursement statements online via the portal. This functionality of reimbursement of expenses should be flexible and also cater to reimbursement of other employee related expenses
FR 4.416	Functionality for manual and automated cheque printing.
FR 4.417	Functionality for preparing a cash flow forecast with varying time horizons. Provision required for automatic bank reconciliation.
FR 4.418	Functionality for Taxation, duties and levies accounting of tax transactions, detailed information flow, challan preparation and filing of different tax returns according to central as well as state government legal requirements.
FR 4.419	Functionality to ensure DMIC IITGNL Compliance as per the applicable provisions of the GST ACT in India. The system must enable DMIC IITGNL to meet all statutory GST compliance requirements including formats and functioning as per the GST act. Flexibility is required for the system to cater to proposed changes in GST as applicable to DMIC IITGNL.
FR 4.420	The system should provide the required G/L reporting functionality as required by DMIC IITGNL users.
FR 4.421	<p>Petty Cash Accounting and/or Imprest Amount Accounting: The system shall provide the functionality for petty cash accounting by:</p> <ul style="list-style-type: none"> • maintaining a record of the currency amounts, advanced terms of number and denominations of notes/coins. • enabling preparation and processing of statement or expenses incurred from petty cash account on mobile phone, on portal, application screen or uploading via excel.

	<ul style="list-style-type: none"> separate authorizations can be provided for this account to users from finance, administration or any other person as per DMIC IITGNL requirements
FR 4.422	Revenue recognition policy of DMIC IITGNL shall be customized into the Finance module. MSI shall interact with DMIC IITGNL Finance department in order to understand such details during implementation.
ACCOUNTS PAYABLE	
FR 4.423	Functionality for automatic reconciliation of sub-ledgers with the control account in the General Ledger. System should allow more than Accounts Payable control account in the General Ledger as per the classification of vendor groups
FR 4.424	User must be able to create/maintain Vendor master record. Common master data of vendors with procurement is required.
FR 4.425	Functionality to process one off payments for vendors with whom DMIC IITGNL does not intend to have a long-term business relationship and maintain a separate master data record.
FR 4.426	User defined facility to classify vendors in groups and assign separate number ranges. These number ranges could be assigned externally or internally by the DMIC IITGNL. The external number require flexibility to have alphanumeric characters.
FR 4.427	System should allow fast data creation or booking or modification of invoices based on purchase order etc.
FR 4.428	The system must allow the DMIC IITGNL to assign vendors to separate control accounts in the general ledger.
FR 4.429	Functionality to block process vendor payments in case of dispute at invoice level or vendor level.
FR 4.430	System must handle multiple modes of payment including electronic and must generate output as required by banks.
FR 4.431	System must have necessary controls for managing sensitive information for vendors e.g. vendors' bank accounts.
FR 4.432	Functionality for recording and monitoring of bank guarantees, Vendor Wise/Contract Wise including timely alerts to DMIC IITGNL management on BG expiry dates, thereby permitting them to take corrective action.
FR 4.433	Functionality in system to provide an alert for an additional BG or enhancing the value of the existing BG due to enhancement in the contracted value of a works contract, and/or purchase order. In case of a new PO released to the existing vendor resulting from an approved Change Request, the system should demand the submission of an additional BG for the appropriate value.
FR 4.434	System should provide functionality at master data level of vendors to restrict operations of these accounts only by a certain set of employees.
FR 4.435	Functionality for processing of payments for vendors with automatic vendor account posting and clearing.
FR 4.436	Functionality for automatic system calculated TDS deductions for vendor payments.
FR 4.437	Functionality for automatic posting of input tax (GST or other existing) whilst vendor invoice processing.
FR 4.438	Functionality of automatically handling re-imbursement of expenses like transport, insurance during vendor invoice processing.
FR 4.439	Whilst processing payments either automatically or manually, for vendors, the system should allow the advances to be adjusted partially or fully.
FR 4.440	Functionality to issue credit/ debit notes by the system.
FR 4.441	Functionality for system generated letters to vendors for balance confirmations.
FR 4.442	Out of the box availability of reports for vendor reconciliations and other reports as per user requirement.

FR 4.443	Out of box functionality for online inquiries on vendor balances on various parameters and statuses.
FR 4.444	System should have a strong reporting functionality as per DMIC IITGNL needs that includes all statutory reporting, analysis of vendor master data, open invoices, overdue payments, payments made in advance, blocked invoices report etc.
ACCOUNTS RECEIVABLE	
FR 4.445	Functionality for automatic reconciliation of sub-ledgers with the control account in the General Ledger.
FR 4.446	User must be able to create/maintain Customer master record.
FR 4.447	Functionality to classify customers in groups and assign number ranges. These number ranges could be assigned externally or internally by the business entity. The external number range may have alphanumeric characters.
FR 4.448	The system must allow the DMIC IITGNL assign separate control accounts for customers in the general ledger.
FR 4.449	Functionality to block posting customer accounts.
FR 4.450	System should provide functionality at master data level of customers to restrict operations of these accounts only by a certain set of employees.
FR 4.451	System must allow monitoring of advances received from customers.
FR 4.452	Automatic processing of receipts via cheque, electronic funds transfer or other means with auto posting of output tax which may be in the form of GST, VAT, sales tax or any other municipal levy. There could be business instances of more than one central tax, state tax or municipal levy.
FR 4.453	While processing receipts either automatically or manually, for customers, the system should allow the advances to be adjusted partially or fully. The posting to customer debtors account should be automatic with clearing of the required entries.
FR 4.454	Functionality to issue debit notes and/or credit notes as applicable with ability to provide discounts, rebates and/or levy charges.
FR 4.455	Functionality for automatic interest calculation for overdue payment. The system must allow the user to specify the interest rates for a customer or a group of customers.
FR 4.456	Functionality for automatic generation of reminder letters for overdue payments in the accounts receivable. The letter format should be user definable.
FR 4.457	System should have functionality to provide reports as required by DMIC IITGNL which includes for example open customer invoice, payments received (partial or full), ageing analysis per overdue dates.
ASSET FINANCIAL MANAGEMENT	
FR 4.458	Functionality to generate automatic asset numbering as well as manual numbering.
FR 4.459	Functionality to maintain detailed information per asset item: asset description, asset class, asset serial number, asset bar code, location, asset main category and sub category, department/cost centre, custodian, employee number, purchase date, depreciation start date, service start date, vendor, PO reference, invoice reference, warranty start date, warranty end date, acquisition cost, salvage value, useful life and depreciation method and any other relevant asset information.
FR 4.460	Functionality to maintain collective information of low value assets like items of furniture.
FR 4.461	Functionality to define parent child asset relationships. (sub asset functionality)
FR 4.462	Functionality to add additional upgrading cost to an existing asset. System should provide a report showing the history of upgrades and include the addition into the new depreciation running over the remaining period of the asset. e.g. Capital construction projects.
FR 4.463	Functionality to capture work in progress (WIP)/construction in progress (CIP) assets and later convert them as normal assets and start depreciating.

FR 4.464	Functionality to add WIP/CIP expenditures to an existing CIP asset through the accounts payable system.
FR 4.465	Functionality in asset system that allows the asset to be marked as physical inventory tracking asset and further generate physical inventory reports.
FR 4.466	System should be able to depreciate assets using common depreciation methods: <ul style="list-style-type: none"> • Straight Line; • Double Declining balance; • Written down value method; and • User defined method of depreciation like based on number of hours.
FR 4.467	Functionality to calculate depreciation based on groups of assets: <ul style="list-style-type: none"> • By Department; • By cost centre; • By Project; and • By business entity.
FR 4.468	Functionality to recalculate depreciation on asset: <ul style="list-style-type: none"> • Based on change in value; • Based on change in depreciation schedule; and • Based on change in asset life.
FR 4.469	Functionality to capitalize assets
FR 4.470	Functionality to perform "un-planned" depreciation
FR 4.471	Functionality to automatically process and post transactions: <ul style="list-style-type: none"> • Depreciation Expenses; • Cost Adjustments; and • Any other transaction as per DMIC IITGNL business needs.
FR 4.472	System should allow user definable depreciation formulas and also cater to multiple methods of depreciation for example relating to Income Tax, Companies Act etc. which includes depreciation methods stipulated by Companies Act in India and Income Tax.
ASSET TRANSFERS	
FR 4.473	Functionality to transfer assets between: <ul style="list-style-type: none"> • Divisions/Departments/Cost Centres • Locations • Custodians • Projects • Work Package (within a project)
FR 4.474	Functionality to transfer all or part of an asset.
FR 4.475	Functionality to transfer groups of assets.
FR 4.476	Functionality to generate transfer slips in case of asset transfers.
FR 4.477	Functionality to monitor a temporary transfer or loan of an asset and/or equipment to another department or Project. This should also include the transfer of an asset and/or equipment for repair work to an external agency
FR 4.478	Transfer of an asset to land inventory due to changes in Land Usage Policy of DMIC IITGNL. The system should provide functionality to maintain a record of the capitalization cost of asset (land and/or building). This Capitalization Cost would include the cost of land and the Cost of Development as on date of the Capitalization of the said Asset. Whilst transferring the Asset to Saleable Land Inventory, the system must have the functionality to proportionately load the costs of development onto this asset transfer which have been incurred from the date of capitalization of the asset to the date of transfer of

	the said asset. The asset needs to be revalued with this additional cost of development prior to the transfer of this asset to minimize the liability of DMIC IITGNL due to Capital Gains. Additionally, the system should also calculate the Capital Gains resulting from such an asset transfer
FR 4.479	Functionality to transfer assets between: <ul style="list-style-type: none"> • Divisions/Departments/Cost Centres; • Locations; and • Custodians.
FR 4.480	Functionality to transfer all or part of an asset.
FR 4.481	Functionality to transfer groups of assets.
FR 4.482	Functionality to generate transfer slips in case of asset transfers.
ASSET RETIREMENTS	
FR 4.483	Functionality to fully retire.
FR 4.484	Functionality to partially retire.
FR 4.485	Functionality to retire by units.
FR 4.486	Functionality to retire by cost.
FR 4.487	Functionality to reinstate retired assets.
FR 4.488	Functionality to process sales of fixed assets with the Automatic creation of gain/loss transactions.
FR 4.489	Functionality to specify different retirement accounts for gains and losses.
REVALUE ASSETS	
FR 4.490	Functionality to revalue assets (change the basis of depreciation and net book value) and adjust the cost of an asset, e.g. capitalization of renovation cost, useful life, depreciation % and write off amounts.
FR 4.491	Functionality to revalue a single asset or group of assets based on percentage or value.
FR 4.492	Functionality to record and amortize revaluation reserve based on International accounting standards.
PHYSICAL VERIFICATION	
FR 4.493	Functionality to maintain a physical control of assets and be able to track assets by serial number, asset number, custody number and project/ cost centre/ location.
FR 4.494	Functionality to create a Fixed Assets Verification Sheet, containing asset code, location, physical balance.
INSURANCE	
FR 4.495	Functionality to track asset insurance details such as sum insured, premium etc.
FR 4.496	Functionality to generate a report showing insurance expiry dates.
REPORTS	
FR 4.497	Generate fixed assets register by: <ul style="list-style-type: none"> • Department/Section; • Location; • Project; and • Business entity.
FR 4.498	Provide functionality for asset sales and automatically calculate the resulting gain and/or loss on such asset sales.
FR 4.499	Projected Depreciation.
FR 4.500	Cost Centre wise.
FR 4.501	Period depreciation reports – summary.

FR 4.502	Asset depreciation per period.
FR 4.503	Generate asset depreciation register (detail and summary).
FR 4.504	Report on fixed asset transactions history (i.e., fixed asset movements).
FR 4.505	Generate unposted depreciation calculation report before transferring them to GL but after running depreciation in the assets module.
FR 4.506	Asset cost report.
FR 4.507	Asset report by major and minor category.
FR 4.508	Following activities should generate a report output: <ul style="list-style-type: none"> • Asset Transfer; • Asset Disposal; • Asset Retirement in the form of sale, scrap, write off etc.; and • Asset Addition.
FR 4.509	Functionality to generate automatic reconciliation report for GL and depreciation register.
FR 4.510	Functionality to prepare Retirement Register by month / asset number: <ul style="list-style-type: none"> • By department; • By location/region; • By account; • By account segment; and • By retirement type.
FR 4.511	The system should provide the reports relating to Assets as per DMIC IITGNL user needs.
MANAGEMENT AND COST ACCOUNTING	
PLANNING BUDGETING FUNDS AND GRANTS MANAGEMENT	
FR 4.512	Capital Investment Planning – integrated with the requirement stated in Projects and Works Management the system should enable the DMIC IITGNL users to create a forecasted investment plan for obtaining funding approval from the relevant stakeholder/institutions.
FR 4.513	Maintain an auditable record of source of funds which can be in the form of Grants, Loans, Equity, Debentures or any other source of funds which be appropriate for DMIC IITGNL.
FR 4.514	Maintain Traceability of allocation of these funds for each project. For example, at IIT infrastructure development would include projects relating to: Telecom, Power, Water and Water Treatment, Waste Management, Land Allocation & Roads, Traffic Management, Housing, Commercial Complexes, Social Facilities, Parks, Information Technology etc.
FR 4.515	Provide the functionality to grant approvals for individual projects and maintain and auditable record of the source of funding for each project.
FR 4.516	Provide functionality to record and track incoming payments received by DMIC IITGNL against approvals for investment plans sanctioned by relevant stakeholders (state Government, Central Government, foreign and domestic financial institutions etc.) against various Funds and/or Grants.
FR 4.517	Provide functionality to record and track utilizations of the funds against Funds/Grants approved by relevant stakeholders (state Government, Central Government, foreign and domestic financial institutions etc.) against various Funds and/or Grants.
FR 4.518	Functionality to maintain of record of the plan versus actual capital expenditure at project level.
FR 4.519	Functionality for tracking of utilization of funds at project level with multi-level roll-up functionality.
FR 4.520	Functionality to provide flexibility in reporting for budgeting and variance analysis.
FR 4.521	Functionality to provide flexibility in reporting of spend and utilization reports.

MANAGEMENT ACCOUNTING	
FR 4.522	System should have functionality to define internal organization structures for internal reporting.
FR 4.523	Should have functionality to amend organization structure according to business needs with complete audit trail of changes done.
FR 4.524	System should have functionality to record business transaction for financial as well as for management account at the same time.
COSTING	
FR 4.525	Functionality to capture and report costs against each dimension in the chart of account structure such as cost centre, unit, department, location, product, project etc.
FR 4.526	Functionality to define cost centres for performing responsibility accounting across the organization, including multiple legal entities under a common management control.
FR 4.527	Facility to pool costs and then allocate / reallocate costs to other cost centres / across organization based on predefined basis.
FR 4.528	Functionality to create flexible cost collectors to collect costs for specific purpose / objective.
FR 4.529	Functionality to settle such collected cost to another cost centre, asset or WBS element or project.
FR 4.530	Functionality to print various cost allocation schedules prior to the financial closing of the period.
FR 4.531	Functionality to allocate overheads either on a percentage basis or as quantified by the service providing department.
FR 4.532	Functionality to rerun cost allocations when the underlying data changes. Functionality must be provided for a test simulation run, which can be approved by DMIC IITGNL.
FR 4.533	Functionality to combine the costs for several input sources and allocate in one allocation source through parameters.
FR 4.534	Functionality to allocate common costs across departments/ services / units based on predefined basis.
FR 4.535	Functionality for Provisions to add relevant taxes and duties wherever applicable.
FR 4.536	Functionality to reconcile costing reports with financial reports.
FR 4.537	Functionality to provide flexibility to accept new detail lines/parameters for preparation of cost sheets.
FR 4.538	Functionality to derive the costs centres or cost collectors automatically based on the normal accounting postings.
FR 4.539	Functionality to assign budget for these cost collectors.
FR 4.540	Functionality to track the actual costs and budget costs on these cost collectors.
FR 4.541	Functionality to support variance analysis between budget and actual across various periods.
FR 4.542	Functionality to set up avail Functionality control on these cost collectors and set up warning or error messages at user defined levels of budget utilisation.
FR 4.543	Functionality to create these cost collectors for reporting purposes only as these costs cannot be allocated further.
FR 4.544	Functionality to compile the total costs in the primary cost collectors and settle the costs to other cost collectors.
FR 4.545	Functionality to create various reports about the costs collected in these cost collectors at various time periods and compare them with the budgets.
FR 4.546	Functionality to compute costs for land/plot valuation purpose based on defined accounting policy. DMIC IITGNL computes the valuation of the land based on actual land acquisition costs as well as the cost of development. The Cost of Land sold and/or Leased is computed of based on the cost of land

	plus the planned cost of development. The proposed system must provide functionality to cater to these DMIC IITGNL requirements as well as performance obligations – incurred and deferred.
FR 4.547	Functionality is required in the system to cater to changes required in valuation of Land and/or Plot on account of changes in Land Use policy of DMIC IITGNL. The system should also provide for the resulting impact of the new Land/Plot valuation in the applicable taxes.
FR 4.548	Functionality to accept costs/rates on ad hoc basis for services provided by departments/cost centre.
FR 4.549	Functionality to maintain mapping between chart of accounts and costing system along with cost centre/responsibility centre system.
FR 4.550	Functionality to allocate cost in the same original GL account Head to multiple cost centres or other cost objects.
FR 4.551	Functionality to assign and report on Fixed Assets allocated to Cost Centres.
FR 4.552	Functionality to capture depreciation for cost sheet preparation from the fixed asset module.
FR 4.553	Functionality to charge of Depreciation to assigned cost centres automatically, while posting Depreciation entries in financial accounting.
FR 4.554	Functionality to determine cost for any process with or without depreciation and interest component. and Functionality to transfer relevant amount to subsequent process and/or service
FR 4.555	Functionality to maintain cost sheets prepared on multiple basis for the same period for comparison purpose.
FR 4.556	Functionality to perform Cost allocations (plan/actual cost accounting) based on full costs. Costs are not split into fixed and proportional costs as only a consolidated entry is posted onto the cost collector, for example canteen costs.
FR 4.557	Functionality to allow to calculate wage costs using the fixed hourly rates determined in cost centre planning.
FR 4.558	Functionality to have Cost Centre Accounting, including itemized costing for specific business events like marketing campaigns or trade fair participation.
FR 4.559	Functionality to add one or more cost centres or one or more nodes of the standard hierarchy for Cost Centre.
FR 4.560	Functionality to get the breakup of costs by way of different accounts.
FR 4.561	Functionality to consider the planned overhead costs in the standard cost estimates based on cost centre planning and activities.
FR 4.562	Functionality to cost roll up from lower levels to higher levels of WBS for Projects.
FR 4.563	Functionality to maintain cost estimates for services provided or to be provided by external vendors.
FR 4.564	Functionality to estimate costs and maintain costs for previous, current and future period in the system.
FR 4.565	The system should also provide other MIS or Management Accounting reports as per the needs of DMIC IITGNL users.
FR 4.566	Functionality for Real-Time Integration of Management Accounting with Financial Accounting for actual and planned data.
FR 4.567	System should have functionality to manage expenses incurred on work or jobs carried out for internal or external customer Detailed line item level details should be provided for actual and planned costs.
FR 4.568	System should provide functionality to plan internal and external resources for various categories of jobs.
FR 4.569	System should allow planning (and reporting) of various types of costs for different categories of jobs.
FR 4.570	System should have functionality to keep track of costs and resources consumed on maintenance of internal or customer assets.

FR 4.571	System should provide adequate control mechanisms for complete lifecycle management of a job or a work order; should have functionality to approve or reject a particular job or a type of expense for a job.
FR 4.572	<p>The module shall have functionality to:</p> <ul style="list-style-type: none"> • Define Chart of Accounts as per the applicable guidelines; • Maintain Bank Account Details; • Maintain Details of Vendors; • Budget provisioning – Provision for Original and Revised Budget; • Re-appropriation of Budget between accounting heads; • Provision to records Receipt; • Transfer of Receipts – cash/cheque to Bank Accounts; • Record direct debit/ credit to bank accounts in books of accounts; • Entry of Bills /Invoice Received from vendors including RA Bills received from vendors executing projects; • Authorization of bills as per the work-flow defined; • Payment Vouchers once the payment is approved; • Keep track of Cheque books and cheque leaves; • Facility for cheque printing; • Direct Payment up to specific limit; • Journal Voucher Entry; • Authorization of Journal Voucher; • Contra Voucher Entry; • Reversal of Vouchers; • Provision for Bank Reconciliation at any point in time; • Manage Deposits received from vendors, citizens; • Keep track of Grants received and expenses made against the specific grant; • Keep record of Investment made and interest accrued on the investments; • Loans management; and • Advances management.
FR 4.573	<p>Functionality for maintaining Books of Accounts and Registers:</p> <ul style="list-style-type: none"> • Cash Book, Bank Book, Cashier's Cash Book, journal; • Daily Journal; • Ledger – Single or Multiple account heads; • Customer wise/vendor wise ledger balances outstanding as per DMIC IITGNL format; • Trial Balance, Income & Expenditure, Balance Sheet with drill down functionality to voucher level for all statements; • Cash Flow Statement; • Bill Register; • Payment Register; • Deposit Register; • Investment Register; • Loans Register; and • Advances Register.

2.2.4.10 Purchase and Inventory Management

Functional Requirements

PURCHASING AND INVENTORY MANAGEMENT	
Purchase Requisition	
FR 4.574	Functionality to create automatically or manually Purchase Requisitions for goods and services. The functionality for automatic generation should be based on spares requirement for an equipment/location, stock level monitoring, due dates as project/ work package schedules, MRP or any other user defined mechanism like safety stock.
FR 4.575	Functionality of employees (or authorized users) or departments to create requisitions and have visibility of PO's issued against these requisitions (including RFQ and RFP).
FR 4.576	Functionality to convert requisition to request for quotations (RFQ)/ request for proposals (RFPs) automatically. RFQ/ RFP should be attached to selected vendors based on past data/performance.
FR 4.577	Functionality to monitor the status of purchase requisition raised.
FR 4.578	Functionality to attach documents (e.g. Word, excel, pdf etc.) with the header and lines of purchasing documents (PR, RFQ, RFP, Quotes, Proposals and PO).
FR 4.579	Functionality to raise Purchase Requisition against a project.
FR 4.580	Functionality to raise Purchase Requisition for service contract with vendors.
FR 4.581	Functionality to automatically create requisition if the quantity on hand goes below re order level.
FR 4.582	Approvals of these requisition should conform to the powers vested in signing authorities. Necessary workflows must be available to facilitate approvals on the system.
FR 4.583	Functionality to create requisitions for whole sale energy and water procurement by DMIC IITGNL.
RECEIVE & EVALUATE QUOTATION	
FR 4.584	Functionality to prepare Request for Quotation against a purchase requisition.
FR 4.585	Functionality to electronically send the request for quotation and link it to multiple suppliers.
FR 4.586	Functionality to enter the quotes received.
FR 4.587	Functionality to have an expiry date for the Quote.
FR 4.588	Functionality to Analyze Vendor's Quotations (Technically, Financially) on following criteria: <ul style="list-style-type: none"> • Lowest Price; • Best Delivery; • Best Technical Proposal; • By assigning points on quality offered; • Payment Term; • Landed Cost (Freight etc.); • Relationship with Vendor (Agent, supplier etc.); and • User definable criteria. • System should be able to evaluate the quotation/proposal on the basis of above criteria.
FR 4.589	Functionality to copy vendor's quotation/proposal into PO either as a whole or selected lines.
PURCHASE ORDER	
FR 4.590	Functionality to create Contracts and/or POs bulk and others as applicable.
FR 4.591	Functionality to convert quotation/requisition/bids to purchase order.
FR 4.592	Functionality to create multiple purchase orders against a single quotation/requisition.
FR 4.593	Functionality to create purchase order for goods and services which would include spares, essential services, office equipment and/or any other item as per DMIC IITGNL business needs.

FR 4.594	Functionality to create purchase order for service contracts with vendors and track the pending commitments made by DMIC IITGNL to each Vendor.
FR 4.595	Functionality to create long term contracts in the system with either a limit either on time period, quantity or value either a limit either on time period, quantity or value.
FR 4.596	Functionality to create multiple releases against the long term purchase contracts.
FR 4.597	Functionality to create replenishment automatically for specific items with respect to the inventory norms defined i.e. safety stock, reorder point, inventory turns.
FR 4.598	Functionality to record purchase order acknowledgement from vendor.
FR 4.599	Functionality to enter price, state taxes, central taxes, GST, municipal levies, payment terms, special discounts, delivery instructions, delivery schedule etc. in purchase order/release order.
FR 4.600	Functionality to set receiving tolerance limits in purchase order or service order.
FR 4.601	Functionality to set 2/3/4 way matching requirements in the purchase order.
FR 4.602	Functionality to send approved PO electronically to vendors (Fax, email etc.).
FR 4.603	System should allow reprint of PO with 'copy' marked on the print out.
FR 4.604	System should be able to capture information pertaining to freight, insurance, etc. at each line item selection as per the terms (CIF, FOB, etc.).
FR 4.605	Functionality to capture penalty clause in PO (% wise, daily rate and lump sum).
FR 4.606	Functionality to enter project details while creating purchase order and interface the details to project.
FR 4.607	Purchase order processing is part of the procurement of materials and services. Its primary purpose is to convert demands to purchase orders (with or without reference to a contract) or delivery schedules for a scheduling agreement and to monitor the fulfilment of these documents.
FR 4.608	Prepare and dispatch RFQs/RFPs/RFIs.
FR 4.609	Requirement to separate out carriage and transport costs.
FR 4.610	Requirement to dispatch PO's via various methods i.e. web, email, fax, post.
FR 4.611	Functionality to assign Follow-up dates on purchase orders especially for delayed and/or critical deliveries.
FR 4.612	Functionality to record Comments for follow up activities.
FR 4.613	Functionality to track different stages of a purchase order (like - In-progress, approved, rejected, closed etc.).
RECEIVING GOOD/ SERVICES	
FR 4.614	Functionality to receive goods and services against a purchase order.
FR 4.615	<ul style="list-style-type: none"> Functionality to track the receipt of against bulk water and electricity contract of goods supplied to DMIC IITGNL against the Contracts entered into by DMIC IITGNL with various authorities, electricity boards, undertakings, public sector enterprises. Alerts/ requisitions should be automatically generated by the system at DMIC IITGNL defined threshold levels before expiry of such supply contracts.
FR 4.616	Functionality to record inspection report for items. System should also provide for creation and/or modification of discrepancy reports whilst inspecting/approving works and/or services performed by external vendors or internal service providers. DMIC IITGNL users must be able to define the approval workflows as per business requirements.
FR 4.617	Functionality to update inventory on item receipt / post-inspection clearance for items with mandatory inspection requirements.
FR 4.618	Functionality to generate receiving document on receipt.

FR 4.619	Functionality to receive un-ordered receipts or substitute items with proper authorization as defined by business.
FR 4.620	Functionality to record multiple receipts against a single PO.
FR 4.621	Functionality to record serial number, expiry date and batch number during receipt for specific items (tracking item by serial number e.g. meters for water & electric tracking item by serial number e.g. meters for water & electricity).
FR 4.622	Functionality to record labor hours and material consumed by an internal employee or contractor against a maintenance work order. These entries must reflect in the costs accumulated against a specific work order.
FR 4.623	System should have provision for rejection of unacceptable items with creation of Discrepancy Report.
INVOICE RECEIPT	
FR 4.624	The solution must accommodate various types of receipt - standard 3-way match, blanket (i.e. limit) order receipting, exemption on receipt for orders up to a specified value. Additionally, the user must have an option of a 2-way match where the vendor need not submit an invoice. The payments are cleared by comparing the G/R or service entry sheet against a PO or purchase contract.
FR 4.625	Receiving an Incoming Invoice, The Functionality to receive, enter, and check vendors' invoices for correctness. The Functionality to manually enter incoming invoices and automated procedures for creating invoices, such as the automated processing of receipts or goods and services.
FR 4.626	Verifying an Incoming Invoice the Functionality to check incoming invoices for correctness in terms of their content, prices, state taxes, central taxes, GST, municipal levies and arithmetic, thus defining the basis for the payment run. The price and conditions are compared to the conditions in the purchase order, or the invoiced quantity is compared to the received quantity. If differences exceed user defined limits, the invoice should be blocked automatically for payment. Tax calculation and processing of delivery costs are also to be integrated.
FR 4.627	The Functionality to for one person to process/verify the invoice and another person to approve the processing and processing of vendor invoices is required. Workflow functionality is necessary to control the process.
FR 4.628	Release of Blocked Invoices the Functionality to release invoices that have been blocked can be released for payment using a monitor function. The Functionality to automatically release of invoices for which the blocking reasons have been clarified. Workflow features support the release process.
FR 4.629	Requirement to create self-bill invoices against agreements or Contracts from within the solution.
FR 4.630	Requirement to reject invoices if they are not valid or legal documents.
MAINTAIN VENDOR RECORDS	
FR 4.631	Functionality to maintain the following information per vendor: <ul style="list-style-type: none"> • Vendor code; • Vendor name; • Aadhar No., PAN No. and GST Registration No.; • Multiple contact names; • Multiple addresses (PO Box, email, phone numbers, fax number, postal addresses); • Default payment/credit terms; • Default currency; • Multiple vendor bank account numbers; • Default delivery options; • Multiple Product description/Category; and • ISO Certification/Validity.

FR 4.632	System to be able to classify vendors as registered/ unregistered and certified/ uncertified, international/domestic.
FR 4.633	System to be able to capture the rules on which the vendor is to be assessed.
FR 4.634	Functionality to automatically update vendor rating based on pre-defined rule.
FR 4.635	Functionality to maintain approved supplier lists for services and/or inventory items along with applicable rates.
FR 4.636	Same entity can be both customer and vendor, link to be maintained and referred as related party.
FR 4.637	Functionality to have vendor specific payment terms.
APPROVAL HIERARCHIES	
FR 4.638	Functionality to designate approval hierarchies to approve Purchase Requisitions, Purchase Orders and Vendor Quotations based on the following criteria: <ul style="list-style-type: none"> • Amount limit; • Item ranges; and • Account ranges.
FR 4.639	Functionality to send an electronic notification to approver to take action on the Purchasing document submitted for approval.
FR 4.640	Functionality to send an electronic notification on approval or rejection of purchasing document (PR, PO and Quotation) to initiator.
FR 4.641	Functionality to automatically forward document for approval to next person in hierarchy if the document is delayed beyond the specified time with a designation.
PURCHASING MIS	
FR 4.642	Functionality to track the status of PR's with respect to PR log date, Item code, quantity etc.
FR 4.643	Functionality to track the status of PO's with respect to PO log date, Item code, quantity and expected time of arrival of the shipment.
FR 4.644	Functionality to generate report on pending PR/PO supplier-wise, item-wise and department-wise.
FR 4.645	Functionality to generate report when level stock on-hand below reorder level with information on PO pending, PR pending etc.
FR 4.646	System should have the Functionality to print summary of expected receipts.
FR 4.647	Functionality to print purchase register for the month.
FR 4.648	Functionality to generate reports on documents pending for approval on which no action has been taken for more than N number of days.
FR 4.649	Functionality to inquire / report on the item purchase cost history over a user defined date range.
FR 4.650	Functionality to generate receipt register.
FR 4.651	Functionality to perform ageing analysis for outstanding Purchase Orders based on cost centre, vendor etc.
FR 4.652	Functionality to generate statutory reports/returns as required by state government for filing sales tax and/or excise duty returns.
MAINTAIN MASTER DATA FOR SERVICES AND INVENTORY ITEMS	
FR 4.653	Functionality to setup and maintain item codes with different segments.
FR 4.654	Functionality to maintain the following information for items but not restricted to: <ul style="list-style-type: none"> • Item code; • Item descriptions; • Purchase lead time per item/supplier;

	<ul style="list-style-type: none"> • Vendor item code; • Default purchasing unit of measure; • Minimum stock level; • Item Status (Active, Obsolete, Blocked etc.); • Expiry date; • Serial Number and Batch Number (for serialized inventory tracking and batch tracking); and • Barcode.
FR 4.655	Functionality to group items into categories and sub-categories.
FR 4.656	System to be capable of linking the supplier item code with the item code in the item master.
FR 4.657	Functionality to maintain conversions between units of measure.
FR 4.658	System should have provision for serial-number control of items.
FR 4.659	System must support bar coding and have the Functionality to scan pre-printed form containing bar codes, quantities, and item descriptions.
ITEM CATALOGUES	
FR 4.660	Functionality to maintain catalogues item-wise and supplier-wise.
FR 4.661	Functionality to update catalogues periodically through catalogue imports.
FR 4.662	Functionality to explode bills and transfer individual items to concerned persons and/or departments
MAINTAIN STOCK LEVELS	
FR 4.663	<p>Functionality to maintain minimum stock levels for items. At DMIC IITGNL maintenance Land/Plot Inventory is a critical business need. The ISM system is required to interface in real time with the e-LMS system to maintain by Land Parcel:</p> <ul style="list-style-type: none"> • Total Area Land Parcel • Area allocated by usage type (residential, commercial, industrial or any other usage type as defined by DMIC IITGNL) • Area available for sale by usage type • Area leased
FR 4.664	Functionality to generate alerts if the quantity falls below pre-defined limits.
FR 4.665	Functionality to classify items based on ABC classification. ABC classification should be based on value of stock & value of movement within a year.
ITEM COSTING	
FR 4.666	<p>Supports the following costing methods:</p> <ul style="list-style-type: none"> • Standard; and • Weighted average.
FR 4.667	Functionality to track the item cost for all material transactions including sale and/or leasing of land/plot to investors.
TRANSACTIONS	
FR 4.668	Functionality to define transaction types and set pre-defined rules for each transaction type. An auditable record should be maintained for all issues and receipts
FR 4.669	<p>Functionality to issue items against:</p> <ul style="list-style-type: none"> • Internal requisition; • Maintenance work order; • Material requisition from projects; and • Or any other user defined requisition.

FR 4.670	Functionality to load the initial stock at cut-over/data-migration with full reconciliation of quantities and financial values
FR 4.671	Functionality to inspect items and or work performed on receipt.
FR 4.672	Functionality to Record quality issues and defect if any.
FR 4.673	Functionality to scan and record barcode information at the time of receipt.
FR 4.674	Functionality to upload Goods receipts voucher details from excel to the system.
FR 4.675	Functionality to record items returned from Projects to Inventory.
FR 4.676	Functionality to provide provision for ageing inventory.
FR 4.677	The system should post the stock adjustments only after approval in system.
INVENTORY MIS	
FR 4.678	Functionality to report the transaction statistics by type (e.g. number of receipt transactions, shipments, transfers, returns etc.) by product group and month.
FR 4.679	Functionality to generate material transaction register.
FR 4.680	Functionality to generate item movement report to track all transactions based on following criteria: <ul style="list-style-type: none"> • Period wide; • Item wise; • Category wise; and • Transaction type wise.
FR 4.681	Functionality to track items reserved with reference.
FR 4.682	Functionality to generate report on inventory balance on-hand with GRV details.

2.2.4.11 Contracts Management

Functional Requirements

CONTRACTS MANAGEMENT	
FR 4.683	Functionality to facilitate DMIC IITGNL, users and/or stakeholders to engage in full management of Contract Lifecycle from Contract drafting, review from multiple perspective, and creating a final Contract document.
FR 4.684	Alerts and notification on contract status to respective departments with linkage to Bank Guarantees
FR 4.685	Functionality for DMIC IITGNL users to retain an overview of their contractual agreements of all sorts. These contracts may vary widely in terms of intended content as well as their possible legal and financial consequences for execution, renewal and denouncement.
FR 4.686	Availability of user-friendly functionality to enable efficient contract management, tracking of contract deadlines, renewal, cancellation and reporting as well as cost assignment.
FR 4.687	The contract management solution shall integrate seamlessly within the ISM modules as well as other applications as per requirements of DMIC IITGNL
FR 4.688	Functionality in the contract management solution to facilitate searching and managing contractual as well as financial data flow.
FR 4.689	Functionality for Template based contract development process.
FR 4.690	Functionality for standardization contracts across the DMIC IITGNL organization.
FR 4.691	Functionality for digital repository of contracts throughout lifecycle to develop & leverage knowledge.
FR 4.692	Functionality for capture and active management of contract master data of - any form main, individual and collective contracts, addendums, etc. - any type sales, purchase and rental contracts,

	service agreements, memberships, warranties, etc. - any category or type vendor and customer contracts, internal agreements, etc.
FR 4.693	Functionality for integration with Document Management System for all types of documents (documents stored in an optical archive and pc documents), mails, internal notes and URL links.
FR 4.694	Functionality for tracing and alerts management for key dates as terms of notice, renewal dates and other terms or due-dates.
FR 4.695	Functionality for assignment of partners and contacts to predefined roles.
FR 4.696	Functionality for customizable contract status management.
FR 4.697	Functionality for activity and task management.
FR 4.698	Functionality for form / template based printouts.
FR 4.699	Functionality for data change history management (contract versioning, change documents, etc.).
FR 4.700	Functionality to adapt the user interface on contract type level by customizing.
FR 4.701	Functionality to provide automated reminders on milestone completion dates, PBG renewal dates, Insurance renewal date etc. and any other important timelines.
FR 4.702	Functionality for the contract management solution should integrate seamlessly with the overall solution. The existing user authorization elements should be reused and tightly integrated.
FR 4.703	Functionality that the platform should be scalable to handle the load of an enterprise-wide contract management approach for DMIC IITGNL.
FR 4.704	Module should be capable of having a reminder tracker for setting reminders for contract completion dates and other renewal reminders

2.2.4.12 Operations, Maintenance and Asset Lifecycle Management

Functional Requirements

OPERATIONS, MAINTENANCE AND ASSET LIFECYCLE MANAGEMENT	
Properties, Roads, Pipeline, Fibre Network	
FR 4.705	Functionality is required to define a location which is a logical representation in the package, that would represent a property or physical location where any equipment such as meter, value, transformers, switches are installed. A location may also represent a road or a channel where a pipeline is housed.
FR 4.706	All references must be geo tagged and have close interface with the GIS system.
FR 4.707	Functionality to install any equipment or asset at a location as described above.
FR 4.708	<ul style="list-style-type: none"> Functionality to map the properties and plots in DMIC IITGNL to a location in the package with the facility of external and internal number ranges for unique property ID's. Land or Plots would be allocated for purposes like: Industrial, Commercial, Residential, Parks & Playgrounds, Educational Institutions & Schools, Hospitals, Police, Fire Services, Roads and Parking Lots, DMIC IITGNL administrative blocks/offices, facilities for supply of electric power, water, gas, telecom, sewage disposal etc. or any other purposes for which DMIC IITGNL wishes to allocate a plot of land. Online bi-directional integration (Create, Modify or Inquire) with the e-Land Management System (e-LMS) would also be required. Additionally, integration would also be required with the Document Management System (DMS). Data migration from the LMS to Asset management.
FR 4.709	Functionality for mapping roads on to location in the package which has linear characteristics.
FR 4.710	Functionality for mapping fibre network on to location in the package which has linear characteristics.
FR 4.711	Functionality for mapping pipelines on to location in the package which has linear characteristics.

FR 4.712	Facility to hierarchically structure the locations in the package with no limitations on depth of the hierarchy. This facility is required for mapping of land parcels or plots as per a location or colony in IIT. Additionally, in a plot the location which would house the meter or the valve would also be at a hierarchical level below the plot.
FR 4.713	Facility to specify the Geographical Co-ordinates for each location/asset or equipment with online bidirectional integration with the GIS system. This module of the ISM should have full Process Integration with the GIS system chosen by DMIC IITGNL
EQUIPMENT MASTER	
FR 4.714	<p>Equipment Master should capture the following information:</p> <ul style="list-style-type: none"> • Equipment ID (With intelligence built in the code); • Manufacturer; • Supplier (if Different from Manufacturer); • Serial number; • Date of (Purchase, Manufacture, Installed, Overhauled etc.); • Equipment / Component Hierarchy (e.g.: An electric motor can be a component of a major equipment); • Warranty information (timeframe, conditions, company through which the warranty is held, expiration date); • Functionality to define common Faults / Equipment; • Functionality to link or attach manuals, operating procedures, graphs and other files to equipment; • Installed by; • Associated cost, histories and failures of a serialized piece of equipment as it moves throughout a plant or facility; • Functionality to track time-related information for Piece of Equipment based on parent Equipment; • Time since new (TSN); • Time since overhaul (TSO); • Functionality to input and track location of the Equipment / Components; • Functionality to define multiple maintenance organizations within the company; and • Functionality to define list of spares required for an equipment.
FR 4.715	<p>The system should provide functionality to record equipment or assets related to the following:</p> <ul style="list-style-type: none"> • Electricity substations, transformers, switches, circuit breakers, feeder lines and other electric network assets necessary for supply of power to IIT users; • Water pumping stations, storage tanks, purification plants, water mains, valves and other water network assets necessary for supply of clean water to IIT users; • Waste water drains, man-holes other waste-water network assets necessary for providing sewage facilities to IIT users; • Storm water drains and rain harvesting pipes and equipment; • Telecom network of fibre, cables and switches; • Street lights, traffic lights (future) and other traffic management/road management equipment (future); • Solid waste bins and sewage treatment equipment and plant; • Vehicles and other fixed assets like furniture, buildings, office equipment; • SCADA infrastructure will be interfaced to generate automatic alarms; and • AMR infrastructure will be interfaced to generate automatic billing.
RESOURCE MASTER	
FR 4.716	Functionality to record the details of maintenance engineers / technicians.

FR 4.717	Functionality to record skill sets against the employee record.
FR 4.718	Functionality to maintenance groups to assign responsibility of the equipment.
FR 4.719	Functionality to maintain hourly rates for resources.
PREVENTIVE / PREDICTIVE MAINTENANCE	
FR 4.720	Functionality to create preventive / predictive maintenance schedules for all the equipment.
FR 4.721	Functionality to create preventive / predictive maintenance schedules for all the locations as logically defined in the system.
FR 4.722	Functionality to create preventive / predictive maintenance schedules for linear assets and their associated locations as represented in the package.
FR 4.723	Functionality to prepare preventive / predictive maintenance check sheets for each equipment / component. Predictive maintenance check sheets should have provision to record discrete values (E.g.: Current, Temperature, Vibration etc.).
FR 4.724	Functionality to define tolerance limits for key parameters like current, temperature etc. The limits should be equipment / component specific.
FR 4.725	System should have functionality to provide planned costs for all the planned work based on maintenance schedules.
FR 4.726	System should have necessary provisions to use master data properties to arrive at the planned costs and also must have integration with financials for reporting of both planned and actual costs.
FR 4.727	Functionality to create preventive / predictive maintenance schedules based on any of the following parameters:
FR 4.728	Operating hours (E.g.: For every 5000 hrs.).
FR 4.729	Time based (E.g.: Daily, Weekly, Bi-Weekly, Monthly, Quarterly, Yearly etc.).
FR 4.730	Combination of Operating hours / time (whichever comes first).
FR 4.731	User defined rules (E.g.: If the observations of predictive maintenance are beyond acceptable limits, new preventive maintenance can be scheduled).
FR 4.732	Functionality to designate a parent / child relationship based on type of maintenance (E.g.: Changing a pump requires various other maintenance operations to be performed).
FR 4.733	Functionality to automatically generate work orders based on the preventive / predictive maintenance schedule.
NOTIFICATIONS	
FR 4.734	<p>System should have functionality to create notifications for planned and unplanned work. The system should provide the creation directly on the ISM or through an online bi-directional interface with the, Portal, CFC, and/or Kiosk for any grievance, complaint, service request or any other reason. For example, these notifications could be related to:</p> <ul style="list-style-type: none"> • Water or Electricity connections, fault repair etc.; • Water and Waste Water Networks including water mains, valves, pumping stations, purification plants, filtering equipment, flow meters, drains, man holes etc.; • Electricity Networks: including substations, transformers, circuit breakers, energy meters etc.; • Service delivery relating to Water, Waste Water, Storm Water, Telecom; • Solid Waste management; • Traffic, Road and Street Light Management; • Parks and Community Facilities; and • Other reasons including complaints and grievances.
FR 4.735	System should allow creation of notification from multiple sources e.g. from portal / apps etc. whilst capturing all details of property customer etc. as required by DMIC IITGNL.

FR 4.736	System should capture the details of the complainant in case of reactive maintenance.
FR 4.737	System should have necessary functionality to capture the status of the service requests.
FR 4.738	System should maintain a complete audit trail from registering and managing of an incident to its conclusion.
FR 4.739	The system should provide functionality to automatically segregate the notifications with different notification types as per DMIC IITGNL needs and automatically route them to an appropriate resolver group or scheduler for further creation of a work order if required.
WORK ORDERS	
FR 4.740	Functionality to be closely integrated with the GIS permit to work module
FR 4.741	<p>Functionality to automatically convert a notification into a work order. DMIC IITGNL requires functionality for multiple work order types as there would be multiple resolver groups and it is necessary to segregate and do reporting on the work orders based on the work order type. For example, these work orders could be related to:</p> <ul style="list-style-type: none"> • Water or Electricity connections; • Water and Waste Water Networks including water mains, valves, pumping stations, purification plants, filtering equipment, flow meters, drains, man holes etc.; • Electricity Networks: including substations, transformers, circuit breakers, energy meters etc.; • Fibre optic network; • Service delivery relating to Water, Waste Water, Storm Water, Telecom; • Solid Waste collection and management; • Traffic, Road and Street Light Management; • Parks and Community Facilities; and • Other reasons.
FR 4.742	<p>Functionality to generate notifications and/or work orders for the following types of maintenance:</p> <ul style="list-style-type: none"> • Breakdown Maintenance; • Preventive Maintenance; • Predictive Maintenance; • Incident Management; • Inspection; • Calibration / Testing; and • Others (Modification, Major Overhaul, Design upgrades etc.). The user should be able to define the notification types.
FR 4.743	Functionality is required for managing Incidents like a Burst Water Mains, Major Fire or Power Break Down. Announcements and Messaging on Bulletin Boards would be required. Additionally, multiple citizens may call regarding the same incident, resulting in multiple work orders being raised thereby unnecessarily flooding the maintenance teams with work. In such an emergency situation, the system should prevent duplication of work orders.
FR 4.744	The system should allow creation of a planned as well as reactive maintenance work orders for a location as represented in the package.
FR 4.745	The system should allow creation of a maintenance work order for a linear asset and its associated locations as represented in the package.
FR 4.746	Automatic notification (for approval of Client) for alarms raised via the SCADA system. If necessary, the MSI may have to develop a real-time interface to achieve this functionality.
FR 4.747	Automatic notification and/or work order creation if a user raises any problem with an DMIC IITGNL asset like a street light through the portal. If necessary, the MSI may have to develop a real-time interface to achieve this functionality.

FR 4.748	Automatic notification and/or work order creation if a customer services representative in the call centre raises any problem with an DMIC IITGNL asset like an open manhole or pot-hole in the road through the portal. If necessary, the MSI may have to develop a real-time interface to achieve this functionality.
FR 4.749	The system should be capable to accept breakdown requests through any means with complete status tracking of these work orders till resolution via the Portal. Functionality should be available to IIT users as there would instances where the work order (or part of a work order) is outsourced to a vendor or 3rd party for resolution or execution. Integration of Works Management with Procurement Functionality is required as the Vendors would be required to perform the work against a long-term contract with a quantity or value limit or a single. purchase order.
FR 4.750	Functionality should be provided by the system, for furnishing work order level details whilst assigning work to Vendors. This would enable the Vendors to submit invoices and DMIC IITGNL to track maintenance and service delivery expenses with traceability of work performed at work order level.
FR 4.751	Drill down functionality is also required at work order level to verify the status of each task or operation which are included as a part of the work order.
FR 4.752	Functionality to have workflow routing for work orders.
FR 4.753	Functionality to track the status of a work order. System should be able to support the following status: <ul style="list-style-type: none"> • Initiated / Waiting for Approval / Prepared / Planned; • Waiting for material; • Released / open (equipment down); • Completed / Cancelled; and • Soft Closing / Finally Closed.
FR 4.754	Functionality to include the following information in work orders: <ul style="list-style-type: none"> • Work Order Start and End Date; • Type of work order (preventive maintenance, predictive maintenance, breakdown maintenance etc.); • Type of work (electrical, mechanical, etc.); • Equipment identification and description; • Priority (E.g. Urgent, Normal etc.); • Designated duration of work order (start/end date and time in minutes); • Where was work performed (location, site); • Nature of the problem; • Customer (requestor) and method of contact; • Date of (Problem reported, work completed etc.); • Resources required (labor, materials, equipment and tools); • Resource ID numbers; • Resource availability; • Lockout / tag-out procedures; • Required permits with workflows for automatic communication/intimation to the concerned department/organisation to enable timely permissions for smooth execution of the maintenance work to be carried out (Permit to Work Functionality) Integrated with the GIS module; • Testing requirements (to validate repair); • Detailed work plan (tasks or operations to be performed, planned time & resources for each operation, task sequencing and dependencies). System should have functionality for automatic cost planning of a work order which would include planned overhead allocations; • Fully integrated real time capture in the work cost details: Actual usage (labor time by employee id, parts, equipment time, time to complete and date completed). Out of the box functionality is also required to periodically review the work orders for allocation of overheads and settlement of variances;

	<ul style="list-style-type: none"> • Description of actual work performed; • System should have functionality to create quotations for the work that need to be charged to customer. Should be able to produce an itemized quotation; • System should have provisions to proceed or not to proceed with quotations depending upon customer's decision; • Should have functionality to bill the customer for services rendered and material consumed, must produce an itemized bill; • Equipment issues; • Equipment condition; • Cause of problem; • Test results; • Date and explanation of past work done on the equipment (type of work, nature of the work, completion time, employees who participated in the work); and • Prepared by.
FR 4.755	Functionality must be there to manage the warranty aspects of an equipment or any component or any spare part used in an equipment.
FR 4.756	System should have functionality to track components/ spares used in an equipment with details like serial number/ manufacturer etc. and must have functionality to manage any component / spare part movement with complete audit trail.
FR 4.757	Functionality to capture at work order level maintenance cost details like labor, costing of materials, services, overhead etc. (external or hired labor, specific maintenance group, etc.).
FR 4.758	Functionality to compare the actual labor hours entered by the technician to the standard labor hours estimated to accomplish the work.
FR 4.759	Functionality to calculate labor costs based on type of hours worked (regular, overtime, periodic, corrective, breakdown, reactive, equipment modification, etc. by target rate).
FR 4.760	Functionality to automatically generate notifications/work orders based on the preventive / predictive maintenance schedule.
FR 4.761	Functionality for configuration of a work order type, without any source code change of the ISM package.
FR 4.762	Functionality to create work orders with varying work order types depending on the nature of the customer grievances or calls.
FR 4.763	Functionality of automatic integration of the Customer Services Portal and/or CRM system to maintenance notification and/or work order creation.
FR 4.764	System should have provision to print notification / work orders with detailed instructions for delivery of the job.
FR 4.765	System should have functionality to update customer about the progress of the job and information may be transmitted by different modes e.g. updates on portal or SMS or Status update on APP.
MAINTENANCE HISTORY MANAGEMENT	
FR 4.766	Functionality to track general maintenance history data: <ul style="list-style-type: none"> • By Equipment Identification number, work order number etc.; • By Location where service was done; and • By Maintenance Sections involved in the service.
FR 4.767	Functionality to use maintenance history to assist in maintenance projections (i.e. resource usage during peak times).
FR 4.768	Functionality to track spare parts consumed against an equipment.
FR 4.769	Functionality for automatic updation of maintenance history for an equipment or location (as represented in the system) by a work order.

MIS	
FR 4.770	<p>Functionality to generate downtime report with the following details:</p> <ul style="list-style-type: none"> • Equipment details; • Reason for failure; • Corrective action taken; • Spares consumed; and • Work-order details.
FR 4.771	<p>Functionality to generate downtime reports:</p> <ul style="list-style-type: none"> • Equipment-wise; • Location-wise; and • Year to date.
FR 4.772	<p>Functionality to generate reports on the following for each equipment:</p> <ul style="list-style-type: none"> • Mean Time Between Failures (MTBF); and • Mean Time to Repair (MTTR).
FR 4.773	<p>Functionality to generate following reports for maintenance:</p> <ul style="list-style-type: none"> • Number of work orders issued and closed per month; • Types of work orders opened and closed per month; • Number of work orders generated per department; • Number of work requests awaiting approval (total, by work order owner and by department whose approval has not been received); • Regular versus overtime hours; • Planned versus unplanned costs, hours, usage, etc.; • Downtime of equipment per work order, year to date, previous year, etc.; • Effective production hours per day; • Cost rates by resources; • Cost by work type; • Maintenance schedule compliance as a percentage of maintenance planned or scheduled jobs completed in a month; • Number of work orders generated from PMs; • Maintenance cost / Actual cost comparison for each equipment; • Productivity measurement of manpower; • Should have functionality to roll up planned / actual costs / planned hours/ actual labour hours consumed by different organization entities other than work order e.g. by department owning the asset; • Must have functionality to link technical assets with financial assets to provide asset lifecycle including non-cash expenses like depreciation.
FR 4.774	<p>Functionality to measure and generate reports to monitor Levels of Service of a work order or a task associated with the work order.</p>
FR 4.775	<p>Functionality to generate an aggregated Levels of Service reports for various types of customer calls or work order types to monitor the performance levels of service delivery to stakeholder (citizens, industrialists, residents etc.).</p>

2.2.4.13 Projects and Works Management

Functional Requirements

PROJECTS AND WORKS MANAGEMENT	
FR 4.776	Capital Investment Planning – To enable investment lifecycle management starting from short term / long term capital investment planning based on organization structure or any alternative structure that represents capital investment control organization, investment ideas, approval or rejection of investment ideas; allocation of funds for approved projects.
FR 4.777	Project: To enable project managers to better identify, select, prioritize, and manage projects. Including key performance metrics on budgets, schedules, and staffing. Solution to provide a centralized view of performance and at-risk elements. To also enable project managers to work closely together with team members and management. The comprehensive project management solution should enable DMIC IITGNL project managers to manage schedules, resources, assigned documents and materials, costs, and budgets. Team members need to be notified via workflow when they need to fulfil their project-related tasks thereby facilitating monitoring and control. Should have functionality to manage capital related work as well as operational expenditure.
FR 4.778	Scheduling Functions: To be able to schedule forwards and backwards according to the relationships between activities. Constraints need to be taken into account, with earliest and latest dates calculated, and floats determined. System should be integrated and/or interfaced with a third party products e.g. MS Project or Primavera as per choice of DMIC IITGNL.
FR 4.779	Document Management: Integration for drawings, technical specifications and other relevant project documents.
FR 4.780	Costs: The ability to plan costs using easy cost planning or by making use of the network calculation of internal and external work, services, and procurement planned in activities that are automatically calculated. The ability to map projects to internal orders or cost planning elements (WBS) elements to plan costs based on resource staffing and cost rates. Should have provision to maintain multiple versions of planned costs including base project cost plans, revisions in planned costs i.e. forecasting, calculation of estimated cost to complete. Should maintain a complete audit trail of changes carried out to any type of planned costs. Must have provision to provide necessary restriction to different users for carrying out different activities related to planning of base costs and / or revision to original cost plans.
FR 4.781	Cost planning should have alternative options available from rough cut planning to detailed cost planning according to different stages of the project as the project progress.
FR 4.782	Budget the ability to control all expenditure during the execution phase. Additionally, the ability to break down the original budget into smaller packages of released budgets to allow an even more accurate availability control. System should have functionality to generate alerts based on pre-defined rule(s) in case of actual expenses or commitments exceed pre-defined limits.
FR 4.783	Resource and Time Management: The ability to assign resources and record time to resources assigned to any project or WBS- including for internal and external resources.
PROJECT EXECUTION	
FR 4.784	The solution must enable the execution of a project based on the project plan including creation of documents, simulation of alternative project structures and analytics using Project system.
FR 4.785	Shall support collaborative access to project documentation.
FR 4.786	The solution must enable confirmation of actual time and costs for projects. The times entered become the actual times and costs for the project. Full change and cancellation handling are required. Approval of the time entered by appropriate authority should be available.

FR 4.787	<p>Project-Oriented Procurement/ Repairs: Purchase Orders for goods and services will need to support multiple projects/WBS. Similarly, a single work order for repairs at the workshop may service multiple projects/WBS.</p> <p>System should have capability to identify goods procured for a specific project.</p>
FR 4.788	<p>Claim Management DMIC IITGNL requires to track contract variations, change requests, e.g. scope, as well as handling claims and/or disputes, this will include costs and/or income.</p> <p>Should have functionality to manage the approvals for claims recorded.</p>
FR 4.789	<p>Project Cash Forecast During execution, need to integrate project cash management and provide accurate information on incoming and outgoing payments.</p>
FR 4.790	<p>Project Progress: analysis/earned value analysis will be needed to determine planned and actual project progress values. Need to provide information on the state of projects and how they are developing. Need to display milestone trend analysis with the relevant dates in a project at different report dates. This is required to analyze/forecast periodic statuses to include costs (e.g. actual, value of work done, forecast), income and outputs.</p>
FR 4.791	<p>Progress Tracking: Required to closely monitor the progress of tasks and activities and monitor project specific purchase orders. User should be able to raise as well as manage escalations as and when required.</p>
FR 4.792	<p>Phase Approvals: Required to provide phase approvals by a structured approval process including decision makers named by DMIC IITGNL corporate policies and digitally signed approval documents. Workflow is required to support an efficient and effective process.</p>
FR 4.793	<p>Procurement Process must be able to access data from across DMIC IITGNL departments and projects and consolidate the procurement process to provide a structured overview.</p>
FR 4.794	<p>Project Reporting: Need a flexible, comprehensive information system to monitor and control project data. Need to evaluate individual projects, partial projects, or multiple projects. Include overview reports and reports offering various degrees of detail is designed to meet the needs of both project management and ordinary project personnel. System shall support analysis of expenditure by asset types.</p>
FR 4.795	<p>Project Structuring: Required to create work breakdown structures (WBS) and networks, with their attendant activities and milestones.</p> <p>Structure a project using phases, tasks, checklists, and checklist items Integration may be required with external project scheduling package.</p> <p>System should have functionality to provide master project templates that can be used to create project structures especially for repetitive nature of projects.</p>
FR 4.796	<p>Project Costs: Required to plan costs using easy cost planning or by making use of the network calculation of internal and external work, services, and procurement planned in activities that are automatically calculable. Integration may be required with external project scheduling package.</p>
FR 4.797	<p>Budget require budget availability controls for all project expenditure during the execution phase. Additionally, the original budget to be broken down into smaller packages of released budgets to allow accurate availability control.</p>
FR 4.798	<p>Scheduling Functions requires scheduling capability of forwards and backwards task movements according to the relationships between activities. Constraints are taken into account, earliest and latest dates are calculated, and floats are determined. Additionally, require both bottom-up and top-down scheduling.</p>
PROJECT ACCOUNTING	
FR 4.799	<ul style="list-style-type: none"> Project Accounting: The solution must enable the precise planning, budgeting and monitoring of detailed activities costs of a project, both large scale such as building a treatment plant, and small scale projects. It is expected that Project accounting will fulfil different purposes in different phases of the project. Help calculate the level of costs and the expected revenues when planning a project. Once the costs have been approved, it will form the basis for allocating the budget.

	<ul style="list-style-type: none"> • During project execution, it must monitor and check variances in the costs. • Must meet the requirements of local accounting standards for construction related projects. • Must assist the project manager to ensure that the project is executed efficiently, on time, and within budget - which he or she achieves by ensuring that the required resources and funds are available as and when needed. DMIC IITGNL requires to report benefit achievements by project categories. • Must calculate applicable penalties / liquidated damages in case of project delays or breach of contract conditions.
FR 4.800	System shall analyze work in progress by planned asset class to ensure prompt recovery of capital taxation allowances.
FR 4.801	System shall allow users to estimate, plan & capture OPEX impact of capital investment.
FR 4.802	Integrated Planning and Tracking: System shall support detailed financial integration including budgeting, cost planning and actual costs confirmations and commitments from various sources.
FR 4.803	Settle Financial Data: required to transfer costs to Financial Accounting, Asset Accounting and Management Accounting to establish cost of equipment for use in maintenance decisions regarding economic value of renewal.
FR 4.804	Automatic generation of requisitions for procurement of materials and/or services required for a Project. The material/services should be made available to the project neither too early nor too late.
FR 4.805	Goods receipt of material and/or services specific to a project should load the costs on to the WBS. The material thus received should be reserved for the particular project and not be issued for other purposes.
FR 4.806	Cost roll up: functionality should be made available to roll up costs from one WBS to another.
FR 4.807	<p>The Projects module shall provide functionality for:</p> <ul style="list-style-type: none"> • Classification of Works based on their types; • Maintain Vendor details; • Maintaining rate schedules and revising the same; • Defining a Project with Work Breakdown Structure; • Estimation and submission for review and approval by the competent authority; • Technical Sanction; • Administrative Approval as per the workflow defined; • Integration with e-Tendering (provided by outsourced agency); • Awarding Work Order to a vendor; • Facility to track the project status by project code through portal; • Facility to input / upload data upon the measurement/progress of work done; • Provision to enter site inspection details/report in the system or upload site visit report • Completion Certificate; • List of Projects - Projects-wise, location-wise reports etc.; and • Project status report.
FR 4.808	It shall be capable of calculating penalties and liquidated damages for delay in project.

2.2.4.14 Human Resources and Payroll Module

Functional Requirements

HUMAN RESOURCE (HR), PAYROLL SYSTEM & ADMINISTRATION	
HR Management and Records	
FR 4.809	The system should record of all employee related master data and any personnel related actions from employee onboarding till retirement. Like:

	<ul style="list-style-type: none"> Employee Personal Data (Id, Name, Sex, Date of Joining, Date of Exit, Date of Birth, Aadhar Number, PAN number, PF Account #(UAN), Passport Number, Address, Permanent Address, Contact Details, E Mail, Phone No etc.) Employee Educational Qualifications Employee Work History Employee Dependants Information Employee Health Records, Eligibility and Medical Insurance Details Employee Contract Details: Deputation, Contractor, Temporary, Permanent, Probation etc. Employee Organization Assignment Details (Department, Location, Position Id, Grade, Reporting Manager, Date of Promotion, Transfers etc.) Employee Working Schedule (shift working, hours of work etc.) Employee Leave Records Employee Maternity Benefits and Special Leave Employee Benefits and Payroll Related Information (Basic Pay, Allowances, Deductions, Voluntary Deductions etc.) Employee Loans and Advances Company Assets assigned to employee like laptops, company car, credit cards etc. Employee Disciplinary Actions Any other information or records as required by DMIC IITGNL
FR 4.810	Functionality to Update Holiday Calendar for Organization as applicable to various Organizational Units and Departments
FR 4.811	Case Management: Requirement to track progress of Absence Disciplinary and Grievance Cases and monitor performance of Unit/Team or Individual and with the requirement to attach Microsoft Word or Scanned Handwritten letters to Case files.
FR 4.812	Requirement to capture details of contractors and consultants who might be paid through the procurement process via third parties.
FR 4.813	HR Processes and Forms: The ability to automate paper-intensive and time-consuming employee-related processes such as hiring, termination, organizational reassignment, and maternity leave. Data entry and flexible workflow templates are required to enable the DMIC IITGNL to handle routine workforce processes quickly.
FR 4.814	Require the ability to streamline and integrate essential workforce processes such as employee administration, payroll, time management, absence recording, and legal reporting. This should enable the company to standardize and consolidate all workforce-related processes and data onto one platform, and ensure that adherence to local regulations and laws can be attained. Requirement to provide a central repository for employee data integrated fully with other business applications, especially maintenance and service delivery.
FR 4.815	Requirement to "electronically" file documents including handwritten scanned letters to an employee personnel record requirement to produce individuals, teams and departments attendance / absence matrix and to "count down" sick pay entitlement, raise necessary alerts and correspondence are all requirements.
Employee and Manager Self Service	
FR 4.816	Employee Self Service: Requirement is to enable employees to do such as access their records to check personal information and update likes of addresses, contacts, next of kin, bank details in lines with best practice. To enable people managers to process authority to recruit, authority to appoint, changes to terms and conditions and with built in work flows to enable forwarding for authorizations and governance and ultimately flowing to personnel records update and generation of appropriate letters or contractual change conformations.
FR 4.817	<p>Additionally, Employees should be able to perform the following functions through ESS:</p> <ul style="list-style-type: none"> Down load monthly payslips / Form -16 Submit evidence for Income Tax exemption for HRA Declare at year beginning planned investments yearly Income Tax Exemptions various Sections of Income Tax Act: for example, 80 C, 80 C, 80 E, 80 G, 80 CCC, 80 CCD 80 D, 80 EE, 80 TTA,

	<p>and other applicable sections</p> <ul style="list-style-type: none"> • Exemption for Interest Payments on Home Loans • Submit evidence at Year End of various investments made • Voluntary Deduction of PF as per applicable policy • Apply for leave • Apply for Training Course and update Course Completion Details • Apply for Travel Requisitions and Submit Travel Claims • Submit claims for reimbursements (medical and other expenses) as per policy • Apply for loans as per eligibility • Submit periodic Self Appraisals for previous period and define KRA's for the next period and Receive Feedback from Managers by means of a work flow when the Manager completes the appraisal process • Participate in 360 degrees appraisals of other employees and also receive 360 degrees feedback for self • Perform any other HR related function as per requirements of DMIC IITGNL
FR 4.818	<p>Manager Self Service: Requirement for people managers to process authority to recruit, authority to appoint, changes to terms and conditions and with built in work flows to enable forwarding for authorisations and governance and ultimately flowing to personnel records update and generation of appropriate letters or contractual change conformations</p> <ul style="list-style-type: none"> • As an employee the manager will be able to perform employee related functions. • Perform approval related functions related to employee for all submissions by reporting employees (examples leave, reimbursements etc.) • Perform Performance Appraisal Related Functions relating to the 360 degree feedback relating to an employee • Perform any other function .as applicable as per requirements of DMIC IITGNL
HR Training, Appraisal and Performance Management	
FR 4.819	Competency Mapping: This should include Requirement the ability to match profiles against positions to determine skill and knowledge gaps which in turn are linked directly to training plans to address the skill gaps.
FR 4.820	Requirement to be able to capture individual development plans to roll up to training plans.
FR 4.821	Requirement to allow individual training courses and development steps to be displayed and monitored.
FR 4.822	<p>Once the employee has attended a training program the results should be stored in the system as well as in the employee profile enabling skills gaps to be addressed.</p> <p>System should provide workflow enabled functionality as per DMIC IITGNL requirements, which facilitates updation of the relevant records either by HR, Employee Manager and/or the employee.</p>
FR 4.823	Career Planning: Require the ability to build structured career paths to give the employee guidance as to what the career progression might be based on their job within the organization. This should linked to the process of Competency Mapping to prepare the employee for the higher positions.
FR 4.824	Require the ability for each employee to manage their career paths and aspirations, either through self-service capabilities or as a result of planning with their managers. This should include Requirement the ability to match profiles against positions to determine skill and knowledge gaps which in turn are linked directly to training plans to fill the necessary qualifications. Require the ability to build structured career paths to give the employee guidance as to what the career progression might be based on their job within the organization.
FR 4.825	Employee Performance Management and Appraisal System: Requirement to provide a flexible framework to integrate corporate goals and strategies with team and individual goals as well as integrate management-by-objectives. It should also provide functionality Requirement to be able to tie compensation to performance.
FR 4.826	The system is required to facilitate a 360 degree appraisal of employees. Through workflows the system should intimate the reporting managers, peers and subordinates to provide the online

	feedback for each employee.
FR 4.827	Functionality required to enable a DMIC IITGNL management committee to take a summary view of all the performance appraisals and implement decisions relating to career development, promotions and/or increments on a periodic basis. Through a workflow enabled system relevant updates to employee master data should be done automatically.
FR 4.828	Requirement to be able to produce metrics to show the distribution of individual performance within teams, departments, organization
FR 4.829	Performance Monitoring: Requirement to categorise transactional queries and escalate to Team Leader where SLA's are in "amber" or "red" status requirement to produce metrics relating to activity work load by Team and Individual. Integration required with the customer interaction portal, which would provide the source data for the transactional queries.
Manpower Planning and Recruitment	
FR 4.830	The system is required to assist DMIC IITGNL is forecasting the demand for human resources and the identify the additional requirement based on the current manpower strength. The system required to provide: <ul style="list-style-type: none"> • A record of approved or sanctioned positions for each department or organisational unit • Job Descriptions to be associated with each position • Nature of the Position (Intern, Temporary, Contractual or Permanent) • Report on manpower requirement based on current manpower and sanctioned positions • Grades and Pay scale for the post • Manpower cost planning
FR 4.831	Workforce Analytics: Requirement the ability to produce metrics and Organization charts relating to work force. Ability to do organizational modelling and workforce planning.
FR 4.832	Manpower Requisition: the system should automatically generate a manpower requisition which should be routed through a workflow approval process as per DMIC IITGNL requirements.
FR 4.833	Issue of Advertisement: one or more manpower requisition should be clubbed to advertise the post and request for applications along with the Job Description for each post. The exact details of the advertisements would be as per DMIC IITGNL requirements. The advertisement is required to be displayed on the DMIC IITGNL portal and/or any other portal or medium (newspaper advertisements) as customer requirements.
FR 4.834	Receive Applications: the system is required to be web enabled to receive applications position wise within the prescribed time line: on line, by email or letters. Integration of the system is required with the Portal.
FR 4.835	System is required to maintain a position wise an applicant data base of CV's, with search capability on various parameters like employee name, qualifications, Aadhar no. etc.
FR 4.836	Short Listing Candi and Evaluate the applications: system should facilitate preparing of shortlists and evaluate the submitted applications against the applicant database based on DMIC IITGNL criteria.
FR 4.837	Interviewer Lists: the system should maintain a list of prospective panel members for each position.
FR 4.838	Scheduling of Interviews: the system should facilitate scheduling of the applicants and Interviewers. The functionality for sending email intimations, SMS and/or letters should be provided by the system
FR 4.839	Interview process: The system should enable DMIC IITGNL to define checklists of evaluation criteria applicable for each position and facilitate recording of the interview results.
FR 4.840	Candidate Selection: The system should facilitate collation of the results of the selection process based on various DMIC IITGNL criteria enable DMIC IITGNL management to finalise the selection of the candidate
FR 4.841	Issue Appointment Letters: The system should facilitate issuing of appointment letters which can be transmitted to candidates on email or in hard copy.

FR 4.842	Onboarding and Induction – system should facilitate for the selected candidates <ul style="list-style-type: none"> background checks; define and facilitate the induction process for each candidate; and Provision and recording of company assets like mobile phones, laptops, company car as applicable for the grade and position.
FR 4.843	Expense Reimbursements: system should facilitate generation of travel requests for the interviewers and/or applicants for attending interviews and/or for employee onboarding. Based on the approved travel requests the travel bookings/arrangements can be done for the recruitment process.
FR 4.844	Workflows: the system should provide flexibility to define by means of a workflow the recruitment process to ensure process adherence as well as provide reminders to the relevant stakeholders in the recruitment process
FR 4.845	To allow users to create project teams based on skills and availability, monitor progress on a project, track time, analyse results, and much more. The solution should empower users to eliminate redundant or ineffective projects, optimize productivity through the smarter use of resources, and manage the workforce as efficiently as possible.
Employee Separation	
FR 4.846	Voluntary Separation: Functionality to accept the resignation or separation letter and as per notice requirements work out the last date of working
FR 4.847	Functionality to intimate acceptance of resignation, with a system work flow system defining the exit processes to be followed
FR 4.848	Exit Interviews: system to provide check lists for the exit interview processes and also record the interview processes System is required to cater to any other functionality as required by DMIC IITGNL
Time and Attendance	
FR 4.849	Time and Attendance: Requirement to optimize processes for planning, managing, and evaluating the working times and activities of internal and external employees via the Time Management capabilities. The system should provide functionality to record the attendance via a Biometric System/Facial Recognition Software/Card based Access Control etc.
Compensation, Benefits and Payroll	
FR 4.850	Compensation and Benefits Management Requirement: to operate Flexi Benefits including the ability to make payments to 3rd parties for provided benefits.
FR 4.851	Requirement to manage pensions administration as per DMIC IITGNL policies and rules.
FR 4.852	Requirement to link DMIC IITGNL overtime rules to payroll to enable paperless/e-enabled automated authorisation and processing for payment to enable employees and managers to view attendees, holidays etc.
Payroll Management	
FR 4.853	Ability to maintain leave records for computation of increments/pay revision with retrospective effect.
FR 4.854	Functionality to generate a monthly payslip for each employee which gives details of: <ul style="list-style-type: none"> Employee Name and Id Month and Year Leave Balance Bank Details Joining Date PAN NO PF Account No and/or UAN Location and Organisational Unit

	<ul style="list-style-type: none"> • Basic Pay • HRA • Other allowances • PF Deduction • Income Tax Deduction • Loan Repayment • Other Deductions and Recoveries • Any other details as required by DMIC IITGNL
FR 4.855	Perform full and final settlement of employees and recover the outstanding loan amounts. Work flow required to ensure full and final settlement is done once a clearance is received from all departments like Organisational Unit, Location, IT, Admin, Finance etc. as per DMIC IITGNL procedures
FR 4.856	<p>In addition to the standard payroll functions, the system should also comprise the following India-specific functions:</p> <ul style="list-style-type: none"> • Indirect Evaluation • Basic Increments • Dearness Allowance • Housing • Car and Conveyance • Long Term Reimbursements • Fringe benefits • Income Tax • Third Party Deductions • Income from Other Sources • Tax on Arrears • Exemptions • Exemption on Leave Travel Allowance • Exemption on Medical Reimbursements • Exemption on Medical Insurance • Exemption on Child Education Allowance • Exemption on Child Hostel Allowance • Exemption on Other Allowances and Reimbursements • Exemption on Leave Encashment • Exemptions due to investments by employees under Sections 80 C, 80D and/or other relevant sections of the Income Tax. • Previous Employment Tax Details • Professional Tax • Provident Fund • Employee State Insurance • Labour Welfare Fund • Nominations • Minimum Net Pay • Recovery of Rounding off Amounts • Loans Enhancement • One Day Salary Deduction • Mid-Year • Termination Work Bench • Gratuity

	<ul style="list-style-type: none"> • Superannuation • Forms as applicable
FR 4.857	Functionality required to generate the challan to deposit the ESI contribution. Suitable workflows are required to be developed to provide timely reminders as per the frequency required by DMIC IITGNL. The employee contributions will be deducted from the monthly payroll. Integration is required for this functionality with the Finance Module as the Employer contribution would be required to be booked as an expense in the Finance Module.
FR 4.858	Functionality required to generate the challan to deposit the PF contribution. Suitable workflows are required to be developed to provide timely reminders as per the frequency required by DMIC IITGNL. The employee contributions will be deducted from the monthly payroll. Integration is required for this functionality with the Finance Module as the Employer contribution would be required to be booked as an expense in the Finance Module. The PF payment records to be maintained and available to the HR department for audit purposes.
FR 4.859	Ability to support configuration and parameterization of different pay components including facility to add/modify/delete pay components.
FR 4.860	Ability to maintain employee data cost centre wise.
FR 4.861	Ability to define pay structures at various levels and types (such as permanent, contract employees, consultants, trainees etc.).
FR 4.862	Ability to support calculation of different allowances based on user-defined criteria.
FR 4.863	Ability to maintain all pay related rules (user definable) for automatic maintenance/ updating of data.
FR 4.864	Facility to indicate carryover and partial recovery.
FR 4.865	Ability to generate monthly balance and cumulative balance position of various accounts related to payroll for user definable periods.
FR 4.866	Ability to support withholding of any amount recoverable from employee against salary, Gratuity and other dues payable to employee.
FR 4.867	Ability to enter, administer and perform payroll for company loans, Voluntary Deductions, Recurring Payments/Deductions and additional payments.
FR 4.868	Ability to prorate salary and allowance payment based on employee hire or resignation date.
FR 4.869	<p>The System must provide functionality to cater to:</p> <ul style="list-style-type: none"> • Keep records of Sanctioned Posts • Employment in case of Death of any employee - Compassionate recruitment • Capture Employee Data – Employee Master • Employee Promotions and increments • Transfer of staff • Leave Management • Enquiry, Punishment Process • Annual Confidentiality report • Maintain Service Book
FR 4.870	<p>Reports:</p> <ul style="list-style-type: none"> • Attendance Register • Employee Detail Register • Transfer Detail report • Employee Pay Slip in a format as applicable to DMIC IITGNL • Salary Summary Individual Report • Professional Tax Report • Pay Comparison Report • Bank Report

	<ul style="list-style-type: none"> • Yearly Salary Sheet Report • Income Tax Deducted Report • TDS Reports • Form 16 • Payroll register • Performance Report Appeals • Grievance Report (status, date of event and final ruling) • Workers compensation • Disciplinary actions (paid/unpaid etc.) • Future leave approval (e.g., approved, deferred, rejected) • Leave status (vacation, sick, injury or any other user definable field)
Administration	
FR 4.871	Travel Policy: System is able to define, with valid to and from dates, the DMIC IITGNL travel policy, as applicable, for various organisational units and/or positions. In case of policy updates, the historical records need to be maintained in the system. The system shall configure applicable DMIC IITGNL travel policy as part of process flows.
FR 4.872	Travel Requisitions: Through a work flow process, the travel requisitions raised by the employees on ESS (Employee Self Service) are approved (as per DMIC IITGNL policy) and then forwarded to the Administration department. Exceptions to the policy are auto-highlighted by the system and routed for appropriate approvals. The details of the travel requisition form/screens will be finalized as per DMIC IITGNL requirements with the selected MSI during the project.
FR 4.873	<p>Shared Service Center: System is required to create a virtual Shared Service Centre (travel desk) where the approved travel requisitions are serviced.</p> <p>The proposed business model for DMIC IITGNL is to have one or more empanelled travel agents who will service these requests and facilitate travel. Finalized business model for the same will be shared with the successful Bidder.</p>
FR 4.874	Invoice Processing: The travel agents on a periodic basis will submit online invoices for ticket booking (train or air), taxis, hotel, travel insurance etc. along with details of approved travel requisitions. The MSI is required to propose, develop and implement the best practices for this process, subject to approval of DMIC IITGNL.
FR 4.875	Change in Travel Plans: System is to provide the functionality for change in travel plans by posting updates to the travel requisition. Alerts for action should immediately be sent to the Employee Manager, Administration and Travel Agent for making the required cancellations. These cancellations should automatically be reflected during the approval process of the vendor invoices.
FR 4.876	Expense Claim Processing: Respective employees will submit the travel claims (expense vouchers) on the ESS Portal where the system should automatically highlight the exceptions. Approval process should be facilitated by workflows in the system. Settlements of these claims should be routed through the reimbursement processes already defined.
FR 4.877	Miscellaneous Procurement: Administration department should be provided authorizations in the system, for using the procurement functionality for items relating to but not limited photocopying, travel services, stationery, printer toners etc. The system should allow requisitions to be created by the respective departments/employees and through a workflow approval process route the approved requisition to the shared service center where the appropriate empanelled vendor will service the request. The selection of the empanelled vendor can be done based on the type of requisition
FR 4.878	<p>Functionality to print gate passes when an asset is required to be physically moved out of the premises of DMIC IITGNL in the following cases:</p> <ul style="list-style-type: none"> • for transfer and/or loan to another department/project • temporary transfer and/or loan to another department /project • sending an asset and/or equipment to an external agency for repairs

2.2.4.15 Water Utility Management and Billing

Functional Requirements

WATER UTILITY MANAGEMENT AND BILLING	
FR 4.879	<p>Customer Service Management:</p> <ul style="list-style-type: none"> Need to support all services-oriented customer business processes. This includes the operation of customer facilitation centres with specific service processes such as customer billing, service order management, complaints & returns management, account & contact management and as follow-up process case management; An Internet-based self-service solution for occupants (lease holders or tenants) of a property or premise is also required. Hereinafter in reference to the detailed functionality related to water utilities, the term occupant includes lease holders as well as tenants; and MSI is required to provide a CRM system through which the services would be delivered to the customers. The CRM system will have a complete record of all customer interactions. The CRM system would also be used to deliver all other services, to be specified by DMIC IITGNL during the implementation project.
FR 4.880	<p>Service Order Management with Utility Billing:</p> <ul style="list-style-type: none"> Need service order management with billing to enable DMIC IITGNL to manage service businesses over the entire service life cycle process. From service contact to create, assign processing and monitoring of service requests to the management of customer connections and installed equipment/devices. Visibility of warranty and entitlements and the billing of time (effort) and materials spent on the work order. To ensure service level targets are met, improve customer satisfaction. Reduce costs and increase revenue by reducing the service-to-cash cycle. Improve service quality through 24x7 customer service - support multichannel interaction - collaborate with customers. Must be able to record and track all interactions with the customer no matter what the medium e.g. telephone or Fax etc. All customer tracking information should be presented to the service agent in a simple and standardized format.
FR 4.881	<p>Service Order Quotation: Need to offer a service order quotation before concluding the actual service order. This gives customers the opportunity to find out more about prices and delivery conditions before agreeing to the service order. Particularly important for Developer Services, Customer Side Leakage.</p>
FR 4.882	<p>Service Order Processing:</p> <ul style="list-style-type: none"> Need to allocate items to multiple external and internal recipients. These may be either billable or non-billable because of warranty claims, and they may stem from service orders or service confirmations. Assign internal and external recipients when creating the service order or service confirmation. When creating an amount allocation document, the bill-to party and invoice value are to be copied from the service order or service confirmation. Subsequently, the user will still be able to process or edit this data in amount allocation. Functionality must allow for sign off / authority levels to be complied as per DMIC IITGNL policy.
FR 4.883	<p>Service Confirmation Processing:</p> <ul style="list-style-type: none"> Ability to confirm working times, materials used, and expenses for services performed. Plan these confirmation items in a service process (for example, a service order) or an in-house repair order. The field service representative should then be able to reference the work order for further action to complete the required business process.

FR 4.884	Billing: Need to create invoices in the name of occupants using one or more billing due list item. Ability to create the invoice with reference to the rate charged, delivery, or to the sales order. Additionally, need to create bill or invoices with reference to contracts.
FR 4.885	Service Contract and Quotation Analysis: <ul style="list-style-type: none"> • Need to be able to monitor customer satisfaction with services performed under contracts. Identify contract products/services with a high net value and produce an overview of the value and volume of active service contracts. Report which particular contracts the service employees are responsible for. • Functionality must support monitoring and reporting the appropriate levels of customer satisfaction.
FR 4.886	Service Order and Quotation Analysis: Need to be able to report on current order volumes and support forecasts about fluctuations in business volumes for the forthcoming year. Need to take measures, e.g., to plan resources according to seasonal peaks or offer customers special service packages during quiet periods. Report by Customer Sector and Segment.
FR 4.887	Customer Service Processes: Must be able to support all occupant-related processes within our customer facilitation centre environment(s) or self-service through the portal. For instance, a partial list of these processes would include: <ul style="list-style-type: none"> • move in; • move out and if required refund of security deposit; • meter-reading entry or submission with WhatsApp with photo of meter reading; • meter inspection; • meter replacement; • bill correction; • Customer Service Process (Collaborative); • Disconnections; • General Inquiry; • Bill Payment; • Viewing Customer Ledger in a format specified by DMIC IITGNL; • Billing Inquiry; • Billing correction; • Process New Connections request and management of security deposit; • Convert a temporary water connection to a permanent connection; • Process Temporary Water Connection request and management of security deposit; and • Customer Master Data Changes.
FR 4.888	The system must allow the new connection request to be made by a lease holder of a premise or property. In case of an apartment block or building the property or premise may refer to an apartment.
FR 4.889	The system must allow a Move in/Move out process for an occupant for a property or premise.
FR 4.890	Identifying Account for Utility Service Processes: <ul style="list-style-type: none"> • During a customer contact, need to be able to use the multi-channel interface (telephone, E-mail, chat, and so on) to identify an account in the system; • Once account is identified and confirmed, the system provides customer information, such as the address, account balance, bills, dunning, credit, and information on past customer contacts; and • Need to be able to initiate business processes for a customer in the customer facilitation centre. And in addition, identify the premise, contract account objects and associated service zones.
FR 4.891	<ul style="list-style-type: none"> • Changing Account Data and Business Agreement Data: The call agent must be able to change account data or business agreement data. • The system must allow the account and/or business agreement to be entered into with the occupant of a property or premise.

FR 4.892	Master Data Overview (Account, Business Agreement, Consumption): During a customer contact, call fact sheets for an account, business agreement, and specific consumption data for an account in the system. To provide quick overview of the existing data, and to allows selection of individual objects from the overview (such as a bill) to be displayed in detail.
FR 4.893	Processing Move-In: Be able to create a move-in in the Citizen Facilitation Centre (CFC) as well as via the portal.
FR 4.894	Processing Move-Out: Be able to create a move-out in the CFC as well as via the portal.
FR 4.895	Processing Move in/Out for Account: Be able to create a move-in/out for an account in the CFC as well as via the portal. The account for move-in and move-out remains constant but the premise changes.
FR 4.896	Processing Move In/Out for Premise: Be able to create a move-in/out for a premise in the CFC). The premise for move-in and move-out remains constant but the account changes.
FR 4.897	Entering Meter Readings: Ability to enter, check, and save the current meter reading. The meter reading may be estimated if an account cannot be accessed by a meter reader.
FR 4.898	Changing Budget Billing Plan: Ability to change the budget billing plan. This could be done by changing the budget billing amount or the meter reading.
FR 4.899	Bill Information/Bill Correction: Ability to add/change information to a bill and to correct it if the meter reading is incorrect.
FR 4.900	Malfunction Notification / Service Notification: Ability to create a malfunction notification in the system. There are different categories of malfunction (for example, meter not recording or recording inaccurate) with different reference objects (for example, connection object, apartment, meter).
FR 4.901	Functionality for the customer agent to escalate an exception.
FR 4.902	Managing Financial Inquiries in Facilitation Centre: Enable customer agents to handle all types of finance-related inquiries with customers by providing access to finance-related data e.g. in the Invoice Display, Payment List, history or reminders and Balance Forward List of the Account or Business Agreement confirmed. The customer agent must be able to access the account balance for the customer's business agreements in a customer contact and display additional information (e.g. next due instalment, last payment or the last dunning notice for the business agreement) as well as a list of documents/document items grouped by several grouping criteria (e.g. all open items, all items included in a reminder letter/communication).
FR 4.903	Processing Payments: Need to generate call lists from the reminder communication and reminder batch run, which are then available for use in the Facilitation Centre to chase customers by telephone/Internet and request payment for open items. Agents should be able to display the call list size, the period, or the duration of the call list, the number of customers, and the names of the customers who are to be called. They can also review the information to be obtained from the customer if the call list is assigned a script. The agents can gather information before they begin answering calls or calling customers themselves. Resulting from the conversation with the customer, and then take payments from the customer for the due items for chasing and create deferral for open items.
FR 4.904	Change Service Location Data: Need to be able to change all relevant service location data (connection object, premise, and point of delivery) during contact with a customer. After identifying the premise, the call centre agent should be able to access the maintenance view for the service location. Here, the agent can change the connection object address, add additional premise data, or determine the grid for the point of delivery, for example.
FR 4.905	Service Contract and Entitlement Management: Service contract and entitlement management enables all service entitlements – warranties, extended warranties, service contracts, and service level agreements to be defined and tracked. Service agreement terms can be adapted and created to suit the varying and diverse requirements of the customer base. When service calls are placed and service orders created the appropriate entitlement information is associated with that activity and can be checked by a service representative or via Web self-service at any time. Particularly used for Customer Side Leakage or Developer Services.

FR 4.906	Complaints and Returns Management: DMIC IITGNL requires complaints management which allows it to easily create, manage and track complaints and returns. Customers can request their preferred action including credit, refund, or replacement of the specified product and installation. Customer Agents are provided with all relevant information to make effective decisions and can take immediate action to comply with the customer request.
FR 4.907	Warranty Analysis: Need to provide information about the amount of products/services with or without warranty and monitor expired warranties.
FR 4.908	Collecting meter readings in the metering database: The system shall have the ability to enter single meter reading as well as transfer meter reading from an external system.
FR 4.909	The system should also be capable of interfacing with Spot billing devices and Meter Reading Instruments for uploading such meter readings data including consumer meter readings. The data of all such meters will normally be downloaded on an external server.
FR 4.910	System should provide data validation checks to minimize data entry errors. It should incorporate user supplied logics to check variations in consumption and generate exceptions. After data entry, the system should generate an Exception Report for non-reading of meters due to any reason. It shall also highlight possible inconsistencies in the metering data. After handling of exceptions by the respective officials, the system should be updated with the result of exception handling. While validating, if the meter reading found low / unacceptable based on earlier readings/trends the system should issue a work order for checking and replacement of meter. If the work orders are not closed with valid reason system should escalate the issue till the same is resolved.
FR 4.911	Data Review The system should provide the facility for the designated officials to review the metering data as per utility defined criteria. In case any discrepancy is found, the system will allow the data to be edited, with proper access rights and audit trails.
FR 4.912	Provision to interface with AMR The system should be able to interface with Automatic Online Meter Reading devices. System should be capable to schedule and collect automatically readings from online connected consumer meters / zonal meters through automatic meter reading system. The system should generate exception in case meter reading found unacceptable after validation check.
FR 4.913	Meter Replacement: the system should provide functionality for meter replacement and correctly the relevant closing meter reading along with meter make, type & serial number of the old meter and the opening meter reading along with make, type & serial number of the new meter. The water / electric consumption for billing purposes, should thus be calculated correctly for the particular period, providing details of meter serial number and opening & closing readings of both meters
FR 4.914	Capturing Meter reading Data: The system should be capable of capturing meter reading data from a Meter Reading Book, handheld computers used for spot metering & billing for uploading and downloading the data. System should be capable to upload and download the data for a given set or group of consumers to Meter Reading Instruments (MRI)/Hand Held Computers (HHC) automatically. System should also keep log of MRI/HHC assigned to meter reader.
FR 4.915	Validations for the spot metering and billing data update: The system should be able transfer or update the meter reading validation logic to the MRI and spot billing machines. The system should have the flexibility of validating the data uploaded from the meter reading instruments. The validation would include restricting the customer data uploads to those that were indicated in the meter reader's schedule.
FR 4.916	Prohibiting the wrong entry, the system shall also have provision for prompting the Meter Reader at the time of entering wrong meter reading values in the spot billing machine.
FR 4.917	Monitoring meter reading plan: The system should make it necessary for the meter readers to upload all the meter readings according to the route plan generated within the timeframe stipulated by the utility. Otherwise exceptions should be generated and further meter reading can be entered only after clearance from specified authority. The system should track and generate the exception reports, for each meter reader to establish performance measures and determine deviations if any. It may include number of meters planned, number of meters actually read per day, number of wrong readings, unread meters by reason etc.

FR 4.918	Monitoring Customer Exception: The system should be able to track customer behaviour in terms of exceptions. For example: The number of times a customer figures in the list of exceptions.
FR 4.919	Supporting meter reading on trust: The system should also have the facility if desired by utility to enter the meter reading as specified by the customer by telephone/ fax/ web portal and record that the same is customer-specified. All customers who provide a reading on trust, should be inspected by the Utility after a specified time period.
FR 4.920	Overdue alert: In case a meter reading becomes overdue (Utility specified criteria), the system would generate the necessary exceptions and alerts.
FR 4.921	Accepting change in metering cycle: The system should be in a position to cater to changes in the metering cycle.
FR 4.922	Capability to store data for a specified period: The system should keep past metering data online for a period specified by the Utility guidelines from time to time.
FR 4.923	Interfacing with spot billing and MRI instruments: The system will support data downloading to and uploading from handheld devices used for Spot metering & billing and MRI. The devices would provide information about the meter number, customer code, meter reader's employee number, meter reading with date and time stamping, and billing amount.
FR 4.924	Meter reading for temporary connections: The System should be capable of accepting opening, closing and intermediate meter readings for temporary connections for generation of bills for such connection.
FR 4.925	Final meter reading for closure of connection: For all kinds of disconnections (whether a customer requests for termination of connection or utility disconnects due to non-payment), the system should accept the terminating meter reading (which will be out of cycle in most cases) for generating the last bill.
FR 4.926	Lifecycle monitoring and testing plan for meters System must be capable of capturing complete meter history (such as type, Make, Model, Batch, Catalogue Number of meters, its place of installation, cycle and record of calibration/testing) throughout meter's lifecycle, starting from arrival in stores till it is being scrapped or destroyed. System must be capable of capturing data like ordinary meter, electronic meter etc. System must be able to identify the meters, which are due for mass replacement or scheduled testing/calibrations and generate a work order for action by field staff. It is desirable that system should be able to interact with meter testing devices for obtaining test report.
FR 4.927	<p>Meter and Device Management: Require connection management processes for connection and device management infrastructure in transmission, distribution and metering companies. With the proposed installation of an Advanced Meter Infrastructure (AMI), it may be required to administrate and run remote and conventional meters in parallel.</p> <p>The system must provide the means to record meter details for a work order. Some examples of meter details are as follows:</p> <ul style="list-style-type: none"> • Meter serial number; • Date installed; • Meter location; • Meter size; • Out-reader location; and • Manufacturer Type.
FR 4.928	MIS generation System should be capable to monitor and track the following: Meter reader's performance, Comparison of input versus expected consumption, variance in consumption for consumers etc.
FR 4.929	Tracking meter location Current location of meter must be tracked i.e. in stores, under testing, at consumer premise, under overhauling etc. Data must be captured at appropriate locations and point of time to track the meter.
FR 4.930	Tracking meter status: The system will track the current status of the meter. Various options would include Correct Meter, Stuck-Up Meter, Sluggish Meter, Door Lock etc.

FR 4.931	Tracking meter/meter boxes Seals Tracking & reconciliation of meter seals i.e. date, type no. of seals, sealed by condition of meter etc. including meter boxes.
FR 4.932	Maintain life cycle information linked to meter: The system shall have the ability to maintain life cycle information on meters. This includes information related to the purchase, movement, installation, inspection, testing and ultimately retiring/scraping the meter.
FR 4.933	Maintain life cycle information linked to service point: The system shall have the ability to maintain life cycle information, including serial numbers on items that are linked to meters connections and service point.
FR 4.934	Editing capability: The system shall allow user to create copies of a given meter and its configuration and be able to edit individual copies as needed, e.g. when a new shipment of meter arrives.
FR 4.935	Tracking stock location: The system shall have the ability to maintain stock locations and asset inventory.
FR 4.936	Create meter identifier: The system shall associate each meter record with a permanent, unique identifier, determined by an authorized user. Duplicate meter identification numbers must be prohibited.
FR 4.937	Editing capability of recorded meter attributes: The system shall have the ability to add, update or delete data/attributes in all fields on the meter record. The ability to change a meter attributes from Billing to Non-Billing and vice versa.
FR 4.938	Procurement and Quality Management: Requirement to purchase devices in a new device category. When the devices are delivered, to receive the goods and assign a serial number for each device (may be manual or automatically). Also sample check to determine whether the delivered devices meet requirements. If the check is successful, transfer the devices to the main stores. Requirement for management and classification of devices and meters. The system must be able to track meters throughout their lifecycle.
FR 4.939	Adding meter record in batches: The system shall have the ability to add meters one at a time or in batches of meters.
FR 4.940	Recoding individual meter test results: The system shall have the ability to maintain unlimited individual test results on each meter.
FR 4.941	Recoding a group of meter test results: The system shall have the ability to maintain unlimited test results on a group of meters to support the analysis of purchase decisions and the annual meter recall program.
FR 4.942	Record connection type: The system shall have the ability to describe the meter connection type.
FR 4.943	Record bar coding information: The system shall have the ability to maintain bar coding information.
FR 4.944	Defining different types of meters: The system must provide the requirement to hold multiple meter types including compound meters, parent meters and sub meters. This functionality must cover all meter types like abstraction, flow meters, zonal meters.
FR 4.945	Manufacturer and calibration validity: The system shall have the ability to define manufacturer and calibration validity for a class of meters.
FR 4.946	Integration with other applications: The system shall have seamless integration with Meter Data Management application, Material management application, Asset Management application, Water Distribution Management Systems, Audit System and GIS.
FR 4.947	Record meter status/conditions: The system shall have the ability to track status of a device such as in-store, issued for installation, installed, sent for repair etc.
FR 4.948	Provision to assign document / text/ drawing related information: The system shall have the provision to assign document / text/ drawing related information to a meter/device.
FR 4.949	Record transactions: The system shall have the ability to record transactions related to meter installation, removal and replacements.

FR 4.950	Allocate/grouping: The system shall have the ability to allocate / group a meter with a zone or water mains.
FR 4.951	Define single level or multi-level relationship: The system shall have the ability to define single level or multi-level main meter and sub-meter relationship.
FR 4.952	Create meter hierarchy: The system shall be able to zone mains customer meter hierarchy and be able to do water leakage management. For this purpose, the MSI may be required to develop a report or query.
FR 4.953	Define meter reading reason: The system shall have the ability to define meter reading reasons such as periodic meter reading, control reading, reading at move-in etc.
FR 4.954	Define and optimize meter route: The system shall have the ability to define and optimize route for the meter reader.
FR 4.955	Sequence meter route: The system shall have the ability to sequence routes.
FR 4.956	Transfer meter between route the system shall have the ability to transfer single or a group of connections from one route to another.
FR 4.957	Integration with GIS: The system shall be interfaced with GIS for optimising delivery of water & electric utility services as well as other services to delivered by DMIC IITGNL.
FR 4.958	Attach note on meter reading the system shall have the provision to include pre-defined notes from Meter reader in Meter reading result.
FR 4.959	Allocate expected consumption for a given period: The system shall have the provision to allocate expected consumption for a device for a given period which may be used in absence of any representative meter read for meter.
FR 4.960	Provision to create meter reading based on criteria: The system shall have the provision to create meter reading order for a customer or for large number of customers based on relevant selection criterion.
FR 4.961	Define estimation rules: The system shall have the ability to define rules for determining "estimated" reading.
FR 4.962	Define validation rules: The system shall allow user defined meter reading validations rules.
FR 4.963	Send failed reading based on rules: The system shall have the ability to send failed reads to responsible department based on defined process for validation.
FR 4.964	Minimize the data entry errors: The system shall have the provision to minimize the data entry errors by validating meter readings based on user defined rules.
FR 4.965	Audit trail of failed meter reading: The system shall have the ability to correct / release / reset / estimate a failed meter reading with audit trail.
FR 4.966	Record certification data: The system shall have the ability to hold certification validity data in the meter record.
FR 4.967	Accept interval data: The system shall have the ability to accept interval meter reading data from AMR system.
FR 4.968	Download consumption information: The system shall have the ability to download previous 12-month consumption information for any or all meters.
FR 4.969	Utilization of multiple formats for meter read input data: The system shall allow utilization of multiple formats for meter read input data. The responder shall specify the available formats in the proposed system.
FR 4.970	Conditions for meter reading accept/reject: The system shall have the ability for meter reading accept/reject conditions to be user defined.
FR 4.971	Extrapolate future interval values: The system shall have the ability to extrapolate future interval values that may be used for forecasting.

FR 4.972	Prepare customer usage profiles: The system shall have the ability to prepare customer usage profiles including charts and graphs.
FR 4.973	Create service orders from meter reading trouble codes: The system shall be able to create service orders from meter reading trouble codes.
FR 4.974	Define different frequencies for meter reading: The system shall have the provision to define different frequencies for meter reading.
FR 4.975	Generate paper route documents: The system shall have the ability to generate paper route documents.
FR 4.976	Manually enter readings from generated paper route documents: The system shall have the ability to manually enter readings from generated paper route documents in the exact same order as originally produced.
FR 4.977	Maintain meter reading notes: The system shall have the ability to maintain meter reading notes.
FR 4.978	Maintain reading codes: The system shall have the ability to maintain reading codes.
FR 4.979	Maintain Reading Instruction Codes and notes: The system shall have the ability to maintain Reading Instruction Codes and notes by Premise and be able to automatically send them to meter reading device.
FR 4.980	Maintain Meter Location Codes: The system shall have the ability to maintain Meter Location Codes.
FR 4.981	Maintain a complete audit trail of all changes: The system shall have the ability to maintain a complete audit trail of all changes to any data item activity.
FR 4.982	Instructions for auditing meter readings: The system shall have the ability to randomly or selectively produce instructions for auditing meter readings through service orders.
FR 4.983	Generate automatic letters/notices: The system shall have the ability to generate automatic letters/notices to customers.
FR 4.984	Capture the meter data from zonal meters.
FR 4.985	Compare reading from consumer and zonal meters: The system shall have the ability to compare reading from consumer and zonal meters.
FR 4.986	Maintain different read types and billing selection priority: The system shall have the ability to maintain different read types and their billing selection priority (e.g. verified read, regular read etc.).
FR 4.987	Maintain locations and dates as meters move: The system shall have the ability to maintain locations and dates as meters move through the utility.
FR 4.988	Query and report on all meter physical locations: The system shall have the ability to query and report on all meter physical locations within the system.
FR 4.989	Maintain history: The system shall have the ability to maintain a history of readings, consumption and demand records.
FR 4.990	Display the Days of Services The system shall have the ability to display the Days of Services (DOS) with the calculated consumption.
FR 4.991	Display cancelled calculated consumption: The system shall have the ability to display cancelled calculated consumption resulting from billing adjustment.
FR 4.992	Recognize multiple meter exchanges and perform consumption calculations: The system shall be able to recognize multiple meter exchanges and perform consumption calculations based on reads from both the old and new meters.
FR 4.993	Maintain relationships between consumption history and a customer, meter and premise. The system shall have the ability to maintain relationships between consumption history and a customer, meter and premise.
FR 4.994	Store monthly demand data and corresponding charges: The system shall have the ability to store monthly demand data and corresponding charges.

FR 4.995	Display all relevant data and information related to a calculated consumption. The system shall have the ability to display all relevant data and information related to a calculated consumption, e.g. Reading Date, Charge Date, Days of Service, Billed Charges.
FR 4.996	Display the prorated consumptions: The system shall have the ability to display the prorated consumptions for each period separately.
FR 4.997	GIS Grid reference required for meters.
FR 4.998	Water Billing Customer Categories: The system must allow the category of the customer to be configurable like Domestic, Group Housing Society, Non-Domestic, Industrial, Commercial, Agricultural, Fire Hydrants, Temporary, Govt Agencies etc.
FR 4.999	<p>Water Bills for a particular Customer Category: System must be configurable to accommodate different tariff rates. The Water Bill line items must clearly indicate the various components which make up the bill. In case the actual consumption during the billing cycle exceeds a certain threshold (configurable), the system should levy a surcharge either on the relevant bill component as per the applicable rate.</p> <p>The system must also allow revision upwards or downwards of rates along with effective dates with a record of the old rate history.</p>
FR 4.1000	<p>Surcharges and Rebates on components of Water Bills must be configurable. These could either be based on percentages or fixed amounts.</p> <p>In certain cases, rebates or subsidies are given to specific customers and the system must cater to this functionality requirement.</p> <p>The system must also allow revision upwards or downwards of surcharges and rebates along with effective dates with an old record history.</p>
FR 4.1001	<p>Govt. Taxes and Levies: rates must be configurable and the system must automatically calculate the applicable amounts and apply them on the bills and if necessary, show them as separate line items.</p> <p>The system must also allow revision upwards or downwards of such taxes and levies along with effective dates with an old record history.</p>
FR 4.1002	Billing Cycle: the system must allow the billing cycle to be specified at customer master data level and/or customer category level. Further it should be possible to change the billing cycle applicable for a customer and/or customer category.
FR 4.1003	<p>Security Deposit: the interest rate on the security deposit must be parameterized and the interest amount should be automatically calculated and credited to the customer account. DMIC IITGNL should have the option of either crediting the security deposit and/or adjust this interest in the bill.</p> <p>Depending upon the change in water consumption, the required security deposit should be recalculated and a demand note be raised for the additional amount. Alternatively, a credit note be raised in favour of the customer in case of a decrease in the required security deposit.</p>
FR 4.1004	Retrospective Billing: system must have the functionality for retrospective recalculation of the water bills and issue a revised billing. The differential credit or debit amount should be automatically refunded and/or adjusted in the subsequent bills.
FR 4.1005	Rebate for Number of Bills: system must allow a configurable rebate for a customer depending on the number of bills generated in a year.
FR 4.1006	Interest on delayed payments should be automatically calculated and debited to customer account as per an DMIC IITGNL specified rate of interest. For part month interest calculation the denominator of number of days in the month should be configurable either to thirty (30) or the actual days in the month.
FR 4.1007	Cheque/Cash Payment: for amounts above a certain configurable threshold the system must not accept cash payments.
FR 4.1008	Joint Invoicing: System must be configurable to handle electricity and water billing in one Invoice. System provides the ability to calculate and bill for all products and services on a single bill, including both metered and unmetered services.

FR 4.1009	Collective Billing: System must be configurable to manage the group billing / collective billing in one invoice and payment should be adjusted accordingly.
FR 4.1010	Billing Simulation: System must be configurable to generate billing based on estimation / reading for checking purpose.
FR 4.1011	Out sorting / Validation: System should be configurable to manage amount level validation at billing and Invoicing level and manual checks, block.
FR 4.1012	Billing reversal / Adjustment: System should be configurable to manage bill correction and adjustment in case of customer complaints / wrong bills.
FR 4.1013	Manual Billing: System should be configurable to address old bill / archive bill generation requirement.
FR 4.1014	Unscheduled Billing: System should be configurable to generate online billing for unscheduled cases like final bill online.
FR 4.1015	Proration Scenario: System provides the ability to prorate based on the number of days that are outside the normal billing schedule. For example, billing days between 25-35 days is billed, based upon 30-days consumption / service charges, or anything outside of that range is billed based on the actual number of days.
FR 4.1016	System has the ability to prorate for days less than system or user- defined number of billing days.
FR 4.1017	System provides the ability to prorate a new bill based on the number of days active.
FR 4.1018	System provides the ability to prorate a final bill based on the number of days active.
FR 4.1019	Bill Print: System should be configurable to take print in Batch or online as per bill printing requirement for schedule or unscheduled billing (online printing).
FR 4.1020	System provides the ability to bill for multiple meters at a single location.
FR 4.1021	System provides the ability to accommodate back billing for a single period with a user-defined start and end date.
FR 4.1022	System provides the ability to produce duplicate copies of the bill.
FR 4.1023	Budget Billing: System calculates the average billing amount over a user-defined period for past billings.
FR 4.1024	System calculates the same monthly payment while capturing actual readings.
FR 4.1025	System provides a user-defined month for account to be reconciled (trued up). Difference between the budget months calculated and payment to the actual amount to be billed.
FR 4.1026	System will provide for estimating should actual reads not be available.
FR 4.1027	System provides the ability to estimate entire billing cycles or routes with user-defined read date.
FR 4.1028	System will calculate the estimated bill based upon the read date, not the bill date, to determine number of days in billing cycle.
FR 4.1029	System will automatically mark services that have been estimated with a unique identifier.
FR 4.1030	System should have the functionality for advance billing (especially for unmeasured customer categories) as well as billing in arrears based on actual or estimated consumption.
FR 4.1031	Functionalities associated with acquisition and purchasing of water from water distribution authority for further distribution at IIT needs to be included as part of this module.
FR 4.1032	Analysis Reports: <ul style="list-style-type: none"> • Demand analysis Report; • Collections analysis Report; • Revenue Recovery analysis Report; • Water Supply effectiveness Analysis Report; and

	<ul style="list-style-type: none"> Customer Service effective analysis Report.
FR 4.1033	<p>Executive Management Reports:</p> <ul style="list-style-type: none"> Consolidated view of operational profit & loss for all circle officers Drill down from the Transaction level to reports right up to section level Change the sorting order and view the report contents with the new sort order
FR 4.1034	<p>Consolidated Reports:</p> <ul style="list-style-type: none"> Consumption and sales; Revenue realization, revenue improvement; Customer complaints and water leakage losses; Executive Summary Report; Demand Vs. Collection; Summary information Report; and Commercial Performance Report.
FR 4.1035	<p>Single Parameter Reports:</p> <ul style="list-style-type: none"> Improvement Reports; Revenue Reports; and Operations Reports.
FR 4.1036	<p>Daily Reports:</p> <ul style="list-style-type: none"> Summary of % cumulative collections against correct month demand till date, last month.
FR 4.1037	<p>Revenue Collection Report:</p> <ul style="list-style-type: none"> Demand raised for the month (As spot billing is done throughout the month cumulative progress is presented); % cumulative collection against correct month demand, till date for this month and for the last month; and Monitoring of cumulative collection for the month till date against the demand raised.
FR 4.1038	<p>Other Reports: Other reports as per the Client requirements arising from time to time during project life cycle.</p>
FR 4.1039	<p>The System shall cover:</p> <ul style="list-style-type: none"> Citizen Service: Application for New Water Connection; Water Connection details given by Citizen; Support Metered and non-metered connections; Capture details of multiple lease holders with Aadhar no.; Maintain details of usage, no. of families, no. of taps, connection size, plumber's name; Billing address; Property no. for which connection is being applied for; Water connection details given by department; Distribution line, road digging details if any, meter make, meter no., initial reading, maximum reading supported, and installation date; Details of security deposit if any; Generation of Work Order; Citizen Service: Closing of connection (Disconnection); Citizen Service: Reconnection; Citizen Service: Change of lease holdership; Citizen Service: Change of usage; Citizen Service: Issuance of Duplicate Water Bill; Citizen Service: No Due Certificate for arrears of water;

	<ul style="list-style-type: none"> • Citizen Service: Meter Testing; • Registration for Plumber. (New registration and Renewal of license); • Meter reading entry; • Capture and print meter reading picture on bill; • Flexibility to capture meter reading at any instance irrespective of any fix reading schedule; • Facility to mark meter cut-off and restoration; • Handle scenarios where meter reading is not possible – meter is not working, stolen, tampered and apply standardized rules for calculating consumption and billing; • Meter reading data upload; • Water Billing; • Metered and non-metered billing; • Define billing schedule and billing cycles; • Support fixed rates, slab-wise rates or telescopic rates; • Support multiple tax/ charges; • Consider advance payments, penalty/ interest, arrears and rebate on early payments, meter rent where applicable; • Facility to generate bill for one connection/ multiple connections; • Pro rata Billing; • Collection – handling rebate on early payments; • Support for integration with Hand-held device for collections; • Disputes registration and resolution; • Facility to upload existing water connection records and outstanding as on cut-off date that is available in digital format; • Data Entry of existing Water connection records and outstanding as on cut-off date that is not available in digital format; • Reports; • Water Connection – List of consumers; • Plumber Register; • List of connections sanctioned; • Disconnection Register; • Security Deposits Register; • Meter Reading – based on various parameters; • Water Consumption statement for a period; • Advance Register; • Demand Register; • Collection Register; • Outstanding Register; and • Top Defaulters as per criteria.
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2.2.4.16 Citizen Grievances Redressal

DMIC IITGNL will provide various public utility services due to which, it might receive few complaints/ suggestions/ feedback pertaining to its services. To address all these complaints, it is necessary to have an efficient and effective grievance redressal mechanism. The objective of public grievance monitoring system is to provide multiple channels of grievance recording, in order to make it more citizens friendly and to provide linkages to different sections for increased transparency, citizen participation and performance accountability.

The system should have the ability to maintain different types of grievances caused to the citizens, department or section that needs to address the grievance, number of days within which the grievance needs to be addressed and nature of grievance whether it is financial or non-financial.

The main activities as part of Public Grievance Monitoring Management process include:

- Registration of the complaint/suggestion;
- Issuance of acknowledgment;
- Trigger an event in the Back-office system;
- Capturing of status of the complaint till it is resolved; and
- Generation of necessary reports for proper monitoring.

Functional Requirements

CITIZEN GRIEVANCES REDRESSAL	
FR 4.1040	The purpose of this module will be to integrate inputs / complaints received on any of the systems and trigger events in the Back-office system for the complaint to be resolved efficiently. The work flows outlined in this document aims at effective monitoring of service levels and reducing repeat complaints.
FR 4.1041	Grievance Management system shall be a web based application where the citizen can send their concerned grievance & suggestion to the respective departments. The citizen may interact with DMIC IITGNL using the portal, the mobile app, the kiosk or approach the citizen facilitation centre. In all these cases the work flow shall proceed from the portal.
FR 4.1042	Citizens can submit complaint/ suggestion/ application/ grievances to DMIC IITGNL. Each complaint is recorded with a unique number which is given to the citizen. These complaints are then forwarded to different sections depending on the type and nature of the complaint. The concerned section staff attends the complaints within the given time period. The reply is sent back from the corresponding department/section to Grievance Handling section and status is updated for the user.
FR 4.1043	Once the grievance is received, it shall have a work flow to trigger an event in the ISM system. The module shall have a comprehensive Service Delivery Framework which: <ul style="list-style-type: none"> • Is easily accessible; • Responsive to citizen's needs; • Enables quick decision capability • Connects all stakeholders with right kind of information in the quickest possible timeline; and • Allows all stakeholders clear visibility and communication.
FR 4.1044	The solution shall offer citizens ability of reaching out to DMIC IITGNL through variety of options to ensure broad based participatory framework of communication, thus enabling wider participation from citizens to improve service quality and civic livability quality. The proposed system shall offer multiple options by Citizen Facilitation Centre, online through web portal, SMS, phone calls & E-Mail, Web App, Mobile App, IVR, call back service, Public Interactive Kiosks etc., to register a complaint. Further, a time bound call centre is also being proposed to support and manage in and out calls to and from Citizens. All complaints shall be allocated, routed and managed through an automated algorithm which is designed to identify actual resource within DMIC IITGNL to manage the complaint and thus removing human interface to work assignment. Further, concerned higher authorities within DMIC IITGNL are to be empowered with real-time mobile Apps and web Apps to monitor the complaint resolution process and capability to intervene if necessary, to help them in decision making process to take needful corrective actions. The system shall automate enforcement of SLA policies and streamline and automate every process from initial citizen request to resolution more efficiently and cost effectively.
FR 4.1045	The system shall be capable of communicating with citizens and officers alike about the status and tracking of the complaints via SMS and email including unique tracking numbers.
FR 4.1046	The complaint redressal system shall enable configuration of DMIC IITGNL's respective geographical and administrative jurisdictions including service delivery essential information. The highest office in government pertaining to DMIC IITGNL management should have access capability to aggregated data and analytics from all the wards within the system.

FR 4.1047	The system shall have the ability to maintain different types of grievances caused to the citizens, department or section that needs to address the grievance, number of days within which the grievance needs to be addressed and nature of grievance whether it is financial or non-financial.
FR 4.1048	It shall have the ability to maintain the statuses of the grievances registered in IIT. Also, the ability to maintain the details of work/application that has not been addressed within the prescribed time, number of days of delay and compensation paid per day in case of delay in SLA of the grievances registered in DMIC IITGNL.
FR 4.1049	The system must maintain the details of officers designated to redress grievances mapped to the department-section and the compensation details from the officer responsible and payment details to the citizens if the applications are not processed within the prescribed time. (Breach of SLA).
FR 4.1050	<p>On sending the grievance & suggestion the department officials are bound to respond to the grievance & suggestion as per the specified time frame. All grievances & suggestion would be allotted a unique number which would be the base for further correspondence. There would be automatic escalation plus provision for DMIC IITGNL staff to post confirmation of a 'before' and 'after' of the complaint. Following reports shall be generated by the applications:</p> <ul style="list-style-type: none"> • All grievances registered during a given period; • Pending grievance registered during a given period; • Disposed grievance during a given period; • Duration of grievances registered during the period; and • Repeated grievances registered during the period.
FR 4.1051	All these reports can be generated departmental wise, grievance wise, department & grievance wise. On the basis of these reports, analysis can be made and decisions shall be taken by government officials.
FR 4.1052	DMIC IITGNL will provide various citizen and public services due to which, it might receive number of complaints/ suggestions/ feedbacks pertaining to its services. To address all these complaints, it is necessary to have an efficient and effective grievance redressal mechanism. It helps in making the administration more accountable, responsive and user friendly. The objective of public grievance monitoring system is to provide multiple channels of grievance recording, in order to make it more citizens friendly and to provide linkages to different sections for increased transparency, citizen participation and performance accountability.
Modes of complaint registration	
FR 4.1053	<ul style="list-style-type: none"> • Through Citizen Facilitation Centre; • Online through web portal; • Through E-Mail; • Through hardcopy applications/mail; • Through SMS; • Mobile App; • Through Calls • Public Interactive Kiosks; • Through IVR; • Based on Recorded details; • Call Back; and • Other existing complaint systems.
FR 4.1054	The system should be capable of converging information management and delivery system, which enables calls, collected through different communication channels to be converged on to the common distribution system and hence brings in commonality in allocation and response mechanism.
Complaint Registration	
FR 4.1055	<p>Through Call Centre (Phone, e-Mail & SMS):</p> <ul style="list-style-type: none"> • A citizen calls designated telephone number;

	<ul style="list-style-type: none"> • Call centre operator registers the single or multiple complaints with required details. • Complaints through e-Mail / SMS shall be received at call centre; and • Complainant shall be communicated the complaint tracking number(s) generated by the system and acknowledgement SMS send to the registered mobile number. <p>At Citizen Facilitation Centre:</p> <ul style="list-style-type: none"> • Citizen visits the CFC location in person to get his / her complaint registered; and • Complaint shall be registered in the system with all due details and a printed acknowledgement receipt shall be given to the citizen. <p>Through Website:</p> <ul style="list-style-type: none"> • Citizen shall be able to register his / her complaint on website and can print acknowledgement receipt. <p>Through Public Interactive Kiosks:</p> <ul style="list-style-type: none"> • Citizen shall be able to register his / her complaints at Public Interactive Kiosks which shall be located at all strategic locations around IIT. Complainant shall be communicated complaint tracking number(s) generated by the system and acknowledgement SMS send to registered mobile number. <p>Through IVR:</p> <ul style="list-style-type: none"> • Citizen calls on the designated number; • This feature shall be available when Call centre is not operational i.e. during non-working hours or when all lines at the call Centre are busy; • In case all the activated extension numbers are engaged with other calls or operator not available to receive calls, the IVR system activates call waiting message for the caller with the option to either wait or option to dial 9 and give missed call for call back to caller or register call via voice recording; • IVR system shall record the complaint details provided by the citizen during the call; • Call centre operator registers the complaint based on the details provided in recording or calls back the citizen to register the complaint; and • Citizen is given a complaint registration number via SMS. <p>Through GIS map:</p> <ul style="list-style-type: none"> • Citizens shall be able to register the complaint by providing their plot number or by selecting the location from the GIS map.
FR 4.1056	There must be no option to delete tickets. They may be classified as Active or non-active
Complaint Allocation	
FR 4.1057	<p>Once a complaint is registered with the system, it automatically is assigned to a concerned area officer dealing with the problem based on the scientific algorithm engine built in to the system and allocation matrix defined. The system should automatically send an SMS and email to officer alerting him / her on the complaint.</p> <p>Application should offer following definable Allocation methods:</p> <ul style="list-style-type: none"> • Workload based allocation; • Round robin allocation based on SLA hours; and • Sequential allocation of complaint to each member of the team. <p>If the complaint is not resolved and closed within the specified period, the same should get escalated to higher authorities. The allocation and escalation process should be fully automated and not require any human intervention; however, system should provide a feature to switch to manual allocation, if needed.</p>
Field Call Report in case of citizen area visit	
FR 4.1058	The DMIC IITGNL officer updates the details of the work done along with the status of the complaint (Pending / closed) in the system against each complaint. The system shall maintain the history of the work done.

Complaint Closure	
FR 4.1059	<p>The officer needs to resolve a complaint within a specified SLA period. Once a complaint is resolved, the officer fills a field call report and submits to a superior, who in turn calls the complainant to seek his / her satisfaction on the measures undertaken to solve the problem.</p> <p>If the complaint is not redressed within a fixed number of hours, the system shoots off SMS and email to higher officials in hierarchy based on the escalation matrix defined.</p>
FR 4.1060	Complaint closure may result in creation of a service request that may or may not have a financial implication and may require consent from the citizen/investor. The system should be able to handle such cases.
Complaint Re-Open Process	
FR 4.1061	The Citizen has option to re-open his / her complaint if not satisfied with the services rendered. The Citizen can request to re-open the complaint via Email or Phone or SMS. Any complaint can be re-opened only if it is within the SLA or re-open hours set for that complaint. All re-opened complaints shall be escalated to concerned senior officials.
Complaint Status	
FR 4.1062	The Citizen should be able to know the status of his / her complaint online from website, application or through phone / SMS.
Citizen Feedback	
FR 4.1063	Citizen/Investors should have an option on the website to voluntarily provide their feedback on the complaint redressal process and also to comment on the satisfaction/dissatisfaction received by them while using the system.
Problem Category, Problem Category, SLA	
FR 4.1064	<p>The various problems, for which the complaints are raised, could be part of a particular Department. These problems are categorized as Drainage Maintenance, Footpath, Roads etc. could be part of Engineering department & Traffic signal/Central Verge plantation site, Tree cutting/trimming related problems could be part of Garden department.</p> <p>Application Administrator should be able to define standard SLA hours, problem category and problems. The application administrator shall be:</p> <ul style="list-style-type: none"> • Able to add/edit/delete standard SLA; • Able to add/edit/delete different type of problem category; • Able to add/edit/delete problems under problem category; • Able to attach standard SLA hours and department to each problem; and • Admin shall be able to change status of problem category in active/inactive state.
Holiday, Department, Designation, Employee	
FR 4.1065	The application administrator should be able to manage DMIC IITGNL's holiday calendar, department, designation and employee details in the system.
Allocation & Escalation Matrix	
FR 4.1066	<p>The application administrator should be able to maintain allocation matrix for the DMIC IITGNL's employees in resolving the various categories of problems for the area for which he / she is responsible to look at. This setup helps the Automatic Complaint allocation to the employees. Set the priority based on which the selected employee will receive the complaints for the selected department's problem category of his/her area.</p> <p>The application administrator should be able to set up the escalation matrix for each department at the various levels and to define what should be the mode of escalation communication for each of these levels and define their frequency.</p> <p>The system automatically escalates the complaints based on SLA, escalation matrix and the frequency defined.</p>
Area Mapping, Area Transfer, Employee Transfer	

FR 4.1067	<p>Complaint allocation process should be tightly integrated with DMIC IITGNL's area, employees and complaints. Based on the problem location, the complaint should get allocated to the DMIC IITGNL official. Each area of a city is mapped with the DMIC IITGNL's operational area and each employee is mapped with location & department.</p> <p>The application administrator can transfer area from one operational area to another as well as an employee from one location to another. The transfer process shall be designed in such a way that all pending complaints shall be automatically be detached from the employee being transferred and the same shall be either automatically attached to the peer or higher official in hierarchy.</p>
Complaint Transfer	
FR 4.1068	DMIC IITGNL Official can transfer his / her pending complaints to another official from the same or different area / location.
Dashboard	
FR 4.1069	Real-time processed information immensely aids senior officials in taking immediate corrective and preventive measures. Analytical reports help administration in identification of areas of concern and root-causes. The Grievances System shall provide a real-time dashboard.
Service Analytics Engine	
FR 4.1070	The system should provide DIY (Do It Yourself) data analytics platform based on the philosophy of analytics for all.
FR 4.1071	The dashboard shall have provision of monitoring service level agreement.
FR 4.1072	The users should be able to access the dashboard in tablets/laptops/desktops.
Mobile App for Citizen	
FR 4.1073	<p>Comprehensive Complaint Redressal System shall be one of the modules in DMIC IITGNL Portal and Mobile Application for easier registration of grievance. The grievance redressal module in DMIC IITGNL Portal and mobile application shall have:</p> <ul style="list-style-type: none"> • Device Registration & profile creation; • Complaint registration; • Complaint Status; • Upload geo location tagged pictures; • Know your Location; • Share App; • Update Profile; and • Citizen Opinion.
Mobile App for Complaint Closure	
FR 4.1074	<p>Grievance Redressal module in the DMIC IITGNL Portal and mobile app shall have a front-end Complaint Closure module for field. Below are the features of the Complaint Closure Module:</p> <ul style="list-style-type: none"> • Easy-to-use authentication process via registered mobile number during initial application set up on the respective mobile devices; • Facility to view the list of complaints allocated to the respective field officer along with the easy access to detailed information on each registered complaint; • Visibility to problem location's image captured and submitted by the citizen, thereby facilitating field officer with ease of locating the problem area; • Real-time monitoring of problem based SLA compared to the defined SLA for each registered complaint allocated to the field officer, thereby allowing better complaint management; • The complaint is colour-coded based on their defined SLA status and problem category – Red for complaints that crossed SLA period for resolution and Green for those complaints that are within SLA; and • Facility to change complaint status from 'Open' to 'On Hold' or 'WIP' or 'Close'.

Decision Support System through Mobile App	
FR 4.1075	By virtue of their duty, officials in DMIC IITGNL are expected to move around. They demand a reliable and accurate system for taking necessary decisions in real-time mode. Through DMIC IITGNL portal and mobile app, senior officers shall have a capability which provides real-time dashboard of operational parameters and highlights areas of concern. It also provides contact book of entire team, that immensely help senior officer in reaching out to the right officer instantly for taking appropriate and timely decisions.
Online Services	
FR 4.1076	Grievance Registration.
FR 4.1077	Grievance Search.
FR 4.1078	Grievance acknowledgement.
FR 4.1079	Grievance resolution intimation.
Masters & Initial Setup	
FR 4.1080	Complaint Type, Sub-types, Capture of Mobile No. of citizen.
FR 4.1081	Mapping of Designation / Roles to Complaint Sub-type.
FR 4.1082	Integration of Complaint Type / Sub-type with Departmental Modules.
FR 4.1083	Citizen Charter for each Complaint Type (Define duration of complaint redressal & escalation path in case of no redressal).
Complaint Acceptance	
FR 4.1084	Complaint Acceptance through Citizen Facilitation Centres / Internet / Kiosks.
FR 4.1085	Facility to make UID ID compulsory for certain complaints. Facility to check dues for allowing certain complaints.
FR 4.1086	SMS alert to concerned employee.
FR 4.1087	Facility to mention the action on complaint.
FR 4.1088	Automatic escalation of Complaints (beyond stipulated time frame).
FR 4.1089	SMS alert to citizen upon Action Taken Report.
FR 4.1090	Facility to accept and analyse citizen feedback on the Administration Action.
FR 4.1091	Facility to mark a complaint as fake / invalid (for not considering it in the normal reports or report for Project System).
MIS	
FR 4.1092	<p>Exhaustive reports shall be generated by the system for officers at various levels for effective decision making and period review of operations.</p> <p>Some of the MIS reports generated from the system will be as follows:</p> <ul style="list-style-type: none"> • Department Wise DMIC IITGNL Location wise SLA Summary (Within SLA v/s Beyond SLA); • Registration Mode wise Complaint Summary; • Department wise IIT Location wise Average TAT Report; • IIT Location wise TAT; • Detailed Complaint Report with FCR; • Detailed Complaint Report without FCR; • SLA Wise Ageing Details; • Complaint Status Summary; • Complaint Transfer Summary; • Department wise weekly status report – Registered, Closed, Within SLA / Beyond SLA;

	<ul style="list-style-type: none"> • Reopen Complaint as on Date with complaint status; • Registered v/s Closed Complaints; • Missed call Detail; • DMIC IITGNL Employee Reporting Hierarchy; • List of on hold complaints; • Operator wise Login-Logout Report; • List of mobile numbers from which complaints registered; • List of complaints Transferred; • DMIC IITGNL Standard SLA v/s Actual TAT report; and • Real-time statistical reports for DMIC IITGNL locations/departments is made available to senior officers on web based as well as on based mobile applications.
FR 4.1093	Pendency reports (complaint-wise / Dept.-wise).
FR 4.1094	Top Performers / Least Performers.
FR 4.1095	Analysis of Grievances.

2.2.4.17 Right to Information

Functional Requirements

The module for RTI should have the ability to accept applications, register requests, make first appeal, payment gateway, disposal to relevant department, track status, maintain an appeal register and status of appeals. The mode of payment for the RTI should be made online through Internet Banking/ Debit Card/ Credit Card.

RIGHT TO INFORMATION (RTI)	
Content	
FR 4.1096	<p>The portal should display the following:</p> <ul style="list-style-type: none"> • RTI circulars; • Names of Public Information Officer (PIO); • Details of Departments: Introduction, Objectives, responsibilities, powers & duties of officers, employees with gross salary, activities, time limit, directory with telephone numbers; • Committee: Members, purpose, type, freq. of meeting, docs available for public; • Projects/ Activities: Budget head, work activities, allocated amount, current statistics. • Details of concessions, subsidies given, computerization done in various depts; and • Scope as per RTI including forms • References links: • The Right to Information Act, 2005; • Guide on The Right to Information Act, 2005; and • The Right to Information Rules, 2012.
General	
FR 4.1097	Provide all services under RTI under a single category.
FR 4.1098	Be able to retrieve service request form.
FR 4.1099	Request can be received on the portal, the mobile application or at the citizen facilitation centre. The request has to be forwarded appropriately and track kept of the information supplied and time lines. The request can also be forwarded from the state government or information commission. In each case the information supplied has to follow the same path.
Apply for Information	

FR 4.1100	The portal should allow Indian citizens to file online application under the Right to Information. The user shall also be able to make payment of the prescribed fees online on this portal online. Functionality to record RTI Applicant details should be available
FR 4.1101	The user should be able to fill the details required to file the RTI. The mandatory fields should be marked with * while the others should be left optional.
FR 4.1102	A prescribed column should be provided to the user to enter the text of the application. The text of the application shall be limited to 2000 words only.
FR 4.1103	If the text of the application entered by the user exceeds the word limit, the user shall have the option to upload the application as an attachment
FR 4.1104	The user shall be directed to the payment page to pay the prescribed fees after filling the details required to file the RTI.
FR 4.1105	The user shall be able to pay the prescribed fee through the following modes: <ul style="list-style-type: none"> • Internet banking; • ATM cum Debit Cards; • Credit Cards (Master/Visa); and • UPI.
FR 4.1106	The system shall be able to send the unique registration number received after filing the RTI to the user by SMS and Email that shall be used by the user for future references.
FR 4.1107	The system shall be able to send email/ SMS alert to the user if additional fees is required for providing the information asked by the user.
FR 4.1108	The user shall be able to see the following on the portal: <ul style="list-style-type: none"> • Application filed on; • Status of the application; and • Additional fees, if required.
FR 4.1109	In case of rejection, the system shall allow the concerned PIO to state the reason of rejection.
FR 4.1110	In case of acceptance, the system shall open a new page with all the accepted service request by the concerned PIO.
FR 4.1111	Allow the PIO to send mail.
FR 4.1112	Save the acceptance / rejection only on digital signature of the PIO.
FR 4.1113	Auto generate notification to concerned officials about service request allocation.
FR 4.1114	The system shall comply with the requirements of filing the RTI as well as other provisions regarding time limit, exemptions etc., as provided in the RTI Act, 2005
FR 4.1115	If documents are to be supplied to the applicant, the system shall be capable of scheduling a meeting (date & time) and accepting payment for the same.
Workflow	
FR 4.1116	Be able to route the service request to concerned officer (Public Information Officer - PIO).
FR 4.1117	Have the functionality to accept service request even if the service request is not directed to particular section.
FR 4.1118	Be able to route such application to MD's office for further re – routing.
FR 4.1119	Allow MD to allocate RTI to concerned PIO for service request under “other categories”.
FR 4.1120	Auto generate notification of service delivery request to concerned PIO on submission of service request.
FR 4.1121	Be able to send SMS alert/Auto generated mails to the applicant and concerned authorities whenever required.

FR 4.1122	Allow the concerned PIO to accept / reject the service request as per the guidelines of the RTI act.
FR 4.1123	Each request received can be forwarded to the concerned department.
FR 4.1124	The workflow should have provision for multiple levels of forward or return within organisation.
Appeal	
FR 4.1125	The portal shall allow Indian citizens to file the first Appeal. The user shall also be able to make payment of the prescribed fees online on this portal.
FR 4.1126	The user should be able to fill the details required to file the Appeal. The mandatory fields should be marked with * while the others should be left optional.
FR 4.1127	A prescribed column should be provided to the user to enter the text of the application. The text of the application shall be limited to 2000 words only.
FR 4.1128	If the text of the application entered by the user exceeds the word limit, the user shall have the option to upload the application as an attachment
FR 4.1129	The user shall be directed to the payment page to pay the prescribed fees after filling the details required to file the Appeal.
FR 4.1130	The user shall be able to pay the prescribed fee through the following modes: <ul style="list-style-type: none"> • Internet banking; • ATM cum Debit Cards; • Credit Cards (Master/Visa); and • UPI.
FR 4.1131	The system shall be able to send the unique registration number received after filing the Appeal to the user by SMS and Email that shall be used by the user for future references.
FR 4.1132	The system shall be able to send email/ SMS alert to the user if additional fees is required for providing the information asked by the user.
FR 4.1133	The system shall automatically use the unique registration number provided to the user as reference number if user files for an Appeal.
FR 4.1134	The user shall be able to see the following status on the portal: <ul style="list-style-type: none"> • Application filed on; • Status of the application; • Status of the appeal; • Additional fees, if required; • Appeal filed on; and • Replied on.
FR 4.1135	If documents are to be supplied to the applicant, the system shall be capable of scheduling a meeting (date & time) and accepting payment for the same.
FR 4.1136	The user shall collect the documents at the Citizen Facilitation Centre (CFC) or at the meeting scheduled.
FR 4.1137	The system shall comply with the requirements of filing the first appeal as well as other provisions regarding time limit, exemptions etc., as provided in the RTI Act, 2005
Track Status	
FR 4.1138	The user shall be able to track the status of the RTI or first appeal filed b
FR 4.1139	The system shall allow user to track the status of RTI or first appeal by entering their mobile number or unique registration number assigned for their application.
MIS	
FR 4.1140	Number of RTI filed.

FR 4.1141	Pending RTI.
FR 4.1142	Department / Employees involved.
FR 4.1143	RTIs closed.

2.2.4.18 Legal

This module will assist the legal cell of DMIC IITGNL in monitoring and analysing all their legal cases and expenditures.

Functional Requirements

LEGAL	
Masters	
FR 4.1144	Advocates, Law firms & their fees.
FR 4.1145	Court Master.
Case Management	
FR 4.1146	Registration of new cases, allocate advocate, allocate DMIC IITGNL officer.
FR 4.1147	Facility to attach various documents related to the case.
FR 4.1148	Entry of Date of Hearing.
FR 4.1149	Alerts to officers with respect to hearing date.
FR 4.1150	Entry of hearing details.
FR 4.1151	Capture of judgment.
FR 4.1152	Details of payments to the advocates & law firms.
FR 4.1153	Linkage to the departmental data.
FR 4.1154	Linkage to GIS to capture location reference for cases.
FR 4.1155	The system should be linked to Finance for payment to law firms.
FR 4.1156	It should also link to the customer master (using property id) for any transaction / interaction / case for updation of current situation.
FR 4.1157	Legal Opinion on various departmental queries, agreement formats to be stored in Document Management.
FR 4.1158	The system should be integrated with the file management and document work flow system. This should include workflows for legal advisory, litigation, contract management, invoices, legal notices, tenders etc.
MIS	
FR 4.1159	Case Pendency reports (Department-wise / advocate or law firm wise / Officer-wise).
FR 4.1160	DMIC IITGNL shall decide what information shall be posted on the dashboard.
FR 4.1161	Reports with respect to Cases won / Lost / Appeals made.
FR 4.1162	Payments to the Legal Advisor / Law firms.
FR 4.1163	Repository / link for various act and provision with search option.
FR 4.1164	Integration / Link to Uttar Pradesh Government site for references.
FR 4.1165	Repository / link of all the cases since 1950 by High court and Supreme Court with search feature.
FR 4.1166	Exact scope of work will be decided on consultation with the department at the time of implementation

2.2.4.19 Secretarial and Meeting Scheduler

Functional Requirements

SECRETARIAL & MEETING SCHEDULE	
FR 4.1167	Maintain a database and records of Directors, Key Management Persons, committees and members and all related compliances. Data to be discussed with the Client.
FR 4.1168	Cater to regular and event based compliances as per time lines
FR 4.1169	Maintain a repository of forms as per the companies act. In addition, reminder functionality for all compliance associated with form submissions should be available.
FR 4.1170	Maintain a database of all Agendas and minutes of meetings
FR 4.1171	The databases may pertain to committees such as audit, board, CSR, and meetings such as general body, independent directors, NRC to name a few.
FR 4.1172	Maintain all forms and payment challans
FR 4.1173	Ability to draft and maintain a progress report (Action taken report) of decisions taken at meetings
FR 4.1174	Integrate with the FMS to add items in the agenda for meetings
FR 4.1175	Ability to create and record Agenda for the meeting.
FR 4.1176	Functionality for various Departments to send topics to include in Agenda
FR 4.1177	Functionality to add agenda items as additional items during the progress of the meeting
FR 4.1178	Preparing and printing Notice for the meeting
FR 4.1179	Emailing the Notice to members
FR 4.1180	Record the resolutions passed
FR 4.1181	Ability to draft Minutes of the Meeting and circulating the same
FR 4.1182	Tagging the officer / group with the respective meeting.
FR 4.1183	Provision for preparation of agenda as per the organization standards.
FR 4.1184	Tracking of progress as per target date, assigned officer with status.
FR 4.1185	Provision to upload the signed agenda in the system.
FR 4.1186	Facilitate SMS or WhatsApp notifications to participants and observers.
FR 4.1187	Provision for intimating about the meeting to a particular user / group.
FR 4.1188	Provision of storing all signed minutes of meeting
FR 4.1189	Integration with Microsoft / other mail and messaging software to push meeting details directly to recipient's calendar (as applicable).
FR 4.1190	Tracking of action taken on agenda items (Action taken reports)
FR 4.1191	Provision for recording progress on action taken report.
FR 4.1192	Maintaining attendance records.
FR 4.1193	Regular notifications to departments responsible for progress.
FR 4.1194	All meetings to be categorized.
FR 4.1195	If any meeting or any item of a meeting is related to any project of DMIC IITGNL, then the project name should be tagged to that meeting/specific item, so that all decisions taken in different meetings relating to a specific project can be fetched instantly.
FR 4.1196	Provision for maintaining contact details with email ID, mobile No. etc. of both internal and external participants / members along with meeting hall in charge.

FR 4.1197	While sending SMS to participants regarding the meeting scheduled, SMS also to be sent to meeting hall in charge to make necessary arrangements.
FR 4.1198	WhatsApp / SMS / notifications to be sent to meeting members, should there be a change in schedule
FR 4.1199	Provision for distributing the agenda notes & MOM, etc. to all participants through email and sending an SMS regarding the same.
FR 4.1200	Provision to create draft and final versions of minutes of meetings
FR 4.1201	As per MOM, target date provision to be kept along with task assigned to the officers and there should be provision for updating action taken report by them along with uploading of supporting documents if required.
FR 4.1202	Provision for uploading scan copy of agenda notes and proceedings with minimum metadata like meeting date, subject, name of participants etc. for old authority meetings, advisory council meetings, etc.
FR 4.1203	Progress and status reports from stakeholders
FR 4.1204	Generation of department-wise action taken/action pending report for particular or all meetings conducted during a date range.
FR 4.1205	Reminder and calendar to be maintained for all secretarial functions
FR 4.1206	Notification to concerned stakeholders on target date of tasks. Capability should be available for requisition of progress and status reports from respective stakeholders.
FR 4.1207	Dashboard should be available for secretarial functions
FR 4.1208	Tagging of projects and reports should be available to assist in filtering all references to a subject

2.2.4.20 Visitor Management

VISITOR MANAGEMENT:	
FR 4.1209	Registration of the visitors (personal details, contact details, purpose of visit, whom to meet, etc.)
FR 4.1210	Maintain a database of visitors with search facility
FR 4.1211	Auto population of data based on the search match
FR 4.1212	Capturing the in time and out time of the visitor.
FR 4.1213	Integration with web cam and printer.
FR 4.1214	Printing of gate pass for entry
FR 4.1215	Work flow to include approval of visitor from the person to be met
FR 4.1216	Gate pass to include QR code for entry to the turnstile, if required
FR 4.1217	Functionality for return of gate pass to enter 'out time' or for official visited to mark it on the system
FR 4.1218	Functionality to notify DMIC IITGNL personnel via SMS/WhatsApp regarding details of the visitor which has registered for meeting at the System. SMS/WhatsApp shall also be sent to Visitor regarding acceptance/rejection or delay in meeting.
FR 4.1219	System shall be integrated with Portal or any other System which enables functionality for DMIC IITGNL personnel to respond to any visit/meeting requests.
FR 4.1220	Generate reports as required
FR 4.1221	The Application shall be available on a tablet and mobile phone.

2.2.4.21 e-Mail Solution and Instant Messenger with Online Storage for DMIC IITGNL

E-MAIL SOLUTION	
FR 4.1222	e-Mail service solution shall be provided by MSI. E-Mail solution shall be enterprise and shall preferably be from the same Cloud Service Provider (CSP).
FR 4.1223	e-Mail solution shall have the domain registered in the name of DMIC IITGNL.
FR 4.1224	MSI shall provide 50, expandable to 75, e-mail domains for users of DMIC IITGNL.
FR 4.1225	The proposed e-mail solution shall have a minimum 50GB active mailbox size capacity for users.
FR 4.1226	The Proposed solution should provide access mail services and data via secured internet access through mobility devices – Smartphones, Tablets etc.
FR 4.1227	The proposed enterprise mailing solution should have unlimited mails archival capacity
FR 4.1228	Should natively support server-side and client-side calendaring and scheduling, including: <ul style="list-style-type: none"> • Checking the online availability of intended attendees for a meeting • Sending of request for meetings - Accept or reject meeting requests • Provide conflict management for meetings • Reply to requests for meeting with a newly proposed time and date • View free busy status of a group of users in a single window and ability to schedule the meeting with all the users in the windows
FR 4.1229	The Enterprise Mail Solution Ability to index Corporate Address book and personal address book alphabetically. All address books must available to the users through rich client, web client and supported mobile devices.
FR 4.1230	The proposed enterprise mailing solution should support accessing mails on popular mobile platforms for Android and iOS platforms through OEM owned and managed Mobile apps including Mobile App Updates.
FR 4.1231	The proposed enterprise mailing solution should be configured for security policy (Password policies) enforcement and remote erase capability for smartphones to protect data on supported mobile devices
FR 4.1232	Should be capable of administration through a single window interface to provide service level control and configuration of the enterprise mailing solution
FR 4.1233	Solution should allow to configure Customize Anti-Spam Policies, Solution should provide Built-In Anti-Malware Protection, Solution should allow to configure Customize Anti-Malware Policies,
FR 4.1234	The proposed solution should provide at least 99.9% Uptime of mailing services
FR 4.1235	The proposed solution should provide on Online Service Health Dashboard
FR 4.1236	MSI shall migrate existing e-mail service of DMIC IITGNL to the proposed e-mail solution provided as part of the ICT MSI RFQ cum RFP.
FR 4.1237	MSI shall support and maintain the e-mail solution for the duration of the Contract. MSI shall also be responsible for migration of existing DMIC IITGNL e-mail solution to the proposed e-mail solution.
FR 4.1238	The Proposed e-Mail solution shall come under the SSO solution.
INSTANT MESSAGING SERVICE	
FR 4.1239	The proposed enterprise messaging service shall be used by DMIC IITGNL internal employees for sending short messages and files internally.
FR 4.1240	The proposed solution should be a commercially available enterprise class SAAS Solution, preferably provided by the CSP proposed for the Project.
FR 4.1241	The Proposed solution should provide access services and data via secured internet access through mobility devices – Smartphones, Tablets etc. through an OEM owned first party App including App updates.

FR 4.1242	Ability to provide conferencing—that is, simultaneous shared communication— between 2 to 100 parties with any combination of the following five functional types: <ul style="list-style-type: none"> • Voice over IP communications • Video communications • Web collaboration via presentation of documents, applications, and desktops including Desktop Sharing and Application Sharing • Web collaboration via joint editing and control of documents, applications, and desktops • Allow File Transfer during the user session • Allow Address Book Integration for user search and Org Hierarchy view in contact card • Allow Calendar Integration with Enterprise Mail and Messaging solution native integration
FR 4.1243	Ability to record conferences for later reviews, optionally to include collaborative content, voice, and/or video. Ability to publish these recordings to a location that is accessible by others
FR 4.1244	Ability to integrate with supported room based video conferencing system that can be directly registered as an end point to cloud based proposed Online Meeting and Instant Messaging solution
FR 4.1245	Cloud based collaborative solution should mandatorily support meeting joining experience from all the latest browser and delivers a full online meeting experience including IM, voice, multiparty video, data collaboration and sharing
FR 4.1246	Ability of the cloud based Online Meeting and Instant Messaging solution to support a meeting to up to 50 participants in a single session
FR 4.1247	Ability to record meeting in the cloud & making it available for future reference
ONLINE STORAGE	
FR 4.1248	Online Storage solution shall provide minimum of 100 GB of Online Cloud Storage per user and Sync Capabilities of Data within User End Points (Laptop/Desktops) and Online Cloud Storage (without any third-party component).
FR 4.1249	Online Storage solution shall allow users to access documents, spreadsheets and presentations and other standard Office file formats and edit simultaneously i.e. should support Co-authoring by multiple users on real time basis.
FR 4.1250	Online Storage solution shall allow Desktop, Mobile Apps (Android and iOS) and Browser based access and experience of Online Cloud based File Storage.
FR 4.1251	Online Storage solution shall have an inbuilt centralized Admin console for Administration and Reporting.
FR 4.1252	Online Storage solution shall allow users to attach the documents from the Online Cloud based File Storage and Sharing platform into the proposed email solution as Placeholders (placeholder with file Link within the Online Cloud storage) without attaching the original file and hence allow mail size optimization along with automated versioning in case of file updates.

2.2.4.22 Enhancement of e-LMS

DMIC IITGNL is in the process of implementing a land management system. This system is to be implemented in 4 phases. Phase 1 has the creation of DMIC IITGNL website, Applicant Registration and Login, Project Information, Upload of Applicant's Documents, Fees & Deposit Calculation & Payment. This is already implemented. The balance phases include:

Phase 2:

- DMIC IITGL Staff, Experts Registration and Login;
- Application Review & Verification by DMIC IITGNL;
- LAC Meeting Notification;
- Resubmission of application process as required;
- Sub-Plotting or Amalgamation of plots;

- Web Portal Updates;
- LAC Meeting Documentation;
- Land Allotment;
- Applicant Actions/Payment of BOP;
- Sub-Lease Deed & Corresponding Documentation; and
- Android Mobile App.

Phase 3:

- Temporary Utility Application;
- Provisional Fire NOC Application;
- NOCs / Building Plan Approval;
- Verification & Response;
- Resubmission / Online Approval for Utility and Fire;
- Commencement Certificate;
- Document Uploads; and
- iOS Mobile App.

Phase 4:

- Online Building Plan Approval;
- Construction Commencement Delay Checks & Reminders;
- Dues Payment;
- Documentation / Notifications;
- NOCs & BCC Approvals;
- Verification / Resubmission;
- Occupancy Notification;
- Subletting, Subleasing, Mortgage, Transfer, Surrender, Restoration etc.; and
- Financial accounting.

Functional Requirements

ENHANCEMENT OF e-LMS	
FR 4.1253	This system will have to be enhanced to include and integrate with the proposed Automated Building Plan Approval System (ABPAS).
FR 4.1254	Include functionality for tree cutting permissions which will come from forest department
FR 4.1255	GIS integration and query functionality as specified in the GIS section to be incorporated
FR 4.1256	Include functionality for alteration, revision and expansion of building.
FR 4.1257	Multiple plinths and multiple buildings in a plot.
FR 4.1258	e-LMS shall be integrated with Finance module for billing and transaction related requirements pertaining to land sales. Functionality to integrate the challan deposited in the bank for payment by investors with Finance and LMS

2.2.4.23 Automated Building Plan Approval System

Automated Building Plan Approval System should be able to provide online solution to DMIC IITGNL for building layout plans movement process monitoring for automatic development control regulations.

Functional Requirements

AUTOMATED BUILDING PLAN APPROVAL SYSTEM	
FR 4.1259	The system shall be able to provide an online solution to DMIC IITGNL for automated building plan review, scrutiny and approval in compliance with the Development Control Regulations (DCR).
FR 4.1260	The stakeholders of this system include – Applicant, Architect and DMIC IITGNL (Client).
FR 4.1261	The functionality given below will have to be met by an enhancement of the e-LMS application together with an automated building plan approval module.
FR 4.1262	The system software shall be able to read the CAD drawings (supporting all versions of AutoCAD), which will be uploaded to the system. Any AutoCAD license which are required by Client to support this functionality shall be provided by MSI.
FR 4.1263	As part of the compliance check, the system shall produce a deviation report with comments and compliance based on the DCR provided by DMIC IITGNL.
FR 4.1264	The system shall accept the files in the pre-defined format. System shall check the basic requirements i.e. land use, planning area, etc. as per the city norms. If the submitted plan is not permissible, then the system shall be able to generate automatic notifications along with the comments.
FR 4.1265	After pre-checking of the plans, the system shall be able to scrutinize in detail the building plans and generate the report accordingly with the comments.
FR 4.1266	The system shall support following features: <ul style="list-style-type: none"> • Transparent citizen service delivery; • Faster processing of file; • Provide service to ensure efficiency and reliability; and • Email and Message service for notification and alerts.
FR 4.1267	The system shall be user friendly for both citizens and DMIC ITGNL staff.
FR 4.1268	The system shall support minimum human intervention during the review and scrutiny process.
FR 4.1269	The system shall integrate with the other modules such as e-LMS, and other ISM applications over web-services.
FR 4.1270	The system shall be independent of one particular machine and can be installed centrally with shared access for multiple users.
FR 4.1271	The system shall be able to provide an online solution to DMIC IITGNL for automated building plan review, scrutiny and approval in compliance with the Development Control Regulations (DCR).
FR 4.1272	System will have facility for uploading the soft copy of the building plan along with the application.
FR 4.1273	System will allow uploading other necessary document along with the application
FR 4.1274	System will allow DMIC IITGNL officials and empanelled architects to access/download the same for verification of particulars.
FR 4.1275	Owner of the land /Applicant will upload the building plan as per Building bye-laws in the CAD neutral drawing format with other supporting documents
FR 4.1276	DMIC IITGNL will verify the documents and drawing and may give their comments
FR 4.1277	Owner / Applicant may have to upload the revised drawing after incorporating the comments given by the DMIC IITGNLs
FR 4.1278	Owner / Applicant will make the payment of the prescribed fee online/offline

FR 4.1279	Facilitate checking of the documents submitted by the applicant for building plan approval. Based on these an acknowledgement will be generated and given to the applicant.
FR 4.1280	System will generate application reference for Building Plan Application/ Layout Application for the applicant and facilitate online tracking of the status of the application.
FR 4.1281	System will send e-mail/SMS notification/WhatsApp to the applicant and empanelled architects to whom that application has been sent
FR 4.1282	The detailed workflow of approval of the plan needs to be mapped in the file management system.
FR 4.1283	Online help will be available to the user for each system function. Topics covered in the user manual shall also be available through the online help.
FR 4.1284	The drawings in .dwg file format or other widely accepted formats to be mapped and evaluated against the prevailing Building bye laws, DCR and other norms as prevalent to DMIC IITGNL. Applicant shall be able to apply for approval of drawings for new construction/ renovation/alteration/demolition etc.
FR 4.1285	A computerized and automated scrutiny report indicating the required/permissible parameters and the proposed parameters is to be tabled including status of each rule whether passed or failed.
FR 4.1286	There will be system generated list highlighting the points on which the plan is failing, thereby enabling all authorities to prepare objection list and inform the applicant to take necessary actions. The applicant will be informed by email/SMS and through the web portal at each step of approval.
FR 4.1287	The acknowledgment letters, approval letters, deviation or the rejection letters etc. will be system generated.
FR 4.1288	System will address automated building scrutiny of preformatted .dwg file or other widely accepted format drawings along with Building plan approval process management in an integrated manner.
FR 4.1289	System will Auto-Detect structures in the drawing based on usage (e.g. Residential, Commercial or Residential- Commercial Mixed) and also auto detection of high-rise buildings or low-rise buildings. This detection will be in accordance with color codes designated for various land uses. For example: yellow for residential, blue for commercial etc.
FR 4.1290	The System will define the colour coding table for the layers that have to be followed in the drawings/document being submitted.
FR 4.1291	System will Auto generate Floor Area Ratio (FAR), Area statement and Schedule of opening by reading preformatted .dwg file or other widely accepted format drawings.
FR 4.1292	System will Auto-generate of plot area & plot area calculation for cross verification with system entered value by triangulation.
FR 4.1293	System will Auto hatch particular objects as per building control rules.
FR 4.1294	System will Auto detect site margins and verification of coverage area.
FR 4.1295	System will Auto-generate failed entity report and marking the same on the drawing
FR 4.1296	System will make Plotting of drawing submitted by Architect and processed through software in non-editable format.
FR 4.1297	The information of the pending application at each stage shall be available through the system to the stakeholders.
FR 4.1298	The system will guide the applicant about the regulations and generate scrutiny report
FR 4.1299	It will ensure an easier integration of 3rd Party Applications using web services or APIs
FR 4.1300	The solution will manage the content lifecycle (drawings, certificates, note sheets etc.) related to each proposal so as to maintain complete traceability
FR 4.1301	System will have the facility to submit payment online i.e. module will be integrated with payment gateway. applicant shall pay fee online for building plan approval.
FR 4.1302	System will be integrated with workflow management system

FR 4.1303	System will have facility to set the different workflow or Same workflow approval level for DMIC IITGNL.
FR 4.1304	Complete requirement will be studied by the MSI at the time of preparation of SRS. For existing Building By-Laws being following by DMIC IITGNL, refer to https://www.greaternoidaauthority.in/blaws2010 .

2.2.4.24 Dashboards

Functional Requirements

DASHBOARDS	
FR 4.1305	<p>The dashboards shall be developed as an interactive, state-of-the-art and user-friendly dashboard to view the details regarding the following as a minimum:</p> <ul style="list-style-type: none"> • Treasury • IIT Software Modules (ISM) Applications • GIS • Information Related to Power and Water Utilities • Solid Waste Management • Environmental Parameters • Information related to Investors and land allotment • Information regarding other trunk infrastructure of IIT • Service level agreements <p>Other key performance indicators related to operations of the City. Dashboards shall the capability of providing snapshots of Key Performance Indicators across modules in order to help in decision making.</p>
FR 4.1306	Dashboards shall display a Web based GIS map of IIT classifying the plots as per their respective land use.
FR 4.1307	<p>Dashboards shall display operational metrics using the following types of graphical and interactive representations as a minimum:</p> <ul style="list-style-type: none"> • Bar graphs • Pie Charts • Histograms
FR 4.1308	<p>The critical parameters for all the operational systems are expected to be tracked in the Dashboard:</p> <p>- Land Management Charges - Water charges - Financial Accounting - Grievance Management - Works Management System – all others.</p>
FR 4.1309	<p>Dashboards shall be able to display details regarding the following as a minimum:</p> <ul style="list-style-type: none"> • Land bank availability (in Ha/ sq. m.) for available and sold plots (For all land use types) • Unsold inventory (in INR Crores for all land use types) • Land revenue received on Quarterly, Half-yearly and Yearly basis (in INR Crores) • Other revenues received on Quarterly, Half-yearly and Yearly basis (in INR Crores) • Land revenues scheduled for receiving (in INR Crores) • Fund availability status (in INR Crores) • Grievances/ complaints received/ pipelined/ resolved • Details of project works and status ongoing at IIT
FR 4.1310	<p>Dashboards shall be able to display the activities initiated between DMIC IITGNL and any investor as per the predefined timelines related to allotment of plot(s). This shall include showcasing information regarding the following:</p> <ul style="list-style-type: none"> • Payments made to and from DMIC IITGNL • Permits/ Licenses/ Letters issued to and from DMIC IITGNL

	<ul style="list-style-type: none"> • Activities/ milestones achieved as on current date for investor and/or DMIC IITGNL • Upcoming activities/ milestone(s) deadline for investor and/or DMIC IITGNL • Notifications regarding any overdue activity/ milestone for investor and/or DMIC IITGNL
FR 4.1311	<p>Dashboards shall be capable of displaying the following in context to a plot or group of plots:</p> <ul style="list-style-type: none"> • Utility Billing and Collections (in INR) • Water Consumption (in cu. m) • Electricity Consumption (in kWh) • Grievances received and their current status on Quarterly, Half-yearly and Yearly basis
FR 4.1312	<p>City's Cockpit/ Dashboards shall be capable of displaying the following industry level parameters in context to a plot or group of plots:</p> <ul style="list-style-type: none"> • Nature of industry • Number of skilled/ semi-skilled/ unskilled workers • Annual and Quarterly turnovers (in INR Crores) • Total production (Yearly basis)
FR 4.1313	<p>Dashboards shall be integrated with e-Land Management System (e-LMS) platform for IIT. The Cockpit shall be capable of extracting and displaying information regarding the following parameters as a minimum:</p> <ul style="list-style-type: none"> • Number of plots open/ scheduled for booking; • Number of applications received (For both individual plots and city as a whole); • Number of allotment letters issued; • Number of subleases issued; • Number of possession letters issued; • Number of defaulters recorded; • Investor chronology / reports; • Alerts/ notifications regarding accomplishment of any overdue activity/ milestone for any investor and/or DMIC IITGNL. • Dashboards shall be capable of viewing information regarding the above-mentioned parameters for the following land use types: <ul style="list-style-type: none"> • Industrial plots (Hi-Tech, Bio-Tech, R&D); • Commercial Mixed-Use plots; • Residential plots (Group Housing, EWS Housing); • Utilities plots.
FR 4.1314	<p>Customizable dashboards for citizens shall also be available where they can view city metrics as per their area of interest such as environment data, social parameters etc.</p>
FR 4.1315	<p>The system should have the ability to compare Year on Year performance of various parameters</p>
FR 4.1316	<p>The dashboard shall have a capability and format for key information input from providers such as health care and education and performance data such as production, employment, collections from industrial users.</p>
FR 4.1317	<p>The users should be able to access the dashboard in tablets/laptops/desktops</p>
FR 4.1318	<p>'Open Data' policy will also be explored for citizen awareness and participation.</p>
FR 4.1319	<p>The details provided above are indicative and exact parameters are to be finalized during implementation. However, dashboards must be provided and a facility to collect the information requirement for Dashboard must be provided through Portal solution and other smart city applications. It may also require integration with various information providers. MSI will be responsible for complete solution design along with integration with information sources for respective indicators. Wherever information needs to be collected from stakeholders residing in the city or investor or various facilities in the city, portal solution will need to be developed by MSI so as</p>

	stakeholders can provide the information required and the same can be presented on KPIs and dashboard.
Authorizations	
FR 4.1320	Dashboard shall be able to display real-time data of operational metrics as per the hierarchy of DMIC IITGNL's officials.
FR 4.1321	Senior Executives of DMIC IITGNL shall be entitled to viewing all sorts of city's operational metrics. Access to view operational metrics shall be given as per the hierarchy of DMIC IITGNL's officials.
FR 4.1322	System shall have an assigned administrator which shall be capable of adding/ removing/ updating the authorization of DMIC IITGNL's officials
FR 4.1323	City's Cockpit/ Dashboards shall be easily customized, integrable with other Smart City Applications and scalable in nature to meet future requirements.

2.2.4.25 Dongle based e-Signature Solution

Proposed Solution

The solution proposed for DMIC IITGNL involves DSC stored dongles/ USB-token. The dongle will store all the digital signatures of officers of the department to enable them to sign from any device such as laptop, desktop, tablet and/or mobile that they access. The investors and technical persons shall digitally sign using their signatures dongles. The MSI is expected to supply all necessary dongles, software and licenses to enable the digital signing solution.

Functional Requirements

DONGLE BASED E-SIGNATURE SOLUTION	
FR 4.1324	The Dongle based e-Signature solution shall enable DMIC IITGNL Officials to digitally sign the documents using Digital Signature Certificates.
FR 4.1325	The e-Signature solution shall be a web socket based solution utilizing 2 Factor authentication for document signing.
FR 4.1326	The Web Socket shall support communications using TCP protocol.
FR 4.1327	DMIC IITGNL official(s) shall be able to digitally sign the documents using their respective digital signature certificate.
FR 4.1328	The e-Signature solution shall be compatible with either/ all of the following web browsers: <ul style="list-style-type: none"> • Google Chrome 16.0 or above • Firefox 6.0 or above • Internet Explorer 10 or above • Safari 6.0 or above • Opera 12.1 or above"
FR 4.1329	The e-Signature solution shall support the following Operating System as a minimum: <ul style="list-style-type: none"> • Windows (XP or above) • Linux (Ubuntu 14.04 or above)
FR 4.1330	e-Signature solution shall ensure that the document is signed using Dongle based DSC at the Client side.
FR 4.1331	e-Signature solution shall be able to integrate with different IIT Software Modules (ISM).
FR 4.1332	e-Signature solution shall be able to integrate with DMIC IITGNL's proposed blockchain solution for land records.
FR 4.1333	e-Signature solution shall allow the same document(s) to be signed by multiple DMIC IITGNL officials.

2.2.4.26 Integration and Interfaces

Functional Requirements

INTEGRATION AND INTERFACES	
FR 4.1334	<p>The DMIC IITGNL functionality requirement is to create a SOA based enterprise framework to enable online integration for the various application components as per the solution proposed by the MSI. This framework must include:</p> <ul style="list-style-type: none"> • Back office modules; • Citizen facing modules; • GIS & web GIS; • Land management system; • Command and Control System; • File Management System; • e-Signature solution. • Multi-channel communication interfaces which includes devices like desktops, laptops, tablets, mobile/handheld devices working on Android, Apple, Windows or any other contemporary platform; • E-mails, WhatsApp and SMS services; • SCADA systems; • Payment Systems (not limited to RTGS, PAYTM, BHIM, Credit Cards etc.); • Banks; • Solid Waste Management System; • Fleet Management Systems and Vehicle Tracking Systems, as applicable; • Systems relating to central and/ or state governments; • Websites/portals of central and/or state governments; • UP government portal – Udyog Bandhu (Integration required); • Systems owned by Vendors and/or City Operators; • Police, Fire Brigade and other relevant state agencies; • Systems/portal relating to any other domestic or international organisation as per DMIC IITGNL business needs; and • Any other system to be included in the proposed solution and being implemented by other Contractors.
FR 4.1335	Functionality should be provided for validation of data movement between source and target system.
FR 4.1336	Functionality should be provided to prevent duplicate updates of batch data files provided by external entities. The scope of this requirement should not be limited to the following illustrative example like reconciliation statements provided by Banks.
FR 4.1337	Not with standing anything contained in this document, the solution should cover all DMIC IITGNL business needs and provide the required interfaces, bi-directional or uni-directional. During the course of the implementation there could be DMIC IITGNL business needs which may arise which will be addressed.
FR 4.1338	The DMIC IITGNL requirement is for online integration as a default. The MSI should propose a batch interface only because it is justified by business exigencies.

2.2.4.27 Foundation Layer

The Integration environment should focus on components that would help in realization of principles of Service Oriented Architecture (SOA). The architecture shall envisage a service delivery environment for creation of services that share the main concepts of services, service descriptions, the specification of an associated data model, and the use of a service contract to help in realization of combinational services via vertical integration. It shall also help in faster and cheaper deployment of new services for silo based applications. One of the key

architectural principles while designing the solution for the SOA compliant architecture shall mostly be of out-of-box functionality and based on best practices in implementing a forward looking and future proof solution.

The details requirements of each layers/components & sub-components of system architecture are given below:

Functional Requirements

ACCESS CHANNEL	
FR 4.1339	Integrated Portal services shall be accessed online through Web, Mobile app and Kiosks via several end user devices (PC, Tablets, Smart-phones, etc.).
Mobile Governance	
FR 4.1340	<p>All modules must have mobile apps.</p> <p>Examples for the portal are given below:</p> <ul style="list-style-type: none"> • All Services including submission of forms and payments; • Acknowledgements and status updates related to delivery of public services; • Grievance registration and tracking; • Alerts related to emergencies, Government notifications and campaigns, weather information, tax reminders, pensions; • Alerts to nearest hospitals and police stations during accidents/ disasters; • Reporting suspicious activity to Law Enforcement agencies; • Maps and location-based services; • Employment opportunities (job ads, availability of jobs); • Mobile-based application filing, such as RTI filing, applying for government services, license renewals, etc.; • Citizen engagement: opinion polls and feedback gathering, stakeholder consultation. • Mobile-based polls; • Mobile work flow alerts to outsourced and DMIC IITGNL employees; • Ability to book key facilities at DMIC IITGNL; and • Integration with weather, environmental and other sensors being provided as part of DMIC IITGNL for enabling open data initiatives.
FR 4.1341	All the above application must have mobile apps that are mirror image of each module.
FR 4.1342	The mobile version should mirror the portal / software module and be adapted for optimum viewing on multiple operating systems and device sizes. However, the actual application layout design for both mobile and web is the responsibility of the MSI.
FR 4.1343	Mobile mirroring is for web site, portal, Software Modules. It is also assumed that MSI would attempt to include as many services over mobile devices as possible, beyond the ones explicitly mentioned in this document.
FR 4.1344	<p>All the important features and functionalities envisaged in the present RFQ cum RFP should be made available through the mobile application.</p> <ul style="list-style-type: none"> • The bidder should design the architecture and should be responsible for its robustness, reliability and scalability. The architecture as envisaged by DMIC IITGNL is that the Portal provides the multi-channel communication interface which drives the mobile apps. • The Portal in turn integrates all modules and applications which are expected to provide out of the box proven and robust functionality. • It is expected that the Bidder would study the detailed requirements related to the software modules and other applications as specified in the RFP and detail out the functionality/business processes. <p>A subset of the Portal Functionality (which may be all functionality depending on the business process design suggested by the bidder) would be mobile enabled such as but not limited to the following:</p>

	<ul style="list-style-type: none"> DMIC IITGNL perspective: approval of leave applications, purchase requisitions, payment release etc, initiate a requisition, work order confirmation etc.; Citizen perspective: Lodge a complaint, pay property tax and other bills etc.; Industry Perspective: apply for water connection or electricity connection, etc.; The bidder should not assume that the above-mentioned examples is a complete list. It is repeated that the solution architects preparing the bid, must have an end to end business process perspective which cuts across business applications which also demonstrates the quality of resources deployed for preparing the solution design which should be included in the proposal; Role based authorisation design should cover end to end business processes as well as the unit application component level; and The final list of business processes to be mobile enabled would be finalised during the project in a phase or sprint as planned by the bidder.
FR 4.1345	All the facilities for a citizen can be accessed through an intuitively designed mobile application.
FR 4.1346	<p>DMIC IITGNL Portal shall be made mobile-compliant through the following:</p> <ul style="list-style-type: none"> Open standards shall be adopted for mobile applications for ensuring the interoperability of applications across various operating systems and devices; Uniform/ single pre-designated numbers (long and short codes) shall be used for mobile-based services to ensure convenience: e.g. 51969 and 166 procured by MeitY for M-Gov Services; Exploit the exploit the mobile services delivery gateway, which would be a central hub for all mobile transactions for device and technology agnostic solutions; and Provide mobile-based services through all delivery channels including SMS, Voice/ IVR, Unstructured Supplementary Service Data (USSD), GPRS/3G, SIM ToolKit, and mobile application store (m-Appstore).
FR 4.1347	The mobile apps shall be provided in Android and iOS versions
FR 4.1348	The apps shall be responsive for viewing in different device sizes
Presentation Layer	
FR 4.1349	The presentation layer i.e. User Interface would be used for the receiving and delivery information for to and from the end-user of the application. It should be responsive.
Single Sign On	
FR 4.1350	<ul style="list-style-type: none"> Single Sign On or SSO refers to granting access to multiple yet related application using a single credential stored in a specific implementation of LDAP/ AD/ ADFS. SSO shares centralized authentication servers that all other applications and systems use for authentication purposes and combines this with techniques to ensure that users do not have to actively enter their credentials more than once. For government user, the SSO implementation should require creation of a domain on a domain controller. All government user laptop/desktop must be part of the domain. Users shall be created on the domain. There has be to trust relation established between the applications, machine and the user. Once the user logs into his/her machine using domain account, no application should present login screen for login into specific applications. Once the user changes his/her domain password, it should automatically be replicated across all connected applications. Password policies should be strictly enforced. As single sign-on provides access to many resources once the user is initially authenticated, it increases the negative impact in case the credentials are available to other people and misused. Therefore, single sign-on should emphasise a strong focus on the protection of the user credentials.
Workflow Engine	
FR 4.1351	Workflow would be used with the automation of procedures where documents, information or tasks are passed among participants according to a defined set of rules to achieve, or contribute to an

	overall business goal. A workflow engine would manage and monitor the state of activities in a workflow, such as the processing and approval of various application forms and determines which new activity to transition to according to defined processes.
ESB/Middleware	
FR 4.1352	<ul style="list-style-type: none"> An Enterprise Service Bus (ESB) is a software architecture model used for designing and implementing communication between mutually interacting software applications in a service oriented architecture (SOA). The ESB supports SOAP Based integration, including SOAP/HTTP, SOAP/JMS, and SOAP/HTTPS and XML messages. The ESB supports message record/ replay capability, DFDL standards-based parser for text and binary data, many programming languages (Java, ESQL, PHP, C#, VB, F#, C++) including .Net, natively web services, Graphical Data mapping for transforming XML, text, and binary data, transaction management (Automatic, Commit, Rollback), SSL, SFTP, and LDAP etc. The ESB provide robust transaction control capabilities including uncoordinated auxiliary transactions. The ESB have the capability to support design, editing and manipulation of WSDL, through an integrated tooling. The ESB provide an integrated testing tool with auto test the integration components developed and integrated development environment for development, test and deployment and debug. The ESB also support TLS 1.1 & TLS 1.2 to offer strict security requirements. <p>Primary duties of an ESB should include:</p> <ul style="list-style-type: none"> Routing messages between services; Should support both synchronous and asynchronous transport protocols, service mapping; Monitor and control routing of message exchange between services; Resolve contention between communicating service components; Control deployment and versioning of services; Marshal use of redundant services; and Provide commodity services like event handling, data transformation and mapping, message and event queuing and sequencing, security or exception handling, protocol conversion and enforcing proper quality of communication service.
Application Design, Development & Customization	
FR 4.1353	<ul style="list-style-type: none"> Compliance with industry standards: Solution shall be compliant with industry standards (their latest stable versions as on date) wherever applicable. This will apply to all the aspects of solution including but not limited to design, development, security, installation, and testing. Platform Flexibility: Open Standards and Interoperability (Usage of standard APIs) shall be considered Web-centric, multi-tier architecture shall be used. Iterative Development: Iterative approach shall be used to develop a software system iteratively and incrementally, allowing developers and users to take advantage of lessons learnt during the development or earlier iterations of the system development. In the iterative development approach, the whole process of System Development typically iterates through all the phases of the System Development Life Cycle (SDLC), starting from gathering requirements to delivering functionality of a working release. Compliance to SOA and EAI: Application shall be based on Service Oriented Architecture (SOA) and EAI. All modules of the application shall expose key functionality through Software APIs in form of SOAP & WS-* or JSON & REST etc. so that they can be consumed by other applications. User Interface: The application's UI should be based on HTML5 standard only and should be compatible with all devices like Desktop, Smartphone and tablet etc. The application interface should be responsive. The application must utilise n-tier architecture with clear separation between Web Servers, Application/Portal servers, Middleware servers and Database servers.

FR 4.1354	Ensure applications execute proper error handling so that errors will not provide detailed system information, deny service, impair security mechanisms, or crash the system.
Technology Standard	
FR 4.1355	<ul style="list-style-type: none"> • Browser Compatibility: The Integrated Application should support common web and mobile browsers like Google Chrome, Internet Explorer, Firefox, Safari and Opera Mini etc. • Bi-Lingual Support: Application shall support at least Unicode 5.1/ 6.0 standard based Bi-lingual versions for user interface. It is expected to be in the Hindi and English (India) languages. • Anywhere Access: Application shall be deployed on state government cloud to enable anytime, anywhere access and to address auto sync/ save, efficiency, and peak load handling issues. Application shall be accessible on all popular devices (PC, mobile or tablets) and across all popular operating system platforms like Windows/ Apple for PCs and Android/ IOS for mobiles. The Integrated e-Office application should also function on the low bandwidth (64 Kbps/ GPRS). • Scalability, Reliability and Flexibility: The technology must be scalable with Department's emerging requirements and m information handling needs of the government increases. The architecture must be scalable and flexible for modular expansion. The IA shall plan and provide for horizontal scalability in such a manner that a new server can be added (or removed) dynamically, as and when required in future, without disturbing the normal functioning of production system. The vertical scalability in servers in terms of additional processors and RAM will have to be provided for handling future growth in transactions. • Interoperability: The system should be interoperable and should comply with open standards for easy integration. The entire system/ subsystem should be interoperable, in order to support information flow and integration. Operating systems and storage technologies from several suppliers must interact well with each other.
Security Standard	
FR 4.1356	<ul style="list-style-type: none"> • Application Access: Ensure applications processing data properly for authenticated users (through central authentication systems), specifically: SSO Login. Establish authorizations for applications by affiliation, membership, or employment, rather than by individual. If individual authorizations are used, these should expire and require renewal on a periodic (at least annually) basis. • Review: Conduct code-level security reviews with professionally trained peers for all new or significantly modified applications; particularly, those that affect the collection, use, and/or display of confidential data. Conduct annual security tests of Internet applications. • Security: application shall support both HTTP and HTTPS (SSL certificate shall be provided by MSI).
Application/Portal Server	
FR 4.1357	<ul style="list-style-type: none"> • Application or Portal server should be an industry standard commercial enterprise grade software product capable being deployed in a high availability mode. • Portal server should provide framework to provide Security, Mobility, Identity based content delivery, collaboration and Enterprise system integration • The portal server should by default provide components that facilitate capabilities to access functionalities like email, calendar, file storage etc. All applications hosted on portal server would be able to use these common services • Should have the ability to aggregate various web enabled enterprise application. Individual application components should be integrated as portlets or webparts • Should have mechanism to authenticate users before allowing access specific to the concerned user. All application hosted on the portal should be able to subscribe to this mechanism • Portal server must provide capabilities to manage content. The Portal server should provide Content Management System (CMS) capabilities. It should provide a hierarchical content store that supports structured and unstructured content, images, content templates, and versions. • Must provide for role based access to different functionalities of CMS. This would include but not limited to - create, edit, delete, lock content categories and content. Should also facilitate maintaining of different version of the content

	<ul style="list-style-type: none"> • The CMS module must provide for workflows to create, manage and publish content. • The CMS module should have the provision to create, edit, cancel workflows relating to CMS • The CMS module should have a search functionality to perform role based search for the content. • The portal should provide search server capabilities. The search server should • provide interface to the end user to search for a resource in the database • The search server should have configuration tool to configure locations to discover, convert and/or display summary information. • The search server should provide support for federated search whereby a single search can be delegated to multiple search engines like (but not limited to) Google, LDAP/Active Directory, RDBMS etc. • Federated search results to displayed on a web page. The results to be role based.
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2.2.4.28 Blockchain for Land Records

Overview

Internet connectivity has fundamentally transformed various aspects of people's lives and the way businesses and governments function. The first phase of internet brought the age of information and instant connectivity, irrespective of the geographical constraints. Due to this, we have been able to generate and disseminate information at a scale which we could not have imagined couple of decades ago. We are currently under a transition phase for a second age of internet. The second age of internet will be instrumental in making sense, adding value and security to this plethora of data and information which is generated on internet every day. The concepts of 'Blockchain', 'Artificial Intelligence' and 'Machine Learning' are the primary drivers which are disrupting the technology of today in order to achieve the aforementioned goals.

Since the advent of crypto currencies like Bitcoin in 2009, people across the globe have started to realize the true potential of blockchain technology as a means for ensuring secured information. Blockchain is a public or a distributed ledger in which all dynamic transactions, records or data are stored i.e. critical data is stored in multiple systems securely and all these systems communicate in a peer to peer network, thereby leading to the creation of secure, distributed repository of information. In addition, by adding cryptography, digital signatures and consensus building mechanisms to this distributed ledger, a secure way of updating and storing of data is enabled. Traditional way of storing data was on centralized systems.

Blockchain is a disruptor as it bypasses any central authority or intermediary which would be required to store, authenticate or settle transactions or records. Blockchain allows different systems to trust a shared record of transactions and data since they cannot be altered. For any change in transactions and records, all participants and systems in a Blockchain need to approve this change. Automated validation across each system on a Blockchain is done via unique cryptographic identifiers, thus adding cutting edge security towards the whole platform.

All this has led to greater transparency, accountability, security and visibility. Blockchain is now being seen as a new technological asset for transformation of various institutions where transactions and digital records are key. Examples of such institutions are banking, healthcare, educations, utilities etc. Similar to the institutions mentioned before, Blockchain is also imperative to the government sector as secured, accountable and authentic exchange of information is of utmost priority. Land record management, updation and storing of citizen data, electronic voting, government contracts etc. are some of the use cases where Blockchain has the capability to leave its lasting impact.

As part of this project, it is proposed to deploy Blockchain for land records management. Land records is generated as part of the e-LMS.

In context to land records management, leveraging blockchain solution offers many advantages such as:

- **Security:** Blockchain ensures increased levels of data security due to its distributed architectural design, avoiding any sort of network breach through parties external to the network. This in turn entrusts the network users to initiate and conclude transactions with increased security.
- **Load distribution:** The architectural design of blockchain platform enables the concept of distributed ledger for storage of land records amongst all the participants of the network transaction. This mitigates any single point of vulnerability or failure.

- **Improved accuracy and efficiency:** Unlike conventional systems which can be manipulated to perform malicious activities with the information, blockchain offers automation functionalities to efficiently validate, detect and avoid any type of data which has the potential to adversely affect the network data or the participant's security.
- **Ease of tracking transactions:** Blockchain enables easy storage and tracking of transactions and information exchange irrespective of the total number of transactions occurring.

Proposed Architecture

This section presents the overall operations of the proposed blockchain solution in context to managing land records data. Please note, since blockchain is an evolving technology, the exact architecture shall be finalized in consultation with the Client as part of Design Phase of the Project.

- When a new transaction is initiated in the form of any Land Parcel lease/allocation, the details of executed transaction gets stored in the transaction log of the ledgers, where they can be identified through their respective Hash keys.
- The above-mentioned process repeats itself again and again, resulting in the formation of a 'chain' of transaction blocks on the DMIC IITGNL's blockchain network. Consider a blockchain network comprising of multiple DMIC IITGNL nodes.
- Different nodes will be linked with each other.
- Now, considering the case of updating land records data, it may be assumed that the DMIC IITGNL wants to share Land Parcel document on the blockchain network. This process is initiated on the blockchain network as a new transaction and circulates on the entire network in the form of a transaction block.
- When the transaction block arrives at the DMIC IITGNL's executing node(s), all DMIC IITGNL node(s) shall perform validation checks on the block in order to check its authenticity. In case the block is found to be malicious, it is rejected without executing. This process goes on as part of backend operations on the blockchain network.
- Once the authenticity of transaction block is verified, the transaction gets executed. On the front end, this activity can be observed in the form of Land Parcel being leased successfully and getting stored on the blockchain database.
- Post the execution of a transaction block, the ledgers of all the other DMIC IITGNL node(s) present on the network gets updated in synchronization with each other through appropriate consensus mechanisms.
- Through this process, DMIC IITGNL should be able to authenticate and secure land records status and identify any malicious activity at any given point in time.

Below depicts the conceptual architecture for the same.

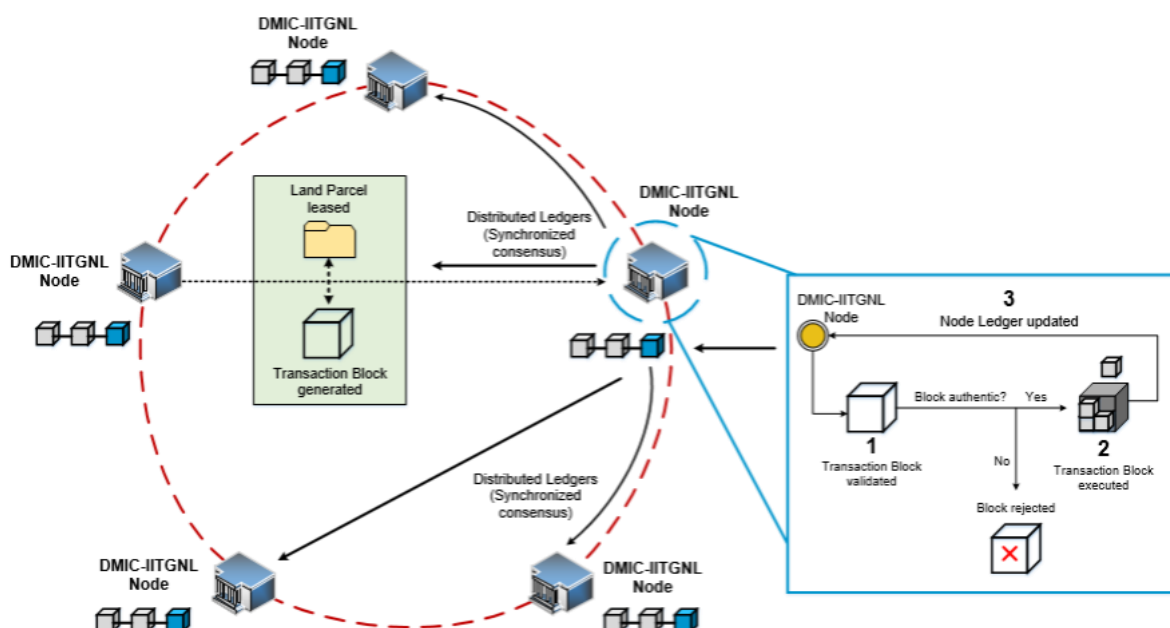


Exhibit 6: Conceptual Architecture for Blockchain Solution

The blockchain solution for land records have multiple benefits due to the technology. Blockchain based solution leads to improved redundancy of the information data along with high levels of resiliency. This ensures a much-improved data security to the users. Blockchain technology shall enhance the overall efficiency with which DMIC IITGNL officials shall manage the land records. It shall also ensure greater levels of transparency. In addition, implementation of blockchain solutions shall aid DMIC -IITGNL officials in maintaining clean logs of land registry. This way, will be enabled to easily track the organizations and/or individuals to whom a particular plot has been allotted till date, hence avoiding any possible issues specific to the use cases discussed.

Functional Requirements

BLOCKCHAIN SOLUTION	
FR 4.1358	The blockchain platform shall enable the admin to assign access roles to different official(s) of DMIC IITGNL.
FR 4.1359	The blockchain platform for IIT shall be developed on an open source platform.
FR 4.1360	The blockchain platform shall provide access to documents stored without compromising the network security.
FR 4.1361	The blockchain platform shall consist of protocols and supporting infrastructure to allow DMIC IITGNL official(s) to review, approve, reject and propose changes in document(s). The activities shall get updated in the ledger in a synchronized manner.
FR 4.1362	The admin. shall not be able to communicate the documents to officials present on the network, and the document(s) shall be independently held by individual officials present on the network.
FR 4.1363	The blockchain platform shall be able to ensure data confidentiality between the admin and DMIC IITGNL official(s), allowing only the authorized official(s) to have access to documents.
FR 4.1364	The Admin shall be able to track which official(s) have reviewed and taken action on any document(s).
FR 4.1365	The blockchain network shall allow simplified integrations with APIs for the required modules.
FR 4.1366	Once any data has been logged on the blockchain, its data shall not be alterable.
FR 4.1367	DMIC IITGNL officials registered on the blockchain network shall be able to exchange document(s) amongst themselves. A log of the same shall be generated in the ledger, which shall only be accessible by the admin along with any other official(s) authorized to access by the admin.
FR 4.1368	The blockchain platform shall enable sharing of document(s) with all the authorized officials.

FR 4.1369	DMIC IITGNL officials present on the blockchain network shall be able to maintain separate logs of documents exchanged with other officials on the network.
FR 4.1370	The admin shall be entitled to manage and control the user IDs of existing and new official(s) to allow/ restrict them permission to access any document(s).
FR 4.1371	The document(s) approved/ rejected/ commented by any official(s) shall contain the signature (such as cryptographic key) of the official(s) who have taken action on any document(s).
FR 4.1372	DMIC IITGNL official(s) shall be able to take action on multiple documents simultaneously. Logging of all such actions shall be recorded in the ledger simultaneously.
FR 4.1373	The admin shall be able to perform the following checks for any document(s): <ul style="list-style-type: none"> • List of all the officials who have taken any action on any document(s); • Validating identities that took action on any document(s); and • Verifying signature(s) of official(s) on any document(s).
FR 4.1374	It shall be possible for official(s) to reject the document(s) with comment(s) approved by the official(s) immediately preceding them as per DMIC IITGNL's predefined organizational hierarchy. In such events, the document(s) shall be resent for review to the concerned official(s).
FR 4.1375	The admin shall be able to directly reject the document(s) with comment(s) approved by official(s) of any level of organizational hierarchy in DMIC IITGNL.
FR 4.1376	The IDs of official(s) who have resigned/ been terminated from DMIC IITGNL shall be automatically blocked from accessing any DMIC IITGNL document(s). MSI shall be responsible for doing any third-party integrations (as needed). The admin shall be able to manage the access roles of such IDs.
FR 4.1377	The admin shall be able to manage the digital signature(s) (Initials) of DMIC IITGNL official(s). The admin shall also be able to change the hierarchy of any official(s) on the network.
FR 4.1378	In events of delay in review/ action on any document(s) by any DMIC IITGNL official(s), alerts and/or notifications regarding the same shall be delivered to admin along with auto-escalation of document(s) to the immediately succeeding official(s).
FR 4.1379	DMIC IITGNL official(s) shall only be allowed to insert their respective digital signature (Initials) while approving/ rejecting/ commenting on any document(s). For this, MSI shall be responsible for performing relevant integrations with the e-Signature solution proposed as part of this Project. Only the admin shall be allowed to verify the authenticity of the digital signature(s) from the database records.
FR 4.1380	Blockchain solution shall provide customized reports in word, pdf, excel.
FR 4.1381	Blockchain solution shall be integrated with dashboards, e-Signature, GIS, e-LMS and other applicable ISM modules.

2.2.5 Public Interactive Kiosk

2.2.5.1 Overview

Public Interactive Kiosks will be deployed across IIT to give the citizens access to various services via single integrated platform. The Kiosks shall integrate with emergency communication modules for monitoring and action on emergencies reported by citizens. This will be a dedicated and fixed structure which will include Wi-Fi access point, emergency call button, charging points, access to citizen centric services using touch screen, and CCTV. Public Interactive Kiosks shall be installed at strategic locations such as Administrative buildings, Public Parks, near Commercial centres, etc.

2.2.5.2 Architecture

Public Interactive Kiosk shall be connected with the City's Integrated Control Centre (CIOC) via a dedicated fibre optic infrastructure. A switch shall be housed inside each Public Interactive Kiosk from where the data will be backhauled to the nearest PoP facility over the fibre optic infrastructure. A conceptual architecture for the same has been presented in Exhibit 7 below.

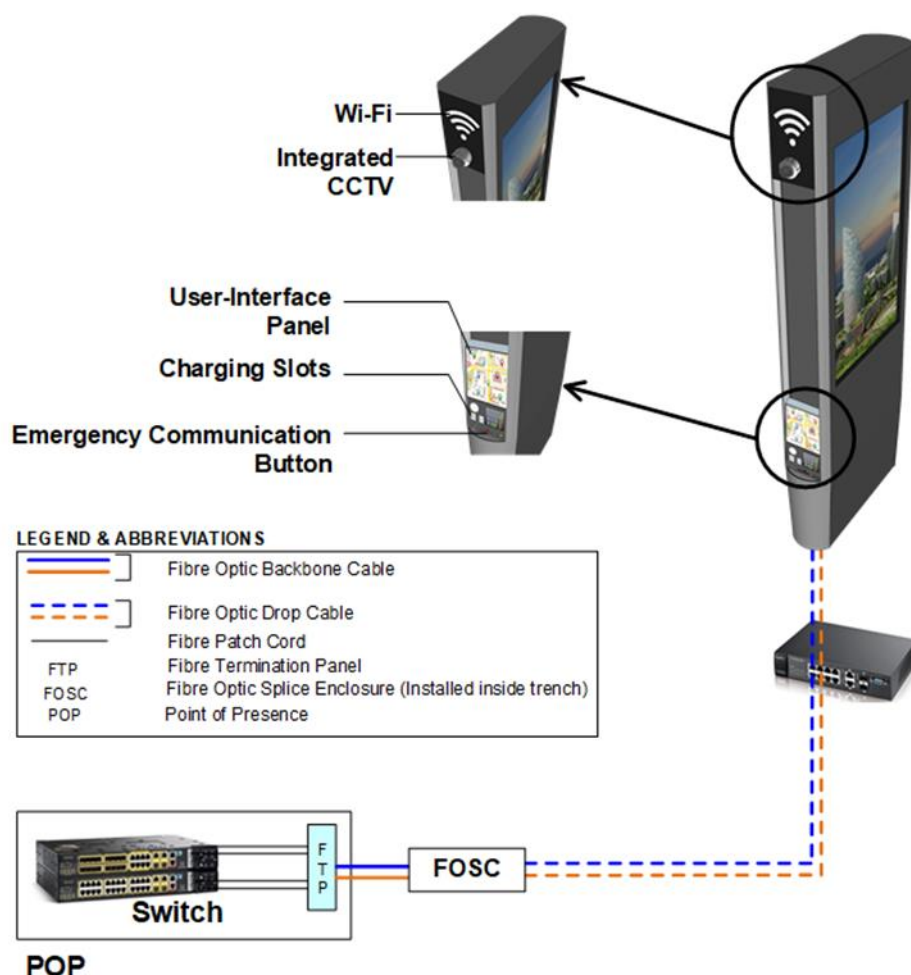


Exhibit 7: Conceptual Architecture for Public Interactive Kiosk

BR - 5 Business Requirements

BR 5.1	Public Interactive Kiosk shall provide various services and information to citizens, visitors, as well as DMIC IITGNL staff, integrated using one common platform.
BR 5.2	Public Interactive Kiosk shall also be the contact point for citizens who are not connected to smart phones or e-mail.

BR 5.3	Public Interactive Kiosk shall be deployed at strategic locations such as Bus Stops, Admin Building, or other government associated buildings, commercial centres etc.
BR 5.4	Using the Public Interactive Kiosk, citizens shall be able to avail multiple city services integrated via the e-governance platform plus shall provide the capability for bill payments.
BR 5.5	Public Interactive Kiosk shall include the following in one integrated structure – emergency call button, touch screen for citizen services with payment options (integrated with e-wallets, debit and credit card) (with additional security features such as PIN), integrated CCTV, Wi-Fi plus additional space for static advertising/promotions.
BR 5.6	Public Interactive Kiosk shall also include capabilities for providing services to differently abled users. As one example, height of ECB shall be such that it supports usage for a person on wheelchair. Bidder to evaluate other possible scenarios.

FR - 5 Functional Requirements

FR 5.1	<p>Public Interactive Kiosks shall have integrated:</p> <ul style="list-style-type: none"> • Emergency Call Button (ECB) • CCTV • Wi-Fi Access Point • Ability to pay bills using e-Wallet, Debit Card and Credit Card. • Touch Screen for availing citizen services with in-built interactive platform • Integration with Environmental Sensors to display information from various sensors • Charging Slots • Static Advertisement on up to Three Faces • Microphone • Speaker • Keypad for entry of pin for authentication • Printing of any Receipts • UPS and Batteries <p>All these components shall be supplied as part of the Integrated Public Interactive Kiosk.</p>
FR 5.2	Public Interactive Kiosk shall be fixed units, embedded inside the ground that shall be weatherproof. IP 65 rated and rated for performance for outdoor technology street furniture.
FR 5.3	Public Interactive Kiosk enclosure shall have the space to house all the hardware equipment required for the Public Interactive Kiosk including switches, UPS, batteries printer for receipts and other associated accessories. All the wiring shall be concealed within the Public Interactive Kiosk enclosure and shall not be visible from outside.
FR 5.4	Public Interactive Kiosk shall integrate with emergency communication modules for monitoring and action on emergencies reported by citizens.
FR 5.5	The Emergency Call Button (ECB) shall have the capability to trigger emergency communications with CIOC. As the Emergency Call Button is pressed, the call should land up to the operators at the CIOC from where it may be routed to the concerned department.
FR 5.6	The CIOC operators shall able to monitor the video of the user who triggered the ECB. Automatic video recording shall be enabled when ECB button is pressed at Public Interactive Kiosks.
FR 5.7	Public Interactive Kiosk shall have in-built speakers and microphone for making an emergency call to/from the CIOC and a keypad for accepting user input.

FR 5.8	The integrated CCTV shall have the capability of recognition. Operators at the CIOC shall be able to monitor the live feed from the CCTV. When the emergency button is pressed, the camera shall automatically focus on the person using the button with a video feed on the video wall at the CIOC.
FR 5.9	The Public Interactive Kiosk shall have in-built charging slots, i.e. two (2) USB ports and one (1) three pin standard plug port.
FR 5.10	<p>The user-interface panel shall built-in capacitive touch screen for interactive purposes including but not limited to:</p> <ul style="list-style-type: none"> • Maps and navigation services i.e. displaying routes across IIT. • Displaying of bus routes across IIT. • Information about IIT along with e-governance services. • Integration with Portal. • Environmental related information via integration with environmental sensors. • Places of attraction in IIT. • Places near me services which may include hotels, government offices, shops, tourist attraction, etc. • Information about the events. • Emergency contact numbers such as hospitals, police, fire, etc. • Integration with ISM. • Integration with digital wallets, credit and debit cards for payments.
FR 5.11	<p>Public Interactive Kiosk shall have a capability for making digital payments for:</p> <ul style="list-style-type: none"> • Utility Bills for government services such as electricity, water, Wi-Fi, etc. • Citizen services • Tickets for the events around the city • Any other DMIC IITGNL supported activity/event
FR 5.12	Public Interactive Kiosk shall have in-built receipt/ticket printer having the functionality of printing of receipts, any other tickets, etc.
FR 5.13	The Public Interactive Kiosk shall have the space for providing the static advertisement around up to three (3) faces.
FR 5.14	The Public Interactive Kiosk shall be multilingual i.e. it shall support languages such as English and Hindi.
FR 5.15	The Public Interactive Kiosk shall have ECB and touch panel at an average height of 1.5m above ground.
FR 5.16	Public Interactive Kiosk shall be upgradable through a central system remotely over internet.
FR 5.17	It shall be possible to monitor critical parameters related to health of kiosk device remotely using the network.

TR - 5 Technical Requirements

TR 5.1	Public Interactive Kiosk's enclosure shall be made of metal or stainless steel fabric and shall be IP 65 rated. It shall be built to last in outdoor environment to support the project operating conditions. Design of the kiosk shall be as per bidder's solution (for example, kiosk under a cabin etc.) And shall meet the requirements of the RFQ cum RFP.
TR 5.2	Metal sheet of the Public Interactive Kiosk housing shall be made in a minimum 16 gauge that can be powder coated as per the required colour choice.

TR 5.3	Public Interactive Kiosk's enclosure shall have space to put all the required hardware including switches and associated accessories.
TR 5.4	Public Interactive Kiosk's shall have PTZ Camera mounted on the top of the Kiosk Enclosure.
TR 5.5	The Camera shall be automatically focused towards the citizen upon pressing of ECB button and shall focus on the user who activated the ECB call with a video feed display at the video wall at Control centre. The ECB call can only be disconnected from control centre level.
TR 5.6	The CIOC operator shall able to monitor the video of the user who triggered the ECB.
TR 5.7	The Public Interactive Kiosk shall also have UPS with batteries with minimum 2 hour backup time.
TR 5.8	The Public Interactive Kiosk shall have the capability of integrated payment through which citizens can make digital payment of city services like payment of bills, booking of event tickets, take receipt print of payments etc.
TR 5.9	The Public Interactive Kiosk enclosure shall have integrated receipt printer for taking printout of bills payments receipt and events tickets etc.
TR 5.10	The Public Interactive Kiosk shall have in-built speakers and microphone. Speakers shall be able to deliver clear stereo sound. Microphone shall be able to isolate the main sound source and minimize background noise. At any time, the speakers shall have an output audio of at least 10 dB above ambient noise.
TR 5.11	Public Interactive Kiosk shall have proper ventilation arrangement for heat removal.
TR 5.12	Public Interactive Kiosk shall have proper in-built wiring arrangement with spike proof power socket.
TR 5.13	Public Interactive Kiosk shall have two (2) service doors with security key so that it can be easily accessed from there.
TR 5.14	Public Interactive Kiosk shall be either fixed to ground or have shoes to hold it on a smooth surface.
TR 5.15	All electrical components shall have quick-disconnect terminals for easy service or removal. All wiring shall be concealed within the Public Interactive Kiosk enclosure and shall not be visible from the outside of the unit.
TR 5.16	Public Interactive Kiosk shall be equipped with sufficient tamper-proof mechanisms to ensure detection at CIOC in case of physical tampering to the Kiosk.
TR 5.17	Public Interactive Kiosk shall be upgradable through a central system remotely over internet.
TR 5.18	It shall be possible to monitor critical parameters related to health of kiosk device remotely using the network.
INTERACTIVE USER PANEL FOR INFORMATION OF CITY SERVICES	
TR 5.19	The panel shall have built-in capacitive touchscreen for interactive applications with required supporting software for dynamic content management from various sources connected to the system. The content management system shall include content from (but not limited to) – e-governance platform, services billing, DMIC IITGNL organized/supported events, data from environmental sensors, digital advertising and promotions (provided as part of the content management system), city news and information, among others. Content shall be on the same display and content for kiosk shall be finalized with successful Bidder.
TR 5.20	The touch screen shall be all-glass with a transparent metallic conductive coating. OR with laminated and tempered glass (3.5 mm + 3.5 mm).
TR 5.21	The touch screen monitor shall have a min. resolution of 1280 x 1024 or better with screen size of minimum 24".
TR 5.22	The screen shall support wide viewing angle, low power consumption, high contrast ratio, high aperture ratio, short response time.
TR 5.23	The content displayed on the panel shall be direct sunlight readable and shall support the feature of auto brightness control.

TR 5.24	The touch screen shall have the embedded thin client with quad core CPU 8GB memory, 32 GB Flash, 1 TB of secondary storage for local storage with required OS.
TR 5.25	The touch screen monitor shall be capable of withstanding most surface contaminants and must be ASTM-D-1308-02 and ASTM-F-1598-95 compliant.
TR 5.26	The touch screen monitor shall be (IP66) rated and complete water- resistant seal compatible. It shall be capable of operating in outdoor rated environments and shall have a rugged screen.
EMERGENCY CALL BOX	
TR 5.27	The ECB shall be integrated with the Public Interactive Kiosk and shall be monitored at CIOC.
TR 5.28	At control centre, graphical display of the locations of the ECBs mounted on the Public Interactive Kiosk shall be provided at the workstations to control, configure and manage ECBs at a minimum.
TR 5.29	The ECB shall be auto-dial operation and shall be capable of automatically answering incoming calls.
TR 5.30	The ECB shall communicate over 10/100/1000 Base-TX copper signal ports over Ethernet.
TR 5.31	The ECB shall support SIP based Voice over Internet Protocol (VoIP) communications standard.
TR 5.32	The ECB shall have network connectivity for monitoring via Web access (HTTP), SNMP, and shall provide the capability of e-mail notification of alarm conditions. Multiple alarms of the conditions shall be provided automatically.
TR 5.33	The ECB shall have automatic adjustment of output volume of audio based on ambient noise detection. At any given time, the sound output from ECB speaker shall be 6-10 dB above ambient noise.
TR 5.34	The call from ECB shall only be disconnected at CIOC. The user shall not have the capability to disconnect the call from the ECB itself.
TR 5.35	The ECB button shall be circular, red in colour and the panel shall have clear label of 'Emergency Call Button'.
DIGITAL PAYMENTS	
TR 5.36	The Public Interactive Kiosk shall have the capability for digital payments like electricity bills, water bills, Wi-Fi recharge/coupon, Payment of penalties (Challans, etc.), payment for any city supported events, etc.
TR 5.37	The Public Interactive Kiosk shall accept all digital payments including credit card, debit card and e-wallets.
TR 5.38	The Public Interactive Kiosk shall have option for taking printout of bills payments receipt and events tickets etc. through integrated receipt printer.
TR 5.39	The digital payments for Public Interactive Kiosk shall comply with all the revenue/financial departments' norms and conditions for such online financial transactions in India and shall adhered to all such norms and conditions.
ELECTRICAL	
TR 5.40	The Public Interactive Kiosk shall be powered by 12/24/48VDC input as per the design requirements to support powering using solar as the primary power. Raw power will be provided for primary power. The ECB inside the Public Interactive Kiosk shall be powered using PoE or PoE+. 230VAC can also be acceptable however, the Bidder shall provide any power conversion if required to meet the requirements of the RFQ cum RFP.
TR 5.41	The Public Interactive Kiosk shall communicate over RJ45, HDMI/DVI and USB.
TR 5.42	The Public Interactive Kiosk shall support operating temperature range of 0°C to +60°C with ambient relative humidity of 10-95% non-condensing.
TR 5.43	The ECB shall have a MTBF of at least 100,000 hours.
TR 5.44	The touch screen monitor shall have a MTBF of at least 50,000 hours.

2.2.6 Environmental Sensors

2.2.6.1 Overview

Environmental parameters, specifically air and noise pollution, are a major concern for the citizens and administrators of any city. As IIT aspires to be an environmentally sustainable smart city, integrated environmental monitoring stations comprising of various sensors shall be implemented in IIT. The objectives of the system include:

- Integrated ambient air and noise pollution monitoring stations comprising of various environmental sensors for monitoring and trending of various ambient air and noise parameters;
- Tracking of IIT's contribution to environment with respect to these parameters and adjusting any framework for the city;
- Environmental sensors shall be integrated with CIOC for central monitoring and analysis;
- Environmental sensor parameters shall be available through City Portal and Applications for citizens as part of 'open data' initiative and to create citizen awareness

BR - 6 Business Requirements

BR 6.1	Integrated ambient air and noise pollution monitoring stations comprising of various environmental sensors shall be implemented in IIT for monitoring and trending of various ambient air and noise parameters.
BR 6.2	Environment monitoring shall be done for tracking that the pollution and noise levels are within the acceptable limits.
BR 6.3	Display of parameters to citizens to create awareness and support 'open data' initiatives.
BR 6.4	Establish frameworks for regulating these parameters in terms of any supporting initiatives for maintaining acceptable levels.
BR 6.5	Central monitoring at CIOC, city application, website and variable message display in an integrated manner.

FR - 6 Functional Requirements

FR 6.1	<p>Environmental Sensor Station Shall monitor following parameters:</p> <ul style="list-style-type: none"> • Carbon Monoxide (Co) Sensor • Ozone (O₃) Sensor • Nitrogen Dioxide (No₂) Sensor • Sulphur Dioxide (So₂) Sensor • Carbon Dioxide (Co₂) Sensor • Particulate Profile (Pm₁₀, Pm_{2.5}) Sensor • Temperature Sensor • Relative Humidity Sensor • Wind Speed Sensor • Wind Direction Sensor • Rainfall Sensor • Barometric Pressure Sensor; And • Noise Sensor.
FR 6.2	Applicable Sensors shall be housed in a compact environmentally rated outdoor enclosure. It shall be an integrated module which shall monitor overall ambient air and noise quality among other parameters as detailed in point above.

FR 6.3	Environmental sensor station shall be ruggedized enough to be deployed in open air areas such as streets and parks.
FR 6.4	Mounting of the environmental sensor module shall be installed on a tripod stand or a standalone pole. Mounting equipment shall be under MSI scope.
FR 6.5	The Response time of the sensors shall be less than 60 seconds.
SYSTEM SOFTWARE	
FR 6.6	Environmental sensor station shall have a pre-installed software.
FR 6.7	Software shall display real time and historical data in chart and table views for dashboard view of the Client.
FR 6.8	Software shall display trends of environmental parameters based on user specific time periods.
FR 6.9	It shall be possible to configure and calibrate the sensors through the software from a remote location.
FR 6.10	It shall display and export sensor diagnostic information.
FR 6.11	Alarms shall be generated for events where the environmental parameters breaches the safe or normal levels.
FR 6.12	Administrator shall be able to manage access privileges for only authorized users.
FR 6.13	Data of all the environmental sensor shall be available on the same software interface.

TR - 6 Technical Requirements

CARBON MONOXIDE (CO) SENSOR	
TR 6.1	Range of CO sensor shall be between 0 to 20 PPM.
TR 6.2	Resolution of CO sensor shall be 0.1 PPM or better.
OZONE (O3) SENSOR	
TR 6.3	O ₃ Sensor shall have a range of at least 0-0.4 PPM.
TR 6.4	Resolution of O ₃ sensor shall be 0.001 PPM or better.
NITROGEN DIOXIDE (NO2) SENSOR	
TR 6.5	NO ₂ Sensor shall have a range of at least 0-0.2 PPM.
TR 6.6	Resolution of NO ₂ sensor shall be 0.001 PPM or better.
SULPHUR DIOXIDE (SO2) SENSOR	
TR 6.7	SO ₂ Sensor shall have a range of at least 0-0.7 PPM.
TR 6.8	Resolution of SO ₂ sensor shall be 0.001 PPM or better.
CARBON DIOXIDE (CO2) SENSOR	
TR 6.9	CO ₂ Sensor shall have a range of at least 0-2000 PPM.
TR 6.10	Resolution of CO ₂ sensor shall be 1 PPM or better.
PARTICULATE PROFILE SENSOR	
TR 6.11	Particulate profile sensor shall provide simultaneous and continuous measurement of PM ₁₀ and PM _{2.5} in ambient air.
TR 6.12	Range of PM _{2.5} shall be 0 to 500 micro gms / cu.m or better.
TR 6.13	Range of PM ₁₀ shall be 0 to 1000 micro gms / cu.m or better.
TEMPERATURE SENSOR	
TR 6.14	Temperature sensor shall have the capability to display temperature in °Celsius and °Fahrenheit.

TR 6.15	Temperature range shall be -10° to +65°C.
RELATIVE HUMIDITY SENSOR	
TR 6.16	Range of relative humidity sensor shall be 1 to 100% RH.
TR 6.17	Resolution and units of relative humidity sensor shall be 1% or better.
WIND SPEED SENSOR & WIND DIRECTION SENSOR	
TR 6.18	Wind speed sensor shall have the capability of displaying wind speed in mph, km/h, m/s.
TR 6.19	Range of wind speed sensor shall be 0-60 m/s.
TR 6.20	Range of the wind direction sensor shall be 0° to 360°.
RAINFALL SENSOR	
TR 6.21	Rainfall sensor shall the capability of displaying level of rainfall in inches and millimetre.
TR 6.22	Daily Rainfall range shall be 0 to 99.99" (0 to 999.8 mm).
TR 6.23	Monthly/yearly/total rainfall range shall be 0 to 199" (0 to 6553 mm).
BAROMETRIC PRESSURE SENSOR	
TR 6.24	Barometric pressure sensor shall have the capability of displaying barometric pressure in Hg, mm Hg and hPa/mb.
TR 6.25	Range of barometric pressure sensor shall be 540 hPa/mb to 1100 hPa/mb.
NOISE SENSOR	
TR 6.26	Noise sensor shall be able to identify the areas of high sound intensity ranging from 30 dBA to 120 dBA.
TR 6.27	Noise sensor shall have resolution of 0.1 dBA.
TR 6.28	Noise sensor shall detect the intensity of the ambient sound in a particular area.
TR 6.29	Nosie Sensors shall be installed for the outdoor applications.
ENVIRONMENTAL SENSOR MANAGEMENT SOFTWARE	
TR 6.30	Software shall be pre-installed on every built system.
TR 6.31	It shall be possible to connect to the station using internet browser on computer tablet or mobile without any need of installing software for viewing information.
TR 6.32	Software shall display real-time and historical data in chart and table views.
TR 6.33	Software shall display trends of environmental parameters based on user specified time periods.
TR 6.34	It shall be possible to configure and calibrate the sensors through the software from a remote location.
TR 6.35	Software shall display and export sensor diagnostic information.
TR 6.36	User shall be able to change sensor module settings through the software and from remote locations.
TR 6.37	Administrator shall be able to manage access privileges for only authorized users.
TR 6.38	Alarms shall be generated for events where the environmental parameters breaches the safe or normal levels.
TR 6.39	It shall be integrated at the CIOC for the purposes of monitoring, display of information and control of the system.
GENERAL	
TR 6.40	The design shall be modular in nature which shall have the capability to add additional environmental sensors in the future into the enclosure.

TR 6.41	It shall be possible to remove or replace individual sensor modules without affecting the functioning of rest of the system.
TR 6.42	It shall be possible to mount the air quality monitoring station to a pole, tripod or wall mounting brackets
ENVIRONMENTAL REQUIREMENTS	
TR 6.43	Enclosure shall be rugged weather proof IP65 rated and shall house the power modules, thermal management system, embedded PC / controller and user configured analyser modules as well.
TR 6.44	Environmental operating range shall be 0°C to +60°C.
ELECTRICAL REQUIREMENTS	
TR 6.45	Power requirements of the system (environmental station) shall 220-240 VAC, 50Hz.
TR 6.46	All modules inside the enclosure shall operate from 12VDC power. The MSI shall be responsible for any power conversions required for operations of this system.
NETWORKING REQUIREMENTS	
TR 6.47	Environmental station shall support communications by Ethernet (RJ45) or Fibre optic communications or 3G/4G.

2.2.7 Other In Facility System

Building Management Systems (BMS) and Access Control System shall be implemented in the PoP room and Admin Building including CIOC. Building management system shall provide a central platform over which various mechanical and electrical parameters of the building (e.g. power feeder system, HVAC, UPS etc.) shall be monitored, controlled and automated in an integrated manner. Access Control system is intended to control physical access to the premises and detection of unauthorized entries. Access control system shall be a combination of card based and fingerprint system along with attendance management system.

BMS shall be integrated with CIOC for central monitoring and control of the Admin Building and POP rooms from a single location. Access Control shall be integrated with BMS system and Facial Recognition Based Access Control System (FRACS) system.

BR - 7 Business Requirements

BUIDLING MANGEMENT SYSTEM (BMS)	
BR 7.1	BMS shall be installed at Admin Building to monitor and control the building parameters.
BR 7.2	BMS shall monitor and control the sub-systems being supplied by MSI for the CIOC area which included CIOC room, Board room, Manager Cabin, Rack room, UPS room, TSP area, CFC room. BMS shall also integrate systems which will be installed by EPC Contractor at the Admin Building.
BR 7.3	BMS shall enable building managers to monitor, control and automate various systems in the building via an integrated platform from a central location.
BR 7.4	BMS shall provide cross system communication inside the building to achieve intelligence in the building.
BR 7.5	BMS shall provide proactive maintenance of the building's systems.
BR 7.6	Provide details regarding energy accountability of the building based on different parameters.
BR 7.7	BMS shall provide visibility and control of the connected systems from a centralized workstation and from a remote location via a web-based interface.
BR 7.8	Minimal human intervention for regular operations of BMS.
BR 7.9	Monitor electricity consumption trends and usage for systems.
BR 7.10	Provide an integrated platform at the workstation that shall allow various users to view and modify various parameters in the system based on respective authorization.
BR 7.11	Integrate BMS or IP enabled fire alarm system at the CIOC for all plots where the respective BMS or IP enabled fire alarm system shall be provided by the respective plot holder.
ACCESS CONTROL SYSTEM	
BR 7.12	Access control system shall be an integrated solution that consists of hardware and software designed to control entry into selected areas and manage movement of personnel within. The system shall be designed to increase security by defining access permissions based on area and time for each user and maintaining a log of all events. Access control shall be installed at PoP and Admin Building
BR 7.13	Access Control System shall also calculate entry and exit time of authorized personnel through attendance system for work time calculation.
BR 7.14	Access Control System along with integrated attendance system shall be installed at CIOC and PoP room across IIT.
BR 7.15	Access Control System shall be integrated with Facial Recognition System (FRS) database for manually and/ or automatically authorizing/ unauthorizing access to different facilities of Administrative Building.
BR 7.16	Attendance or Time Management System shall be integrated with ISM – HR and Payroll module for automated calculation for payroll.

FR - 7 Functional Requirements

BUILDING MANAGEMENT SYSTEM (BMS)	
FR 7.1	<p>BMS shall provide the following functionalities as a minimum but not limited to:</p> <ul style="list-style-type: none"> • Monitoring and control of HVAC system; • Monitoring and control of internal and external lighting in the building; • Monitoring of electrical power distribution system by integrating LT panel; • Integration with the Fire detection and alarm system; • Monitor and manage energy consumption throughout the building for the purpose of tracking quality and usage of electricity; • Integration with video surveillance system inside Admin Building and PoP; • Integration with access control; • Monitoring and control of UPS; • Monitoring of Diesel Generator parameters.
FR 7.2	<p>Following features shall be offered by BMS software:</p> <ul style="list-style-type: none"> • Graphical user interface • Alarms • Automatic monitoring • Logging • Report Generation • Time scheduling • Data storage • Point History and Trending • Preventive Maintenance • Audit trail
FR 7.3	BMS shall support open protocols such as BACnet/IP, Lon Works, and/or Modbus protocol.
FR 7.4	BMS solution shall include all necessary hardware and software such as workstation, servers, Direct Digital Controllers, field sensors, network switches, wiring and ducting etc.
FR 7.5	BMS shall be web-enabled with a capability to access the central software through any standard web browser such as Internet Explorer, Google Chrome, Mozilla Firefox etc.
FR 7.6	BMS shall integrate with Smart City Platform for unified monitoring from control centre.
ACCESS CONTROL SYSTEM	
FR 7.7	The Access Control System shall be intended to control physical access to premises and detects unauthorized access. The System shall be implemented as one unified system with smart network controllers and interface panels.
FR 7.8	Access control system has the capability to classify users so that they can have access only to spaces where they are allowed to enter according to programmed time schedules.
FR 7.9	<p>Access Control System shall comprise of:</p> <ul style="list-style-type: none"> • Automated Card / Fingerprint based access control at designation areas, doors, utility rooms, control room. • The system shall support attendance management based on entry and exit time for all employees and staff. • A Controller with access control software shall indicate valid/invalid cards/fingerprints and authorization rights assigned to gain or deny access into restricted areas. • Automated locks for opening or closing of gates. • A workstation with access control software for management and monitoring at CIOC.

FR 7.10	Access Control System shall be IP based. All hardware and software required for complete Access Control Solution such as workstation, server, network switch, controllers, access control readers, access cards, wiring, cabling etc. shall be part of the Access Control System.
FR 7.11	The Access Control System shall be of open-architecture, PC-based system on a unified platform.
FR 7.12	All designated security controlled doors shall be fitted with a suitable card reader and fingerprint sensors.
FR 7.13	Access Control System shall have a finger-print scanner which at the entry for personnel to register its entry and exit time for work-time calculation.
FR 7.14	All door access activities shall be logged into the central database. Any unauthorized attempt or invalid card used shall be reported to the system, including door held and forced opened alarm as priority alarms.
FR 7.15	Reports shall always be readily available and DMIC IITGNL or their designate shall be able to request for the reports on exactly what information from the report is required with the use of event filters.
FR 7.16	All access doors shall have an emergency break-glass door release installed to unlock the door for exit in the event of emergency. In addition, all dedicated doors along the escape route shall automatically open during fire alarm activation.
FR 7.17	The time schedule shall include holiday facilities to allow user programming for public holidays and user definable special holidays. All schedules shall be definable by day, hours and minutes.
Integration Requirements	
FR 7.18	Access Control System shall be interfaced with the Building Management System (BMS) for integrated monitoring and control of all the building utilities.
FR 7.19	Access Control system shall be interfaced with HR Management System of the designed ISM system for attendance management and work-time calculations.
FACIAL RECOGNITION BASED ACCESS CONTROL SYSTEM (FRACS)	
FR 7.20	Facial Recognition System shall be used for the following use cases: <ul style="list-style-type: none"> • Entry and exit along with timestamping of CIOC/ DMIC IITGNL staff members. • Enrolment of visitors along with timestamping their exit time.
FR 7.21	The Facial Recognition System database shall act as a common repository for searching facial images.
FR 7.22	Facial Recognition System must provide a comprehensive solution for automatic facial recognition capabilities.
FR 7.23	The quality of photo captured by Facial Recognition System shall be acceptable by the system for the following types of facial verification: <ul style="list-style-type: none"> • 1: N verification
FR 7.24	Facial Recognition System shall offer logical algorithms to ease the facial matching process.
FR 7.25	The algorithm shall perform facial recognition with a high accuracy and short processing time.
FR 7.26	Facial Recognition System shall be able to match facial images with the database regardless of vantage point and facial changes, including the following as a minimum: <ul style="list-style-type: none"> • Changes in facial expression; • Changes in face's angle; • Changes in hairstyle; • Changes in beard; and • Addition/ removal of eyeglasses/ sunglasses and/ or scarfs.
FR 7.27	Facial Recognition system shall be able to classify the faces captured into the following classes as a minimum: <ul style="list-style-type: none"> • Staff; and • Visitor.

Staff Enrolment and Attendance Management	
FR 7.28	It shall be ensured that the staff data recorded as part of enrolment process is transferred to the centralized database on a real-time basis.
FR 7.29	<p>Facial Recognition System shall record the following details as part of the one-time enrolment of CIOC staff members:</p> <ul style="list-style-type: none"> • Staff's Face and Figure templates; • Staff ID Number; • Staff Name; • Staff Designation (with Role at CIOC); • Staff's Date of Joining; • Staff's Contact Number; • Biometric data; • Department Name; and • Shift details (if any). <p>The above recorded details shall be stored directly in the centralized database developed for Facial Recognition System.</p>
FR 7.30	The solution shall be capable of checking and notifying about duplication of staff's facial data in the database. In the event of re-enrolment of any staff member, the same shall be notified to the concerned official prior to recording duplicated data.
FR 7.31	Facial Recognition System shall be able to capture and generate an alarm in events of any staff member is absent or arriving late and/or leaving early from his/her shift. This also involves timestamping entry and exit timings of staff's photo.
FR 7.32	<p>Facial Recognition System shall be capable of marking attendance of staff members considering the following pre-configured scenarios as a minimum:</p> <ul style="list-style-type: none"> • Full day working hours; and • Half day working hours.
FR 7.33	In situations of network downtime, the staff enrolment data shall be stored temporarily in the recording device's memory. The data shall get transferred to the centralized database automatically post the restoration of network connectivity without any human intervention.
Administrative Roles	
FR 7.34	<p>The Admin personnel of CIOC shall be enabled to perform the following manually:</p> <ul style="list-style-type: none"> • Deletion of staff enrolment data; • Insertion of staff enrolment data; and • Updation of information in staff enrolment data etc.
FR 7.35	The Admin personnel shall be capable of accessing and retrieving historic data records.
FR 7.36	The Admin personnel shall be able to mark manual attendance of CIOC staff members' entry/ exit timings in the database in events of downtime of Facial Recognition based attendance system.
FR 7.37	Admin personnel shall be able to authorize/ deauthorize the visitors access to different monitoring facilities of CIOC.
FR 7.38	<p>Admin personnel shall be able to manually update the class assigned to a person amongst the following:</p> <ul style="list-style-type: none"> • Staff; and • Visitor.
FR 7.39	Admin personnel shall be able to manually lock/ unlock the access to different facilities of CIOC building for staff members and visitors.
Integrations	
FR 7.40	Facial Recognition based Access Control System shall be capable of integrating with the Smart City Platform and the relevant dashboards developed for IIT.

FR 7.41	Facial Recognition based Access Control System software shall be integrated with ISM – HR and Payroll module. The system should send work-time calculation of DMIC IITGNL staff at a minimum to the ISM in order to enable automated development of payroll.
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TR - 7 Technical Requirements

FACIAL RECOGNITION BASED ACCESS CONTROL SYSTEM (FRACS)	
TR 7.1	Facial Scanner & Detector device shall enable biometric authentication through the following as a minimum: <ul style="list-style-type: none"> • Face recognition; • Finger print recognition and/or RFID Cards.
TR 7.2	The Facial Scanner & Detector shall operate on Android 6.0 OS or better.
TR 7.3	The Facial Scanner & Detector shall be equipped with 1 GHz Quad Core processor or better.
TR 7.4	The Facial Scanner & Detector shall have a minimum 4 inch LCD Touch Display screen.
TR 7.5	The Facial Scanner & Detector shall have an on-device memory of minimum of 2 GB + 4 GB Flash Memory or better.
TR 7.6	The Facial Scanner & Detector shall have a memory capacity of storing the following on-device/ server: <ul style="list-style-type: none"> • 1,00,000 facial templates • 5,00,000 finger print templates • 5,00,00 user capacity
TR 7.7	Facial Scanner & Detector shall have a memory log to store minimum 10,00,000 Transaction Logs and minimum 10,000 Images.
TR 7.8	Facial Scanner & Detector shall be compatible with either of the following RFID cards: <ul style="list-style-type: none"> • MIFARE Classic; • DESFire; • DESFire EV1; • EM Prox; • HID Prox.
TR 7.9	The Facial Scanner & Detector device shall support either one of the following communications as a minimum: <ul style="list-style-type: none"> • TCP/IP Protocol (For server based communications) • Wi-Fi • Ethernet (1000 Base-T) • RS 232 • RS 485 • Wiegand IN/ OUT
TR 7.10	The Facial Scanner & Detector device shall be equipped with camera of resolution 1.3 MP or better having autofocus functionality.
TR 7.11	Resolution of images captured by the camera shall be 500 dpi or better.
TR 7.12	The Matching Speed of Facial Scanner & Detector device shall be the following: <ul style="list-style-type: none"> • <1 Sec or better for 1:10,000 Face matching; and/or, • <1 Sec or better for 1:50,000 Fingerprint matching.
TR 7.13	The Facial Scanner & Detector device shall have a False Rejection Rate (FRR) of 0.1% or better. It shall also have a False Acceptance Rate of 0.0001% or better.

TR 7.14	The Operating Temperature of Facial Scanner & Detector shall be in the range of 0° C to +40° C or better.
TR 7.15	The Facial Scanner & Detector device shall have either or all of CE / FCC / RoHS/ WEEE/ BIS Certifications.
TR 7.16	<p>Facial Scanner & Detector device shall have the following functionalities as a minimum:</p> <ul style="list-style-type: none"> • Ability to detect live face and/or live fingerprint; • Attendance should not be marked using image/ video; • Device must ensure that the person(s) marking the attendance is / are physically present; • The download punch information of employees from the readers should be transferred to the central server in real-time; • To capture picture of authorized or unauthorized users & transfer the same to server on real time basis w/o any delay unless network is down; • Device security shall be enhanced by adding user as admin in device; • Configurable card or fingerprint verification for logging in to the device for extra security; • Integrated with real time alarm display on server; and • E-mail sending facility through application in case of critical events like matching fail, tamper, door forced/ not closed, blacklisted user attempt etc.
TR 7.17	Facial Scanner & Detector shall enable enrolment of a person by capturing face template and/or template of minimum two (2) fingers.
TR 7.18	The Facial Scanner & Detector shall have an operational Power rating of 12V-24V DC (1A - 3.5 A).
TR 7.19	Facial Scanner & Detector device shall be operational in Relative Humidity range of 0% to 90% (Non-Condensing)
TR 7.20	The Facial Scanner & Detector device shall be a wall-mounted device.

2.2.8 IT and Other Common Infrastructure

2.2.8.1 Data Security

The smart city network architecture shall adopt an end-to-end security model that protects data and infrastructure from malicious attacks, thefts, natural disasters, etc. The architecture shall be implemented in such a way that the system is protected from hackers and other threats. The data security system shall address security policies, hardware and software, along with the connectivity between the field device and the respective application. Data Security for Integrated Industrial Township (IIT) shall adhere to the model framework of cyber security requirements set for Smart City (K-15016/61/2016-SC-1, Government of India, and Ministry of Urban Development) and any amendments thereof.

Note that the client at its discretion may have the authority to carry a security audit of the entire system during the course of the Project or post implementation at regular intervals.

TR - 8 Technical Requirements

FIREWAL	
TR 8.1	The Firewall appliance must have certifications like NDPP / ICSA / EAL4 or equivalent.
Hardware Architecture	
TR 8.2	The appliance based security platform must be capable of providing firewall and VPN (both IPsec and SSL) functionality in a single appliance.
TR 8.3	The device must be fully populated in all respects like memory, ports, storage etc.
TR 8.4	The appliance must support at least 4*40G, 4*10 G, 4*1 G with transceivers (SR) from day 1.
Performance & Scalability	
TR 8.5	Firewall must support stateful inspection throughput minimum of 80 Gbps in Active-Active deployment or Active-Passive deployment.
TR 8.6	Firewall must support at least 5 million concurrent sessions.
TR 8.7	Firewall must support at least 250,000 connections per second with application detection enabled.
TR 8.8	NGFW must support 3DES/AES IPsec VPN throughput of at least 5Gbps.
TR 8.9	Firewall must support at least 1000 VLANs.
TR 8.10	Firewall must support 10 virtual firewalls from day one. Virtual firewall should offer separation up to the hardware level and allow to have different software version in each virtual firewall.
Firewall Features	
TR 8.11	Firewall must provide application inspection for DNS, FTP, HTTP, SMTP, LDAP, MGCP, RTSP, SIP, SCCP, SQLNET, TFTP, H.323, SNMP, SQLNET.
TR 8.12	Firewall module must support security policies based on (IPv4 and IPv6).
TR 8.13	Firewall solution must provide protection against botnets.
TR 8.14	Firewall must support creating access-rules with IPv4 & IPv6 objects simultaneously.
TR 8.15	Firewall must support operating in routed & transparent mode. must be able to set mode independently for each context in multi-context mode.
TR 8.16	In transparent mode firewall must support arp-inspection to prevent spoofing at Layer-2.
TR 8.17	Must support Non Stop Forwarding in HA during failover and Graceful Restart
TR 8.18	Firewall must support static nat, pat, dynamic nat, pat & destination based nat.
TR 8.19	Firewall must support Nat66 (IPv6-to-IPv6) & Nat 64 (IPv6-to-IPv4) functionality.

TR 8.20	Firewall must have at least 3000 native application filters available from day 1.
TR 8.21	Must be able to support at least 5000 network objects, 1000 services and 5000 rules base.
TR 8.22	Firewall must support Restful API for integration with 3rd party solutions like Software Defined Networking.
TR 8.23	The Firewall must support Link Aggregation Control Protocol 802.3ad.
TR 8.24	Firewall must have integrated redundant power supply.
High-Availability Features	
TR 8.25	Firewall must be able to operate in Active/Standby or Active/Active mode.
TR 8.26	Firewall must support port aggregation functionality for the failover control & data interfaces for provide additional level of redundancy.
TR 8.27	Firewall must support redundant interfaces to provide interface level redundancy before device failover.
TR 8.28	Firewall must support 802.3ad Ether-channel functionality to increase the bandwidth for a segment across different modules.
TR 8.29	Firewall must support failover of IPv4 & IPv6 sessions.
TR 8.30	Firewall must replicate Nat translations, TCP, UDP connection states, ARP table, ISAKMP & IPsec SA's, SIP signalling sessions.
TR 8.31	Firewall must support failover of IPv4 & IPv6 sessions of individual providers.
TR 8.32	Firewall must support latest IKEv2 standards.
TR 8.33	Must support pre-shared keys & Digital Certificates for VPN peer authentication.
TR 8.34	Must support perfect forward secrecy & dead peer detection functionality.
TR 8.35	Must support Nat-T for IPsec VPN.
Routing Features	
TR 8.36	Firewall must support IPv4 & IPv6 static routing, OSPF v2 & v3, PBR, PBR for BGP v4 & v6, IGMP v2 & V3.
TR 8.37	Firewall must support PIM multicast routing
TR 8.38	Firewall must support SLA monitoring for static routes.
Management Capabilities	
TR 8.39	Firewall management of firewall policies via internal or external centralised management solution
TR 8.40	Firewall must support SNMP 2c & 3
TR 8.41	Firewall must support packet capturing functionality to send the packet capture to Wire shark for detailed packet analysis.
TR 8.42	The Solution Should be able to orchestrate with open stack.
TR 8.43	Firewall must support the functionality of Auto-Update to check for latest software versions & download the same.

2.2.8.2 Operator Workstation

The operator workstations shall be specifically installed for the operators at the City's Integrated Operations Centre. Other than this, there will also be a need to provide Laptops. The specifications for Operator Workstations and Laptop requirements are mentioned below.

OPERATOR WORKSTATIONS	
TR 8.44	The workstations shall have a wireless optical mouse with bluetooth connection complying with FCC and CE norms.
TR 8.45	The workstation shall be Energy star 5.0/BEE star certified/ BIS.
TR 8.46	The workstations shall have a 104 Key English wireless keyboard with Bluetooth connection.
TR 8.47	Keyboards, Mouse and accessories shall be connected via respective signal extender as required.
TR 8.48	Workstation would have Integrated Realtek ALC3861 High Definition Audio Codec (2 Channel) with Internal Speaker.
TR 8.49	The workstations shall have a latest 9th Generation Intel Processor: Intel Core i7-9700, 8 Core, 12MB Cache, 3.0Ghz, 4.7 Ghz Turbo (The latest Intel Core i7 Processor have 3.0Ghz clock speed)
TR 8.50	The workstations shall have at least 8 GB DDR3 memory @ 2666 MHz.
TR 8.51	The workstations shall have a min. of 4 DIMM slots supporting up to 64GB ECC. One DIMM Slot must be free for future upgrade.
TR 8.52	The workstations shall have a min. 1 TB SATA III hard disk @ 7200 RPM or higher.
TR 8.53	The workstations shall have two colour LED monitors of minimum 23.8" diagonal non-glare screen and a dual AMD Radeon Pro WX2100 (2GB memory size, 48 Gbps memory bandwidth) professional graphics card with mDP and DP ports or better.
TR 8.54	The workstations shall have graphic accelerator of ATI Rage Pro/AGP graphics acceleration: HEVC Encode
TR 8.55	The Monitors shall have a minimum resolution of 2560 x 1440 with 5ms response time or better specifications.
TR 8.56	The workstations shall have a DVD-RW as an optical drive or better.
TR 8.57	The workstations shall have an industry-standard professional-grade operating system. Acceptable systems include Microsoft Windows 10 pro 64 Bit.
TR 8.58	The workstations shall have at the minimum ports: 1 serial, 6 USB 2.0 or higher with 2 in the front, integrated autosensing RJ-45 network interface, and Line-In/Mic In and Line-out/speaker Out (3.5 mm) audio in/out jacks.
TR 8.59	The workstations shall have an expansion bus of 3 PCI/ PCIe Slots;
TR 8.60	The workstations shall have latest Microsoft Office Professional and Antivirus. Microsoft Office license shall be perpetual for each workstation.
TR 8.61	Other pre-loaded software (open source/ free) shall be Latest version of Adobe Acrobat Reader, Scanning Software (as per scanner offered).
TR 8.62	The AC input power shall be 220-240 VAC +/- 10% at 50/60 Hz +/- 1Hz.
TR 8.63	The workstations shall have a dual port 1 Gbps Ethernet network interface card.
TR 8.64	The workstation shall be operational in temperature between ten degrees Celsius (10°C) to thirty degrees Celsius (30°C).
TR 8.65	The workstation shall be loaded with advanced antivirus, antispyware, desktop firewall, intrusion prevention (comprising of a single, deployable agent) which can be managed by a central server.
LAPTOP	
TR 8.66	Laptop shall have an Intel Core i7–9th Gen, six core 64-bit processor with Intel 620 Graphics card.
TR 8.67	The Laptop shall have at least (1*16) GB DDR4 memory @ 2400 MHz.

TR 8.68	The Laptop shall have a minimum 1TB SSD hard disk.
TR 8.69	The Laptop shall have a minimum of 2 DIMM slots supporting up to 32GB ECC.
TR 8.70	The Laptop shall have a port supporting 1 Gbps Ethernet network interface card.
TR 8.71	The Laptop device shall have a display screen of 15.3 inches (FHD) with pixel resolution of 1920X1080.
TR 8.72	The Laptop shall have the following minimum ports: <ul style="list-style-type: none"> • 1 HDMI; • Three (3) USB 3.0; • Integrated autosensing RJ-45 network interface; • Line-In/Mic In and Line-out/speaker Out audio in/out jacks.
TR 8.73	Laptop shall have a standard audio sound card and speakers.
TR 8.74	The Laptop device shall have Windows 10 Pro as the Operating System (OS).
TR 8.75	The Laptop device shall have latest Microsoft Office Professional and appropriate Antivirus. Microsoft Office license shall be perpetual for each laptop.
TR 8.76	Other pre-loaded software (open source/ free) shall be Latest version of Adobe Acrobat Reader, Scanning Software (as per scanner offered).
TR 8.77	The Laptop device shall have the latest version of Web-GIS Enterprise solution along with its license.
TR 8.78	The AC input power for the Laptop device shall be 220-240 VAC.
Tablet	
TR 8.79	The tablet shall have memory of at least 64 GB.
TR 8.80	The tablet shall support both Wi-Fi and cellular communications.
TR 8.81	The tablet shall come with a protection case.
TR 8.82	The tablet shall come with all standard accessories.

2.2.8.3 Communication Cabinets with Racks

The cabinets shall be installed at CIOC and PoP room. The cabinets shall be capable of accommodating all the network devices to support the design requirements.

FR - 8 Functional Requirements

FR 8.1	The cabinets shall be capable of accommodating all the network devices to support the design requirements.
FR 8.2	All cabinets shall be designed to carry the anticipated load of all equipment that shall be installed inside the cabinet including having at least 30% spare capacity per rack.
FR 8.3	All cabinets shall be provided with standard accessories including vertical and horizontal cable manager, lights, fans, and power bars as needed to support the design requirements of this Project.

Technical Requirements

COMMUNICATION CABINETS WITH 42 U RACKS	
TR 8.83	The cabinets shall be capable of accommodating all the network devices to support the design requirements and shall include at least size 42U racks.

TR 8.84	All cabinets shall be supplied with standard 19" wide rack mount assemblies that shall allow for mounting of standard rack-mount equipment.
TR 8.85	All cabinets shall be supplied with standard lockable doors.
TR 8.86	The cabinets shall be as a minimum IP 20 rated.
TR 8.87	All cabinets shall have provision for cable entry from top & bottom of rack with knock-off, pre-punched marked openings.
TR 8.88	All cabinets shall have vertical cable managers in front with suitable accessories on each side of the rack with covers for concealed wiring within the rack.
TR 8.89	Front door shall be made of Tinted toughened glass and should be lockable.
TR 8.90	All cabinets shall have equipment mounting frame (rail notches) for mounting of equipment.
TR 8.91	Shelves for equipment placement shall be provided as required.
TR 8.92	All cabinets shall be designed to carry the anticipated load of all equipment that shall be installed inside the cabinet with at least 30% spare per rack.
TR 8.93	All cabinets shall be provided with standard accessories including vertical and horizontal cable manager, lights, fans, and power bars as needed to support the design requirements of this Project.
TR 8.94	The rack shall have ventilation louvers or uniform perforations on side panel & rear door & equipment cooling with fans (4nos.) housed in fan trays.
TR 8.95	Two strips each with minimum 8 numbers of 5A/15A, 230 VAC power outlets with MCB, inbuilt surge suppressor & line filter for conditioned power output shall be provided.
TR 8.96	The device shall support operating temperature range of 5°C to +40°C.
Outdoor Enclosures/ Field Cabinets	
TR 8.97	Weather proof IP55 compliant UV resistant outdoor metallic enclosure/ field cabinet in conformance with DIN 41494.
TR 8.98	Vandal proof design with single side door and lock design shall be as per industrial best practise and compliant to industrial lock.
TR 8.99	Suitable size as per site requirements to house the field equipment.
TR 8.100	Material for outdoor enclosure/ field cabinet must be of Galvanised Iron with material thickness of minimum 1.2mm and minimum two number of locks.
TR 8.101	IP 55 rating must be provided for outdoor enclosure/ field cabinet to keep the temperature within suitable operating range for equipment's and also avoid intentional water splash and dust intake
TR 8.102	Outdoor enclosure/ Field cabinet to be ground mounted on concrete/non-concrete base with features of Rain Canopy, Cable entry with glands, proper earthing and Fans/any other accessories as required for seamless operation of equipment's within outdoor enclosure/ field cabinet.
TR 8.103	MSI shall ensure that each location shall be fitted with outdoor enclosure/ field cabinet sized and dimensioned to host all equipment necessary to operate Surveillance, Wi-Fi and other ICT components as defined in this RFQ cum RFP.
TR 8.104	The size of outdoor enclosure / field cabinet shall be sufficient to house all the system components, which may be installed at the intersection, rotaries or nearby
TR 8.105	This outdoor enclosure/ field cabinet shall house the electronic components including field switches and UPS with batteries required for all field components at that location.
TR 8.106	MSI shall ensure that internal outdoor enclosure/ field cabinet cabling shall be designed for an easy connection and disconnection of the equipment and power, marked with identifiers and installed in

	proper cable guidance trays
TR 8.107	The MSI shall ensure that all outdoor enclosure/ field cabinet compartments shall be equipped with a natural convection air circulation system via provision of air circulation filters for temperature and humidity control that shall not require maintenance and shall allow free circulation of air inside the enclosures/ cabinet to prevent overheating as well as the build-up and effects of humidity and heat, without permitting the entry of elements that might endanger system operation
9U RACKS AT RMUs ROOM	
TR 8.108	The rack shall be capable of accommodating all the network devices to support the design requirements and shall include at least size 9U racks.
TR 8.109	The rack shall have the following size configurations as a minimum: <ul style="list-style-type: none"> • Width: 500mm • Depths: 500mm
TR 8.110	The rack shall have bolted construction.
TR 8.111	All racks shall have provision for cable entry from top & bottom of rack.
TR 8.112	All racks shall be supplied with standard front glass door with locks.
TR 8.113	All racks shall be supplied with standard 19" mounting angles at front are reversible.
TR 8.114	All racks shall have PDU: 5 x 5 Amps and 5 x 15 Amps.
TR 8.115	The racks shall have cooling fan with 230VAC/50Hz as a minimum.
TR 8.116	The racks shall have Cable Manager: 19" with PVC/Metal Loops.
TR 8.117	The racks shall have Mounting Hardware packet for mounting of equipment's inside the rack to be included.
TR 8.118	The racks shall have Earth continuity kit.

2.2.8.4 Uninterruptable Power Supply (UPS)

The UPS unit shall be provided at each PoP rooms and CIOC room (Command and Control Centre, CFC Room and Rack Room) to backup entire DMIC IITGNL devices & switches, emergency lights and Fire detections system. In view of providing redundant power supply to the field devices and switches, UPS shall be provided at every switch across the DMIC IITGNL.

UPS system shall provide a redundant power supply to the following needs:

- Servers and important network and storage equipment;
- Access control, Fire Detection & suppression system and surveillance system.

BR - 8 Business Requirements

BR 8.1	The UPS unit shall be provided with external batteries as needed to support the run-time requirements.
BR 8.2	All DMIC IITGNL equipment installed at PoP, Field cabinets and CIOC shall be connected on the UPS.
BR 8.3	The quantity of batteries required for the UPS, shall be calculated based on the equipment load and run-time.
BR 8.4	The UPS units shall provide backup power to critical load. In addition, UPS shall also provide cleansed power to these equipment.

Functional Requirements

FR 8.4	The UPS unit shall be 3:1 or 3:3 Phase (as per the final load requirement) On-line modular UPS. If the rating of UPS is equal to or above 15KVA at particular location, it should be considered as 3:3 phase UPS and specifications should be considered accordingly. If the rating is below 15KVA, it remains as 3:1 Phase UPS. The MSI shall be responsible for any conversations needed to support this output configuration.
FR 8.5	The UPS design shall ensure that a single component/ device failure shall not result in failure of the entire UPS system. The design of UPS System shall be modular to permit easy maintenance.
FR 8.6	The various overload capacities of inverters, static switch, and step-down transformer/voltage stabilizer as specified herein are the minimum requirements.
FR 8.7	The UPS system to be supplied by the MSI shall have maximum humming noise level of 65 DB one meter away from the UPS cabinets. This shall not exceed 69 dBA measured 5 feet from surface of the UPS

Technical Requirements

TR 8.119	The MSI shall provide the calculations to support the UPS rating and number of batteries as part of the Bid submission. UPS shall be provided as N+1 physically redundant configuration
TR 8.120	The UPS unit shall include Valve Regulated Sealed Maintenance Free Lithium ion Batteries with typical lifetime of five (5) years and minimum reserve time of (4) four hours under full load conditions.
TR 8.121	The battery system design shall be provided with necessary devices to prevent deep discharge beyond recommended limits to prevent the batteries discharging beyond end cell voltage specified by the battery maker. The connections from battery to battery shall be by using copper bus bar strips.
TR 8.122	The UPS unit shall provide a nominal output voltage of 220/230/240VAC(1P) 50/60 Hz or 380/400/415VAC 50/60 Hz(3P).
TR 8.123	The UPS design IGBT based for Rectifier & Inverters and shall have Output PF of Unity (1). Overloading capability of UPS shall be up to 105%-continues; 106 -125% - 10 min; 126 - 150% - 1min; Greater than 150% - 200 msec or higher.
TR 8.124	The UPS offered shall have efficiency not less than 96%.
TR 8.125	The Harmonic distortion (iTHD) of UPS shall be less than 3% on linear load.
TR 8.126	The UPS and batteries shall be mounted in a separate cabinet & the enclosure shall be under lock & key, utilising the minimum possible space and arranged in an aesthetic manner.
TR 8.127	The UPS shall be of True online with double conversion topology. It shall support an output 1 power factor at full load.
TR 8.128	The UPS shall have a microprocessor-based unit status and control display with the status and alarm indicators displayed on the status LED indicator and LCD display.
TR 8.129	The UPS unit shall have load level indicators that display the approximate electrical load placed upon the UPS. The UPS unit shall have a row of battery level indicators on LCD that display the approximate battery capacity.
TR 8.130	The UPS shall have self-diagnostic functionality to detect any failure/fault in the UPS system and shall display the same on the LCD display of the UPS,
TR 8.131	The UPS unit shall have a minimum of the following LED indicators or display on LCD: <ul style="list-style-type: none"> • UPS Mode: On-line, Backup/Battery and Bypass; • Over Load Indicator: This will display when UPS is running on overload; • Battery Status Indicator: This will illuminate when battery is low or faulty/disconnected; and • System Fault: This will illuminate when there is some fault or interruption in UPS.

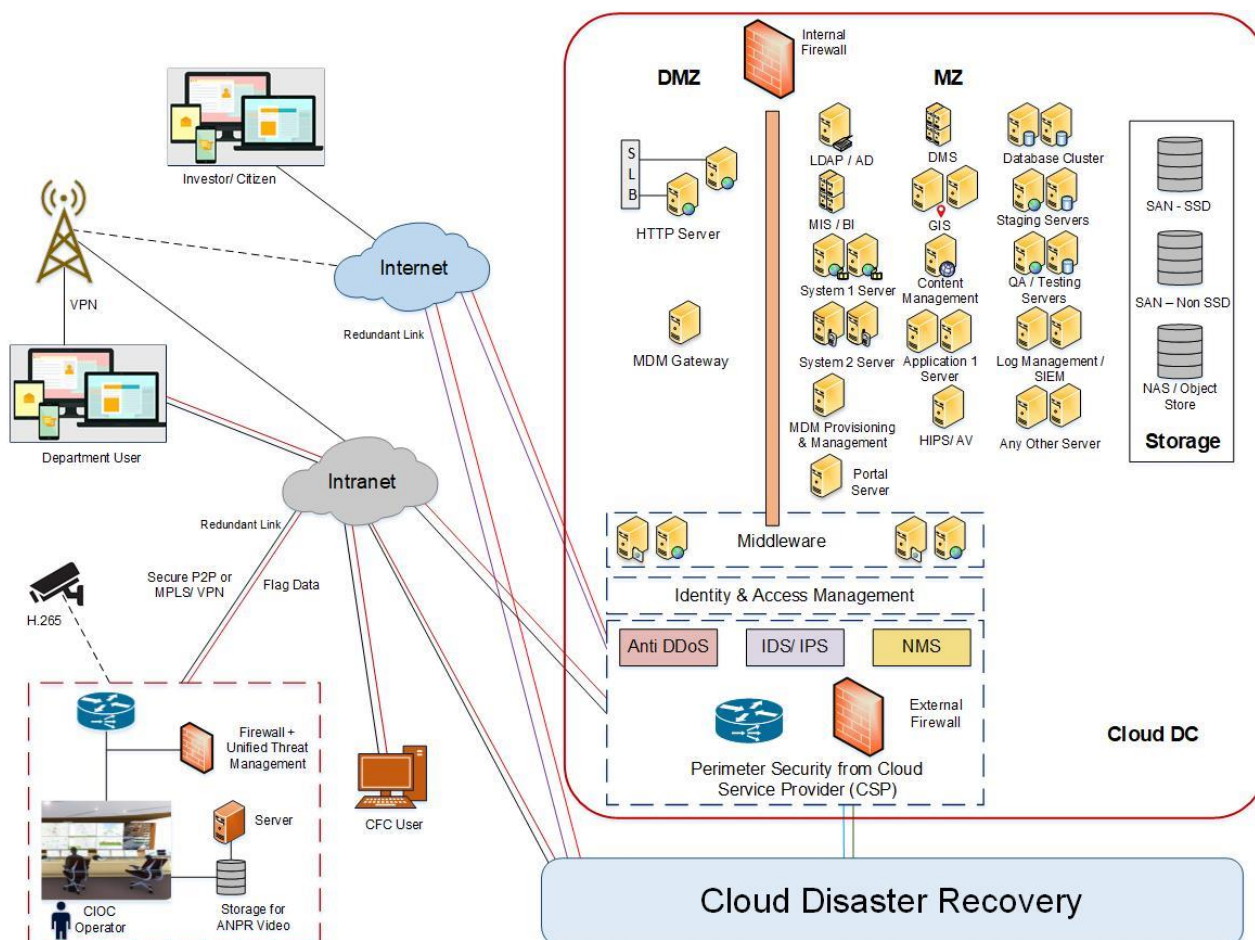
TR 8.132	<p>The UPS unit shall have minimum of the following audible alarms:</p> <ul style="list-style-type: none"> Line Failure: This will be audible when required input electrical supply to UPS is not available; Battery Low: This will be audible when battery voltage falls below the threshold value; Bypass Mode: This will be audible when UPS is running on bypass mode; and System Fault: Audible alarm will be generated when any fault is detected in the UPS system
TR 8.133	<p>The UPS unit shall have following readings on the LCD panel as minimum:</p> <ul style="list-style-type: none"> Voltage and frequency Levels: This shall display input and output voltage and frequency levels; Battery Voltage: This shall display battery voltage in Volts; Load: This shall display the load connected in percentage to the UPS output; and Temperature: This shall display the internal temperature of UPS unit for overheating.
TR 8.134	The UPS unit shall include full-time protection from sudden voltage increase with inrush protection and AC line filtering.
TR 8.135	The UPS shall be able to predict the life and failure of internal FAN. The speed of FAN shall be able to vary as per load on the UPS. It shall also be able to predict Battery ageing
TR 8.136	The UPS unit shall include Ethernet communication port to support remote management and monitoring capabilities using SNMP including alarm contacts and remote shutdown, Remote monitoring and testing software shall be included. The manufacturer shall provide all SNMP traps.
TR 8.137	The UPS unit shall be capable of starting without input power, the unit shall start up and operate from the battery, with output frequency same as the last operating frequency.
TR 8.138	The UPS unit shall include automatic restart. Upon restoration of utility AC power after complete battery discharge, the UPS shall automatically restart and resume operation.
TR 8.139	The UPS unit shall be enclosed to prevent accidental contact with energized parts.
TR 8.140	The UPS unit shall have a built-in input fuse and/or a circuit breaker for protection from over voltage and current variations.
TR 8.141	The UPS unit shall provide an over voltage shutdown and shall have over voltage protection
TR 8.142	The UPS unit shall provide short circuit shutdown protection.
TR 8.143	External battery charger (if required) for the specified battery bank shall be provided. The battery charger shall automatically recharge the battery.
TR 8.144	The external battery charger shall be provisioned to be mounted in separate box/cabinet or UPS itself.
TR 8.145	The UPS unit shall be compliant to IEC 62040-1 safety standards as a minimum. Product shall have CE & ROHS
TR 8.146	The UPS shall have a BACnet card for integration with BMS.
TR 8.147	The UPS system shall have an operating temperature of 0 degrees to 40 degrees C.
TR 8.148	UPS shall support capability to centrally monitor UPS status from EMS.
UPS FOR FIELD DEVICES	
TR 8.149	The MSI shall supply UPS with (2) two hour backup for Field devices.
TR 8.150	The UPS unit shall be provided with external batteries as needed to support the run-time requirements. The quantity of batteries required for the UPS, shall be calculated based on the equipment load and run-time The Bidder shall provide the calculations to support the UPS rating and number of batteries as part of the Bid submission
TR 8.151	The UPS unit shall include separate, sealed, maintenance-free batteries with a typical lifetime of five (5) years.
TR 8.152	The UPS unit shall provide an output of 230VAC, 50 Hz. The Bidder shall be responsible for any conversions needed to support this output configuration.

TR 8.153	The Harmonic distortion (iTHD) of UPS shall be less than 3% on linear load.
TR 8.154	All the Input and output cabling and related ancillary works (civil/electrical, etc.) shall be in the scope of the MSI.
TR 8.155	The UPS shall be of True online with double conversion topology.
TR 8.156	The UPS shall have a microprocessor-based unit status and control display with the status and alarm indicators displayed on the status LED indicator and LCD display.
TR 8.157	The UPS unit shall have load level indicators that display the approximate electrical load placed upon the UPS. The UPS unit shall have a row of battery level indicators that display the approximate battery capacity.
TR 8.158	The UPS shall have self-diagnostic functionality to detect any failure/fault in the UPS system and shall display the same on the LCD display of the UPS.
TR 8.159	The UPS unit shall have a minimum of the following LED indicators: <ul style="list-style-type: none"> ▪ UPS Mode: On-line, Backup/Battery and Bypass; ▪ Battery Status Indicator: This will illuminate when battery is low or faulty/disconnected; and • System Fault: This will illuminate when there is some fault or interruption in UPS.
TR 8.160	The UPS unit shall have minimum of the following audible alarms: <ul style="list-style-type: none"> • Line Failure: This will be audible when required input electrical supply to UPS is not available; • Battery Low: This will be audible when battery voltage falls below the threshold value; • Over Load Indicator: This will display when UPS is running on overload; • Bypass Mode: This will be audible when UPS is running on bypass mode; and • System Fault: Audible alarm will be generated when any fault is detected in the UPS system.
TR 8.161	The UPS unit shall have following readings on the LCD panel as minimum: <ul style="list-style-type: none"> • Voltage and frequency Levels: This shall display input and output voltage and frequency levels; • Battery Voltage: This shall display battery voltage in Volts; • Load: This shall display the load connected in percentage to the UPS output; and • Temperature: This shall display the internal temperature of UPS unit for overheating.
TR 8.162	The UPS unit shall include full-time protection from sudden voltage increase with inrush protection and AC line filtering.
TR 8.163	The UPS unit shall include Ethernet communication port to support remote management and monitoring capabilities using SNMP including alarm contacts and remote shutdown. Remote monitoring and testing software shall be included. The manufacturer shall provide all SNMP traps.
TR 8.164	The UPS unit shall be capable of starting without input power. The unit shall start up and operate from the battery, with output frequency same as the last operating frequency.
TR 8.165	The UPS unit shall include automatic restart. Upon restoration of utility AC power after complete battery discharge, the UPS shall automatically restart and resume operation.
TR 8.166	The UPS unit shall be enclosed to prevent accidental contact with energized parts.
TR 8.167	The UPS unit shall have a built-in input fuse and/or a circuit breaker for protection from over voltage and current variations.
TR 8.168	The UPS unit shall provide an over voltage shutdown and shall have overvoltage protection.
TR 8.169	The UPS unit shall provide short circuit shutdown protection.
TR 8.170	External battery charger (if required) for the specified battery bank shall be provided. The battery charger shall automatically recharge the battery.
TR 8.171	The external battery charger shall be provisioned to be mounted on the rack or UPS itself. Except this, no separate space will be provided for mounting of the external charger.
TR 8.172	The UPS unit shall be compliant to IEC 62040-1 safety standards as a minimum. Product shall have CE & ROHS certifications.

TR 8.173	The UPS system shall have an operating temperature of 0 degrees to 45 degrees C.
TR 8.174	UPS shall support capability to centrally monitor UPS status from EMS.

2.2.8.5 Data Hosting for IIT

Below is the indicative architecture for hosting infrastructure for IIT:



Note:

1. Server Applications shown in the architecture are for illustration purposes only. Actual Server requirements may vary as per Project requirements.
2. All Intranet Applications are on SSO and they should land on MZ.
3. There should not be any need for accessing DMZ by Intranet MZ users.
4. MZ Servers should not be able to make unsolicited outbound calls to Internet.

Exhibit 8: Conceptual Architecture of Data Hosting

Business Requirements

BR 8.5	Hosting infrastructure shall include cloud Data Centre (DC) and cloud Disaster Recover Centre (DRC) services for hosting of applications.
BR 8.6	Cloud Platform/Infrastructure/Solution i.e. DC and DRC shall host all applications excluding video surveillance as part of this Project. .
BR 8.7	Solution shall adhere to guidelines issued by Ministry of Electronics and Information Technology (MeitY) over time to time. Service Level for DC & DRC shall be as per MeitY guidelines. Only MeitY empanelled Cloud Service Providers shall be allowed to provide cloud hosting services for this Project. Deployment model of cloud shall be Government Community Cloud (GCC)/Public Cloud. Exact deployment model shall be finalized during design validation stage.

BR 8.8	Hosting Infrastructure shall have capability of handling enterprise workloads with autoscaling features.
BR 8.9	The proposed application cloud environment should provide flexibility to scale the environment vertically and horizontally: <ul style="list-style-type: none"> Vertically: Upscale/downscale the solution to higher configuration Virtual Machines (i.e. VMs with different combinations of CPU and Memory); and Horizontally: Add more Virtual Machines of the same configuration to a load balanced pool.
BR 8.10	Hosting infrastructure shall be fully secure with no scope of data breach/leaks/thefts/data mining/privacy breach etc.
BR 8.11	Hosting Infrastructure shall have the characteristics such as rapid elasticity and ability to handle hardware failures without downtime.
BR 8.12	Hosting Infrastructure shall have extremely high availability with no point of failure of the Compute / Virtual Machines and storage volumes.
BR 8.13	In case of failure, cloud solution shall have automated processes which shall move customer data traffic away from the affected area.
BR 8.14	Cloud solution shall be complied with ITIL (Information technology Infrastructure library) standards.
BR 8.15	The Data Centre and Data Recovery centre shall be in Active-Active / Active- Passive mode as per MSI solution complying the high availability with no point of failure.
BR 8.16	For the devices connecting to the secured zone of the hosting infrastructure i.e. Militarized Zone (MZ), the infrastructure shall employ a node trust policy and validate that end device is secure from any malicious content before granting access.
BR 8.17	For on Premise server room, the MSI shall deploy desired physical servers along with the applicable hardware like storage, firewall in the allocated server room.
BR 8.18	The Hosting Infrastructure must have assured protection with security built at multiple levels and 24x7 monitoring by provisioning physical security, biometric identification and close circuit monitoring.
BR 8.19	Surveillance video feeds will be stored on Premise Data Centre for 30 days.

Functional Requirements

CLOUD HOSTING / INFRASTRUCTURE	
It shall provide tools or capabilities that enable users to unilaterally provision / order, manage, and use the Cloud solution with below minimum features.	
FR 8.8	The MSI shall offer Infrastructure as a Service (IaaS) / Platform as a Service (PaaS) / Software as a Service (SaaS) based solution or a combination of the same, as per the MSI's solution.
FR 8.9	The solution shall have the ability of Auto-scaling (Vertical and Horizontal), Scaling up / down on demand.
FR 8.10	It shall have self-service provisioning, where there is minimal dependency on the Cloud Service Provider (CSP) and DMIC IITGNL can configure, implement, auto-scale and manage the environment without any human intervention from the CSP.
FR 8.11	It shall have agility with the functionality of software defined configurations to add / remove capacity.
FR 8.12	MSI shall have the overall responsibility of the environment and has the ability to log, monitor, and audit the traffic and usage.
FR 8.13	The solution shall have security features out of the box.
FR 8.14	Complete visibility & control of the environment shall be available with the Client –cloud governance capabilities.

FR 8.15	Solution shall provide reporting capabilities (e.g., personal health dashboard, security logs, audit reports) to the Client on the portal with a historical data of minimum period of two weeks.
FR 8.16	User / Admin Portal (User Profile Management, Trouble Management).
FR 8.17	The solution shall be capable to perform Role Based Access Control to segregate users based on their roles and privileges.
FR 8.18	Cloud solution shall be accessible via both Internet and MPLS/VPN.
CLOUD INFRASTRUCTURE / HOSTING AT DATA CENTRE	
FR 8.19	DC Cloud Infrastructure facilities shall have routers, firewalls, LAN, WAN, internet access, and hosting centres, backup, operations management, and data management capabilities.
FR 8.20	DC Cloud Infrastructure facilities shall have security and data privacy capabilities which include but not limited to data and network security including Anti-Virus, Virtual Firewall, Web Application Firewall, Intrusion Prevention System, Intrusion Detection System, Anti-DDOS, DDOS Protection, Access and Rights Management, Web Application Filter, SIEM etc.
FR 8.21	Reports of periodic third-party inspections/audits and the certifications shall be available online or shared on demand for scrutiny.
DISASTER RECOVERY CENTRE (DRC) / SECONDARY DC	
MSI should provide cloud services at alternate site i.e. DRC / Secondary DC in case of disaster at primary location. Below functionalities shall be complied for DRC / Secondary DC:	
FR 8.22	DRC Cloud Infrastructure solution shall be offered from physically apart data centre (Primary and Secondary Data Centre / Disaster Recovery Centre (DRC) in India to provide business continuity with no interruptions in case of any disruptions / disaster to one of the data centre facility. DRC shall not be in primary data centre.
FR 8.23	The proposed architecture shall be hosted in either Active-Active mode or Active Passive mode based on MSI solution.
FR 8.24	In case of failure of data centre Cloud infrastructure, operations shall be resumed from Secondary Data Centre / Disaster Recovery Centre (DRC).
FR 8.25	MSI shall adhere to the RPO and RTO requirements
FR 8.26	During the change from DC to secondary DC / DRC or vice-versa (regular planned changes) there should not be any data loss.
FR 8.27	Secondary DC / DRC Cloud Infrastructure shall have security and data privacy capabilities which include but not limited to data and network security including Anti-Virus, Virtual Firewall, Web Application Firewall, Intrusion Prevention System, Intrusion Detection System, Anti-DDOS, DDOS Protection, Access and Rights Management, Web Application Filter, SIEM etc..
FR 8.28	Reports of periodic third party inspections/audits and the certifications shall be available online or shared on demand for scrutiny.
FR 8.29	In case of disaster, DRC is expected to operate at 50% capacity of DC.
CLOUD GOVERNANCE CAPABILITIES	
Solution shall have an audit and compliance features which enables the Client agency to monitor the provisioned resources, performance, resource utilization, and security compliance. It shall have the following functionalities:	
FR 8.30	Monitoring of cloud resources with alerts to Client on security configuration gaps, such as overly permissive access to certain compute instance ports and storage buckets, minimal use of role segregation using identity and access management (IAM), and weak password policies.

FR 8.31	System-wide visibility into resource utilization, application performance, and operational health through proactive monitoring (collect and track metrics, collect and monitor log files, and set alarms) of the cloud resources.
FR 8.32	Visibility into the performance and availability of the cloud services being used, as well as alerts that are automatically triggered by changes in the health of those services.
FR 8.33	Event-based alerts, to provide proactive notifications of scheduled activities, such as any changes to the infrastructure powering the cloud resources.
FR 8.34	Capture logs of all user activity within an account. This is required to enable security analysis, resource change tracking, and compliance auditing.
FR 8.35	Ability to discover all provisioned resources and view each of the configuration. Notifications shall be triggered each time a configuration changes, and agencies shall be given the ability to dig into the configuration history to perform incident analysis.
FR 8.36	Continuous monitoring and optimization of auto-scaling rules and limits.
FR 8.37	Optimize overall cost of resources require to run overall operations of the Client.
FR 8.38	Cloud infrastructure should not allow any data mining, data theft, data breach violations of any type.
INTEGRATION	
FR 8.39	All alerts, logs and events generated by cloud infrastructure / hosting should be seamlessly integrated with Enterprise Management System, Network Management System, Anti-DDOS, SIEM or any other solution provided by the MSI.
TRACK RESOURCE INVENTORY AND CHANGES	
FR 8.40	Resource inventory, configuration history & change notifications functionalities shall be provided.
FR 8.41	Guidelines for provisioning, configuring and continuously monitoring compliance shall be provided.
FR 8.42	Solution shall automatically record a resource's configuration when it changes.
FR 8.43	Solution shall examine the configuration of resources at any single point in the past.
FR 8.44	Client shall receive notification of any configuration change.
PERSONALIZED DASHBOARD	
FR 8.45	Dashboards shall provide a personalized view of service health, consumption and usage.
FR 8.46	Dashboards shall provide proactive notifications.
FR 8.47	Dashboards shall have the capability of detailed troubleshooting guidance.
FR 8.48	Dashboards shall have the capability of integration and automation.
PHYSICAL SERVER FOR ON-PREMISE HOSTING	
FR 8.49	Physical Servers shall be provided to support local processing and storage as per the solution proposed by the MSI and as per the Application.
FR 8.50	A sufficient number of physical servers shall be provisioned such that their CPU, RAM, and other key server component performance do not individually exceed 50% utilization individually.
FR 8.51	Sufficient amount of storage shall be provided to support the operational needs.
FR 8.52	Suitable commercial off-the-shelf antivirus software shall be provided for the duration of the contract.

FR 8.53	The central system server shall have a hot standby to mitigate any risk of failure in central system which halts the system performance.
FR 8.54	Server shall be designed to provide a fully redundant and fault tolerant system and shall be available for 99.99% or greater. The unscheduled down time shall be less than 0.01%.
FR 8.55	Server shall be provided with the Server Rack, Storage, KVM Module as needed to optimize the overall IT infrastructure operations.

Technical Requirements

GENERAL	
TR 8.175	The application hosting solution shall provide flexibility of hosting the solution on VMs of varying configuration scales.
TR 8.176	Cloud solution shall have a Cloud Management interface which shall have the ability to unilaterally provision and de-provision the specific IaaS/ PaaS/ SaaS services contemplated by the project via Web Portal, Command Line Interface and Web Services Application Programming Interface ("API"). All the communication for these purposes shall be secured at transport level using SSL / TLS / SSH.
TR 8.177	Hosting solution shall have "Auto Scale" capability enabling provision of additional resources based on the seasonal peak loads.
TR 8.178	Hosting solution shall have the ability to provision virtual machines, storage and bandwidth dynamically (or on-demand), on a self-service mode or as requested.
TR 8.179	The service shall offer a secure Web administration interface, which shall provide to remotely administer the virtual instances: RDP for Windows instances and SSH for Linux instances.
TR 8.180	Hosting solution shall provide the capability to copy or clone virtual machines for archiving, troubleshooting, and testing.
TR 8.181	The service shall provide the ability to provision Block Storage capabilities for the virtual machine instances. These storages can be dynamically scalable on-demand and Virtual Machine instances shall be able to mount it as OS drives.
TR 8.182	The hosting software shall define compute, storage and networking, with access to a web services API for these capabilities.
TR 8.183	The hosting infrastructure shall support the applications developed on Microsoft .net, Java/JavaScript and one major permissive free license development language, such as Python, PHP or Ruby.
TR 8.184	The public facing services shall be deployed in a zone (DMZ) different from the application services. The Database nodes (RDBMS), back-office systems shall be in a separate zone (MZ) with higher security layer. The UAT and training portals on the cloud shall be separate from the production portal in a different subnet than the production environment and setup such that users of the environments are in separate networks.
TR 8.185	The hosting infrastructure shall have suitable security and networking solutions.
TR 8.186	The hosting infrastructure shall provide real-time analytics and enable trend identifications on the usage.
NETWORK SERVICES	
TR 8.187	Hosting solution shall provide IP addressing that shall support: IPv4, IPv6, DHCP, IP address and port assignment on external (public) interfaces, dedicated VPN connectivity and the ability to map Project DNS domains to hosting services addresses enabling services, sites and applications operating in the hosting infrastructure to be viewed as URLs.
TR 8.188	Hosting service shall provide a traffic management mechanism to implement availability based load balancing for virtual Machine Instances.
TR 8.189	Hosting solution shall provide virtual private network (VPN) connectivity from hosting environment in both Site-to-Site and Point-to-Site configurations.

TR 8.190	Cloud solution shall provide an option of extending an MPLS to cloud.
TR 8.191	Cloud service provider's infrastructure shall be protected against DDoS.
TR 8.192	Hosting solution shall provide virtual network isolation capabilities among the virtual machines and must support the use of private virtual networks.
TR 8.193	Cloud service provider shall have redundant ISPs providing Internet connectivity to their data centre / network.
TR 8.194	Hosting service shall provide connectivity with options to leverage carrier provided MPLS and shall be backed by SLA.
TR 8.195	Direct peering with large TSPs in India for speedy and efficient delivery of content to all users accessing the service from various devices on various network service providers.
TR 8.196	The proposed hosting platform shall have ability to deploy VMs in multiple security zones, as required for the project, defined by network isolation layers in the Client's local network topology.
TR 8.197	The cloud solution shall be able to monitor VM up/down status and resource utilization such as RAM, CPU, Disk, IOPS and network Provide hardware or software based virtual load balancer Services (VLBS) through a secure, hardened, redundant CSP Managed Virtual Load Balancer platform.
SECURITY, PRIVACY AND COMPLIANCE REQUIREMENT	
TR 8.198	Following security features shall be provided as part of the Cloud solution: <ul style="list-style-type: none"> • Availability of global third party certifications: Cloud Services shall be certified (by a third party) for ISO 9001, ISO 27001, ISO 20000; • Identity and Access Management (IAM): that allows controlling of level of access to the users to the CSPs infrastructure services. With IAM, each user shall have unique security credentials, eliminating the need for shared passwords or keys and allowing the security best practices of role separation and least privilege; • Cloud solution shall provide Directory service as a cloud service backed by SLA. The Identity service shall allow single sign-on (SSO); and • Secure Access – Client access points, also called API endpoints, shall allow secure HTTP access (HTTPS) so that the Agencies shall establish secure communication sessions with Cloud services using Secure Sockets Layer (SSL)/Transport Layer Security (TLS) (Latest version).
TR 8.199	All VMs shall be hardened with only known ports open and documented. MSI shall disclose the open ports along with reason associated with the same. MSI shall ensure that all other ports remain closed.
TR 8.200	Hosting Solution shall have capability of Role Based Access Control to segregate users based on their roles and privileges.
TR 8.201	Hosting solution shall provide flexibility to choose various firewall and router solutions from the industry leading vendors or as requested by Client.
TR 8.202	Hosting solution shall manage the underlying hardware infrastructure and virtualization layer following the appropriate patch management and technology refresh cycles.
TR 8.203	Following security solutions shall be implemented by MSI: <ul style="list-style-type: none"> • Centralized Anti-Virus for the virtual machines, workstations/ laptops, Public Interactive Kiosks and on-premise hosting infrastructure; • DDoS attack Protection and Anti-DDoS; • Next Generation Firewalls; • Host Intrusion Prevention System (HIPS); • Intrusion Prevention System (IPS); • Web Application Firewall to help protect web applications from common web attacks such as SQL injection or cross-site scripting; • SIEM (Security Incident and Event Management) to monitor the security incidents; and • Mobile Device Management (MDM).

TR 8.204	Hosting solution shall be fully secure and should not allow any data privacy breach, security breach, data mining, data corruption of any type.
TR 8.205	The hosting infrastructure shall provide hardware or software based virtual load balancing as a service to provide stateful failover and enable Customers to distribute traffic load across multiple servers.
TR 8.206	Network Access Control of end devices shall ensure that required level of security policies are implemented on end devices before allowing access to MZ.
ADDITIONAL FEATURES	
Following components shall be part of the hosting solution:	
TR 8.207	Operating System, Antivirus/Antispam/Antimalware, Patch Management Tools for non-Windows/Linux OSs.
TR 8.208	Provide the user administration / portal of cloud services to have visibility into the dashboard, SLAs, management reports, etc.
TR 8.209	Management, Monitoring and Audit: Security Information and Event Management tools, Performance Monitoring Tools, Patch/Update Management Tools for OS, DB.
TR 8.210	VPN: VPN server / gateway for providing VPN connectivity to some set of users.
TR 8.211	Any additional tools required to run the hosted applications in secure manner shall be proposed.
TR 8.212	The system shall be able to restore from the backup whenever required.
TR 8.213	Configure, schedule, monitor and manage backups of all the data including but not limited to files, images and databases.
SERVER RACK	
TR 8.214	The cabinets shall be capable of accommodating all the network devices to support the design requirements and shall include at least size 42U racks.
TR 8.215	All cabinets shall be supplied with standard 19" wide rack mount assemblies that shall allow for mounting of standard rack-mount equipment.
TR 8.216	All cabinets shall be supplied with standard lockable doors.
TR 8.217	The cabinets shall be IP 20 rated.
TR 8.218	All cabinets shall have provision for cable entry from top & bottom of rack with knock-off, pre-punched marked openings.
TR 8.219	All cabinets shall have vertical cable managers in front with suitable accessories on each side of the rack with covers for concealed wiring within the rack.
TR 8.220	Front door shall be made of Tinted toughened glass and should be lockable.
TR 8.221	All cabinets shall have equipment mounting frame (rail notches) for mounting of equipment.
TR 8.222	Shelves for equipment placement shall be provided as required.
TR 8.223	All cabinets shall be designed to carry the anticipated load of all equipment that shall be installed inside the cabinet with at least 30% spare per rack.
TR 8.224	All cabinets shall be provided with standard accessories including vertical and horizontal cable manager, lights, fans, and power bars as needed to support the design requirements of this Project.
TR 8.225	The rack shall have ventilation louvers or uniform perforations on side panel & rear door & equipment cooling with fans (4nos.) housed in fan trays.
TR 8.226	Two strips each with minimum 8 numbers of 5A/15A, 230 VAC power outlets with MCB, inbuilt surge suppressor & line filter for conditioned power output shall be provided.
TR 8.227	The device shall support operating temperature range of 5°C to +40°C.
ON PREMISE PHYSICAL SERVER	

TR 8.228	Servers will be provided to support local processing and storage as per the requirements of this RFQ cum RFP.
TR 8.229	A sufficient number of physical servers shall be provided such that their CPU, RAM, and other key server component performance do not exceed 50% utilization individually.
TR 8.230	The MSI shall provide sufficient amount of storage to support the operational needs. The storage on-site shall be for at least 30 business days post which the storage can be archived to on-site media provided by the MSI.
TR 8.231	The server shall have Dual Processor Intel Xeon Scalable CPU / 16 Cores 3.6 GHz or better.
TR 8.232	The server shall have 128 GB of RAM, Configures with 3 TB of storage. The memory shall be scalable to double the capacity configured.
TR 8.233	The Server shall include 2-Hot plug redundant power supplies and cooling fans.
TR 8.234	The Server shall have an Optical Drive 48x SATA CDRW/DVD Combo Drive.
TR 8.235	The Server chassis shall be rack mountable and include rack mounting hardware. The chassis should support Compute and storage sleds.
TR 8.236	The Server shall include 12 Gbps Hardware 2Gbps Cache RAID controller (RAID 0, 1, 5, 10, 50) supporting up to eight (8) hot-plug Serial-attached SCSI (SAS) drives.
TR 8.237	The Server shall include hard drives based on volume of data to be stored. The transaction data storage requirements shall be estimated based on total transactions & related calculations as per the functional requirements.
TR 8.238	<p>The Server shall provide either of the following license version (Enterprise and Commercial Grade Edition) Operating System:</p> <ul style="list-style-type: none"> • Microsoft Windows Server 2012 / 2016; • Canonical Ubuntu Latest Version; • Red Hat Enterprise Linux (RHEL); • SUSE Linux Enterprise Server (SLES); • VMware; • Citrix XenServer.
TR 8.239	Suitable commercial off-the-shelf antivirus software shall be provided for the duration of the contract.
TR 8.240	The central system server shall have a hot standby to mitigate any risk of failure in central system which halts the system performance.
TR 8.241	Server shall be designed to provide a fully redundant and fault tolerant system and shall be available for 99.99% or greater. The unscheduled down time shall be less than 0.01%.
TR 8.242	Server shall be provided with the link load balancers and server load balancers as needed to optimize the overall IT infrastructure operations. The most efficient operations of servers shall be the responsibility of the MSI.
TR 8.243	<p>The Server Management Software shall provide role-based security along with pre-failure warning for:</p> <ul style="list-style-type: none"> • CPU; • Memory; • HDD.
TR 8.244	The Server shall be provided with redundant hot swappable power supplies. The power supplies shall be FCC Class-A certified.
TR 8.245	The Server shall comprise of redundant fully populated Hot swap fans.
TR 8.246	<p>The Server shall meet the following remote management capabilities:</p> <ul style="list-style-type: none"> • Manage the server hardware and software components remotely; • Power on/off and boot the system remotely.

TR 8.247	<p>The Server shall comprise of the following interfaces and ports:</p> <ul style="list-style-type: none"> • 4 X 1 GE (LAN) ports; • 1 X 10 G SFP+ dual port; • 1 X 16GB FC HBA DP; • 1 Serial interface; • 1 VGA interface; 3 USB ports. • 3 PCIe Gen 3
ON PREMISE STORAGE	
TR 8.248	The MSI shall provide unified storage for storing the video data for at least 30 days on- premise server. Any other non-video data which is generated on-premise shall be stored in unified storage.
TR 8.249	All video event/flagged data and other non-video data generated on-premise to be archived on cloud hosting infrastructure for the duration of the Project.
TR 8.250	Unified Storage Solution should be IP Based/iSCSI/FC/FCOE/NFS/CIFS as per the application requirement
TR 8.251	<p>The storage should have no single point of failure on components like controllers, disks, cache memory, I/O Ports, Power supply, Fan, etc.</p> <p>Storage solution should comprise of Active-Active Load Balancing Storage Controllers.</p>
TR 8.252	The storage array must have complete cache protection mechanism either by de-staging data to disk or providing complete cache data protection with battery backup for minimum 48 hours
TR 8.253	Storage should support all industry standard RAID type like RAID 0, 1, 10, 5,6 & 50.
TR 8.254	Modular design to support controllers and disk drives expansion.
TR 8.255	Should be Rack Mountable
TR 8.256	The controllers / Storage nodes should be redundant and upgradable without any disruptions / downtime.
TR 8.257	Licenses for the storage management software should include disc capacity/count of the complete solution and any additional disks to be plugged in the future, up to max capacity of the existing controller/units.
TR 8.258	Should be able to manage from Web and Command Line console for entire storage system.

2.2.9 City's Integrated Operations Centre (CIOC)

As part of the IIT Smart City Project, it is envisaged that City's Integrated Operations Centre (CIOC) at IIT admin building will act as the 'nerve' of IIT that will help in making the city operations intelligent, integrated and efficient.

CIOC will leverage information provided by multiple city systems, which further helps in providing an integrated, seamless, proactive and comprehensive response mechanism for day-to-day city operations and challenges. It includes the City Command And Control Centre with the necessary hardware and software to support city operations. Through a centrally integrated platform at the CIOC, DMIC IITGNL will have capabilities for visualization and analytics of city operations (using Big Data, predictive and prescriptive analytics etc.) via cross-functional integration of various systems. All city infrastructure and systems deployed as part of IIT will be integrated at CIOC for central monitoring, control and integrated operations. An essential feature of the CIOC will be a smart city platform which will be a combination of system layers that when combined make use of Big Data, ICT and other infrastructure, advanced computing, analytics, and visualization to enhance a city's intelligence while normalizing the data.

There are a number of functions and systems that will be managed out of the CIOC. Depending on the type of system and the respective functions, they will be monitored and/or controlled from the CIOC and will have the option of sharing a feed to another agency as required via the CIOC. Note that the Power systems, street lighting, water and wastewater systems, Solid Waste SCADA will be provided by Others and have been explained as part of other sections of this RFQ cum RFP. These systems will be SCADA based using their respective individual system deployments and will only be integrated at the CIOC for critical alarms and functionality. It is not expected that there is an entire duplication of these systems for the purposes of monitor and control at the CIOC

An overview of the parameters of these specific applications is provided below:

Table 4: An overview of the CIOC parameters

SYSTEM	MONITOR	CONTROL	FEED SHARING (EXTERNAL)
Electrical system including metering	✓		✓
Street lighting	✓	✓	
Water (including metering) and Wastewater	✓		
Environmental Sensors	✓	✓	✓
City Surveillance including sharing feed with Police	✓	✓	✓
Emergency Communications	✓	✓	
Fire	✓		✓
IIT Software Modules (ISM)	✓	✓	✓
ICT infrastructure – Wired & Wireless	✓	✓	
Facilities management – DMIC IITGNL building	✓	✓	
Facilities management – non DMIC IITGNL building (BMS or IP based Fire Alarm)	✓		
Traffic Management including ATCC and ANPR	✓	✓	✓
Education	✓		
Healthcare	✓		
Public Interactive Kiosks	✓	✓	
Solid Waste SCADA	✓		

City's Integrated Operations Centre (CIOC) will be designed and developed in a manner that it serves as a unified and integrated platform to monitor, control and manage pan-city IT and non-IT infrastructure. The facility

developed for CIOC will comprise of multiple facilities, each of them dedicated to different purposes such as city surveillance, traffic monitoring and management, emergency responses, city maintenance and operations etc. The CIOC facility will also serve as a host to Network Operations Centre (NOC), respective Utilities Centre, Single Window Service Desk, Contact Centre etc., enabling cross-systems integrations and coordination amongst various city authorities.

All kinds of camera and surveillance devices installed across IIT will be integrated with the City Surveillance facility of CIOC. This also include the cameras installed for non-ICT purposes such as water and power utilities, bus shelters, open spaces etc. The surveillance feeds of all such cameras will be displayed on a video wall. Further, the Emergency Response Centre of CIOC will focus primarily on dealing with requests related to crisis situations, riots, natural disasters such as earthquakes etc.

All SCADA systems will have their own software and area of operations. A mini version of all SCADAs, which will be replica centres for utilities with mostly monitoring functionalities, will be positioned at the CIOC facility for integrated monitoring and operations. The utilities which will be monitored through these mini SCADA centres include power network including metering, streetlight, solid waste SCADA and water/wastewater network including metering, as applicable. The personnel monitoring the utilities infrastructure will be able to perform tasks such as operations, monitoring, event and alarms generation and escalation etc. The mini SCADA centres will also be integrated with the main monitoring facility of the CIOC just like other units/ centres within CIOC.

In addition to this, various city-level applications will also be developed and integrated with solutions such as IIT Software Modules (ISM), City Portal, City's Cockpit/ Dashboards etc. This in turn will improve transparency of data access amongst the different departments of IIT while ensuring efficient, integrated and operations intelligent management of IIT.

All these multiple systems and IoTs will be integrated with the Smart City Platform. The platform will take feeds/inputs from various sensors, real-time systems, processed data and legacy data to enable data normalization, proactive monitoring, analytical prediction and cross-system communications for making an intelligent city. GIS will be leveraged as an underlying layer at smart city platform. In terms of analysis, using this platform, the city shall achieve statistical and predictive analytics, big data analytics, business intelligence and real-time event processing. Through this platform, various 'mined' information shall be shared with city officials and citizens in the form of reports, dashboards, standard APIs and open-data. A high-level architecture of the Project, specifically for interaction with CIOC, is presented below.

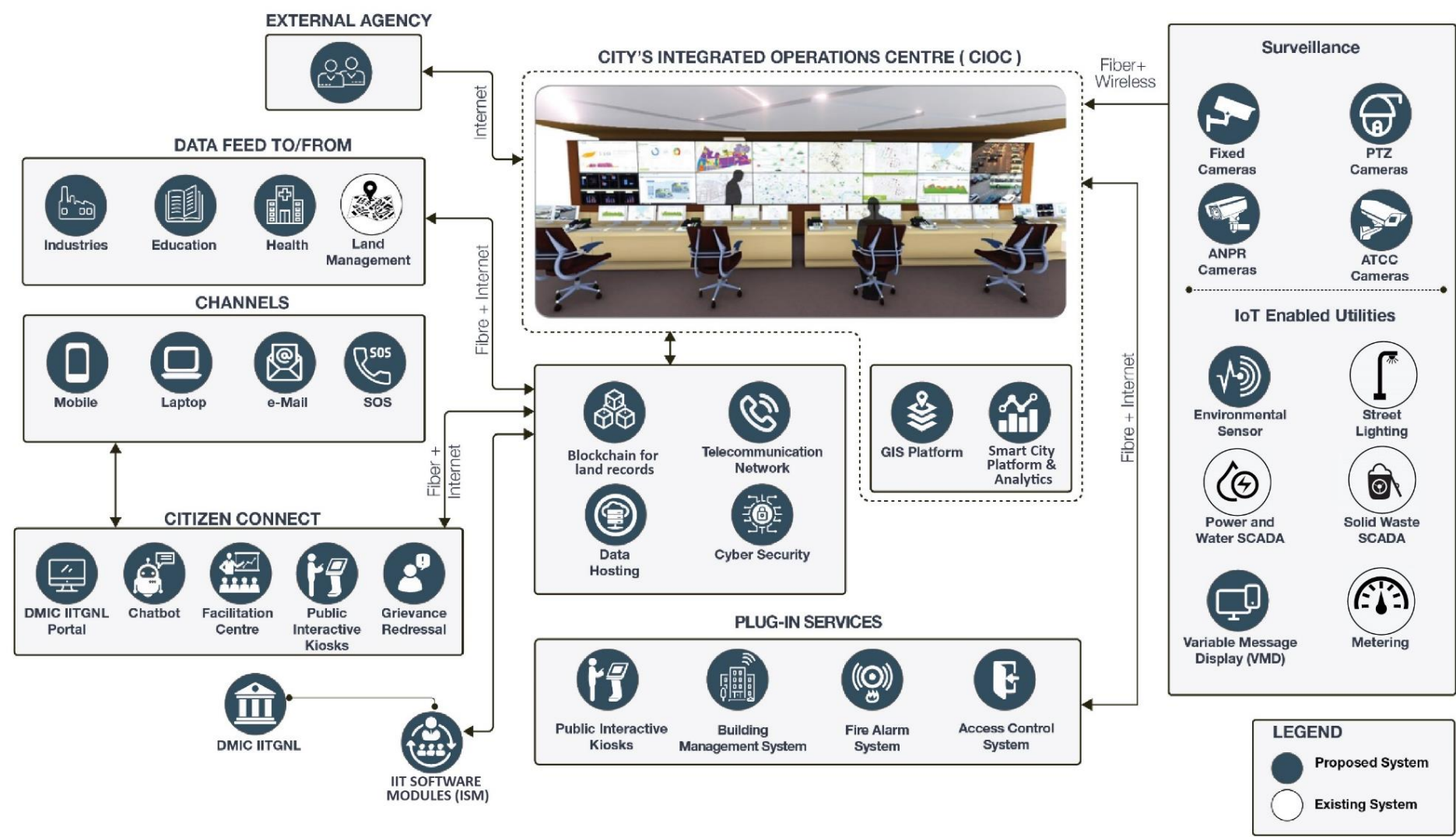


Exhibit 9: High level architecture of the Project

Exhibit 10 below presents an indicative functional diagram of the logical connections between various components at the CIOC. A brief description of each component is presented below:

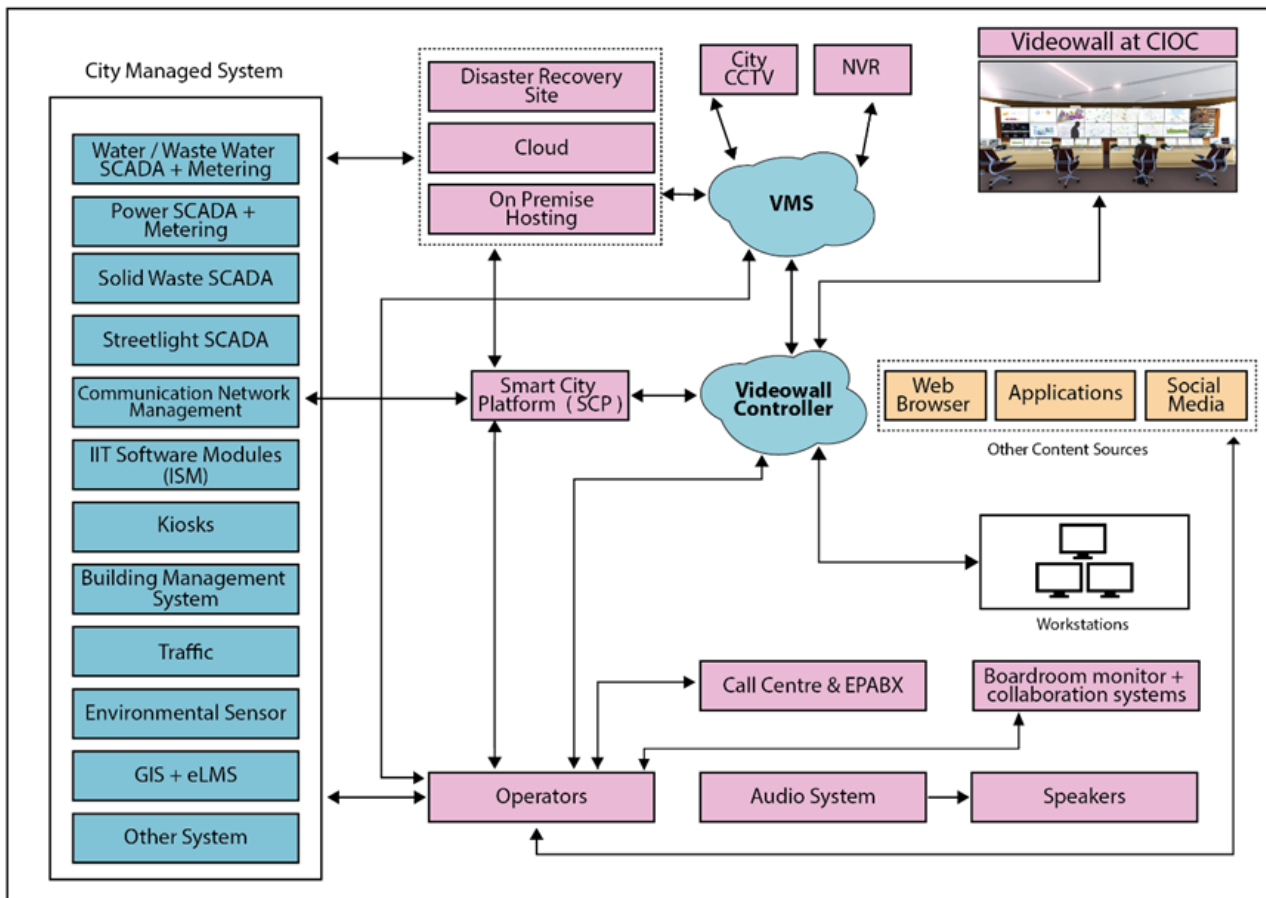


Exhibit 10: Functional view of CIOC

- Applications, Social Media and Web Browsers: Multiple software applications shall be a content input into the CIOC Systems. Social media will also be integrated to understand social sentiment;
- Audio System and Speakers: A system of audio components to provide annunciations in the operation spaces within the CIOC;
- Boardroom Monitor + Video conference system: This will be used for Video conference between internal and external agencies of DMIC IITGNL for city management and operations purposes;
- Call Centre & EPABX: A 24 x 7 call centre shall be setup to support city operations. The call centre shall have the capability of expansion as required to support City services. EPABX phones will be used for communication by Operators;
- City CCTV Cameras, ATCC and ANPR: These are the primary video inputs into the Video Systems;
- City Managed Systems: Content for a number of city systems to be managed and monitored at the CIOC;
- Cloud, Disaster Recovery Site and On-Premise Hosting: Are external to the City limits and used for system applications and data storage for some of the systems;
- Videowall Controller: The Videowall Controller shall manage all networked visual content throughout the facility, including the video display wall and the boardroom display. This system will manage a dashboard for City Management Systems to be displayed and monitored on the video wall;
- Video Recording: Video recorders shall be dedicated for recording and archiving of camera video;
- Operator Workstations: These workstations shall be dedicated for CIOC System use at the operator consoles. They are the point of control for the various systems at the CIOC;

- Smart City Platform: Various smart city dashboards, Key Performance Indicators (KPI's), and analytics that are available as display visuals to aid city operations and better manage the City. This platform will also input and output feeds from other systems and agencies such as fire, education, healthcare, etc.;
- Video Display Wall: The Video Display Wall shall be located in the Operations Room and shall be the primary visual display for operators at the CIOC; and
- Video Management System: The Video Management System shall manage CCTV streaming video, PTZ control, and video archiving.

One of the key components and focal point of the system is the Videowall controller. The Videowall controller will manage and drive all visual content to the various display devices, including the video display wall. All smart city systems will connect content through the videowall. Operators ultimately have the ability to control and manage content through the videowall controller.

The operators will also manage and control CCTV cameras, other IOC systems, and dispatch to system maintenance staff. They will be responsible for monitoring and managing the smart city systems out of the CIOC.

BR - 9 Business Requirements

BR 9.1	CIOC shall act as the 'nerve' of IIT and shall assist DMIC IITGNL in enhancing efficiencies of city operations and management.
BR 9.2	CIOC shall include command and control centre, operator workstations, cabin and boardroom space along with a dedicated rack room.
BR 9.3	CIOC shall enable cross-system and cross-agency coordination to monitor, operate and manage the city in an integrated manner.
BR 9.4	Using the smart city platform, different agencies/departments of DMIC IITGNL shall be able to monitor and utilize information of other departments for delivering services in an integrated and more efficient manner.
BR 9.5	The smart city platform shall be able to normalize the data coming from different devices of various OEMs. It shall support integration with multiple vendors.
BR 9.6	The data store function shall acquire data both automatically and manually. Automatic data acquisition shall be met through industry-standard data transports. Data Acquisition via Dynamic Data Exchange (DDE) and for Process Control (OPC) along with other proprietary transports shall also be supported.
BR 9.7	All systems being implemented as part of this Project and Systems provided by 'Other Parties' shall be monitored and controlled on a standalone basis at CIOC as per the requirements of the Project.
BR 9.8	Through the smart city platform, DMIC IITGNL shall have capabilities for various visualization and analytics of city operations. These analytics shall be achieved via cross-system integration of various systems and as per the standard operating procedure discussed and agreed upon with the Client. Analytics shall include both prescriptive and predictive analytics.
BR 9.9	CIOC shall provide reporting capabilities for city administrators to keep record of city operations.
BR 9.10	The systems at CIOC shall ensure that integrity and confidentiality of all information gained is secure at all times.
BR 9.11	The smart city platform shall be the integration point at which data from across the city converges for processing. This shall allow all information to be managed within the same network, eliminating many communication problems that are faced by siloed systems and networks.
BR 9.12	The CIOC shall be rated for 24x7 operations.
BR 9.13	CIOC shall have shift-based operations for an overall 24x7 support.
BR 9.14	Integrate with other SCADA/IoT based systems including water and wastewater, power, solid waste and streetlighting (providing by Others) at the CIOC for monitoring and control of these systems. Note that these SCADA based systems shall be primarily monitored and controlled from their respective

	system. However, the smart city platform shall provide the capabilities to DMIC IITGNL operators to visualize all attributes and override the control of these systems as per the defined standard operating procedures for critical functionalities only.
BR 9.15	Integrate all systems from CIOC to a central GIS platform being provided as part of this Project and as detailed in the (ISM) section. GIS will be the foundation layer and database for the City data.
BR 9.16	Smart city platform will not necessarily duplicate all functionality derived out of individual system specific applications but will monitor and integrate various features using which an intelligent city operation can be achieved.
BR 9.17	CIOC shall be scalable to accommodate future growth and support hardware and software additions and upgrades.
BR 9.18	The overall work shall be in reference to standards published as per ISO 37120, ISO 37122 and World Council of City Data (WCCD).
BR 9.19	CIOC Software should have Location engines for geographical, Device engine for aggregation of sensors data, Data & Analytics engine for storing data feeds from the device engine & external data sources and Service management to performs service management, Subscription engine for user roles authentication with global standards.

FR - 9 Functional Requirements

This section presents both the functional requirements and indicative standard operating procedures that are envisaged for the systems being integrated at CIOC

FR 9.1	CIOC shall provide a holistic and real time view of all city operations on a video wall along with individual views on operator workstations.
FR 9.2	CIOC shall enable monitoring, control and automation of various city operations in order to ease and organise city operations.
FR 9.3	CIOC shall enable system and cross system analytics through smart city platform in order to make city operations intelligent.
FR 9.4	CIOC shall leverage information provided by multiple city systems in order to provide an integrated, seamless, proactive and comprehensive response mechanism for day-to-day city operations and challenges.
FR 9.5	CIOC shall provide real time dashboards, visualizations, KPIs, historical trending, analytics and other intelligent features to facilitate city operations analysis by city administrators.
FR 9.6	CIOC shall provide alarm features for immediate notification to city administrators in case critical event occurs in the city.
FR 9.7	The Videowall Controller provided as part of CIOC will manage and drive all visual content to the various display devices, including the video display wall. All city systems will display content through the videowall controller.
FR 9.8	The operators will also manage and control various systems, and dispatch to system maintenance staff. They will be responsible for monitoring and managing all integrated city systems out of the CIOC.
FR 9.9	The Smart City Platform shall normalize, analyse and use this data for efficient operations and management of the city.
FR 9.10	All workstation units of the operator workstations shall be installed at the central rack rooms so that space at the CIOC operator desks can be optimized. The operators and other personnel operating from the CIOC shall only have displays, keyboard and mouse at their workstation desks.
FR 9.11	The platform shall receive direct feeds and raw data from the IIT City Systems. City Systems shall include the following: <ul style="list-style-type: none"> • Building Management System (BMS); • Education (as applicable);

	<ul style="list-style-type: none"> • IIT Software Modules (ISM); • Emergency; • Healthcare (as applicable); • Power & Water IoT/SCADA; • Street Lights; • Automated Waste Collection System; • Environmental Sensors; • Variable Message Displays / Digital Display Signs; • Surveillance; • ATCC and ANPR; • GIS; • Telecommunication Network including fibre network and Wi-Fi; • IoT; and • Any other system being included as part of this Project. <p>It shall also receive, normalize and make good data received from social media integration. It is required that the platform supports both structured and unstructured data inputs.</p>
FR 9.12	Direct connections and data from devices / systems shall include real-time City Systems data, KPIs and video feeds from CCTV cameras.
FR 9.13	Visual data from City Systems shall be integrated into the platform user interface and directed to the videowall controller for display on the video display wall and boardroom monitor.
FR 9.14	The platform shall be capable of managing/monitoring data and visualizations for all City Systems.
FR 9.15	The platform shall be capable of managing/monitoring all city functions. These functions shall be incorporated into the platform with a single user interface.
FR 9.16	The platform shall support integration with all other systems being provided by others as part of this Project and as provided by other Contractors.
FR 9.17	Some of the systems shall have their respective SCADA system for monitoring and control. Using the smart city platform, visualizations of all data received from these SCADA systems is possible. However, only critical functionality defined using the SOPs shall be enabled using the smart city platform for the purposes of monitor and control of these systems.
FR 9.18	The platform (or an integrated component of the platform) shall be capable of performing data consolidation, normalization, and cross system analytics.
FR 9.19	The platform shall be user configurable and compatible with all standard industry protocols for individual systems. It shall be the only system through which all data consolidation, normalization and cross system and individual analytics shall be performed for all city systems.
WATER AND WASTEWATER	
FR 9.20	Communicate locations of personnel, equipment, outage information and safety measures with internal and field personnel.
FR 9.21	Perform IoT operations as required by line personnel.
FR 9.22	Administer IoT programming and data collection functions.
FR 9.23	Utilize the IoT system to monitor system statistics.
FR 9.24	Dispatch water and wastewater service requests to the appropriate internal and field personnel using the ISM system.
FR 9.25	Assist in gathering information for reporting needs (broad reports, departmental benchmarks, etc.).
FR 9.26	Track progress of water and wastewater service requests against pre-determined KPIs.

FR 9.27	Report back to client and contract staff on progress of each water and wastewater service request and close out service requests when completed using the ISM system.
FR 9.28	Maintain asset information held in the database using GIS and ISM system.
FR 9.29	Monitor trunk infrastructure in terms of leaks, breaks, etc.
FR 9.30	Update site specific water and wastewater files and other documentation for helpdesk compliance.
FR 9.31	Billing for services using the ISM system.
FACILITIES MANAGEMENT AND BUILDING MANAGEMENT SYSTEMS (BMS)	
FR 9.32	Interface with the Building Management Systems (BMS) installed in CIOC and other key DMIC IITGNL buildings for monitoring and control of all the building systems and parameters available through the BMS.
FR 9.33	Interface with all the Building Management Systems (BMS) or IP enabled fire alarm system installed in non-DMIC IITGNL buildings for monitoring of essential parameters.
FR 9.34	Log calls/jobs on the helpdesk database utilizing helpdesk/ISM software (inquiries may be received by telephone, facsimile, email or in person).
FR 9.35	Allocate and dispatch work orders to directly employed (or subcontracted) maintenance team via ISM system. Work order tracking to be done at CIOC.
FR 9.36	Take ownership of the Preventative Maintenance (PM) schedule and track reactive maintenance (RM) service requests using the ISM system.
FR 9.37	Track progress of PM and RM service requests against pre-determined KPIs.
FR 9.38	Report back to client and contract staff on progress of each PM and RM service request and close out service requests when completed using the ISM system.
FR 9.39	Maintain asset information held in the database using the ISM system.
FR 9.40	Update site specific facilities management files and other documentation for helpdesk compliance.
FR 9.41	Dispatch of emergency services.
POWER NETWORK	
FR 9.42	Monitoring of smart power meters for various parameters (if available).
FR 9.43	Monitor trunk infrastructure in terms of outages, leaks, etc. (if available).
FR 9.44	Monitoring of outage or tampering alerts for smart power meters (if available).
FR 9.45	Log calls/jobs on the helpdesk database utilizing helpdesk/ISM software (inquiries may be received by telephone, facsimile, email or in person).
FR 9.46	Dispatch outage and power quality calls to the appropriate internal and field personnel using the ISM system.
FR 9.47	Track progress of outage and power quality service requests against pre-determined KPIs.
FR 9.48	Report back to client and contract staff on progress of each outage and power quality service request and close out service requests when completed using the ISM system.
FR 9.49	Maintain asset information held in the database using the ISM system.
FR 9.50	Update site specific power files and other documentation for helpdesk compliance.
FR 9.51	Create awareness within the city for energy consumption and utilization.
COMMUNICATIONS NETWORK	
FR 9.52	Monitoring of the smart telecommunications management system for issues and outages (including any alarms) in terms of passive infrastructure for non-DMIC IITGNL and both active and passive infrastructure for DMIC IITGNL.

FR 9.53	Monitoring and control of the city Wi-Fi infrastructure.
FR 9.54	Monitoring and control of all actives implemented as part of the DMIC IITGNL infrastructure.
FR 9.55	Log calls/ jobs on the helpdesk database utilizing helpdesk/ISM software (inquiries may be received by telephone, facsimile, email or in person) using the ISM system.
FR 9.56	Dispatch telecommunications service request calls to the appropriate internal and field personnel using the ISM system.
FR 9.57	Track progress of telecommunications service requests against pre-determined KPIs.
FR 9.58	Report back to client and contract staff on progress of each telecommunications service request and close out service requests when completed using the ISM system.
FR 9.59	Maintain asset information held in the helpdesk database using the ISM system.
FR 9.60	Update site specific telecommunications files and other documentation for helpdesk compliance.
FR 9.61	Billings and collections from telecom service providers for revenue sharing using the ISM system.
CITY SECURITY	
FR 9.62	Accurately and promptly observe, monitor and operate closed circuit television (CCTV) cameras and related equipment, and, where necessary direct Police Officers to real time incidents.
FR 9.63	To identify, report, and record anything suspicious, in line with CIOC procedures.
FR 9.64	To operate surveillance equipment ethically and in accordance with training, policy and procedures, manufacturer's instructions and relevant legislation.
FR 9.65	To ensure all equipment is functioning correctly, carry out equipment checks as required and report all faults to relevant personnel, carry out basic non-technical system maintenance as required.
FR 9.66	Creating of workflows where automatic alerts can go to concerned authorities (police etc.) in case of security emergencies.
FR 9.67	Integrate with ANPR and ATCC to visualize key metrics and alarms.
FR 9.68	Integrate with Variable Message Displays to display content to tenants. Platform should have the capability of automatically displaying messages as per prescribed schedules, SOPs etc. Workflows should be available for displaying data.
PUBLIC INTERACTIVE KIOSKS	
FR 9.69	Monitoring of the status Public Interactive Kiosks/sites throughout IIT.
FR 9.70	Log calls/jobs on the helpdesk database utilizing helpdesk/ISM software (inquiries may be received by telephone, facsimile, email or in person) using the ISM system.
FR 9.71	Dispatch Public Interactive Kiosks/site service request calls to the appropriate internal and field personnel.
FR 9.72	Track progress of Public Interactive Kiosks/site service requests against pre-determined KPIs.
FR 9.73	Report back to client and contract staff on progress of each Public Interactive Kiosks/site service request and close out service requests when completed using the ISM system.
FR 9.74	Maintain asset information held in the helpdesk database using the ISM system.
FR 9.75	Update site specific Public Interactive Kiosks/site files and other documentation for helpdesk compliance.
IIT SOFTWARE MODULES (ISM)	
FR 9.76	Integrate with GIS system provided as part of this Project. GIS shall act as the underlying layer over which visualization shall take place.
FR 9.77	Integrate GIS functionalities such as 3D walk throughs of the City, Utility Asset Management Module, RoW permits.

FR 9.78	Integrate with all Back-Office and Customer Facing ISM systems such as Finance, HR, Project Management, Contracts Management, Operations, Maintenance and Asset Lifecycle Management, CRM, Portal, Grievance Redressal System etc. for monitoring their operations as well as KPI monitoring, tracking, alarm generations, cross system workflows etc.
FR 9.79	Integrate with social media platforms for monitoring of trends, citizen feedback etc.
STREET LIGHTING	
FR 9.80	Monitoring of circuits, central control and automation while integrating with the feeder panel based street lighting system.
FR 9.81	Log calls/jobs on the helpdesk database utilizing helpdesk/CRM software (inquires may be received by telephone, facsimile, email or in person) using the ISM system.
FR 9.82	Dispatch staff for service request calls using the ISM system.
FR 9.83	Maintain asset information using the ISM system.
ENVIRONMENTAL SENSORS	
FR 9.84	Monitor key inputs from pollution sensors, noise sensors, particle sensors, etc.
FR 9.85	Create awareness within the city based on dynamic inputs received from sensors and display output to various interfaces including city application, Public Interactive Kiosks and digital screen.
FR 9.86	Create necessary SOPs as per alarms generated by environmental sensors.
PUBLIC INTERACTIVE KIOSKS AND EMERGENCY COMMUNICATIONS	
FR 9.87	Interface with emergency communication modules in public interactive kiosks for monitoring and action on emergencies reported by citizens.
FR 9.88	Interface with police, fire and ambulance as needed for emergency services.
FR 9.89	Real-time monitoring of emergency dispatch vehicles (as applicable).
FR 9.90	Assesses nature or urgency of the issue; determines and establishes priority of call; resolves the issue or escalates and/or transfers call to appropriate staff/agency as necessary.
FR 9.91	Identifies the type of service being requested by listening, asking relevant questions, evaluating information obtained, and determining City services available to successfully handle the request.
FR 9.92	Creates or researches customer information in the Customer Relationship Management (CRM) system; records information on all customer inquiries or problems; provides updates on previously created cases.
FR 9.93	Follows system and department-specific procedures to create service requests and work orders in specialized department software systems.
FR 9.94	Conducts research using various City and public resources to provide customers with complete, accurate, and thorough answers to requests for information, inquiries, and/or problems.
FR 9.95	Dispatches calls in accordance with established procedures and policies using a workflow system, including determining priority of calls and contacting and sending appropriate response unit.
FR 9.96	Observes and complies with departmental policies and procedures, customer service quality standards, and compliance guidelines.
EDUCATION	
FR 9.97	Monitor key ratios (KPIs) that will be important inputs for economic indicators.
HEALTHCARE	
FR 9.98	Monitor key ratios (KPIs) that will be important inputs for economic indicators.
ANALYTICS AND VISUALIZATIONS	
FR 9.99	Through the smart city platform, various critical functionalities including historian, trending, analytics, visualizations, dashboards etc shall be achieved. The analytics required for the smart city platform

	shall be integrated with the overall solution. Analytical capabilities of the platform shall include streaming data analytics, data quality, reporting and data exploration, forecasting, predictive and prescriptive analytics and optimization.
FR 9.100	Smart city platform shall be capable of communicating with various types of sensors/devices and their management platforms/applications for single/multiple services irrespective of the OEM, software and applications that they support. Data exchange between various sensors and their management applications shall strictly happen using this platform making it one true source of data abstraction, normalization, correlation and enabling further analysis. Adequate security checks and mechanisms shall be provided as part of the platform to ensure data confidentiality and limit any unauthorized access.
FR 9.101	CIOC shall make use of cross-system data analytics from historian and real-time information received from independent systems through smart city platform to aid in the operations and management of city services.
FR 9.102	The platform shall have ability to synthesize, analyse and integrate data from all City systems. It should provide analytical insights for running real time sensors and to decision makers for policy making and optimized decision making.
FR 9.103	The platform shall have the ability to generate alarms based on user provided inputs as defined in the SOPs.
FR 9.104	Analytic outputs shall be derived from historic and real-time information received from the various city systems. The analytic outputs shall also support forecasting based on various inputs and shall support setting of targets for various parameters.
FR 9.105	CIOC shall have integration and deployment capabilities for web, applications, real time dashboards, business intelligence, workflow, event management, KPIs, monitoring along with integration with analytics.
FR 9.106	CIOC shall be able to support rule engine for multiple event correlation, What-if analysis tools, threat detection tools, capabilities for integration with social media platforms.
FR 9.107	CIOC shall be capable of alarm management functionalities such as: <ul style="list-style-type: none"> • Targeting: Locate the sensor in GIS display which has detected the security risk or has malfunctioned and include automatic coloured notifications; • Alarm description: basic information about nature of alarm; • Device: Name of sensor or system; • Acknowledgement and dismissal of alarms; • SOPs: list of activities which needs to be carried out by operator for category of alarms; • Provision of filter of alarms; • Archiving of alarms; and • Searching of alarms.
FR 9.108	CIOC shall be capable of audit trail functionalities and log files for user activities in order to effectively track response time on events. Capability of setting SLAs to response time should be available.
FR 9.109	Reporting function shall be a part CIOC dashboard visualization tool. It shall provide information about current status of the CIOC on functions performed. Following functionalities shall be supported by Reporting Module as a minimum: <ul style="list-style-type: none"> • Reporting module shall offer a library of “statement”, “report” and “predefined dashboards” which can be easily modified as per DMIC IITGNL needs; • It shall allow the design of new reporting templates (creation of new fields, graphical formats, flat tabular formats, calculations, sorting, totals, sub totals, combination of existing reports etc.). Moreover, the users should be able to export/import data for/from external applications not limited to for example excel/ MS-access, for specific reports; • It shall allow creation or insertion of graphics into the generated documents or reports or dashboards. Nevertheless, “developing customer documents” must be within the reach of the users;

	<ul style="list-style-type: none"> Print outs shall be available on paper (A4 and A3) and in an electronic file format, as text files in column, Microsoft Excel or Adobe PDF document. In addition to the Microsoft suite of products, compatibility should also be ensured with the corresponding open source equivalent suite of office products; and Generating recurring reports should be automated.
FR 9.110	CIOC shall be capable of analytics for various city systems in order to provide operators and city administrators with situational awareness and an understanding of historical trends. For instance, baselining of frequency and nature of registered complaints shall be done along with response time to address them.
FR 9.111	CIOC shall be capable of analytics for city systems where it shall develop insight into possible future conditions or events. Analytics shall measure the efficacy of services delivered and also help operators and city personnel to test scenarios. For instance, in case of heavy fire emergencies, it shall be able to predict response time of firefighting and ambulance vehicles to these emergencies based on inputs from tracking systems.
FR 9.112	CIOC shall support vision of crowd sourcing and analytics of data from various platforms i.e. city application and web portal among others for the purposes of empowering citizens.
FR 9.113	Capability of asset management where ISM data shall assist with scheduling of maintenance or determining if a renewal of assets is required.
FR 9.114	On receiving a fire or emergency alarm from BMS, CIOC shall automatically alert firefighting authorities using automatic notifications. CIOC shall also alert medical facilities for dispatch of ambulances and to make necessary provisions in hospitals for victims.
FR 9.115	CIOC shall have the capability to take predicted environmental condition feed from third party systems. In case of rain predictions, CIOC shall automatically alert departments for preventive maintenance of water logging issues.
FR 9.116	Display of Standard Operating Procedures (SOPs) shall be available where step-by-step instructions based on Client's policies and tools to resolve the situation shall be presented to operator in a quick and easy way for operator to verify the situation. Development of SOPs shall be the responsibility of MSI.
FR 9.117	The platform UI shall allow operators to configure the windows displayed on the executive dashboard. It shall also allow the users to change the workflow of systems.
FR 9.118	<p>The platform graphical user interface (GUI) shall present information on standard workstations. It shall have the following capabilities:</p> <ul style="list-style-type: none"> Able to present management data such as dashboards, alarm and alerts, incident information in colour coded, clear, simple and unambiguous, logical format; Colour coding on the platform application GUI shall represent the different status of a task or incident/alert; GUI layout and arrangement of windows shall be user customizable; and Be able to present information and distinguish between an early warning or anticipation type set of data and emergency or crisis operating mode.
FR 9.119	The platform shall be capable of presenting information in a browser-based format such that it is accessible from any terminal connected to the CIOC with a web browser. The supported browsers shall include but not limited to IE, Chrome, Firefox and Safari. In addition, the platform shall also be able to present information on mobile devices such as tablets and smartphones while maintaining the basic UI features.
FR 9.120	The platform shall provide user and subscription management by providing different tier of user categorization, authentication, authorization and services based on the subscriptions.
FR 9.121	Part of the visualization at the DMIC IITGNL CIOC will include monitoring a set of relevant ISO 37120 and ISO 37122 indicators. Some sample indicators which are tentatively required to be monitored at CIOC are provided below:

	<ul style="list-style-type: none"> Assessed value of commercial and industrial properties as a percentage of total assessed value of all properties; Primary education student/teacher ratio; Total residential electrical energy use per capita (kWh/year); Energy consumption of public buildings per year (kWh/m²); Fine particulate matter (PM2.5) concentration; Number of in-patient hospital beds per 100,000 population; Percentage of the city's solid waste that is recycled; Green area (hectares) per 100,000 population; Percentage of city population with potable water supply service; and Total domestic water consumption per capita (litres/day).
FR 9.122	Analytic capabilities are envisaged to understand the real-time and batch data to act with intelligent decisions. The analytics shall integrate both with historical and real-time streaming data from water, energy, parks, street lighting, and batch data from ISM applications, among others responding to citizen-provided information.
FR 9.123	<p>Automatically detect when citizen services are needed as indicated but not limited to the following: Water treatment plant issues, water quality degradation and water flow analysis for recycling. It should include:</p> <ul style="list-style-type: none"> Distributed water management - Industrial & Residential (neighbourhood) Water Consumption Forecasting and Recycle Water usage is important; Real time streaming analytics on tweets and social media events, blogs, grievances and discussion portal with data quality and content categorization; and Dynamically sense the citizen environment and mitigate government service disruptions through social media and other citizen data. Provide proven intelligence system for planning and asset maintenance for Smart Electricity Grid which is envisaged to be with 100% underground cable network: <ul style="list-style-type: none"> ➤ Provide proven intelligence to integrate AMI / AMR data, Billing Data and other data sources to detect technical losses, faults etc. as applicable. Public Security Analytics: <ul style="list-style-type: none"> ➤ Enable the law enforcement to identify the area of security concerns including heat maps; ➤ Forecast the man power required for surveillance in high risk area; ➤ Identify hidden areas of security concerns; and ➤ Profile each area based on the type of predominant crime.
FR 9.124	Smart City Platform shall have SOPs and mechanisms to aid city official in case of disaster events.
FR 9.125	<p>Smart City Platform shall be capable of handling and managing crises such as pandemics, disasters, attacks etc. in the city. Following functionalities to manage crises shall be part of the platform:</p> <ul style="list-style-type: none"> Platform shall provide holistic view of crisis preparedness; The platform shall be capable of managing crisis situations such as area healthcare administration and assessment, natural disasters like earthquakes, various epidemic/pandemics such as Covid-19, dengue etc., environmental and industrial disruptions/calamities; The platform shall support disaster response drills; The platform shall provide real-time risk scoring, zone demarcation, zone color coding, zonal segregation and various related features; The platform shall use real-time data to provide relevant KPIs, analytics for executive decision support and actionable insights. The platform shall be capable of forecasting and advisories specifically predictive and prescriptive analytics using machine learning; The platform shall enable multi-department collaborative functioning on a single platform including cross-departmental workflows;

	<ul style="list-style-type: none"> The platform shall be able to facilitate monitoring and mobilizing workforce as and when required between different stakeholders at various levels; The platform shall have interfaces including user-friendly single view dashboards with GIS mapping and real-time data visualization for managing crises; The platform shall be able to enable users to create, customize, and design workflows and SOPs; The platform shall adhere to all government protocols, advisories, guidelines, SOPs, strategies, notifications, and orders; The platform shall integrate with video analytics for integrated monitoring at the time of crises.
FR 9.126	The smart city platform shall be a single, integrated platform that shall provide seamless metadata exchange and single administration interface.
FR 9.127	The platform shall provide capabilities of integration with big-data and shall provide in-memory analytics capabilities.
FR 9.128	The centralized analytics shall take an enterprise approach by supporting analytics throughout the infrastructure including from cloud/on-premises to edge and any point in between.
FR 9.129	Streaming analytics capabilities shall include machine learning streaming capabilities such as regressing, decision tree, filtering live stream data, etc.
FR 9.130	The smart city platform shall have capabilities of visual monitoring of event streams, configure real-time dashboards for analytical CIOC, interactive filters, and query dynamic live stream with support of automatic notifications through SMS, email and other alerts.
FR 9.131	The memory engine shall provide various types of dashboards and capabilities that allow drilling down on the dashboards and interlinkages of report objects and integration with GIS.
FR 9.132	The platform shall use leading text analytic solution to synthesize feedback comments and provide actionable intelligence.
FR 9.133	Scalability/Usability: The platform shall enable flexible and on-demand scale-up for data volume and number of users.
FR 9.134	The platform and other city systems shall integrate, interface and communicate with applicable third-party City/State portals and services such as Dial 100, Emergency helplines etc. (as applicable).
FR 9.135	The platform shall integrate with SMS, e-Mail and WhatsApp gateway to automatically trigger necessary communication to concerned personnel in case of events, alarms etc.
VIDEO DISPLAY WALL	
FR 9.136	Video display wall content will not be switched frequently and shall be displayed real-time. It shall be rated for 24x7 operations.
FR 9.137	Functionality of centre zone for common viewing, for example map of the city can be enlarged and copied to the centre of the display wall for general reference.
FR 9.138	Option to create multiple layouts shall be present.
FR 9.139	Video display wall shall be integrated with Videowall Controller, so content managed can be displayed on the video wall.
FR 9.140	Ability for all CCTV video, CATV, web pages, IoT and all other display content to be routed to the board room.
FR 9.141	Ability to manage the content within the boardroom or at the operators' consoles.
FR 9.142	Ability to add content from an CIOC workstation or boardroom computer.
FR 9.143	The video display wall product selected shall be durable for optimal use in a 24/7 operational mode.
FR 9.144	The focus of the design characteristics are ergonomics for the various viewers, quality and stability of the images, uniformity across the whole area, availability of the system, limited maintenance and low disruption of the control room operations.
FR 9.145	Video display wall shall be capable of displaying High Definition (HD) content.
FR 9.146	Gaps between screens shall be negligible to view HD graphics on multi screens.

FR 9.147	Auto calibration feature shall be provided to avoid periodic maintenance.
FR 9.148	There shall be a user interface for all settings and operational parameters.
BOARDROOM MONITOR	
FR 9.149	The display of Boardroom Monitor shall be seventy inches (70") diagonal at minimum.
FR 9.150	The Monitors shall be installed at Boardroom for Video Conferencing and Review Meetings.
VIDEO CONFERENCING (VC) SYSTEM	
FR 9.151	The VC system shall allow live visual connection between two or more people residing in separate locations for the purpose of communication.
FR 9.152	The VC system shall be flexible, provides interactive content collaboration to distant teams.
FR 9.153	The VC system shall support transmission of full-motion video images and high-quality audio between 2 or more locations.
FR 9.154	The VC system shall support multipoint videoconferencing which allows three or more participants to sit in a virtual conference room and communicate to each other.
ROOM CONTROL SYSTEM INCLUDING PANEL	
FR 9.155	The boardroom and the operations room shall have their independent room control systems. All systems including lighting, HVAC, audio etc. being installed as part of the CIOC shall be integrated using this room control panel
FR 9.156	The room control systems shall include and support a minimum of 7" touch panel display.

TR - 9 Technical Requirement

VIDEO DISPLAY WALL (VDW)	
TR 9.1	The VDW shall be made up of DLP™ rear-projection cubes. Each DLP™ display cube shall measure 70 inches in diagonal. It shall include all controllers required for its operations.
TR 9.2	The native resolution of each Visual Display Unit / Rear Projection Module should be 1920 X 1080 pixels (Full HD) and should have Laser as its light source with ultra-thin configuration.
TR 9.3	The light source lifetime of the laser shall be at least 60,000 hours.
TR 9.4	The brightness uniformity of the VDM shall be $\geq 95\%$.
TR 9.5	The project engine of VDW shall be rated for performance in project conditions.
TR 9.6	The Rear Projection Module shall have laser/LED as its light source.
TR 9.7	The screen shall have negligible inter screen gap to give seamless viewing experience.
TR 9.8	The Cube shall have inbuilt redundancy in power supply and laser/LED light source.
TR 9.9	The VDW shall include video walls mounted close to each other to give a seamless viewing experience.
TR 9.10	Each cube of the VDW shall have its own IP address and on-board web server to provide standard information like status and health.
TR 9.11	The VDW shall be the primary visual information point to see CCTV videos, incident alarms, IoT screens, network health conditions, GIS maps, and any application running on city systems.
TR 9.12	The VDW shall provide a collaborative visual for operators and management to work and coordinate on various tasks in different situations.
TR 9.13	The VDW product selected shall be durable for optimal use over a long time in a 24/7 operational mode.
TR 9.14	The VDW shall provide image uniformity across the whole display area.
TR 9.15	The VDW shall have system availability with limited maintenance and low disruption of the operations room operations.
TR 9.16	The VDW shall be capable of displaying high definition (HD) and standard definition (SD) content.
TR 9.17	The VDW shall provide minimum viewing angles of: <ul style="list-style-type: none"> Horizontal - ± 35 degrees; and Vertical - ± 27 degrees.
TR 9.18	Auto colour and brightness management mechanism to be provided.
TR 9.19	The VDW shall have a user interface for all settings and operational parameters.
TR 9.20	The VDW shall support with enhanced brightness of at least 300 cd/m ² to accommodate ambient light expected inside the room.
TR 9.21	The VDW units shall be new and current to the manufacturer's product line. The units shall not be discontinued products.
TR 9.22	Each VDW unit shall have front / rear-access to the projection modules and internal components of the cubes for maintenance purposes.
TR 9.23	The brightness uniformity of each display cube and across the entire VDW shall be minimum 95%.
TR 9.24	The video display cubes shall have anti-reflective screens in order to reduce reflection and glare on the display wall.
TR 9.25	All video display cubes shall have a consistent image quality and brightness across the display wall.
TR 9.26	The VDW will have at least one (1) female DVI-I/HDMI input connector.

TR 9.27	A pedestal shall be provided to support the VDW. If the manufacturer's standard pedestal does not comply with the height requirement, the MSI shall supply a custom setup.
TR 9.28	The support structure shall have open internal space for equipment.
TR 9.29	The support structure shall have easy to open front / rear access covers. However, access should be available as per control room design.
TR 9.30	The MSI shall provide lateral support for the VDW. If fixations are required behind the VDW, the MSI shall propose and design an appropriate support system.
TR 9.31	The VDW pedestal shall be physically secured to the concrete floor of the building. It shall not sit on top of the raised floor.
TR 9.32	The VDW shall allow for easy maintenance of modules, colour sync systems, etc. where downtime is no greater than 60 minutes.
TR 9.33	The AC input power shall be 110-240 VAC +/- 10% at 50/60 Hz +/- 1Hz. Power consumption of each cube shall be less than 350W.
TR 9.34	The VDW shall have an operational temperature between ten degrees Celsius (10°C) to forty degrees Celsius (35°C).
TR 9.35	The VDW shall have a relative humidity of 20 to 80%, non-condensing or better.
Display Content Management System (DCMS) or Video Wall Management System or Videowall Controller	
TR 9.36	The DCMS shall include the VDW controller for the Operations Room VDW and a system to manage the visual content.
TR 9.37	The DCMS shall be able to display visual content on videowall.
TR 9.38	The DCMS shall be able to input, manage, and distribute visual content.
TR 9.39	The DCMS shall be able to decode, transmit, manage, and display the following formats of digital streaming video: <ul style="list-style-type: none"> • MPEG-4; and / or • H.264.
TR 9.40	The DCMS shall treat the VDW as a single display. It shall act as a single canvas with no pixel separation.
TR 9.41	The DCMS shall have the ability to create multiple spaces for different users to control display content. The DCMS shall be able to create a minimum of six (6) distinct operator-controlled display areas. These display areas cannot cross over into another. The display areas can be created anywhere within the VDW.
TR 9.42	The DCMS shall be able to create display layouts for any sized display, including boardroom monitor and the operations room display.
TR 9.43	The DCMS shall be able to manage users and roles. The DCMS shall have an administrator role to have master control of all functions.
TR 9.44	The DCMS shall be able to separate the video wall into variable sized sections so that system defined users can manage only their portion of the video wall. Users not belonging to a particular group managing another portion of the video wall shall not be entitled to change layouts and sources.
TR 9.45	The DCMS shall be able to stretch, re-position, and resize any video source on any display device.
TR 9.46	The DCMS shall be supplied with a user interface (UI) independent of other systems. Three (3) mouse clicks (average) to execute DCMS function is a requirement for performance.
TR 9.47	The DCMS shall have a seamless interface within the VMS UI of the CCTV.
TR 9.48	The DCMS shall be accessible on any networked workstation or networked monitor.
TR 9.49	The DCMS shall be able to create and edit user groups. DCMS permissions for users and user groups shall be customizable. At a minimum the definable permissions shall include UI function rights, viewing access rights, source list access rights, and display access rights.

TR 9.50	The DCMS shall include an administrator role that shall be able to manage system configuration, sources, user groups, and user authentication.
TR 9.51	All users on the DCMS shall have a password-protected login.
TR 9.52	The DCMS shall be able to display independent visual sources simultaneously on the VDW in the Operations Room. The sources shall be of HD or 4CIF resolution.
TR 9.53	The DCMS shall be able to add borders to individual original video content source.
TR 9.54	The DCMS shall be able to display a minimum of ten (10) web browser applications without the use of screen capturing from an external network source.
TR 9.55	It is also acceptable that The DCMS be able to select and display any multi-monitor display on a DCMS connected source. For example, if an operator has three (3) monitors, the operator can select monitors one (1) through two (2) for display on the VDW, while leaving monitor 3 for local display only.
TR 9.56	Visual content from networked sources shall be transmitted and displayed with no pixel loss or degradation.
TR 9.57	The DCMS shall be able to accept a minimum input of four (4) CATV video sources. Demodulator shall be a part of the overall MSI solution, if required to comply with the given requirement.
TR 9.58	The DCMS shall be able to search for networked video sources.
TR 9.59	The DCMS workstation client software shall run on an industry standard-based operating system.
TR 9.60	The DCMS shall have the ability to provide alerts to the administrator and designated users via e-mail.
TR 9.61	The DCMS shall have an API openly available without charge for future integration with third party applications.
TR 9.62	The AC input power shall be 110-240 VAC +/- 10% at 50/60 Hz +/- 1Hz.
Video wall management software	
TR 9.63	The software should be able to pre-configure various display layouts and access them at any time with a simple mouse click or schedule/timer based.
TR 9.64	The software should enable the users to see the desktop of the graphics display wall remotely on the any PC and change the size and position of the various windows being shown.
TR 9.65	The software should enable various operators to access the display wall from the local keyboard and mouse of their workstation connected with the DCMS and Video Wall on the Ethernet.
TR 9.66	The software should copy the screen content of the workstation connected on the Ethernet with the DCMS to be shown on the Display wall in scalable and moveable windows in real time environment.
BOARDROOM MONITOR	
TR 9.67	The display shall utilize LCD with backlit LED technology.
TR 9.68	The display shall be seventy inches (70") diagonal at minimum.
TR 9.69	The display shall have a native resolution of UHD resolution.
TR 9.70	The display shall have an aspect ratio 16:9.
TR 9.71	The display shall be equipped with a media USB for direct plug and play from USB.
TR 9.72	The display shall have a built-in or external tuner.
TR 9.73	The display shall be a commercial grade product.
TR 9.74	The display shall have a built-in low-profile speaker.
TR 9.75	The display shall have a typical brightness greater than 300 cd/m ² .
TR 9.76	The net weight of the display shall be less than 100 Kgs.

TR 9.77	The AC input power shall be 110-240 VAC +/- 10% at 50/60 Hz +/- 1Hz.
TR 9.78	The boardroom monitor shall be equipped with at least one (1) of each input format including HDMI, Display Port, and Ethernet (RJ45).
TR 9.79	The boardroom monitor shall be operational in temperature between ten degrees Celsius (10°C) to forty degrees Celsius (40°C).
VIDEO CONFERENCING SYSTEM	
TR 9.80	The VC system shall allow live visual connection between two or more people residing in separate locations for the purpose of communication.
TR 9.81	The VC system shall be flexible, provides interactive content collaboration to distant teams.
TR 9.82	The VC system shall support transmission of full-motion video images and high-quality audio between 2 or more locations.
TR 9.83	The VC system shall support multipoint videoconferencing which allows three or more participants to sit in a virtual conference room and communicate to each other.
TR 9.84	The VC system shall have the following capabilities: white boarding, annotating, and application sharing from a computer or tablet. All shall be included as part of a comprehensive, collaborative video session.
TR 9.85	The VC system shall have innovative facial-tracking algorithms/push-to-talk option to accurately frame all room participants.
TR 9.86	The VC system shall support 16:9 and 4:3 aspect ratio and automatic gain control.
TR 9.87	The VC system shall support multiple video sources.
TR 9.88	The VC system shall have the capability to zoom in and follow the person speaking.
TR 9.89	The VC system camera shall offer brilliant visual clarity with a HD sensor, and shall be available with minimum 10x zoom and a wide-angle lens adapter.
TR 9.90	<p>Participants shall be able to have the following functionality using Remote Control or GUI of video system or through the video conferencing MCU:</p> <ul style="list-style-type: none"> • Mute My Line / Unmute My Line; • Increase Broadcast Volume / Decrease Broadcast Volume; • Mute All Except Me / Cancel Mute All Except Me; • Change Password; • Mute Incoming Participants / Unmute Incoming Participants; • Play Help Menu; • Enable Roll Call / Disable Roll Call; • Roll Call Review Names / Roll Call Stop Review Names; • Terminate Conference; • Start Personal Layout; • Change to Chairperson; • Increase Listening Volume / Decrease Listening Volume; • Override Mute All; • Start Recording / Stop Recording / Pause Recording; • Secure Conference / Unsecured Conference; and • Show Number of Participants.
TR 9.91	The VC system camera shall be mountable on flat panel display or on a shelf in the cart.
TR 9.92	Controls of the VC system shall be accessed via the room control system to maintain a single source for control.

TR 9.93	The VC system shall include a codec, camera, microphone with option to extend additional microphone/s and remote controller for user control.
TR 9.94	The VC system UI shall be intuitive and easy to use.
TR 9.95	The VC system shall support following video standard protocols: <ul style="list-style-type: none"> • H.261/H.263/H.264 AVC; and • H.263/H.264 video error concealment.
TR 9.96	The VC System should have applicable audio and video interface required for video conferencing. Any converters required for video display shall be provided by the MSI.
TR 9.97	The AC input power shall be 110-240 VAC +/- 10% at 50/60 Hz +/- 1Hz.
TR 9.98	The VC system shall use 1 x 10/100/1000 Ethernet and support IPv4 and IPv6.
TR 9.99	The VC system shall be operational in temperature between ten degrees Celsius (10°C) to forty degrees Celsius (40°C).
ROOM CONTROL SYSTEM INCLUDING PANEL	
TR 9.100	The boardroom and the operations room shall have their independent room control systems. All systems including lighting, HVAC, audio etc. being provided as part of the CIOC shall be integrated using this room control panel.
TR 9.101	The room control systems shall support a minimum of 7" touch panel display.
TR 9.102	The touch panel displays shall be of high resolution.
TR 9.103	The touch panel displays shall be desk mount with a cradle.
TR 9.104	The touch panel displays shall be wireless.
TR 9.105	The touch panel interfaces shall be intuitive and easy to use.
TR 9.106	The touch panel displays shall support full battery operations.
TR 9.107	The touch panel displays shall support full motion video preview and monitoring.
TR 9.108	The room control processors shall support secure industry standard communication protocols.
TR 9.109	The room control processors shall support the required number of ports for connection with variety of device following contract documents.
TR 9.110	The room control processors shall support 10/100/1000 Base-T.
TR 9.111	The room control processors shall support Ethernet-controllable devices.
TR 9.112	The room control processors shall support automatic clock synchronization.
TR 9.113	The room control panels shall support control system synchronization.
TR 9.114	The room control panels shall support multi-level password protection.
TR 9.115	The room control panels shall support an easy to use browser based user interface.
TR 9.116	The room control system hardware shall be rack mountable.
TR 9.117	The room control systems shall integrate with other non-AV systems in the room. This includes and not limited to window coverings and lights in both the operations room and boardroom.
TR 9.118	The AC input power shall be 110-240 VAC +/- 10% at 50/60 Hz +/- 1Hz.
TR 9.119	The room control system shall be operable between 10 °C and +40 °C / 10% to 90%, non-condensing.
OPERATOR CONSOLE	
Materials	
TR 9.120	Consoles are primarily a workspace that support operator workstations and monitors for monitoring various systems at the CIOC, including the independent city systems and smart city platform. They maximize workspace for both the operators and communications staff, while meeting the ergonomic

	and occupational needs for staff working shift patterns with 24/7 coverage.
TR 9.121	All operator consoles shall be designed to meet the shape, dimensions, and orientation requirements within the Operations Room.
TR 9.122	The console shall be capable of accommodating two (2) operators along with all necessary hardware and accessories (monitor, keyboard, power receptacles etc.) required by the operators.
TR 9.123	The consoles shall satisfy the functional, aesthetic and ergonomic requirements of the working environment of the Operations Room staff.
TR 9.124	All console materials and components shall be of sufficient design, manufacturing, and operational quality to provide dependable and durable performance for constant use 24 hours a day, every day of the year.
TR 9.125	The consoles shall provide work surfaces with multiple vertical locations (stand / sit system) - standing height, work surface height, and below work surface height.
TR 9.126	The consoles shall be of a modular design, allowing for future equipment and room layout configurations.
TR 9.127	The consoles shall be fabricated to meet or exceed recognized industry quality standards (e.g., ANSI/BIFMA or equivalent).
TR 9.128	The consoles shall be designed to accommodate a variety of computer displays, communications and operator interface devices and include appropriate power and data cabling management for said devices.
TR 9.129	Each console shall be capable of accommodating, as a minimum: <ul style="list-style-type: none"> • Two (2) Operator desk and chair; • Four (4) wide-screen 610 mm (24 inch) LED monitors. Each monitor arm should accommodate two screens as a minimum; • Two (2) standard keyboard; • Two (2) standard mouse; • Two (2) set of headset jacks mounted underneath desk; • Two (2) VOIP telephone; • Free space for paperwork; • Desk slats for binder/manual storage; and • Two (2) large file drawer for storage.
TR 9.130	A selection of finishes shall be available for all console components. The console provider shall provide sample finishes to coordinate with the Operations Room environment, millwork, aesthetics, and the adjacent Cabin / Boardroom furniture finishes.
TR 9.131	All console components shall include trim pieces including fillers, connectors, full or partial end trims, top caps, etc. as required to create a professional appearance.
TR 9.132	All consoles and components shall not display manufacturer or vendor logo, name, or equivalent signage and nameplates.
Structure	
TR 9.133	Each console main structure shall be constructed of thick wall custom profile extruded aluminium alloy, or structural equivalent (e.g., 10-gauge steel).
TR 9.134	Structural assembly components (e.g., cabinet frames) shall be constructed of precision-tooled cold-rolled steel, or structural equivalent, and finished with durable electrostatic powder coat finish, or equivalent.
TR 9.135	Levelling glides shall provide a maximum height adjustment of up to 64 mm (2.5 inch) for each console and component.
TR 9.136	Structural assembly components shall be bolted as required to the raised floor tiles through the carpet tiles at locations a minimum of 305 mm (12 inch) from any floor access or other floor service location.

TR 9.137	Consoles shall provide work surface stability at all vertical positions including full height (stand) position, via suitable structural components such as a third leg.
Mounting System	
TR 9.138	Each console shall furnish a mounting system consisting of either a work surface mount (with articulated arm) or slat wall mount (with double pivoting articulating arm).
TR 9.139	Mounting systems shall be available from 174mm to 522mm in height utilizing a vertical stackable option in incremental heights above the console work surface.
TR 9.140	Stacking elements shall be load-bearing on all tiers and shall use like parts as base panels (i.e. skins, electrical, horizontal beams, etc.) to create a professional appearance.
TR 9.141	Mounting systems shall be capable of being equipped with a maximum of Two (2) monitor arms at each console. Monitor arms shall be removable and interchangeable with other consoles. Monitor arms shall be easily moveable horizontally across the mounting system if slat wall mount is used. Each console should have two mounting systems capable to accommodating two monitor arms.
TR 9.142	Each monitor arm shall be capable of supporting a variety of typical LED monitor sizes and types (including iPads and other types of tablets) weighing up to and including 23 kg (50 lbs).
TR 9.143	Each monitor arm shall have swivel, tilt, and height-adjustable capability with appropriate positive friction or mechanical locking mechanism to maintain the desired positions and orientations. Monitor arms should be single touch adjustable for ease of use.
Wiring and Cabling	
TR 9.144	Special components shall not be required to bring power, data, and communication wiring into consoles.
TR 9.145	The console placements in the Operations Room and dimensions shall be adjusted accordingly to integrate all cabling service entry accesses in the floor.
TR 9.146	Consoles shall not obstruct or interfere with any raised floor access location cabling services or functionality.
TR 9.147	All consoles shall provide suitable provisions to regain reasonable access to each raised floor access location to preserve the ability to install future power/cabling services into the console via cabling service entry accesses in the floor.
TR 9.148	Each console shall provide a built-in cable management system that accommodates four (4) wiring runs, two (2) for power and two (2) for data and communication (e.g., through hollow leg space or other hollow spaces in the structure).
TR 9.149	Cable management system shall provide continuous and appropriate components to protect all cables, including those connected with extension cords, during height adjustable work surface vertical height transitions.
TR 9.150	The cable management system shall provide appropriate access points and continuous cable management throughout the entire console, including but not limited to: <ul style="list-style-type: none"> • All floor access locations; and • Entire height adjustable work surfaces of each console, including returns.
TR 9.151	The cable management system shall be integrated, routed, and accessible to enable easy addition/removal of cables/wires in the future and shall not be interfered when adding or removing stacking elements.
TR 9.152	The cable management system shall have the capability to accommodate vertical cable runs in all stationary components neatly and internally.
TR 9.153	The cable management system in all stationary structures, bases, frames and components shall be capable of maintaining a minimum 51 mm (2 inch) bend radius required for any future cable.
TR 9.154	Power strips shall be durable metal construction or equivalent.
TR 9.155	Power strips shall not incorporate any surge, overload, or power on/off switch.

TR 9.156	Each console shall provide one (2) fully integrated receptacle power strip mounted horizontally throughout the entire height adjustable work surface frame, accessible from the work surface.
TR 9.157	Each console shall provide two (4) fully integrated four (4) receptacle power strips mounted vertically at each back corner.
TR 9.158	Each console shall be provided with computer extension cables for two operators that shall connect workstations in the Rack Room to I/O endpoints at the consoles in the Operations Room. Extension cables may consist of powered cable extender units. Extension cables shall be a suitable length, fully shielded, and interface with video, mouse, keyboard, speakers, and microphone computer interfaces.
TR 9.159	Each computer extension cable (Two per console) shall provide the following connectors at the workstation end in the Rack Room: <ul style="list-style-type: none"> • One (1) HD-15/HDMI male video; • One (1) USB female keyboard and DVI/HDMI adaptor; • One (1) USB female mouse and DVI/HDMI adaptor; • Two (2) USB female (spares); • One (1) 3.5 mm male speaker; and • One (1) 3.5 mm male microphone.
TR 9.160	Each computer extension (two computer extension per console) cable shall provide the following connectors at the height adjustable work surface end: <ul style="list-style-type: none"> • One (1) HD-15/HDMI female video; • One (1) USB female keyboard and DVI/HDMI adaptor; • One (1) USB female mouse and DVI/HDMI adaptor; • Two (2) USB female (spares); • One (1) 3.5 mm female speaker; and • One (1) 3.5 mm female microphone.
TR 9.161	Wiring and cabling details provided in this set of specifications are indicative only. The console provider shall confirm the wiring and cabling details with the DMIC IITGNL or their designate during the detailed design of the consoles.
Height-Adjustable Work Surfaces	
TR 9.162	Each console shall provide height-adjustable work surfaces, enabling Operations Room staff to work from various vertical positions while sitting or standing. Slat walls (if used) shall automatically raise and lower at the same rate and distance as the work surface is raised or lowered.
TR 9.163	Each console's entire work surface shall be fully height-adjustable.
TR 9.164	Each console height adjustment system shall smoothly and evenly lift and lower all work surfaces together and provide the capability to stop at any time to provide a stable and secure work surfaces at any position within the height range of travel.
TR 9.165	The height adjustment system velocity shall be constant and virtually the same rate when lifting and lowering work surfaces.
TR 9.166	Cable management system shall function without requirement for manual alteration, as the work surfaced is height-adjusted. Cables during lift and lowering operation shall be controlled and protected via a suitable mechanism such as a flexible cable chain or equivalent.
TR 9.167	Sufficient space shall be provided between moving and stationary components for safe movement, with no pinch points.
TR 9.168	Each console shall provide reasonable maintenance and service access to height adjustment system electrical and mechanical components.
Desk Binder/Manual Storage	
TR 9.169	Each console shall have two (2) binder/manual storage unit above desk top.
Free Work Space	

TR 9.170	Each console shall have sufficient free work space for paper work on the console desk top.
Keyboard Trays	
TR 9.171	Each console shall have an ergonomic keyboard tray drawer installed underneath the desk workspace.
TR 9.172	Ergonomic keyboard tray drawers shall glide on steel ball bearings and shall be mounted with durable metal hardware.
Large File Drawer	
TR 9.173	Each console shall have two (2) file drawer unit with lockable casters for storage below the desk top.
TR 9.174	As a minimum, the following drawer fronts construction material shall be available: <ul style="list-style-type: none"> • 17 mm (11/16 inch) particle board core with high-pressure laminate facing and edges; • Steel with powder coated finish; and • Wood veneer with solid wood facing and edges.
TR 9.175	Drawer glide shall be a minimum two-part precision steel ball bearing suspension, with cushioned stops, both in and out.
TR 9.176	File drawer is to expose a minimum of 100% of its overall length when fully extended from the console.
TR 9.177	File drawer shall have drawer bumpers to cushion and quiet the drawer.
TR 9.178	Drawer dividers and one (1) pencil tray shall be included in the file drawer. The pencil tray should be about 102 mm (4 inch) wide and 25 mm (1 inch) deep, and the length of the pencil tray shall be equal to the width of the drawer. The pencil tray shall be secured in the drawer in such manner to prevent its sliding during the operation of the drawer.
TR 9.179	File drawer shall be provided with compressor/hanging rails for side-to-side filing.
TR 9.180	File drawer shall accommodate legal and letter paper filing.
Reliability	
TR 9.181	Consoles shall be designed for high durability and performance.
TR 9.182	Consoles shall be warranted for 24/7 use.
OPERATOR WORKSTATIONS	
TR 9.183	The workstations shall be rack mounted with only keyboard, video, mouse at the operator console. The MSI shall neatly install the workstations at the designated rack locations in the rack room. For Workstation specifications, refer 2.2.8.2 (Operator Workstation).
MULTI-FUNCTIONAL PRINTERS INCLUDING SCANNER	
TR 9.184	Printers shall be of latest laser technology & for duplex printing (colour and black and white) for all paper size including but not limited to A4 and A3.
TR 9.185	It shall have Print Speed 30ppm or above.
TR 9.186	It shall have Resolution Min 600 x 600 dpi or better.
TR 9.187	It shall have Memory 1 GB or higher.
TR 9.188	It shall have Copy speed 12ppm or better.
TR 9.189	It shall have scanner of Flat Bed type with ADF.
TR 9.190	It shall have Interface USB 2.0, Ethernet Port.
TR 9.191	It shall have the duty cycle of monthly 5000 pages at minimum.
TR 9.192	Full toner Cartridge shall be supplied with the printer. MSI shall be responsible for refilling of cartridge during the Project duration including maintenance phase.
TR 9.193	It shall have input tray capacity of minimum 100 sheets.
TR 9.194	It shall have output tray capacity of minimum 100 sheets.

TR 9.195	Printer shall be accompanied with the necessary accessories such as connecting cables, driver media, etc.
CONTACT CENTRE SOLUTION	
TR 9.196	The contact centre solution shall include VoIP based PBAX, IVRS, phones among other hardware and software. Using the contact centre solution, citizens can contact DMIC IITGNL through the emergency communications system or through the contact centre helpline number.
TR 9.197	The contact centre solution shall be able to route voice/ VOIP calls from centralized Interactive Voice Response System (IVRS) to respective call centre (s) along with interaction history of the calling party.
TR 9.198	The callers shall be able to access the various services through state-of-art centralized integrated Interactive Voice Response System (IVRS). The information is envisaged to be available to the customer through telephone (IVRS) and call centres operators.
TR 9.199	The IVRS shall establish two-way communication on the same channel with customers through recorded synthesized voice in Hindi / English or in combination of languages to give information, reply to queries and provide other. Number of concurrent users shall be approximately 15.
TR 9.200	IVRS shall be modular and scalable in nature for easy expansion without requiring any change in the software.
TR 9.201	It shall be possible to access IVRS through any of the access devices such as Landline telephone, Mobile phone (GSM as well as CDMA) etc.
TR 9.202	IVRS shall support various means of Alarm indications in case of system failures, e.g. Functional error, missing voice message prompt, etc., and shall generate error Logs.
TR 9.203	The system shall have the ability to define business rules based upon which the system shall quickly identify, classify and prioritize callers, and using sophisticated routing, to deliver interactions to the best qualified operator in the any of the connected local/remote call centre, regardless of interaction channel.
TR 9.204	The application shall provide (Computer-Telephony Integration) CTI services such as: <ul style="list-style-type: none"> • Automatic display (screen pop) of information concerning a user/customer on the call operator screen prior to taking the call based on ANI, DNIS or IVR data; • Synchronized transfer of the data and the call to the call centre operator; • Transfer of data (via CRM integration or through contact centre) corresponding to any query raised by any IP operator regarding a query raised by a customer whose call is being attended by the call IP operator; and • Call routing facilities such as business rule based routing, skills-based routing etc.
TR 9.205	The application shall support integration to leading CTI middleware vendors.
TR 9.206	It shall provide pre-integration with industry standard IVR servers and enhance routing & screen-pop by passing forward the information.
TR 9.207	It shall provide facilities for outbound calling list management, and software based predictive or preview dialling for at least 5 outbound dialling ports as a minimum.
TR 9.208	The application shall allow service level plans to be varied by day, time of day, or a specific date.
TR 9.209	Call Centre Operator's Desktop: The operator's desktop shall have an application which shall fulfil the following functionalities (via CRM or Contact Centre solution): <ul style="list-style-type: none"> • It shall provide consistent operator interface across multiple media types like fax, SMS, telephone, email, and web call back; • Operator shall have VoIP based telephones (with digital display pads) on the workstation with wireless headsets; • It shall provide the operators with a help-desk functionality to guide the operators to answer a specific query intelligently; • It shall also provide an easy access to operators to previous similar query which was answered successfully;

	<ul style="list-style-type: none"> It shall also be possible to identify a request to be a similar request made earlier; It shall be possible for operators to mark a query as complex/typical and put in to database for future reference by other operators; and It shall be possible for operators to escalate the query.
TR 9.210	IVRS shall be able to get information /text/data from databases, convert to voice, and speaks it back to the caller in relevant/desired language.
TR 9.211	IVRS shall maintain log of all services offered which can be used for audit and analysis purpose.
TR 9.212	System shall provide for 100% recording of calls using a call logger. The recording shall contain detailed call information and the solution must provide advanced searching capabilities.
TR 9.213	Call Centre representative (supervisor and admin) must have view to unified screen giving both network & service view.
TR 9.214	There shall be enough provision for supervisory view supported by Supervisory terminals.
TR 9.215	System shall be able to integrate with e-mail / SMS and WhatsApp gateway so that appropriate messages can be sent to the relevant stakeholders after the interaction and any updates thereon.
TR 9.216	Shall intelligently and automatically responds to email inquiries or routes inquiries with skills based routing discipline to operators.
TR 9.217	Shall have an Intelligent distribution of email to operators.
TR 9.218	System shall be able to route emails to the Call agent using single system, based on the availability and skills and shall be able to send auto-acknowledgement.
TR 9.219	System shall provide unified agent licenses to handle voice calls and emails.
TR 9.220	System shall support auto-forward capabilities to pre-defined cell phone numbers i.e. auto patching.
TR 9.221	System shall support single solution for inbound calls, outbound calls and emails handling and intelligently route the calls to available call agent.
TR 9.222	Contact Centre shall come with appropriate server (to be hosted on cloud). Recording of call shall be done via the server. Call recording for 60 days shall be available through the server. Backup and archiving of call recordings shall be available and done by the MSI.
EPABX SYSTEM	
TR 9.223	It shall have provision for at least 75 IP Phone extensions Expandable to 150 Extensions. 75 IP phones shall be supplied as part of the system for DMIC IITGNL employees.
TR 9.224	It shall have 6 Party Internal/External Multi group Tele-conferencing facility to all the Call Takers, Dispatchers and Supervisors/ Managers etc.
TR 9.225	It shall support all the standard features like Call Transfer, Call Forward, Call pick-up, Call hold, Call Barge-in etc.
TR 9.226	It shall have ISDN PRI Cards 4 Nos. at minimum that shall be expandable for 8 Nos.
TR 9.227	It shall have PCM-TDM, IP, Non-blocking as technology
TR 9.228	It shall support prevalent Telecom interfaces.
TR 9.229	It shall support analog and IP/ Soft phone (As applicable).
TR 9.230	It shall have Integrated/External Voice messaging system with required channels for IVRS function.
TR 9.231	It shall have Voice Messaging-Pre-defined text to voice conversion information.
TR 9.232	It shall have an estimated wait time in case if all operators are busy.
TR 9.233	It shall have voice mail instructions to caller in case all the operators are busy.
TR 9.234	It shall have 6 party In and Out Multi group conferencing facility to be provided to all the Call Takers, Supervisor and Manager etc. (To be configurable Dynamically).

TR 9.235	It shall have IP based phone instrument with programmable one touch keys, Graphical display, Keys with LED, 4 Programmable keys with dual function, 10 fixed function keys.
TR 9.236	It shall support SIP based communications.
AUTOMATIC CALL DISTRIBUTION (ACD) REQUIREMENTS	
TR 9.237	It shall have an ability to queue or hold the call for an operator if none is immediately available.
TR 9.238	It shall have an ability to keep the callers informed as to the status of the call and providing information to callers while they wait in queue.
TR 9.239	System shall be able to perform prioritized call routing.
TR 9.240	It shall be possible to define Operator Preference options using: <ul style="list-style-type: none"> • Longest total time in idle state since login; • Longest time in idle state since last status change; • Longest total time since last ACD call; and • Alarms for callers in queue & Call-back message support.
CALL TRANSACTION LOG	
TR 9.241	A call transaction log for both inbound and outbound calls shall be created automatically by the CTI server while a call is received by the ACD system.
TR 9.242	The call transaction log shall be saved on the hard-disk of the active CTI server automatically while the call is dropped (Customer or operator).
TR 9.243	The call transaction log shall contain the following minimum information: <ul style="list-style-type: none"> • Time of call received into ACD; • Time of call answered by operators; • Time of call disconnect; • Duration of call in ACD; • Call handling time by the operators; • Both source and destination operator ID; • In case of call from PSTN, Trunk ID shall also be included; • ANI and DNIS; and • User data from IVRS or Intelligent work station.
Supervisor Module	
TR 9.244	Any supervisor shall be able to monitor or control assigned teams in the call Centre.
TR 9.245	It shall show the live activity of each operator in details as well as in a summarized fashion including information like total number of calls received, calls answered, average response time etc.
TR 9.246	The Supervisor console shall also graphically display live status of the call session summary, number of call waiting in the queue, call traffic etc.
TR 9.247	Live status of the group shall be shown, including waiting calls and calls being answered currently.
TR 9.248	Access to the supervisor console shall be restricted
Audit Trail	
TR 9.249	It shall have a comprehensive audit trail detailing every user activity including system/security administrators with before and after image.
TR 9.250	Audit trails presented by the system shall be very detailed with all the related fields, such as User ID, time log, changes made before and after, Machines ID etc.
TR 9.251	It shall have the facility to generate security report(s) and audit the whole process from logs reports at any future date. The system shall have complete audit trail of any changes to the system e.g. alert generated, system configuration etc.

TR 9.252	The system shall not allow audit log to be deleted and any attempts to delete must be logged.
TR 9.253	<p>The system shall have at a minimum following standard report:</p> <ul style="list-style-type: none"> • List of users, user privileges and status; • User sign-off and sign-on; • User violation – unsuccessful logon attempts; and • User additions, amendments and deletions with before & after image.
NETWORK TIME PROTOCOL (NTP) BASED DIGITAL CLOCK	
TR 9.254	The digital clock shall be synced with the Network Time Protocol (NTP).
TR 9.255	The Network Time Server (NTS) shall be a high-bandwidth NTP time server.
TR 9.256	The NTS shall synchronize with a GPS satellite.
TR 9.257	The NTS shall support a 50 nanosecond time accuracy to UTC.
TR 9.258	The NTS shall have minimum of 3 independent 10/100 Base-T ports.
TR 9.259	The NTS shall comprise of high-resolution display.
TR 9.260	The NTS shall compliance with IPv6 and IPv4.
TR 9.261	The NTS shall have a secure web-based management application that is intuitive for easy control and maintenance.
TR 9.262	The NTS shall support SSH, SSL, SCP, SNMP v3, custom MIB, HTTPS and Telnet protocol.
TR 9.263	The NTS shall be equipped with USB ports.
TR 9.264	The NTS shall have independent/in-built time references: GPS, IRIG B, 1PPS, 10 MHz.
TR 9.265	The NTS shall have versatile timing outputs; IRIG B, 1PPS, 10 MHz.
TR 9.266	The NTS shall be easy to configure.
TR 9.267	The NTS shall be able to synchronize a minimum of 500 clocks.
TR 9.268	The NTS shall include GPS antenna.
TR 9.269	The GPS antenna shall be roof-top mountable.
TR 9.270	The GPS antenna shall be rugged and all-weather.
TR 9.271	The GPS antenna shall have amplifier: LNA +40 dB gain and bandpass filter for out-of-band interference rejection.
TR 9.272	The GPS antenna shall come with industry standard cable with low-loss, and capable for lengths of up to 1000 feet without signal degradation.
TR 9.273	The NTP digital clock shall display digital characters in red colour.
TR 9.274	The NTP digital clock shall retains time and date during loss of power and/or reference using a battery backed real-time clock (RTC) chip and maintenance-free rechargeable battery.
TR 9.275	The NTP digital clock shall support configuration of time zone and daylight saving time parameters.
TR 9.276	The NTP digital clock shall include a software utility which provides easy configuration of clocks and generators attached to network.
TR 9.277	The digital clock shall have fully configurable network settings, including DHCP/BOOTP/STATIC IP.
TR 9.278	The digital clocks configuration shall be saved to non-volatile memory and survives power losses.
TR 9.279	The digital clock shall have password protection that prevents unauthorized clock configuration tampering.
TR 9.280	The digital clock shall have option to display time in 12- or 24-hr format – hh:mm:ss.
TR 9.281	The digital clock shall have option to display date in mm:dd:yy, dd:mm:yy or yy:mm:dd.

TR 9.282	The digital clock shall have adjustable brightness levels.
TR 9.283	The time and date shall be visible at 350 feet (100 meters).
TR 9.284	The digital clock shall be wall-mountable and comes with required mounting brackets.
TR 9.285	The digital clock case shall be in black colour.
TR 9.286	The AC input power shall be 110-240 VAC +/- 10% at 50/60 Hz +/- 1Hz.
TR 9.287	The digital clock shall support 10/100/1000 Ethernet network.
TR 9.288	The digital clock shall have an operational temperature between Ten degrees Celsius (10°C) to forty degrees Celsius (40°C).
SMART CITY PLATFORM	
TR 9.289	The platform shall serve as the integration point for all infrastructure domains within the city, operating with strong security and high reliability for 24 hours per day and 7 days a week.
TR 9.290	The platform shall be operational with low network latency at all times. It shall have an inbuilt historian and shall provide real-time information, along with historical information and analytics.
TR 9.291	Management dashboard that provides the real-time status shall be automatically updated when certain actions, incidents and resources have been assigned, pending, acknowledged, dispatched, implemented, and completed. The above attributes shall be colour coded.
TR 9.292	<p>Smart city platform shall include the following core components as a minimum:</p> <ul style="list-style-type: none"> • Business Rules and SOP definitions – it shall enable users to define the business rules around incidents handling and emergency response as per the agreed SOPs with the Client for a smart city; • Platform – The platform shall provide a common data integration layer which can collect and contextualize information from disparate data sources regardless of individual source specific protocol. The platform shall support templatization to allow ‘build-once-deploy-everywhere’ functionality; • Incidents lifecycle engine – It shall manage the life cycle of incidents and related entities via pre-defined workflows. Workflow for operational alerts and escalations should be triggered automatically without human intervention; • Task management – It shall manage planning, preparation of an incident including resource allocation, task management, etc.; • Analytics and MIS – It shall provide users with business analytics, reporting and tools to organize, evaluate and efficiently perform day to day operations; • Reports and Dashboards – It shall provide filterable reports and dashboards about critical information pertaining to incidents and KPIs collated in a single view which can be drilled down further for more detailed information; • Security and Roles – It shall manage roles definition for internal and external access; • Historian - Platform shall have in-built function to store all platform related data for a user defined period of time; • The platform shall provide a real-time relational database storage for long-term storage of process data. The data store shall enable the storage of real-time and historical data for each analog, discrete or string tag name. It shall also store summary, event, alarm and configuration data; • The platform data store shall have store and forward capability. If the data store is offline or unreachable, the engine servicing active objects shall store data locally, and forward the buffered data to the data store with time stamps and quality information when the data store server is available; • Centralized data archiving for operational data – It shall provide facility for centralized storage of operational data (time series or transactional) with high granularity and data compression capabilities; and

	<ul style="list-style-type: none"> • Mobility – It shall enable operators and the crew members to access the workflow task assigned to them and act using the native mobile application. They should be able to close the loop of workflow by acknowledging the real time status of action assigned to them.
TR 9.293	The platform shall have cross functional workflows with ability to communicate between people, devices and systems.
TR 9.294	The platform shall allow the operators to develop customizable SOP templates based on actual requirements.
TR 9.295	<p>The platform shall be able to issue, log, track, manage and report on all activities underway during these modes of operation:</p> <ul style="list-style-type: none"> • anticipation of incident; • incident or crisis; • recovery.
TR 9.296	The platform shall allow creation of hierarchy of incidents and be able to present the same in the form of a tree structure for analysis purposes.
TR 9.297	The dashboard content and layout shall be configurable and information displayed on these dashboards shall be filtered by the role of the person viewing dashboard.
TR 9.298	The platform shall provide complete view of facilities, sensors, and alarms in an easy-to-use and intuitive GIS-enabled graphical interface with a powerful workflow and business logic engine.
TR 9.299	The platform shall be able to dynamically update information regarding the systems and/or solutions it is interfaced with, displaying their status on a near real-time basis.
TR 9.300	The platform shall have the ability to extract data in desired formats for publishing and interfacing purposes.
TR 9.301	The platform shall have mobility devices & applications for field staff to ensure fast restoration of services in case of alarms & issues. In case of non-attending of alarm, decision escalations will be done automatically. After closure of issue, the workflow shall be closed with feedback from those devices.
TR 9.302	The platform shall have tightly integrated System to have all relevant information of all assets in Smart City Area to give real time status of assets & update automatically in case of failure. Note that as part of this project, an asset management system is being provided via the ISM system. Some of these functionalities shall be met using the asset management system provided as part of the ISM system.
TR 9.303	All data on the platform shall provide ability to attach documents and other artefacts to incidents and other entities.
TR 9.304	The platform server shall be backed up at least once a day.
TR 9.305	It shall be possible to combine the different views onto a single screen or a multi-monitor workstation.
TR 9.306	The platform shall provide possibility to connect to workstations in order to be displayed in one or more video wall with one or more module/application/solution being independently and/or simultaneously being displayed and functional. The platform shall be customizable, scalable, and flexible for integration of all City Systems.
TR 9.307	The platform shall maintain a comprehensive and easy to understand audit trail / log files of read and write actions performed on the system.
TR 9.308	The system shall also provide an integrated user interface to other third-party information systems part of other packages (if any).
TR 9.309	The smart city platform shall take feeds/inputs from various sensors, citizens, real-time systems, processed data and legacy data to enable proactive monitoring, analytical prediction and cross-system communications for making an intelligent city. In terms of analysis, using this platform, the city can achieve analytics, business intelligence and real-time event processing. Through this platform, various 'mined' information can be shared with city officials and citizens in form of reports, dashboards, standard APIs and open-data. The platform should also allow the manufacturers of the sensors to develop integrations themselves using SDKs without affecting the applications and existing

	integrations. It shall also leverage an in-built IoT layer which will enable realization of all desired functionalities of the RFQ cum RFP. This IoT layer shall integrate and enable cross system communications along with all analytics features desired as part of the RFQ cum RFP for various IoT devices being installed as part of the project at present and in future.
TR 9.310	The platform shall integrate devices using their respective APIs into this platform. It shall be able to integrate any type of sensor immaterial of the technology or vendor of the respective sensor and application.
Platform Software	
TR 9.311	Platform software shall be capable of processing all inputs from all City Systems, including active data and direct feeds, with low network latency.
TR 9.312	The platform software shall provide output to the Video Display Wall (VDW) in its compatible formats – e.g. webpages and H.264.
TR 9.313	Tools for data collection and analysis, monitoring and control of all services shall include, but not limited to: <ul style="list-style-type: none"> • Applications on the platform to process inputs from selected City Systems; and • Remote control software to directly monitor and control selected City Systems at the CIOC/ Mayor's Office.
Platform Hardware	
TR 9.314	The platform shall be hosted on the cloud. Only the video data streaming shall be done locally, since surveillance hosting is being done on-premise.
Operator's Workstation, Manager's Workstation and Boardroom Display	
TR 9.315	Platform visuals shall be displayable as an individual window, or as combination of several windows of information on the operators' workstation, manager's workstation, and boardroom display.
OTHER SPECIFICATION	
Lighting	
TR 9.316	All overhead lighting shall be LEDs both recessed direct and indirect lighting, including pot-lights.
TR 9.317	The overhead lighting treatment shall be incorporated into the other ceiling elements to create an aesthetic specialty ceiling design, in combination with the Rooms.
TR 9.318	Overhead lighting intensity shall be: <ul style="list-style-type: none"> • For Operations Room: at least 400 lux; • For Cabin/Boardroom: at least 500 lux; and • For Rack Room: at least 500 lux.
TR 9.319	Dimming control shall be continuous (all lights dimmable) and zone-based (with a minimum of 4 lighting zones on separate circuits).
TR 9.320	Dimming control shall have various configurations preset for the ideal operations lighting environment, based on the perimeter glass wall natural lighting conditions (e.g., sunny, cloudy, partly cloudy, night, etc.).
TR 9.321	Appropriate wall boxes for corresponding dimmer size shall be provided. Dimmers shall not be ganged in one box.
TR 9.322	Manual switches shall be used for on / off lighting control and for overriding any preset lighting configurations.
TR 9.323	Cover plates for switches shall match the colour of switches, receptacles, and receptacle cover plates. Cover plates shall be of the same manufacturer as the devices.
TR 9.324	All lighting fixtures shall be of high-grade quality over and above the standard level of quality for office lighting.
TR 9.325	Lighting arrangement shall accommodate console locations.

TR 9.326	Lighting shall be configured in order to reduce glares and reflections on console monitors and on the video wall, as well as accommodate any other lighting needs the monitors and video wall may have.
TR 9.327	Lighting system shall be integrated with room control panel and BMS for integrated operations.
Ceiling	
TR 9.328	The specialty ceiling treatment shall incorporate the following as a minimum: <ul style="list-style-type: none"> • Overhead lighting; • Suspended audio system components (e.g., speakers); • Fire / CO alarms; • Wet sprinklers; and • Sound absorption ceiling tiles.
TR 9.329	In the Operations Room, the specialty ceiling treatment shall also accommodate a fill-in wall partition between the upper edge of the video display wall and the ceiling.
TR 9.330	In Rack Room, the ceiling shall be open (to the concrete slab) to allow access to cable and fibre infrastructure and HVAC system. The ceiling slab shall be reinforced to support the fully loaded weight of cable trays, fibre trays, and the overhead electrical (power) raceway. Each of these will be securely fastened to the ceiling slab with either uni-strut bars or hangers and threaded rods.
Floors	
TR 9.331	Flooring with proper acoustic treatment shall be used to reduce the impact sound by at least 14dB.
TR 9.332	A 12 in / 0.30 m raised floating floor shall be installed, bolted to the understructure (i.e., pedestals).
TR 9.333	The raised floating floor shall have the ability to be accessed from any location within the Operations Room and Cabin / Boardroom.
TR 9.334	The baseboard treatment shall extend to conceal the 12 in / 0.3 m raised floating floor.
TR 9.335	The raised floating floor shall be capable of supporting general loading of 600 – 1200 kg / m ³ (123 – 245 lb / ft ²).
TR 9.336	The raised floating floor shall be capable of supporting in excess of the concentrated static loading of the consoles, video wall and loaded equipment racks.
TR 9.337	The raised floating floor shall be grounded.
TR 9.338	The pedestal / supporting structure for the video wall shall be fastened to the concrete slab floor.
TR 9.339	Stub conduits shall be installed in the concrete slab floor (underneath the raised floating floor) of the Operations Room.
Glass Partition Walls	
TR 9.340	The Glass partition walls to be provided between the Board Room/Cabin and Operations Room shall be made up of 12mm toughened laminated glass with frame-less structure.
TR 9.341	The glass partition shall be supported by 600mm high Modular metal partition (having the same finish as that of wall cladding) from the floor.
TR 9.342	Proper structure shall be made to ensure the fixing of glass from slab above false ceiling and flooring.
TR 9.343	Safety film shall be applied on the glass to avoid shattering.
TR 9.344	Glass shall be fitted on anodized extrusion with tool less technology and shall have a provision for replacing glass with perforated sheet/acoustic tile by removing the glass.
DIESEL GENERATOR (DG) WITH AMF PANEL	
TR 9.345	The scope includes supply, installation, testing and commissioning of 500 KVA Continuous rating (Prime Rating) AC 3 phase, 4 wire, 1500 rpm, 0.8pf, 50hz D.G Set with accessories i.e. vibration mounts, Base frame, In Built fuel tank of 990 liters, Residual Silencer flexible connection bellow / expansion joints, Engine & DG control panel, Batteries - 2 Nos. of 180 AH/12V and Battery leads and

	Acoustic Enclosure (Canopy) Complete in All Respect to run the DG in synchronization with AMF Panel. DG set shall be for entire Admin Building.
TR 9.346	The DG set shall be of the regular production models of the manufacturer for industrial applications and already type tested either at the manufacturer's works or outside.
TR 9.347	<p>Minimum following Standards shall be considered to manufacture the product:</p> <ul style="list-style-type: none"> • IS: 2253 - Designation for type of construction and mounting arrangement of rotating electrical machines. • IS: 4691 - Degree of protection providing by enclosures of rotating electrical machinery. • IS: 4728 - Terminal marking of rotating electrical machines. • IS: 7132 - Guide for testing 3phase Synchronous Machines. • IS: 5422 - Turbine type generators. • IS: 4889 - Methods of determination of efficiency of rotating electrical machines. • IS: 1271 - Insulation materials for Electric machinery and apparatus in relation to their thermal stability services, classification. • IS: 4722 - Specification for rotating electrical machines. • IS: 13947 - AC circuit breakers.
TR 9.348	The DG set shall have provision of RS485 port/ BACnet cards with open protocol to access all the desire data from remote location for analysis and monitoring at BMS.
TR 9.349	The DG set shall be provided with class A1 governing as per the latest edition of BS: 5514.
TR 9.350	The "Cyclic irregularity" of the diesel engine set for direct coupling to an electric generator, "angular deviation of AC generators" given by diesel engine for parallel operation, and the "engine governor speed droop characteristics", shall be restricted to the values specified under the latest edition of BS:5514.
TR 9.351	Torsional analysis of the dynamic system should be as per specified in the latest edition of BS: 5514.
TR 9.352	The generator set shall be manufactured in compliance with CPCB norms & certification is mandatory requirement from OEM.
TR 9.353	Noise level rating of the DG should as per CPCB norms and not exceed more that 105DB without acoustic enclosure and 75DB with acoustic enclosure at 3meter distance.
TR 9.354	Diesel engine shall be capable of starting without the use of cold starting aids so long the ambient temperature at the site is not below 4 degree C.
TR 9.355	Where the diesel engine is specified/offered with battery starting arrangement, the starter motor shall be capable to starting the engine without having to disengage the driven machine with the help of a clutch where the diesel engine is equipped with a dual starter the synchronizing switch and the corresponding wiring/connection with the starter motor shall be provided by the system.
TR 9.356	In case of diesel engines driving the engine mounted battery charging alternator, the OEM shall also provide battery, automatic Electronics float & boost type battery charger suitable for taking power from supply authority's power source and mounted on a free standing type of a panel.
TR 9.357	The battery charger shall be capable of delivering a current equal to 100% of the 20 hours discharge rate of the battery and also equipped with charging rate selector device.
TR 9.358	The diesel engine is required to start/stop automatically. Necessary controls (automatic-cum -manual) in the engine panel and the interconnecting wiring and piping from the panel to the engine and starting equipment is required.
TR 9.359	A pilot lamp shall be provided in the line side of the starting equipment circuit to indicate that the controller is in the automatic position. In the event the engine does not start after three attempts have been made, the controller shall stop all further cranking and operate the auto-visual alarm.
TR 9.360	Engine cooling shall supply with radiator based cooling system.

TR 9.361	The Fuel tank shall have 990 ltr capacity equipped with shielded level gauge, strainer and a hand hole of not less than 150mm dia, besides the required fuel connections and a drain plug. Fuel oil transfer pump to transfer oil from barrels to day tank shall also be provided.
TR 9.362	The inside surfaces of the fuel tank and the float tank shall be coated with enamel red or black of ICI or its equivalent and the outside surface to be given two coats of the oil resistant primer paint.
TR 9.363	The fuel tank shall be hydrostatically tested at a pressure not less than 0.35Kg/sqcm.
TR 9.364	All piping, valves, fittings and supports inside DG house shall be part of supply.
TR 9.365	An instrument panel mounted on the engine shall be provided and shall comprise the following flush mounted instruments and gauges: <ul style="list-style-type: none"> • Cooling water inlet and outlet temperature (In Case of Water Cooled Engine) • Cooling water inlet temperature to lubricating oil cooler (In Case of Water Cooled Engine) • Lubricating oil inlet and outlet temperature • Lubricating oil pressure gauge • Tachometer, positive driven • Hour counter.
TR 9.366	Following warning indication and automatic shut-down alarms shall be provided on control panel: <ul style="list-style-type: none"> • High coolant temperature shutdown • Fail to crank shutdown • Over speed shutdown • Over cranking shutdown • Over current alarm and shutdown • Short circuit shutdown • Low oil pressure shutdown and alarm • Low and high coolant temperature alarm • Low battery alarm • Low fuel-day tank alarm • Low & high DC voltage alarm • Low & high AC voltage alarm • Under frequency alarm • Ground fault alarm • Overload alarm • Emergency stop
TR 9.367	The alternator shall be mounted on a common base frame together with the prime mover unless otherwise agreed. The generator shall be provided with necessary lifting hooks and two earth terminals for connection to main earth grid.
TR 9.368	The alternator winding shall be class "H" insulation with temperature limitation to class "H".
TR 9.369	The stator windings shall be brought out to six insulated terminals in two separate terminal boxes. The alternator shall, therefore, be provided with three separate terminal boxes i.e. for the line neutral stator connection and for control connection.
TR 9.370	The terminal box for the line terminal shall have 40% free space and each segregated for easy cable end connection of cable size specified.
TR 9.371	The neutral box in addition to the space for neutral earthing cable shall have sufficient room for the current transformers used for the protection of the generator. Star connection shall be formed in the neutral side of terminal box.
TR 9.372	The terminal box for control cable shall contain properly marked terminals for all internal equipment e.g. embedded temp., detectors etc.

TR 9.373	All terminals shall be stud type.
TR 9.374	All terminal boxes shall be complete with lugs and double compression type cable glands.
TR 9.375	The direction of the rotor of the machine shall be compatible with that of the prime mover. A clear indication of the direction of rotation shall be given on either end of the machine.
TR 9.376	Space heaters shall be installed within the enclosure as per site condition. Location and max surface temperature of the heaters shall be such that no damage can be caused to any insulation. Heaters shall be suitable for operation on a single phase 240V AC supply unless otherwise specified with thermostatic control. Also monitoring of "HEATER HEALTHY" shall be provided.
TR 9.377	Field winding shall have class "H" insulation with excellent electrical and mechanical properties. The field winding shall be capable of operating at a field voltage with excitation capacity $E_{max}/E_n = 1.6$ for at least two minutes to meet improved stability requirements.
TR 9.378	<p>A rating plate of SS material shall be fixed on the generator frame and shall give the following information:</p> <ul style="list-style-type: none"> • Manufacturer's name • Serial number, Type and frame reference • Rated output in KVA & KW • Rated power factor, frequency and voltage • Rated stator current and speed in Rev/ Min. • Class of Insulation • Phase rotation (CW or CCW) • Customer's indent no. • Year of manufacture • Weight of rotor and stator in Kg.
TR 9.379	The generator shall be provided with brush less type solid state excitation system.
TR 9.380	AC voltage generated in the exciter shall be rectified by the rotary rectifier assembly and feed power to the main field circuit of the generator.
TR 9.381	The exciter capacity shall be at least 20% more than the maximum requirement at any time. The exciter winding shall be insulated with class "H" insulation.
TR 9.382	<p>Automatic solid state voltage shall be provided with the following features as a minimum:</p> <ul style="list-style-type: none"> • Short circuit protection • Manual voltage control switches with adjuster • Cross current compensation for parallel operation • Voltage builds up circuitry • Stator & field current limiter
TR 9.383	<p>The Generator control panel shall comprise the minimum as following:</p> <ul style="list-style-type: none"> • Metering equipment • Indicating instruments • Local switchgear (MCCB) for receiving DG set power and outgoing to main panel. • Battery charger • Lub oil motor start/stop, if motor driven lub. oil system
TR 9.384	The panel shall be free standing, metal enclosed, dust and vermin proof type with a hinged door and having a degree of protection IP-51 as per IS:13947. The max height of the operation handle/switches shall not exceed 1500mm and the min. height not below 300mm.
TR 9.385	All auxiliary devices for control, indicator, measurement and alarm such as push button control/ selector switches, indicating lamps, metering instruments, annunciators etc. shall be mounted on the front door of the panel.

TR 9.386	Adequate number of potential free contacts shall be provided in the control panel for any remote control, monitoring of the generator set.
TR 9.387	All switches shall be load-break, heavy duty type. All fuses shall be non-deteriorating HRC cartridge pressure fitted, link type. The contactor shall be air-break type having AC-1 duty rating.
TR 9.388	All control/ selector switches shall be rotary back connected type having a cam-operated contact mechanism with knob type handle. "STOP" push buttons shall be stay put type.
TR 9.389	Wiring for power, control and signaling circuits shall be done with FRLS insulated copper conductors having 660/1100V grade insulation. Min. size of control wires shall be 1.5sqmm. Terminal shall be acceptable for wires up to 10sqmm size and for conductors larger than 10sqmm bolted type terminals with crimping lugs shall be provided. A Minimum of 10% spare terminals shall be provided on each terminal block.
TR 9.390	An adequately sized earth bus shall be provided in the panel for connection to the main earth grid. All non-current carrying metallic parts of the mounted equipment shall be earthed. Doors and movable parts shall be earthed using flexible copper connections.
TR 9.391	<p>The generator control panel shall consist of all Auto-transfer switch, circuit breakers, protective relays if applicable and accessories required to control the generator operation and shall include but not limited to the following:</p> <ul style="list-style-type: none"> • Voltmeter, Ammeter, Power factor & Frequency Meter • Kilowatt meter with maximum demand indicator • Kilowatt hour meter • Hour run meter • Start-Stop and automatic mains monitoring system • Emergency off push button • Manual speed adjusting control reset for overload, alarm muting • Fully automatic trickle battery charger with voltmeter • Indicating lamps for 'Mains available', 'Mains on load', Standby available', 'Standby on load', 'Alarm', 'Mains fail' etc. • Audio and visual (Flasher) alarm
TR 9.392	<p>The generator control panel shall consist of all Auto-transfer switch, circuit breakers, protective relays if applicable and accessories required to control the generator operation and shall include but not limited to the following:</p> <ul style="list-style-type: none"> • Voltmeter, Ammeter, Power factor & Frequency Meter • Kilowatt meter with maximum demand indicator • Kilowatt hour meter • Hour run meter • Start-Stop and automatic mains monitoring system • Emergency off push button • Manual speed adjusting control reset for overload, alarm muting • Fully automatic trickle battery charger with voltmeter • Indicating lamps for 'Mains available', 'Mains on load', Standby available', 'Standby on load', 'Alarm', 'Mains fail' etc. • Audio and visual (Flasher) alarm
TR 9.393	<p>The start-stop and automatic mains monitoring system shall be equipped with the following:</p> <ul style="list-style-type: none"> • Duty selector switch for 'off-automatic-test-manual' operation • Manual start-stop push button switch • Manual alternator circuit breaker 'On-Off' switch • Cancel alarm & reset switch • Indicating lamps

	<ul style="list-style-type: none"> Battery Status
TR 9.394	Alternator: 500 KVA self excited, brush less type, 3 phase, 415 volts 50 Hz, 4 pole, AC alternator complete with all accessories.
TR 9.395	Engine: water cooled diesel engine with rated capacity of 608 BHP at 1500 rpm, turbo charged, direct injection type, 4 stroke, 10 cylinder including fuel tank of minimum 990 ltrs. capacity fabricated with 2.5 mm thick MS sheet duly calibrated and painted with one coat of primer and two coats of synthetic enameled paint of approved colour, residential type silencer with exhaust pipe 150 mm dia MS pipe duly wrapped with asbestos rope of legging of specified quality and specification
TR 9.396	AMF Panel: Cubical, compartmentalized, AMF panel board with all power and control contactors, switches, meters and other accessories, internal wiring, connection, inter-connection etc. for trouble free smooth function for 500 KVA DG Set complete with battery charger and leads as required.
TR 9.397	Base Plate: Common base plate of required size for mounting of engine alternator and vibration damping arrangement with cushy foot mounting i/c painting etc. as required.
TR 9.398	Foundation: Suitable size cement concrete (1:2:4) foundation duly plastered and finished with neat coat of cement as required.
AMF Panel for 500KVA Diesel Generator Set	
TR 9.399	AMF panel shall be Cubical, compartmentalized with all power and control contactors, switches, meters and other accessories, internal wiring, connection, inter-connection etc. for trouble free smooth function for 500 KVA DG Set complete with battery charger and leads as required.
TR 9.400	The control cubicle shall be complete with necessary internal/ cabling/ control wiring (between DG Set & AMF panel), control circuit MCB's etc. and shall have provision for control/ power cables and complete in all respects including space for installation of energy meter in lockable space as per requirement of the local supply authorities.
TR 9.401	<p>The AMF panel shall contain minimum requirements as following:</p> <ul style="list-style-type: none"> Incomer: 630 amps 4 pole (36 KA) Electrically operated fully draw out type Communicable air circuit breaker with built in microprocessor based 6.0 A release unit for protection and measurement as per specification and with following accessories: 1 Set. 0-500 volts digital electronic voltmeter with inbuilt selector switch and control MCB's. 0-400 amps digital electronic ammeter with Inbuilt selector switch and 3 Nos. 400 / 5, 15 VA, CLI, CTs. Digital electronic KWH meter with ming class-I CT's. Digital Electronic Frequency meter Digital Electronic Kilowatt meter with ming class-I CT's. 3 Nos. LED type Phase indicating light with control MCB's and toggle switches.
TR 9.402	<p>Multi-functional numeric relay with mod bus RS 485 ports for following protection.</p> <ul style="list-style-type: none"> Voltage restrained over current protection (50 V / 51 V). Thermal overload (49) Current unbalance (46) Loss of excitation (40) Reverse Power (32) Under Power (37) Under / Over voltage (27 / 59) / 1 Set Each Under / Over frequency (81) 1 Set Each Breaker failure protection. Earth fault protection relay (64 R) Differential protection relay (87 G) with PS class CT's on both side. Master trip relay Trip circuit supervision relay Engine cranking relay

	<ul style="list-style-type: none"> • 24 V DC shunt trip • Mains supply voltage sensing relay • Emergency stop push button • Selector switch for Auto / Manual / Test • Selector switch for engine control OFF/ON • Five push buttons – start, stop, reset, test and accept. • Three indicating lamps “load on set”, ‘Load on Mains’ and “Set fail to start’ • 16 Window alarm annunciator panel with hooter, push buttons, aux. Contactors etc. • Battery Charger
TR 9.403	AMF Logic - Mains priority, DG selection-single DG, Both DG, Auto/Manual, Controller Bypass, Hour based DG Run, Fail to start, Next DG Start on failure of first one, Alarm for fail to go on Load, DG controller should have Rev Power, U/V, O.V, U/F protection with RS 485 port, MODBUS protocol, software support for BM integration-To be mentioned in the SLD.
TR 9.404	Bus Bars: 630 amps 4 pole (36 KA) Aluminum bus bars with colour coded heat shrinkable insulating sleeves.
TR 9.405	All MCCB's shall be suitable for 36 kA (Icu=Ics=Icw for 1 sec.)
TR 9.406	415 / 110 V suitable rating control transformer shall be provided for aux. Control supply
TR 9.407	Wiring with space heater, thermostat and control MCB's shall be provided all vertical sections of main LT panel.
TR 9.408	All incoming as well as outgoing feeders shall have pad locking facility.
TR 9.409	Suitable danger board shall be provided.
TR 9.410	All bus bar section / backside panels shall have pad locking facility and hinged type door.
TR 9.411	Panel should be as per SLD & Specification.

3 Detailed Scope of Work

3.1 MSI Scope of Services - Overview

The Project requires turnkey services wherein the MSI shall broadly cover the following main scope of services:

- Design;
- Supply;
- Install;
- Test;
- Integrate;
- Commission; and,
- Operations and maintenance.

The subsequent sections detail out the scope with respect to execution of this Project. The MSI shall note that the activities defined within scope of work mentioned are indicative and may not be exhaustive. MSI is expected to perform independent analysis of any additional work that may be required to be carried out to fulfil the requirements as mentioned in this bid document and factor the same in its response.

The following Exhibit 11 presents the detailed scope of services that have to be carried out as a part of the contract.

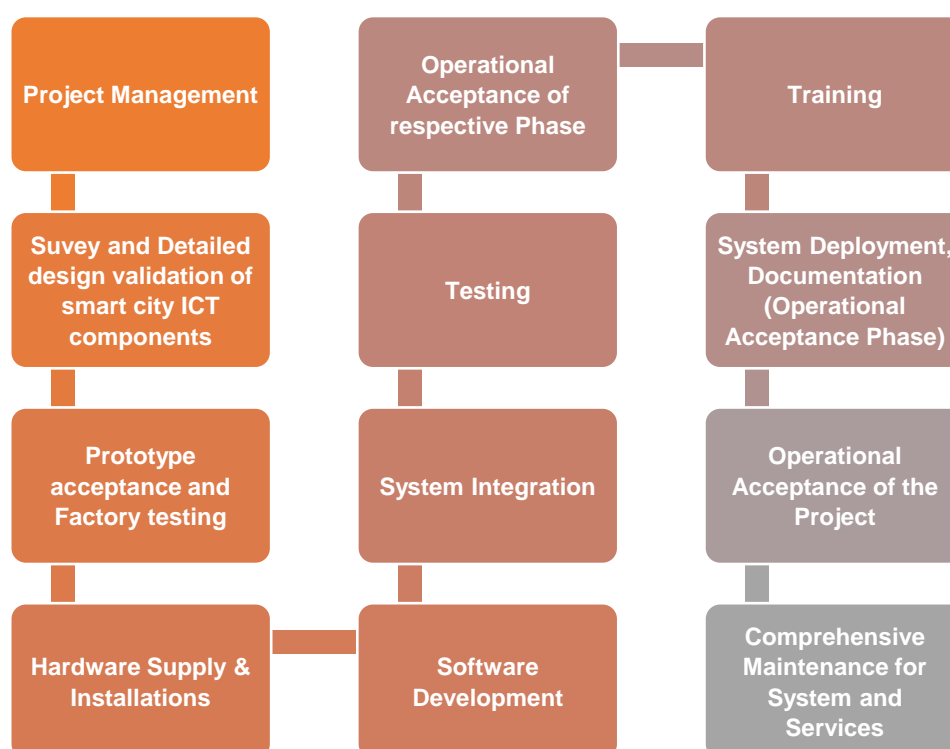


Exhibit 11: Detailed Scope of Work

3.1.1 Project Management

MSI shall be responsible for end to end project management for the implementation and maintenance of the smart city ICT components. MSI shall deploy a competent team of experts for project management which shall include a Project Manager along with a deputy.

The Project Manager shall be the single point of contact that shall assume overall responsibility of the Project and ensure end to end working of the Project. He shall function as the primary channel of communication for all Client requirements to the implementation team. In case of any absence of the project manager (sickness

or vacation), the MSI shall ensure that an alternate project manager (as approved by the client or its representative) shall be provided during the absence period.

As per the finalized staff deployment plan, MSI shall be obligated to ensure availability of Key Experts at the Project location (Greater Noida) during the entire Contract duration. Mechanisms to transparently record and monitor Key Expert availability at project location shall be under the scope of MSI. The MSI shall provide monthly report to the Client providing compliance for availability of Key Expert at Project location.

MSI shall be responsible for preparing a master schedule of work which shall highlight implementation plan for all the Project milestones. The schedule shall identify the manufacture, delivery, installation, integration of equipment (Software and Hardware), training programs, test procedures, delivery of documentation and the respective solutions. The schedule shall also show Client and any third-party responsibilities along with the activities in the timeline. MSI shall conduct bi-weekly meetings between the Client (and / or its representative) and the 'key personnel' to discuss project progress and implementation in Greater Noida, Uttar Pradesh. All key personnel associated with the project shall also be available for meetings whenever asked by the Client or its representative.

MSI shall also be responsible for effective risk and issue management and escalation procedures along with matrix as part of project management. MSI shall identify, analyse, and evaluate the project risks and shall develop cost effective strategies and action plan for mitigation of risks. As part of the Project, MSI shall monitor, report and update risk management plans and shall be discussed during project meetings.

MSI shall prepare minutes of every meeting which takes place and submit to Client or its representative for tracking of the Project. MSI shall propose a suitable progress reporting mechanism for the project duration.

All the tools required by MSI for project management, configuration management, issue and risk management, escalation procedure and matrix document repository etc. shall be factored in the proposal submitted by MSI. MSI shall submit periodic baseline schedules in Work Breakdown Structure (WBS).

Based on progress reports, MSI shall also accordingly update the master schedule of work on a continuous basis during the period of the contract.

All deliverables shall be submitted in at least two (2) formats i.e. draft and final. The Client's representative will have at least 30 days to review and comment on every deliverable. The practice of submissions for all deliverables will be that three (3) hard copies and CDs of every deliverable shall be submitted. The submissions will include both hard and soft copies.

3.1.2 Survey and Detailed Design Validation of all Smart City ICT Components

MSI shall conduct end-to-end survey of the site area, additional requirement gathering and based on the observations, assess and validate the present conditions, implementation approach and methodology, project challenges and mitigations and other project critical information. During the survey stage itself, MSI shall mobilize its entire staff and fully acquaint them with the site conditions. It is MSI's responsibility to periodically survey the site and be updated on the conditions during the course of the contract. During the design validation stage, MSI is also expected to:

- Workshops with different stakeholders for capturing business requirements, creating awareness of best practices, communicating the changes, building consensus on process design etc. These needs to be organized at different intervals and in different places throughout the duration of the projects as needed.
- Stake holder consultation other than workshops, with those stake holders who will be identified by DMIC IITGNL, for critical inputs, review, suggestions, process description etc.
- Review sessions with different stake holders for signing off the deliverables, walking through the deliverables for facilitating quick understanding.

The MSI shall also be responsible for the detailed design validation of the project. MSI shall discuss in detail and validate with the Client or its representatives the detailed design of the smart city ICT components and fine tune any requirements. It is the MSI's responsibility to satisfy the operational requirements of the Client and adopt industry best practices for implementation during the design stage itself. Based on the survey observation, analysis and discussion with the Client, the MSI shall submit a Detailed Project Report. The report shall include end-to-end design validation for the project including any project understanding, analysis, detailed design, integration plan, and for-construction drawings. Complete set of design and construction drawing

including method of installation as applicable shall also be included in the Detailed Project Report. Construction details shall accurately reflect actual job conditions.

All technical data sheets of the products may be submitted ahead of time by the MSI. It is MSI's responsibility to get all technical data sheets approved by the Client or its representative to meet the overall project schedule.

Design and construction drawings shall include the following at a minimum:

- All system device locations as required for installation, operation and maintenance;
- Cable requirements, routing and location (as applicable);
- Typical mounting details;
- Single Line Diagrams (SLDs);
- Splicing diagrams;
- Wiring diagrams;
- 3D layouts and renderings for PoP and CIOC;
- Any other layouts;
- Any other requirement to meet the requirements of the RFQ cum RFP.

All drawings shall be updated/revised to "as-built" conditions when installation is complete.

Design submissions shall be based on project requirements and shall include as applicable, but not limited to, the following:

- Complete listing of specifications to be used along with detailed technical data sheet;
- Detailed engineering drawings;
- Shop drawings including product data sheets;
- Revisions to original design submissions.

No work requiring shop drawing submission shall commence until final review has been obtained by Client. However, review of the shop drawings by the Client shall not relieve the MSI of his responsibility for detailed design validation inherent to shop drawings.

For the software components, MSI will create requirement analysis documents. This includes System Requirements Specifications (SRS) and the Functional Requirements Specifications (FRS). The MSI shall be responsible for documenting any existing/planned 'processes' of the Client as part of these deliverables. Document shall also clearly illustrate the integration points for systems such as IIT Software Modules (ISM), Smart City Platform, Building Management System, Video Management System etc. The required customizations and development on these modules shall also be included in detail as part of project report.

As part of the Project, the ICT Consultant shall provide drawings to the MSI in raw format. These drawings include typical details, proposed equipment location, routing and typical splicing. It will be MSI's responsibility to work on these drawings as a base, update them as per the latest site conditions, and convert these drawings to 'for-construction' drawings.

3.1.3 Prototype Acceptance and Factory Acceptance Testing

After the approvals of the technical data sheets by the Client or its representative, MSI shall submit the prototype of the material presented in the Detailed Project Report to the Client or its representative for its review and approval. Note that it shall be MSI's responsibility to get the prototypes approved in due course of time without affecting the overall schedule of completion of works.

Material provided as part of the Project shall undergo Prototype Acceptance Test (PAT) and Factory Acceptance Test (FAT). Details regarding the PAT and FAT are presented in Testing Section of the Scope of Work. MSI shall also present to the Client and its representatives the test results for PAT and FAT in the form of Test Result Documentation presented in the Testing section. The Client and its representative at their own discretion shall visit any FAT site. MSI shall be responsible for organizing all logistics required for any such site visit. The materials which shall undergo PAT and FAT shall be as per Client discretion.

For all the software components, the MSI shall also propose prototype of solution components as part of this phase and get the required approvals.

3.1.4 Hardware Supply and Installation Stage

MSI shall be responsible for the supply and installation of all components as part of IIT smart city ICT components to meet the technical, functional, business and performance requirements of this RFQ cum RFP. No deviations from these requirements shall be acceptable by the Client. Any additional hardware or software component required to meet the technical and performance requirement of the project and not specified as part of this document but required to meet the overall requirements of the project shall be factored in as part of the Bid and provided by the MSI. MSI shall deliver the project and install and handle the equipment in accordance with manufacturer's requirements. Installation process of the MSI shall be flexible and shall accommodate Client's requirements without affecting the schedule as specified in the RFQ cum RFP.

MSI shall be responsible to provide ICT enabled energy meters (minimum 25 numbers) for measuring electricity consumption of the Smart City ICT components. MSI shall be responsible for all supply, storage and handling of the material provided as part of the project. The OEM proposed for the IT infrastructure shall be in line with the national security policy (as applicable).

If there is removal/change of any existing material during installation process and belongs to the Client, the material shall be handed-over to the Client. MSI shall also be responsible for reinstating any site in the project limits at no additional cost to the client. It shall be the MSI's responsibility to supply and install all hardware in compliance with the requirements of the RFQ cum RFP. Since this is a turnkey contract, MSI shall be responsible for all implementation works on the project including any civil, structural, electrical, etc. works required to meet the requirements of the project. Necessary foundation and civil requirements for installation of ICT equipment shall be under MSI's scope. All power conversions necessary to operate the equipment shall be under the scope of MSI. The Client shall only provide raw power for all the equipment.

3.1.5 Software Development

MSI shall be responsible for development and deployment of all software required to meet the requirements of the project. Some of the software may be COTS or may require bespoke development. MSI shall be fully responsible for developing, implementing and integrating all software required for the project.

All software development/ implementation may be demonstrated to the Client periodically in Greater Noida, Uttar Pradesh, as per the project requirements. All software shall be developed based on the approved software and functional requirements specifications. The technology platform chosen for all software shall be based on industry standards based and shall be secure. Migration of data shall be the responsibility of the MSI. MSI is required to take the source data in the format which is available. Subsequently, MSI is required to take complete ownership of data migration and also develop a detailed plan for data migration against the same.

The MSI shall ensure that full support from the OEMs is provided during the course of the contract. MSI shall be responsible to provide any upgrades, patches, fixes to the software during the course of the contract at no additional cost to the client. Detailed requirements for Software development have been presented as part of Section 3.2.4.

3.1.6 System Integration

MSI shall be responsible for the integration of all hardware and software supplied as part of this Project as per the technical and performance requirements of the project. The system integration scope also includes integration of the Project components with the components provided by others as per the details of the RFQ cum RFP.

It shall be MSI's responsibility to integrate the software components being developed as part of IIT. This includes integration of selected software components with the Smart City Platform for monitoring the smart city ICT elements implemented as part of IIT. Similarly, MSI shall also undertake integrations associated with ISM, Building Management Systems, Video Management Systems etc. It shall be the responsibility of MSI to take approval of the Client for the Integration of the overall system as per the RFQ cum RFP. Post systems integration, the Client shall review and approve the overall performance of the integrated system as per the requirements of the RFQ cum RFP. MSI shall be responsible for fixing any requirements that are not found in compliance with the original RFQ cum RFP and approved detailed design at no additional cost to the client.

3.1.7 Testing

All materials, equipment, systems, manufacturing or configuration processes, or other items to be provided under the Contract shall be inspected and tested in accordance with the requirements specified in this document and will be subject to Client or its representative's approval. The testing shall include any existing civil infrastructure equipment or materials to be taken over by the MSI. Approvals or passing of any inspection by the Client shall not, however, prejudice the right of the Client or its representative to reject the material if it does not comply with the specification or requirements of the RFQ cum RFP when erected or give complete satisfaction in service.

The MSI shall design and successfully complete tests to demonstrate that all equipment, materials and systems furnished and installed function in the manner intended and in full compliance with the requirements outlined in the RFQ cum RFP and the approved detailed design of the MSI.

All tests shall be subject to inspection or witnessing of tests by the Client or its representative. Inspection or witnessing of tests may be waived at the sole discretion of the Client or their representative, subject to the MSI furnishing the Client or their representative with properly completed test certificates in accordance with the requirements of the RFQ cum RFP. Failure of the Client or their representative to witness any test shall not relieve the MSI of the obligation to meet the requirements of the Contract.

MSI shall submit an Acceptance Test Procedures document (ATP), for Client's approval prior to undertaking any testing. The ATP shall clearly address:

- Type of testing and device to be tested;
- How each testable specification requirement will be demonstrated, including the test environment and set-up, specific functionality to be tested, method for performing the test and quality assurance procedures;
- The results that will constitute success for each test;
- Timing of test within the overall Contract schedule;
- The location for testing;
- Personnel required to conduct the test;
- Approximate time required to execute the test or set of tests;
- Responsibilities of both the MSI and Client's representatives during each test; and

The ATP shall include an updated Compliance Matrix which includes the RFQ cum RFP requirements which will be demonstrated; and a cross-reference to the test procedure(s) that serve to address each contract requirement. The Compliance Matrix shall be used as a "punch list" to track which requirements have not yet been demonstrated at each stage of testing. A requirement classified as having been "demonstrated" during a certain ATP stage can be subsequently redefined as having been "not demonstrated" if compliance issues emerge prior to System Acceptance. ATP shall be submitted to Client at least three (3) weeks in advance of any intended testing.

All measuring instruments required to measure test parameters shall be calibrated by an approved testing authority. The equipment shall be inspected for standards of construction and electrical and mechanical safety.

Test results shall be recorded for all tests conducted under this Contract. The MSI shall make test results available to Client or their designate for review immediately after completion of the tests.

ATP for each test shall be collated, bound and delivered as part of the close-out documentation requirements specified herein.

ATP shall incorporate the following distinct stages for each deployed stage as mentioned below:

Hardware Component Acceptance Testing Procedures (ATPs):

- **Prototype Acceptance Tests (PAT):** Prototype Approval Test shall be conducted only on the customised equipment for their design and compliance to functional specifications. PAT shall be completed before conducting FAT and only after approval of PAT by Client's representative, the equipment shall go in production. PAT shall be witnessed by Client's representatives.

- **Factory Acceptance Tests (FAT):** FAT shall be conducted before the equipment is shipped to Client for installation, and deficiencies shall be rectified before shipping to Client for installation. All devices furnished by the MSI shall be tested and subjected to a nominal 48-hours burn-in period at the factory. FAT shall be witnessed by Client's representatives at their discretion.

Factory acceptance tests shall be conducted on randomly selected final assemblies of all equipment to be supplied. Sample size for FAT shall be a minimum of 10%. In case any of the selected samples fail, the failed sample is rejected and additional 20% samples shall be selected randomly and tested. In case any sample from the additional 20% also fails the entire batch may be rejected. Items which shall undergo FAT shall be as per Client discretion.

- **Pre-Installation Testing (PIT):** All equipment supplied under this Contract shall undergo pre-installation testing in accordance with the ATP. This shall include existing equipment, any spare parts, any new equipment provided by Client or their designate and new equipment provided by the MSI.

If the equipment is considered a standard production item, the MSI may, with the prior consent of the Client or their representative, supply a copy of the equipment manufacturer's quality control test results in place of a MSI performed test.

All PIT testing shall be carried out prior to installation of the equipment. After satisfactory completion of the MSI's PIT tests, the MSI shall supply all test measurements and results to the Client or their representative, together with a Test Certificate.

- **Installation Acceptance Tests (IAT):** IAT shall be conducted after installation of each equipment type, and deficiencies shall be rectified before the initiation of SAT. IAT may be witnessed by Client's representatives.
- **System Integration Testing (SIT):** The MSI is responsible for the proper and harmonious operation of all subsystems installed under this Contract. Where connections of the new systems to existing subsystems or equipment supplied by others are required, the MSI is responsible for connection of equipment specified in the Contract and for initial system integration tests. Such a test will verify the full functionality of each subsystem as they are interconnected. This will require testing to be coordinated by the MSI with the Client or their designate. This work will be carried out under the direction of the Client or their designate.

Completion, submission and approval of all relevant PAT, FAT, PIT and IAT tests and results must be complete prior to carrying out any SIT tests.

The MSI shall:

- Complete all equipment and subsystem tests required in the Contract;
- Test each subsystem independently;
- Add subsystems one at a time and monitor the overall performance;
- Fail safe testing of all subsystems one at the time while monitoring overall systems performance.

A SIT certificate will be issued when all system tests have been completed satisfactorily, and the MSI has supplied a full set of Test Certificates and a Test Certificate for the complete system.

- **System Acceptance Tests (SAT):** SAT shall be conducted after the entire system/module has been installed, integrated and commissioned. Deficiencies, if any shall be rectified before the initiation of the final Burn-in Period at the end of the Project. SAT shall be conducted on full system completion only to determine if the system business, functional and technical requirements as specified in the bidding documents are met. SAT shall be witnessed by Client's representatives. Data migration, if any, will be carried out by MSI prior to commencement of this stage. Scrutiny of all inspection reports, audit findings, Contracts, licensing agreements etc. shall also be done as part of SAT. Post successful completion of SAT, 'System Acceptance Certificate' for the System or the Subsystem which was tested will be issued by the Client. On issuance of System Acceptance Certificate for the individual system, the Comprehensive Maintenance phase (AMC Phase) will commence for the system component. Comprehensive Maintenance period for each respective system will continue till for the entire Contract duration, irrespective of the time of successful SAT.

Software Component Acceptance Testing Procedures (ATPs):

For software component ATPs, refer to section 3.2.4.

Third Party Testing:

MSI shall get at least 1% of the material to be supplied as part of the RFQ cum RFP tested by a government laboratory such as NABL, TEC (or any other approved by the Client). Third party labs shall test the equipment for their conformance to the RFQ cum RFP requirements. No material shall be supplied on-site without successful third party testing from a government lab. The components that shall undergo third party lab testing shall be decided by the Client or its representative in consultation with the MSI.

Third Party Inspection

MSI shall also be responsible for ensuring third party inspection of all the material supplied as part of the Project from a Government Agency. The tentative scope of work of the third party agency shall be as per following:

- **On Supply of Material:** Third party government agency shall perform an inspection once the material is supplied on-site and before commencement of any installation. Third party government agency shall certify that the material supplied on-site are as per the make & model and quantity approved by the Client or its representative. In addition, it shall also certify that material supplied on-site are in a proper condition and without any damage or wear and tear. In case there is a payment milestone based on supply of material, third party government agency shall also certify the submission of invoices are as per the material supplied on-site.
- **Before System Acceptance Test (SAT):** MSI shall get the system certified by the third party inspection agency before commencing SAT with the Client or its representative. Third party agency shall ensure that business, functional and technical specifications mentioned as part of the RFQ cum RFP are fulfilled by the MSI before calling for official SAT.

All the commercials associated with appointing a third-party government agency for inspection shall be included by the MSI as part of the financial proposal. MSI shall submit the names of at least three third party government agencies as part of the Detailed Project Report (DPR) along with their company profile and inspection experience. Client shall approve one third party government agency in consultation with the MSI.

Client may authorize the MSI to proceed to the next testing stage with certain deficiencies not yet resolved.

The MSI shall provide written notice to Client at least five (5) days in advance of any testing, indicating the specific tests to be completed as well as the date, time and location. The MSI shall be required to reschedule testing if Client witnessing representatives cannot be present or if other circumstances prevent testing from taking place.

MSI shall provide written Test Results Documentation (TRD) within one week of completing each stage of testing. The TRD shall document the results of each ATP procedure and provide an updated Compliance Matrix that indicates which contract requirements have been demonstrated. The TRD must be approved before Client will grant System Acceptance. A sample format for the TRD is provided below:

Item #:		Tester:	
Item Description:		Date:	
Test:			
Test Set-up:			
Clause	Test Procedure	Expected Results	Actual Results
Witnessed: (This Does Not Constitute Approval) Reviewed and Approved:			

MSI shall be responsible to carry out all the testing as per the satisfaction of the Client and its representatives. It is the responsibility of the MSI for all documentation required for establishing approval and acceptance of installation and operation of the system components. All the costs those are associated with any testing are to be borne by the MSI including the costs of travel and accommodation of the Client or its representatives from

their home locations in their cost bid. In the interest of the MSI, maximum of three (3) people shall be nominated by the Client to attend any such testing wherever it is carried out.

In case of failure of any testing, the failure component shall be repaired and the test shall be rerun. If a component has been modified as a result of failure, that component shall be replaced in all like units and the test shall be rerun for each unit.

MSI shall provide the Client with a copy of the manufacturer's quality assurance procedures for information. Documentation certifying the showing that each item supplied has passed factory inspection shall also be submitted by the MSI.

3.1.8 Operational Acceptance of Respective Phase

The implementation schedule for the Project has been divided into phases, as given in Sections 2.1 and 5. Each phase constitutes completion of multiple modules or sub-systems as identified in Section 2.1. Post successful completion of SATs for all the individual modules or sub-systems in the respective phase, Operational Acceptance Certificate for the respective phase will be issued by the Client. It is MSI's responsibility to complete the SATs for all the individual modules in the phase before the stipulated time assigned for operational acceptance of the respective phase. For all the individual systems, sub-systems, modules which undergoes successful completion of SATs in the particular phase, Comprehensive Maintenance Phase / AMC phase will commence.

Client may authorize the MSI to proceed to the next phase with certain deficiencies not yet resolved.

3.1.9 Training

Post the system integration, MSI shall train Client and any representatives to operate the implemented systems and to conduct any routine diagnostics and routine maintenance work. Training shall be done during Operational Acceptance of the Project phase for the entire Project and before Final Deployment. The period of training shall be mutually agreed upon by Client and MSI.

The MSI shall provide training courses for at least:

- Decision Makers/ Management;
- Client's operations personnel;
- Users of Various Systems/Applications developed as part of the project.

The actual number of each of above categories of trainees will be provided during the course of the Contract. MSI shall provide all training materials in both Microsoft Office and Adobe PDF formats, consisting of graphics, video and animations on Compact Disc (CD) and Digital Video Disc (DVD) with a permission to reproduce copies later on.

MSI shall also be responsible for full capacity building of DMIC IITGNL staff. Training and capacity building shall be provided for all individual modules along with their respective integrations. All training materials shall be developed by the MSI.

The Training Plan (TP), including the training schedule and course outlines, must be provided to Client for review at least two (2) weeks in advance of the start of training. The TP must be approved by Client before the start of training.

MSI shall furnish all special tools, training videos, self-learning tools, equipment, training aids, and any other materials required to train course participants, for use during training courses. Training shall include, as a minimum, a four (4) hour session on system maintenance and configuration, and a four (4) hour session on system operation.

The instructors shall demonstrate a thorough knowledge of the material covered in the courses, familiarity with the training materials used in the courses, and the ability to effectively lead the staff in a classroom setting. If at any stage of training, the Client feels that on-field sessions are required, the same shall be conducted by the MSI. The language of training shall be in English/Hindi as indicated by the Client during this stage.

If any instructor is considered unsuitable by Client, either before or during the training, the MSI shall provide a suitable replacement within one (1) week of receiving such notice from Client.

The MSI shall provide brief refresher versions of each training course to the original trainees and new inductees between three to six months after System Acceptance for each deployment stage at no additional cost.

MSI shall train 30 staff of the Client during the initial stage. Subsequently, MSI shall train around 25 staff every 3 to 6 months during the contract period.

MSI has to ensure that training sessions are effective, and the attendees shall be able to carry on with their work efficiently. For this purpose, it is necessary that effectiveness of the training session is measured through a comprehensive online feedback mechanism.

MSI shall also deploy a team of Change Management experts to support the stakeholders in assimilating the technology for DMIC IITGNL staff. MSI shall help the Client with complete Change Management exercise needed to make this project a success. Change Management initiative, to be designed & implemented by MSI, shall focus on addressing key aspects of Project including building awareness in personnel on benefits of new system, changes (if any) to their current roles & responsibilities, addressing the employee's concerns & apprehensions with respect to implementation of new system and benefits that are planned for the employees.

MSI must ensure the below:

- Induction Kit, Knowledge Management portal (Centralized Knowledge Portal, Repository of process, templates, Videos, Checklist, Re-usable artefacts, Training Manuals).
- Once training is done, there should be a process to measure Reverse Knowledge Transfer. The Knowledge Transfer, handover should be done in phase manner as per below.
 - Knowledge Transfer Phases: Knowledge Acquire -> Reverse Knowledge Transfer -> Shadow Support -> Independent mode

3.1.10 Final Deployment and Documentation (Operational Acceptance Phase)

After addressing the Client feedback and any deficiency observed during completion of data migration, System Acceptance Tests (SAT) of all the systems/modules/sub-systems and Operational Acceptance of all the phases, Final deployment shall be considered by the MSI. For achievement of final deployment, MSI shall also be responsible for development of a cutover strategy which shall include initial data take on, sequence of data take on, set up of support mechanisms to minimize business impact due to any cutover activities.

During this phase, MSI shall handover detailed documentation that describes the site conditions, system design, configuration, training, as-built conditions, operation and maintenance. All documentation shall be in English, shall utilize metric measurements, and shall be submitted directly to Client in paper hardcopy and electronically in Word/AutoCAD/Excel/Project and Adobe Acrobat.

All installation drawings shall be prepared in AutoCAD, GIS and Adobe Acrobat and provided on CD-ROM as well as hard copies. The drawings shall contain sufficient detail including but not limited to equipment dimensions, interfaces, cable details, equipment mounting and fire protection.

Electrical and electronic drawings shall be supplied to show engineering changes made to any component or module any time during the contract period.

'As-built' Documents delivered by the MSI shall include:

- An inventory of all components supplied including model name, model number, serial number and installation location;
- An inventory of all spare parts supplied including brand, model number, and serial number and storage location;
- All reference and user manuals for system components, including those components supplied by third parties;
- All warranties documentation, including that for components supplied by third parties;
- As-builts in CAD and GIS;
- A diagram indicating the as-built inter-connections between components;
- Software documentation which also includes the version number of all software, including that supplied by third parties;
- Cable run lists and schedules;
- All network and equipment details such as IP addresses, user names, and passwords;

- Manufacturer's test procedures and quality assurance procedures for information.
- Data communication protocols; and
- 'As-Built' drawings for all components installed.

MSI shall submit to the Client copies of comprehensive operating and maintenance manuals, and log sheets for all systems and hardware supplied as part of this bid document. These shall be supported with the manufacturer's operating and maintenance manuals. The manuals shall be complete, accurate, up-to-date, and shall contain only that information that pertains to the system installed. Maintenance documents shall include:

- Equipment installation and operating documentation, manuals, and software for all installed equipment;
- System Installation and setup guides, with data forms to plan and record options and configuration information;
- The schedule/procedures for preventive maintenance, inspection, fault diagnosis, component replacement and on-site warranty support administration on each system component;
- Hard copies of manufacturer's product specification sheets, operating specifications, design guides, user's guides for software and hardware, and PDF files on CD-ROM or non-volatile memory stick of the hard-copy submittal;
- Complete list of replaceable parts including names of vendors for parts not identified by universal part numbers (such as EIA codes);
- Manufacturer's product specification sheets, operating specifications, design guides, user's guides;
- Permits; and
- Contractor names and telephone number lists for all project trades.

MSI shall provide Systems Manuals (SM), documentation including:

- The configuration and topology of central systems hardware and software;
- Central systems software functions and operations;
- Scheduled maintenance required for the central systems; and
- Database structure and data dictionary.

MSI shall also provide following documents for any be-spoke software development:

- Business process guides;
- Program flow descriptions;
- Data model descriptions;
- Sample reports;
- Screen formats;
- Frequently Asked Questions (FAQ) guides;
- User Manuals and technical manuals;
- Any other documentation required for usage of implemented solution.

Documentation of processes shall be done using standard flow charting software. An intuitive online learning tool depicting standard operating procedures of system usage are required to be deployed. There shall be a provision of training system in the deployment architecture so as new employees can be inducted easily.

All pages of the documentation shall carry a title, version number, page number and issue date, and shall contain a complete subject index. MSI shall be responsible for fully coordinating and cross referencing all interfaces and areas associated with interconnecting equipment and systems.

Documentation shall require re-issues if any change or modification is made to the equipment proposed to be supplied. MSI may re-issue individual sheets or portions of the documentation that are affected by the change

or modification. Each re-issue or revision shall carry the same title as the original, with a change in version number and issue date.

Each volume shall have a binder (stiff cover and spine), and drawings shall be protected by clear plastic to withstand frequent handling. The binding arrangement shall permit the manual to be laid flat when opened.

The paper used shall be of good quality and adequate thickness for frequent handling.

This phase will also be used to assess system and project stabilization. All the bugs and deficiencies identified in previous phases are to be rectified in this Phase.

Following successful completion of the SAT for all the individual systems, operational acceptance of all the phases and rectification of any identified deficiencies and bugs, the approved Systems will be put into service and its performance monitored for a period of Fifteen (15) consecutive calendar days for the purpose of verifying system reliability in an operating environment. This will be called referred the Burn-In Period. Any failures and defects occurring in this time will be documented. Any serious defects which affect the availability of the systems/modules will be a basis for restarting the test. MSI shall also review health, usage and performance of the systems/modules till it is stabilized during Burn-in Period. Upon the satisfactory completion of this burn in period, a Completion Certificate will be issued.

The MSI shall not commence Burn-in Period until SAT for all the project components have been performed and successfully completed/approved. Commencement of Burn-in Period will be conditional on the Client or their designate providing written notification of Client's readiness to proceed to Burn-in Period.

The MSI shall be suitably prepared for the Burn-in Period prior to the start date. Repeated failure of the Burnin Period may result in the MSI having to reimburse the Client or their representative for costs incurred. No compensation to the MSI will be made for repeat testing.

The Burn-In Period shall be demonstrated to the Client's representatives. If for any reason the burn-in is found to be incomplete or non-compliant, these will be communicated to the MSI in writing on the lapses that need to be made good. A one-time extension will be provided to the MSI for making good on the lapses pointed out before offering the system to Client for review. Failure to successfully demonstrate the burn-in period may lead to termination of the contract with no liability to Client.

3.1.11 Operational Acceptance of the Project

At the successful completion of SATs of all the Project systems, Operational Acceptance of all the Phases and the Burn-In Period, the Project shall be considered for operational acceptance. At the close of the work and before issue of final certificate of completion by the Client, the MSI shall furnish a written guarantee indemnifying Client against defective materials and workmanship for a period of one (1) year after completion which is referred to as Defect Liability Period. The MSI shall hold himself fully responsible for reinstallation or replace free of cost to Client during the Defect Liability period. MSI shall provide approved temporary replacement equipment and material such that the system remains fully functional as designed and commissioned during repair or replacement activities at no cost to the Client

3.1.12 Comprehensive Maintenance for System and Services

MSI shall be responsible for comprehensive maintenance of both hardware and software, up-gradations in the system, expansion of the system, technical manpower, spares management and replenishment, performance monitoring and enhancements, preventive and corrective maintenance of the IIT smart city ICT components deployed as part of this project and shall maintain service levels as defined in the RFQ cum RFP. All equipment and material supplied by the MSI shall be provided with standard warranty against defects of design and manufacturing and against faults and failures associated with workmanship of MSI and its sub-contractors commencing from operation acceptance of the system. All equipment found to be defective during comprehensive maintenance shall be repaired or replaced by the MSI at no cost to the Client. Comprehensive Maintenance Phase shall include Defect Liability Period (Warranty Period) and Post-Warranty Service Period.

MSI shall provide all the technical, managerial, and other staffing required to manage day-to-day maintenance of the IIT smart city ICT components during the Contract period.

All spares required for the smooth operation of the IIT smart city ICT components shall be maintained by the MSI for the entire duration of the contract to meet SLA requirements. The cost of the spares, repairs, and replacement shall all be deemed to be included in the price quoted by the MSI. MSI shall also institutionalize

structures, processes and reports for management of SLA. Root cause analysis and long term problem solutions shall also be part of MSI scope.

MSI shall maintain all data regarding entitlement for any upgrade, enhancement, refreshes, replacement, bug fixing and maintenance for all project components during Warranty. MSI shall be responsible for updates/upgrades and implementation of new versions for software and operating systems when released by the respective OEM at no extra cost to the Client during entire duration of contract. Requisite adjustments / changes in the configuration for implementing different versions of system solution and/or its components shall also be done by MSI. The MSI shall also ensure application of patches to the licensed software covering the appropriate system component software, operating system, databases and other applications. Software License management and control services shall also be conducted by the MSI during this phase. Any changes/upgrades to the software during comprehensive maintenance shall be subjected to comprehensive and integrated testing by MSI to ensure that changes implemented in system meets the specified requirements and doesn't impact any other function of the system. Issue log for errors and bugs identified in the solution and any change done in solution (vis-à-vis the FRS, BRS and SRS signed off) shall be periodically submitted to the Client. MSI shall also be responsible for operating all software components of the project including all support, content updates, system updates and upgrades throughout the duration of contract. All the software developments, customizations and integrations, done specific for IIT such as ISM, smart city platform, VMS etc. shall also be maintained by the MSI.

MSI shall ensure OEM support during Comprehensive Maintenance stage for system performance, performance tuning, calibrations, upgrades etc. MSI shall provide all support for formulation of all policies and procedures related to System Administration, Data Base Management, applications, archives, network management & security, back up and data recovery and archive, data synchronization after crash. Assistance to Client shall be provided as needed in management of legacy data interfaced, print spools, batch jobs, printer configuration etc.

MSI shall prepare a detailed System administration manual, Data administration manual, operational manual, User manual which shall be used by Client's employees to operate IIT smart city ICT components. This shall also include how the various parameters shall be monitored/ tuned in a live system. Preparation of requisite system configuration for disaster recovery management and fail over system plan shall also be under the supervision of MSI. The MSI shall also maintain the following minimum documents with respect to ICT components:

- High level design of system;
- Module level design of system;
- System Requirement Specifications (SRS);
- Any other explanatory notes about system;
- Traceability matrix;
- Compilation environment.

MSI shall also ensure updation of following documentation of software system:

- Documentation of source code;
- Documentation of functional specifications;
- Application documentation is updated to reflect on-going maintenance and enhancement including FRS and SRS, in accordance with the defined standards;
- User manuals and training manuals are updated to reflect on-going changes/enhancements;
- Adoption of standard practices in regard to version control and management.

The communication costs (Internet charges, telephone charges, 3G/4G/GPRS connectivity charges) and any other incidental charges related to maintenance period shall be in the scope of the MSI and considered to be included in the proposal submitted by the MSI for the entire contract duration.

Any planned and emergency changes to any component during maintenance period shall be through a change management process. For any change, MSI shall ensure:

- Detailed impact analysis;

- Change plan with roll back plan;
- Appropriate communication on change required has taken place;
- Approvals on change;
- Schedules have been adjusted to minimum impact on production environment;
- All associated documentation is updated post stabilization of the change;
- Version control maintained for software.

Any software changes required due to problems/bugs in the developed and/or integrated software/application will not be considered under change control. The MSI will have to modify the software/application free of cost. This may lead to enhancements/customizations and the same needs to be implemented by the MSI at no extra cost.

If the Operating System or additional copies of Operating System are required to be installed / reinstalled / de-installed, the same should be done as part of the post implementation support.

Comprehensive maintenance of individual systems and services shall commence upon successful completion of System Acceptance Test (SAT) and issuance of 'System Acceptance Certificate' by the Client. It should be noted that during the implementation period, SAT of various systems, solutions and services shall happen before the Operational Acceptance of the Phases and the Project. Post successful completion of SATs during implementation phase, respective component shall commence their comprehensive maintenance phase. The comprehensive maintenance of all such respective systems and services shall continue till the completion of the contract period, irrespective of the time comprehensive maintenance phase commenced for these particular systems or services. Applicable SLAs and penalties shall be levied on the systems and services which went into maintenance phase during the implementation period. The applicable penalties for the systems and services shall be deducted during release of the performance security post completion of the implementation phase. Recurring payments associated with comprehensive maintenance shall only be applicable post successful commencement of Comprehensive Maintenance/AMC Phase for the entire Project.

Support Personnel Required

Well trained, efficient and effective support personnel (Engineers) shall be provided by the MSI during the maintenance phase of the project. Any fault originating for the IIT smart city ICT components shall be addressed by the MSI support staff in the least time possible. The support staff shall work in a shift based system and provide full support coverage and maintain the system as per the SLAs defined. Following Support Personnel shall be deputed by the MSI during the comprehensive maintenance phase:

- Site Support Engineer;
- Software Module Support Engineer;
- Six (6) CIOC Operators;

Above mentioned Engineers shall be well qualified and trained to support the Client's operational and technical staff in day-to-day operations of the IIT smart city ICT components provided by the MSI. The staff assigned shall be well qualified to attend to the emergency situations and shall be able to communicate in an effective and efficient manner. Support staff shall be well trained on the smart city ICT components to understand and take necessary action in any kind of situation. Please note above mentioned support personnel shall be available 24X7 at site. MSI shall depute Six (6) qualified personnel at CIOC as the city operators and shall be involved in day to day management of IIT and CIOC.

In addition to the training to the operations staff during acceptance stage, the MSI shall conduct half-yearly training refreshment sessions to train the new staff inducted by the Client and to enhance the knowledge of the Client's staff operating the IIT smart city ICT components by adopting "train the trainer" approach.

3.2 System Specific Scope of Services

3.2.1 Fibre Optic Infrastructure

- MSI shall undertake a detailed and comprehensive network architecture design validation of smart ICT components covering all the locations in Integrated Industrial Township, IT and physical infrastructure in line with the overall objective and requirements of the project. MSI shall identify the space required for setting up the network infrastructure at each of the location;
- MSI shall be required to undertake the GIS based survey to design the OFC route planning and network topology and share the same with the Client. MSI can make use of the publicly available data and tools such as Google Maps, ArcGIS, and NIC developed maps etc. However, the ownership of the accuracy and validation of the data map information shall be with the MSI;
- The network architecture validation exercise shall involve:
 - Detailed Network architecture covering all locations;
 - Detailed Fibre layout;
 - Detailed Network solution and deployment architecture covering the central infrastructure at CIOC, PoP and Cloud.
 - Solution required for managing / monitoring the complete Network Backbone, Distribution and Access Layers.
 - Detailed information security architecture to ensure data privacy as well as security.
 - MSI shall validate Network architecture that includes all of the above along with other design elements like data standards, technology standards, interoperability standards, security architecture and other such guidelines / standards. This shall be prepared in active consultation with Client or its representative;
- MSI shall validate the space requirements for all active electronics with the Client;
- MSI shall factor inclusion of various Client offices and their location, bandwidth requirements, security, LAN/WAN protocols, network topology for each of the Smart City ICT component during design validation;
- The Network Architecture once approved shall be base lined either in part or in whole and the Client shall institutionalize the processes for Architecture Change management to undertake any change in the respective location, as required during the contract phase;
- Designing IP Address Schema:
 - The MSI shall design suitable IP Schema for the entire Network Backbone including CIOC, PoP, smart city ICT components and interfaces to external systems/ network. The MSI shall ensure efficient traffic routing irrespective of link medium;
 - The MSI shall maintain the IP Schema with required modifications from time to time within the scope of the project.
- MSI shall coordinate and validate with the Client the detailed cable routing along with locations of joints, terminations etc.;
- EPC Contractor shall provide end-to-end concrete encased ICT trench for the backbone & distribution fibre optic infrastructure. MSI to leverage this concrete encased trench and provide any core cutting for implementing its fibre optic infrastructure. All core cutting required for fibre optic infrastructure entry/exit inside ICT trench and RMU rooms or other locations shall be under MSI scope;
- MSI shall be responsible for laying 2 nos. of 110 mm (2 x 110 mm) HDPE duct for connecting RMU rooms, Admin building, PoP rooms or any other building with ICT concrete trench. Last mile access connectivity between ICT trench and RMU rooms, Admin Building and PoPs shall be under MSI scope;
- MSI to provide trench for connectivity to plots/RMU room's and devices from the backbone and distribution trench as per the requirements of this RFQ cum RFP.
- In case of road crossing for installation of fibre optic infrastructure or electrical cable, MSI shall be

responsible for micro trenching. Restoration of road or civil infrastructure shall be under the scope of MSI;

- MSI to coordinate with EPC Contractor for all civil requirements and ensure all design requirements are met on-site;
- MSI to assess and incorporate in the implementation the type of soil, long cuttings, new embankments, water logged areas, types of major bridges, major yards etc.;
- MSI to work out the requirements of heavy tools and plants depending upon nature of the territory, availability of roads alongside etc.;
- MSI to work out requirement of transport vehicles like jeeps, lorries, motor trolleys, etc. as needed for execution of the work;
- MSI to provide all manhole/handhole with core cutting near to the field device locations for connectivity to plots and field devices across backbone and distribution network. MSI to coordinate with EPC Contractor for the manhole/handhole/pits locations, detailed design and access. MSI to provide manholes/handholes/pits within DMIC IITGNL plots and any additional required for field level connectivity;
- Before carrying out laying and installation of ducts and fibre, MSI shall prepare an installation report (approved by the Client or its representative) which shall constitute the following:
 - Closely examining the proposed cable route and prepared cable route plans;
 - Installation and preparation of site plans for buildings required for the execution of the work, as offices at different stations, store godowns;
 - Siting of areas for loading/unloading of cable drums and siding facilities for the for the project;
 - Preparation of the material schedule required for different protective works;
 - Arranging isolated components circuits to be provided in the cable;
 - Investigation of special problems, if any, of the section and finding out proposed solution thereof.
- MSI is expected to put in practices for precaution against damage by Termites & Rodents;
- Cable laying is proposed either by traditional Cable pulling method or by Cable blowing method (preferably);
- After the cable is laid and splicing is complete, measurements in the below proforma shall have to be prepared and maintained:

Section		Distance	Cable Length	Fibre No.	Loss in DB		Remarks
From	To				1310 nm	1550 nm	

- MSI shall coordinate with TSPs, cellular and any other tenants for their fibre optic infrastructure requirements and any other network requirements. The tenants will be responsible for providing their respective FOSCs and splicing (installation). MSI shall be responsible for supervising this splicing works and any integration;
- MSI shall only be responsible for splicing of backbone, distribution and access network for DMIC IITGNL plots and DMIC IITGNL field devices only;
- MSI shall be responsible for installing racks inside RMU rooms along with installation of actives (if required) for connecting field devices. MSI shall neatly place fibre optic cable coils inside plot RMU rooms;
- For non-DMIC IITGNL plots, MSI shall provide the fibre optic infrastructure from the ICT trench until inside the individual plots RMU room's. Using this fibre optic infrastructure provided inside the RMU rooms, the plot developer shall be responsible to extend its own dedicated fibre optic infrastructure inside the plot till RMU rooms and install the required fibre optic cable with the FOSC and splicing. In this case, the MSI shall be responsible for full supervision of these works and assistance in integrating this infrastructure end-to-end. For all DMIC IITGNL plots, the MSI shall be responsible for end-to-end

fibre optic infrastructure;

- All coordination with plot developers for splicing and integration with DMIC IITGNL fibre shall be under the scope of the MSI;
- MSI shall compute and implement all the storage infrastructure required as part of the fibre optic infrastructure. All networking and firewall requirements for the fibre optic infrastructure will also need to be undertaken by MSI;
- MSI shall be responsible for data encryption and data security;
- Provide details on connection type, speed and bandwidth required at the CIOC and PoP (as applicable) for connectivity to outside world;
- Maintain the fibre asset management system during the course of the contract;
- Proper earthing, grounding and lightning suppression for all applicable equipment under the scope of MSI;
- MSI shall be responsible for supply and installation of all handholes/pits, wherever required;
- MSI shall be responsible for installing field cabinets at rotaries and other areas. Connectivity of Fibre Optic cable from ICT trench till Field cabinet shall be under the scope of MSI. Additionally, last mile connectivity between field cabinets and field devices shall be the responsibility of the MSI;
- MSI to ensure that field cabinets are vandal proof. Finalization of location of field cabinets shall be proposed by MSI as per site feasibility. The same shall be approved by the Client;
- Raw power tapping point is available at rotaries. MSI shall be responsible to extend raw power (power cable) from power tapping point at rotaries and other areas till field devices. In case, raw power at rotaries is not available, MSI shall extend power cable from the nearest tapping point till field devices. All installation and coordination work associated with extending raw power till equipment shall be the responsibility of the MSI;
- MSI shall integrate all applicable equipment and applications with EMS for centralized monitoring including SLAs.

Secondary PoP

- MSI shall be required to undertake the complete site preparation, plot development including plot boundary, in compliance with the DC regulations/Plot Development Guidelines of the Client (as applicable) and design-build exercise for two (2) PoP facilities as per the requirement in consultation with Client and its representative;
- Primary PoP will be co-located in Admin Building and will be part of the CIOC area. The requirements of development of Primary PoP (Server Room and TSP Room) has been covered as part CIOC section;
- Required area for Secondary PoP will be provided by Client. Following are the requirements specific for Secondary PoP;
- The detailed design in all aspects for the design-build (including but not limited to civil, mechanical, structural, electrical, communications, fire, fit-outs, etc.) of the PoP facility and the plot shall be the responsibility of the MSI and be approved by the Client or its representative. The MSI shall have the required personnel on the team including architect, structural engineer, MEP, etc. as needed for this design-build. At least two (2) options for the design-build shall be proposed for the PoP facility
- This scope includes finalization of locations of the PoP (in case of change in PoP locations), development of the building, in compliance with the Client's regulations including necessary infrastructure within the plot, fencing, coordination, coordination for installation of cellular towers and any other infrastructure of the tenants (if required), partitioning for dedicated space for every tenant, and construction of the PoP facility;
- All tenants will get dedicated partitioned space for their equipment along with access to power and other basic infrastructure. MSI shall ensure that the passive infrastructure in terms of ducts, termination points, etc. for routing within the PoP is provided for all tenants. MSI shall coordinate with all tenants to ensure end-to-end installation of all the tenant provided equipment. All tenant space shall have

dedicated access, be secure and should be modular in construction so that the number of tenants can be increased or decreased in the future;

- MSI shall furnish the PoP rooms as part of the civil work in all aspects. All material to be used shall be of fine quality ISI marked or equivalent. The furnishing includes but not limited to:
 - Trench works;
 - Masonry works;
 - Cutting and chipping of any existing area;
 - Glazing;
 - False ceilings;
 - False floorings;
 - Paint work;
 - Storage;
 - Layouts and partitioning;
 - Doors and Locks;
 - Fire detection;
 - Cement concrete works;
 - Insulation.
 - Rodent repellent system
- MSI shall install electrical distribution system in the buildings. MSI shall be responsible for proper and uninterrupted equipment working and shall ensure this by having the telecom equipment and server room power distribution with redundancy:
 - Incoming electrical feeder supply;
 - UPS system with battery bank for all DMIC IITGNL loads;
 - Connection between UPS system and the DMIC IITGNL equipment shall be redundant. No single point of failure shall exist in the power connectivity between the DMIC IITGNL equipment and UPS;
 - Electricity Metering.
- Since PoP room is a critical area, air conditioning system shall be exclusively installed by MSI to maintain the required temperature for the DMIC IITGNL area only. Server room/ rack room at Primary and Secondary POP shall have precision air conditioning for cooling purposes. All AC units shall be redundant such that failure of one does not impact the operating temperature required to be maintained in the DMIC IITGNL area;
- MSI shall install UPS system to provide redundant power supply to following needs:
 - All DMIC IITGNL equipment;
 - Access control;
 - Fire detection and gas suppression system of PoP facility as per the specifications.
- MSI shall do complete electrical cabling work for telecommunication equipment which shall include but not limited to:
 - Main electrical panel in room;
 - Power cabling;
 - UPS distribution board;
 - UPS point wiring;
 - Power cabling for utility points and utility components etc.;

- Online UPS;
- Separate earth pits for the component;
- MSI shall use fire retardant cables of rated capacity exceeding the power requirements of equipment to be used at maximum capacity;
- All material shall conform to ISI standards as per industry practice.
- MSI shall be responsible for the lighting works in the building. Following items need to be undertaken by MSI for lighting:
 - Supply of all equipment associated with implementation of lighting including fixtures, lamps, wiring etc.;
 - Wiring for lighting system in the building;
 - Installation of lighting fixtures;
 - Warranty for the lighting equipment;
 - Critical lights shall be connected to UPS for uninterrupted lighting;
 - Post the installation, MSI shall ensure that lux levels of the building are as per IES-HB-10-11.
- The facility shall be equipped with adequate and advanced IP based Fire Detection and Suppression system. The system shall raise an alarm in the event of smoke detection. The system shall have proper signage, response indicators and hooters in case of an emergency. The system shall be based as per NFPA standards. MSI shall integrate Fire Alarm with CIOC for remote monitoring;
- Access control system shall be deployed by the MSI with the objective of allowing entry and exit to and from the premises to only authorized personnel with appropriate door locks and controller assembly. It shall be installed at entry and exit of PoP rooms. In addition, it shall also be installed at DMIC IITGNL partition area inside PoP. All equipment associated with implementation of Access Control including wiring, workstation etc. shall be under MSI scope.
- MSI shall also be responsible for installing a rodent repellent provision inside the PoP facilities;
- MSI shall be responsible for extending electrical, water and sewage connection till PoP for utilities purposes. MSI shall coordinate with EPC Contractor for extending utilities till Secondary PoP;

3.2.2 Public Wi-Fi

- The MSI shall validate through a coverage modelling and/or detailed survey in IIT area the number of hotspots required;
- The MSI shall have a Wi-Fi operator, Licensed ISP in India who shall be able to meet all requirements for operations of network as per RFQ cum RFP who will be responsible for operating this Wi-Fi network. The Wi-Fi network operator shall be a neutral operator i.e. a tenant based model where any licensed service provider may offer Wi-Fi services using this network;
- The MSI shall be responsible for monetization of Public Wi-Fi services in compliance with the requirements of the RFQ cum RFP;
- The APs shall be installed at poles and kiosks.
- Raw bandwidth required for the public Wi-Fi network shall be provided at no additional cost by the MSI. Internet bandwidth from ISP to Wi-Fi shall be under MSI scope;
- Testing of Wi-Fi network for penetration, security and coverage post deployment of the network;
- The MSI shall comply with all the standards and best practices. MSI shall also ensure that DoT and TRAI guidelines issued from time to time including but not limited to security, user registration, equipment EIRP, etc. At no point Client or its authorized entities shall be responsible for any non-compliance on account of non-adherence by the MSI;
- The MSI shall develop and implement a billing and accounting software for e-recharge, enabling Wi-Fi usage and accounting for the service revenue as per the requirements stated in this RFQ cum RFP;

- MSI shall also be responsible for:
 - Providing Technical manpower, for the contract period from the date of acceptance, to look after the day to day management of services related to Wi-Fi facility management. These services shall include:
 - Providing connectivity to user devices as per requirements of this RFQ cum RFP and in consultation with the Client or its representative;
 - Satisfactorily handling all the issues related to connectivity, performance and security.
 - Providing adequate security mechanisms in Public Wi-Fi service equipment to prevent unauthorized access or interfaces to services, calls, protocols and data;
 - The MSI shall provide all the usage data/log/analysis for further usage like usage prediction, planning towards additional resource deployment
- MSI shall be responsible of installing the poles which will co-locate field devices such as Wi-Fi APs, surveillance cameras and other equipment. Poles will be installed at rotaries and other strategic locations. Poles are required to be aesthetically pleasing with decorative LED lights. Three (3) designs of poles shall be submitted by MSI to Client for approval.
- It is the responsibility of the MSI to propose location of poles as per requirement and site feasibility. The same shall be approved by the Client.
- Foundation and Civil requirements associated with installation of poles shall be under MSI's scope.

3.2.3 City Surveillance with ATCC and ANPR Cameras

- MSI shall install CCTV Cameras at all strategic locations including rotaries, roads, intersections, public spaces/buildings, and other critical/sensitive facilities like City's Integrated Operations Centre and PoP Rooms;
- MSI shall submit the video coverage modelling for the proposed cameras;
- MSI shall be responsible for integrating the City Surveillance System with the City Infrastructure;
- MSI shall be responsible to provide local server and storage equipment a minimum at CIOC for storing the video feeds. In order to bring in redundancy to the solution, there shall be a failover option where surveillance recording starts from Secondary PoP in case the CIOC goes down;
- MSI shall conduct a survey and prepare a detailed report on the basis of which locations, positions, mounting arrangements and height, orientation/field of view of the CCTV cameras shall be finalized;
- MSI shall be responsible for making proper adjustments to have the best possible image/video captured. MSI to also ensure cameras are protected from on-field challenges of weather, physical damage and theft;
- MSI shall be responsible for integrating each CCTV with the central application server by providing the unique ID, IP addresses, etc.
- MSI shall be responsible for data encryption and data security of the videos recorded;
- MSI shall be responsible for installation of CCTVs on poles. Foundation and other associated civil requirements for installation of poles shall be under MSI scope;
- Supply and installation of Gantries and Poles for ATCC, ANPR and VMDs shall also be under the scope of MSI. Foundation and other associated civil requirements for installation of gantries and poles shall be under MSI scope.

3.2.4 IIT Software Modules (ISM)

3.2.4.1 General

- The MSI is required to assess the requirements of DMIC IITGNL as listed in the RFQ cum RFP;
- It is expected that for the back-office system shall support a total of at least 50 departmental users, independent of any individual module. The users shall have the ability to access the modules through

desktop/ laptop or mobile devices simultaneously;

- The population projection for IIT is assumed to be 30,000 residents and 50,000 industrial workforce by 2030. The number of users of the citizen facing applications is projected to be around 11,000 within the next 5-10 years;
- Design/Develop/Configure/customize ISM Components as per the RFQ cum RFP. Each software module must have a mobile application with iOS and Android version;
- Update all content of the website, portal and mobile application during the course of the contract. Development of the content and design of the website shall be the scope of the MSI;
- The MSI is also required to institutionalize the mechanisms and transfer the knowledge so that DMIC IITGNL will be able to manage the incremental improvements and future expansions of the ISM solution, on its own;
- ISM shall support integration with the Aadhar card and other government initiatives. It shall also support integration with digital signature;
- Supply all hardware, firmware, Operating System (OS), virtualization, application software licenses required for solution components including any database, middleware and any other software licenses including comprehensive software AMC for implementation (hosted on cloud or on-premise) and Comprehensive Maintenance Phase. OS and database shall be commercial grade products only;
- Provide system architecture for all the applications including hardware and cloud architecture;
- Provide Disaster recovery, back-up solution, specify RTO (Recovery time objective), RPO Recovery point objective), Clustering, Single sign on, proposed application uptime, proposed Application response time for various applications in scope, storage requirements over the implementation and Comprehensive Maintenance period;
- Complete installation of all software components, configuration of the same as per designed architecture is the responsibility of MSI during implementation and Comprehensive Maintenance period;
- Configure and adapt the solution to meet the best practices for smart cities and statutory requirements as applicable in India;
- Data extraction, preparation and migration of data to the productive systems;
- Cover various functional units of DMIC IITGNL and other stakeholders and carry out system configuration and implement access controls based on requirements;
- Training the users and facilitating the adoption of the ISM solution by the DMIC IITGNL users/employees;
- Providing application support for five years after completing the implementation of ISM. All upgrades and enhancements to the system will be in scope of services during entire contract period;
- ISM – Set up End User Training Environment with self-learning kits for new employees;
- MSI shall coordinate with GNIDA, Udyog Sarthi, police, fire agency, electricity agency/discoms, tree officers and any other agencies as applicable for application integration; and
- All backend database modification, if any, to be made under written approval from Client.

DMIC IITGNL intends to expand the usage of the ISM platform to cover all the requirements of DMIC IITGNL, in stages, the MSI is expected to propose the ISM solution with the capabilities listed in the detailed functional and business requirements section.

3.2.4.2 Methodology for IIT Software Modules (ISM) Implementation

The MSI is required to deploy a comprehensive methodology for implementation of the ISM at DMIC IITGNL to ensure that the organization can achieve the objectives of the project and harness the capabilities of the ISM solution components and the embedded best practices. The implementation methodology should provide early visibility to the DMIC IITGNL users, streamline business processes and deliver faster results to all the stakeholders of the project. The MSI's project methodology should include:

- Startup or Inception Phase;
- Requirements Gathering Phase;
- Design Validation Phase;
- Build or Development Phase;
- Training, and User Acceptance Testing;
- Final Deployment and Go Live;
- Stabilization Phase; and
- Comprehensive Maintenance and Post Implementation Phase.

The MSI is advised to propose appropriate, methodologies for implementation/development of each ISM component addressing the above points. The MSI is free to choose from development methodologies such as Agile, Enterprise Unified process, Iterative or Waterfall. Further, components of ISM may each be developed using different methodology in the interest of the project, however, the MSI must ensure integration of all ISM components and ensure that all methodologies implemented dovetail seamlessly during the project. Following are indicative list of activities which are expected to be undertaken by the MSI during each phase.

S. NO.	PHASE	ACTIVITIES
1.	Startup or Inception Phase	<ul style="list-style-type: none"> • Governance and Project Management Document • Stakeholder Matrix • Roles and Responsibilities Matrix • Project plan and schedule • Team composition and structure • Scope Management Procedure • Project Reporting and Escalation Procedures • Project Standards and Recording of Project Docs • Issues and Risk Management • Escalation Matrix • Development Environment Setup and IT Landscape Proposal for Development, QA and Pre-Production/Production • Provision of Infra with Internet for Project Team
2.	Requirements Gathering Phase	<ul style="list-style-type: none"> • As Is Process Doc Flow Charts • Inventory of Current IT Systems (doc) • Systems to be retired • Systems to be retained • Identification of Interfaces • Evaluation of Desktops/Laptops/Tablets with end users • Evaluation of Network Infra • Minutes of Meeting of User Workshops • Data Strategy and migration of historical data (doc) • Logical Technology Architecture for IT Infrastructure • Organization Change Management and User Training Approach Doc • SRS (System Requirement Specification) and FRS (Functional Requirement Specifications).
3.	Design Phase	<ul style="list-style-type: none"> • Business Flow Charts for To Be Processes • High Level Design including architecture, user interfaces, E-R diagram of Database and data flow diagram. • Data Migration Plan

		<ul style="list-style-type: none"> Physical Technology Architecture for IT Infrastructure Security architecture Interface Functional Specs User Training Plan
4.	Development Phase	<ul style="list-style-type: none"> Installation of Software Config Management/Release Process Tool MSI's QA processes and procedures Development Process and Standards Hand Book Program (partial/full) build release Plans Test Data preparation for acceptability testing Test data preparation for regression testing Release document with MSI's QA Test Report. Approved UAT Plan with Test Scenarios/Test Data Software Build ready for release to QA instance Setup and Installation Manual Cleansed and Prepared Master and Transaction Data End User Training Material and Setup of Training Environment Setup of the Infra and Environment for UAT (inclusive of install of OS, software plug ins. Patches and UAT Build) Training to End User UAT Team Installation and End User Training on Issue Logging/SLA Tool.
5.	Testing	<ul style="list-style-type: none"> Data Migration Test Cycle Report Testing Cycle reports. Testing cycle will be repeated in case of issues. No UAT will be passed in case any critical issue is not resolved. Version control for build/patch/program is required. Final Build for Deployment Pending Issues Report Setup of Production Environment End User Training Environment Setup End User Training Schedule and Allocation of Participants Phase end review report Business Usage Readiness Report-I
6.	Deployment	<ul style="list-style-type: none"> Help Desk Setup including Ticketing tool Cloud Server Setup Cyber security plans/processes Final Data Migration User Training Business Usage Readiness Check-II Report- System Acceptance or Switch Over to Production Environment with Version Number SLA monitoring tool

7.	Post Go Live till Start of Support Phase	<ul style="list-style-type: none"> • Pending Issue List • Status Report Daily/Weekly • Infra monitoring daily/weekly • Ticket monitoring resolution • SLA Monitoring, • User Feedback
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3.2.4.3 ISM Project Requirements:

Following shall be taken care by MSI for implementation methodology for the project:

- **Adoption of best practices:** Process Improvement will be done to enable DMIC IITGNL to adopt some of the best practices embedded in the components of the ISM Solution. The areas that can bring maximum benefits will be identified by MSI in close coordination with DMIC IITGNL process owners. MSI will also bring in knowledge of the best practices adopted by other customers to the DMIC IITGNL implementation.
- **Software Development:** Plan for ISM customization/development – The MSI should plan for following developments as a part of the ISM Solution:
 - Seamless integration across ISM components;
 - Documents outputs in pdf, excel, .rtf formats;
 - All the reports as required by DMIC IITGNL;
 - Customized development for reports, enhancements (including complete module development), Interfaces, data conversions/migration and forms to address functionality gaps in the proposed COTS or packaged solution (if provided). Any other customization/ development required to complete the scope of the solution and meet the requirements of RFQ cum RFP; and
 - The development activities are required to be carried out in a 3 system IT landscape comprising of Development, QA and Production. The QA and Production instances to be in joint custody between MSI and DMIC IITGNL.
 - During Requirement gathering phase and design phase, it is possible that additional Functional Requirements (FRs) are suggested by Client stakeholders. For such a scenario, MSI shall include the necessary developments in the ISM solution. Client reserves the right to propose additional FRs but no more than 5% of the FRs asked as part of the ISM section of the RFQ cum RFP.
- **Documentation:** The MSI shall ensure preparation of complete documentation of all software development deliverables, configuration settings, customized applications, other activities, steps / stages involved in the development/implementation including the source code for the customized product developed for DMIC IITGNL. The MSI will provide detailed final system documentation for reference of DMIC IITGNL. MSI shall prepare the final user manual incorporating all details of all menus and functionality provided by the system. The source code of customizations will be property of DMIC IITGNL.
- **Tools:** As part of the proposal, MSI is required to propose and use the set of tools which would be used by the team members for project management, configuration management, issue tracking, document repository etc.
- The software configuration management tool, is required to be used to number, monitor and control the versions of release notes, builds, programs as well as patches of software releases which are released for UAT and subsequently for Production. The said tool should also enable if required a roll back in the deployment of a software build, program and/or patch.
- The implementation/Development Methodology shall include the following:
 - The methodology to be deployed by the MSI to implement and/or develop the ISM solution may have different phases, work elements and activities.
 - **Critical activities of Implementation/Development:** While there are different techniques and tools available as a part of the methodology, the following are expected to be part of the implementation methodology to be adopted by the MSI:

- Workshops with different stake holders for capturing business requirements, creating awareness of best practices, communicating the changes, building consensus on process design etc. These needs to be organized at different intervals and in different places throughout the duration of the projects;
 - Stake holder consultation other than workshops, as advised by DMIC IITGNL, for critical inputs, review, suggestions, process description etc.; and
 - Review sessions with different stake holders, walking through the deliverables for facilitating quick understanding.
- Documentation of proceeding: recording the developments, discussions, deliverables, using standard methodology, native tools available with the ISM solution components and MS Office Products;
- Work standards/practices for documentation, configuration, testing, data migration etc.; and
- Training the different stake holders, on a continuous basis
- **Project Plan:** The MSI should submit a draft integrated Work Plan for all the ISM components, clearly identifying the different work packages, dependencies. The workplan shall adhere to the project phasing as suggested in this document. In addition, there should be a separate integration work package for linking the ISM components and ensuring working of end-to-end DMIC IITGNL processes. During project startup, by means of a Work Shop led by the MSI, the plan/sub plans would be reviewed and approved. The MSI needs to separately estimate the effort related to Review Preparation, Review and Modification. The Work Plan approval process is likely to be iterative.
- **Issue and Risk Management:** Those items that require documentation, formal investigation and approval should be managed as issues and risk management methodology must be proposed by the MSI.
- **Testing & Acceptance:** The MSI shall provide standard functionality test suites for testing the ISM components. For software, the MSI shall prepare the test plan and shall get it approved from DMIC IITGNL. Test Data for different scenario (Test Cases) will be prepared in consultation with the users concerned for testing the modules. All testing to be conducted by the MSI is required to be designed to ensure the following:
 - The tests once conducted are repeatable using the same set of inputs/data resulting in the same identical expected results/outputs;
 - Traceability / Audit Trail for the tests conducted;
 - Regression Testing is planned and conducted for any changes to the software required to be done for enhancements and/or bug fixing;
 - Integration, System and UAT Tests are conducted in the QA environment using the software configuration management tool to monitor and control the versions of the software builds, programs as well as patches; and
 - A path is defined and adhered to for software releases from Dev to QA and then to the Production environment.

The pre-commissioning tests shall be carried out to assess the following but not limited to:

- MSI must ensure that the ISM applications are built in a 3-environment scenario. These would be Development, QA/Testing, Production environments. Application for usage shall be only hosted in production environment.
- The testing environment must be in the same domain as the production environment and needs to be configured as a subdomain.
- MSI must ensure that no partner software/component is loaded into testing environment directly. The ownership of all such releases must be taken by MSI.
- MSI must not move any system into release environment unless cleared by Client.
- MSI must ensure that the version deployed a stable platform/environment for testing of functionality based on user/client requirement.
- For each build moved into test environment, the MSI must ensure the following:

- The build/version number of the code must be visible on the home page of the application being launched. The MSI must publish/specify the release numbering system and adhere to the same.
- Each release must be complete in all functional aspects. Third part integration like payment gateway, SMS gateway, WhatsApp and email integration, if required, must be provided as per the RFQ cum RFP.
- For any module being released, the MSI must ensure that all dependent modules are also released at the same time.
- Each such release into the testing environment must be accompanied by a Test Incident Report (TIR) that at least includes the following information:
 - i. Conformance to the functional requirements;
 - ii. Use case scenarios – both positive and negative to test out the functionality
 - iii. Test cases for testing the listed scenarios
 - iv. Test data to be entered
 - v. Expected outcome
 - vi. Performance of the system with reference to response time and accuracy
- Client or its representative shall validate that the outcome of the test matches the expected outcome if they enter the data as documented.
- In case incremental functionality is being released for testing, then MSI should conduct proper regression testing. The TIR should also contain the above-mentioned data for all previously released functionalities/modules
- Whenever a release is made in the test environment after correction of defects/bugs or addition of functionality, the release must include an Impact Analysis document to identify the modules/areas that were impacted with the changes effected. The TIR must include all test cases pertaining to the changes.
- Wherever possible, MSI shall use automated tools to conduct the regression testing. The scripts for the same should be made available with Client or its representative along with necessary documentation to decipher the script.
- On successful verification of the testing by Client or its representative, a clearance on the functionality would be given to the MSI.
- Basis other dependencies like Security, Load/Stress testing being addressed in due time, the MSI may be given an approval to move the build into the release environment.
- MSI to ensure that there exists adequate checks and balances to ensure that there is no change in the code/environment from the testing environment.
- MSI shall be responsible for testing hardware as per requirement such as iOS devices, android devices etc.

Software Component ATPs are as per below:

- **Software Factory Acceptance Test (SFAT):** In case of COTS software components, SFAT will be conducted for that software component at the Software Laboratory before it is delivered to Client for necessary project specific customizations. In case of any customized software, the MSI shall also propose prototype of solution components as part of this test and get the required approvals. Software which shall SFAT shall be as per Client discretion.
- **System Integration Testing (SIT) / System Acceptance Test (SAT):** The MSI is responsible for the proper and harmonious operation of all software subsystems developed, installed and integrated under this Project. This will require testing to be coordinated by the MSI with the Client or their representative. The MSI is required to prepare procedures detailing the steps for conducting SIT/SAT, which are accepted by the Client. The MSI shall after development and customization/configuration of the ISM Components, conduct these tests to demonstrate that the system meets all the requirements (functional and technical) as brought out in this RFQ cum RFP.

On the basis of SIT/SAT conducted by the MSI, a report comprising of the test results, would be submitted for review and approval by DMIC IITGNL. The said test report and response times would be audited by Client. As per the requirements of the Client, some test cases/scenarios would also be demonstrated.

A SIT certificate will be issued when all system tests have been completed satisfactorily, and the MSI has supplied a full set of Test Certificates and a Test Certificate for the complete system.

- **Stress and Load Testing:** Comprehensive stress and load testing of software modules shall be conducted to demonstrate robustness and reliability of the system will be undertaken for approximately 30% of projected population, subject to applicability. MSI shall conduct load testing using automated tools. The MS should clearly demonstrate the name/version of the tool being proposed for load testing. In addition, MSI shall demonstrate that the server performance and audit logs are non-mutable and the system administrators do not have access to transactional data. For hardware, following requirements will be checked:
 - Performance: The provided infrastructure including servers and storage should be able to meet the performance requirements at 60% usage level. This should be substantiated through published benchmarks including detailed calculations being used to interpolate, as required.
 - Scalability: The systems and the architecture design should be scalable to take the load as stated for 5 years. The database servers should have vertical and horizontal scalability to provide provision for meeting the requirement for next 5 years. The storage system including backup solution should provide vertical scalability with additional disks/ controllers/ cache as required for meeting the requirement beyond 3 years up to 5 years as stated in the requirements.
- **Security Testing (including penetration and vulnerability test):** Security test shall be conducted to demonstrate security requirements at network layer and software applications. The software components shall pass vulnerability and penetration testing for rollout of each phase. Components shall also pass web application security testing for in the case of applicable web applications. Security testing shall be carried out for exact same environment/architecture that shall be set up for go-live. Penetration test shall be carried out periodically and vulnerability analysis shall be carried half-yearly during maintenance phase. For all applications hosted on-cloud or hosted on premises, the security testing shall be a mandatory requirement. Following are further requirements of Security Testing:
 - The solution shall demonstrate single sign on for all the applications provided in the solution.
 - The solution shall demonstrate SSL/TLS1.3 based transaction in the application software.
 - The solution shall demonstrate two-factor authentication.
 - The solution shall demonstrate role based access.
 - The MSI must ensure that the security audit is conducted by authorized government third party agency. Third party security audit shall be the responsibility of the MSI. The MSI shall take prior approval from Client before on-boarding third party security audit agency. MSI shall provide certificate of security audit to the Client.
 - DMIC IITGNL may engage an independent third-party agency at its discretion for validating the results of the security audit mentioned above.
- **User Acceptance Testing (UAT):** Successful completion of the SIT/SAT is a prerequisite for the Client and its Representatives to start the UAT. The MSI is responsible for:
 - Developing a User Acceptance Test Plan to include testing of: Functionality, end to end Business Process which includes the interfaces, Role Based Authorizations, Data Migration, Cutover Procedures, Help Desk Support Processes, Performance and/or Stress Testing on the fully integrated ISM on an environment which is acceptable to DMIC IITGNL. For each Test Case and/or Test Scenario, the prerequisites as well as the setup procedures also need to be documented. The Test Plan is required to ensure conformance to the functional, technical and/or performance specifications as specified in the RFQ cum RFP. The UAT Plan as well as the Cutover need to be approved by the Client;
 - Cutover Plan and Simulation Testing: The MSI must evolve and detail a comprehensive cut

over plan including initial data take on, sequence of data take on, set up of support helpdesk, helpdesk procedure to minimize business impact of cut over activities;

- User Acceptance Testing: the testing is required to be comprehensive auditable and repeatable. The MSI is responsible for documenting the Test Results and preparing a UAT report;
 - Business Usage Readiness Post satisfactory conclusion of these acceptance tests, a business readiness check would be conducted by the ISM Project Governance team, which would give the go ahead for starting the Deployment Phase Activities;
 - Deficiencies, if any shall be rectified before the initiation of the final Burn-in Period.
 - Post successful completion of UAT, System Acceptance Certificate for the module which undergoes testing will be issued by the Client. On issuance of System Acceptance Certificate for the individual module, the Comprehensive Maintenance phase (AMC Phase) will commence for the system component / module. Comprehensive Maintenance period for each respective system/module will continue till for the entire Contract duration, irrespective of the time of successful SAT.
- **Data Migration:** Migration of data in the new system is responsibility of MSI. DMIC IITGNL along with MSI will jointly decide on what data will be migrated. The expected sources of data which would require migration are:
 - Property and Customer data from the Land Management System which is currently in development and would Go Live before ISM;
 - Financial data;
 - Government files;
 - Existing e-mail solution to the proposed e-mail solution;
 - Data in excel sheets from the desk tops; and
 - GIS data for commissioned assets at the time of system deployment.

However, data migration scope will be defined as per the plan to be submitted by MSI and accepted by DMIC IITGNL.

The MSI is required to take the source data in the format which is available. The MSI is required to take complete ownership of this activity and develop a detailed plan for data migration. The data migration and cutover procedures are required to be a part of User Acceptance Test Plan to be submitted by the MSI. At present, it is envisaged to scan, index and migrate 75,000 pages from manual files to the file management system. In addition, MSI is expected to enter approx. 1000 historical transactions since 2014 from Tally to the proposed Finance module of ISM. MSI to enter transactions till the Go-Live of the Project.

- **End-User Training:** The MSI is expected to conduct role based training (with the authorizations for each role and/or user activated) to facilitate user adoption of ISM. The training material should be prepared accordingly by the MSI, with training data and business scenarios which the end users can relate to. Successful completion of end user training is necessary prior to granting operational acceptance by DMIC IITGNL to the MSI. It is necessary that the end user training is conducted by trainer with expertise in the business domain and the person who is part of functional team of MSI.
 - UAT for each phase and component;
 - Hardware and software configuration, including readiness of end user desk tops and printers as per DMIC IITGNL requirements;
 - Data migration to production environment;
 - End User Training of for each user to facilitate the adoption of the ISM by the end users of DMIC IITGNL;
 - User creation/ role identification for each phase;
 - Facilitate in setting up central help desk for any queries;

- Review the MSI readiness to monitor and /or support, the health, usage and performance of the system till it stabilizes;
- Ensuring resolution/ Documentation of all pending issues raised during implementation/development of ISM;
- Final configuration/ integration, volume and stress testing; and
- Switch over to production environment or Go-Live, as per Cutover Plan.

Usage Ready Definition: “Usage Ready” means commissioning and integration of all the hardware including End User Desk Tops/Laptops/Mobile Devices, hosting infrastructure, and all the components of the ISM solution as per the RFQ cum RFP, configured, customized and used successfully by all the intended users of DMIC IITGNL for successfully executing all the intended transactions as required as per RFQ cum RFP and as per the SLAs and / or mutually agreeable levels. The “Usage Ready” shall come into effect only on approval by DMIC IITGNL.

- The ISM solution is required as to successfully generate at least one balance sheet for the complete operations, for one financial quarter or successfully use the system for three months after usage ready, whichever is longer.

The Project Managers from the DMIC IITGNL and MSI will jointly initiate the notice for inspection after satisfactory completion of all the following:

- All the activities as listed in the ICT MSI RFQ cum RFP;
- After scrutinizing all the inspection reports, audit findings, Contracts, licensing agreements etc.; and
- Satisfactory completion of closing of accounts and generation of complete balance sheet for one financial quarter, with the ISM solution and approved by the head of finance and accounts of DMIC IITGNL.

3.2.4.4 Support Services during Comprehensive Maintenance Phase

On user and system acceptance the ISM solution components, the MSI will provide three months of system stabilization services (operational acceptance phase). During this phase, the MSI will take up the following:

- Tasks related to bug fixing (if any) in customization made in the system;
- Maintaining back-ups of the implemented system;
- Coordinating with OEM's of the respective ISM component for resolving any product related issues;
- Minor developments, improvements in the output and input formats;
- Hand holding the users;
- Formulation of Post “Complete deployment” Support Strategy i.e. Comprehensive Maintenance;
- Formulating the mechanisms for Post “Complete deployment” Monitoring;
- Carrying out the Review of issues and activities carried out during user adoption and system stabilization period; and
- Monitoring and fine-tuning system response.

After completion of operational acceptance phase, the project will enter comprehensive maintenance phase. The support phase will be 5 years after system stabilization support.

The support services shall be designed to achieve the following broad objectives:

- Facilitating user adoption;
- Continuous improvement and refinement of the processes, reports;
- Operations of help desk and refresher training;
- Institutionalizing structures and processes for management of SLA, strategic control;
- Root cause analysis of recurrent problems and permanent fix with prior permission of DMIC IITGNL

at no extra cost is part of support scope; and

- Liaison with respective OEMs in case of product related issues and provision of workaround solutions in case of delays in providing resolution;

The support services shall include below activities.

- Help desk operations: Initial Response, Immediate telephonic response and support for usage related and other minor problems. Dial-in support for handling, minor bug fix;
- SLA based support: The system integrator is required to detail out their support process. The industry standard Service level agreements shall be proposed by the system integrator;
- Periodic reporting on SLA management needs to be provided by the system integrator. Root cause analysis and long term solutions to fix the problems shall be part of the reporting mechanisms. There will be no additional cost for fixing the problems through root cause analysis;
- System Improvements: As per the business needs to DMIC IITGNL the MSI will carry out minor system improvements across all ISM components: report developments, enhancements and/or interfaces development/implementation, as per priority set by DMIC IITGNL;
- Onsite support: On-site support for hand holding the users, database recovery and data synchronization after crash, performance tuning, bug fix, update for all critical functions;
- Updates/ Upgrades/ New releases/ New versions: The MSI shall provide and implement from time to time the Updates/ Upgrades/ New releases/ New versions of the software and operating systems as required at no extra cost. The MSI should ensure upgrades, updates & patches of the ISM Solution Components are applied as and when released by the respective OEMs;
- If the Operating System or additional copies of Operating System are required to be installed/ reinstalled/ de-installed, the same should be done as part of the post implementation support;
- MSI should carry out any requisite adjustments / changes in the configuration for implementing different versions of ISM solution and/or its components;
- MSI shall ensure application of patches to the licensed software covering the appropriate ISM solution component software, operating system, databases and other applications;
- Software License Management: The MSI shall provide services for ISM solution component license management and control;
- Operational Support: On-site operational support after implementation;
- ISM Component support: The MSI must ensure the support from the relevant OEM for services relating to system functionality, technical functionality, performance tuning, upgrades etc.;
- Documentation: Upgrade the Documentation system on any new releases and provide any updates of technical and functional manuals;
- End User training environment: Establishment of centre of excellence (CoE) having an integrated environment with all the ISM components for the following purposes
 - Processes and structures for continuous improvement;
 - Processes and structures for solution roll out;
 - Skills and expertise to maintain support and continuously improve the ISM end to end business processes and solution; and
 - Train new and existing users.
- Technical Support
 - The technical support for the ISM solution components is meant to ensure OEM support for system performance, performance tuning, upgrades etc.;
 - Formulation of all policies and procedures related to System Administration, Data Base Management, applications, archives, network management & security, back up etc.;
 - Prepare requisite system landscape and procedures for smoothly implementing the ISM solution

component. This shall also take into consideration the phased implementation as required as per RFQ cum RFP;

- The MSI shall prepare and submit an authorization matrix for approval for various processes to be used in the deployed systems and processes. Upon approval by DMIC IITGNL the MSI shall implement the approved authorizations in the system authorizations and perform any related activity or task as and when required by DMIC IITGNL;
- Assist DMIC IITGNL to manage the legacy data interfaces, print spools, batch Jobs, printer configuration etc.;
- Prepare a detailed System administration manual, Data administration manual, operational manual, User manual which shall be used by DMIC IITGNL employees to run ISM production environment. This shall also include how the various parameters shall be monitored/ tuned in a live system;
- Finalize the back up and data archival policies for all the ISM Components. All necessary configurations shall be done and tested; and
- Prepare requisite system configuration for disaster recovery management and Fail Over system plan.

3.2.4.5 Security and System Access

Single Sign On (SSO):

Single Sign On (SSO) capability is required using Microsoft/Linux/Open Source based users' account directory to control all the accesses to the resources. Access to all the system shall be through a Portal with Single sign on facility. Once a user is signed in all the available system features as per authorization matrix will be available to users without requiring to sign in another system. For meeting this requirement state of the art single sign on solution which is tightly integrated with Portal shall be recommended.

DMIC IITGNL requires the ISM system to be integrated with Single Sign On to grant all rights with a single login in for each user.

Credential Management:

The application will allow the assignments of rights and responsibilities to each user through a unique user ID. User IDs are assigned to standard profiles. These profiles will describe the areas and types of transactions and types of transactions accepted for matching users. The application will allow and manage separate authorizations based on actions to be taken.

Managing user profiles:

Users will be divided into user groups with specific clearances. The application will thus help manage specific user profiles which may be defined during the period of project and/ or productive use of ISM. Some sample profiles are defined as below:

- System Administrator (opening / closing the application, authorization management);
- Function Administrator (management standards and parameters);
- Agent entry;
- Agent validation; and
- Role Based Authorizations and Segregation of duties.

System specific control shall be provided based on user ID:

- Division / Department level;
- Module Level;
- Functional or menu level (e.g., data entry, data inquiry, budgeting);
- Screen level;
- Field level on a screen;

- Transactions by function (e.g., add, change or delete); and
- Transaction level (e.g., normal credit/debit, reversing entry, prior period adjustment).

For security purposes, following system audit reports shall also be provided by the system:

- Transactions by user ID;
- Transactions by date and time;
- Changes to Master files;
- Prohibits users from accessing specific account codes or account segments;
- Ability to provide log file of changes made to specific fields of records; and
- Generates security exception report that lists the users who have accessed the system and highlights attempts to gain unauthorized access.

The proposed ISM solution (for each component) is required to meet the DMIC IITGNL needs for defining role based authorization and segregation of duties by out of the box (programming not required) features for controlling individual user access at the following levels:

Organization or sub organization level:

Master Data Level: depending on the role the user would be allowed to access and/or operate only on a limited set of master data. Following is an indicative list of examples to illustrate the requirement. DMIC IITGNL reserve the right to add, subtract or modify the list as per its business needs:

- An Investor or plot lease holder, who has acquired an Industrial plot can only view details concerning his/her plot of land;
- An DMIC IITGNL employee (or partner employee) is only allowed to issue POs for certain type of materials no other material types;
- An DMIC IITGNL employee can undertake sale of only commercial property and not industrial or residential plots; and
- An DMIC IITGNL employee can make payments but not approve the vendor invoices.

Transaction Level: flexibility to limit the role of each user for each transaction to one or more of the following:

- If transaction permission is granted, then role is limited to document creation or modification only; and
- If transaction permission is granted, then role is limited to viewing documents only.

3.2.4.6 Reporting

The ISM components shall have a standard reporting module that offers a library of “statement”, “report” and “predefined dashboards” which can be easily modified as per DMIC IITGNL needs. The MSI will be required to make these modifications as a part of scope for the project.

It is also expected that the ISM components will allow the design of new reporting templates (creation of new fields, calculations, sorting, totals, sub totals, combination of existing reports etc.). Moreover, the users should be able to export/import data for/from external applications not limited to for example excel/MS-access, for specific reports.

The MSI will also be required to ensure that it is possible to create or insert graphics into the generated documents or reports or dashboards. Nevertheless, “developing customer documents” must be within the reach of the users.

Print outs will be available on paper (A4 and A3) and in an electronic file format, as text files in column, Microsoft Excel or Adobe PDF document. In addition to the Microsoft suite of products, compatibility should also be ensured with the corresponding open source equivalent suite of office products.

Generating recurring reports should be automated. MSI to discuss and finalize content and formats of the report in consultation with the Client.

3.2.4.7 Archiving

Shelf life of online data shall be 5 years, in addition to the current year. Beyond this period, the data will be extracted and stored outside of the ISM components. The application should therefore allow for extraction of archives for at least 10 years. If necessary, this data will be still being accessible and available via simple query tools requiring no technical knowledge. MSI is required to propose an industry standard tool for data archiving all the data for ISM modules.

3.2.4.8 Interfaces

Integration services shall include:

- Define integration scope between the ISM modules and all other applications in use;
- Set-up data movement for various systems under integration framework;
- Create enterprise integration framework for various integration touchpoints. Approach for integration shall be SOA based and must be facilitated by industry best practices;
- Validation of data movement between source and target system.

MSI is required to propose a composite solution for integration which is SOA and BPM enabled. BPM will be configured to meet the requirements of workflow processes across systems. Main integration between systems will be web services based and industry standard solution is required to be proposed by the system integrator.

The below tables provide indicative list of system touchpoints required. Each of the touchpoints may have requirement of more than one integration.

S No	From	To	Description
1	ISM	Bank	Outgoing Payments
2	ISM	Payment channels	Outgoing Payments
3	ISM	Credit Card	Outgoing Payments
4	Bank	ISM	Incoming Payments, Bank Reconciliation
5	Payment channels	ISM	Incoming Payments
6	Credit Card	ISM	Incoming Payments
6	ISM	e-LMS	
7	ISM	GIS	Equipment, Locations, Assets
8	e-LMS	ISM	Property Id's would be first created on LMS
9	GIS	ISM	Equipment, Locations, Assets
10	GIS	LMS	Plot coordinates, Locations
11	LMS	GIS	Property
12	ISM	File Management System (FMS)	Document linkage at various processes
13	FMS	ISM	Document linkage at various processes
14	FMS	Portal	
15	FMS	e-LMS	Building Plans, etc.
16	FMS	FMS	
17	ISM	Portal/Mobile	
18	ISM	E Mail	User Authentication and mail services

S No	From	To	Description
			Integration with notification services
19	Portal	Mobile	
20	Portal	E Mail	User Authentication and mail services

Some of the processes that will be required for integration are listed below. However, this is an indicative list and exact requirements will be defined during requirements session of various phases.

Processes

S No	Process	Descriptions	Interfaces
1	Town Planning and Plotting	<ul style="list-style-type: none"> Town Planning and Plotting of Land parcels which will be created in e-LMS The land parcels/plots would be allotted property ids in LMS which would be replicated in the ISM 	<ul style="list-style-type: none"> e-LMS – ISM (property ids)
2	Investor Registration	Investor logs on to the portal and registers the details stored as customer record in the e-LMS. Customer Id is created	<ul style="list-style-type: none"> Portal – e-LMS – ISM
3	Plot Inquiry	<ul style="list-style-type: none"> Investor will approach via the Portal, and access the e-LMS: Portal – e-LMS: for viewing the plots and township e-LMS – GIS: for populating the GIS with the plots Portal – GIS: web GIS view would give the Entrepreneur a view of the township and its plots, what is available and what can be purchased, the price details would be fetched from e-LMS 	<ul style="list-style-type: none"> Portal – e-LMS e-LMS - GIS Portal - GIS
4	Plot Reservation	<p>After Inquiry the Investor will:</p> <ul style="list-style-type: none"> Select Plot and reserves it. A sales order would be created in the ISM in favour of the Investor Finalize the instalments Pay Initial Deposit as advance along with sales order 	<ul style="list-style-type: none"> Portal – e-LMS Portal – Email for confirmation to the Investor Portal - ISM (customer record X-fer) Portal – RTGS/Net banking/Credit Card/Pay Wallets / Debit Card Payment Gateway -ISM
5	Plot Billing	Raise an invoice with for payment of first invoice	<ul style="list-style-type: none"> ISM – e-LMS (update payment status) ISM – e-Mail for intimation to Investor
6	Plot Payment Receipt		<ul style="list-style-type: none"> Payment Gateway to ISM ISM to e-LMS ISM - Email (Payment Confirmation) Portal - e-LMS (updated status)

S No	Process	Descriptions	Interfaces
7	New Connection	Initial touch point is the portal either directly by the resident, by a call to the Customer Interaction Center	<ul style="list-style-type: none"> Portal –ISM (Notification creation) ISM-Portal (Operator is intimated about work order for new connection)
8	New Connection Installation	Operator Work Man down loads a list of jobs allocated. Identifies the property details from the GIS Map and performs the tasks assigned for the day. For each task completed the workman enters the order confirmation on his mobile device	<ul style="list-style-type: none"> Mobile – ISM (list of tasks) Mobile-Web GIS (property location and details of water mains from which connection is to be given) Mobile-ISM (job confirmation as well as input for materials consumed) Mobile – ISM (service entry sheet) ISM - E mail (caller for job completion)
9	Operator Payments Processing	Operator submits invoice for jobs performed via portal	<ul style="list-style-type: none"> Portal to ISM ISM – Payment Gateway
12	Purchase Requirement Approval	Approval of PR on mobile	<ul style="list-style-type: none"> ISM- Mobile – ISM
13	Leave Approval	Leave approval on mobile	<ul style="list-style-type: none"> ISM – Mobile - ISM
14	Payment Approval	Approval of payments on Mobile	<ul style="list-style-type: none"> ISM – Mobile - ISM
15	Building Plan Submissions	Building plan submission on Portal linking with e-LMS	<ul style="list-style-type: none"> Portal – e-LMS e-LMS - FMS Portal –FMS
16	Project Report Submission	Project report linkage with ISM and e-LMS	<ul style="list-style-type: none"> Portal – e-LMS e-LMS - FMS Portal – FMS FMS - ISM
17	SCADA	SCADA alarms into ISM as work order and alert on mobile	<ul style="list-style-type: none"> SCADA - ISM ISM – e-Mail (inform operator) ISM - Mobile

3.2.5 Public Interactive Kiosks

- MSI shall be responsible for creating the required software platform to support the functionalities of the Public Interactive Kiosk;
- MSI shall be responsible for integrating the VoIP features at the CIOC for transferring the call to the respective departments;
- MSI shall be responsible for integrating each kiosk with the central application server by providing the unique ID, IP addresses, etc.;

- MSI shall be responsible for upgrading the OS, firmware and other related platform of the Kiosk periodically;
- MSI shall be responsible for replenishment of consumables including paper for printing receipts and tickets;
- MSI shall be responsible for carrying out the turnkey works for implementing the kiosks;
- MSI shall coordinate with the EPC Contractor and other plot developers for installation and Right of Way (RoW).
- Wi-Fi hotspots as part of Kiosk are additional to the requirement of 30 access points asked in the BoQ.
- Kiosks shall be installed outdoors, although a few of the kiosks might be installed indoors. Locations to be finalized by MSI with the Client and its representative.
- Extending electrical and fibre optic connection to the kiosk from the nearest tapping point shall be the responsibility of the MSI.
- Foundation and civil works related to installation of Kiosk shall be in MSI Scope.

3.2.6 Environmental Sensor

- MSI shall be responsible for integration of environmental sensor data with the smart city platform at CIOC. Any development, customizations, interface curation required for integration of environmental sensor with smart city platform shall be under the scope of MSI.
- MSI shall implement a Variable Message Display (VMD) to display environmental parameters to the public. MSI shall be responsible for all civil, electrical and communication works to implement VMD. The VMD shall also be integrated with the Smart City Platform at CIOC.
- Any recurring costs associated with environmental sensors associated with telecom connectivity (3G/LTE) shall be under MSI scope.

3.2.7 ICT Interface for Automated Waste Collection System

- MSI shall be responsible for integrating the other sub-systems with the Automated Waste Collection System. This also includes coordination and integration with the EPC Contractor.

3.2.8 ICT Interface for Water, Power, Automated Waste Collection System and Streetlight Infrastructure

- EPC Contractor shall provide for the following:
 - SCADA for water distribution system;
 - AMR meters for water at individual plots;
 - SCADA sensors at water reservoirs and pumping stations;
 - Feeder based streetlight SCADA system;
 - Automated suction-based waste collection system from individual plots till waste collection sites.

MSI shall work in close coordination with EPC Contractor and ensure all integrations at CIOC as per finalized design requirements are catered;

- Power SCADA system in being installed by Electrical Contractor. AMR meters are also installed at every plot for consumption monitoring and billing. Upon handover of Electrical SCADA system, Power Discom, appointed by the Client, will undertake operations of the Power SCADA. MSI shall work in close coordination with Electrical Contractor and Power Discom to ensure all integrations at CIOC as per finalized design requirements are catered;
- It is expected that not all functionality of this infrastructure will be duplicated at the CIOC but only critical parameters shall be enabled at the CIOC. This shall be finalized by the MSI in consultation with the Client, the EPC Contractor, Electrical Contractor, Power Discom and the ICT consultant;

- EPC Contractor and Electrical Contractor shall provide water and power meters respectively with in-built M2M communications module. MSI shall work with the EPC and Electrical Contractor to finalize the communications requirements of these meters and integrate them with the overall system;
- Integrate the operations and maintenance of this infrastructure with the IIT Software Modules (ISM);

3.2.9 City's Integrated Operations Centre (CIOC)

- The detailed design in all aspects for the design-build (including but not limited to civil, mechanical, structural, electrical, communications, fire, fit-outs, furniture, etc.) of the CIOC shall be the responsibility of the MSI and be approved by the Client or its representative. The MSI shall have the required personnel on the team including architect, structural engineer, MEP, etc as needed for this design-build. At least two (2) options for the design-build shall be proposed for the CIOC;
- CIOC area shall consist of CIOC operations room including operator consoles with video wall, a Manager Cabin, Boardroom + Visitor room for management and decision making, a rack room for co-locating telecom equipment (Primary PoP), CFC room, TSP room, UPS and Electrical room. Design/build of all the CIOC area shall be done by MSI. Entire CIOC area shall be approximately 3000 sq. ft.;
- As CIOC shall be implemented at Administrative Building, MSI shall coordinate with the EPC Contractor assigned for development building for the spatial and basic infrastructure requirements;
- EPC Contractor shall provide an outer shell for the CIOC including walls of the CIOC room. It will be MSI's scope to provide all infrastructure and fit-out within the CIOC room as per the requirements of this RFQ cum RFP;
- MSI shall coordinate with Administrative Building architect for any requirements associated with layout of the CIOC;
- MSI shall take consultation and approval of Client or its representative, for the interior layout and material to be procured for CIOC;
- MSI shall furnish the CIOC as part of the civil work in all aspects. All material to be used shall be of fine quality ISI marked or equivalent. The furnishing includes but not limited to:
 - Trench works;
 - Masonry works;
 - Cutting and chipping of any existing area;
 - Glazing;
 - False ceilings;
 - False floorings;
 - Paint work;
 - Storage;
 - Layouts and partitioning;
 - Doors and Locks;
 - Fire proofing of all surfaces;
 - Cement concrete works;
 - Insulation.
- MSI shall install electrical distribution system inside the CIOC. MSI shall be responsible for proper and uninterrupted equipment working and shall ensure this by having the IT equipment and server room power distribution with redundancy:
 - Incoming HT/LT feeder supply;
 - UPS system with battery bank for all DMIC IITGNL loads.

- Connection between UPS system and the IT equipment shall be redundant. No single point of failure shall exist in the power connectivity between the IT equipment and UPS.
- Since CIOC is a critical area, air conditioning system shall be exclusively installed by MSI to maintain the required temperature. The A/C shall be capable of providing sensible cooling capacities at ambient temperature and humidity with adequate air flow. The task of MSI shall include but not limited to:
 - Connecting the indoor unit with main electrical point;
 - Connecting indoor and outdoor units mechanically (with insulated copper piping);
 - Connecting indoor and outdoor unit to power;
 - The air conditioning shall be linked to a secondary power supply as redundant source to prevent them from shutting down in case of power outage.
- MSI shall do complete electrical cabling work for IT equipment which shall include but not limited to:
 - Main electrical panel in room;
 - Power cabling;
 - UPS distribution board;
 - UPS point wiring;
 - Power cabling for utility points and utility components etc.;
 - Online UPS;
 - Separate earth pits for the component;
 - MSI shall use fire retardant cables of rated capacity exceeding the power requirements of equipment to be used at maximum capacity;
 - All material shall conform to ISI standards as per industry practice.
- MSI shall be responsible for the lighting works in the facility. Following items need to be undertaken by MSI for lighting:
 - Supply of all equipment associated with implementation of lighting including fixtures, lamps, wiring etc.;
 - Wiring for lighting system in the building;
 - Installation of lighting fixtures;
 - Warranty for the lighting equipment;
 - Critical lights shall be connected to UPS for uninterrupted lighting;
 - Post the installation, MSI shall ensure that lux levels of the building are as per IES-HB-10-11 and requirements of this RFQ cum RFP.
- The CIOC shall be equipped with adequate and advanced Fire Detection and Suppression system. The system shall raise an alarm in the event of smoke detection. The system shall have proper signage, response indicators and hooters in case of an emergency. The system shall be based as per NFPA standards;
- MSI shall be responsible for supplying and installing Diesel Generator (DG) for the Admin Building. Operations and maintenance of DG including purchase and refilling of fuel, preventive maintenance, corrective maintenance shall be the responsibility of the MSI;
- The Access control system shall be deployed by the MSI with the objective of allowing entry and exit to and from the premises to only authorized personnel with appropriate door locks and controller assembly. Access control shall be a combination of facial recognition based for entry/exit from CIOC and biometric + card based access control for movement inside CIOC premises and Admin Building. MSI shall be responsible for all civil, electrical, workstation, server, switches and communication works required for implementing Access Control at CIOC. Access control system shall also be enabled with attendance management system for DMIC IITGNL staff. The attendance management system shall be integrated with ISM by the MSI;

- A web enabled Building Management System (BMS) shall be implemented by the MSI for CIOC area. BMS shall enable building managers to monitor, control and automate various systems in the building via an integrated platform from a central location. All accessories associated with the BMS including central application, Workstation, Direct Digital Controllers (DDCs), cabling, conduiting, sensors, electrical, switches etc. shall be under the MSI scope. MSI shall also develop an I/O summary with exhaustive integration capabilities and submit it to the Client for review. Since, BMS is a design-build exercise, MSI shall ensure compatibility of all CIOC systems such as Air Conditioning, Lighting, UPS, DG etc. with BMS. The MSI shall integrate BMS parameters with the Smart City Platform. Proposed BMS shall have spare capacity for integration with Building Systems provided by EPC Contractor at Admin Building;
- MSI shall also install CCTV surveillance system inside CIOC for video surveillance of the facility. The MSI shall also ensure that CIOC area is Wi-Fi enabled;
- CIOC shall be equipped with Audio System including speakers for announcements and any other audio requirements. Any accessory and component associated with Audio System including software, Audio Processors, Amplifiers, Switchers, Microphone shall be the responsibility of the MSI.
- MSI shall also be responsible for installing a rodent repellent provision inside the CIOC facility;
- Manager Cabin and CFC room shall also be equipped with colour + black & white desk printer and scanner;
- MSI shall be responsible for compliance with all local standards and certifications, including building, electrical and occupational requirements;
- MSI shall integrate CIOC with various other City systems and infrastructures. MSI shall coordinate with all the stakeholders of these city systems for integration purposes;
- MSI shall be responsible for setting up the required software platform and interfacing CIOC with other city components;
- Define SOPs with the Client or its representative for the operations to ensure that CIOC systems are configured to support the operational procedures;
- Development of workflows, SOPs and customizations associated with Contact Centre solution shall be under the scope of MSI;
- MSI shall be responsible for operating CIOC and the Contact Centre under the supervision of the Client;
- Creation of KPIs and dashboards as per the requirement of the Client;
- Mobile version for the smart city platform for the Client;
- The MSI shall also be responsible for setting up a Testing Control Centre at site using the same ICT infrastructure (reduced quantities) that is planned for the CIOC. Testing Control Centre will act as a temporary / mini control centre for IIT till final control centre at Admin Building is not operational. Testing Control Centre shall be of approximately 500 Sq. ft. area and will be inside an existing building. MSI will be provided with space inside existing building and all end to end retrofitment works associated with setting up for Testing Control Centre shall be under MSI scope;
- Testing Control Centre will only include command and control centre area for centralized monitoring requirements. All necessary requirements for setting up Testing Control Centre such as civil works, interiors, connectivity, communication systems, electrical, air conditioning, boardroom monitor, furniture, servers shall be under the scope of MSI. The MSI may leverage any existing infrastructure of the building or provide upgraded/new infrastructure for the purposes of Testing Control Centre. This will be a make-shift arrangement and the necessary equipment will be migrated and reinstalled at CIOC once the Admin Building is available. Any installation and dismantling required for this shall be under the scope of the MSI. This will be only for temporary basis;
- The design layouts including ICT components with quantities which will be installed at Testing Control Centre shall be finalized with Client during design approval stage;

- MSI shall be responsible for setting up the Testing Control Centre on priority within 4 months of the effective date. MSI shall be responsible for operating and maintaining the Testing Control Centre at its own expense until the migration to the CIOC;
- Since all applications are pre-dominantly hosted on cloud, MSI shall be responsible for migration of Testing Control Centre to CIOC with minimum downtime;
- MSI shall be responsible for integrating the Power SCADA systems, Water SCADA system, Streetlight SCADA, Automated Waste Collection System SCADA with CIOC using latest and best industry practices;
- Any other additional equipment/accessory which are required as part of CIOC such as USV KVM extenders shall also be in the scope of the MSI.

3.2.10 Data Hosting for IIT

The Project requires turnkey services for hosting wherein the MSI shall broadly cover the following main scope of services:

- Installation and Implementation of hosting Infrastructure with combination of Cloud and On-Premises infrastructure;
- Testing;
- Commissioning; and
- Operations, Management and Maintenance of the implemented infrastructure.

The subsequent sections detail out the scope with respect to data hosting for IIT. The MSI shall note that the activities defined within scope of services mentioned are indicative and may not be exhaustive. MSI is expected to perform independent analysis of any additional work that may be required to be carried out to fulfil the requirements as mentioned in this RFQ cum RFP document and factor the same in its response.

Below are mentioned the scope of services, which shall be carried out by the MSI:

- Project Management;
- Installation and Implementation;
- Operational Acceptance; and
- Operation and Maintenance

3.2.10.1 Project Management

MSI shall be responsible for end to end project management for the implementation and support of hosting infrastructure. MSI shall deploy required manpower for the purpose of Project Management of the hosting infrastructure.

3.2.10.2 Installation and Implementation

As part of implementation of the hosting infrastructure, MSI's scope of services shall be as following:

- Provide required IT infrastructure as IaaS/PaaS/ SaaS for hosting required applications on cloud. The MSI shall host all the applications including e-LMS and website as part of the application landscape that needs to be hosted on cloud infrastructure and on-premise infrastructure as defined in below table;
- Provide all required IT infrastructure for on-premises applications.
- MSI shall integrate and migrate the e-LMS application and website on cloud. For the same, MSI shall coordinate with e-LMS SI. The migration is required for the existing and operational system from existing infrastructure to new infrastructure with below activities:
 - Migration Planning: Comprehensive planning for migration of the application suite and data to the cloud developing the migration roadmap, identifying the constraints and inhibitors to cloud migration. The migration plan shall also include plan for coexistence of non-cloud and cloud architectures during and after migration and test plans for verifying successful migration. Also, this

exercise shall support working with e-LMS SI and Client for optimizing the architecture and hosting requirements. For budgeting purposes, hosting requirement for e-LMS is given below:

DESCRIPTION	UNIT	QTY.
Server Environment		
Hardware		
4 Core CPU, 12 GB RAM, 150 GB HDD, Linux for Web and Application including Apache 2.4x and PHP 7.2	NOS.	1
4 Core CPU, 12 GB RAM, 100 GB HDD, Linux for Database including MySQL 5.6	NOS.	1
2 Core CPU, 8 GB RAM, 200 GB HDD, Linux for File Server, Backup Server and Integration Server	NOS.	1
Internet Bandwidth		
Internet Data transfer – Internet Access port for Hosted Server	GBPS	200
Storage		
Block Storage – HDD	GB	200
Other Solutions		
cPanel, Firewall, Security tools, Performance Monitoring Tools, Patch/Update Management Tools for OS, DB, VPN, One Static IP, Web Application Firewall, Load Balancer, Server Load Balancer etc.	-	-

- Suggestions on modifications to the applications based on:
 - Complete architectural understanding of the existing applications and processes necessary for successful migration of the applications and data as well as continued operation and maintenance of the services;
 - Analysis of the interdependencies such as application dependencies and affinities to servers, server configuration etc.;
 - Dependencies between applications and data; and
 - Requirement of any up-gradation of OS & DB to latest version available in market.
- Validate the architecture for deployment of hosting infrastructure provided by the MSI;
- Setup of Development, Quality, and Production Environments by provisioning the necessary compute & storage infrastructure on the cloud and on premise along with the underlying software licenses to host the Application Suite.;
- MSI shall ensure that all data from cloud DC is backed up to Cloud DRC / Secondary DC in regular intervals for the duration of the Project. MSI shall ensure that no data is deleted or overwritten without the written consent of the Client;
- There should be no single point of failure in terms of hosting infrastructure.
- Configuring external connections to the hosted infrastructure required to upload database backups and virtual machine (VM) images to the hosting environment; and
- MSI's bid should factor all hardware/ software/ cloud infrastructure cost till project completion (including AMC support by OEMs).
- MSI shall be responsible for hosting of applications mentioned in this document, including but not limited to:

S. NO	APPLICATION	CLOUD HOSTING	ON PREMISE HOSTING
1.	City Integrated Operation Centre Applications and Smart City Platform	✓	
2.	Surveillance System- Video Management and Video Analytics		✓
3.	Automatic Number Plate Recognition (ANPR)	✓	
4.	Automatic Traffic Counter and Classifier (ATCC)	✓	
5.	Variable Message Digital Signage	✓	
6.	Public Interactive Kiosk	✓	
7.	Building Management System (BMS) And Access Control System		✓
8.	Facial Detector & Scanner for Access Control (Software)		✓
9.	Enterprise Management System (EMS)	✓	
10.	Environmental Sensors (Software)	✓	
11.	IIT Software Module (ISM)	✓	
12.	Wi-Fi Management System	✓	
13.	Blockchain For Land Records	✓	
14.	E-LMS	✓	
15.	Any other solution/OEM specific requirement	✓	

Any other applications commissioned by Client for meeting their requirements.

- The application software, the necessary licenses for deploying Client applications ecosystem comprising of the work streams shall be provided by e-LMS SI for e-LMS system and MSI for all other applications;
- The MSI shall ensure for providing Internet Bandwidth and connectivity at the DC & Secondary DC / DRC, including termination devices, for end users to access Client application from Client premises and from anywhere based on access rights;
- The MSI shall use the Cloud Services to monitor the service levels and utilizations of the server, storage and other services. Where required, the MSI shall provision additional monitoring tools for measuring the application performance related service levels;
- The MSI shall be responsible for ensuring security of Client applications and infrastructure from any threats and vulnerabilities. The MSI shall address ongoing needs of security management including, but not limited to, monitoring of various devices / tools such as firewall, intrusion prevention/ detection, content filtering and blocking, virus protection, even logging & correlation and vulnerability protection through implementation of proper patches and rules. The MSI can leverage existing security infrastructure of Cloud Service Provider (CSP) and extend the same as per the scope of the RFQ cum RFP; and
- The solution needs to provide the ability for Client's IT Administrators to automatically provision the services via a Web Portal (Self-Provisioning), provide metering and billing to provide service assurance for maintenance & operations activities.
- The MSI shall prepare and submit a project plan with mapping of infrastructure at hosting site including following parameters:
 - Server Provisioning;
 - Storage Requirements;
 - Network interfaces requirement;

- Network throughput requirement;
- Adequate Backup requirement; and
- Failover mechanism for replication links.
- On acceptance of project plan by Client the MSI shall implement the hosting solution and offer for testing.
- While the initial sizing & provisioning of the underlying infrastructure (including the system software and bandwidth) may be carried out for the first year; subsequently, it is expected that the MSI, based on the growth in the user load (peak and non-peak periods; year-on-year increase), shall scale up or scale down the compute, memory, storage, and bandwidth requirements to support the scalability and performance requirements of the solution and meet the SLAs using the auto-scaling feature..

3.2.10.3 DRC / Secondary DC:

- MSI shall be responsible for sizing and providing the DC - Secondary DC / DRC replication link so as to meet the RTO and the RPO requirements. In case of disaster, DRC to operate at 50% of the DC load for all applications;
- MSI is required to make provision of Active – Active DRC or Active – Passive DRC (as per MSI solution) and meet the requirements provided in the RFQ cum RFP;
- DC and DRC shall adhere to guideline issued by MeitY over time to time. Only MeitY empanelled Cloud Service Providers shall be allowed to provide cloud hosting services for this Project;
- Business Continuity Plan (BCP), DR events and DR authority to be finalized during the Implementation Phase;
- In Comprehensive Maintenance Phase, application uptime level SLAs shall not be applicable during disaster events;
- DC/ DR management solution to monitor compliance of RTO, RPO, Failover/ Failback, Mock drills shall also be provided as part of the solution; and
- The MSI shall ensure adequate bandwidth between the Data Centre Facilities to provide business continuity and application response times. The solution shall offer minimum RPO and RTO (both for application) as specified in the table below section. For any breach in RTO and RPO requirements, applicable SLAs will be levied.

APPLICATION	RTO	RPO
City Integrated Operation Centre Applications and Smart City Platform	<=30 Mins	<= 20 mins.
Automatic Number Plate Recognition (ANPR)	<= 60 Min	<= 45 mins.
Automatic Traffic Counter and Classifier (ATCC)	<= 60 Min	<= 45 mins.
Variable Message Digital Signage	<= 60 Min	<= 45 mins.
Public Interactive Kiosk Software	<= 60 Min	<= 20 mins.
Enterprise Management System (EMS)	<= 30 Min	<= 20 mins.
Environmental sensors (Software)	<= 60 Min	<= 45 mins.
ISM Applications	<= 30 Min	<= 20 mins.
Wi-Fi Management System	<= 60 Min	<= 45 mins.
Blockchain for land records	<= 30 Min	<= 20 mins.
Any other Servers and applications	As applicable	As applicable

3.2.10.4 Operational Acceptance of Hosting Infrastructure:

As part of operational acceptance of Hosting Infrastructure, MSI's scope of services shall be as following:

- The MSI shall facilitate System Acceptance Tests. System acceptance tests shall be performed by Client or its representative; however, MSI shall have to facilitate System Acceptance during commissioning of the system, to ascertain whether the system conforms to the scope of services. The MSI shall facilitate the testing of application from the Client users during the System Acceptance. Necessary support shall be provided by the application vendor of the Client;
- System Acceptance shall be provided after hosting infrastructure have been provisioned;
- MSI shall address any deficiency, if any, reported by the Client or its representative during system acceptance tests. MSI shall address all concerns and make necessary upgrades at no additional cost to the Client; and
- MSI shall provide testing instances, version control, application rollout plan.

Operations and Support of Hosting Infrastructure

As part of operations and support of hosting infrastructure being provided by MSI, scope of services shall be as following:

The MSI shall be responsible for providing 24*7*365 days managed services and support for Client Cloud infrastructure and for on premise infrastructure from the date of issuance of operational acceptance by Client till end of the contract. MSI shall provide at least two contact details for helpdesk and centralized email for attending Client requests and complaints.

- MSI shall be responsible for the following:
 - Provide the required compute, memory, and storage required, building the redundancy into the architecture (including storage) and load balancing to meet the service levels;
 - Provide ability to provision virtual machines, and storage dynamically (or on-demand), on a self-service mode or as requested;
 - MSI shall offer fine-grained access controls including, conditions like time of the day, originating IP address, use of SSL certificates, or authentication with a multifactor authentication device; and
 - Patch and Configuration Management.
- User Administration:
 - MSI shall implement Identity and Access Management (IAM) that properly separates users by their identified roles and responsibilities, thereby establishing least privilege and ensuring that users have only the permissions necessary to perform their assigned tasks;
 - MSI shall be responsible for administration of users, identities and authorizations, properly managing the root account, as well as any Identity and Access Management (IAM) users, groups and roles they associated with the user account;
 - The MSI shall support multiple users with a management portal; and
 - The MSI shall provide Billing / Invoice tracking through a web portal aggregated by user application and service at mutually agreed intervals post project handover.
- MSI shall be responsible for security administration. MSI shall:
 - Appropriately configure the security groups in accordance with the Client's networking policies;
 - Regularly review the security group configuration and instance assignment in order to maintain a secure baseline;
 - Secure and appropriately segregate / isolate data traffic/application by functionality using DMZs, subnets etc.;
 - Ensure that the hosting infrastructure and all applicable systems hosted on it, respectively, are properly monitored for unauthorized activity;
 - Implement anti-malware and host-based intrusion detection systems on instances, as well as any required network-based intrusion detection systems in accordance with the Client's policies;
 - Review audit logs to identify any unauthorized access to the hosting infrastructure.

- Shall provide mechanisms to enable data isolation and privacy in its environment.
- Conduct regular independent third party assessments of the CSP's security controls to determine the extent to which security controls are implemented correctly, operating as intended, and producing the desired outcome. CSP shall make these reports available to customers via secured portal; and
- The MSI shall conduct vulnerability and penetration test (from a third party testing agency) on the environment provisioned for Client every 6 months and reports shall be shared with the Client. The MSI needs to update the system in response to any adverse findings in the report, without any additional cost to Client.
- MSI shall be responsible for monitoring performance and service levels. MSI shall:
 - Provide and implement tools and processes for monitoring the availability of assigned applications, responding to system outages with troubleshooting activities designed to identify and mitigate operational issues;
 - Review the service level reports, monitoring the service levels and identifying any deviations from the agreed service levels;
 - Monitoring of service levels, including availability, uptime, performance, application specific parameters, e.g. for triggering elasticity, request rates, number of users connected to a service;
 - Detecting and reporting service level agreement infringements; and
 - Monitoring of performance, resource utilization and other events such as failure of service, degraded service, availability of the network, storage, database systems, operating Systems, applications, including API access within the cloud service provider's boundary.
- MSI shall be responsible for the following usage reporting and billing management services:
 - Tracking system usage and usage reports;
 - Monitoring, managing and administering the monetary terms of SLAs and other billing related aspects;
 - Provide the relevant reports including real time as well as past data/information/reports for Client to validate the billing and SLA related penalties; and
 - Optimize the overall cost to Client for hosting infrastructure usage for running its operations.
- MSI shall be responsible for configuring the infrastructure for back-up. Root Cause Analysis (RCA) of all incidents should be provided within 24 hours of the incident occurrence.
- MSI shall be responsible for following business continuity services:
- Provide business continuity services in case the system becomes unavailable;
- MSI shall support third party audits and shall enable the logs and monitoring as required to support for third party audits;
- MSI shall ensure uptime and utilization of the hosting infrastructure as per SLA's defined in this RFQ cum RFP;
- Upgrades - Any required version/Software /Hardware upgrades, patch management etc. hosting site shall be supported by the MSI for the entire contract period at no extra cost to the Client;
- MSI is required to provision auto-scaling rules for hosting infrastructure consultation with Client;
- MSI shall advise Client on optimal operational practices, recommend deployment architectures for hosting infrastructures, design and implement automated scaling processes, day-to-day and emergency procedures, deploy and monitor underlying services, performance reporting and metrics, and ensure the overall reliability and responsive operation of the underlying services through both proactive planning and rapid situational response;
- MSI shall interface with the Cloud Service Provider(s) on behalf of Client for all activities including monitoring the reports (e.g. usage, security, SLA), raising (or escalating) tickets / incidents and tracking the same to resolution; and

- Create and maintain all the necessary technical documentation, standard operating procedures, configurations required for continued operations and support of hosting infrastructure services.
- MIS Reports - MSI shall submit the reports on a regular basis in a mutually decided format. The MSI shall workout the formats for the MIS reports and get these approved by the Client after award of the contract. The following is only an indicative list of MIS reports that may be submitted to the Client:
 - Monthly Reports;
 - Component wise server as well as Virtual machines availability and resource utilization;
 - Consolidated SLA / Non- conformance report;
 - Summary of component wise uptime;
 - Log of preventive / scheduled maintenance undertaken;
 - Log of break-fix maintenance undertaken;
 - All relevant reports required for calculation of SLAs;
 - Summary of issues / complaints logged with the OEMs;
 - Summary of changes undertaken in the environment provisioned for Client including major changes like configuration changes, patch upgrades, etc. and minor changes like log truncation, volume expansion, user creation, user password reset, etc.;
 - Summary of resolved, unresolved and escalated issues / complaints;
 - Log of backup and restoration undertaken; and
 - Any other reports required by the Client.

3.2.10.5 DRC / Secondary DC:

- Conduct secondary DC / DRC drill (for the Client's environment), on the discretion of the Client, at the interval of every six months of operation wherein the Primary DC has to be deactivated and complete operations shall be carried out from the secondary DC / DRC Site. However, during the change from DC to secondary DC / DRC or vice-versa (regular planned changes), there should not be any data loss and should meet the RTO and RPO requirements. The MSI shall clearly define the procedure for announcing secondary DC / DRC based on the proposed secondary DC / DRC solution. The MSI shall also clearly specify the situations in which disaster shall be announced along with the implications of disaster and the time frame required for migrating to secondary DC / DRC. The MSI shall plan all the activities to be carried out during the Disaster Trial and issue a notice to the Client at least two weeks before such trial.

3.2.11 Telecom Connectivity

- MSI shall be responsible for establishing telecom connectivity via feasible wired link at CIOC and Admin Building including Testing Control Centre. The link established by the MSI shall be operational as per the SLA with minimal points of failure and network downtime. In case of any downtime, the MSI shall ensure that there is no packet/data loss and upon restoration, the link is live with data transmission starting from the time of point of failure
- MSI shall be responsible for purchasing bandwidth from any of the Telecom Service Provider(s) active in the project area on behalf of DMIC IITGNL along with any associated Active/ Passive infrastructure required for facilitation of telecommunication connectivity at IIT. It shall be MSI's responsibility to ensure appropriate bandwidth availability for connectivity as per the requirements of the RFQ cum RFP. Leased line connectivity should support functioning of all activities at CIOC and Admin Building along with operations of back-end applications by DMIC IITGNL employees;
- Leased line connection to admin building shall be equipped with split tunnel connectivity with SSL VPN to Cloud Service Provider (CSP) to enable site to site connectivity with CSP in a secured environment. Telecom connectivity shall ensure smooth operations of all cloud hosted applications.
- Telecom connectivity shall also support internet bandwidth for DMIC IITGNL users at Admin Building (minimum 20 users).

- The telecommunication link established by the MSI shall be geographically redundant network with minimal points of failure;
- MSI shall be responsible for the overall operations and maintenance of the leased line link including the Active/Passive infrastructure. MSI shall be responsible for comprehensive maintenance of the communication link till the completion of the Contract period.
- Supply and maintenance cost of toll-free numbers and contact centre solution including EPBAX number shall also be borne by the MSI. For budgeting purpose, Bidder shall assume 5 Lakhs minutes worth of call traffic will be done yearly.

3.2.12 SMS, e-Mail and WhatsApp Gateway

- Supply, installation and maintenance cost of SMS gateway, e-Mail gateway and WhatsApp gateway shall be borne by the MSI;
- MSI shall integrate SMS, WhatsApp, e-Mail gateway with the Project components as per the process requirement of the Client. Necessary e-Mail, SMS or WhatsApp shall be triggered as per the requirement of the Client;
- Duplicate messages will not be sent by SMS and WhatsApp. Cases where SMS or WhatsApp message will be triggered shall be decided by the Client in consultation with the MSI as per the workflow requirement;
- SMS gateway console should be available with Client admin for monitoring and controlling purposes;
- For budgeting purposes, MSI shall assume 8 Lakh SMS transactions will be done for the entire project duration.

4 Roles and Responsibilities

4.1 Master System Integrator (MSI)

MSI shall be responsible for providing a complete system that incorporates all specification requirements, including but not limited to:

- Provide all components as per the Project requirements;
- Deployment of a competent team of experts for each system solution with relevant prior experience and depth of knowledge in each functional area. Team of experts shall be able to supervise end to end business processes for all project components;
- Scheduling the activities and accordingly deploying the resources in a pragmatic manner in order to complete the implementation of the smart city ICT components within the required scope, quality and time constraints;
- Project Team and Management: Since the continuity of the key members of the project team is essential, MSI to follow diligent process for ensuring continuity of key personnel assigned for implementation of the project. For project team, MSI shall carry out following responsibilities:
 - At the project initiation, the MSI will share the profiles of the “Key Personnel” with Client and these key profiles shall meet the minimum eligibility criteria highlighted in the RFQ cum RFP as well as the proposal submitted by the MSI;
 - Regular meetings between key personnel and the Client or its representative to discuss project implementation and progress;
- Deployment of a project structure for effective governance, monitoring, review and risk mitigation;
- Provision of all Testing services, up to and including the System Acceptance Test and operational acceptance;
- Provision of all Installation and Configuration services defined as part of bid document;
- Provision of detailed Documentation for the MSI's solution;
- Provision of all Training and associated documentation for Client's personnel;
- MSI shall provide Project Quality services as following:
 - Adoption of standard methodology encompassing project documentation at various phases, following robust review mechanisms and ensuring quality at all the stages of the project;
 - The MSI is expected to deploy all the quality assurance mechanisms as per international quality standards for this project;
 - ICT systems shall be deployed in such a manner that they are scalable and upgradations of hardware and software are possible with minimal efforts. MSI shall include product upgrade as part of scope during installation;
 - Detailed quality assurance plan for all the phases of the project shall be provided by the MSI.
- MSI shall be responsible for the following feedback, monitoring and adoption mechanism:
 - Stakeholder Mapping: The MSI will put together a structure and mechanism for ensuring that all the relevant stakeholders are consulted, feedback adopted and key differences identified, so as to facilitate standardization as well as user adoption;
 - MSI shall indicate the deliverables which shall go for internal review and accordingly the level of expertise that will be deployed for the reviews and the deliverables which will follow quality assurance plans;
 - If any of the deliverables are not accepted by the Client, it shall have the right to seek deployment of experts from MSI to review the deliverables. Client shall also hire third party experts to review the deliverables, if required;

- Mechanism to adopt feedback/audit findings: There are three types of feedback for the deliverables – from the users/stake holders, from the internal experts of the MSI and the third-party experts hired by DMIC IITGNL. The following is expected from the MSI on these feedbacks/audit findings:
- All the feedback shall be discussed with Client and based on the guidance of Client, the feedback shall be incorporated into the project;
- Since the feedbacks/audit findings for any rework is by nature correcting the inadequacy of quality of the work produced in the first place, Client will not accept any change notice requests for these reworks;
- MSI shall build in adequate mechanisms to control the risks of time over runs possibly due to effort required to rework bad quality deliverables;
- MSI shall indicate in the beginning of each phase how it plans to take feedback and the mechanisms to incorporate the feedbacks into the project plan and deliverables;
- MSI shall report to Client how the feedbacks have been incorporated into the project deliverables and take a sign off from the designated authority of Client.
- Warranty for all equipment and software, up to and following System Acceptance, and provision of a System Warranty following System Acceptance;
- All Spare Parts for the MSI Solution to meet the SLA requirements;
- Technical Support services following System Acceptance;
- MSI to coordinate with Client to complete the civil and electrical work as required;
- MSI to coordinate with all necessary stakeholders involved in the project for successful and smooth implementation;
- MSI shall work closely with EPC Contractor and Electrical Contractor to meet the requirements of the Project;
- MSI shall provide all the integration support and develop necessary API, Program and necessary development to integrate with city operations with the CIOC and ISM applications;
- MSI shall be responsible for demonstrating software development/implementation to the client periodically in Greater Noida as per the project requirements;
- Training for relevant personnel;
- Secure storage of all equipment on-site;
- Maintaining an on-site office during construction (temporary) shall also be the responsibility of the MSI;
- MSI shall depute an on-site project coordinator in Greater Noida;
- Maintenance support for system and field equipment;
- Client may at any anytime during the contract period choose to undertake an independent third party audit of the implemented system including both application and infrastructure audit. The MSI shall support this audit;
- All reinstatement works including civil shall be the responsibility of the MSI;
- Extension of power from the nearest tapping points shall be the responsibility of MSI;
- Locations of Wi-Fi access point, CCTV and Kiosk will be finalized by MSI and Client or its representative through mutual discussions.
- Temporary power during construction/implementation stage to be arranged and paid by MSI. Client shall only provide power during operations phase;
- Temporary internet connectivity at site for general use and demonstration purposes shall be under MSI scope.

- For Utility Plots, Manhole, Handhole and open trench along with FOSC etc. will be in the scope of MSI.

4.2 Client

Through its authorized personnel and representatives Client shall:

- Provide basic infrastructure (power, space, access) required at each facility for installation of System equipment and for Training;
- Client shall provide required area for development of PoP room;
- Shall approve any provision of raw electricity up to mains power distribution panel at CIOC, PoP rooms, other sites;
- Client shall pay the electricity bill for the smart city ICT components under the scope of this contract;
- Assign a Project Manager with the authority to make decisions (and/or designate representatives with such authority) on behalf of Client;
- Participate in all scheduled project activities, attend scheduled meetings and promptly respond to new meeting requests, requests for information, technical support or other necessary communication activities;
- Provide staff, and facilities for all Training held in accordance with the Training Plan;
- Participate and approve the results of all tests, in accordance with the Test Plan;
- Provide payment gateway for all financial transactions;
- Provide as-builts files/documentation (whichever available) for GIS works to be undertaken by the MSI;
- Any coordination or permits required for performing works in the project area;
- Client shall assist the MSI in:
 - Obtaining necessary permits or permissions for any activities requiring outside authorization;
 - Coordinating logistical arrangements to receive project related equipment at project facilities;
 - Providing access to field implementation locations as required;
 - Timely acquisition of required technical data from EPC Contractor, Electrical Contractor or other parties;
 - Obtaining any new, changed, or updated operational information necessary for the MSI to configure and initialize the system; and
 - Scheduling and coordination for staff participating in training sessions as per the agreed training schedule.

5 Implementation Schedule (Activities, Milestones and Deliverables)

MSI shall deliver all project activities/milestones/deliverables to the Client as per the timelines stated in this section. MSI shall submit at least two (2) versions of each deliverable as per following:

- Draft Version;
- Final Version.

Client or its authorized representative shall take thirty (30) days to review and provide comments on all respective deliverables. MSI shall ensure that all comments provided by the Client or its authorized representative shall be incorporated in the final version of all deliverables.

All deliverables indicated in the tables below are indicative only and shall be read in conjunction with the Detailed Scope of Work section and Volume II (Standard Form of Contract) of the RFQ cum RFP for detailed requirements. Client or its authorized representative reserves the right to ask for additional information, documents and deliverables throughout the Project.

ACTIVITIES/ MILESTONES/ DELIVERABLES	EXPECTED DATE OF DELIVERY/ COMPLETION FROM EFFECTIVE DATE (D)
Mobilization of Resources	D + 1 Month
Setup of Project Office	D + 1 Month
Submission of Project Plan and Detailed Project Report including all applicable Datasheets and Shop Drawings	D + 2 Month
e-LMS Migration and hosting on cloud infrastructure	D + 2 Month
All Design and Engineering drawings	D + 3 Months
Setting up of Testing Control Centre	D + 4 Months
Testing, Commissioning & Integration Plan for Phase-1	D + 4 Months
Testing for Phase-1	D + 5 Months
Operational Acceptance of Phase-1	D + 6 Months
Testing, Commissioning & Integration Plan for Phase- 2	D + 6 Months
Testing for Phase- 2	D + 7 Months
Operational Acceptance of Phase- 2	D + 8 Months
Testing, Commissioning & Integration Plan for Phase- 3	D + 8 Months
Testing for Phase- 3	D + 9 Months
Testing, Commissioning & Integration Plan for Phase- 4	D + 10 Months
Operational Acceptance of Phase- 3	D + 10 Months
Testing for Phase- 4	D + 11 Months
Operational Acceptance of Phase- 4	D + 12 Months
Operational acceptance of the Project	D + 15 Months
Comprehensive Maintenance / AMC Phase	D + 75 Months

Appendix A: Standards (for Reference only)

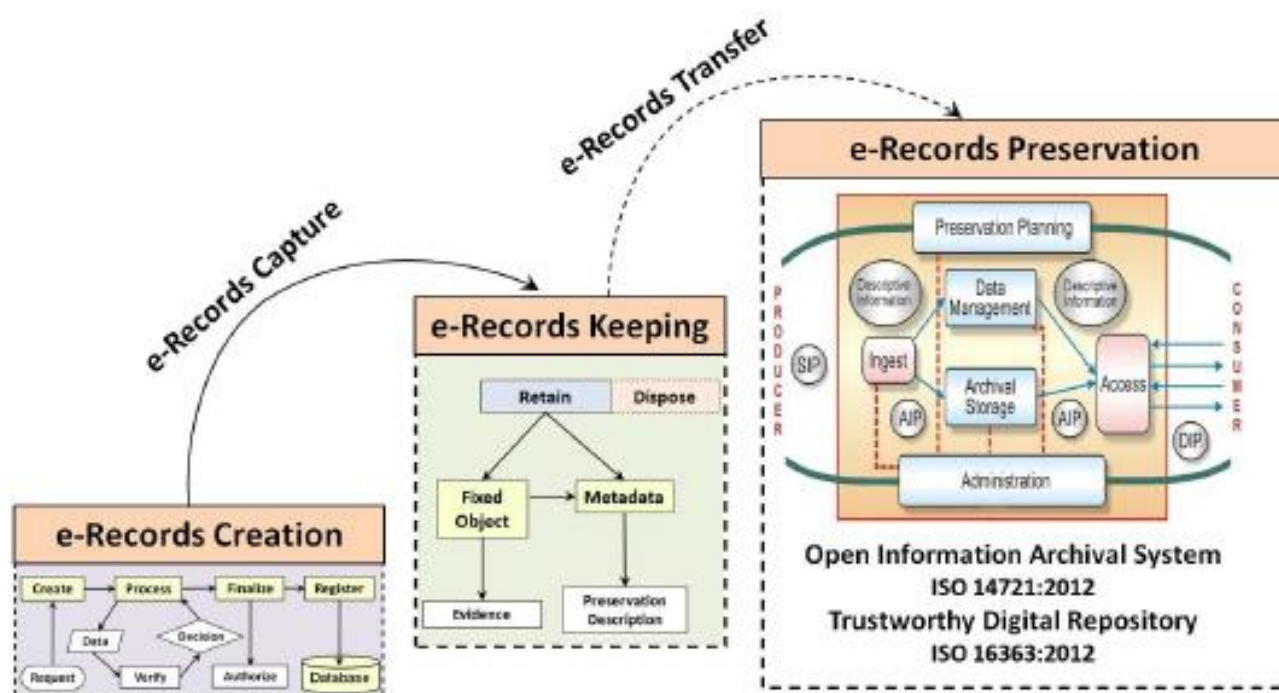
1. Digital Preservation Standards

The **e-Governance Standard for Preservation Information Documentation (eGOV-PID) of Electronic Records (eGOV-PID)** provides a standardized metadata dictionary and schema for describing the "preservation metadata" of an electronic record. This standard proposes to capture most of the preservation information (metadata) automatically after the final e-record is created by the e-Government system. Such preservation information documentation is necessary only for those e-records that need to be retained for long durations (e.g. 10 years, 25 years, 50 years and beyond) and the e-records that need to be preserved permanently.

The implementation of this standard helps in producing the valid input i.e. Submission Information Package (SIP) for archival and preservation purpose as per the requirements specified in the ISO 14721 Open Archival Information Systems (OAIS) Reference Model.

The eGOV-PID allows to capture the preservation metadata in terms of cataloguing information, enclosure information, provenance information, fixity information, representation information, digital signature information and access rights information.

The core concepts of 'preservability' are based on the requirements specified in IT ACT, ISO/TR 15489-1 and 2 Information Documentation - Records Management and ISO 14721 Open Archival Information Systems (OAIS) Reference Model. It introduces 5 distinct steps of e-record management i.e. e-record creation, e-record capturing, e-record keeping, e-record transfer to designated trusted digital repository and e-record preservation which need to be adopted in all e-Governance projects.



STANDARD	DESCRIPTION
ISO 15836:2009	Information and documentation - The Dublin Core metadata elements
ISO/TR 15489-1 and 2	Information and Documentation - Records Management: 2001
ISO 14721:2012	Open Archival Information Systems (OAIS) Reference Model
ISO/DIS 16363: 2012	Audit & Certification of Trustworthy Digital Repositories
METS, Library of Congress, 2010	Metadata Encoding and Transmission Standard (METS) -
InterPARES 2	International Research on Permanent Authentic Records - A Framework of Principles for the Development of Policies, Strategies and Standards for the Long-term Preservation of Digital Records, 2008

STANDARD	DESCRIPTION
ISO 19005-1:2005 Use of PDF 1.4 (PDF/A-1b) with Level B	<p>Capture of e-records in PDF for Archival (PDF/A) format - PDF/A-1a is based on the PDF Reference Version 1.4 from Adobe Systems Inc. (implemented in Adobe Acrobat 5 and latest versions) and is defined by ISO 19005-1:2005.</p> <p>Conformance is recommended for archival of reformatted digital documents due to following reasons:</p> <ul style="list-style-type: none"> • PDF/A-1b preserves the visual appearance of the document • Digitized documents in image format can be composited as PDF/A-1b <p>PDF/A for e-governance applications</p> <ul style="list-style-type: none"> • Apache FOP 1.1 library can be used in the application logic for dynamically publishing the e-records in PDF/A format. <p>PDF/A for document creation</p> <ul style="list-style-type: none"> • Libre Office 4.0 supports the exporting of a document in PDF/A format. • MS Office 2007 onwards the support for “save as” PDF/A is available. • Adobe Acrobat Professional can be used for converting the PDF documents to PDF/A format.
ISO 19005-2:2011 Use of ISO 32000-1 (PDF/A-2)	<p>Recommended for preservation of documents requiring the advanced features supported in it.</p> <p>PDF/A-2a is based on ISO 32000-1 – PDF 1.7 and is defined by ISO 19005-2:2011.</p> <p>Its features are as under:</p> <ul style="list-style-type: none"> • Support for JPEG2000 image compression • Support for transparency effects and layers • Embedding of OpenType fonts • Provisions for digital signatures in accordance with the PDF Advanced Electronic Signatures – PAdES standard • Possibility to embed PDF/A files in PDF/A-2 for archiving of sets of documents as individual documents in a single file <p>PDF/A-2 does not replace the PDF/A-1 standard but it co-exists alongside with an extended set of features.</p> <p>PDF/A-1a and PDF/A-1b compliance are minimum essential for e-government records as recommended in the IFEG technical standard of DeitY.</p>
JPEG2000 (ISO/IEC 15444-1:2004) and PNG (ISO/IEC 15948:2004)	<p>Image file formats - which support lossless compression are recommended as raster image file formats for e-governance applications as specified in Technical Standards for Interoperability Framework for e-Governance (IFEG) in India, published in 2012 by e-Gov Standards Division, DeitY.</p>
ISO/IEC 27002: 2005	<p>Code of practices for information security management for ensuring the security of the e-records archived on digital storage.</p>

2. Localization and Language Technology Standard

- Character Encoding Standard for Indian Languages**

Standardization is one of the baselines to be followed in localization. Standardization means to follow certain universally accepted standards, so that the developers could interact through the application. Standardization becomes applicable in almost everything specific to the language – for instance, a standard glossary of terms for translation, a standard keyboard layout for input system, a standard collation sequence order for sorting, a standard font etc.

Character Encoding standard for all constitutionally recognized Indian Languages should be such that it facilitates global data interchange.

ISCII is the National Standard and Unicode is the global character encoding standard.

Unicode shall be the storage-encoding standard for all constitutionally recognized Indian Languages including English and other global languages as follows:

SPECIFICATION AREA	STANDARD NAME	OWNER	NATURE OF THE STANDARD	NATURE OF RECOMMEND ACTIONS
Character Encoding for Indian Languages	Unicode 5.1.0 and its future upgradation as reported by Unicode Consortium from time to time.	Unicode Consortium, Inc.	Matured	Mandatory

- Font Standard for Indian Languages**

A single International Standard to comply with UNICODE data storage. This ensures data portability across various applications and platforms.

ISO/IEC 14496-OFF (Open Font Format) is based on a single International Standard and complies with UNICODE for data storage. This ensures data portability across various applications and platforms. Open type font is a smart font which has built- in script composition logic.

ISO/IEC 14496-OFF (Open Font Format) for font standard would be the standard for Indian Languages in e-Governance Applications. **ISO/IEC 14496-OFF (Open Font Format) for font standard is mandatory for all 22 constitutionally recognized languages.**

ISO/IEC 14496-OFF (Open Font Format)

OFF fonts allow the handling of large glyph sets using Unicode encoding. Such encoding allows broad international support for typographic glyph variants.

OFF fonts may contain digital signatures, which enable operating systems and browsing applications to identify the source and integrity of font files, (including the embedded font files obtained in web documents), before using them. Also, font developers can encode embedding restrictions in OFF fonts which cannot be altered in a font signed by the developer.

3. Metadata and Data Standards

Standardization of data elements is the prerequisite for systematic development of e-Governance applications.

Data and Metadata Standards provide a way for information resources in electronic form to communicate their existence and their nature to other electronic applications (e.g. via HTML or XML) or search tools and to permit exchange of information between applications.

The present document “Data and Metadata Standards- Demographic” focuses on Person Identification and Land Region codifications. It includes the following:

- **Mechanism for allocation of reference no.** to the identified Generic data elements, and their grouping.
- **Generic data elements specifications like:**
 - Generic data elements, common across all Domain applications
 - Generic data elements for Person identification
 - Generic data elements for Land Region Codification
 - Data elements to describe Address of a Premises, where a Person resides
- **Specifications of Code Directories like:**
 - Ownership with rights to update
 - Identification of attributes of the Code directories
 - Standardization of values in the Code directories
- **Metadata of Generic Data Elements:**
 - Identification of Metadata Qualifiers
 - Metadata of the data elements
- **Illustration of data elements to describe:**
 - Person identification
 - Address of a premises

This Standard would be applicable to all e-Governance applications in India as per the Government’s Policy on Open Standards (refer <http://egovstandards.gov.in/policy/policy-onopen-standards-for-e-governance/>)

Reference Standards:

- ISO Standard 1000:1992 for SI Units
- MNIC Coding for Person Identification
- ISO 693-3 for International language codes
- RGI’s coding schemes for Languages
- Top level document provided by Working Group on Metadata and Data Standards
- EGIF (e- Government Interoperability Framework) Standard of U.K.
- uidai.gov.in/UID_PDF/Working_Papers/A_UID_Numbering_Scheme.pdf
- [http:// www.dolr.nic.in](http://www.dolr.nic.in) for conversion table of units as used by Department of Land
- Records
- GoI Policy on open standards version 1.0 released in November, 2010
- UID DDSVP Committee report, Version 1.0, Dec 09, 2009
- ANSI92 Standard

4. Mobile Governance

Framework for Mobile Governance (m-Governance)

Mobile Governance (m-Governance) is a strategy and its implementation to leverage available wireless and new media technology platforms, mobile phone devices and applications for delivery of public information and services to citizens and businesses.

The following are the main measures laid down:

- Web sites of all Government Departments and Agencies shall be made mobile compliant, using the “**One Web**” approach.
- **Open standards** shall be adopted for mobile applications for ensuring the interoperability of applications across various operating systems and devices as per the Government Policy on Open Standards for e-Governance.
- **Uniform/ single pre-designated numbers** (long and short codes) shall be used for mobile-based services to ensure convenience.

5. Guidelines for Indian Government Websites

It is suggested that the Indian Government websites adhere to certain common minimum standards, as prerequisites for a Government website to fulfil its primary objective of being a citizen centric source of information & service delivery.

These Guidelines have been framed with an objective to make the Indian Government Websites conform to the essential pre-requisites of UUU trilogy i.e. Usable, User-Centric and Universally Accessible. They also form the basis for obtaining Website Quality Certification from STQC (Standardization Testing Quality Certification) an organization of Department of Information Technology, Government of India.

These Guidelines are based on International Standards including ISO 23026, W3C's Web Content Accessibility Guidelines, Disability Act of India as well as Information Technology Act of India.

- **Indian Government Entity**

All websites and Portals belonging to the Indian Government Domain at any hierarchical level (Apex Offices, Constitutional Bodies, Ministries, Departments, Organizations, States/UTs, District Administrations, and Village Panchayats et al) must prominently display a strong Indian Identity and ownership of Indian Government.

The above objective can be achieved through the following:

- The National Emblem of India MUST be displayed on the Homepage of the websites of Central Government Ministries/Departments. The usage of National Emblem on an Indian Government website must comply with the directives as per the 'State Emblem of India (Prohibition of improper use) Act, 2005'.

Further, the State Governments should also display the State Emblem (or the National Emblem in case the State has adopted the National Emblem as its official State Emblem) as per the Code provided in the above Act. The Public Sector organisations and autonomous bodies should display their official logo on the Homepage of the website to re-enforce their identity.

- The Homepage and all important entry pages of the website MUST display the ownership information, either in the header or footer.
- The lineage of the Department should also be indicated at the bottom of the Homepage and all important entry pages of the website. For instance, at the bottom of the Homepage, the footer may state the lineage information, in the following manner:
 - a. This Website belongs to Department of Heavy Industries, Ministry of Heavy Industries and Public Enterprises, Government of India' (for a Central Government Department).
 - b. This Website belongs to Department of Industries, State Government of Uttar Pradesh, India' (for a State Government Department).
 - c. This is the official Website of Gas Authority of India Limited (GAIL), a Public Sector Undertaking of the Government of India under the Ministry of Petroleum and Natural Gas (for a Public Sector Undertaking).
 - d. This is the official Website of the District Administration of Thanjavur, State Government of Tamil Nadu (India)' (for a District of India).
- All subsequent pages of the website should also display the ownership information in a summarized form. Further, the search engines often index individual pages of a website and therefore, it is important that each webpage belonging to a site displays the relevant ownership information.
- In case of those websites which belong to Inter-Departmental initiatives involving multiple Government Departments which are difficult to list on the Homepage, the Government ownership should still be reflected clearly at the bottom of the page with detailed information provided in the 'About the Portal/Website' section.

- The page title of the Homepage (the title which appears on the top bar of the browser) **MUST** be complete with the name of the country included, for instance, instead of the title being just Ministry of Health and Family Welfare, it should state, Government of India, Ministry of Health & Family Welfare.

Alternatively, in case of a State Government Department, it should state 'Department of Health, Government of Karnataka, India '. This will not only facilitate an easy and unambiguous identification of the website but would also help in a more relevant and visible presence in the search engine results. Further, it is important since the screen readers used by the visually impaired users first read the title of the page and in case the title is not explanatory enough, it may confuse or mislead them.

- **Government Domains**

The URL or the Web Address of any Government website is also a strong indicator of its authenticity and status as being official. In today's era with a large proliferation of websites, which resemble Government websites and fraudulently claim to provide reliable Government information and services, the role of a designated Government domain name assumes a lot of significance.

Hence, in compliance to the Government's Domain Name Policy, all Government websites MUST use 'gov.in' or 'nic.in' domain exclusively allotted and restricted to Government websites. The military institutions and organisations in India may also use 'mil.in' domain in place of or in addition to the gov.in /nic.in domain. The above naming policy applies to all Government websites irrespective of where they are hosted.

Those Departments and Government entities that are using and have been publicising a domain name other than the above should take appropriate early action to register official government domain names and use the existing ones as 'alias' for a period of six months. An intermediary page with a clear message notifying the visitors about the change in the URL and then auto redirecting them to the new URL after a time gap of 10 seconds should be used.

The Domain Name Conventions, as specified in the '.IN Registration' policy should be followed while registering a 'gov.in' Domain Name.

National Informatics Centre (NIC) is the exclusive Registrar for GOV.IN domain names. The use of GOV.IN Domain is restricted to the constituents of Indian Government at various levels right from Central, State/UT, District & Sub-District, block, village etc.

For detailed information and step-by-step procedure on how to register a .GOV IN Domain, one may visit <http://registry.gov.in> .

- **Link with National Portal**

- **india.gov.in:** The National Portal of India is a single window source for access to all information and services being provided by the various constituents of the Indian Government to its citizens and other stakeholders.

There are exclusive sections on Citizens, Business, Overseas, Government, Know India, Sectors etc. catering to the information needs. Sections targeting special interest groups such as Government Employees, Students, Senior Citizens, Kids etc. are also present.

- a. **Since the National Portal is the official single entry Portal of the Indian Government, all Indian Government websites MUST provide a prominent link to the National Portal from the Homepage and other important pages of citizens' interest.**
- b. **The pages belonging to the National Portal MUST load into a newly opened browser window of the user.** This will also help visitors find information or service they could not get on that particular website. It is quite common that citizens are not aware which information or service is provided by which Department.

As per linking Policy of the National Portal, no prior permission is required to link 'india.gov.in' from any Indian Government website. However, the Department providing a link to the National Portal is required to inform the National Portal Secretariat about the various sections of the National

Portal that they have linked to, so that they can be informed of any changes, updations / additions therein. Also, it is not permitted that the National Portal Pages be loaded into frames on any site. These must be loaded into a new browser window.

Special Banners in different sizes and colour schemes for providing a link to the National Portal have been given at <http://india.gov.in/linktous.php>

Instructions on how to provide a link have also been given. The Government websites / portals may choose any banner from the ones provided, depending upon their site design and place the same on their Homepage.

- **Content Copyright**

Copyright is a form of protection provided under law to the owners of “original works of authorship” in any form or media. It is implied that the original information put up on the website by a Government Department is by default a copyright of the owner Department and may be copied, reproduced, republished, uploaded, posted, transmitted, or distributed only if the copyright policy of the concerned Department allows so.

Hence, the information, material and documents made available on an Indian Government website MUST be backed up with proper copyright policy explaining the terms and conditions of their usage and reference by others. The copyright policy of a Department could be liberal, moderate or conservative depending upon their preferences based on the kind of information available on their website. However, since it is a duty of a Government Department to provide all the information in the public domain freely to the citizens, the Departments should aim to have a liberal copyright policy.

The Departments should also be sensitive towards publishing any information having a third party copyright. The Government Departments MUST follow proper procedures to obtain the permission, prior to publishing such information on their websites.

If any published Government Document/Report is being reproduced on any website, whether as excerpts or in full, the source of the same i.e. Full Title of the Report/Document along with the name of the concerned Department and year of publication MUST be provided.

- **Content Hyper linking**

Since Government websites often receive queries and requests from owners of other websites who might want to provide a hyper link to their web pages, every Indian Government website MUST have a comprehensive and clear-cut hyper linking policy defined and spelt out for those who wish to hyper link content from any of its sections. The basic hyper linking practices and rules should ideally be common across the websites of a State/Ministry.

The hyperlinking policy enumerating the detailed criteria and guidelines with respect to hyperlinks with other sites may be made available under the common heading of **‘Hyperlinking Policy’** and displayed at a common point on the Homepage of all sites under the ownership a State/Ministry.

- To create a visual distinction for links that lead off site, Cascading Style Sheets (CSS) controls or XSL or some such similar mechanism should be used. In case the link takes the user to another website of the same Department/Ministry/ State, a seamless transition should be used through appropriate CSS controls.
- Third party content should only be linked when consideration about the copyright, terms of use, permissions, content authenticity and other legal and ethical aspects of the concerned content have been taken into account.
- The overall quality of a website’s content is also dependent, among other things on the authenticity and relevance of the ‘linked’ information it provides.
- Further, it MUST be ensured that ‘broken links’ or those leading to ‘Page Not Found’ errors are checked on a regular basis and are rectified or removed from the site immediately upon discovery.

- **Privacy Policy**

Government websites should follow an extremely cautious approach when it comes to collecting personal details/information about the visitors to the sites. It should be an endeavor to solicit only that information which is absolutely necessary.

In case a Department solicits or collects personal information from visitors through their websites, it MUST incorporate a prominently displayed Privacy Statement clearly stating the purpose for which information is being collected, whether the information shall be disclosed to anyone for any purpose and to whom.

Further, the privacy statement should also clarify whether any cookies shall be transferred onto the visitor's system during the process and what shall be the purpose of the same.

Whenever a Department's website allows e-commerce and collects high risk personal information from its visitors such as credit card or bank details, it MUST be done through sufficiently secure means to avoid any inconvenience. SSL (Secure Socket Layer), Digital Certificates are some of the instruments, which could be used to achieve this.

6. Open APIs

Policy on Open Application Programming Interfaces (APIs)

Interoperability among various e-Governance systems is an important prerequisite for upgrading the quality and effectiveness of service delivery. For promoting Open Standards for software interoperability across various Government departments and agencies, GoI has already notified the “Policy on Open Standards for e-Governance” and “Technical Standards on Interoperability Framework for e-Governance”.

Open API is the API that has been exposed to enable other systems to interact with that system. Open API may be either integrated with the host application or may be an additional piece of software that exposes any proprietary API with an Open API equivalent. The Open API, whenever possible, may be free of charge and without restrictions for reuse & modifications.

The objectives of the policy are to:

- Ensure that APIs are published by all Government organisations for all e-Governance applications and systems.
- Enable quick and transparent integration with other e-Governance applications and systems.
- Enable safe and reliable sharing of information and data across various e-Governance applications and systems.
- Promote and expedite innovation through the availability of data from e-Governance applications and systems to the public.
- Provide guidance to Government organizations in developing, publishing and implementation using these Open APIs.

Government of India shall adopt Open APIs to enable quick and transparent integration with other e-Governance applications and systems implemented by various Government organizations, thereby providing access to data & services and promoting citizen participation for the benefit of the community.

The Open APIs shall have the following characteristics for publishing and consumption:

- The relevant information being provided by all Government organizations through their respective e-Governance applications shall be open and machine readable.
- All the relevant information and data of a Government organization shall be made available by Open APIs, as per the classification given in the National Data Sharing and Accessibility Policy (NDSAP-2012), so that the public can access information and data.
- All Open APIs built and data provided, shall adhere to National Cyber Security Policy.
- The Government organizations shall make sure that the Open APIs are stable and scalable.
- All the relevant information, data and functionalities within an e-Governance application or system of a Government organization shall be made available to other e-Governance applications and systems through Open APIs which should be platform and language independent.
- A Government organization consuming the data and information from other e-Governance applications and systems using Open APIs shall undertake information handling, authentication and authorization through a process as defined by the API publishing Organization.
- Each published API of a Government organization shall be provided free of charge whenever possible to other Government organizations and public.
- Each published API shall be properly documented with sample code and sufficient information for developers to make use of the API.
- The life-cycle of the Open API shall be made available by the API publishing Government organization. The API shall be backward compatible with at least two earlier versions.
- All Open API systems built and data provided shall adhere to GoI security policies and guidelines.

- Government organizations may use an authentication mechanism to enable service interoperability and single sign-on.

The policy shall be applicable to all Government organizations under the Central Government and those State Governments that choose to adopt this policy for the following categories of e-Governance systems:

- All new e-Governance applications and systems being considered for implementation.
- New versions of the legacy and existing systems.

7. Internet of Things

- **Sensor & Actuators**

- **IEEE 1451**

IEEE 1451 is a set of smart transducer interface standards developed by the Institute of Electrical and Electronics Engineers (IEEE) Instrumentation and Measurement Society's Sensor Technology Technical Committee describing a set of open, common, network-independent communication interfaces for connecting transducers (sensors or actuators) to microprocessors, instrumentation systems, and control/field networks.

- **Identification Technology**

- ISO/IEC JTC 1/SC31 Automatic identification and data capture techniques**

It develops and facilitates standards within the field of automatic identification technologies. These technologies include 1D and 2D barcodes, active and passive RFID for item identification and OCR.

- **Domain Specific Compliance:**

Sensors/IoT Devices/Actuators should follow the compliance to respective domain specific standards, like healthcare devices HL7, OBD-II, Electric Vehicle Charging etc.

- **Communication Technology**

- **Thread:**

Networking protocol called Thread that aims to create a standard for communication between connected household devices.

- **AllJoyn:**

Open source AllJoyn protocol was initially developed by Qualcomm provides tools for the entire process of connecting and maintaining devices on a Wi-Fi network.

- **IEEE 802.15.4:**

It offers physical and media access control layers for low-cost, low-speed, low-power Wireless Personal Area Networks (WPANs).

IEEE 802.15.4e-2012, IEEE 802.15.4-2011, IEEE 802.15.4-2003, IEEE 802.15.4-2006

- **IETF IPv6 over Low power WPAN (6LoWPAN):**

It defines encapsulation and header compression mechanisms that allow IPv6 packets to be sent to and received over IEEE 802.15.4 based networks.

6LoWPAN Frame Format

Fragmentation and Reassembly

Header Compression

Support for security mechanisms

- **IETF "Routing Over Low power and Lossy (ROLL):**

IPv6 Routing Protocol for Low power and Lossy Networks (LLNs) (RPL)

RPL Topology Formation (Destination Oriented Directed Acyclic Graphs - DODAGs)

RPL Control Messages

- **IETF Constrained Application Protocol (CoAP):**

It offers simplicity and low overhead to enable the interaction and management of embedded devices.

- **Use Case/ Application Specific:**

- **Industrial IoT (IIoT):** Object Modeling Group (OMG) has been active in IIoT standardization efforts. OMG IIoT standards and activities include (but are not limited to):
 - a. Data Distribution Service (DDS)
 - b. Dependability Assurance Framework For Safety-Sensitive Consumer Devices
 - c. Threat Modeling
 - d. Structured Assurance Case Metamodel
 - e. Unified Component Model for Distributed, Real-Time and Embedded Systems
 - f. Automated Quality Characteristic Measures
 - g. Interaction Flow Modeling Language™ (IFML™)

(Source: <http://www.omg.org/hot-topics/iiot-standards.htm>)
- **eHealth:** IEEE has many standards in the eHealth technology area, from body area networks to 3D modeling of medical data and personal health device communications. IEEE 11073 standards are designed to help healthcare product vendors and integrators create devices and systems for disease management.
- **eLearning:** The IEEE Learning Technology Standards Committee (LTSC) is chartered by the IEEE Computer Society Standards Activity Board to develop globally recognized technical standards, recommended practices, and guides for learning technology.
- **Consortia**
 - **Open Interconnect Consortium:**

OIC (Atmel, Dell, Broadcom, Samsung, and Wind River as members) is an open environment to support the billions of connected devices coming online.
 - **Industrial Internet Consortium:**

It was founded by Intel, Cisco, AT&T, GE & IBM with the goal of developing standards specifically for industrial use of the Internet of Things.
- **Architecture Technology**
 - **IEEE P2413: Standard for an Architectural Framework for the Internet of Things**

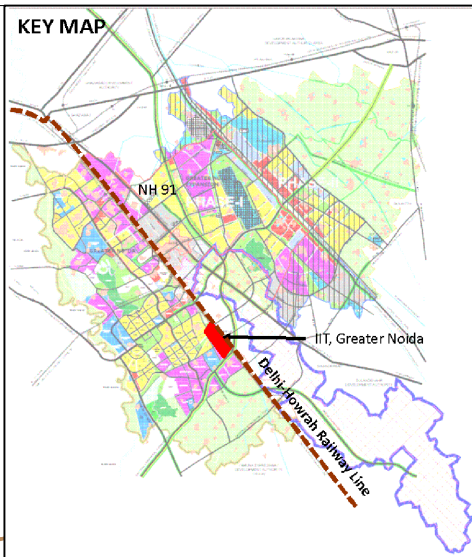
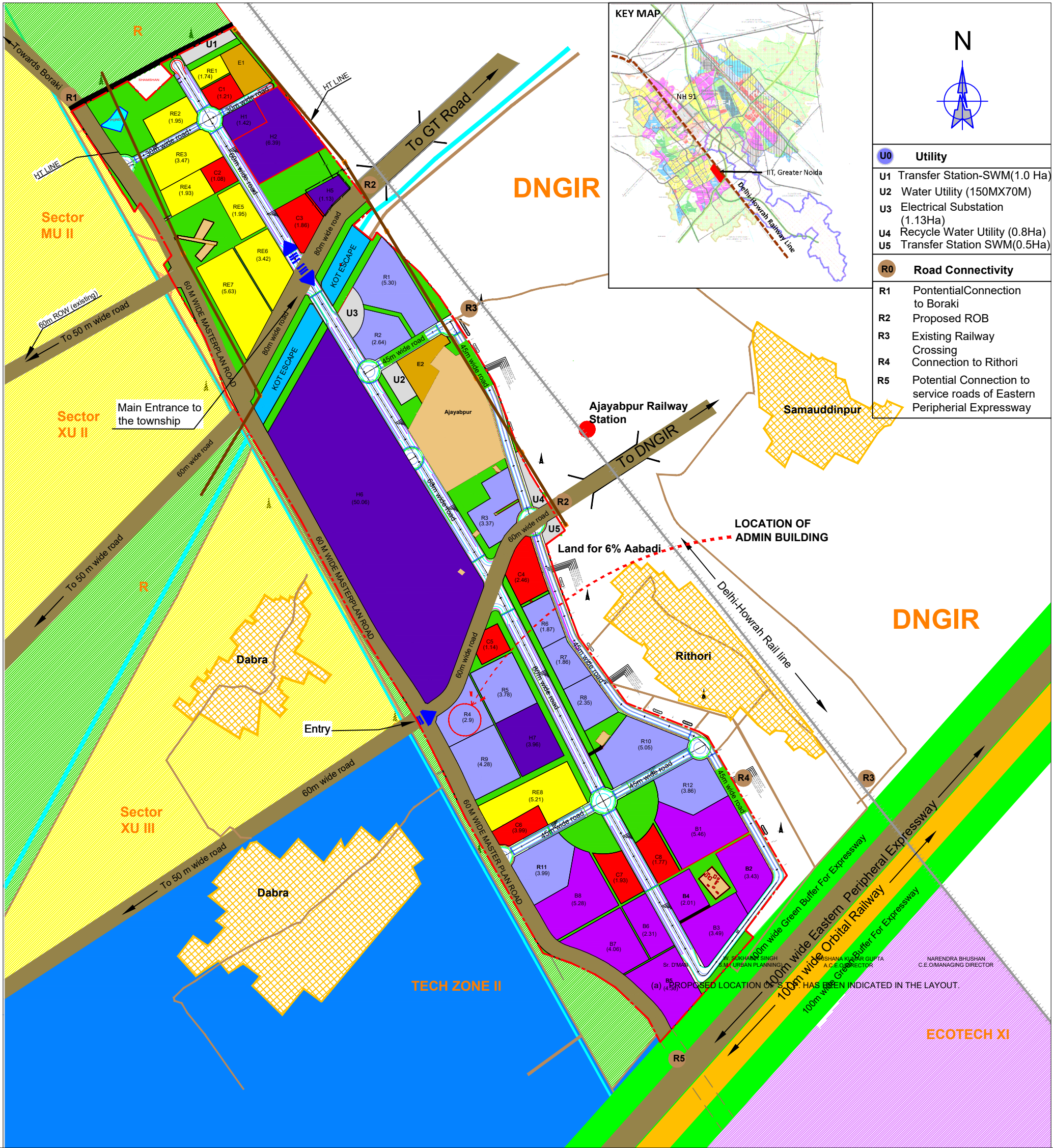
The architectural framework for IoT provides a reference model that defines relationships among various IoT verticals (e.g., transportation, healthcare, etc.) and common architecture elements.

The standard also provides a reference architecture that builds upon the reference model. The reference architecture covers the definition of basic architectural building blocks and their ability to be integrated into multi-tiered systems.
- **Further Readings for Standards**
 - **ITU Standardization Roadmap**

This document was released on 6 May 2016. It contains a collection of Standards/ITU-T Recommendations that fit into the scope of Joint Coordination Activity for IoT and Smart Cities. It includes Standards/ITU-T Recommendations related to Internet of Things (IoT), smart cities and communities (SC&C), network aspects of identification systems, including RFID (NID) and ubiquitous sensor networks (USN). Refer References for the link.
 - **IERC Position Paper on IoT Standardization:**

It presents an inventory of existing standards and provides an overview of past and current activity in relation to standardization in the area of Internet of Things, and assembles a series of examples of standardization activities in this area.

Appendix B: IIT, Greater Noida Site Layout Plan



U0 Utility	
U1	Transfer Station-SWM(1.0 Ha)
U2	Water Utility (150MX70M)
U3	Electrical Substation (1.13Ha)
U4	Recycle Water Utility (0.8Ha)
U5	Transfer Station SWM(0.5Ha)
R0 Road Connectivity	
R1	PontentialConnection to Boraki
R2	Proposed ROB
R3	Existing Railway Crossing
R4	Connection to Rithori
R5	Potential Connection to service roads of Eastern Peripheral Expressway

REVISED SITE LAYOUT PLAN FOR INTEGRATED INDUSTRIAL TOWNSHIP, GREATER NOIDA

LAND-USE DISTRIBUTION

Land Use	Area as per Revised Site Layout Plan (Ha.) 20.07.18	%age area as per revised Site Layout Plan
Industry	134.57	50.78
Hi-Tech (incl. IT)	62.96	23.76
Bio-Tech	30.36	11.46
R & D	41.25	15.57
Commercial Mixed use	15.44	5.83
Residential (Group Housing + EWS Housing)	29.50	11.13
Utilities	4.45	1.68
Green & Water Bodies	41.76	15.76
Roads	39.28	14.82
Existing Structures	-	-
Total area excluding GNIDA Roads	265.00	100.00
Total Project Area	302.63	

SURESH KUMAR Sr. D'MAN	W. SUKHABIR SINGH S.M. (URBAN PLANNING)	KRISHANA KUMAR GUPTA A.C.E.O.DIRECTOR	NARENDRA BHUSHAN C.E.O/MANAGING DIRECTOR
4.	(a) PROPOSED LOCATION OF ADMIN BUILDING HAS BEEN INDICATED IN THE LAYOUT.	APPROVED	
DEEPAI BAKSHI Sr. Mgr. (Urban Plg.)	LEENU SAHGA G.M.(Plg. & Arch.)	KRISHAN KUMAR A.C.E.O	DEEPAK AGGARWAL C.E.O
3.	Change of Location of different land-uses keeping their respective %age area intact	Revision done on 20.07.18	
2.(i)	An 18M wide road proposed for access to the adjoining village (Ghorl Bacheda). An access road of 9 mt. width proposed, resultant change in area negligible.	Approved in the 16th Board Meeting of IITGNL on 27.03.2017	
(ii)	The access to the settlement between Industrial Plots R8 and R9 earlier provided from the 45 mt. changed to 60 mt. wide road.		
(iii)	The access to the settlement in the southern part of the Township earlier being provided by a road between C9 (commercial plot) and B4 industrial plot is proposed to be converted to green belt. Proposed access provided by a road of 9 mt. width.		
1.	Approval of the Site Layout Plan of IITGN	Approved in the 100th Board meeting of GNIDA dated 04.02.2015	
S.No.	Revisions	Date	
REVISED SITE LAYOUT PLAN FOR INTEGRATED INDUSTRIAL TOWNSHIP, GREATER NOIDA (PREPARED BY ATKINS)			
100 250 500 mts		Scale: 1:10000 @ A2	Date:18/07/2018

LEGEND

Hi-tech/IT Industry	GNIDA Masterplan roads
Bio-tech Industry	IIT Internal Roads
R & D Industry	Existing Settlement roads
Commercial / Mixed Use	Area not under IIT
Residential - Group housing	Existing Structures
Residential - EWS Housing	Kot Escape Canal
Utility	Pond
Open Space / Green Buffer	HTL Tower
	HTL Line
	IIT Site Boundary
	Delhi - Howrah Rail line

DEEPAI BAKSHI Sr. Mgr. (Urban Plg.)	B.K. TRIPATHI A.C.E.O	PARTHASARTHI SENSARMA C.E.O & M.D.
DEEPAI BAKSHI Sr. Mgr. (Urban Plg.)	LEENU SAHGA G.M.(Plg. & Arch.)	KRISHAN KUMAR A.C.E.O
DEEPAI BAKSHI Sr. Mgr. (Urban Plg.)	LEENU SAHGA G.M.(Plg. & Arch.)	P.C.GUPTA A.C.E.O
		DEEPAK AGGARWAL C.E.O

Drawing No.: TCE.7504A-292-MP-6301