



**DMIC INTEGRATED INDUSTRIAL TOWNSHIP GREATER NOIDA LIMITED
NATIONAL COMPETITIVE BIDDING (NCB)**

APPOINTMENT OF MASTER SYSTEM INTEGRATOR (MSI)

FOR

**SUPPLY, IMPLEMENTATION, INTEGRATION, OPERATIONS AND MAINTENANCE OF SMART CITY
ICT COMPONENTS AT INTEGRATED INDUSTRIAL TOWNSHIP**

DMIC INTEGRATED INDUSTRIAL TOWNSHIP GREATER NOIDA LIMITED (DMIC IITGNL)

REQUEST FOR QUALIFICATION (RFQ)

CUM

REQUEST FOR PROPOSAL (RFP)

Volume III – Terms of Reference

(DMIC IITGNL/2022-23/338)

March 2023

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(DMIC IITGNL)**

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Abbreviations

Abbreviations	Definition
AAA	Authentication, Authorization and Accounting
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
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
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
BFD	Bidirectional Forwarding Detection
BGP	Border Gateway Protocol
BIFMA	Business and Institutional Furniture Manufacturers Association

Abbreviations	Definition
BIM	Building Information Modelling
BIS	Bureau of Indian Standards
BLF	Busy Lamp Field
BMP	Bitmap
BMS	Building Management System
BOOTP	Bootstrap Protocol
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
CFM	Connectivity Fault Maintenance
CIF	Common Intermediate Format
CIFS	Common Internet File Service
CCC	Command and Control Center
CIP	Construction in Progress
CLI	Caller Line Identification
CMDB	Configuration Management Database
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

Abbreviations	Definition
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 IITGNL	Delhi Mumbai Industrial Corridor Integrated Industrial Township Greater Noida Limited
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

Abbreviations	Definition
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
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

Abbreviations	Definition
FCC	File Client Cache
FCOE	Fibre Channel over Ethernet
FCR	First Call resolution
FDMS	Fibre Distribution Management System
FHD	Full High Definition
FOB	Free on Board
FOC	Fibre Optic Cable
FOP	Formatting Objects Processor
FOSC	Fibre Optic Splice Closure
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
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

Abbreviations	Definition
HRA	House Rent Allowance
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
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

Abbreviations	Definition
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
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

Abbreviations	Definition
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
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

Abbreviations	Definition
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	National Industrial Corridor
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
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

Abbreviations	Definition
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
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

Abbreviations	Definition
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
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

Abbreviations	Definition
RTA	Regional Transport Authority
RTC	Real Time Clock
RTF	Rich Text Format
RTGS	Real Time Gross Settlement
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
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

Abbreviations	Definition
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
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

Abbreviations	Definition
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
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

Abbreviations	Definition
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 National Industrial Corridor (NIC) 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 NIC. Hence, under the Influence Region, National Industrial Corridor Development and Implementation Trust (NICDIT) 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. NICDIT with the development of NIC 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:

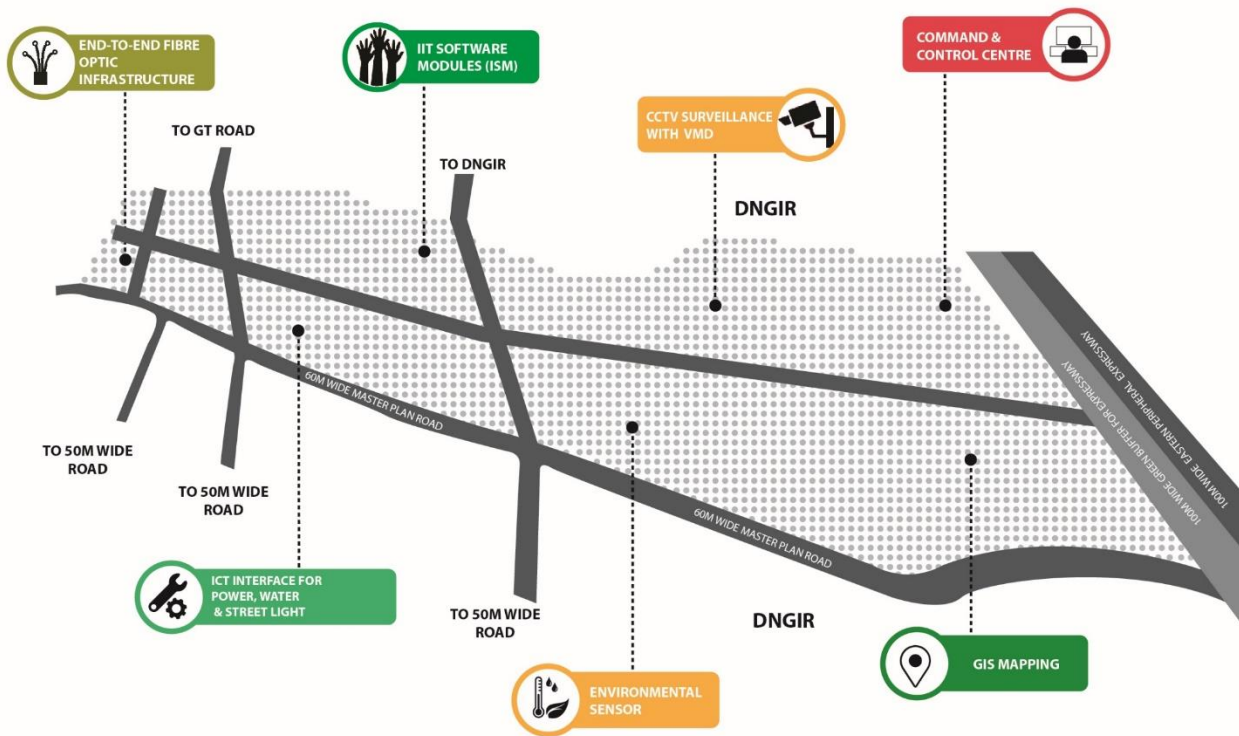


Exhibit 1: Smart City ICT Components

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, fibre optic backbone 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.

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 S for the implementation of the Project and for integrating their services with the overall ICT solution. It will be the purview of the MSI to obtain all APIs/interface required for ensuring successful integration of this Project in-line with the requirements of this RFQ cum RFP.

2 Project Overview and Components

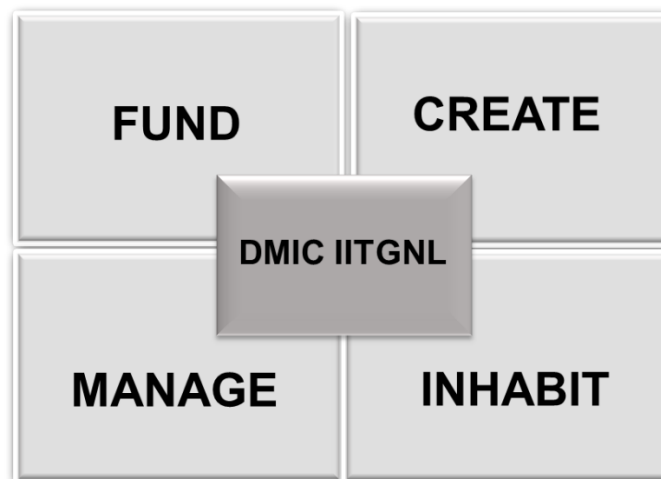
DMIC IITGNL intends to implement a greenfield industrial smart city called IIT. As one of the key initiatives for realizing this vision, DMIC IITGNL plans to implement a state-of-the-art ICT infrastructure along with various components for IIT as part of this Project. At the centre of the Project is the Command and Control Center (CCC) which will be the nerve centre for the city. All applications and sensors installed as part of IIT will be integrated at the CCC and will be monitored/controlled from this common location. The CCC 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 CCC using either wired or wireless communications. The wired communications i.e. field devices and sensors will be connected over a fibre optic based infrastructure which will be deployed throughout the Project area. It is desired that with this Project, an overall Fibre-to-the-X (FTTX) architecture is implemented for all field device connectivity.

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. 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. 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. As part of the scope, all applications, with the exception to video data, shall be hosted on cloud. Further, some other department specific applications shall be deployed as part of this Project.

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 CCC for cohesive monitoring as part of this SoW.

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;

- 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, streetlights 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, 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 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.. Various functions under managing the city are as under:

- Monitor key performance indicators;
- Operate and Manage Infrastructure Services;
- Command and Control Centre Driven services delivery mechanism;
- 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.
CCTV Surveillance System	<ul style="list-style-type: none"> • CCTV surveillance system for proactive monitoring of strategic areas and infrastructure across the City. • Variable Message Displays (VMD) to display important city information to citizens via digital screens.
IITGNL Software Modules (ISM)	IITGNL 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. This also includes an integrated GIS based system. ISM system shall enable DMIC IITGNL to have efficient business processes that can be managed in an integrated manner.
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.
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.

COMPONENT	PROJECT REQUIREMENT
Command and Control Center (CCC)	All city infrastructure and systems deployed as part of IIT will be integrated at CCC 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.

MSI is required to adhere to the following Government notifications:

- Order No. P-45021/2/2017-PP (BE-II) issued by Department for Promotion of Industry and Internal Trade (DPIIT) under Ministry of Commerce and Industry, Government of India, dated, 04th June 2020.
- Office Memorandum No. F. No. 6/ 18/2019 – PPD issued by Public Procurement Division, Department of Expenditure, Ministry of Finance, Government of India, dated, 23rd July 2020.

In addition to the above, the Intellectual Property Rights (IPR) of the software components provided as part of this RFQ cum RFP preferably should not reside in Country sharing Land Border with India. OEM must provide with a Declaration, which the Bidder must certify and take ownership, about the Intellectual Property Rights (IPR) & Source Code Residence/Filing in the respective Country as a Documentary Evidence, if asked by the Client or its representative.

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

COMPONENT	PROJECT REQUIREMENT
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 CCC and ISM and complete coordination with the EPC Contractor and Electrical Contractor shall be the responsibility of this MSI. MSI shall be responsible to validate availability of APIs or any other interface required to enable successful integration of this project. As required, MSI shall provide

COMPONENT	PROJECT REQUIREMENT
	these required interfaces to enable successful integration of all EPC infrastructure with the CCC.
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 CCC. This also includes coordination and integration with the EPC Contractor for enabling Waste Collection System integration with CCC.
Power Discom	DMIC IITGNL has appointed Noida Power Company Limited (NPCL) as the Power Discom for electricity distribution at IIT. MSI shall work in close coordination with Power Discom for integrated SCADA at CCC and fibre optic infrastructure installation inside Ring Main Unit (RMUs) Rooms, if required.
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, where applicable.

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 0	D + 3 Months	<ul style="list-style-type: none"> E-Mail solution and Messenger Setting up of Cloud hosting infrastructure along with security architecture e-LMS Migration and hosting on cloud infrastructure. Implementation of Environmental Sensor Go-Live of GIS Platform Setting of Command and Control Centre (CCC) (Physical Infrastructure) Implementation of water billing system
Phase 1	D + 4 months	<ul style="list-style-type: none"> Setting up of EMS for SLA monitoring Setting up for DMIC IITGNL Office IT infrastructure Completion of Mini PoP at Utility Building. Fibre Connectivity – 50% Implementation of BoQ items. CCTV surveillance with VMDs – 50% implementation of BoQ items. Implementation of Smart City Platform along with Integration of Surveillance, GIS and Water Utility Billing System

PHASE	TIMELINE	PROJECT COMPONENTS
Phase 2	D + 6 months	<ul style="list-style-type: none"> Fibre Optic Infrastructure – 100% Implementation of BoQ items CCTV surveillance with VMDs – 100% implementation of BoQ items. 100% completion of remaining IIT Software Modules (ISM) Command and Control Centre (CCC) – 100% implementation 100% integration of system provided by third party systems (power,, AWCS, streetlight) at CCC. 100% completion of any other components
End to end Go – Live (Operational Acceptance of the Project)	D + 7 month	<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 of the entire system. Handover of Final As-Builts, Training manuals, Maintenance manuals, User manuals etc.
Comprehensive Maintenance / AMC Phase	D + 43 months	<ul style="list-style-type: none"> Defect Liability Period/Warranty Phase. Post Warranty Service Phase.
<p>Note –</p> <ul style="list-style-type: none"> Every phase will have activities involved for integration amongst various ICT components and integration with EPC Contractor, Electrical Contractor and other SCADA works with CCC and ISM. EMS for SLA monitoring shall integrate modules as soon as they become operational. Dashboards shall integrate modules as soon as they become operational. All modules shall also integrate with GIS and Web GIS as soon as they become operational. The Client may decide to change the priority of implementation as per the requirement of the Project and the MSI shall support these endeavours. 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 is envisioned to have an end-to-end fibre optic infrastructure with an overall FTT-X architecture for all its services. This infrastructure will be used for DMIC IITGNL services. 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 one 1 PoP facility (Mini-PoP) shall be provided for co-location of equipment and fibre optic termination for DMIC IITGNL needs. The second POP will be collocated at the Command and Control Centre room, which will act as the Primary POP.
- From this PoP facility, 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. This shall be provided in a dual homed ring configuration. It is envisioned that in case of downtime of Primary PoP, services can be resumed from mini PoP.
- The last layer for communications will be the access layer i.e. connectivity to field device that will be provided from the access network through drop fibre from distribution network.
- 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;

2.2.1.1 Backbone 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 Mini POP and CCC. Mini PoP will be housed at site location while the Primary POP shall be at the Control Centre building.

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 end-devices.

The distribution network will provide end-to-end connectivity to the field devices. It is planned to lay down 1x48 count fibre cable for field devices.

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, traffic monitoring and other field devices.

2.2.1.5 Point of Presence (POP)

Point-of-Presence (PoP) rooms are where all DMIC IITGNL city services shall originate/terminate. There will be one (1) primary PoP and one (1) Mini PoP proposed at geographically distributed location across IIT. The PoPs shall have dedicated space DMIC IITGNL services.

The PoPs shall be categorized and sized as follows:

- One (1) Primary PoP which shall be in the Control Centre. Rack room or Server Room at Control Centre will act as the PoP for co-location of DMIC IITGNL equipment.
- One (1) Mini PoP: Approximate area of 100 sq. ft. (Building Area) will be for Mini PoP. The Mini PoP will act as a redundant site for Primary PoP in case of downtime. It is expected that Mini PoP will be inside an existing utility building.

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.

2.2.1.6 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 Mini PoP. Distribution layer shall be connected with core and access network/layer in dual homed ring architecture. (i.e. Primary PoP to Mini PoP and Mini PoP to CCC i.e. 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 etc.; and
- **Last Mile Layer:** In this layer, field devices shall be connected with Access layer switch in linear connectivity.

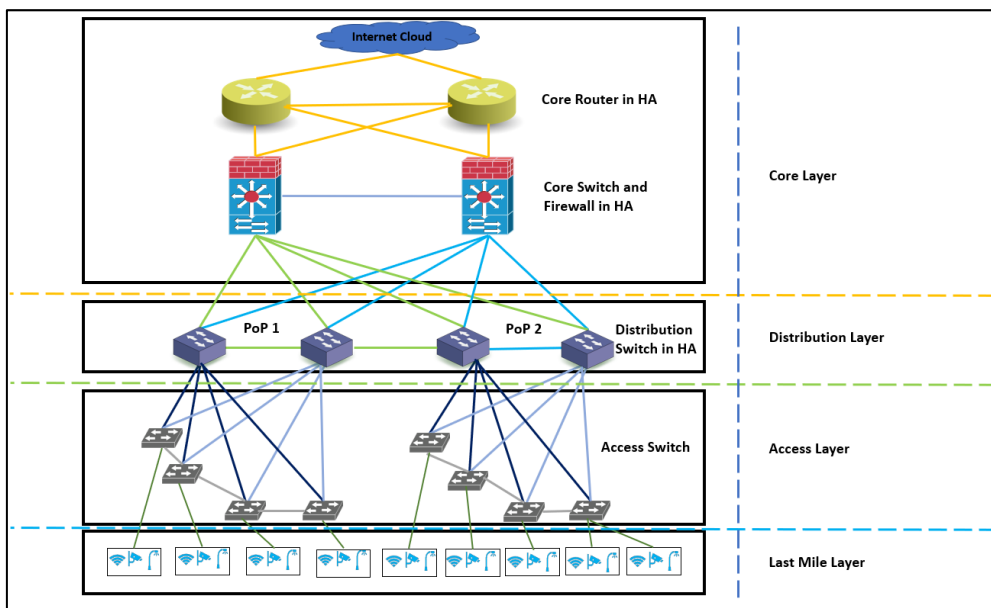


Exhibit 2: Overall Network Architecture

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 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.

Access Layer

Access layer consist of multiple field 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 layer switches will also be installed at rotaries and other project areas inside cabinets in order to connect field devices.

Field Devices

Field devices shall consist of CCTVs, Variable Message Displays, Environmental sensors, and any other device as applicable. These devices will be connected to the field switch.

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 for the IIT smart city network within the IITGNL campus.
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.
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 DMIC IITGNL network. Each of these PoPs shall be connected over a dedicated high-speed backbone network that will support a 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 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.
BR 1.6	Manholes and handholes shall be placed at strategic locations for the fibre optic infrastructure throughout the DMIC IITGNL RoW. 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. As per space requirement, ICT trench can also be leveraged for co-locating FOSC. However, MSI is required to maintain aesthetic and space inside ICT trench while installing FOSC.
BR 1.7	Manholes shall be provided at splice location (wherever required) which shall cater to current and future splice requirements.
BR 1.8	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 1.9	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 1.10	DMIC IITGNL network shall be reliable, interoperable, open standards based, available and resilient. It shall be scalable, manageable, supporting segregation of traffic and sustainable.
BR 1.11	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.

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 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 1.2m x 1.0m (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 inside 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	There are two (2) types of ducts for fibre optic laying to fulfil the connectivity of the ICT infrastructure: <ul style="list-style-type: none"> • 1x40mm (OD) HDPE ducts for backbone, distribution and access infrastructure; 1x40mm (OD) HDPE duct for last mile connectivity;
FR 1.12	The tentative colour allocation for the backbone/distribution ducts are: <ul style="list-style-type: none"> • 1x40mm orange for Distribution Network. • 2x40mm blue for backbone; and • 1x40mm aqua for access and last mile connectivity.
FR 1.13	All HDPE ducts shall be colour coded as per EIA/TIA 598 standard.
FR 1.14	For field device connectivity, each device shall have dedicated 1x40mm HDPE duct for last mile network. It shall be responsibility of MSI for all works including trenching and civil works for last mile connectivity.
FR 1.15	The duct shall have in-built crush and rodent protection chemical at outer sheath of every duct.
FR 1.16	HDPE Duct should have "DMIC IITGNL" marked at every 1 mtrs.
FR 1.17	For Utility Plots, Manhole, Handhole and open trench along with FOSC etc. will be in the scope of MSI.
FR 1.18	MSI shall be responsible for the infrastructure related to entry/exit of Admin Building and Mini PoP,
OPTICAL FIBRE CABLE	
FR 1.19	The DMIC IITGNL fibre optic network shall have an overall Fibre-to-the-X (FTTX) architecture.
FR 1.20	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 1.21	All fibre optic cable shall be ordered in standard tube and colour configuration based on EIA/TIA 598.
FR 1.22	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 1.23	For distribution to 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 network switch. It is expected that the field devices like CCTV will share the same poles and will be connected over a ring architecture. All 48-count distribution fibre shall be ordered with fibre in eight (8) tubes with 6 count per tube.
FR 1.24	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 1.25	Outdoor-rated Unshielded Twisted Pair (UTP) Communications Category (CAT) 6 Cable to provide Ethernet connectivity between network switches and end devices such as CCTV etc. located within 90 m from the switch location.
FR 1.26	The UTP cable shall be outdoor-rated Anti-Rodent double PE sheath Cable UTP CAT 6 cable.
FR 1.27	Wherever installed, the UTP cables shall be supplied with either in-built surge suppressor or shall have additional surge suppressors.
FR 1.28	Each conductor of the UTP cable shall be insulated with a coloured high density polyethylene jacket with varying twisted length to minimize crosstalk.
FR 1.29	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 1.30	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 1.31	The surge arrestor shall be such that they do not interfere with normal communications.
FR 1.32	The termination shall protect the cable terminations from water and mechanical damage and shall be resistant to salt corrosion.
FR 1.33	Any provided patch panel or wall plate shall provide mechanical support for all connections enclosed and shall maintain insulation between them.
FR 1.34	All cable entries shall be provided with appropriate cable pathway.
FIBRE OPTIC ACCESSORIES	
FR 1.35	Optical Connectors: Optical connectors shall be used to terminate optical fibre for their interconnection and distribution.
FR 1.36	Fibre Patch cords: Fibre Patch cords shall be used to connect Fibre Termination Panel to the network switch.
Fibre Distribution Management System (FDMS)/Optical Cable Entrance Facility (OCEF) and Fibre Termination Panels	
FR 1.37	OCEF/FDMS shall be installed at the PoPs and shall be used to manage all fibre entry/exit inside all POPs.
FR 1.38	The OCEF/FDMS shall be equipped with splice trays to accommodate the requirement of this Project.
FR 1.39	The OCEF/FDMS shall have built in slots to secure fibre and management clips to hold spools of slack fibre.
FR 1.40	The OCEF/FDMS shall have identification labels inside the door.
Fibre Optic Patch Panel	
FR 1.41	Fibre Optic Patch Panels shall be installed at termination location at PoP and at every field switch location installed on the pole or cabinet.
FR 1.42	The Patch panels shall be capable of supporting SC/ST/LC type ports for backbone, distribution and access network.
FR 1.43	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.
ACTIVE ELECTRONICS (SWITCHES, MEDIA CONVERTERS)	
FR 1.44	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 1.45	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).
FR 1.46	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 1.47	Core router for connectivity to the outside world i.e. for worldwide web services and for connectivity to the cloud service provider.
FR 1.48	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 1.49	The switches from any one vendor shall be interoperable with other brands.
FR 1.50	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 1.51	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 1.52	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 1.53	The proposed solution shall provide at a minimum the following functions: <ul style="list-style-type: none"> • Configuration Management; • Fault Management; • Incident, Problem and Change Management; • Asset Management; • Remote Control; • SLA Management & Monitoring; • 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 1.54	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 1.55	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. t shall support a minimum of 1000 end points at day 1 and shall be scalable up to 2500 end points to cater future requirements.
FR 1.56	The proposed solution should include all hardware and software required to configure, control and monitor the network connected SNMP/ICMP based devices.
FR 1.57	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 1.58	The proposed solution shall provide discovery & inventory of physical network devices and other IP devices.
FR 1.59	The proposed solution shall be able to generate utilization of physical as well as virtual servers.
FR 1.60	The proposed system shall be able to perform real-time or scheduled capture of device configurations.
FR 1.61	The proposed system shall also provide features to capture, view & upload network device configuration.
FR 1.62	The proposed system shall be able to auto-discover the network including the network elements.
FR 1.63	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 1.64	The proposed system shall include the ability to download software loads, activate new software loads, or get information about the active software load).
FR 1.65	The EMS shall have a help desk which shall be a web enabled management system with SMS and email based alert system for the Helpdesk Call management and SLA reporting.
FR 1.66	Help desk facility shall also be provided through Toll-free lines, landlines, helpdesk tool, E-mail, direct walk-in etc.
FR 1.67	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 1.68	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 1.69	Help desk shall analyze the incident / call statistics and provide monthly reports.
POINT OF PRESENCE (POP)	
FR 1.70	PoP facilities are co-location spaces for DMIC IITGNL infrastructure.
FR 1.71	POP shall be telecommunications grade facilities built for 24x7 operations.
FR 1.72	CCC 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. The exact location of the CCC shall be finalized during the course of the implementation of the project. It will either be at the GNIDA office in Greater Noida or on-site. MSI shall be flexible in terms of its design and implementation to accommodate this requirement of location of CCC at no additional cost to the Client.
FR 1.73	Mini PoP will serve as the termination point for distribution fibre network as well as nodes on the core backbone communications ring that supports intra-PoP communication.
FR 1.74	Mini PoP will be housed inside existing Utility Building. A suitable room inside existing building shall be prepared for Mini PoP operations.
RODENT REPELENT SYSTEM	
FR 1.75	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 in IIT. They will be used for backbone, distribution and access communications (as required).
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 coilable 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 waterproof 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	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: <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	All the duct shall be clearly marked with indelible ink at intervals of 1 meter 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: <ul style="list-style-type: none"> • DMIC IITGNL with logo; • Manufacture's name or trade mark;

	<ul style="list-style-type: none"> • 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 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	The Duct shall be installed in a bundle of Two (2), as applicable, 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 HDPE Duct. Last mile access connectivity between ICT trench till respective RMU rooms, PoPs, Admin building, field devices 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 lifetime 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.
<p>Testing: Following testing specific to HDPE duct shall be met. For other testing requirements, refer to the testing section.</p>	
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.

	<ul style="list-style-type: none"> 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	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.
Following tests are to be carried out on the laid HDPE duct:	
TR 1.53	Duct Cleaning (Sponge Test): <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	Crush and Deformity Test: <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. 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	Pressure Testing: <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.
MANHOLE	
TR 1.57	Manholes shall be placed at strategic location finalised as per the approved OFC network drawing prepared by MSI.
TR 1.58	MSI shall be responsible to prepare the manhole drawing & take the approval from client, before starting execution at site.
TR 1.59	Manhole(s) shall be capable of withstanding the required load based on the actual site conditions.
TR 1.60	The top of manhole should be flushed with the ground level.
TR 1.61	The manholes shall be placed on properly compacted surface to ensure uniform distribution of soil pressure on floor.
TR 1.62	Manhole shall be precast RCC square type with minimum wall thickness of 100mm and shall include 6mm diameter or more steel reinforcement.

TR 1.63	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 1.64	The manhole shall have suitable excess from cable trench and sufficient holes/ cutouts in all walls for PLB HDPE duct entries and exits.
TR 1.65	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 1.66	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 1.67	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 1.68	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 1.69	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 1.70	Manholes shall have capabilities to absorb water as per ASTM 570 or applicable BIS standards.
TR 1.71	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 1.72	Handholes shall be placed at strategic location finalised as per the approved OFC network drawing prepared by MSI.
TR 1.73	The handholes shall be sized per minimum 0.5m x 0.5m x 0.5m (l x w x d) inside clear space.
TR 1.74	The product shall meet or exceed the following American Society for Testing and Materials (ASTM) Standards: <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; • 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 and • ASTM C 1028: Standard Test Method for Determining the Static Coefficient of Friction.
TR 1.75	Handholes shall be made of medium duty HDPE with Polymer Concrete Lid.
TR 1.76	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 1.77	<p>The boxes, rings and lids shall meet the physical and chemical requirements listed in Table:</p> <table border="1"> <thead> <tr> <th colspan="3">Physical and Chemical Properties of Handhole components</th> </tr> <tr> <th>Property</th> <th>ASTM</th> <th>Test Value</th> </tr> </thead> <tbody> <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> </tbody> </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 1.78	Holes for keeping service loops of duct shall be of suitable height and direction as per the Project requirements.																					
TR 1.79	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 1.80	All lids shall be manufactured with the markings "DMIC IITGNL" in the logo area of the lid, in 25 mm recessed letters.																					
TR 1.81	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 1.82	Bolts used on handholes and lids shall be stainless steel, recessed hex head bolts with washer.																					
TR 1.83	The top of handhole shall be flushed with the ground level.																					
TR 1.84	All PLB HDPE duct entries, cable entries and holes shall be properly sealed.																					
TR 1.85	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 1.86	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 1.87	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 1.88	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 1.89	<p>The HDPE manholes shall have following markings provided on each unit:</p> <ul style="list-style-type: none"> • Code of product; • Name of Manufacturer; • Date of manufacturing; and • Named as 'DMIC IITGNL OFC HANDHOLE'. 																					
OPTICAL FIBRE CABLE (OFC) OR FIBRE OPTIC CABLE (FOC)																						
The Single mode optical fibre shall meet or exceed the following industry standards:																						
TR 1.90	ITU-T G.652-D Characteristics of a single-mode optical fibre and cable.																					
TR 1.91	ANSI/ICEA S-87-640-1999 - Standard for Optical Fibre Outside Plant.																					
TR 1.92	All applicable TIA/EIA standards for single mode fibre cable and those listed in these technical requirements.																					
TR 1.93	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 1.94	The single mode optical fibre shall enable dual operating wavelengths at 1310nm and 1550nm nominal. The optical fibre shall be non-dispersion shifted.																					

TR 1.95	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 1.96	The single mode optical cable shall have the cladding diameter = 125.0µm ±1.0 and Mode Field diameter = 9.0µm ± 0.4.
TR 1.97	The single mode optical cable shall have polarization mode dispersion (PMD) coefficient ≤ 0.2 at 1310nm.
TR 1.98	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 1.99	When Optical Time Domain Reflectometer (OTDR) is used, measurements shall be made from both directions and the results shall be averaged.
TR 1.100	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 1.101	The Chromatic Dispersion of single mode fibre shall be measured in accordance with EIA-455-175 or EIA-455-168 or any other latest applicable ITU-T or ANSI/TIA standard.
TR 1.102	The cut-off wavelength of cabled fibre shall be less than 1260 nm. The wavelength shall be measured according to EIA-455-170 or any other latest ITU-T or ANSI/TIA standard.
TR 1.103	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 1.104	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 1.105	Fibre optic cable shall be able to withstand a pulling tension of at least 2500N without any resulting damage.
TR 1.106	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 1.107	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 1.108	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 1.109	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 1.110	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 1.111	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 1.112	Packing List supplied with each drum shall have at least following information: <ul style="list-style-type: none"> • Drum No.; • Type of cable; • Physical length of cable; • No. of Fibre;

	<ul style="list-style-type: none"> 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 1.113	<p>All the cable shall be clearly marked with indelible ink at intervals of 1 meter 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 1.114	<p>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.</p>
TR 1.115	<p>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.</p>
TR 1.116	<p>The cabled optical fibre shall maintain mechanical and optical integrity through an operational temperature range of 0°C to +70°C.</p>
TR 1.117	<p>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.</p>
TR 1.118	<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 1.119	<p>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.</p>
TR 1.120	<p>Lightning withstand current shall comply with Telcordia GR-20 standards.</p>
TR 1.121	<p>A sheath slitting cord is required for each sheath.</p>
<p>Installation Requirements:</p>	
TR 1.122	<p>The outer jacket of the cable shall be fungus inert and shall be suitable for long term exposure to sunlight and weather.</p>
TR 1.123	<p>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.</p>
TR 1.124	<p>A 10 m slack per cable in every Trench/Manhole or other location shall be placed along the fibre optic cable route as per DMIC IITGNL requirement.</p>
TR 1.125	<p>Each length of cable shall be wound on a separate cable reel.</p>
TR 1.126	<p>Suitable mechanical pulling aids shall be deployed to ensure that the maximum pulling tension is not exceeded at any time during the installation.</p>
TR 1.127	<p>Tags shall be installed at all cable end points (manholes, etc.).</p>

TR 1.128	The cable shall be neatly dressed, labelled and organized.
Testing: Following testing specific to fibre optic cable shall be met.	
TR 1.129	<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 1.130	<p>Pre-Installation Testing Requirements:</p> <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 1.131	<p>Post-Installation Testing Requirements:</p> <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 1.132	<p>Mechanical Testing Requirements:</p> <p>The cable shall meet the following test requirements without physical damage to the cable and/or cable components and without degradation of optical transmission.</p>
TR 1.133	<p>Crush and Impact Test (Outdoor Cable):</p> <p>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 or any other latest applicable IEC standard. 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.</p>
TR 1.134	<p>Twist and Flexibility Test:</p> <p>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 or any other latest applicable IEC standard. 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.</p>
TR 1.135	<p>Water Ingress Test:</p> <p>A water ingress test shall be carried out on a sample of cable according to the requirements of EIA-455-82A/IEC 794 or any other latest applicable IEC standard. No water shall leak through the open end of the 3.0m test sample.</p>

TR 1.136	<p>Certificates and Proof of Factory Testing:</p> <p>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.</p>
TR 1.137	<p>General:</p> <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 1.138	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 1.139	A non-hygroscopic dielectric tape shall be wrapped around the insulated pairs.
TR 1.140	A tight fitting black polyethylene jacket shall be extruded over the conductors.
TR 1.141	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 1.142	The cable shall have a water repellent filled core and shall have a sunlight and weather resistant jacket of polyethylene (e.g. XLPE/HDPE/MDPE). MSI shall propose solution to meet the requirements of the RFQ cum RFP for fulfilling this particular requirement.
TR 1.143	The cable shall have a guaranteed transmission performance up to 250 MHz.
TR 1.144	The cable shall have characteristic impedance of 100 ± 15 (Ohms).
TR 1.145	Materials used in the cable shall not support galvanic action.
COPPER PATCH CORDS	
TR 1.146	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 1.147	Patch cords shall be terminated with 8-pin 8-conductor "RJ-45" style connectors.
TR 1.148	Pre-fabricated patch cords shall be supplied in individual packages.
TR 1.149	All cabling and connectors shall be in accordance with ANSI/TIA/EIA-568-B or any other latest applicable ANSI/TIA/EIA standard.
COPPER PATCH PANEL	
TR 1.150	The copper communication cable shall be terminated at the associated patch panel or field device.
TR 1.151	The patch panels shall be sized to support the design requirements.
TR 1.152	The standard termination is to be according to ANSI/TIA/EIA-568A.
TR 1.153	The termination shall protect the cable terminations from water and mechanical damage and shall be resistant to salt corrosion.
TR 1.154	All material of the termination and associated mounting accessories shall be non-reactive and the complete assembly shall not support galvanic cell action.
TR 1.155	All cable entries shall be provided with appropriate cable pathway.

TR 1.156	Any provided patch panel or wall plate shall provide mechanical support for all connections enclosed and shall maintain insulation between them.
TR 1.157	Connectors shall be sealed water resistant and shall accommodate the #23 AWG gauge solid conductors. Insulation displacement terminal lugs are permitted.
SURGE SUPPRESSOR	
TR 1.158	Wherever installed, the UTP cables shall be supplied with either in-built surge arrestor or shall have additional surge suppressors.
TR 1.159	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 1.160	The surge suppressors shall be such that they do not interfere with normal communications.
FIBRE OPTIC SPLICE CLOSURE (FOSC)	
TR 1.161	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 1.162	Fibre Optic Splice Closures shall be IP 68 rating.
TR 1.163	Be re-enterable without the use of additional parts or special materials.
TR 1.164	Not require special tools to enter or assemble.
TR 1.165	Be constructed of non-corrosive materials.
TR 1.166	Have a life expectancy of at least 25 years.
TR 1.167	Be capable of storing up to 3.0m lengths of expressed buffer tubes.
TR 1.168	Accommodate splice organizers which accept heat-shrink fusion protectors or splice protection packs.
TR 1.169	Have provisions for storing Fibre splices and un-spliced Fibre/buffer tubes.
TR 1.170	Be non-filled (no encapsulating material) to prevent water intrusion.
TR 1.171	Meet all performance standards over the operating temperature range of 0°C to +60°C.
TR 1.172	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 1.173	The optical connectors shall comply with Telcordia GR-326-CORE, NWT, American Society for Testing and Materials (ASTM), Telecommunications Industry Association (TIA), ANSI as well as Underwriters Laboratories for flammability tests.
TR 1.174	Optical connectors shall conform to the following standards at a minimum: <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;

	<ul style="list-style-type: none"> Adapters available to mate with other connectors; Insertion Loss < 0.2 dB; Return Loss > -50dB; 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 1.175	<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 1.176	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 1.177	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 1.178	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 1.179	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 1.180	The 1U Rack mount module provides slack storage space for Loose tube Fibre
TR 1.181	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 1.182	The module shall be easily opened and closed without any degradation
TR 1.183	The shelves should have slides upon which the Splice Tray Assembly & Patch Panel is placed
TR 1.184	Fully loaded configuration along with pigtails and adaptors
TR 1.185	Identification mechanism of incoming and outgoing cables/pigtails/patch cords and adaptors shall be provided.
TR 1.186	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 1.187	<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.

TR 1.188	It shall be possible to fix the fibre splicing cum patching shelf on the 19" rack, with mounting screws and nuts.
TR 1.189	Splice Trays shall be easily flipped at an angle of 90 degrees based on the hinge clip.
TR 1.190	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 1.191	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 1.192	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 1.193	The splicing Tray shall be non-metallic and made of ABS Blend material.
TR 1.194	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 1.195	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 1.196	The Patch panels shall adhere to Telecordia GR-449 Core or equivalent specifications.
TR 1.197	The Patch panels shall be capable of supporting SC/ST/LC type ports.
TR 1.198	The Patch panels shall include the mounting hardware for EIA/TIA standard racks as per rack requirements.
TR 1.199	The Patch panels shall provide a minimum of four cable entry points.
TR 1.200	The Patch panels shall support rings to maintain minimum fibre bending radius, and to prevent accidental physical damage.
TR 1.201	The Patch panels shall provide physical protection for the individual fibres.
TR 1.202	The Patch panels shall provide terminating facilities for fibre optic connectors, including the through adapter.
TR 1.203	The Patch panels shall provide a lockable compartment in which fusion splice trays are housed which is separate from the fibre patching area.
TR 1.204	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 1.205	Please refer to the Communication Cabinets with Racks specifications mentioned under IT Infrastructure specification Section 2.2.5.3
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 1.206	The Industrial Grade Switch installed at the field shall have at least eight (8) 1000BaseTX ports and 4 X 1 G fibre ports for backhaul (uplink) connectivity. The PoE/PoE+ feature may also be provided via industrial grade PoE/PoE+ injectors for these switches.
TR 1.207	The copper ports shall support PoE / PoE+.
TR 1.208	The industrial grade switches shall support a MAC table size of up to 4000 addresses.

TR 1.209	The industrial grade switches shall at a minimum carry IP30 rating.
TR 1.210	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 1.211	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 1.212	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 1.213	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 1.214	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 1.215	Modular architecture or standalone fixed switch with required interfaces from day one.
TR 1.216	Shall have redundant power supply and fans
TR 1.217	Shall have line rate performance
TR 1.218	Shall have minimum 600 Gbps of switching throughput.
TR 1.219	Shall have up to 600 Mpps of switching capacity
TR 1.220	Switch should be supplied with minimum 4 x 10 G fibre/copper port from day 1
TR 1.221	Switch should be supplied with minimum 24 x 1G/ SFP fibre port
TR 1.222	SFP/SFP+/XFP/QSFP/Optical modules to be provided as per the solution design by MSI
Performance:	
TR 1.223	Switch should support 56K IPv4 Routing entry
TR 1.224	Switch should support IPv6 28K Routing entry
TR 1.225	Switch should support minimum 4K Multicast Routing entry
TR 1.226	Switch should support 16K MAC addresses
Resiliency:	
TR 1.227	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 1.228	IEEE 802.1D Spanning Tree Protocol, IEEE 802.1w Rapid Spanning Tree Protocol and IEEE 802.1s Multiple Spanning Tree Protocol

TR 1.229	IEEE 802.3ad Link Aggregation Control Protocol (LACP)
Layer 2 Features:	
TR 1.230	Shall support up to 4,000 port or IEEE 802.1Q-based VLANs
TR 1.231	Shall have the capability to monitor link connectivity and shut down ports at both ends if uni-directional traffic is detected, preventing loops
TR 1.232	Shall support Jumbo frames on GbE and 10-GbE ports
TR 1.233	Internet Group Management Protocol (IGMP)
TR 1.234	IEEE 802.1AB Link Layer Discovery Protocol (LLDP)
Layer 3 Features (any additional licenses required shall be included):	
TR 1.235	Static Routing for IPv4 and IPv6
TR 1.236	Policy-based routing
TR 1.237	Dynamic Host Configuration Protocol (DHCP) client, Relay / server
QoS and Security Features:	
TR 1.238	Access Control Lists for both IPv4 and IPv6 for filtering traffic to prevent unauthorized users from accessing the network
TR 1.239	Port-based rate limiting and access control list (ACL) based rate limiting
TR 1.240	IEEE 802.1x to provide port-based user authentication with multiple 802.1x authentication sessions per port
TR 1.241	Media access control (MAC) authentication to provide simple authentication based on a user's MAC address
TR 1.242	Dynamic Host Configuration Protocol (DHCP) snooping for security
Management Features:	
TR 1.243	Configuration through the CLI, console, Telnet, SSH or Web Management
TR 1.244	SNMPv1, v2, and v3 and Remote monitoring (RMON) support
TR 1.245	Should support Streaming Telemetry, Netflow/ Sflow/ Jflow, SPAN, RSPAN or equivalent
TR 1.246	Management security through multiple privilege levels with password protection
TR 1.247	FTP, TFTP support.
TR 1.248	Port mirroring to duplicate port traffic (ingress and egress) to a local or remote monitoring port.
TR 1.249	RADIUS/TACACS+ for switch security access administration
TR 1.250	Network Time Protocol (NTP) or equivalent support
Environmental Features:	
TR 1.251	Shall provide support for RoHS/ WEEE
TR 1.252	Shall be capable of supporting AC / DC Power inputs
TR 1.253	Operating temperature of 0°C to 40°C
TR 1.254	Safety and Emission standards including UL 60950-1; IEC 60950-1; VCCI Class A; EN 55022/ 55032 Class A
Additional Requirement:	
TR 1.255	Switch should support IPv4 & IPv6 from day1.
Ethernet Switch & Router – Layer 3	
CORE SWITCH	

Architecture:	
TR 1.256	Modular architecture or fixed form architecture, with necessary redundancy for Fan and Power supply
TR 1.257	Switch should have Redundant Power Supply and Fans
TR 1.258	The Switch should support non-blocking architecture, all proposed line cards/transceivers must provide wire speed line rate performance
TR 1.259	The switch should not have any single point of failure like power supplies and fans (applicable as per overall solution).
TR 1.260	Shall provide distributed Layer-2 (switching) and Layer-3 forwarding (Routing) on all line cards or Ports (any additional hardware required for the same shall be proposed)
TR 1.261	Shall have minimum 1Tbps of switching capacity
TR 1.262	Shall have up to 800 MPPS of switching throughput for both IPV4 And IPV6
TR 1.263	Switch should be supplied with minimum 6 x 40G fibre port
TR 1.264	Switch should be supplied with minimum 12 x 10G Fibre port
TR 1.265	SFP/SFP+/XFP/QSFP/Optical modules to be provided as per the solution design by MSI
TR 1.266	Shall be 19" Rack Mountable.
Resiliency:	
TR 1.267	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 1.268	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 1.269	IEEE 802.1D Spanning Tree Protocol, IEEE 802.1w Rapid Spanning Tree Protocol and IEEE 802.1s Multiple Spanning Tree Protocol.
TR 1.270	IEEE 802.3ad Link Aggregation Control Protocol (LACP).
Layer 2 Features:	
TR 1.271	Shall support up to 4,000 port or IEEE 802.1Q-based VLANs.
TR 1.272	Shall support GARP VLAN Registration Protocol or equivalent feature to allow automatic learning and dynamic assignment of VLANs.
TR 1.273	Switch should support minimum 100K no. of MAC addresses.
TR 1.274	Internet Group Management Protocol (IGMP).
TR 1.275	IEEE 802.1AB Link Layer Discovery Protocol (LLDP).
TR 1.276	Multicast VLAN to allow multiple VLANs to receive the same IPv4 or IPv6 multicast traffic or should support PIM
Performance Requirement:	
TR 1.277	should support MPLS and VPN's.
TR 1.278	The switch should have minimum 100K IPv4 and 100K IPv6 Routes.
TR 1.279	The switch should support minimum 4K multicast routes.
Layer 3 Features (any additional licenses required shall be included):	
TR 1.280	Static Routing for IPv4 and IPv6.
TR 1.281	OSPF for IPv4 (OSPFv2) and IPv6 (OSPFv3).
TR 1.282	Policy-based routing.

TR 1.283	Dynamic Host Configuration Protocol (DHCP) client, Relay /server.
QoS and Security Features:	
TR 1.284	Access Control Lists for both IPv4 and IPv6 for filtering traffic to prevent unauthorized users from accessing the network.
TR 1.285	Powerful QoS feature supporting strict priority (SP) queuing, weighted round robin (WRR) and weighted fair queuing (WFQ) /equivalent.
TR 1.286	IEEE 802.1x to provide port-based user authentication with multiple 802.1x authentication sessions per port.
TR 1.287	Media access control (MAC) authentication to provide simple authentication based on a user's MAC address.
TR 1.288	Dynamic Host Configuration Protocol (DHCP) snooping for security.
TR 1.289	Switch should support for Role Based access control (RBAC) for restricting host level network access as per policy defined.
Management Features:	
TR 1.290	Configuration through the CLI, console, Telnet, SSH or Web Management.
TR 1.291	SNMPv1, v2, and v3 and Remote monitoring (RMON) support.
TR 1.292	sFlow (RFC 3176) or equivalent for traffic analysis.
TR 1.293	Management security through multiple privilege levels with password protection.
TR 1.294	FTP, TFTP support.
TR 1.295	Port mirroring to duplicate port traffic (ingress and egress) to a local or remote monitoring port.
TR 1.296	RADIUS/TACACS+ for switch security access administration.
TR 1.297	Network Time Protocol (NTP) or equivalent support.
TR 1.298	Shall have Ethernet OAM (IEEE 802.3ah) or equivalent management capability.
Environmental Features:	
TR 1.299	Shall provide support for RoHS/ WEEE regulations.
TR 1.300	The switch should not have any single point of failure like power supplies and fans (applicable as per overall solution).
TR 1.301	Operating temperature of 5°C to 40°C.
TR 1.302	Safety and Emission standards including UL 60950-1; IEC 60950-1; VCCI Class A; EN 55022/55032, Class A.
Additional Requirement:	
TR 1.303	Switch should support IPv4 & IPv6 from day1.
TR 1.304	All relevant licenses for all the features and scale should be quoted along with switch.
CORE ROUTER	
Architecture:	
TR 1.305	Modular architecture or fixed form architecture, with necessary redundancy for Fan and Power supply
TR 1.306	Should have power supply redundancy. There should not be any impact on the router performance in case one of the power supplies fails.
TR 1.307	All interface modules/ SFP, power supplies should be hot swappable for high availability.
TR 1.308	Router should be provided with 1+1 or 1+N power supply redundancy.
TR 1.309	The router shall support following type of interfaces –40GE, 10GE, 1GE interfaces.

TR 1.310	Chassis should be 19" rack mountable type.
TR 1.311	The operating system of the router shall have a microkernel- based architecture.
TR 1.312	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 1.313	Should be supplied with necessary power cards, data cables, connectors, CD's, manuals, bracket accessories, wire managers and other appropriate accessories.
Performance:	
TR 1.314	Router shall support minimum non-blocking capacity of 180 Gbps & 250MPPS.
TR 1.315	The router should have capability of minimum 1 million IPv4 and 500K IPv6 routes.
TR 1.316	The router should support minimum 100K MAC address, minimum 2K Pseudowires.
TR 1.317	Router should have 8K multicast routes.
High Availability:	
TR 1.318	Shall support Non-Stop forwarding for fast re-convergence of routing protocols (BGP, OSPF).
TR 1.319	Shall support SyncE (1588).
TR 1.320	Shall support link aggregation using LACP as per IEEE 802.3ad.
TR 1.321	Boot options like booting from TFTP server, Network node & Flash Memory.
TR 1.322	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 1.323	Should have Multicast routing protocols IGMPv1, v2, v3, PIM- SM (RFC2362) and PIM-SSM, MSDP/PIM, IGMP v2 snooping.
TR 1.324	Should have DHCPv6 and OSPFv3 for IPv6, 6PE & 6VPE.
TR 1.325	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.
TR 1.326	Router shall support MPLS OAM, Ethernet OAM protocols – CFM (IEEE 802.1ag), Link OAM (IEEE 802.3ah) and ITU Y.1731.
TR 1.327	The routers shall support both L2 and L3 services on all interfaces.
TR 1.328	Configuration Roll Back to recover the mis-configured router to last good configuration.
QoS Features:	
Shall support the following:	
TR 1.329	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 1.330	Shall support Strict Priority Queuing or Low Latency Queuing to support real time application like Voice and Video with minimum delay and jitter.
TR 1.331	Platform must support hierarchical shaping, scheduling, and policing for the control upstream and downstream traffic.
TR 1.332	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 1.333	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 1.334	Support per-user Authentication, Authorization and Accounting through RADIUS or TACACS.

TR 1.335	The routers shall provide IETF Netflow- v9/J-Flow/equivalent feature. This feature shall be available for all interfaces provisioned on the router.
TR 1.336	Shall support multi-level of access.
TR 1.337	DHCP snooping, control plane policing.
TR 1.338	SNMPv3 authentication, SSHv2.
TR 1.339	Multiple privilege level authentications for console and telnet access through Local database or through an external AAA Server.
Debug, Alarms & Diagnostics:	
TR 1.340	Support for monitoring of Traffic flows for Network planning and Security purposes.
TR 1.341	Display of input and output error statistics on all interfaces.
TR 1.342	Display of Input and Output data rate statistics on all interfaces.
TR 1.343	Display of Dynamic ARP table.
TR 1.344	Telnet, Trace-route, Ping and extended Ping.
TR 1.345	Router shall support System & Event logging functions as well as forwarding of these logs onto a separate Server for log management or should support syslog for management.
TR 1.346	Router shall have Debugging features to display and analyse various types of packets.
Accounting:	
TR 1.347	The router should have following accounting features: <ul style="list-style-type: none"> • Packet & Byte Counts; • Start Time Stamp & End Time Stamps; • Network Time Protocol; • Input & Output interface ports; • Type of service, TCP Flags & Protocol; • Source & Destination IP addresses; • Source & Destination TCP/UDP ports.
Management:	
TR 1.348	Shall support latest version of Secure Shell for secure connectivity.
TR 1.349	Embedded RMON support for four groups – history, statistics, alarms and events.
TR 1.350	Should have to support Out of band management through Console / external modem for remote management.
TR 1.351	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 1.352	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 1.353	Minimum 4 x 40G fibre port from day 1.
TR 1.354	Minimum 4 x 10G fibre port from day 1.
TR 1.355	Minimum 4 X 1Gig fibre port from day 1.
TR 1.356	SFP/SFP+/XFP/QSFP/Optical modules to be provided as per the solution design by MSI.
Environmental:	
TR 1.357	Operating temperature: 5 to 40 degrees.

TR 1.358	Humidity – 5% to 85% non-Condensing.
L2 SWITCH (Server/Workstation Connectivity Ethernet Switch – Minimum 24 Ports)	
Architecture:	
TR 1.359	Shall be 1RU, 19" Rack Mountable.
TR 1.360	24 RJ-45 autosensing 10/100/1000 ports.
TR 1.361	Shall support minimum 4 x 1/10G fibre port
TR 1.362	1 RJ-45 serial console port.
TR 1.363	Switch shall have minimum 128 Gbps of switching fabric and 95.23 Mbps of forwarding rate.
TR 1.364	SFP/SFP+/XFP/QSFP/Optical modules to be provided as per the solution design by MSI.
Resiliency:	
TR 1.365	Switch should support internal field replaceable unit redundant power supply from day 1.
TR 1.366	IEEE 802.1D Spanning Tree Protocol, IEEE 802.1w Rapid Spanning Tree Protocol and IEEE 802.1s Multiple Spanning Tree Protocol.
TR 1.367	IEEE 802.3ad Link Aggregation Control Protocol (LACP).
Layer 2 Features:	
TR 1.368	Shall support minimum 500 IEEE 802.1Q-based VLANs.
TR 1.369	Shall support GARP VLAN Registration Protocol or equivalent feature to allow automatic learning and dynamic assignment of VLANs.
TR 1.370	Shall support IEEE 802.1ad QinQ.
TR 1.371	Shall support Jumbo frames on GbE ports.
TR 1.372	Internet Group Management Protocol (IGMP).
TR 1.373	Multicast Listener Discovery (MLD) snooping.
TR 1.374	IEEE 802.1AB Link Layer Discovery Protocol (LLDP).
TR 1.375	Shall support Voice VLAN feature to automatically assigns VLAN and priority to devices like IP phones.
TR 1.376	Switch must support 8 hardware queues
TR 1.377	Switch shall have 1K or more multicast routes.
TR 1.378	Switch should support flow/Sflow/Netflow/Jflow entries.
TR 1.379	Switch should support 32 or more STP Instances.
TR 1.380	Switch shall have minimum 16K MAC Addresses and minimum 500 active VLAN.
TR 1.381	Should support minimum 11K IPv4 routes or more.
Layer 3 Features (any additional licenses required shall be included):	
TR 1.382	Static Routing for IPv4.
TR 1.383	Static Routing for IPv6.
TR 1.384	Dynamic Host Configuration Protocol (DHCP) client and Relay.
TR 1.385	Proxy ARP to allow normal ARP operation between subnets.
QoS and Security Features:	
TR 1.386	Access Control Lists for Layer 2 to Layer 4 traffic filtering.
TR 1.387	Shall support global ACL, VLAN ACL, port ACL, and IPv6 ACL.

TR 1.388	Powerful QoS feature supporting strict priority (SP) queuing, weighted round robin (WRR) / SP+WRR or equivalent.
TR 1.389	should support QOS on all interfaces.
TR 1.390	IEEE 802.1x to provide port-based user authentication with multiple 802.1x authentication sessions per port.
TR 1.391	Should support Media access control (MAC) authentication to provide simple authentication based on a user's MAC address.
TR 1.392	Dynamic Host Configuration Protocol (DHCP) snooping for security.
TR 1.393	Port security / port isolation.
TR 1.394	STP BPDU port protection to prevent forged BPDU attacks.
TR 1.395	STP Root Guard to protect the root bridge from malicious attacks or configuration mistakes IP Source guard to prevent IP spoofing attacks.
TR 1.396	IP Source guard to prevent IP spoofing attacks.
TR 1.397	Dynamic ARP protection blocking ARP broadcasts from unauthorized hosts.
Management Features:	
TR 1.398	Configuration through the CLI, console, Telnet, SSH or Web Management
TR 1.399	SNMPv1, v2, and v3 and Remote monitoring (RMON) support
TR 1.400	sFlow (RFC 3176) or equivalent for traffic analysis
TR 1.401	Management security through multiple privilege levels
TR 1.402	FTP, TFTP, and SFTP/SCP support
TR 1.403	Port mirroring to mirror ingress/egress ACL-selected traffic from a switch port or VLAN to a local or remote switch port
TR 1.404	RADIUS/TACACS+ for switch security access administration
TR 1.405	Network Time Protocol (NTP) or equivalent support
Environmental Features:	
TR 1.406	Shall provide support for RoHS and WEEE regulations
TR 1.407	Shall have features to improve energy efficiency like variable-speed fans, shutoff unused ports etc should support EEE (Energy Efficient Ethernet)
TR 1.408	Operating temperature of 0°C to 45°C
TR 1.409	Safety and Emission standards including UL 60950-1; IEC 60950-1; VCCI Class A; EN 55022 Class A
Additional Requirement:	
ENTERPRISE MANAGEMENT SYSTEM (EMS)	
Availability - Monitoring, Management and Reporting	
TR 1.410	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 1.411	The proposed system shall support exclusion of specific IP addresses or IP address ranges.
TR 1.412	The discovery shall be able to identify and model of the ICT asset.
TR 1.413	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 1.414	The proposed solution shall determine device availability and shall exclude outages from the availability calculation with an option to indicate the reason.
TR 1.415	The proposed solution shall provide out of the box root cause analysis.
TR 1.416	The proposed solution shall have an integrated user-friendly application.
TR 1.417	The proposed solution shall include all required licenses.
TR 1.418	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 1.419	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 1.420	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 1.421	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 1.422	The proposed solution shall provide polling agents to upload status, changes or alerts of the local devices attached with the Ethernet enabling devices.
TR 1.423	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 1.424	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 1.425	The proposed solution shall be capable of managing any SNMP/ICMP device from any vendor.
TR 1.426	The proposed solution shall support SNMPV1, SNMPV2C and SNMPV3 and shall automatically discover and poll SNMP and ICMP devices.
TR 1.427	SNMP traps for all IP enabled devices shall be provided by the respective product manufacturers.
TR 1.428	The proposed solution shall allow notifications to be automatically sent to phones, offsite workstations, etc. for efficient response.
TR 1.429	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 1.430	The proposed solution shall allow for providing different levels of security access i.e. viewing, logging and managing.
TR 1.431	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 1.432	The operation of the NMS shall be tested while the backbone network is under 30% network utilization.
TR 1.433	The proposed solution must provide an interface for IT helpdesk personnel to create guest credentials.
TR 1.434	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 1.435	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 1.436	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 1.437	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 1.438	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 1.439	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 1.440	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 1.441	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 1.442	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 1.443	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 1.444	The proposed solution shall correlate performance data from HTTP Servers (external requests) with internal application performance data.
TR 1.445	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 1.446	The proposed solution shall allow data to be seen only by those with a need to know and limit access by user roles.
TR 1.447	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 1.448	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 1.449	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 1.450	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 1.451	The proposed system shall address management challenges by providing centralized management across physical and virtual systems.
TR 1.452	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 1.453	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 1.454	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 1.455	The proposed solution shall support monitoring Processors, File Systems, Log Files, System

	Processes, and Memory etc.
TR 1.456	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 1.457	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 1.458	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 1.459	It shall be able to automate monitoring, data collection and analysis of performance from single point.
TR 1.460	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 1.461	Role based Access — Enables role-based management by defining access privileges according to the role of the user.
TR 1.462	The proposed Virtual Performance Management system shall integrate latest virtualization technologies.
Helpdesk - Monitoring, Management and Reporting	
TR 1.463	The proposed helpdesk system shall provide flexibility of logging, viewing, updating and closing incident manually via web interface.
TR 1.464	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 1.465	Each incident shall be able to associate multiple activity logs entries via manual update or automatic update from other enterprise management tools.
TR 1.466	The proposed helpdesk system shall be able to provide flexibility of incident assignment based on the workload, category, location etc.
TR 1.467	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 1.468	The proposed helpdesk system shall provide grouping access on different security knowledge articles for different group of users.
TR 1.469	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 1.470	The proposed helpdesk system shall support tracking of SLA (Service Level Agreements) for call requests within the help desk through service types.
TR 1.471	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 1.472	The proposed helpdesk system shall integrate tightly with the knowledge tools and CMDB and shall be accessible from the same login window.
TR 1.473	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 1.474	The tool shall support Flow monitoring and traffic analysis for NetFlow, J-Flow, sFlow, Netstream, IPFIX technologies.
TR 1.475	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 1.476	The solution shall be of passive type and should not cause any performance overheads.
Incident Management and Root Cause Analysis Reporting	
TR 1.477	Incidents shall be categorized and prioritized. While prioritizing incidents the impact and urgency of the incident shall be taken into consideration.
TR 1.478	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 1.479	Testing shall be performed to ensure that recovery action is complete and that the service has been fully restored.
TR 1.480	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.
Change and Configuration Management	
TR 1.481	Change management provides information on changes and enables better control of changes to reduce errors and disruption in services.
TR 1.482	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 1.483	All changes are logged, prioritized, categorized, assessed, authorized, planned and scheduled to track and report all changes. All the logs should be immutable.
TR 1.484	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 1.485	The roles and responsibilities of the management shall include review and approval of the implementation of change management policies, processes and procedures.
TR 1.486	A configuration management database shall be established which stores unique information about each type Configuration Item CI or group of CI.
TR 1.487	The Configuration Management Database (CMDB) shall be managed such that it ensures its reliability and accuracy including control of update access.
TR 1.488	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 1.489	Corrective actions shall be taken for any deficiencies identified in the audit and shall be reported to the management and process owners.
TR 1.490	Information from the CMDB shall be provided to the change management process and the changes to the CI shall be traceable and auditable.
TR 1.491	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 1.492	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 1.493	<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

	<ul style="list-style-type: none"> • TEC norms for basic infrastructure of internal & external communication network.
TR 1.494	<p>General:</p> <ul style="list-style-type: none"> • The PoPs shall include both primary and Mini PoP facilities. These facilities shall act as co-location spaces for DMIC IITGNL needs; • Note that at this point in time, the exact location of the CCC is not finalized but it will either be the GNIDA building in Greater Noida or one location on-site. The Bidder shall assume the location to be either of the two and include costing for the same accordingly as part of its Bid price. • All DMIC IITGNL owned fibre optic infrastructure shall originate and terminate at the PoPs with dual entry-exit redundant paths; • The Primary PoP will also act in a Mini PoP capacity as a termination point for distribution fibre that connects to the devices located within its immediate vicinity • The PoPs shall have sufficient space for UPS for DMIC IITGNL infrastructure. • 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. • The exact design of the POP room shall be finalized with the successful Bidder during the design stage of the project. It is required that the MSI provides a telecom grade facility and ensures the required costing is accounted for in the proposal for the same.
TR 1.495	<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 1.496	<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; • 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 1.497	<p>Communication:</p> <ul style="list-style-type: none"> • 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.

System Output:

A tentative list of system outputs and processes which the MSI shall achieve out of fibre optic infrastructure component have been given below. The list may be further upgraded and finalized during implementation phase:

S. NO.	PROCESS	PROVIDER	INPUT	OUTPUT	PLATFORM
Fibre Asset Management:					
P1.	CCC operator is able to see the status of fibre optic infrastructure laid across the city by navigating on the GIS based map and clicking on the fibre optic network displayed. This will show different parameters related to any fibre optic cable, such as fibre count, colour, number of ducts, allocation of fibre cores to different plots/ devices etc.	Fibre Asset Management Tool	Database of Survey Images	GIS Base Map	CCC and GIS map
Enterprise Management System:					
P2.	Retrieval, storage, analysis and display of following information from all IP SNMP and/or ICMP capable network devices: <ul style="list-style-type: none"> • Configuration Management; • Fault Management; • Incident, Problem and Change Management; • Asset Management; • Remote Control; • SLA Management & Monitoring; • 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; • Traffic analysis. 	EMS Tool	IP SNMP and/or ICMP devices (including Switches) connected over network	Dashboards/ Alerts in the form of Network and Sub-Networks Maps Windows	CCC
P3.	A citizen/user/DMIC IITGNL employee calls helpdesk operator and reports an incident in city either through emergency communication system or through the customer care number.	Help Desk Management Tool	User Calls	<ul style="list-style-type: none"> • Incident attempted to be resolved within the resolution period 	EMS Tool

S. NO.	PROCESS	PROVIDER	INPUT	OUTPUT	PLATFORM
	Helpdesk operator generates a call ID number and assigns a severity level to the incident. Accordingly, a resolution time period is assigned for the incident and is attempted for resolution as per the Escalation Matrix. The helpdesk operator will track such incidents to resolution. Downtime, severity, faults related to all ICT equipment shall be logged.			<ul style="list-style-type: none"> Incident escalated as per the matrix to higher officials in case of delay caused in initial level resolution Status on incident updated in EMS and informed to the user as well 	
P4.	<p>At the end of any month/year, the helpdesk operator is able to generate a report containing a log of the following details:</p> <ul style="list-style-type: none"> Statistics of Calls received/ answered/ missed etc. Incidents generated in system with their respective ID Level of severity assigned to those incidents Resolution time assigned to those incidents Time in which incidents were actually resolved etc. 	Help Desk Management Tool	User Calls	Reports and Analytics on different parameters	EMS Tool

2.2.2 City Surveillance Cameras

2.2.2.1 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:

- City Entry / Exit Points;
- Roads;
- Intersections/ Junctions;
- Public spaces/ buildings; and
- Around critical facilities like Command & Control Center (CCC) Point of Presence rooms (PoP), 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) shall also be installed at city junctions and all the entry/ exit points of Integrated Industrial Township (IIT). 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 Command & Control Center (CCC) for viewing and analytics. CCC shall consist of local server and storage equipment for storing all these video feeds.

2.2.2.2 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 CCC via dedicated ring-based fiber 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 fiber network/TSP link to be provided by the MSI as applicable. From this location the feed will be sent to the CCC. At the CCC 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-Station, of the city shall also be integrated with the CCC. 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 3 below:

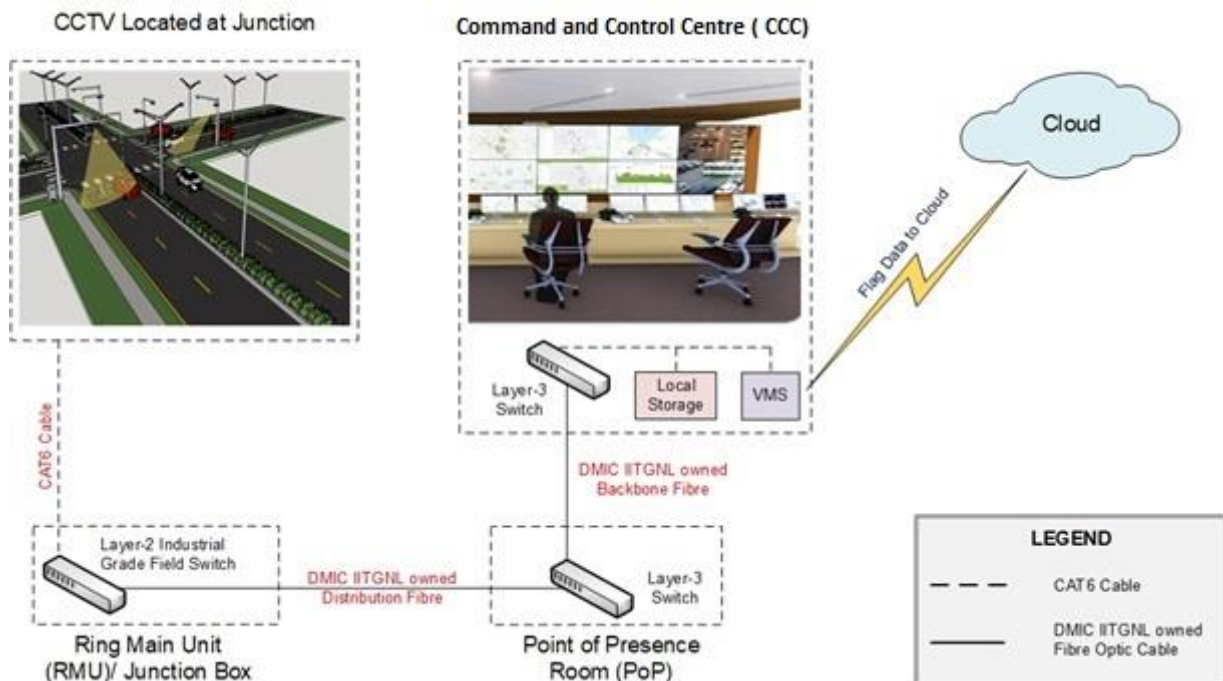


Exhibit 3: Conceptual System Architecture for City Surveillance System

Business Requirements

BR 1.12	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 1.13	City Surveillance System shall support edge analytics or central analytics for pro-active monitoring.
BR 1.14	City Surveillance System shall enable real time recording of the video.
BR 1.15	CCTVs shall be co-located on poles
BR 1.16	CCTVs shall be integrated with the CCC to provide direct live feed to view and monitor activities around the City.
BR 1.17	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.
POLES FOR FIELD DEVICES	
BR 1.18	Poles should be used for mounting ICT field device at variable height as per the site condition.

Functional Requirements

GENERAL	
FR 1.76	City Surveillance System shall consist of: <ul style="list-style-type: none"> • Fixed Cameras. • PTZ Cameras. • 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 1.77	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 cameras.
FR 1.78	All the Cameras shall be IP based.
FR 1.79	Cameras shall have an integral receiver/driver that shall be capable of controlling pan-tilt, zoom and focus locally and also remotely from the CCC.
FR 1.80	The video feeds received from all the cameras shall be directed to the Command-and-Control Centre (CCC) for viewing and analytics. CCC shall consist of local server and storage equipment for storing all these video feeds.
FR 1.81	All cameras shall support real-time video content analysis.
FR 1.82	Indicative list of capabilities that IIT city surveillance system are as follows: <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.

	<ul style="list-style-type: none"> • 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.
CAMERAS WITH BUILT-IN VIDEO ANALYTICS	
FR 1.83	<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 (for PTZ Camera): 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 1.84	<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 1.85	<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. Please refer TR 1.521 of Volume III of the RFQ cum RFP document for recording parameters as well.</p>
FR 1.86	<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 1.87	<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 1.88	<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 1.89	<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 1.90	<p>The system should not limit amount of storage to be allocated for each connected device.</p>

FR 1.91	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.
FR 1.92	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.
FR 1.93	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 1.94	The Recording Server / System shall support Camera devices from various manufacturers.
FR 1.95	The Recording Server / System shall support the PTZ protocols of the supported devices listed by the camera OEMs.
FR 1.96	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. Mini PoP.
FR 1.97	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 1.98	Central software application to be installed at the CCC shall be able to run on any PC based on standard operating systems.
FR 1.99	Video Management System (VMS) shall be non-proprietary and open-ended.
FR 1.100	Central Application Server shall allow user to view live video stream.
FR 1.101	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 1.102	The system shall support a distributed architecture with no single point of failure.
FR 1.103	Video shall normally stream direct from recording server to client due to security reason.
FR 1.104	A client or any other operator shall ask "permission" to connect to a camera.
FR 1.105	There shall be no single management server. System management shall be distributed throughout the system.
FR 1.106	Recording failover management shall be standard without need for additional license.
FR 1.107	It should be possible to record to multiple recorders at the same time.
FR 1.108	DMIC IITGNL's workstations must remain "connected" to all recording devices simultaneously.
FR 1.109	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 1.110	VMS shall be ONVIF compliant with profiles S, G T and M. The Declaration of ONVIF S, G T & M Profile shall be available on ONVIF Official Website www.onvif.org in the Conformant Devices.
FR 1.111	Users shall be able to display any camera view (virtual pre-set).
FR 1.112	VMS shall allow users to review the hidden/privacy zone in live video if the user has the appropriate permission.
FR 1.113	Administrators shall be able to configure hidden/privacy zone on fixed cameras.

FR 1.114	VMS shall allow the display of analytics on video.
FR 1.115	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 1.116	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 1.117	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 1.118	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 1.119	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 1.120	<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 joystick 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 1.121	<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.

	<ul style="list-style-type: none"> 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 1.122	<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. 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 1.123	<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 1.124	<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 1.125	Users shall be able to configure the recording schedule for cameras on local storage.
FR 1.126	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 1.127	Users shall be able to copy recording schedules from one camera to other cameras on the same or another local storage.
FR 1.128	Users shall be able to find recordings within a specified time period.
FR 1.129	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 1.130	The Video Management System shall support alarm inputs from 3rd party systems.

FR 1.131	Users shall be able to sort the alarm information in various ways by clicking on column headings.
FR 1.132	Users shall be able to specify a priority for each alarm camera (1-10.).
FR 1.133	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 1.134	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 1.135	The users shall be able to display a map showing the location of the alarm.
FR 1.136	Users shall be able to view pending alarms in a list ordered by priority and time.
FR 1.137	Users shall be able to filter the alarm list to show alarms only from specific areas (sites and zones.).
FR 1.138	The Video Management System shall be able to display alarm procedure document for the alarm.
FR 1.139	The Video Management System shall allow users to acknowledge alarms, entering alarm response text as required.
FR 1.140	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 1.141	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 1.142	Users shall be able to produce reports of historical alarms and events and export to RTF or CSV formats.
FR 1.143	The Video Management System shall ensure that alarms are held on an alarm server, not on a user's PC.
FR 1.144	The Video Management System (VMS) shall support integration with external data sources.
FR 1.145	The Video Management System shall notify users of problems with local storage. The notifications will be those supported by each local storage.
FR 1.146	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 1.147	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 1.148	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 1.149	The Video Management System shall allow users to log out and log in without closing the application.
FR 1.150	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 1.151	Users shall be able to change their own password (if given write permission to the site database).
FR 1.152	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 1.153	The Video Management System shall allow configuration of IP Video System devices via their web configuration interface.
FR 1.154	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 1.155	Administrators shall be able to create a hierarchy of sites and sub-sites for organizing cameras and other items by location.
FR 1.156	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 1.157	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 1.158	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 1.159	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 1.160	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 1.161	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 1.162	<p>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:</p> <ul style="list-style-type: none"> • Bitmap (BMP) • JPEG (JPG) • Portable Network Graphics (PNG) • AutoCAD drawings (DWG) • GIS
FR 1.163	Users shall be able to add links to other maps.
FR 1.164	Users shall be able to reposition items by drag and drop or entering specific coordinates on a map.
FR 1.165	Users shall be able to add cameras to map.
FR 1.166	Users shall be able to specify the field of view for each camera on a map.
FR 1.167	Users shall be able to specify the amount of detail displayed on map for each object including icons, matrix numbers and labels.

FR 1.168	Colour schemes on a map shall be configurable to make text and fields-of-view more visible.
FR 1.169	The map shall be fully scalable with zoom and pan supported under mouse control.
FR 1.170	Users shall be able to displays the previous maps viewed (back, forward).
FR 1.171	Users shall be able to link to any map from any map.
FR 1.172	Users shall be able to display live video from any camera on a map.
FR 1.173	Clause deleted.
FR 1.174	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.
FR 1.175	The offered VMS Application shall be Audited for Security Audit Certificate as per OWASP Guidelines by Cert-In Empanelled Auditors, to Mitigate Cyber Security risks.
FR 1.176	Future provisioning of 50% of total number of cameras is to be considered by MSI for VMS licenses calculation.
VARIABLE MESSAGE DISPLAY (VMD)	
FR 1.177	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 1.178	The Central Control software shall allow controlling multiple Variable Message Display from one console.
FR 1.179	The VMD shall come in various sizes to be placed at different location as per site requirements.
FR 1.180	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 1.181	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 1.182	The system shall be capable of controlling brightness & contrast through software.
FR 1.183	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 1.184	The system shall be capable of providing multilevel event log with time & date stamp.
FR 1.185	The system shall be role based defined solution. Various users shall access the system using single sign on access.
FR 1.186	The system shall use open standards and protocols such as NTCIP to the extent possible.
FR 1.187	The system shall have the facility to export reports to excel and PDF formats.
FR 1.188	All VMD shall be connected/configured for remote monitoring through network for two-way communication between VMD and CCC to check system failure, power failure & link breakage.
FR 1.189	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 1.190	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 1.191	The system shall be capable to display warnings, traffic advice, route guidance and emergency messages to citizens in real time.
FR 1.192	The VMD shall display text and graphic messages using Light Emitting Diode (LED) arrays.
FR 1.193	The System shall able to display failure status of any LED at the CCC.
FR 1.194	The CCC 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 CCC workstation shall receive status data from the VMD controller.
FR 1.195	VMD controllers shall continuously monitor the operation of the VMD via the provided communication network.
FR 1.196	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 1.197	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 1.198	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 1.199	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 1.200	VMD shall check the display area if it is working properly and relay its correctness back to the CCC in case of faults before displaying any message on the VMD.
POLES FOR FIELD DEVICES	
FR 1.201	Location of poles shall be finalized as per approved road cross section or as suggested by Client at site.
FR 1.202	The minimum life requirement of pole structure shall be 25 years (metal parts).
FR 1.203	The MSI should not use any banned/restricted material as per Indian Regulations.
FR 1.204	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 1.205	The poles shall be aesthetically and visually appealing.
FR 1.206	Poles shall be equipped with safety devices and lightening protection kits etc.
FR 1.207	Poles should have the required load bearing capacity to accommodate applicable ICT equipment such as Fixed Cameras, PTZ Cameras and any other equipment.

Technical Requirements

FIXED & PTZ CAMERA, LENSES AND MOUNTS	
TR 1.498	The camera control shall comply with the latest release of Open Network Video Interface Forum (ONVIF) standards.
TR 1.499	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 1.500	The camera shall incorporate AGC circuitry to provide for compensation at low light levels.
TR 1.501	The lens shall be integrated with the camera.
TR 1.502	Video output resolution shall be as per respective camera lens specifications.

TR 1.503	The camera shall be capable to produce minimum 15 frames per second (fps).
TR 1.504	The camera shall provide automatic white balance, automatic exposure, automatic gain control, electronic shutter, and backlight compensation.
TR 1.505	The camera shall be a true day/ night camera with mechanical IR cut filter.
TR 1.506	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 1.507	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 1.508	The cameras shall capture audio and compress using G.711 technique and transmit real-time using fibre optic-based communications system.
TR 1.509	All cameras shall support on-board real-time video content analysis.
TR 1.510	All cameras shall support both Constant Bitrate (CBR) and Variable Bit-Rate (VBR) options.
TR 1.511	The camera shall support up to 3 video profiles as a minimum, each providing independent configuration of bitrate, frame rate and resolution.
TR 1.512	The camera shall support on-board storage via micro SDHC/ SDXC slot and card with a minimum capacity of 128 GB.
TR 1.513	All cameras shall have integral in-built adaptive IR technology. For fixed cameras, the IR shall support a range of at least 70 m and for PTZ it shall support a range of at least 150m moving with zoom (adaptive).
TR 1.514	<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 1/2.9" +/- 1% progressive scan CMOS or better. • Fixed Camera resolution shall be 2 Megapixels or better. • Minimum 1 In and 1 Out Alarm Interface
TR 1.515	<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 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° ±5% 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. • Minimum 2 In and 1 Out Alarm Interface
TR 1.516	There shall be a minimum of 100 assignable automatic preset positions.
TR 1.517	There shall be 4 or more definable privacy zones as per project requirements.
TR 1.518	All cameras shall provide effective 24/7 imaging performance for CCTV surveillance applications.
TR 1.519	All cameras shall provide user control, with remote configuration for functions including streaming and compression settings, exposure, white balance, picture size, cropping/privacy, brightness, sharpness, saturation, day-night switching point, frame rate, image rotation/mirror, snapshot, dynamic bandwidth allocation and motion detection.

STORAGE SOLUTION	
TR 1.520	The storage solution shall be supplied as part of the Project. For storage, please refer to the specifications in Section 2.2.5.5 (On Premise Storage).
TR 1.521	Bandwidth optimization - The Recording Server / System shall offer different codec (H.264 or better, MJPEG, MPEG-4, etc.) and frame rate (4CIF or better) options for managing the bandwidth utilization for live viewing at CIOC.
SENSOR SYSTEM COMPONENTS	
TR 1.522	The system shall cover up to minimum 4 lanes.
TR 1.523	The system shall have the capability to connect minimum 4 sensor at a time.
TR 1.524	The Local Processing Unit shall be din rail mountable.
TR 1.525	The system shall have the following features: <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 1.526	The system shall have the capability to connect with local computer using a password protection system.
TR 1.527	The local computer software shall have the compatibility of system configuration, viewing, recording, data collecting & monitoring.
TR 1.528	System shall have non-volatile local storage for vehicle information to prevent data loss during power outages.
TR 1.529	System components shall contain necessary electrical protection to prevent damage from electrical surges, spikes and the effects of lightning.
CENTRAL APPLICATION	
TR 1.530	The software shall be able to run on any PC based on industry standard OS.
TR 1.531	The software shall support ONVIF compliant cameras and devices.
TR 1.532	The software shall show live video from IP Cameras and Video Transmitters in MJPEG, MPEG4 and H.264 formats.
TR 1.533	The software shall support cameras with resolutions ranging from Standard Definition, High Definition (HD) and up to 5 Megapixel.
TR 1.534	The software shall show video across 4 displays per workstation - each display can have up to 25 viewing panes.
TR 1.535	The software shall allow configuration of the video and audio stream settings for each user, depending on the support hardware.
TR 1.536	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 1.537	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)

	<ul style="list-style-type: none"> Standard (4:3)
TR 1.538	Users shall be able to move any image from one display screen to another via drag-and-drop.
TR 1.539	Users shall be able to digitally zoom up to 1000% and also digitally scroll live video from any camera using the mouse wheel.
TR 1.540	The software shall allow the display of objects detected via analytics on the video (up to 10 at once).
TR 1.541	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 bitrate
VARIABLE MESSAGE DISPLAY (VMD)	
TR 1.542	The Variable Message Display (VMD) shall be installed at various strategic location as per discussion with the Client.
TR 1.543	The minimum dimension of the VMD shall be 2.8m in length, 1.5m height and 0.2m in depth.
TR 1.544	The LED in the display board shall support full colour as per IRC/EN 12966 standard.
TR 1.545	VMD shall automatically provide different luminance levels as per requirement but shall also be controllable from the CIOC using software.
TR 1.546	VMD shall also be capable of automatically dimming the board based on ambient light levels required.
TR 1.547	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 1.548	The VMD shall be capable of performing easily even if exposed to direct sunlight.
TR 1.549	The pixel pitch of VMD shall be minimum 10 mm or better. Viewing display shall be full matrix.
TR 1.550	The VMD shall support R3 class contrast ratio and B3 class beam width as per IRC/EN 12966 standard.
TR 1.551	The IP rating shall be minimum IP 66 for front and IP 55 for back.
TR 1.552	VMD shall support synchronized Dot to Dot display.
TR 1.553	It shall be capable of displaying real time message generated from CCC.
TR 1.554	The display shall be designed in such a way to avoid reflection and shall be UV resistant.
TR 1.555	The viewing distance shall be 150 m or more at the character size of 240 mm from the moving vehicle.
TR 1.556	VMD shall have self-diagnostic feature to test for correct operation.
TR 1.557	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 1.558	The system shall be able to generate alarm at CCC in case of any LED pixel failure.
TR 1.559	The refresh frequency for the VMD shall be 90 Hz. The flicker rate shall be minimum and not detectable by the naked eye.
TR 1.560	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 1.561	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 1.562	The VMD shall support communication by Ethernet or Fibre Optic cable or 3G/4G.

TR 1.563	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.
GENERAL FOR SURVEILLANCE SYSTEMS	
TR 1.564	All CCTV cameras shall support Power over Ethernet (PoE or PoE+).
TR 1.565	The camera shall use an Ethernet 10/100Base-TX network interface with RJ45 connector.
TR 1.566	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 1.567	The camera shall incorporate a built-in web server, built-in FTP server / built-in FTP client.
TR 1.568	The cameras shall have, at a minimum, the following configurable features: <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 three (3) simultaneous unicast streams.
TR 1.569	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/H.265 or better format.
TR 1.570	All cameras shall have an operating temperature range of 0°C to +55°C at humidity: 5% - 90% RH.
TR 1.571	The environmental housing shall be of suitable size and provide a temperature-controlled atmosphere for the camera, lens and receiver-driver/ encoder.
TR 1.572	The housing shall allow for easy disconnect of all external cables.
TR 1.573	The housing, mounting arm and the dome camera installed assembly shall be suited to withstand wind gusts of 150 km/h.
TR 1.574	The housing for CCTV shall meet the IP66 or better and IK 10 for protection.
TR 1.575	The cameras shall have a Mean Time Between Failure (MTBF) of at least 100,000 hours.
TR 1.576	The cameras shall have the following: Certifications: UL-62368-1, CE, FCC, BIS (IS 31252 Part 1: 2010/IEC 60950-1).
POLES FOR FIELD DEVICES	
TR 1.577	Pole shall be octagonal/conical/circular with the minimum height of 6 mtrs.
TR 1.578	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 1.579	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 1.580	The poles shall have base plate and necessary knockout provision to mount field devices at various height.
TR 1.581	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 1.582	Pole foundation shall have provisioning of at least two 40mm diameter duct for incoming & outgoing of IT & power cables.
TR 1.583	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 1.584	<p>Pole material shall conform to the below standards:</p> <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 1.585	All electrical and IT wiring/cabling including any other accessories to complete the job is part of MSI scope of work.
TR 1.586	<p>The MSI shall provide the design criteria for structural calculations based on:</p> <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 1.587	An earthing system, to the provisions of internationally accepted standard shall be provided at each pole.
TR 1.588	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 1.589	MSI shall submit at least 3 sample of poles for approval.
TR 1.590	Pole shall have aesthetically appealing and decorative LED lights for display purposes.

System Output:

A tentative list of system outputs and processes which the MSI shall achieve out of city surveillance have been given below. The list may be further upgraded and finalized during implementation phase:

S. NO.	PROCESS	PROVIDER	INPUT	OUTPUT	PLATFORM
Built-in Video Analytics:					
P1.	Cameras capture details of an object which enters and remains in any specific user defined zone for more than a pre-defined time period, e.g. No-Parking Zone. This incident triggers an alarm and notifies the CCC operator with high priority to take action against such objects.	VMS Tool	Images/ Video Feeds with Analytics from Fixed and PTZ cameras	Relevant action/response against object by CCC operator	CCC and GIS
P2.	If any object is detected in specified zones for a time more than the predefined time period, the object is treated as an abandoned object. This triggers an alarm to the CCC operator, who in turn shall take relevant action to resolve the incident on priority.	VMS Tool	Images/ Video Feeds with Analytics from Fixed and PTZ cameras	Informing City Authorities about abandoned object to avoid any mishap	CCC and GIS
P3.	If any camera is hampered or sabotaged by any natural disaster or by any	VMS Tool	Images/ Video Feeds with Analytics from	Alarm with high priority to CCC operator. Dispatch of	CCC, GIS and EMS

S. NO.	PROCESS	PROVIDER	INPUT	OUTPUT	PLATFORM
	human/animal, an alarm shall be triggered and CCC operator shall be notified about it, who shall take proactive action to dispatch a service team and get the camera functioning again.		Fixed and PTZ cameras	Service team to repair the sabotaged camera(s). Event to be logged in EMS for SLA monitoring.	
Video Management System:					
P4.	To check video feed of any camera in near real time across the city, CCC operator can do so by accessing the VMS software, which shall relay the footage to the operator and record simultaneously.	VMS Tool	<ul style="list-style-type: none"> Fixed Cameras PTZ Cameras 	Images/ Video Feeds with Analytics	CCC and GIS
Variable Message Display:					
P5.	CCC operators shall relay message or graphic to be displayed on VMD, which it shall receive the message through the VMD controller, displaying digital messages, advisories, broadcast or contextual notifications, advertisements to the public at IIT, Environmental parameters etc.	VMD Platform	CCC Operators	Alphanumeric Text/ Graphic Messages on VMD screens	GIS and CCC

2.2.3 IITGNL Software Modules (ISM)

As part of the IITGNL 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 backend 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.

Main system components for ISM:

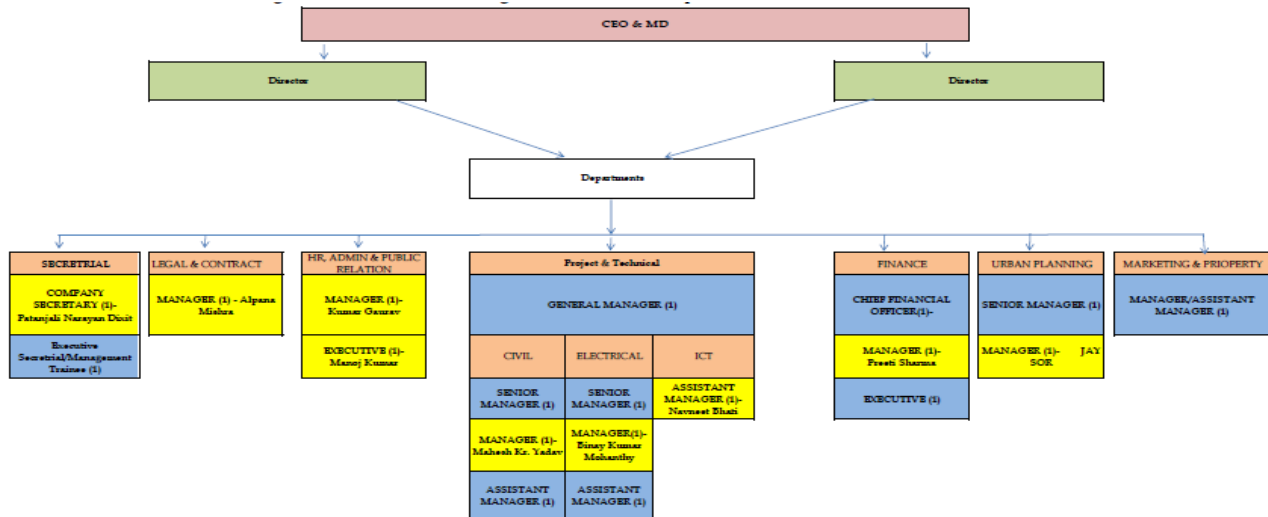
- DMIC IITGNL Corporate Website – there is an existing website www.iitgnl.com which will be revamped as part of this Project. Technology stack for existing website is PHP 7.0 and MYSQL 5.6;
- Customer Facing Systems: Multi-Channel Communication Centre for citizens, Portal, Web based GIS layer, Grievance Redressal system and Mobile Applications,
- Backend systems including Email Solution with Messenger, DMIC IITGNL Portal, CRM and KPI/Dashboards.
- GIS System
- Water connection and Billing,
- 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 consumption with a one (1) day time lag;
- Payment of Land related maintenance charges and other billings, Water 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.

2.2.3.1 DMIC IITGNL Organization Structure



ORGANISATION CHART AS ON DATE:2021

FILLED UP Positions Vacant Positions

Exhibit 4: Organization Structure of DMIC IITGNL as approved on 14th October 2020

The above exhibit represents the organization structure for DMIC IITGNL which was approved on 14th October 2020. Following are the departments which are currently operating in DMIC IITGNL:

S. NO.	DEPARTMENT/ COMPANY
1.	Legal & Contract
2.	Projects and Technical
3.	Finance

4.	Urban Planning
5.	Marketing and Property

The above organization structure is tentative and may change and evolve as the department grows and accommodates more functions.

In subsequent sections, as-is assessment of the above departments along with desirable IT interventions and department process flows have been provided. Please note that the process flows are tentative and may change and evolve as per department discretion. Additionally, it is expected from the MSI to study these and any new process flows and re-engineer the same as per industry and software best practices in order to meet the business and functional requirements given in the RFQ cum RFP. However, it is required from the MSI that all process flows are accommodated as part of ISM as finalized during Business Process Re-engineering phase.

2.2.3.2 IITGNL Software Modules (ISM) Requirements

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

S. NO	PROPOSED MODULES
1.	GIS
1.1.	Survey
1.2.	Base maps
1.3.	Web GIS
1.4.	3D Modelling
2.	Website
3.	Customer Relationship Management (CRM)
4.	Portal for citizens (Investors) and officers
5.	Water Utility Management and Billing
6.	Citizen grievance management
7.	e-Mail solution along with Messenger
8.	Dashboards
9.	Mobile applications for each module
10.	SOA based integration framework for applications

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 IITGNL.

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 or redeveloped 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, mobile, on phone (connection to centralized help desk), walk in to help desk, send mails to centralized help desk mail id.

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 and sensors 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 Land Management System (existing), Payment Systems, Banks (payment gateway), GIS, Portal, SCADA systems, and E- Gov systems. Integrations ideally shall be SOA based.

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.

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.

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 are also 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 are also installed to generate automatic alarms.
- Wastewater drains, man-holes other waste-water network assets necessary for providing sewage facilities to DMIC IITGNL users. IoT equipment are also 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 fiber, cables and switches.
- Streetlights, 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.

All above assets, sensors and IoTs will be integrated over GIS and ERP as applicable.

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;
- E-Governance applications accessible to investors, citizens and officers via the portal and the Customer facilitation centre;
- This will all be integrated to the proposed GIS and ISM applications.
- Billing related to all utilities to investors/allottees is to be undertaken via ISM.

Business Requirement

IITGNL SOFTWARE MODULES (ISM)	
BR 1.19	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 1.20	IITGNL Software Modules (ISM) shall provide a holistic and integrated solution to meet the needs of both DMIC IITGNL and citizens. ISM modules shall not be standalone applications. They shall be integrated, GIS enabled and have mobile apps for features which require officer or citizen interaction. The solution shall be online based.
BR 1.21	ISM shall enhance transparency, accessibility and efficiency of DMIC IITGNL functions in an integrated manner.
BR 1.22	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 1.23	ISM shall streamline, standardize electronic information gathering and access.
BR 1.24	ISM shall facilitate information reuse, across and within various departments of DMIC IITGNL.
BR 1.25	ISM shall reduce system maintenance and training requirements by adopting standard systems and processes for DMIC IITGNL.
BR 1.26	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 1.27	ISM shall have continued compliance with Government frameworks including NeGP and Government of Uttar Pradesh e-Governance policy, legal regulations and standards.
BR 1.28	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 1.29	ISM solution shall be modular and customizable to meet the requirements of the Project.
BR 1.30	ISM shall integrate with utilities implemented by third parties (water, wastewater, automated waste collection etc.) for billing purposes. ISM solution shall have the capability for printing of all bills generated by any ISM module. Solution shall ensure the printed bills/invoices are sent to investors/allotees for Billing purposes. For Water, a complete Billing system is expected as part of this solution to be provided by the MSI. Note that the EPC Contractor has only implemented as SCADA system for the water. For other systems including power, solid waste, streetlighting, integration is expected in terms of data from the EPC contractor.
BR 1.31	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. It is MSI's responsibility that city's sensor and IoT data shall integrate with ISM as applicable and as per finalized design.
BR 1.32	Assets should be stored only at one place (without duplication) in the ISM modules. Data entered in one module should not be required to be entered again.
BR 1.33	All modules of ISM shall be fully integrated with common databases. Master data files shall be common to all ISM modules.
BR 1.34	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 1.35	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 1.36	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. Further, MSI is required to open and maintain Application Store account for iOS (Apple) and Google Play store under the name of DMIC IITGNL. All activities including but not limited to facilitation, coordination and any applicable payments regarding opening and maintaining of account on iOS and Google Play store shall be under the scope of MSI. MSI shall not undertake any activity associated with this account without prior consent of DMIC IITGNL.
BR 1.37	ISM shall have dashboards which shall be capable of receiving input data from different systems, subsystems and software applications on a real-time basis. Data conversion from external third party systems for viewing on dashboards shall be under MSI scope.
BR 1.38	ISM Dashboards developed for IIT shall serve as a unified platform to display Management Information System (MIS) details of all operational modules.
BR 1.39	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 1.40	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 1.41	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 1.42	ISM shall generate a unique ID whenever a transaction or process flow is triggered for audit / traceability purposes.
BR 1.43	Single sign on (SSO) is a necessary requirement for ISM modules. Single sign on for user authentication will be via Active Directory / LDAP with an Identity and Access Management application.
BR 1.44	SSO to be implemented across the entire IT landscape. Irrespective whether it is hosted on premise or on cloud.
BR 1.45	Governance, Risk and Compliance (GRC) access control tools should be included as part of ISM that shall help DMIC IITGNL to automatically detect, manage and prevent access risk violations and reduce unauthorized access to company data and information.
BR 1.46	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.
BR 1.47	ISM solution shall be scalable to accommodate any future growth arising out other DMIC IITGNL initiatives such as Multi-Modal Logistics Hub (MMLH) and Multi-Modal Transport Hub (MMTH).

The software modules envisaged under ISM shall be of three kinds:

1. Standard COTS modules
2. Bespoke applications

Standard COTS or bespoke Modules:

MSI is to supply the following modules as standard COTS products, customised to IITGNL's requirements:

1. **Portal**
2. **GIS (The web GIS shall be a be-spoke development)**
3. **Email and instant messenger**
4. **Customer relationship management**

Bespoke Modules:

Bidder may evaluate the specifications in the following section and offer the solutions or develop the modules as extensions of the COTS products:

1. **Enhancement of Website**
2. **Grievance redressal**
3. **Water Utility Management**
4. **Integration with e-LMS**
5. **Mobile Applications**

2.2.3.2.1 Dashboards

Functional Requirements

DASHBOARDS	
FR 1.208	<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 • IITGNL Software Modules (ISM) Applications • GIS • Information Related to Power and Water Utilities

	<ul style="list-style-type: none"> • Solid Waste Management • Environmental Parameters • Information related to Investors and land allotment • Information regarding other trunk infrastructure of IIT • Service level agreements • Information from IIT sensors and IoTs <p>Other key performance indicators related to operations of the City. Dashboards shall have the capability of providing snapshots of Key Performance Indicators across modules in order to help in decision making.</p>
FR 1.209	Dashboards shall display a Web based GIS map of IIT classifying the plots as per their respective land use.
FR 1.210	<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 1.211	The critical parameters for all the operational systems are expected to be tracked in the Dashboard: - Land Management Charges - Water charges - Financial Accounting - Grievance Management - Works Management System – all others.
FR 1.212	<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 1.213	<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 • 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 1.214	<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 1.215	<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 1.216	<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 1.217	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.
FR 1.218	The system should have the ability to compare Year on Year performance of various parameters
FR 1.219	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.
FR 1.220	The users should be able to access the dashboard in tablets/laptops/desktops
FR 1.221	'Open Data' policy will also be explored for citizen awareness and participation.
FR 1.222	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 stakeholders can provide the information required and the same can be presented on KPIs and dashboard.
Authorizations	
FR 1.223	Dashboard shall be able to display real-time data of operational metrics as per the hierarchy of DMIC IITGNL's officials.
FR 1.224	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 1.225	System shall have an assigned administrator which shall be capable of adding/ removing/ updating the authorization of DMIC IITGNL's officials
FR 1.226	City's Cockpit/ Dashboards shall be easily customized, integrable with other Smart City Applications and scalable in nature to meet future requirements.

2.2.3.3 Standard COTS Modules

2.2.3.3.1 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.
- Integration of sensor/IoT data for monitoring and controlling purposes on GIS 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 1.227	<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 1.228	<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 1.229	<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 1.230	<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 1.231	<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 1.232	<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. Any hardware/scanner requirements to meet this functionality shall be in MSI scope.
<p>Web-GIS Integration</p>	
<p>FR 1.233</p>	<p>All the data collected through the steps mentioned above has to be pushed into the Web-GIS portal 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 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
<p>FR 1.234</p>	<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 project only after the client authorization; • 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;

- 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:
 - Bar Charts
 - Line Charts
 - Row Charts
 - Compound charts
 - Pie charts / Donut charts (both as a charting widget and on map as cluster symbols)
 - Scatter chart
 - Temporal charts (Time of day, day of week, Date, Temporal heat map)

	<ul style="list-style-type: none"> ➤ Data table ➤ 2D and 3D view (capability to extrude polygons based on any attribute parameters In a 3D widget) • 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. Users must be able to display, edit and sync data.
FR 1.235	<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 neighboring 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. • The detailed view will be for internal or outsourced employee users. Here depending on authorization level, data may be displayed. The editing rights of spatial and non-spatial data are with the outsourced employees.

Web-GIS Development tools	
FR 1.236	<ul style="list-style-type: none"> Developing the Web-GIS modules for visualization, 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 1.237	<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> <ul style="list-style-type: none"> Smart City Platform: GIS shall be the underlying layer over which multiple city services shall be visualized at the Smart City Platform.
FR 1.238	<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"> Web site CRM Portal Dashboards Land management system Land maintenance related charges Utility payments Grievance redressal
FR 1.239	<ul style="list-style-type: none"> Web-GIS integration to the website: Web-GIS should be integrated with the official web-site of IITGNL 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>
Utility Asset Management Module	

FR 1.240	<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 1.241	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 1.242	<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. • Pushing the ROW excavation, utility management and re-instatement report into the back end for analysis and spatial records.
Land related charges	
FR 1.243	<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 1.244	<p>The user should be able to:</p> <ul style="list-style-type: none"> • Search by Property Index Number

	<ul style="list-style-type: none"> • 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 1.245	<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 ➤ GIS shall integrate with all sensors/IoTs implemented in IIT for visualization and action purposes.
Utility Payments	
FR 1.246	<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 and wastewater Charges-> Search Connection Page ➤ Water and wastewater Charges-> Search online receipts ➤ Water and wastewater Charges-> Search Ledger ➤ Water and wastewater Charges-> Pay online Page ➤ Automated Solid Waste Collection charges ➤ Any other Utility/miscellaneous Billing as required by DMIC IITGNL • To select the consumer based on: <ul style="list-style-type: none"> ➤ Property Index Number

	<ul style="list-style-type: none"> ➤ Service No. ➤ Property Lease Holder ➤ House No.
FR 1.247	<p>Based on 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 1.248	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 1.249	<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 1.250	<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 1.251	<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>

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

E-MAIL SOLUTION	
FR 1.252	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 1.253	e-Mail solution shall have the domain registered in the name of DMIC IITGNL.
FR 1.254	MSI shall provide 50, expandable to 75, e-mail domains for users of DMIC IITGNL.
FR 1.255	The proposed e-mail solution shall have a minimum 50GB active mailbox size capacity for users.
FR 1.256	The Proposed solution should provide access mail services and data via secured internet access through mobility devices – Smartphones, Tablets etc.
FR 1.257	The proposed enterprise mailing solution should have unlimited mails archival capacity
FR 1.258	<p>Should natively support server-side and client-side calendaring and scheduling, including:</p> <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 1.259	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 1.260	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 1.261	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 1.262	Should be capable of administration through a single window interface to provide service level control and configuration of the enterprise mailing solution
FR 1.263	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 1.264	The proposed solution should provide at least 99.9% Uptime of mailing services
FR 1.265	The proposed solution should provide on Online Service Health Dashboard
FR 1.266	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 1.267	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 1.268	The Proposed e-Mail solution shall come under the SSO solution.
INSTANT MESSAGING SERVICE	
FR 1.269	The proposed enterprise messaging service shall be used by DMIC IITGNL internal employees for sending short messages and files internally.
FR 1.270	The proposed solution should be a commercially available enterprise class SAAS Solution, preferably provided by the CSP proposed for the Project.
FR 1.271	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 1.272	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 1.273	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 1.274	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 1.275	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 1.276	Ability of the cloud based Online Meeting and Instant Messaging solution to support a meeting to up to 250 participants in a single session

FR 1.277	Ability to record meeting in the cloud & making it available for future reference
ONLINE STORAGE	
FR 1.278	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 1.279	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 1.280	Online Storage solution shall allow Desktop, Mobile Apps (Android and iOS) and Browser based access and experience of Online Cloud based File Storage.
FR 1.281	Online Storage solution shall have an inbuilt centralized Admin console for Administration and Reporting.
FR 1.282	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.

2.2.3.3.3

Functional Requirements

LETTER & CORRESPONDENCE MANAGEMENT	
FR 1.283	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 1.284	The system shall have a facility to add emails directly to the Letter Management System.
FR 1.285	The system shall allow capturing the letter using mobile device like Smartphone/ Tablet and add directly to the Letter Management System.
FR 1.286	The system will allow Auto-Numbering of the letters registered, which can be easily tracked at any point in time.
FR 1.287	The system shall have a facility to route the correspondences Letter to the user whom it is addressed to.
FR 1.288	The System shall allow the recipient of the letter to view the same and do annotations.
FR 1.289	The system shall allow the recipient to take different actions on the letter like (1) Filing the Letter to an existing/New electronic File (2) Forwarding the same to other users for action (3) Forwarding the same to multiple users together for action.
FR 1.290	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 1.291	The system shall have a facility to track a correspondence at any point in time.
FR 1.292	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 1.293	The system will have inbuilt inbox for receiving correspondence.
FR 1.294	The system will have electronic management and tracking of correspondence encompassing tasks such as diary entry, indexing, noting, cross-referencing, search/ retrieval etc.
FR 1.295	The system will have interoperability between departments/agencies allowing stakeholders to collaborate and share files, documents, etc.
FR 1.296	Capability of maintenance of e-registers for individuals, divisions, and departments

FR 1.297	The system will have BARCODE integration for file and correspondences (DAK) tracking.
FR 1.298	The system will have file-viewer to enable electronic view of physical files.
FR 1.299	Note-sheet view of files with support for formatting and linking reference notes.
FR 1.300	The system will have provision to capture user details and timestamp along with every note.
FR 1.301	The system will have end-to-end audit trail.
FR 1.302	The system should have a mobile app compatible with android and iOS for all functionality
FR 1.303	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.

2.2.3.3.4 Portal

Functional Requirements

DMIC IITGNL PORTAL	
FR 1.304	It shall be a state-of-the-art portal based on industry standard best practices.
FR 1.305	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 1.306	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 1.307	Portal server should provide framework to provide Security, Mobility, Identity based content delivery, collaboration and Enterprise system integration
FR 1.308	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 1.309	Portal server should at a minimum provide the following common functionalities that would be used by all applications hosted on it.
FR 1.310	Ability to provide secure, encrypted and authorised access between enterprise resources and end user browser
FR 1.311	Ability to aggregate various web enabled enterprise application
FR 1.312	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 1.313	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 1.314	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 1.315	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 1.316	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 1.317	The CMS module must provide for workflows to create, manage and publish content.
FR 1.318	The CMS module should have the provision to create, edit, delete workflows relating to CMS

FR 1.319	The CMS module should have a search functionality to perform role-based search for the content.
FR 1.320	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 1.321	The search server should have configuration tool to configure locations to discover, convert and/or display summary information.
FR 1.322	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 1.323	Federated search results to displayed on a web page. The results to be role based
FR 1.324	The Portal and Mobile App shall be in Hindi, English and shall be user friendly.
FR 1.325	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 1.326	Users may access the portal directly or via the web site to avail of services.
FR 1.327	<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 1.328	<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; • Government bodies; and • Third party vendors.
FR 1.329	Each type of stakeholder shall have different needs and authorizations 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 1.330	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 1.331	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 1.332	Citizens who are residents:

	<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 1.333	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 1.334	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 1.335	<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; • 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 1.336	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:

	<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 1.337	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.
FR 1.338	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.
FR 1.339	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.
FR 1.340	Each user shall have a customisable landing page and shall have access to only the portlets as per his role and rights.
FR 1.341	The portal shall be mirrored on a mobile app (iOS & Android).
FR 1.342	Through service Portal, any user can seek service, status check on service request, lodging incident/complaint, getting information, providing suggestions.
FR 1.343	<p>The user shall contact DMIC IITGNL by following means:</p> <ul style="list-style-type: none"> • Web portal; • Mobile Application; • E-mail; • Web Portal; • Surface mail; and <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 1.344	Login options of different user groups shall be provided.
FR 1.345	The mobile version (Android & iOS) shall mirror the portal and be adapted for optimum viewing on multiple operating systems and device sizes.
FR 1.346	The Portal platform shall support deployment on all three platforms - Linux, UNIX and Windows.
FR 1.347	The Portal platform shall provide support for portal standards such as JSR 168, WSRP 2.0 and JSR-170.

FR 1.348	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 1.349	Support for centralized, web-based user provisioning ensuring single definition of users, roles, groups and access rights.
FR 1.350	System shall have search capabilities that support powerful and comprehensive full-text searching, metadata searching or people search.
FR 1.351	It shall support multiple databases like Oracle, SQL Server, DB2, HANA, Informix etc. without requirement of any additional software.
FR 1.352	Shall manage portal content using web content management from common content management repository through out-of-the-box integration.
FR 1.353	The portal solution shall allow the users themselves to personalize their user interface.
FR 1.354	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 1.355	Portal shall support a stand-alone, service-oriented architecture.
FR 1.356	Support for out of the box integration with content management system for web content management and publishing on the portal.
FR 1.357	The administration tools shall provide granular control and delegation of administration tasks for custom role-based management.
FR 1.358	Portal shall deliver content based on user attributes or preferences.
FR 1.359	Support for unified Single Sign On for internal integrated applications.
FR 1.360	Support for personalization of home page using drag & drop functionality.
FR 1.361	Support for display of the user's work list information.
FR 1.362	Support for personalized notifications and alerts.
FR 1.363	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 1.364	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 1.365	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 1.366	Portal shall provide support for discussion forums.
FR 1.367	Leverages a common management console to manage all distinct applications/modules and monitor performance.
FR 1.368	Provides ability to perform Advanced Search based on multiple metadata.
FR 1.369	Ability to display search keywords in bold within title and excerpt of search result page.
FR 1.370	Ability to perform search across web content, files on a file server, databases, IMAP email, document repositories and applications.
FR 1.371	Search results are based on user's security role and display what the user is authorized to access.
FR 1.372	Ability to integrate with LDAP/AD based security.
FR 1.373	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 1.374	Enterprise wide Portal shall enable content publishing within portal framework.
FR 1.375	Portal shall provide Template driven portal development to simplify portal creation process.

FR 1.376	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 1.377	Reporting and Monitoring shall be inbuilt and provided as part of Portal inherent capability.
FR 1.378	Inherent Portal analytics shall be able to capture page traffic, portlet traffic, content usage, services and response times.
FR 1.379	Analytics console with inbuilt UI framework for Analytics reports, graphs and charts.
FR 1.380	Shall support a single content management repository for both structured and unstructured content.
FR 1.381	Search results are based on user's security role and display what the user is authorized to access.
FR 1.382	<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.

2.2.3.3.5 Customer Relationship Management (CRM)

Functional Requirements

CUSTOMER RELATIONSHIP MANAGEMENT	
General	
FR 1.383	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 agents will be using the CRM for Investor/Citizen related interactions.
FR 1.384	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 1.385	The CRM shall be able to respond to all the identified incidents, requests and queries within a predefined time period.
FR 1.386	The CRM shall provide the best possible answer to the user(s) interacting through the Chatbot interface.
FR 1.387	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 1.388	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 1.389	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 1.390	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 1.391	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 1.392	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. 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. The CRM should provide a facility to end users to easily add a new call type and/or service offering.
FR 1.393	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. The CRM must generate an acknowledgement with a reference no for a successfully submitted application
FR 1.394	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 1.395	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 1.396	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 1.397	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 1.398	There must be no option to delete tickets. They may be classified as Active or non-active or cancelled.
FR 1.399	The CRM must be web-enabled and shall have an app (for Android & iOS) which will be accessed through the portal.
FR 1.400	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 1.401	Facility to check citizen data relating to: <ul style="list-style-type: none"> • Bill Dues; • Application Status; • Payment Status; • Complaint status; and • Renewal Status.
FR 1.402	The CRM System will provide the required functionality to enable the CFC Agent to collect payments and issue a receipt for: <ul style="list-style-type: none"> • Collection of taxes and service charges with and providing rebates on early payments; • Issue of Duplicate Bill; and

	<ul style="list-style-type: none"> make a booking for rental of DMIC IITGNL facilities.
FR 1.403	<p>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.</p>
FR 1.404	<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 1.405	<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 1.406	Informing Citizen/Investor about the changes done in form of a Notice.
FR 1.407	Facilitating Citizen to file an objection against the Notice.
FR 1.408	<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 1.409	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 1.410	The CRM system must allow the end user to setup and/or modify SLA's for any request or grievance
FR 1.411	The CRM system shall have online integration with the ISM and/or Other Business Applications as per needs of DMIC IITGNL
FR 1.412	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 1.413	The CRM shall enable System Admin staff to control access to ticket information by other city Administrative officials.
FR 1.414	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 1.415	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 1.416	The CRM shall be able to generate tickets against any incident, requests and queries received from the user(s).
FR 1.417	The CRM shall be able to route the tickets generated to the concerned city administrative officials immediately after its generation.
FR 1.418	The CRM shall be able to update the status of tickets on a periodic basis.
FR 1.419	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 and IVRS
FR 1.420	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 1.421	The CRM shall have report generation and analytics capabilities.
FR 1.422	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 1.423	The real-time dashboard shall enable city administrative officials to analyse the efficiency of CRM module.
FR 1.424	City administrative officials shall be enabled to filter out the attributes prior to generating reports and analytics (predictive and prescriptive).
FR 1.425	The CRM platform shall enable generation and export of reports in Excel, PDF and CSV formats as a minimum.

2.2.3.4 Bespoke applications

2.2.3.4.1 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 1.426	The website is expected to be revamped to world class standards and follow Government of India guidelines for websites. Responsibility of curation of content for the website shall be of the MSI.
FR 1.427	The website has to include the chatbot functionality as given in this document
FR 1.428	Home Page: A clean, visually compelling home page that quickly conveys to the visitor IIT and what the DMIC IITGNL does.
FR 1.429	It would include (not limited to): <ul style="list-style-type: none"> • About IIT; • Message from the CEO; • Investment opportunities;

	<ul style="list-style-type: none"> • 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 1.430	Corporate Branding: Clearly communicates a sense of 'identity' at first glance.
FR 1.431	Visual appeal: The site must have an attractive mix of text, images, audio and video.
FR 1.432	Fast Loading Pages: Optimization of web pages for a faster browsing experience with compatibility with key industry browsers and platforms.
FR 1.433	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 1.434	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 1.435	<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 1.436	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>).
FR 1.437	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.
FR 1.438	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.
FR 1.439	Calendar: A dynamic calendar that displays events as well as filters for searching/ sorting events.
FR 1.440	Contact Form: Provides a web-based contact form with anti-spam controls.
FR 1.441	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.

FR 1.442	Social Media Engagement Tools: New tools to improve interaction with social media
FR 1.443	Blog: The site should have a Blog section to facilitate discussions on various topics.
FR 1.444	Career: The site should have a career section which should accept online job application that would be fed directly into the HRM system.
FR 1.445	Language Options: The website should be available in English and Hindi.
FR 1.446	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.
FR 1.447	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.
FR 1.448	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.
FR 1.449	Settings: Website must not require plug-ins as a default.
FR 1.450	Performance: Site must be able to handle multimedia (video) with high performance.
FR 1.451	HTML Compliance: Full compliance with HTML 5.0 or higher.
FR 1.452	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.
FR 1.453	Website visit counter functionality should be available on website.
Design and Construction	
FR 1.454	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.
FR 1.455	Work closely with the DMIC IITGNL at each stage of the design to identify user needs and corresponding user interface requirements, workflows, and functionalities.
FR 1.456	Ensure integration of all elements including content, information format, compatibility with software platforms used by DMIC IITGNL and standards for content management.
FR 1.457	Select a platform that allows easy integration of multimedia products and user-friendly administrator interface.
FR 1.458	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 1.459	Develop corresponding user interface components (web templates, style sheets, scripts, images, dashboards, social media interfaces) as needed.
FR 1.460	Use simple, cost-effective techniques to test designs with representatives of target audience prior to launch of site.
FR 1.461	Submit the final concept to DMIC IITGNL for review prior to ‘going live.’
FR 1.462	Secure the existing website prior to transitioning to the new platform.
FR 1.463	Keep a full backup of the website through the duration of the project.
FR 1.464	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 1.465	Content Migration - The complete migration of the new website to existing DMIC IITGNL URL. Deployment of new content.
FR 1.466	The website must have an app (for Android & iOS) reflecting all website content.

FR 1.467	GIS map to be published on the DMIC IITGNL website with linkages to apply for land.
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2.2.3.4.2 Water Utility Management and Billing

Functional Requirements

WATER UTILITY MANAGEMENT AND BILLING	
FR 1.468	<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 1.469	<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 1.470	<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 1.471	<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 1.472	<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 1.473	<p>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.</p>
FR 1.474	<p>Service Contract and Quotation Analysis:</p> <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 1.475	<p>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.</p>
FR 1.476	<p>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:</p> <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 1.477	<p>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.</p>
FR 1.478	<p>The system must allow a Move in/Move out process for an occupant for a property or premise.</p>
FR 1.479	<p>Identifying Account for Utility Service Processes:</p> <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

	<ul style="list-style-type: none"> 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 1.480	<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 1.481	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 1.482	Processing Move-In: Be able to create a move-in in the Citizen Facilitation Centre (CFC) as well as via the portal.
FR 1.483	Processing Move-Out: Be able to create a move-out in the CFC as well as via the portal.
FR 1.484	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 1.485	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 1.486	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 1.487	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 1.488	Bill Information/Bill Correction: Ability to add/change information to a bill and to correct it if the meter reading is incorrect.
FR 1.489	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 1.490	Functionality for the customer agent to escalate an exception.
FR 1.491	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 1.492	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 1.493	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 1.494	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 1.495	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 1.496	Warranty Analysis: Need to provide information about the amount of products/services with or without warranty and monitor expired warranties.
FR 1.497	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 1.498	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 1.499	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 1.500	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 1.501	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 1.502	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 1.503	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 1.504	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 1.505	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 1.506	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 1.507	Monitoring Customer Exception: The system should be able to track customer behavior in terms of exceptions. For example: The number of times a customer figures in the list of exceptions.
FR 1.508	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 1.509	Overdue alert: In case a meter reading becomes overdue (Utility specified criteria), the system would generate the necessary exceptions and alerts.
FR 1.510	Accepting change in metering cycle: The system should be in a position to cater to changes in the metering cycle.
FR 1.511	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 1.512	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 1.513	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 1.514	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 1.515	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 1.516	<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 1.517	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 1.518	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 1.519	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 1.520	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 1.521	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 1.522	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 1.523	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 1.524	Tracking stock location: The system shall have the ability to maintain stock locations and asset inventory.
FR 1.525	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 1.526	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 1.527	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 1.528	Adding meter record in batches: The system shall have the ability to add meters one at a time or in batches of meters.
FR 1.529	Recoding individual meter test results: The system shall have the ability to maintain unlimited individual test results on each meter.
FR 1.530	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 1.531	Record connection type: The system shall have the ability to describe the meter connection type.
FR 1.532	Record bar coding information: The system shall have the ability to maintain bar coding information.
FR 1.533	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 1.534	Manufacturer and calibration validity: The system shall have the ability to define manufacturer and calibration validity for a class of meters.

FR 1.535	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 1.536	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 1.537	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 1.538	Record transactions: The system shall have the ability to record transactions related to meter installation, removal and replacements.
FR 1.539	Allocate/grouping: The system shall have the ability to allocate / group a meter with a zone or water mains.
FR 1.540	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 1.541	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 1.542	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 1.543	Define and optimize meter route: The system shall have the ability to define and optimize route for the meter reader.
FR 1.544	Sequence meter route: The system shall have the ability to sequence routes.
FR 1.545	Transfer meter between route the system shall have the ability to transfer single or a group of connections from one route to another.
FR 1.546	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 1.547	Attach note on meter reading the system shall have the provision to include pre-defined notes from Meter reader in Meter reading result.
FR 1.548	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 1.549	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 1.550	Define estimation rules: The system shall have the ability to define rules for determining "estimated" reading.
FR 1.551	Define validation rules: The system shall allow user defined meter reading validations rules.
FR 1.552	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 1.553	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 1.554	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 1.555	Record certification data: The system shall have the ability to hold certification validity data in the meter record.
FR 1.556	Accept interval data: The system shall have the ability to accept interval meter reading data from AMR system.

FR 1.557	Download consumption information: The system shall have the ability to download previous 12-month consumption information for any or all meters.
FR 1.558	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 1.559	Conditions for meter reading accept/reject: The system shall have the ability for meter reading accept/reject conditions to be user defined.
FR 1.560	Extrapolate future interval values: The system shall have the ability to extrapolate future interval values that may be used for forecasting.
FR 1.561	Prepare customer usage profiles: The system shall have the ability to prepare customer usage profiles including charts and graphs.
FR 1.562	Create service orders from meter reading trouble codes: The system shall be able to create service orders from meter reading trouble codes.
FR 1.563	Define different frequencies for meter reading: The system shall have the provision to define different frequencies for meter reading.
FR 1.564	Generate paper route documents: The system shall have the ability to generate paper route documents.
FR 1.565	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 1.566	Maintain meter reading notes: The system shall have the ability to maintain meter reading notes.
FR 1.567	Maintain reading codes: The system shall have the ability to maintain reading codes.
FR 1.568	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 1.569	Maintain Meter Location Codes: The system shall have the ability to maintain Meter Location Codes.
FR 1.570	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 1.571	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 1.572	Generate automatic letters/notices: The system shall have the ability to generate automatic letters/notices to customers.
FR 1.573	Capture the meter data from zonal meters.
FR 1.574	Compare reading from consumer and zonal meters: The system shall have the ability to compare reading from consumer and zonal meters.
FR 1.575	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 1.576	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 1.577	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 1.578	Maintain history: The system shall have the ability to maintain a history of readings, consumption and demand records.
FR 1.579	Display the Days of Services The system shall have the ability to display the Days of Services (DOS) with the calculated consumption.

FR 1.580	Display cancelled calculated consumption: The system shall have the ability to display cancelled calculated consumption resulting from billing adjustment.
FR 1.581	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 1.582	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 1.583	Store monthly demand data and corresponding charges: The system shall have the ability to store monthly demand data and corresponding charges.
FR 1.584	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 1.585	Display the prorated consumptions: The system shall have the ability to display the prorated consumptions for each period separately.
FR 1.586	GIS Grid reference required for meters.
FR 1.587	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 1.588	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. The system must also allow revision upwards or downwards of rates along with effective dates with a record of the old rate history.
FR 1.589	Surcharges and Rebates on components of Water Bills must be configurable. These could either be based on percentages or fixed amounts. In certain cases, rebates or subsidies are given to specific customers and the system must cater to this functionality requirement. The system must also allow revision upwards or downwards of surcharges and rebates along with effective dates with an old record history.
FR 1.590	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. The system must also allow revision upwards or downwards of such taxes and levies along with effective dates with an old record history.
FR 1.591	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 1.592	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. 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.
FR 1.593	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 1.594	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 1.595	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 1.596	Cheque/Cash Payment: for amounts above a certain configurable threshold the system must not accept cash payments.
FR 1.597	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 1.598	Collective Billing: System must be configurable to manage the group billing / collective billing in one invoice and payment should be adjusted accordingly.
FR 1.599	Billing Simulation: System must be configurable to generate billing based on estimation / reading for checking purpose.
FR 1.600	Out sorting / Validation: System should be configurable to manage amount level validation at billing and Invoicing level and manual checks, block.
FR 1.601	Billing reversal / Adjustment: System should be configurable to manage bill correction and adjustment in case of customer complaints / wrong bills.
FR 1.602	Manual Billing: System should be configurable to address old bill / archive bill generation requirement.
FR 1.603	Unscheduled Billing: System should be configurable to generate online billing for unscheduled cases like final bill online.
FR 1.604	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 1.605	System has the ability to prorate for days less than system or user- defined number of billing days.
FR 1.606	System provides the ability to prorate a new bill based on the number of days active.
FR 1.607	System provides the ability to prorate a final bill based on the number of days active.
FR 1.608	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 1.609	System provides the ability to bill for multiple meters at a single location.
FR 1.610	System provides the ability to accommodate back billing for a single period with a user-defined start and end date.
FR 1.611	System provides the ability to produce duplicate copies of the bill.
FR 1.612	Budget Billing: System calculates the average billing amount over a user-defined period for past billings.
FR 1.613	System calculates the same monthly payment while capturing actual readings.
FR 1.614	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 1.615	System will provide for estimating should actual reads not be available.
FR 1.616	System provides the ability to estimate entire billing cycles or routes with user-defined read date.
FR 1.617	System will calculate the estimated bill based upon the read date, not the bill date, to determine number of days in billing cycle.

FR 1.618	System will automatically mark services that have been estimated with a unique identifier.
FR 1.619	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 1.620	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 1.621	Analysis Reports: <ul style="list-style-type: none"> • Demand analysis Report; • Collections analysis Report; • Revenue Recovery analysis Report; • Water Supply effectiveness Analysis Report; and • Customer Service effective analysis Report.
FR 1.622	Executive Management Reports: <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 1.623	Consolidated Reports: <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 1.624	Single Parameter Reports: <ul style="list-style-type: none"> • Improvement Reports; • Revenue Reports; and • Operations Reports.
FR 1.625	Daily Reports: <ul style="list-style-type: none"> • Summary of % cumulative collections against correct month demand till date, last month.
FR 1.626	Revenue Collection Report: <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 1.627	Other Reports: Other reports as per the Client requirements arising from time to time during project life cycle.
FR 1.628	The System shall cover: <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;
- 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

	<ul style="list-style-type: none"> • Top Defaulters as per criteria.
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2.2.3.4.3 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 1.629	The purpose of this module will be to integrate inputs / complaints received on any of the systems and trigger events in the ERP system for the complaint to be resolved efficiently. The workflows outlined in this document aims at effective monitoring of service levels and reducing repeat complaints.
FR 1.630	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 workflow shall proceed from the portal. Grievance Management shall work seamlessly with CRM to log complaints.
FR 1.631	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 1.632	Once the grievance is received, it shall have a workflow 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 1.633	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 1.634	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 1.635	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 1.636	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 1.637	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 1.638	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 1.639	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: <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 1.640	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 1.641	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 1.642	<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;

	<ul style="list-style-type: none"> • Based on Recorded details; • Call Back; and • Other existing complaint systems.
FR 1.643	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 1.644	<p>Through Call Centre (Phone, e-Mail & SMS):</p> <ul style="list-style-type: none"> • A citizen calls designated telephone number; • 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 1.645	There must be no option to delete tickets. They may be classified as Active or non-active
Complaint Allocation	
FR 1.646	<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

	<ul style="list-style-type: none"> 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 1.647	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 1.648	<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 1.649	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 1.650	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 1.651	The Citizen should be able to know the status of his / her complaint online from website, application or through phone / SMS.
Citizen Feedback	
FR 1.652	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 1.653	<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 1.654	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 1.655	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

	<p>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 1.656	<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 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 1.657	DMIC IITGNL Official can transfer his / her pending complaints to another official from the same or different area / location.
Dashboard	
FR 1.658	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 1.659	The system should provide DIY (Do It Yourself) data analytics platform based on the philosophy of analytics for all.
FR 1.660	The dashboard shall have provision of monitoring service level agreement.
FR 1.661	The users should be able to access the dashboard in tablets/laptops/desktops.
Mobile App for Citizen	
FR 1.662	<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 1.663	<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;

	<ul style="list-style-type: none"> • 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 1.664	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 1.665	Grievance Registration.
FR 1.666	Grievance Search.
FR 1.667	Grievance acknowledgement.
FR 1.668	Grievance resolution intimation.
Masters & Initial Setup	
FR 1.669	Complaint Type, Sub-types, Capture of Mobile No. of citizen.
FR 1.670	Mapping of Designation / Roles to Complaint Sub-type.
FR 1.671	Integration of Complaint Type / Sub-type with Departmental Modules.
FR 1.672	Citizen Charter for each Complaint Type (Define duration of complaint redressal & escalation path in case of no redressal).
Complaint Acceptance	
FR 1.673	Complaint Acceptance through Citizen Facilitation Centres / Internet / Kiosks.
FR 1.674	Facility to make UID ID compulsory for certain complaints. Facility to check dues for allowing certain complaints.
FR 1.675	SMS alert to concerned employee.
FR 1.676	Facility to mention the action on complaint.
FR 1.677	Automatic escalation of Complaints (beyond stipulated time frame).
FR 1.678	SMS alert to citizen upon Action Taken Report.
FR 1.679	Facility to accept and analyse citizen feedback on the Administration Action.
FR 1.680	Facility to mark a complaint as fake / invalid (for not considering it in the normal reports or report for Project System).
MIS	
FR 1.681	Exhaustive reports shall be generated by the system for officers at various levels for effective decision making and period review of operations. Some of the MIS reports generated from the system will be as follows: <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;

	<ul style="list-style-type: none"> • 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; • 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 1.682	Pendency reports (complaint-wise / Dept.-wise).
FR 1.683	Top Performers / Least Performers.
FR 1.684	Analysis of Grievances.

2.2.3.4.4 Integration and Interfaces

Functional Requirements

INTEGRATION AND INTERFACES	
FR 1.685	<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"> • Citizen facing modules; • GIS & web GIS; • Land management system; • Command and Control System; • 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 provided by third parties; • Payment Systems (not limited to RTGS, PAYTM, BHIM, Credit Cards etc.); • Banks; • Solid Waste Management System; • Systems relating to central and/ or state governments; • Websites/portals of central and/or state governments; • UP government portal – Udyog Bandhu (Integration required); • NIC Portal; • Government e-Marketplace (GeM) Portal; • Systems owned by Vendors and/or City Operators;

	<ul style="list-style-type: none"> • 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 1.686	Functionality should be provided for validation of data movement between source and target system.
FR 1.687	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 1.688	Notwithstanding 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 1.689	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.

2.2.3.4.5 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 1.690	Integrated Portal services shall be accessed online through Web and Mobile app via several end user devices (PC, Tablets, Smartphones, etc.).
Mobile Governance	
FR 1.691	<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 applying for government services, license renewals, etc.; • Citizen engagement: opinion polls and feedback gathering, stakeholder consultation. • Mobile-based polls; • Mobile workflow alerts to outsourced and DMIC IITGNL employees; • Ability to book key facilities at DMIC IITGNL; and

	<ul style="list-style-type: none"> Integration with weather, environmental and other sensors being provided as part of DMIC IITGNL for enabling open data initiatives.
FR 1.692	All the above application must have mobile apps that are mirror image of each module.
FR 1.693	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 1.694	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 1.695	<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 authorization 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 1.696	All the facilities for a citizen can be accessed through an intuitively designed mobile application.
FR 1.697	<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 1.698	The mobile apps shall be provided in Android and iOS versions
FR 1.699	The apps shall be responsive for viewing in different device sizes
Presentation Layer	

FR 1.700	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 1.701	<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 to be 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 1.702	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 1.703	<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, many programming languages (Java, ESQ, 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

	<ul style="list-style-type: none"> • 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 1.704	<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 1.705	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 1.706	<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 1.707	<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.

	<ul style="list-style-type: none"> • 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 1.708	<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 • 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.

2.2.4 Environmental Sensors

2.2.4.1 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 CCC 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

Business Requirements

BR 1.48	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 1.49	Environment monitoring shall be done for tracking that the pollution and noise levels are within the acceptable limits.
BR 1.50	Display of parameters to citizens to create awareness and support 'open data' initiatives.
BR 1.51	Establish frameworks for regulating these parameters in terms of any supporting initiatives for maintaining acceptable levels.
BR 1.52	Central monitoring at CCC, city application, website and variable message display in an integrated manner.

Functional Requirements

FR 1.709	<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 1.710	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 1.711	Environmental sensor station shall be ruggedized enough to be deployed in open air areas such as streets and parks.
FR 1.712	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 1.713	The Response time of the sensors shall be less than 60 seconds.
SYSTEM SOFTWARE	
FR 1.714	Environmental sensor station shall have a pre-installed software.
FR 1.715	Software shall display real time and historical data in chart and table views for dashboard view of the Client.
FR 1.716	Software shall display trends of environmental parameters based on user specific time periods.
FR 1.717	It shall be possible to configure and calibrate the sensors through the software from a remote location.
FR 1.718	It shall display and export sensor diagnostic information.
FR 1.719	Alarms shall be generated for events where the environmental parameters breaches the safe or normal levels.

FR 1.720	Administrator shall be able to manage access privileges for only authorized users.
FR 1.721	Data of all the environmental sensor shall be available on the same software interface.
FR 1.722	Environmental parameters shall be integrated with VMDs, CCC, city website and mobile application.

Technical Requirements

CARBON MONOXIDE (CO) SENSOR	
TR 1.591	Range of CO sensor shall be between 0 to 20 PPM.
TR 1.592	Resolution of CO sensor shall be 0.1 PPM or better.
OZONE (O3) SENSOR	
TR 1.593	O ₃ Sensor shall have a range of at least 0-0.4 PPM.
TR 1.594	Resolution of O ₃ sensor shall be 0.001 PPM or better.
NITROGEN DIOXIDE (NO2) SENSOR	
TR 1.595	NO ₂ Sensor shall have a range of at least 0-0.2 PPM.
TR 1.596	Resolution of NO ₂ sensor shall be 0.001 PPM or better.
SULPHUR DIOXIDE (SO2) SENSOR	
TR 1.597	SO ₂ Sensor shall have a range of at least 0-0.7 PPM.
TR 1.598	Resolution of SO ₂ sensor shall be 0.001 PPM or better.
CARBON DIOXIDE (CO2) SENSOR	
TR 1.599	CO ₂ Sensor shall have a range of at least 0-2000 PPM.
TR 1.600	Resolution of CO ₂ sensor shall be 1 PPM or better.
PARTICULATE PROFILE SENSOR	
TR 1.601	Particulate profile sensor shall provide simultaneous and continuous measurement of PM ₁₀ and PM _{2.5} in ambient air.
TR 1.602	Range of PM _{2.5} shall be 0 to 500 micro gms / cu.m or better.
TR 1.603	Range of PM ₁₀ shall be 0 to 1000 micro gms / cu.m or better.
TEMPERATURE SENSOR	
TR 1.604	Temperature sensor shall have the capability to display temperature in °Celsius and °Fahrenheit.
TR 1.605	Temperature range shall be -10° to +65°C.
RELATIVE HUMIDITY SENSOR	
TR 1.606	Range of relative humidity sensor shall be 1 to 100% RH.
TR 1.607	Resolution and units of relative humidity sensor shall be 1% or better.
WIND SPEED SENSOR & WIND DIRECTION SENSOR	
TR 1.608	Wind speed sensor shall have the capability of displaying wind speed in mph, km/h, m/s.
TR 1.609	Range of wind speed sensor shall be 0-60 m/s.
TR 1.610	Range of the wind direction sensor shall be 0° to 360°.
RAINFALL SENSOR	
TR 1.611	Rainfall sensor shall the capability of displaying level of rainfall in inches and millimetre.
TR 1.612	Daily Rainfall range shall be 0 to 99.99" (0 to 999.8 mm).

TR 1.613	Monthly/yearly/total rainfall range shall be 0 to 199" (0 to 6553 mm).
BAROMETRIC PRESSURE SENSOR	
TR 1.614	Barometric pressure sensor shall have the capability of displaying barometric pressure in Hg, mm Hg and hPa/mb.
TR 1.615	Range of barometric pressure sensor shall be 540 hPa/mb to 1100 hPa/mb.
NOISE SENSOR	
TR 1.616	Noise sensor shall be able to identify the areas of high sound intensity ranging from 30 dBA to 120 dBA.
TR 1.617	Noise sensor shall have resolution of 0.1 dBA.
TR 1.618	Noise sensor shall detect the intensity of the ambient sound in a particular area.
TR 1.619	Noise Sensors shall be installed for the outdoor applications.
ENVIRONMENTAL SENSOR MANAGEMENT SOFTWARE	
TR 1.620	Software shall be pre-installed on every built system.
TR 1.621	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 1.622	Software shall display real-time and historical data in chart and table views.
TR 1.623	Software shall display trends of environmental parameters based on user specified time periods.
TR 1.624	It shall be possible to configure and calibrate the sensors through the software from a remote location.
TR 1.625	Software shall display and export sensor diagnostic information.
TR 1.626	User shall be able to change sensor module settings through the software and from remote locations.
TR 1.627	Administrator shall be able to manage access privileges for only authorized users.
TR 1.628	Alarms shall be generated for events where the environmental parameters breaches the safe or normal levels.
TR 1.629	It shall be integrated at the CCC for the purposes of monitoring, display of information and control of the system.
GENERAL	
TR 1.630	The design shall be modular in nature which shall have the capability to add additional environmental sensors in the future into the enclosure.
TR 1.631	It shall be possible to remove or replace individual sensor modules without affecting the functioning of rest of the system.
TR 1.632	It shall be possible to mount the air quality monitoring station to a pole, tripod or wall mounting brackets
ENVIRONMENTAL REQUIREMENTS	
TR 1.633	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 1.634	Environmental operating range shall be 0°C to +60°C.
ELECTRICAL REQUIREMENTS	
TR 1.635	Power requirements of the system (environmental station) shall 220-240 VAC, 50Hz.
TR 1.636	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 1.637	Environmental station shall support communications by Ethernet (RJ45) or Fibre optic communications or 3G/4G.

System Output:

A tentative list of system outputs and processes which the MSI shall achieve out of Environmental Sensors have been given below. The list may be further upgraded and finalized during implementation phase:

S. NO.	PROCESS	PROVIDER	INPUT	OUTPUT	PLATFORM
Environmental Sensors:					
P1.	Applicable Sensors shall be housed in a compact environmentally rated outdoor enclosure. It shall be an integrated module which shall monitor the following parameters: <ul style="list-style-type: none"> Gaseous pollutants concentration in Air Temperature Noise Weather parameters (Windspeed, Humidity, Barometric Pressure etc.) 	Environment Sensor Management Software	Reading recorded by applicable Sensors	Real-time environmental data is displayed on multiple channels i.e. Variable Message Display, GIS map, CCC, ISM	CCC, GIS, ISM
P2.	CCC operator receives an alarm along with location on GIS map if any of the Environmental sensors/ sensor module(s) is found to be malfunctioning/ disconnected from the server. The operator then generates an incident ticket and dispatches a service team to resolve the issue.	Environment Sensor Management Software	Location of Environmental Sensor on Base Map about malfunctioning/ disconnected sensor modules	Dispatch of Service team for repair/replacement of sensor modules. Incident shall be logged in EMS.	CCC, GIS and EMS
P3.	If gaseous pollutants cross a predefined threshold level creating a hazardous atmosphere for IIT citizens, an Environment alert is generated for CCC operator. The operator verifies the alarm and further notifies city admin for further action. Environmental Advisory is also sent to citizens via VMD, Portal, ISM. This continues until the ambient environmental conditions are restored.	Environment Sensor Management Software	Alerts to CCC operator about poor environmental conditions	<ul style="list-style-type: none"> Notifying city admin by CCC operator about the environmental conditions Notification of environmental advisory to citizens via different channels such as VMD, ISM, Portal. 	CCC, GIS, ISM

2.2.5 IT and Other Common Infrastructure

2.2.5.1 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.

Technical Requirements

FIREWALL	
TR 1.638	The Firewall appliance must have certifications like NDPP / ICSA / EAL4 or equivalent.
Hardware Architecture	
TR 1.639	The appliance based security platform must be capable of providing firewall and VPN (both IPsec and SSL) functionality in a single appliance.
TR 1.640	The device must be fully populated in all respects like memory, ports, storage etc.
TR 1.641	The appliance must support at least 4*40G, 4*10 G, 4*1 G with transceivers (SR) from day 1.
Performance & Scalability	
TR 1.642	Firewall must support stateful inspection throughput minimum of 80 Gbps in Active-Active deployment or Active-Passive deployment.
TR 1.643	Firewall must support at least 5 million concurrent sessions.
TR 1.644	Firewall must support at least 250,000 connections per second
TR 1.645	NGFW must support 3DES/AES IPsec VPN throughput of at least 5Gbps.
TR 1.646	Firewall must support at least 500 VLANs.
TR 1.647	Firewall must support 10 virtual firewalls from day one.
Firewall Features	
TR 1.648	Firewall must provide application inspection for DNS, FTP, HTTP, SMTP, LDAP, MGCP, RTSP, SIP, TFTP, H.323, SNMP,
TR 1.649	Firewall module must support security policies based on (IPv4 and IPv6).
TR 1.650	Firewall solution must provide protection against botnets.
TR 1.651	Firewall must support creating access-rules with IPv4 & IPv6 objects simultaneously.
TR 1.652	Firewall must support operating in routed & transparent mode. must be able to set mode independently for each context in multi-context mode.
TR 1.653	In transparent mode firewall must support anti-spoofing or arp-inspection to prevent spoofing at Layer-2.
TR 1.654	Must support Non Stop Forwarding in HA during failover and Graceful Restart
TR 1.655	Firewall must support static nat, pat, dynamic nat, pat & destination based nat.
TR 1.656	Firewall must support Nat66 (IPv6-to-IPv6) & Nat 64 (IPv6-to-IPv4) functionality.

TR 1.657	Firewall must have at least 3000 native application filters available from day 1.
TR 1.658	Must be able to support at least 3000 network objects.
TR 1.659	Firewall must support Restful API for integration with 3rd party solutions like Software Defined Networking.
TR 1.660	The Firewall must support Link Aggregation Control Protocol 802.3ad.
TR 1.661	Firewall must have integrated redundant power supply.
High-Availability Features	
TR 1.662	Firewall must be able to operate in Active/Standby or Active/Active mode.
TR 1.663	Firewall must support port aggregation functionality for the failover control & data interfaces for provide additional level of redundancy.
TR 1.664	Firewall must support redundant interfaces to provide interface level redundancy before device failover.
TR 1.665	Firewall must support 802.3ad Ether-channel functionality to increase the bandwidth for a segment across different modules.
TR 1.666	Firewall must support failover of IPv4 & IPv6 sessions.
TR 1.667	Firewall must replicate Nat translations, TCP, UDP connection states, ARP table, ISAKMP & IPsec SA's, SIP signalling sessions.
TR 1.668	Firewall must support failover of IPv4 & IPv6 sessions of individual providers.
TR 1.669	Firewall must support latest IKEv2 standards.
TR 1.670	Must support pre-shared keys & Digital Certificates for VPN peer authentication.
TR 1.671	Must support perfect forward secrecy & dead peer detection functionality.
TR 1.672	Must support Nat-T for IPsec VPN.
Routing Features	
TR 1.673	Firewall must support IPv4 & IPv6 static routing, OSPF v2 & v3, BGP, IGMP v2 & V3.
TR 1.674	Firewall must support PIM multicast routing
TR 1.675	Firewall must support SLA monitoring for static routes.
Management Capabilities	
TR 1.676	Firewall management of firewall policies via internal or external centralised management solution
TR 1.677	Firewall must support SNMP 2c & 3
TR 1.678	Firewall must support packet capturing functionality to send the packet capture to Wire shark for detailed packet analysis.
TR 1.679	Firewall must support the functionality of Auto-Update to check for latest software versions & download the same.

2.2.5.2 Operator Workstation

The operator workstations shall be specifically installed for the operators at the Comman and Control Center. The specifications for Operator Workstations requirements are mentioned below.

OPERATOR WORKSTATIONS	
TR 1.680	The workstations shall have a wireless optical mouse with Bluetooth connection complying with FCC and CE norms.

TR 1.681	The workstation shall be Energy star 5.0/BEE star certified/ BIS.
TR 1.682	The workstations shall have a 104 Key English wireless keyboard with Bluetooth connection.
TR 1.683	Keyboards, Mouse and accessories shall be connected via respective signal extender as required.
TR 1.684	Workstation would have Integrated Realtek ALC3861 High Definition Audio Codec (2 Channel) with Internal Speaker.
TR 1.685	The workstations shall have a latest 12 th Gen Intel® Core™ i7-12700 (25 MB cache, 12 cores, 20 threads, 2.10 GHz to 4.90 GHz Turbo, 65 W)
TR 1.686	The workstations shall have at least 32, 2X 16 GB DDR4 memory @ 2666 MHz.
TR 1.687	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 1.688	The workstations shall have a min. 500 GB SATA III hard disk @ 7200 RPM or higher and 500 GB SSD hard disk.
TR 1.689	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 1.690	The workstations shall have graphic accelerator of ATI Rage Pro/AGP graphics acceleration: HEVC Encode
TR 1.691	The Monitors shall have a minimum resolution of 2560 x 1440 with 5ms response time or better specifications.
TR 1.692	The workstations shall have a DVD-RW as an optical drive or better.
TR 1.693	The workstations shall have an industry-standard professional-grade operating system. Acceptable systems include Microsoft Windows 10 pro 64 Bit or better.
TR 1.694	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 1.695	The workstations shall have an expansion bus of 3 PCI/ PCIe Slots;
TR 1.696	The workstations shall have latest Microsoft Office Professional and Antivirus. Microsoft Office license shall be perpetual for each workstation.
TR 1.697	Other pre-loaded software (open source/ free) shall be Latest version of Adobe Acrobat Reader, Scanning Software (as per scanner offered).
TR 1.698	The AC input power shall be 220-240 VAC +/- 10% at 50/60 Hz +/- 1Hz.
TR 1.699	The workstations shall have a dual port 1 Gbps Ethernet network interface card.
TR 1.700	The workstation shall be operational in temperature between ten degrees Celsius (10°C) to thirty degrees Celsius (30°C).
TR 1.701	The workstation shall be loaded with advanced antivirus, antispymware, desktop firewall, intrusion prevention (comprising of a single, deployable agent) which can be managed by a central server.

2.2.5.3 Communication Cabinets with Racks

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

Functional Requirements

FR 1.723	The cabinets shall be capable of accommodating all the network devices to support the design requirements.
FR 1.724	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 1.725	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 1.702	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 1.703	All cabinets shall be supplied with standard 19" wide rack mount assemblies that shall allow for mounting of standard rack-mount equipment.
TR 1.704	All cabinets shall be supplied with standard lockable doors.
TR 1.705	The cabinets shall be as a minimum IP 20 rated.
TR 1.706	All cabinets shall have provision for cable entry from top & bottom of rack with knock-off, pre-punched marked openings.
TR 1.707	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 1.708	Front door shall be made of Tinted toughened glass and should be lockable.
TR 1.709	All cabinets shall have equipment mounting frame (rail notches) for mounting of equipment.
TR 1.710	Shelves for equipment placement shall be provided as required.
TR 1.711	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 1.712	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 1.713	The rack shall have ventilation louvers or uniform perforations on side panel & rear door & equipment cooling with fans (4nos.) housed in fan trays.
TR 1.714	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 1.715	The device shall support operating temperature range of 5°C to +40°C.
Outdoor Enclosures/ Field Cabinets	
TR 1.716	Weatherproof IP55 compliant UV resistant outdoor metallic enclosure/ field cabinet in conformance with DIN 41494.
TR 1.717	Vandal proof design with single side door and lock design shall be as per industrial best practise and compliant to industrial lock.

TR 1.718	Suitable size as per site requirements to house the field equipment.
TR 1.719	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 1.720	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 1.721	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 1.722	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, and other ICT components as defined in this RFQ cum RFP.
TR 1.723	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 1.724	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 1.725	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 1.726	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

2.2.5.4 Uninterruptable Power Supply (UPS)

The UPS unit shall be provided at Mini PoP rooms and CCC 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.

Business Requirements

BR 1.53	The UPS unit shall be provided with external batteries as needed to support the run-time requirements.
BR 1.54	All DMIC IITGNL equipment installed at Mini PoP, Field cabinets and CCC shall be connected on the UPS.
BR 1.55	The quantity of batteries required for the UPS, shall be calculated based on the equipment load and run-time.
BR 1.56	The UPS units shall provide backup power to critical load. In addition, UPS shall also provide cleansed power to this equipment.

Functional Requirements

FR 1.726	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. For Field uses, UPS should be 1:1 Phase.
FR 1.727	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 1.728	The various overload capacities of inverters, static switch, and step-down transformer/voltage stabilizer as specified herein are the minimum requirements.
FR 1.729	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

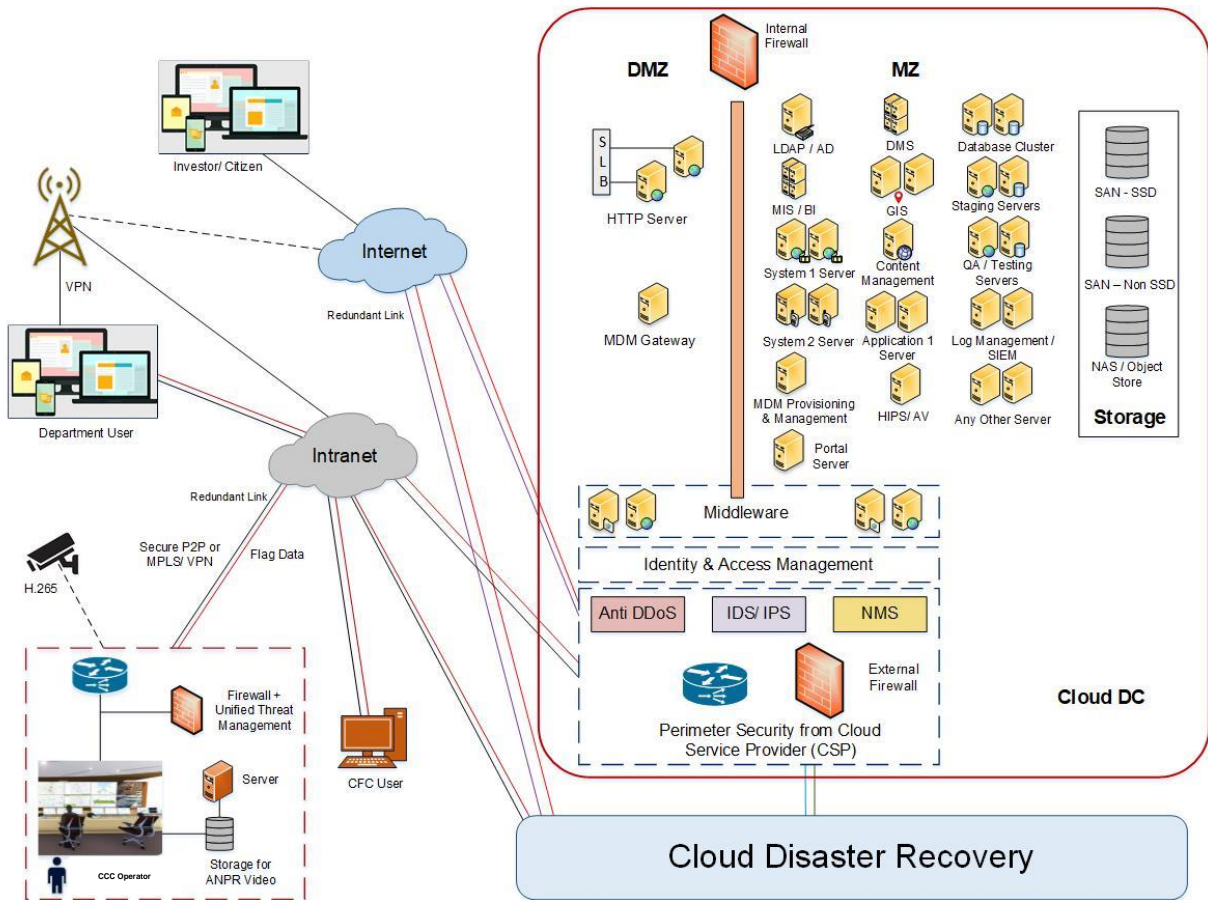
TR 1.727	The MSI shall provide the calculations to support the UPS rating and number of batteries as part of the Bid submission. UPS shall be provided as N+1 physically redundant configuration
TR 1.728	The UPS unit shall include Sealed Maintenance Free Lithium ion Batteries with typical lifetime of five (5) years and minimum reserve time of (4) four hours under full load conditions.
TR 1.729	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 1.730	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 1.731	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 1.732	The UPS offered shall have efficiency not less than 96%.
TR 1.733	The Harmonic distortion (iTHD) of UPS shall be less than 3% on linear load.
TR 1.734	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 1.735	The UPS shall be of True online with double conversion topology. It shall support an output 1 power factor at full load.
TR 1.736	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 1.737	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/LED that display the approximate battery capacity.
TR 1.738	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 1.739	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 1.740	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;

	<ul style="list-style-type: none"> • 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 1.741	<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 1.742	The UPS unit shall include full-time protection from sudden voltage increase with inrush protection and AC line filtering.
TR 1.743	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 1.744	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 1.745	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 1.746	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 1.747	The UPS unit shall be enclosed to prevent accidental contact with energized parts.
TR 1.748	The UPS unit shall have a built-in input fuse and/or a circuit breaker for protection from over voltage and current variations.
TR 1.749	The UPS unit shall provide an over voltage shutdown and shall have over voltage protection
TR 1.750	The UPS unit shall provide short circuit shutdown protection.
TR 1.751	External battery charger (if required) for the specified battery bank shall be provided. The battery charger shall automatically recharge the battery.
TR 1.752	The external battery charger shall be provisioned to be mounted in separate box/cabinet or UPS itself.
TR 1.753	The UPS unit shall be compliant to IEC 62040-1 safety standards as a minimum. Product shall have CE & ROHS
TR 1.754	The UPS shall have a BACnet card / RS232 / RS485 / IP port for integration with BMS.
TR 1.755	The UPS system shall have an operating temperature of 0 degrees to 40 degrees C.
TR 1.756	UPS shall support capability to centrally monitor UPS status from EMS.
UPS FOR FIELD DEVICES	
TR 1.757	The MSI shall supply 1:1 Phase UPS with (2) two-hour backup for Field devices.
TR 1.758	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 1.759	The UPS unit shall include separate, sealed, maintenance-free batteries with a typical lifetime of five (5) years.
TR 1.760	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 1.761	The Harmonic distortion (iTHD) of UPS shall be less than 3% on linear load.
TR 1.762	All the Input and output cabling and related ancillary works (civil/electrical, etc.) shall be in the scope of the MSI.

TR 1.763	The UPS shall be of True online with double conversion topology.
TR 1.764	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 1.765	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 1.766	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 1.767	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 1.768	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 1.769	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 1.770	The UPS unit shall include full-time protection from sudden voltage increase with inrush protection and AC line filtering.
TR 1.771	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 1.772	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 1.773	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 1.774	The UPS unit shall be enclosed to prevent accidental contact with energized parts.
TR 1.775	The UPS unit shall have a built-in input fuse and/or a circuit breaker for protection from over voltage and current variations.
TR 1.776	The UPS unit shall provide an over voltage shutdown and shall have overvoltage protection.
TR 1.777	The UPS unit shall provide short circuit shutdown protection.
TR 1.778	External battery charger (if required) for the specified battery bank shall be provided. The battery charger shall automatically recharge the battery.
TR 1.779	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 1.780	The UPS unit shall be compliant to IEC 62040-1 safety standards as a minimum. Product shall have CE & ROHS certifications.
TR 1.781	The UPS system shall have an operating temperature of 0 degrees to 45 degrees C.
TR 1.782	UPS shall support capability to centrally monitor UPS status from EMS.

2.2.5.5 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 5: Conceptual Architecture of Data Hosting

Business Requirements

BR 1.57	Hosting infrastructure shall include cloud Data Centre (DC) and cloud Disaster Recover Centre (DRC) services for hosting of applications.
BR 1.58	Cloud Platform/Infrastructure/Solution i.e. DC and DRC shall host all applications excluding video surveillance as part of this Project. .
BR 1.59	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 empaneled 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 as per Client requirements.
BR 1.60	Hosting Infrastructure shall have capability of handling enterprise workloads with autoscaling features.

BR 1.61	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 1.62	Hosting infrastructure shall be fully secure with no scope of data breach/leaks/thefts/data mining/privacy breach etc.
BR 1.63	Hosting Infrastructure shall have the characteristics such as rapid elasticity and ability to handle hardware failures without downtime.
BR 1.64	Hosting Infrastructure shall have extremely high availability with no point of failure of the Compute / Virtual Machines and storage volumes.
BR 1.65	In case of failure, cloud solution shall have automated processes which shall move customer data traffic away from the affected area.
BR 1.66	Cloud solution shall be complied with ITIL (Information technology Infrastructure library) standards.
BR 1.67	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 single point of failure.
BR 1.68	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 1.69	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 1.70	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 1.71	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 1.730	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 1.731	The solution shall have the ability of Auto-scaling (Vertical and Horizontal), Scaling up / down on demand.
FR 1.732	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 1.733	It shall have agility with the functionality of software defined configurations to add / remove capacity.
FR 1.734	MSI shall have the overall responsibility of the environment and has the ability to log, monitor, and audit the traffic and usage.
FR 1.735	The solution shall have security features out of the box.
FR 1.736	Complete visibility & control of the environment shall be available with the Client –cloud governance capabilities.
FR 1.737	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 1.738	User / Admin Portal (User Profile Management, Trouble Management).
FR 1.739	The solution shall be capable to perform Role Based Access Control to segregate users based on their roles and privileges.
FR 1.740	Cloud solution shall be accessible via both Internet and MPLS/VPN.
CLOUD INFRASTRUCTURE / HOSTING AT DATA CENTRE	
FR 1.741	DC Cloud Infrastructure facilities shall have routers, firewalls, LAN, WAN, internet access, and hosting centres, backup, operations management, and data management capabilities.
FR 1.742	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 1.743	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 1.744	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 1.745	The proposed architecture shall be hosted in either Active-Active mode or Active Passive mode based on MSI solution.
FR 1.746	In case of failure of data centre Cloud infrastructure, operations shall be resumed from Secondary Data Centre / Disaster Recovery Centre (DRC).
FR 1.747	MSI shall adhere to the RPO and RTO requirements
FR 1.748	During the change from DC to secondary DC / DRC or vice-versa (regular planned changes) there should not be any data loss.
FR 1.749	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 1.750	Reports of periodic third-party inspections/audits and the certifications shall be available online or shared on demand for scrutiny.
FR 1.751	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 1.752	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 1.753	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 1.754	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 1.755	Event-based alerts, to provide proactive notifications of scheduled activities, such as any changes to the infrastructure powering the cloud resources.
FR 1.756	Capture logs of all user activity within an account. This is required to enable security analysis, resource change tracking, and compliance auditing.
FR 1.757	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 1.758	Continuous monitoring and optimization of auto-scaling rules and limits.
FR 1.759	Optimize overall cost of resources require to run overall operations of the Client.
FR 1.760	Cloud infrastructure should not allow any data mining, data theft, data breach violations of any type.
INTEGRATION	
FR 1.761	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 1.762	Resource inventory, configuration history & change notifications functionalities shall be provided.
FR 1.763	Guidelines for provisioning, configuring and continuously monitoring compliance shall be provided.
FR 1.764	Solution shall automatically record a resource's configuration when it changes.
FR 1.765	Solution shall examine the configuration of resources at any single point in the past.
FR 1.766	Client shall receive notification of any configuration change.
PERSONALIZED DASHBOARD	
FR 1.767	Dashboards shall provide a personalized view of service health, consumption and usage.
FR 1.768	Dashboards shall provide proactive notifications.
FR 1.769	Dashboards shall have the capability of detailed troubleshooting guidance.
FR 1.770	Dashboards shall have the capability of integration and automation.
PHYSICAL SERVER FOR ON-PREMISE HOSTING	
FR 1.771	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 1.772	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 1.773	Sufficient amount of storage shall be provided to support the operational needs.
FR 1.774	Suitable commercial off-the-shelf antivirus software shall be provided for the duration of the contract.
FR 1.775	The central system server shall have a hot standby to mitigate any risk of failure in central system which halts the system performance.

FR 1.776	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 1.777	Server shall be provided with the Server Rack, Storage, KVM Module as needed to optimize the overall IT infrastructure operations.

Technical Requirements

GENERAL	
TR 1.783	The application hosting solution shall provide flexibility of hosting the solution on VMs of varying configuration scales.
TR 1.784	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, and Web Services Application Programming Interface ("API"). All the communication for these purposes shall be secured at transport level using SSL / TLS / SSH.
TR 1.785	Hosting solution shall have "Auto Scale" capability enabling provision of additional resources based on the seasonal peak loads.
TR 1.786	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 1.787	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 1.788	Hosting solution shall provide the capability to copy or clone virtual machines for archiving, troubleshooting, and testing.
TR 1.789	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 1.790	The hosting software shall define compute, storage and networking, with access to a web services API for these capabilities.
TR 1.791	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 1.792	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 1.793	The hosting infrastructure shall have suitable security and networking solutions.
TR 1.794	The hosting infrastructure shall provide real-time analytics and enable trend identifications on the usage.
NETWORK SERVICES	
TR 1.795	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 1.796	Hosting service shall provide a traffic management mechanism to implement availability based load balancing for virtual Machine Instances.
TR 1.797	Hosting solution shall provide virtual private network (VPN) connectivity from hosting environment in both Site-to-Site and Point-to-Site configurations.
TR 1.798	Cloud solution shall provide an option of extending an MPLS to cloud.
TR 1.799	Cloud service provider's infrastructure shall be protected against DDoS.

TR 1.800	Hosting solution shall provide virtual network isolation capabilities among the virtual machines and must support the use of private virtual networks.
TR 1.801	Cloud service provider shall have redundant ISPs providing Internet connectivity to their data centre / network.
TR 1.802	Hosting service shall provide connectivity with options to leverage carrier provided MPLS and shall be backed by SLA.
TR 1.803	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 1.804	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 1.805	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 1.806	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, SOC1, SOC2 and SOC3; • 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 1.807	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 1.808	Hosting Solution shall have capability of Role Based Access Control to segregate users based on their roles and privileges.
TR 1.809	Hosting solution shall provide flexibility to choose various firewall and router solutions from the industry leading vendors or as requested by Client.
TR 1.810	Hosting solution shall manage the underlying hardware infrastructure and virtualization layer following the appropriate patch management and technology refresh cycles.
TR 1.811	Following security solutions shall be implemented by MSI: <ul style="list-style-type: none"> • Centralized Anti-Virus for the virtual machines, workstations/ laptops 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; • and • Mobile Device Management (MDM).
TR 1.812	Hosting solution shall be fully secure and should not allow any data privacy breach, security breach, data mining, data corruption of any type.

TR 1.813	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 1.814	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 1.815	Operating System, Antivirus/Antispam/Antimalware, Patch Management Tools for non-Windows/Linux OSs.
TR 1.816	Provide the user administration / portal of cloud services to have visibility into the dashboard, SLAs, management reports, etc.
TR 1.817	Management, Monitoring and Audit: Security Information and Event Management tools, Performance Monitoring Tools, Patch/Update Management Tools for OS, DB.
TR 1.818	VPN: VPN server / gateway for providing VPN connectivity to some set of users.
TR 1.819	Any additional tools required to run the hosted applications in secure manner shall be proposed.
TR 1.820	The system shall be able to restore from the backup whenever required.
TR 1.821	Configure, schedule, monitor and manage backups of all the data including but not limited to files, images and databases.
SERVER RACK	
TR 1.822	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 1.823	All cabinets shall be supplied with standard 19" wide rack mount assemblies that shall allow for mounting of standard rack-mount equipment.
TR 1.824	All cabinets shall be supplied with standard lockable doors.
TR 1.825	The cabinets shall be IP 20 rated.
TR 1.826	All cabinets shall have provision for cable entry from top & bottom of rack with knock-off, pre-punched marked openings.
TR 1.827	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 1.828	Front door shall be made of Tinted toughened glass and should be lockable.
TR 1.829	All cabinets shall have equipment mounting frame (rail notches) for mounting of equipment.
TR 1.830	Shelves for equipment placement shall be provided as required.
TR 1.831	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 1.832	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 1.833	The rack shall have ventilation louvers or uniform perforations on side panel & rear door & equipment cooling with fans (4nos.) housed in fan trays.
TR 1.834	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 1.835	The device shall support operating temperature range of 5°C to +40°C.
ON PREMISE PHYSICAL SERVER	
TR 1.836	Servers will be provided to support local processing and storage as per the requirements of this RFQ cum RFP.

TR 1.837	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 1.838	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 1.839	The server shall have Dual Processor Intel® Xeon® Silver 4314 Processor 24M Cache, 2.40 GHz or better.
TR 1.840	The server shall have 4 X 32GB RDIMM, 3200MT/s, Dual Rank 16Gb BASE x8, Configured with 3 TB of storage. The memory shall be scalable to double the capacity configured.
TR 1.841	The Server shall include 2-Hot plug redundant power supplies and cooling fans.
TR 1.842	The Server shall have an Optical Drive 48x SATA CDRW/. DVD +/-RW, SATA, Internal.
TR 1.843	The Server chassis shall be rack mountable and include rack mounting hardware.
TR 1.844	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 1.845	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 1.846	The Server shall provide either of the following license version (Enterprise and Commercial Grade Edition) Operating System: <ul style="list-style-type: none"> • Microsoft Windows Server 2012 / 2016 / 2019 or better; • Canonical Ubuntu Latest Version; • Red Hat Enterprise Linux (RHEL); • SUSE Linux Enterprise Server (SLES); • VMware; • Citrix XenServer.
TR 1.847	Suitable commercial off-the-shelf antivirus software shall be provided for the duration of the contract.
TR 1.848	The central system server shall have a hot standby to mitigate any risk of failure in central system which halts the system performance.
TR 1.849	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 1.850	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 1.851	The Server Management Software shall provide role-based security along with pre-failure warning for: <ul style="list-style-type: none"> • CPU; • Memory; • HDD.
TR 1.852	The Server shall be provided with redundant hot swappable power supplies. The power supplies shall be FCC Class-A certified or equivalent CE certified.
TR 1.853	The Server shall comprise of redundant fully populated Hot swap fans.
TR 1.854	The Server shall meet the following remote management capabilities: <ul style="list-style-type: none"> • Manage the server hardware and software components remotely; • Power on/off and boot the system remotely.
TR 1.855	The Server shall comprise of the following interfaces and ports: <ul style="list-style-type: none"> • 4 X 1 GE (LAN) ports;

	<ul style="list-style-type: none"> • 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 or better.
ON PREMISE STORAGE	
TR 1.856	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 1.857	All video event/flagged data and other non-video data generated on-premise including for CCTV Surveillance to be archived on cloud hosting infrastructure for the duration of the Project.
TR 1.858	Unified storage with dual controller and 192 GB DRAM cache shall be provided. Unified Storage Solution should be IP Based/iSCSI/FC/FCOE/NFS/CIFS as per the application requirement
TR 1.859	The storage should have no single point of failure on components like controllers, disks, cache memory, I/O Ports, Power supply, Fan, etc. Storage solution should comprise of Active-Active Load Balancing Storage Controllers.
TR 1.860	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 1.861	Storage should support all industry standard RAID type like RAID 0/1, 5 and 6..
TR 1.862	Modular design to support controllers and disk drives expansion.
TR 1.863	Should be Rack Mountable
TR 1.864	The controllers / Storage nodes should be redundant and upgradable without any disruptions / downtime.
TR 1.865	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 1.866	Should be able to manage from Web and Command Line console for entire storage system.

2.2.6 Command and Control Center (CCC)

As part of the IIT Smart City Project, it is envisaged that Command and Control Center (CCC) will act as the 'nerve' of IIT that will help in making the city operations intelligent, integrated and efficient.

CCC 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 necessary hardware and software to support city operations. Through a centrally integrated platform at the CCC, 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 CCC for central monitoring, control and integrated operations. An essential feature of the CCC 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 CCC. Depending on the type of system and the respective functions, they will be monitored and/or controlled from the CCC and will have the option of sharing a feed to another agency as required via the CCC. Note that the Power systems, street lighting, water and wastewater systems, Solid Waste SCADA will be provided by Third Parties 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 CCC 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 CCC.

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

Table 4: An Overview of the CCC 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	✓		✓
IITGNL Software Modules (ISM)	✓	✓	✓
ICT infrastructure	✓	✓	
Facilities management – DMIC IITGNL building	✓	✓	
Facilities management – non DMIC IITGNL building (BMS or IP based Fire Alarm) – if applicable	✓		
Education	✓		
Healthcare	✓		
Solid Waste SCADA	✓		

Command and Control Center (CCC) 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 CCC 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 CCC facility will also serve as a host to Network Operations Centre (NOC), respective Utilities Centre, Single Window Service Desk 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 CCC. 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 CCC 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 (except water utility billing and management which will be provided by the MSI). A mini version of all SCADAs, which will be replica centres for utilities with mostly monitoring functionalities, will be positioned at the CCC 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 CCC just like other units/ centres within CCC. All coordination, integration and ensuring availability of required APIs to enable this integration will be under the scope of this MSI.

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 CCC, is presented below.

Appointment of Master System Integrator (MSI) for Supply, Implementation, Integration, Operations and Maintenance of Smart City ICT Components at Integrated Industrial Township (IIT) under the DMIC Integrated Industrial Township Greater Noida Limited (DMIC IITGNL)

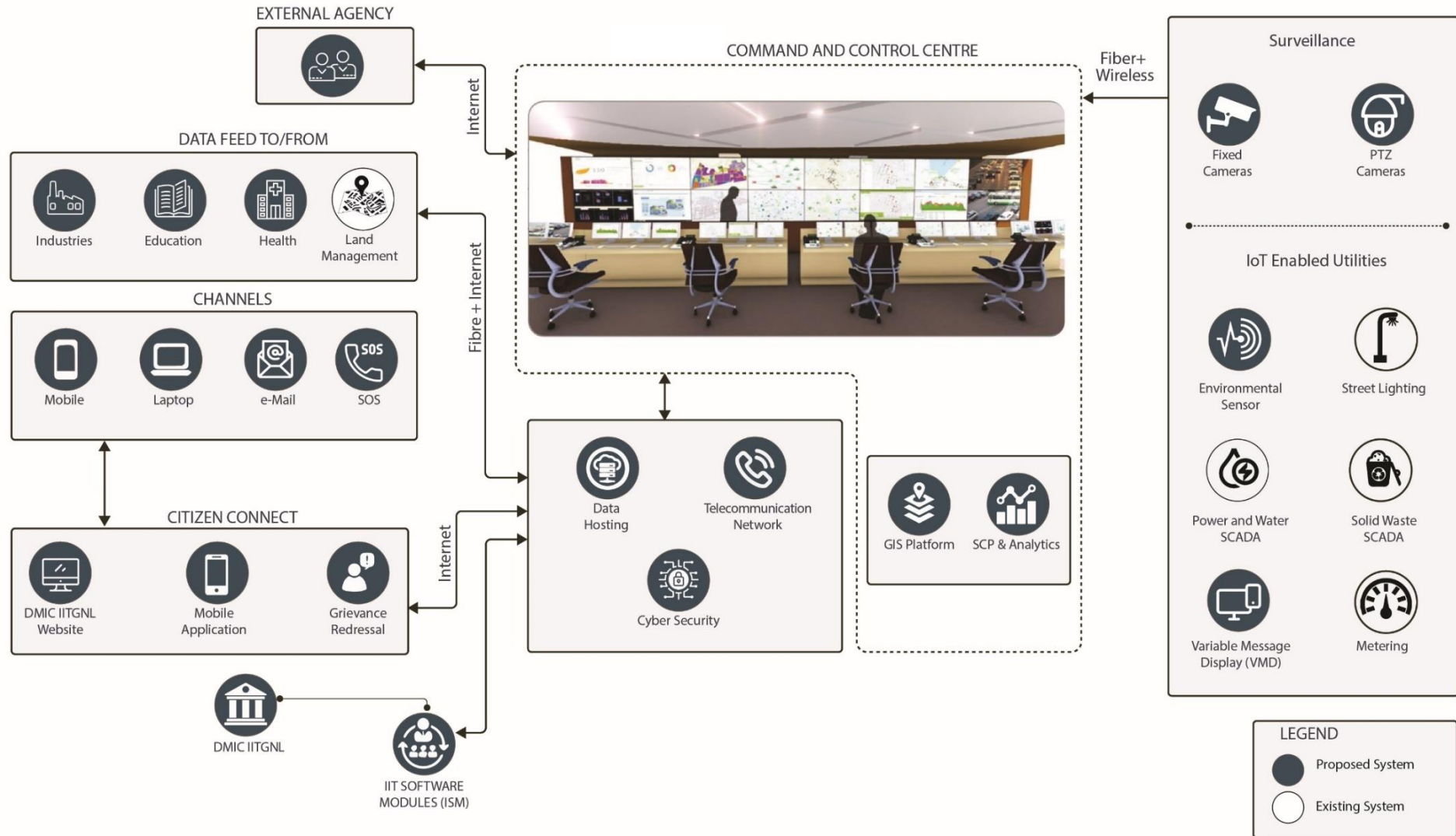


Exhibit 6: High level architecture of the Project

Business Requirements

BR 1.72	CCC shall act as the 'nerve' of IIT and shall assist DMIC IITGNL in enhancing efficiencies of city operations and management.
BR 1.73	CCC shall enable cross-system and cross-agency coordination to monitor, operate and manage the city in an integrated manner.
BR 1.74	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 1.75	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 1.76	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 and open standard transports shall also be supported.
BR 1.77	All systems being implemented as part of this Project and Systems provided by 'Other/Third Parties' shall be monitored and controlled on a standalone basis at CCC as per the requirements of the Project.
BR 1.78	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 1.79	CCC shall provide reporting capabilities for city administrators to keep record of city operations.
BR 1.80	The systems at CCC shall ensure that integrity and confidentiality of all information gained is secure at all times.
BR 1.81	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 1.82	The CCC application shall be audited for security audit certificate by Cert-In Empanelled auditors to mitigate cyber security risks. Furthermore, the IPR of offered CCC must not reside in country sharing land border in India and the OEM of the CCC application shall not be an entity sharing land border in India. The CCC OEM shall be from OEM whose IPR is preferably residing in India.
BR 1.83	CCC shall have shift-based operations for an overall 24x7 support.
BR 1.84	Integrate with other SCADA/IoT based systems including water and wastewater, power, solid waste and streetlighting (providing by Others) at the CCC 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. Please note that water utility management and billing system shall be provided by this MSI and integrated completely.
BR 1.85	Integrate all systems from CCC 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 1.86	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 1.87	CCC shall be scalable to accommodate future growth and support hardware and software additions and upgrades. MSI shall ensure at least 30% spare capacity to ensure future integrations in case of expansion in the city systems. Additionally, CCC shall be capable of accommodating future

	integrations arising out of other DMIC IITGNL initiatives such as Multi-Modal Logistics Hub (MMLH) and Multi-Modal Transport Hub (MMTH).
BR 1.88	The overall work of the DMIC IITGNL shall be in reference to standards published as per ISO 37120, ISO 37122 and World Council of City Data (WCCD).
BR 1.89	CCC 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.
BR 1.90	Smart City Platform being offered by the Bidder shall be successfully deployed and currently operational in Three (3) Projects in India for any safe or smart city applications.
BR 1.91	The overall architecture of the CCC shall be such that there will be a set of 2 screens on-site for display only while the actual CCC shall either be at the GNIDA building or on-site as confirmed by the Client. The MSI shall be responsible to ensure end-to-end integration of the CCC with the site including providing any telecom connectivity on-site for the CCC. In terms of number of operators, there shall be 3 operators required with a provision of 1 more operator as desired by the client.
BR 1.92	Overall, the integration responsibility with all third party applications shall reside with this MSI and the MSI shall study and provision for any interface (API) as required to ensure successful integration of all third party applications with the CCC.

Functional Requirements

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

FR 1.778	CCC shall provide a holistic and real time view of all city operations on a video wall along with individual views on operator workstations.
FR 1.779	CCC shall enable monitoring, control and automation of various city operations in order to ease and organise city operations.
FR 1.780	CCC shall enable system and cross system analytics through smart city platform in order to make city operations intelligent.
FR 1.781	CCC 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 1.782	CCC shall provide real time dashboards, visualizations, KPIs, historical trending, analytics and other intelligent features to facilitate city operations analysis by city administrators.
FR 1.783	CCC shall provide alarm features for immediate notification to city administrators in case critical event occurs in the city.
FR 1.784	The Videowall Controller provided as part of CCC 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 1.785	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 CCC.
FR 1.786	The Smart City Platform shall normalize, analyse and use this data for efficient operations and management of the city.
FR 1.787	All workstation units of the operator workstations shall be installed at the central rack rooms so that space at the CCC operator desks can be optimized. The operators and other personnel operating from the CCC shall only have displays, keyboard and mouse at their workstation desks.
FR 1.788	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"> • Education (as applicable);

	<ul style="list-style-type: none"> • IIT Software Modules (ISM); • Emergency; • Healthcare (as applicable); • Power & Water IoT/SCADA; • Streetlights; • Automated Waste Collection System; • Environmental Sensors; • Variable Message Displays / Digital Display Signs; • Surveillance; • GIS; • Telecommunication Network including fibre network; • 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 1.789	Direct connections and data from devices / systems shall include real-time City Systems data, KPIs and video feeds from CCTV cameras.
FR 1.790	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 1.791	The platform shall be capable of managing/monitoring data and visualizations for all City Systems.
FR 1.792	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 1.793	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 1.794	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 1.795	The platform (or an integrated component of the platform) shall be capable of performing data consolidation, normalization, and cross system analytics.
FR 1.796	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.
FR 1.797	The offered CCC Application shall be Audited for Security Audit Certificate as per OWASP Guidelines by Cert-In Empanelled Auditors, to Mitigate Cyber Security risks.
WATER AND WASTEWATER	
FR 1.798	Communicate locations of personnel, equipment, outage information and safety measures with internal and field personnel.
FR 1.799	Perform IoT operations as required by line personnel.
FR 1.800	Administer IoT programming and data collection functions.
FR 1.801	Utilize the IoT/sensor system to monitor system statistics.
FR 1.802	Dispatch water and wastewater service requests to the appropriate internal and field personnel using the ISM system.
FR 1.803	Assist in gathering information for reporting needs (broad reports, departmental benchmarks, etc.).
FR 1.804	Track progress of water and wastewater service requests against pre-determined KPIs.

FR 1.805	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 1.806	Maintain asset information held in the database using GIS and ISM system.
FR 1.807	Monitor trunk infrastructure in terms of leaks, breaks, etc.
FR 1.808	Update site specific water and wastewater files and other documentation for helpdesk compliance.
FR 1.809	Consumption monitoring via meters. Billing for services using the ISM system.
FACILITIES MANAGEMENT SYSTEMS (FMS)	
FR 1.810	Log calls/jobs on the helpdesk database utilizing helpdesk/ISM software (inquiries may be received by telephone, facsimile, email or in person).
FR 1.811	Allocate and dispatch work orders to directly employed (or subcontracted) maintenance team via ISM system. Work order tracking to be done at CIOC.
FR 1.812	Take ownership of the Preventative Maintenance (PM) schedule and track reactive maintenance (RM) service requests using the ISM system.
FR 1.813	Track progress of PM and RM service requests against pre-determined KPIs.
FR 1.814	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 1.815	Maintain asset information held in the database using the ISM system.
FR 1.816	Update site specific facilities management files and other documentation for helpdesk compliance.
FR 1.817	Dispatch of emergency services.
POWER NETWORK	
FR 1.818	Monitoring of smart power meters for various parameters (if available).
FR 1.819	Monitor trunk and IoT infrastructure in terms of outages, leaks, etc. (if available).
FR 1.820	Monitoring of outage or tampering alerts for smart power meters (if available).
FR 1.821	Log calls/jobs on the helpdesk database utilizing helpdesk/ISM software (inquiries may be received by telephone, facsimile, email or in person). Interface with Power Discom as required.
FR 1.822	Dispatch outage and power quality calls to the appropriate internal and field personnel using the ISM system.
FR 1.823	Track progress of outage and power quality service requests against pre-determined KPIs.
FR 1.824	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 1.825	Maintain asset information held in the database using the ISM system.
FR 1.826	Update site specific power files and other documentation for helpdesk compliance.
FR 1.827	Create awareness within the city for energy consumption and utilization.
COMMUNICATIONS NETWORK	
FR 1.828	Monitoring of the smart telecommunications management system for issues and outages (including any alarms) in terms both active and passive infrastructure for DMIC IITGNL.
FR 1.829	Monitoring and control of all actives implemented as part of the DMIC IITGNL infrastructure.
FR 1.830	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 1.831	Dispatch telecommunications service request calls to the appropriate internal and field personnel using the ISM system.
FR 1.832	Track progress of telecommunications service requests against pre-determined KPIs.

FR 1.833	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 1.834	Maintain asset information held in the helpdesk database using the ISM system.
FR 1.835	Update site specific telecommunications files and other documentation for helpdesk compliance.
CITY SECURITY	
FR 1.836	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 1.837	To identify, report, and record anything suspicious, in line with CCC procedures.
FR 1.838	To operate surveillance equipment ethically and in accordance with training, policy and procedures, manufacturer's instructions and relevant legislation.
FR 1.839	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 1.840	Creating of workflows where automatic alerts can go to concerned authorities (police etc.) in case of security emergencies.
FR 1.841	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.
IITGNL SOFTWARE MODULES (ISM)	
FR 1.842	Integrate with GIS system provided as part of this Project. GIS shall act as the underlying layer over which visualization shall take place.
FR 1.843	Integrate GIS functionalities such as 3D walk throughs of the City, Utility Asset Management Module, RoW permits.
FR 1.844	Integrate with all ERP and Customer Facing ISM systems such as, CRM, Portal, Grievance Redressal System etc. for monitoring their operations as well as KPI monitoring, tracking, alarm generations, cross system workflows etc.
FR 1.845	Integrate with social media platforms for monitoring of trends, citizen feedback etc.
STREET LIGHTING	
FR 1.846	Monitoring of circuits, central control and automation while integrating with the feeder panel and individual streetlight based street lighting system. Monitor status, power consumption and faults for streetlight system, as applicable.
FR 1.847	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 1.848	Dispatch staff for service request calls using the ISM system.
FR 1.849	Maintain asset information using the ISM system.
ENVIRONMENTAL SENSORS	
FR 1.850	Monitor key inputs from pollution sensors, noise sensors, particle sensors, etc.
FR 1.851	Create awareness within the city based on dynamic inputs received from sensors and display output to various interfaces including city application and digital screen.
FR 1.852	Create necessary SOPs as per alarms generated by environmental sensors.
EMERGENCY COMMUNICATIONS	
FR 1.853	Interface with police, fire and ambulance as needed and available for emergency services.
FR 1.854	Real-time monitoring of emergency dispatch vehicles (as applicable).

FR 1.855	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 1.856	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 1.857	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 1.858	Follows system and department-specific procedures to create service requests and work orders in specialized department software systems.
FR 1.859	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 1.860	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 1.861	Observes and complies with departmental policies and procedures, customer service quality standards, and compliance guidelines.
EDUCATION	
FR 1.862	Monitor key ratios (KPIs) that will be important inputs for economic indicators.
HEALTHCARE	
FR 1.863	Monitor key ratios (KPIs) that will be important inputs for economic indicators.
ANALYTICS AND VISUALIZATIONS	
FR 1.864	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 1.865	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 1.866	CCC 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 1.867	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 1.868	The platform shall have the ability to generate alarms based on user provided inputs as defined in the SOPs.
FR 1.869	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 1.870	CCC 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 1.871	CCC 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 1.872	<p>CCC shall be capable of alarm management functionalities such as:</p> <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 1.873	<p>CCC 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.</p>
FR 1.874	<p>Reporting function shall be a part CCC dashboard visualization tool. It shall provide information about current status of the CCC on functions performed. Following functionalities shall be supported by Reporting Module as a minimum:</p> <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; • 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 1.875	<p>CCC 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.</p>
FR 1.876	<p>CCC 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.</p>
FR 1.877	<p>CCC 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.</p>
FR 1.878	<p>Capability of asset management where ISM data shall assist with scheduling of maintenance or determining if a renewal of assets is required.</p>
FR 1.879	<p>CCC shall have the capability to take predicted environmental condition feed from third party systems. In case of rain predictions, CCC shall automatically alert departments for preventive maintenance of water logging issues.</p>
FR 1.880	<p>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.</p>

FR 1.881	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 1.882	<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 1.883	The platform shall be capable of presenting information in a browser-based format such that it is accessible from any terminal connected to the CCC 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 1.884	The platform shall provide user and subscription management by providing different tier of user categorization, authentication, authorization and services based on the subscriptions.
FR 1.885	<p>Part of the visualization at the DMIC IITGNL CCC will include monitoring a set of relevant ISO 37120 and ISO 37122 indicators. Some sample indicators which are tentatively required to be monitored at CCC are provided below:</p> <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 1.886	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 1.887	<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.

	<ul style="list-style-type: none"> • 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 manpower 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 1.888	Smart City Platform shall have SOPs and mechanisms to aid city official in case of disaster events.
FR 1.889	<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 colour 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; • 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 1.890	The smart city platform shall be a single, integrated platform that shall provide seamless metadata exchange and single administration interface.
FR 1.891	The platform shall provide capabilities of integration with big-data and shall provide in-memory analytics capabilities.
FR 1.892	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 1.893	Streaming analytics capabilities shall include machine learning streaming capabilities such as regressing, decision tree, filtering live stream data, etc.
FR 1.894	The smart city platform shall have capabilities of visual monitoring of event streams, configure real-time dashboards for analytical CCC, interactive filters, and query dynamic live stream with support of automatic notifications through SMS, email and other alerts.
FR 1.895	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 1.896	The platform shall use leading text analytic solution to synthesize feedback comments and provide actionable intelligence.
FR 1.897	Scalability/Usability: The platform shall enable flexible and on-demand scale-up for data volume and number of users.
FR 1.898	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 1.899	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 1.900	Video display wall content will not be switched frequently and shall be displayed real-time. It shall be rated for 24x7 operations.
FR 1.901	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 1.902	Option to create multiple layouts shall be present.
FR 1.903	Video display wall shall be integrated with Videowall Controller, so content managed can be displayed on the video wall.
FR 1.904	Ability to manage the content at the operators' consoles.
FR 1.905	Ability to add content from an CCC workstation.
FR 1.906	The video display wall product selected shall be durable for optimal use in a 24/7 operational mode.
FR 1.907	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 1.908	Video display wall shall be capable of displaying High Definition (HD) content.
FR 1.909	Gaps between screens shall be negligible to view HD graphics on multi screens.
FR 1.910	Auto calibration feature shall be provided to avoid periodic maintenance.
FR 1.911	There shall be a user interface for all settings and operational parameters.
DISPLAY SCREENS	
	It is required that there are at least two (2) 70" screens provided for display purpose only (viewing) on-site at a utility building. These screens will display mirror data from the CCC video wall and shall allow showcasing of all applications from a viewing perspective on-site. These screens shall be LED TV that shall be integrated seamlessly on-site and display all data from the video wall for demonstration and monitoring perspective. Minimal hardware to support this integration shall be provided on-site for this at the utility building. It is understood that this will act as a CEO display for the smart city for all monitoring of smart city operations.
	There shall be telecom connectivity which may be required between this utility building and the CCC depending on the final location on the control centre. All such connectivity shall be in the scope of the MSI at no additional cost. The CCC may be at the GNIDA building or another building on-site with which these display screens shall be integrated.

Technical Requirement

VIDEO DISPLAY WALL (VDW)	
TR 1.867	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 1.868	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 1.869	The light source lifetime of the laser shall be at least 100,000 hours.
TR 1.870	The brightness uniformity of the VDM shall be =>95%.
TR 1.871	The project engine of VDW shall be rated for performance in project conditions.
TR 1.872	The Rear Projection Module shall have laser as its light source.
TR 1.873	The screen shall have negligible inter screen gap to give seamless viewing experience.
TR 1.874	The cube shall have redundancy in laser light source and power supply.

TR 1.875	The VDW shall include video walls mounted close to each other to give a seamless viewing experience.
TR 1.876	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 1.877	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 1.878	The VDW shall provide a collaborative visual for operators and management to work and coordinate on various tasks in different situations.
TR 1.879	The VDW product selected shall be durable for optimal use over a long time in a 24/7 operational mode.
TR 1.880	The VDW shall provide image uniformity across the whole display area.
TR 1.881	The VDW shall have system availability with limited maintenance and low disruption of the operations room operations.
TR 1.882	The VDW shall be capable of displaying high definition (HD) and standard definition (SD) content.
TR 1.883	The VDW shall provide minimum viewing angles of: <ul style="list-style-type: none"> • Horizontal - ± 35 degrees; and • Vertical - ± 27 degrees.
TR 1.884	Auto colour and brightness management mechanism to be provided.
TR 1.885	The VDW shall have a user interface for all settings and operational parameters.
TR 1.886	The VDW shall support with enhanced brightness of at least 300 cd/m ² to accommodate ambient light expected inside the room.
TR 1.887	The VDW units shall be new and current to the manufacturer's product line. The units shall not be discontinued products.
TR 1.888	Each VDW unit shall have front / rear-access to the projection modules and internal components of the cubes for maintenance purposes.
TR 1.889	The brightness uniformity of each display cube and across the entire VDW shall be minimum 95%.
TR 1.890	The video display cubes shall have anti-reflective screens in order to reduce reflection and glare on the display wall.
TR 1.891	All video display cubes shall have a consistent image quality and brightness across the display wall.
TR 1.892	The VDW will have at least one (1) female DVI-I/HDMI input connector.
TR 1.893	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 1.894	The support structure shall have open internal space for equipment. Depth of each cube should be less than or equal to 750mm.
TR 1.895	The support structure shall have easy to open front / rear access covers. However, access should be available as per control room design.
TR 1.896	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 1.897	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 1.898	The VDW shall allow for easy maintenance of modules, colour sync systems, etc. where downtime is no greater than 60 minutes.
TR 1.899	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 1.900	The VDW shall have an operational temperature between ten degrees Celsius (10°C) to forty degrees Celsius (35°C).
TR 1.901	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 1.902	The DCMS shall include the VDW controller for the Operations Room VDW and a system to manage the visual content.
TR 1.903	The DCMS shall be able to display visual content on videowall.
TR 1.904	The DCMS shall be able to input, manage, and distribute visual content.
TR 1.905	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 1.906	The DCMS shall treat the VDW as a single display. It shall act as a single canvas with no pixel separation.
TR 1.907	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 1.908	The DCMS shall be able to create display layouts for any sized display, including boardroom monitor and the operations room display.
TR 1.909	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 1.910	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 1.911	The DCMS shall be able to stretch, re-position, and resize any video source on any display device.
TR 1.912	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 1.913	The DCMS shall have a seamless interface within the VMS UI of the CCTV.
TR 1.914	The DCMS shall be accessible on any networked workstation or networked monitor.
TR 1.915	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 1.916	The DCMS shall include an administrator role that shall be able to manage system configuration, sources, user groups, and user authentication.
TR 1.917	All users on the DCMS shall have a password-protected login.
TR 1.918	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 1.919	The DCMS shall be able to add borders to individual original video content source.
TR 1.920	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 1.921	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 1.922	Visual content from networked sources shall be transmitted and displayed with no pixel loss or degradation.
TR 1.923	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 1.924	The DCMS shall be able to search for networked video sources.
TR 1.925	The DCMS workstation client software shall run on an industry standard-based operating system.
TR 1.926	The DCMS shall have the ability to provide alerts to the administrator and designated users via e-mail.
TR 1.927	The DCMS shall have an API openly available without charge for future integration with third party applications.
TR 1.928	The AC input power shall be 110-240 VAC +/- 10% at 50/60 Hz +/- 1Hz.
Video wall management software	
TR 1.929	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 1.930	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 1.931	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 1.932	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.
DISPLAY SCREEN at Temporary Setup at IIT site	
TR 1.933	The display shall utilize LCD with backlit LED technology.
TR 1.934	The display shall be seventy inches (70") diagonal at minimum.
TR 1.935	The display shall have a native resolution of UHD resolution.
TR 1.936	The display shall have an aspect ratio 16:9.
TR 1.937	The display shall be equipped with a media USB for direct plug and play from USB.
TR 1.938	The display shall have a built-in or external tuner.
TR 1.939	The display shall be a commercial grade product.
TR 1.940	The display shall have a built-in low-profile speaker.
TR 1.941	The display shall have a typical brightness greater than 300 cd/m ² .
TR 1.942	The net weight of the display shall be less than 100 Kgs.
TR 1.943	The AC input power shall be 110-240 VAC +/- 10% at 50/60 Hz +/- 1Hz.
TR 1.944	Display screen shall be equipped with at least one (1) of each input format including HDMI, Display Port, and Ethernet (RJ45).
TR 1.945	The display screen shall be operational in temperature between ten degrees Celsius (10°C) to forty degrees Celsius (40°C).
OPERATOR CONSOLE	
Materials	
TR 1.946	Consoles are primarily a workspace that support operator workstations and monitors for monitoring various systems at the CCC, 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 1.947	All operator consoles shall be designed to meet the shape, dimensions, and orientation requirements within the Operations Room.
TR 1.948	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 1.949	The consoles shall satisfy the functional, aesthetic and ergonomic requirements of the working environment of the Operations Room staff.
TR 1.950	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 1.951	The consoles shall provide work surfaces with multiple vertical locations (stand / sit system) - standing height, work surface height, and below work surface height.
TR 1.952	The consoles shall be of a modular design, allowing for future equipment and room layout configurations.
TR 1.953	The consoles shall be fabricated to meet or exceed recognized industry quality standards (e.g., ANSI/BIFMA or equivalent).
TR 1.954	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 1.955	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 1.956	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,
TR 1.957	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 1.958	All consoles and components shall not display manufacturer or vendor logo, name, or equivalent signage and nameplates.
Structure	
TR 1.959	Each console main structure shall be constructed of thick wall custom profile extruded aluminium alloy, or structural equivalent (e.g., 10-gauge steel).
TR 1.960	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 1.961	Levelling glides shall provide a maximum height adjustment of up to 64 mm (2.5 inch) for each console and component.
TR 1.962	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 1.963	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 1.964	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 1.965	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 1.966	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 1.967	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 1.968	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 1.969	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 1.970	Special components shall not be required to bring power, data, and communication wiring into consoles.
TR 1.971	The console placements in the Operations Room and dimensions shall be adjusted accordingly to integrate all cabling service entry accesses in the floor.
TR 1.972	Consoles shall not obstruct or interfere with any raised floor access location cabling services or functionality.
TR 1.973	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 1.974	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 1.975	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 1.976	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 1.977	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 1.978	The cable management system shall have the capability to accommodate vertical cable runs in all stationary components neatly and internally.
TR 1.979	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 1.980	Power strips shall be durable metal construction or equivalent.
TR 1.981	Power strips shall not incorporate any surge, overload, or power on/off switch.
TR 1.982	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 1.983	Each console shall provide two (4) fully integrated four (4) receptacle power strips mounted vertically at each back corner.
TR 1.984	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 1.985	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 1.986	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 1.987	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 1.988	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 1.989	Each console's entire work surface shall be fully height adjustable.
TR 1.990	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 1.991	The height adjustment system velocity shall be constant and virtually the same rate when lifting and lowering work surfaces.
TR 1.992	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 1.993	Sufficient space shall be provided between moving and stationary components for safe movement, with no pinch points.
TR 1.994	Each console shall provide reasonable maintenance and service access to height adjustment system electrical and mechanical components.
Desk Binder/Manual Storage	
TR 1.995	Each console shall have two (2) binder/manual storage unit above desktop.
Free Workspace	
TR 1.996	Each console shall have sufficient free workspace for paper work on the console desk top.

Keyboard Trays	
TR 1.997	Each console shall have an ergonomic keyboard tray drawer installed underneath the desk workspace.
TR 1.998	Ergonomic keyboard tray drawers shall glide on steel ball bearings and shall be mounted with durable metal hardware.
Large File Drawer	
TR 1.999	Each console shall have two (2) file drawer unit with lockable casters for storage below the desk top.
TR 1.1000	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 1.1001	Drawer glide shall be a minimum two-part precision steel ball bearing suspension, with cushioned stops, both in and out.
TR 1.1002	File drawer is to expose a minimum of 100% of its overall length when fully extended from the console.
TR 1.1003	File drawer shall have drawer bumpers to cushion and quiet the drawer.
TR 1.1004	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 1.1005	File drawer shall be provided with compressor/hanging rails for side-to-side filing.
TR 1.1006	File drawer shall accommodate legal and letter paper filing.
Reliability	
TR 1.1007	Consoles shall be designed for high durability and performance.
TR 1.1008	Consoles shall be warranted for 24/7 use.
OPERATOR WORKSTATIONS	
TR 1.1009	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 2.2.5.2 (Operator Workstation).
MULTI-FUNCTIONAL PRINTERS INCLUDING SCANNER	
TR 1.1010	Printers shall be of latest laser technology, Wi-Fi Printer & for duplex printing (colour and black and white) for all paper size including but not limited to A4 and A3.
TR 1.1011	It shall have Print Speed 30ppm or above.
TR 1.1012	It shall have Resolution Min 600 x 600 dpi or better.
TR 1.1013	It shall have Memory 1 GB or higher.
TR 1.1014	It shall have Copy speed 12ppm or better.
TR 1.1015	It shall have scanner of Flat Bed type with ADF.
TR 1.1016	It shall have Interface USB 2.0, Ethernet Port.
TR 1.1017	It shall have the duty cycle of monthly 5000 pages at minimum.
TR 1.1018	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 1.1019	It shall have input tray capacity of minimum 100 sheets.
TR 1.1020	It shall have output tray capacity of minimum 100 sheets.

TR 1.1021	Printer shall be accompanied with the necessary accessories such as connecting cables, driver media, etc.
SMART CITY PLATFORM	
TR 1.1022	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 1.1023	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 1.1024	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 1.1025	<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 • 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 1.1026	The platform shall have cross functional workflows with ability to communicate between people, devices and systems.
TR 1.1027	The platform shall allow the operators to develop customizable SOP templates based on actual requirements.
TR 1.1028	The platform shall be able to issue, log, track, manage and report on all activities underway during these modes of operation:

	<ul style="list-style-type: none"> • anticipation of incident; • incident or crisis; • recovery.
TR 1.1029	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 1.1030	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 1.1031	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 1.1032	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 1.1033	The platform shall have the ability to extract data in desired formats for publishing and interfacing purposes.
TR 1.1034	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 1.1035	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 1.1036	All data on the platform shall provide ability to attach documents and other artefacts to incidents and other entities.
TR 1.1037	The platform server shall be backed up at least once a day.
TR 1.1038	It shall be possible to combine the different views onto a single screen or a multi-monitor workstation.
TR 1.1039	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 1.1040	The platform shall maintain a comprehensive and easy to understand audit trail / log files of read and write actions performed on the system.
TR 1.1041	The system shall also provide an integrated user interface to other third-party information systems part of other packages (if any).
TR 1.1042	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 1.1043	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 1.1044	Platform software shall be capable of processing all inputs from all City Systems, including active data and direct feeds, with low network latency.
TR 1.1045	The platform software shall provide output to the Video Display Wall (VDW) in its compatible formats – e.g. webpages and H.264.
TR 1.1046	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 CCC/ Mayor's Office.
Platform Hardware	
TR 1.1047	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	
TR 1.1048	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 1.1049	All overhead lighting shall be LEDs both recessed direct and indirect lighting, including pot-lights.
TR 1.1050	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 1.1051	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 1.1052	Dimming control shall be continuous (all lights dimmable) and zone-based (with a minimum of 4 lighting zones on separate circuits).
TR 1.1053	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 1.1054	Appropriate wall boxes for corresponding dimmer size shall be provided. Dimmers shall not be ganged in one box.
TR 1.1055	Manual switches shall be used for on / off lighting control and for overriding any preset lighting configurations.
TR 1.1056	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 1.1057	All lighting fixtures shall be of high-grade quality over and above the standard level of quality for office lighting.
TR 1.1058	Lighting arrangement shall accommodate console locations.
TR 1.1059	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 1.1060	Lighting system shall be integrated with room control panel and BMS for integrated operations.
Ceiling	
TR 1.1061	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);

	<ul style="list-style-type: none"> • Fire / CO alarms; • Wet sprinklers; and • Sound absorption ceiling tiles.
TR 1.1062	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 1.1063	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 1.1064	Flooring with proper acoustic treatment shall be used to reduce the impact sound by at least 14dB.
TR 1.1065	A 12 in / 0.30 m raised floating floor shall be installed, bolted to the understructure (i.e. pedestals).
TR 1.1066	The raised floating floor shall have the ability to be accessed from any location within the Operations Room and Cabin / Boardroom.
TR 1.1067	The baseboard treatment shall extend to conceal the 12 in / 0.3 m raised floating floor.
TR 1.1068	The raised floating floor shall be capable of supporting general loading of 600 – 1200 kg / m ³ (123 – 245 lb / ft ²).
TR 1.1069	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 1.1070	The raised floating floor shall be grounded.
TR 1.1071	The pedestal / supporting structure for the video wall shall be fastened to the concrete slab floor.
TR 1.1072	Stub conduits shall be installed in the concrete slab floor (underneath the raised floating floor) of the Operations Room.

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 09 presents the detailed scope of services that have to be carried out as a part of the contract.

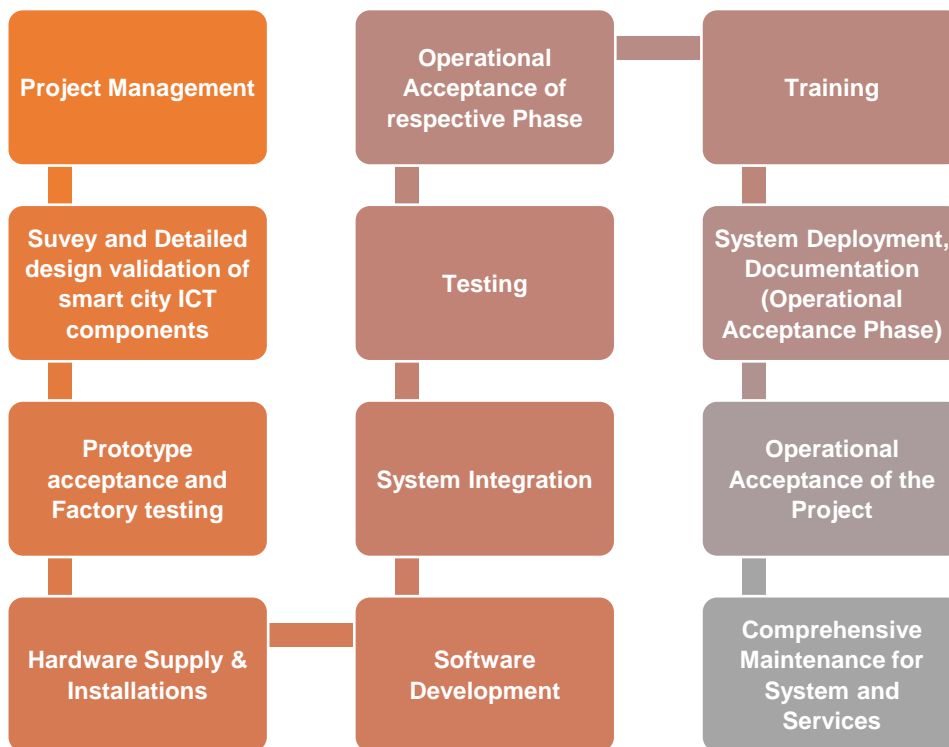


Exhibit 07: Detailed Scope of Work

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 CCC;
- 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, , 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 are COTS and some 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 3.2.3.

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, , 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 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 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 3.2.3.

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. Support manpower which shall be deputed by the MSI during the comprehensive maintenance phase has been covered as part of Volume I.

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. MSI shall depute qualified personnel at CIOC as the city operators and shall be involved in day to day management of IIT and CIOC. These CIOC Operators shall also help in helpdesk functions as well as any other requirement by DMIC IITGNL such as data entries, migration etc. MSI shall also make available functional experts and developers when asked by DMIC IITGNL in order to help DMIC IITGNL in any complaint resolution, new developments or advisories.

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, splicing 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 such as, CCC, Utility Building etc. shall be under MSI scope. MSI shall ensure no damage is done to EPC Contractor's Fibre Optic Infrastructure while doing their installation works.
- MSI shall be responsible for laying HDPE duct and FOC 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, CCC and PoPs shall be under MSI scope;
- 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, as applicable, with core cutting near to the field device locations for connectivity to 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 be responsible for splicing of backbone, distribution and access network for DMIC IITGNL plots and DMIC IITGNL field devices only (as applicable);
- 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;
- 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.

PoP

- MSI shall be required to construct a PoP room inside the designated and finalized Utility Building inside IIT;
- Required area for Mini PoP will be provided by Client. Following are the requirements specific for Mini 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 Mini PoP facility 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 mini PoP room, in compliance with the Client's regulations including necessary infrastructure within the plot, coordination, and construction of the PoP facility;
- 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 room. 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 CCC and Mini POP shall have 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 CCC 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. 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, connection till PoP for utilities purposes. MSI shall coordinate with EPC Contractor for extending utilities till Mini PoP;

3.2.2 City Surveillance Cameras

- MSI shall install CCTV Cameras at all strategic locations including rotaries, roads, intersections, public spaces/buildings, and other critical/sensitive facilities like CCC 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 CCC 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 Mini PoP in case the CCC 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;
- Supply and installation of Gantries, cabinets and Poles for 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.
- MSI shall be responsible of installing the poles which will co-locate field devices such as 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 IITGNL Software Modules (ISM)

3.2.3.1 General

- The MSI is required to assess the requirements of DMIC IITGNL as listed in the RFQ cum RFP;
- 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;
- MSI is required also to incorporate all the department process flows which have been mentioned in the RFQ cum RFP. The department process flows are tentative and may change/evolve as per requirements of DMIC IITGNL. MSI is required to suggest best and optimized industry practices and process flows for inclusion in ISM solution.
- 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 integrate with the Aadhar card and other government initiatives (as applicable). It shall also support integration with digital signature. Aadhar authentication device such as fingerprint scanner shall also be provided by MSI for DMIC IITGNL employees in order to enable Aadhar based digital signature solution;
- ISM shall coordinate and integrate with Udyog Sarathi, National Informatics Centre (NIC) and Government e-Marketplace (GeM) portals.
- Supply all hardware, firmware, Operating System (OS), virtualization, application software licenses

required for solution components including any database, RDBMS software, 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. SSL certification (wildcard) for DMIC IITGNL domain shall also be supplied and integrated by MSI;

- 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. MSI shall assess legacy data which is required to be migrated;
- Cover various functional units of DMIC IITGNL and other stakeholders and carry out system configuration and implement access controls based on requirements;
- Training DMIC IITGNL 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.
- ISM shall also integrate with utilities applications and sensors/IoTs (as applicable). Integration with ICT infrastructure in terms of sensors/IoTs shall also be undertaken, as applicable.
- Access Control and Process control mechanisms shall be put in place by the MSI in consultation with DMIC IITGNL. Applicable and robust Governance, Risks and Compliance (GRC) access control tools and framework should be deployed for the solution. It shall ensure that DMIC IITGNL's data security and authorization standards are met. The tool shall help in preventing and identifying authorization risks and shall also ensure continuous compliance and control. Risks recognition, analysis and mitigation parameters shall also be achieved via this tool.

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.

3.2.3.2 Methodology for IITGNL 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 • Business Process Re-engineering • High Level Design including Solution architecture, user interfaces, E-R diagram of Database and data flow diagram. • Data Migration Plan • 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

3.2.3.3 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.
 - The developed systems are to be demonstrated to the client's satisfaction in the pre-production (QA) environment.
 - 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 Workshop 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 has 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. Frequency of penetration testing and vulnerability testing shall be done during maintenance phase in compliance with the SLA requirements given in the RFQ cum RFP. 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 desktops; 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.

- **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.

3.2.3.4 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.

3.2.3.5 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.

Single sign on (SSO) is a necessary requirement for ISM modules. Single sign on for user authentication will be via Active Directory / LDAP with an Identity and Access Management application. SSO to be implemented across the entire IT landscape. Irrespective whether it is hosted on premise or on cloud.

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:

3.2.3.6 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.

3.2.3.7 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.

3.2.3.8 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. Any API development required for applications under MSI's scope to enable integration with any third-party system shall be MSI Scope.

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	Payment Gateways	Outgoing Payments
4.	Bank	ISM	Incoming Payments, Bank Reconciliation

S No	From	To	Description
5.	Payment channels	ISM	Incoming Payments
6.	Payment Gateways	ISM	Incoming Payments
7.	ISM	e-LMS	
8.	ISM	GIS	Equipment, Locations, Assets
9.	e-LMS	ISM	Property Id's would be first created on LMS
10.	GIS	ISM	Equipment, Locations, Assets
11.	GIS	LMS	Plot coordinates, Locations
12.	LMS	GIS	Property
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	<ul style="list-style-type: none"> User Authentication and mail services; 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

S No	Process	Descriptions	Interfaces
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)
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 downloads 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
10.	Purchase Requirement Approval	Approval of PR on mobile	<ul style="list-style-type: none"> ISM- Mobile – ISM
11.	Leave Approval	Leave approval on mobile	<ul style="list-style-type: none"> ISM – Mobile - ISM
12.	Payment Approval	Approval of payments on Mobile	<ul style="list-style-type: none"> ISM – Mobile - ISM

S No	Process	Descriptions	Interfaces
13.	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
14.	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
15.	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

3.2.4 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 CCC.
- Any recurring costs associated with environmental sensors associated with telecom connectivity (3G/LTE) shall be under MSI scope.

3.2.5 ICT Interface for Automated Waste Collection System (AWCS)

- EPC Contractor is implementing an Automated Waste Collection System where solid waste will be transported to solid waste collection site from individual plots via dedicated ducts or vacuum chutes. It is an automated IoT based solution. Implementation of AWCS is in advanced stages of completion.
- MSI shall be responsible for integrating with AWCS. Integration with AWCS shall be done with Smart City Platform at CCC, GIS and ERP (ISM). Applicable IoT and application feed as shared by AWCS such as consumption data, faults, alerts shall be integrated by MSI for visualization and actionable purposes.
- AWCS integration is only possible from PLCs via ethernet ports. Protocol for integration shall be via Modbus TCP/IP. PLCs where ethernet port is present is only available at solid waste plant locations. It shall be the responsibility of the MSI to integrate with AWCS PLCs via Modbus TCP/IP. Connectivity provisions at site including switch requirements and transporting the feed to PoP and ultimately to cloud for integrations with CCC shall be under MSI scope.
- Input/Output (IO) parameters which are available at PLCs via Modbus TCP/IP shall be shared with MSI. It shall be responsibility of the MSI to filter required parameters and integrate with CCC for monitoring and visualization purposes.
- MSI shall be required to coordinate with EPC Contractor for facilitating integrations.
- All billing / consumption related information (if available) may be integrated with ERP for generation and printing of bills and sharing the same with allottees via ISM.

3.2.6 ICT Interface for Water, Wastewater, Power, Surveillance and Streetlight Infrastructure

- EPC Contractor shall provide for the following:
 - SCADA/IoT for water distribution system;

- AMR meters for water at individual plots;
- SCADA sensors at water reservoirs and pumping stations;
- Feeder and individual streetlight based streetlight SCADA system;
- CCTV Surveillance cameras installed at Utility Buildings and other areas.
- Wastewater SCADA and Sensors.

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

- For water and wastewater SCADA system, a Honeywell based system is being implemented which shall monitor and control potable and recycled water, primarily at pumping stations. Only integrations from PLCs via Modbus TCP/IP through ethernet port is available. It shall be the responsibility of the MSI to integrate with water and wastewater SCADA PLCs via Modbus TCP/IP. Connectivity from PLCs including switch requirements and transporting the feed to PoP and ultimately to cloud for integrations with CCC shall be under MSI scope. Input/Output (IO) parameters which are available at PLCs via Modbus TCP/IP shall be shared with MSI. It shall be responsibility of the MSI to filter required parameters and integrate with CCC for monitoring and visualization purposes. Further, providing and integrating with the water utility management system and billing system shall be in the scope of this MSI (including a comprehensive water utility management system).
- 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 CCC as per finalized design requirements are catered;
- A Bajaj based controller is available at every streetlight and feeder level. IoT functionalities such as individual streetlight on/off, ambient sunlight based on/off, scheduling, power consumption information etc. are available via the Streetlight SCADA system. MSI shall integrate Streetlight SCADA with CCC via Web APIs. APIs are available from Streetlight SCADA vendor which shares information such as light status, light condition, alarms, faults, lamp condition or driver condition, fault details, pole details, pole ID, geo mapping details etc.
- Ninety-Six (96) Honeywell based IP cameras are installed at various utility buildings inside IIT by EPC Contractor with Two (2) NVRs for video recording. MSI shall integrate IP based video cameras with CIOC for monitoring purposes. Integration for capturing any alarms or errors shall also be facilitated.
- It is expected that not all functionality of this infrastructure will be duplicated at the CCC but only critical parameters related to performance, status, consumption, billing, faults, alarms shall be enabled at the CIOC and further integrated with ISM and GIS. 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);
- MSI shall ensure secure integrations take place with all utilities SCADA and sensors via APIs or other data protocols such as Modbus TCP/IP. Integrated data shall be visualized over GIS layer and integrated with ERP and Smart City Platform (as applicable and decided by Client).
- Integrate consumption data of mentioned infrastructure except power for billing purposes. Invoices shall be generated, printed and shared with allottees via ISM.

3.2.7 Command and Control Center (CCC)

- 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 CCC 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 CCC;

- CCC area shall consist of CCC operations room including operator consoles with video wall, a Manager Cabin for management and decision making, a rack room for co-locating telecom equipment, CFC room, UPS and Electrical room. Design/build of all the CCC area shall be done by MSI. Entire CCC area shall be approximately 500 sq. ft.;
- A display only setup of smart city platform to be developed by MSI at site as per location provided by the client.
- As CCC shall be implemented at GNIDA Building or any other building on-site, MSI shall coordinate with the IITGNL OFFICIALS for the spatial and basic infrastructure requirements;
- MSI shall coordinate with GNIDA Building architect for any requirements associated with layout of the CCC;
- MSI shall take consultation and approval of Client or its representative, for the interior layout and material to be procured for CCC;
- MSI shall furnish the CCC 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 CCC. 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 CCC 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. A/C inside server room shall be precision AC only for precise cooling. 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 CCC 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 also install CCTV surveillance system inside CCC for video surveillance of the facility. The MSI shall also ensure that CCC area is Wi-Fi enabled;
- CCC 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 CCC facility;
- MSI shall be responsible for compliance with all local standards and certifications, including building, electrical and occupational requirements;
- MSI shall integrate CCC 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 CCC with other city components;
- Define SOPs with the Client or its representative for the operations to ensure that CCC systems are configured to support the operational procedures;
- MSI shall be responsible for operating CCC and any helpline/helpdesk 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;
- Telecom connectivity with sufficient bandwidth for operations of entire smart city control centre and availability with redundant links shall be provided between site and GNIDA building (if CCC is finalized there) and cost of the same to be loaded in this bid. The exact location of CCC shall be decided in due course of time by the Client.

- MSI shall be responsible for integrating the Power SCADA systems, Water SCADA system, Streetlight SCADA, Automated Waste Collection System SCADA, Surveillance cameras with CIOC using latest and best industry practices;
- Any other additional equipment/accessory which are required as part of CCC such as USV KVM extenders shall also be in the scope of the MSI.

3.2.8 Data Hosting for IITGNL

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

3.2.8.1 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.

3.2.8.2 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 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		

DESCRIPTION	UNIT	QTY.
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, Pre-Production/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		✓

S. NO	APPLICATION	CLOUD HOSTING	ON PREMISE HOSTING
			✓
3.	Variable Message Digital Signage	✓	
			✓
4.	Enterprise Management System (EMS)	✓	
5.	Environmental Sensors (Software)	✓	
6.	IIT Software Module (ISM)	✓	
7.	E-LMS	✓	
8.	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. MSI shall be responsible for end-to-end security for the cloud solution as well as on-premise storage. 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..

3.2.8.3 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
Command and Control Center Applications and Smart City Platform	<=30 Mins	<= 20 mins.
Variable Message Digital Signage	<= 60 Min	<= 45 mins.
Enterprise Management System (EMS)	<= 30 Min	<= 20 mins.
Environmental sensors (Software)	<= 60 Min	<= 45 mins.
ISM Applications	<= 30 Min	<= 20 mins.
Any other Servers and applications	As applicable	As applicable

3.2.8.4 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.

3.2.8.5 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.

3.2.9 Telecom Connectivity

- MSI shall be responsible for establishing telecom connectivity via feasible link between CCC and setup at site plus for link between site and Cloud. 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 site and CCC along with operations of back-end applications by DMIC IITGNL employees.
- Leased line connection to CCC 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 CCC. (minimum 5 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.

3.2.10 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 CCC 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 CCTV 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 CCC, 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
Detailed Project Report (DPR) including, Business Blueprint finalization, EULA and sign-off from DMIC IITGNL and Shop Drawings	D + 2 Months
Go – Live and Operational Acceptance of Phase - 0	D + 3 Months
Go – Live and Operational Acceptance of Phase - 1	D + 4 Months
Go – Live and Operational Acceptance of Phase - 2	D + 6 Months
Training to DMIC IITGNL staff	D + 6.5 Months
End to end Go-Live (Operational Acceptance of the Project)	D + 7 Months
Comprehensive Maintenance / AMC Phase	D + 43 Months

Appendix A: Standards (for Reference only)

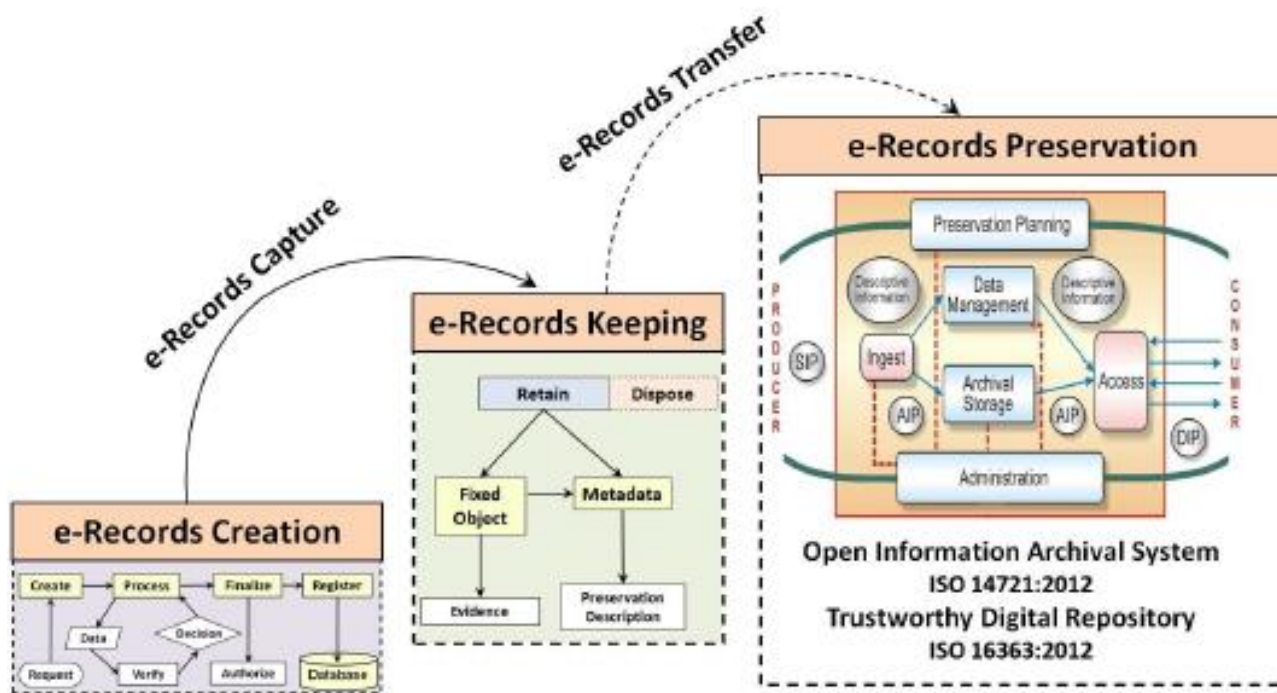
1. Digital Preservation Standards

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
<p>ISO 19005-1:2005 Use of PDF 1.4 (PDF/A-1b) with Level B</p>	<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.
<p>ISO 19005-2:2011 Use of ISO 32000-1 (PDF/A-2)</p>	<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>
<p>JPEG2000 (ISO/IEC 15444-1:2004) and PNG (ISO/IEC 15948:2004)</p>	<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>
<p>ISO/IEC 27002: 2005</p>	<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://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, December 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:
 - This Website belongs to Department of Heavy Industries, Ministry of Heavy Industries and Public Enterprises, Government of India' (for a Central Government Department).

- This Website belongs to Department of Industries, State Government of Uttar Pradesh, India' (for a State Government Department).
- 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).
- 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 organizations 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 publicizing 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.

- 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.
- 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.

- **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):

- Data Distribution Service (DDS)
- Dependability Assurance Framework For Safety-Sensitive Consumer Devices
- Threat Modeling
- Structured Assurance Case Metamodel
- Unified Component Model for Distributed, Real-Time and Embedded Systems
- Automated Quality Characteristic Measures
- 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**

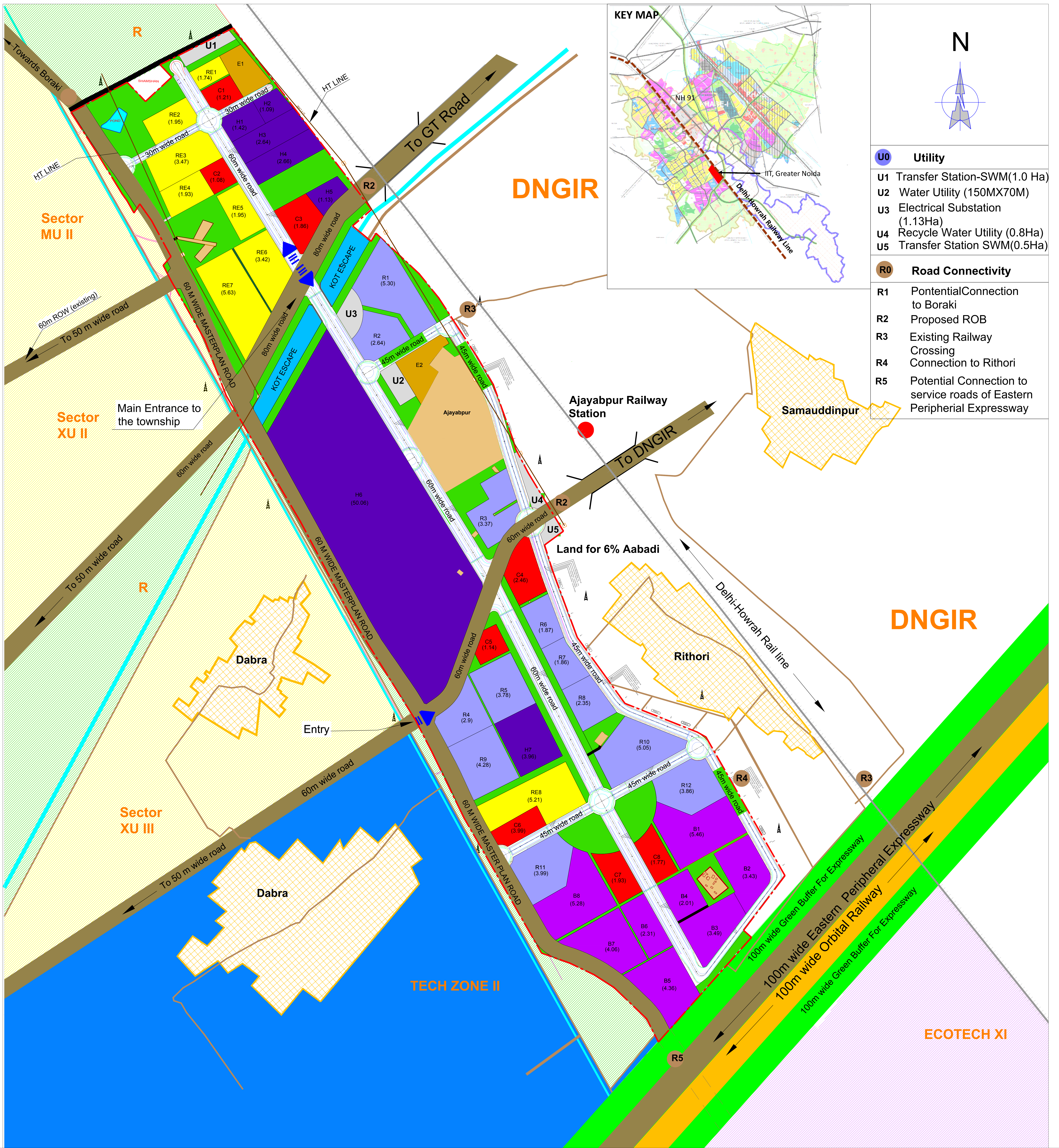
➤ **ITU Standardization Roadmap**

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



REVISIONED SITE LAYOUT PLAN FOR INTEGRATED INDUSTRIAL TOWNSHIP, GREATER NOIDA

AREA STATEMENT

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	

Revisions:

- Change of Location of different land-uses keeping their respective %age area intact
- An 18M wide road proposed for access to the adjoining village (Ghori Bacheda).
- An access road of 9 mt. width proposed, resultant change in area negligible.
- The access to the settlement between Industrial Plots R8 and R9 earlier provided from the 45 mt. changed to 60 mt. wide road.
- 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.

Revision done on 20.07.18
Approved in the 16th Board Meeting on 27.03.18

REVISIONED SITE LAYOUT PLAN FOR INTEGRATED INDUSTRIAL TOWNSHIP, GREATER NOIDA

LEGEND

- Hi-tech/IT Industry
- Bio-tech Industry
- R & D Industry
- Commercial / Mixed Use
- Residential - Group housing
- Residential - EWS Housing
- Utility
- Open Space / Green Buffer
- GNIDA Masterplan roads
- IIT Internal Roads
- Existing Settlement roads
- Area not under IIT
- Existing Structures
- Kot Escape
- Pond
- 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 SENSARMMA C.E.O & M.D.
DEEPAI BAKSHI Sr. Mgr. (Urban Plg.)
LEENU SAHGAL G.M.(Plg. & Arch.)
KRISHAN KUMAR A.C.E.O.
DEEPAK AGGARWAL C.E.O.
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DEEPAK AGGARWAL C.E.O.



Scale: 1:10000 @ A2

Date:18/07/2018

Drawing No.: TCE.7504A-292-MP-6301

Appendix C: Additional Department Process Flow

The following process flows mentioned below are envisaged as part of the future. These process flows are currently not applicable. MSI shall incorporate the process flows as and when DMIC IITGNL adopts the below mentioned functions:

Sector Layout Planning:

Once land has been acquired from GNIDA and appropriately surveyed and mapped by the Projects Department, all relevant data inputs (including survey drawing from Projects Department in AUTOCAD format, area of land acquired in hectares, details of any existing demarcations or structures, etc.) are forwarded to the Planning Department for formulation of Sector Layout Plans. This exercise has three components:

- Zoning of land for various land uses, e.g. residential, commercial, industrial, institutional.
- Demarcation of acquired land into plots, including sizing of plots and assignment of plot numbers
- Hard and soft infrastructure planning, in consultation with the Projects Department

S.N O.	PROCESS	PROVIDER	INPUT	OUTPUT	PLATFORM
Planning Department receives survey drawings (AUTOCAD) from Projects Department, details of acquired land from Land Department					
P1.	Based on inputs received from the Projects and Land Departments, Sector Layout Plans are to be formulated in order to define plans for various land uses, demarcate and number individual plots, and plan around the development of necessary hard/soft infrastructure.	Planning Department.	Survey drawings (AUTOCAD) from Projects Department, details of land acquired by Land Department	Sector Layout Plans	AUTOCAD Drawing
P2.	Layout Plan forwarded for multiple approvals along the designated approval ladder: <ul style="list-style-type: none"> • CEO • Board (full approving authority) 	Planning Department	Sector Layout Plan(s)	Signoffs from relevant approving authorities	Offline
P3.	Plot details forwarded to concerned Property Department(s) for scheme formulation, Projects for project development				

Encroachment Removal:

In future, department may be setup which shall be responsible for identifying and facilitating removal of encroachments, including but not limited to illegal occupancy of public space (street vendors, dukandars, etc.), illegal development of land, and pasting of bills. These tasks may handled by a cell of encroachment officers within DMIC IITGNL Department.

S.N O.	PROCESS	PROVIDER	INPUT	OUTPUT	PLATFORM
Individual or entity encroaches on acquired and planned land					
P1.	An encroachment case may be flagged to Encroachment Removal Cell. An encroachment may be flagged in one of two ways: <ul style="list-style-type: none"> • On a daily basis, officers of the Encroachment Removal Cell will conduct patrols within the city to identify instances of encroachment. • Post receipt of a grievance 	Planning Department, Property Department, Encroachment Cell, standard grievance mechanisms	Case identified via patrol or receipt of grievance	Case forwarded to Encroachment Cell for Review	Offline/Online

S.N O.	PROCESS	PROVIDER	INPUT	OUTPUT	PLATFORM
	through one of the standard platforms, the case will be flagged for investigation by the Encroachment Cell				
P2.	Encroachment Removal Cell reviews case liaises with relevant authorities (police etc.) and Law Department	Encroachment Removal Cell, Law Department	Case forwarded to Encroachment Cell for Review	Case investigated by Encroachment Removal cell.	Offline
P3.	Deployment of Encroachment Cell after investigation of all facts	Encroachment Cell	-	-	Offline
P4.	Encroachment removed successfully				

Horticulture Development & Maintenance:

Post award of horticulture work to contractors/vendors, actual gardening work shall start and should be regularly maintained throughout the city.

S.N O.	PROCESS	PROVIDER	INPUT	OUTPUT	PLATFORM
Vendor selected via tender					
P1.	Site handed over to accepted contractor. Third party quality control (QC) team for ongoing monitoring. The QC team is maintained on an annual basis and contracted through the standard tender management process.	Landscaping and Horticulture Department	Accepted contractor	Site handed over to contractor	Offline
P2.	Project work under progress. Based on timelines laid out in the Estimate, project management timelines are formalized in a Program Evaluation Review Technique (PERT) chart, identifying process steps, cycle times and waiting times for the duration of the project management cycle	Landscaping and Horticulture Department	Sanctioned tender document	PERT Chart	Offline
P3.	Measurement book to be maintained detailing daily progress – to be signed by the contractor/vendor handling the project on a daily basis. Measurement book to be forwarded to Finance department on a monthly basis for signoff.	Landscaping and Horticulture Department	Measurement book, running bill	Technical Supervisor signoff	Offline
P4.	Weekly progress report to be prepared and submitted by Landscaping and Horticulture Department for signoff	Landscaping and Horticulture Department	Weekly progress report	Concerned Personnel signoff	Offline
P5.	The maintenance and watering schedule chart are updated by the	Landscaping and	Weekly progress	Updated maintenance	Offline

Appointment of Master System Integrator (MSI) for Supply, Implementation, Integration, Operations and Maintenance of Smart City ICT Components at Integrated Industrial Township (IIT) under the DMIC Integrated Industrial Township Greater Noida Limited (DMIC IITGNL)

S.N O.	PROCESS	PROVIDER	INPUT	OUTPUT	PLATFORM
	Horticulture Department	Horticulture Department	report(s)	and watering schedule	
P6.	Regulate maintenance of the plantations				