RFP FOR SELECTION OF LOCAL SYSTEM INTEGRATOR FOR IMPLEMENTATION OF INTEGRATED COMMAND AND CONTROL CENTRE AND SMART ELEMENTS IN HUBBALLI-DHARWAD

Volume 2: Scope of Work

Dated: June 2018

RFP No. HDSCL/ ICCC/ 2018-19

HUBBALLI DHARWAD SMART CITY LIMITED

Contents

1. Introduction

1.1 Bidding Data Sheet

Particulars	Details
Name of Purchaser	Hubballi- Dharwad Smart City Limited (HDSCL)
Name of the Engagement	Selection of System Integrator for implementation of ICT solutions and establishment of Integrated Command and Control Center (ICCC) for Hubballi - Dharwad Smart City
Release Date of RFP	06.06.2018
Last date & time for submission of Pre-Bid Queries	19.07.2018 by 16:00 hrs
Pre-Bid Meeting	20.06.2018 at the HDSCL office, IT Park, 4th floor, "E" block, Hubballi - 580029
Last date (deadline) for submission of the bid (e-Procurement portal)	06.07.2018 at 16:00 hrs
Opening of Technical Bids	09.07.2018 at 11:00 hrs
Presentation by Bidders	Will be intimated to successful bidders later
Opening of Commercial Bids	Will be intimated to successful bidders later
Validity of Proposal	Proposals must remain valid 180 days after the Submission date.
Method of Selection	The Selection of LSI shall be through two stage Least Cost System (LCS) with the 1st Stage consisting of Prequalification and Technical Criteria evaluation. The minimum qualifying marks for 1st stage would be 80 marks out of 100 marks. 2nd stage would be evaluation of Financial Bid and the Bidder with L1 Bid will be selected based on Grand Total Price (Capex Price + Opex Price with NPV) exclusive of applicable taxes.
Address of Communication	The Managing Director, HDSCL Office, IT Park, 4th floor, "E" Block, Hubballi - 580029

Particulars	Details
Bidding in Consortium	Consortium of up to 3 members including Lead Bidder is allowed (Lead Bidder and 2 Consortium Partner) The lead bidder shall be jointly & severally responsible for complete scope, whereas partner/s shall be severally responsible only for its/their respective scope. The bid should contain details of all the members of the consortium including their legal status and specify their roles and responsibilities in the project. The members of the consortium shall enter into an Agreement for the purpose of submitting the proposal and the same shall be submitted with the proposal, failing which bid will be summarily rejected.
Sub-Contracting	• Limited sub-contracting is allowed for outdoor activities such as fibre laying, camera installation, network provisioning, mechanical and civil work as required in the project. • Bidder needs to mention details of any sub-contracting proposed in the bid along with name of sub-contractor and activity assigned. Any change in sub-contractor at later date will be allowed only after approval of HDSCL.
Tender Fees	As indicated in the e-procurement portal
Earnest Money Deposit / Bid Security	INR 39.57 Lakhs (INR 39,57,000/-) To be submitted as per clause 2.8 of RFP Vol I.

Note

1. HDSCL reserves the right to change any schedule of bidding process.

1.2 Project Objectives

One of the primary objectives of Hubballi-Dharwad Smart City Limited (HDSCL) under its Smart City Mission is to drive citizen centricity through improvements in City Operations, improve efficiency of municipal services and promote a better quality of life for residents. In order to achieve these objectives, Hubballi-Dharwad Smart City Limited desires to foster the development of a robust ICT infrastructure that supports digital applications and ensures seamless oversight of city-wide operations through Integrated Command and Control Centre, improved Solid waste Management, Surveillance, Smart Parking, Emergency response mechanisms and real time tracking of services and vital city metrics throughout the city and in government departments.

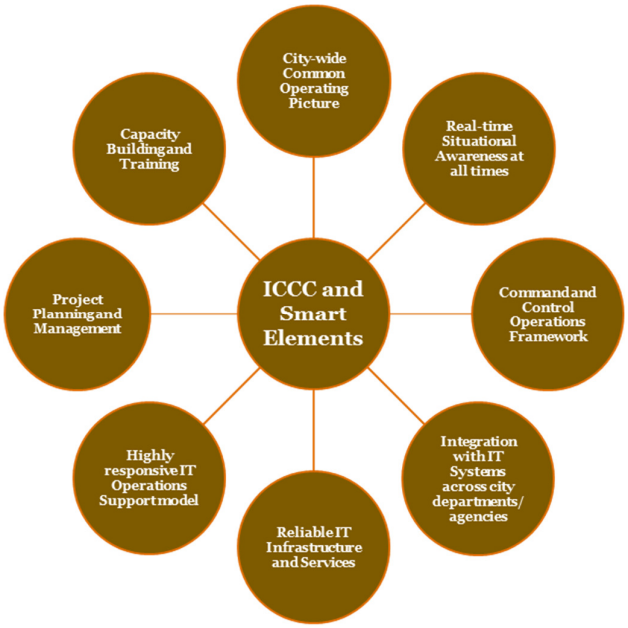


Figure -1 ICCC and its Components

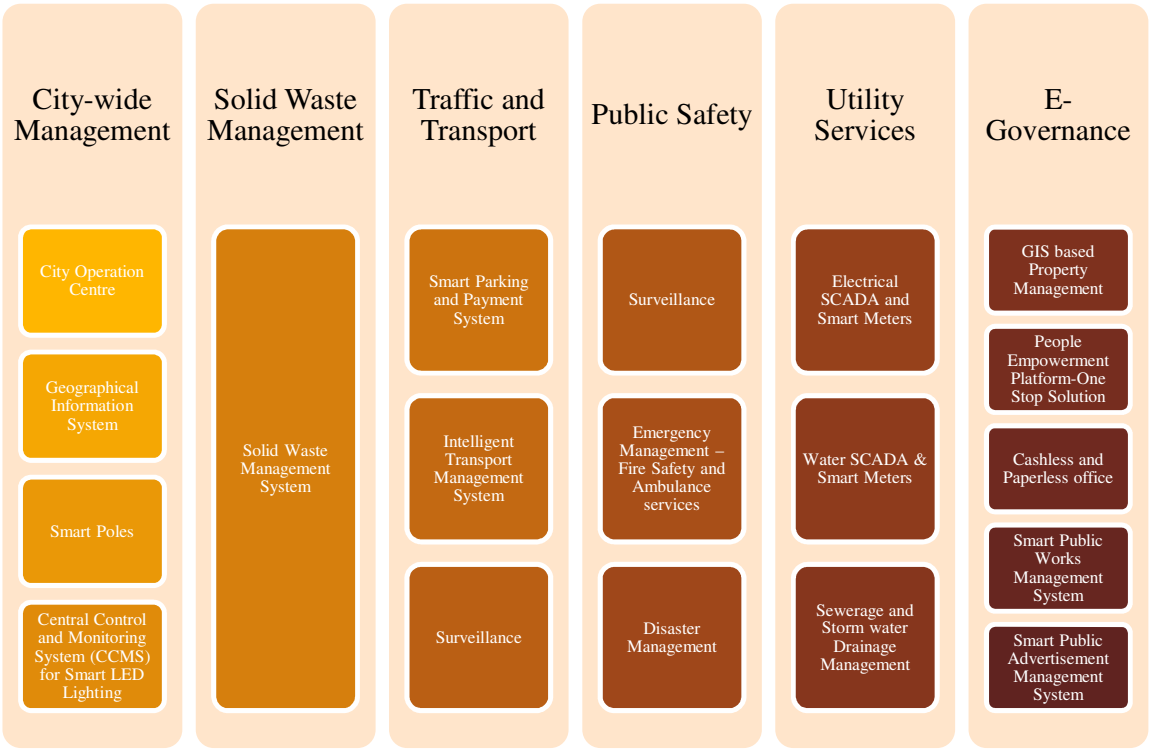
The key objective of this project is to establish a collaborative framework where input from different functional departments of Hubballi-Dharwad Municipal Corporation and other stakeholders such as transport, water, fire, police, e-governance, etc. can be assimilated and analyzed on a single platform; consequently resulting in aggregated city level information. Further, this can be converted to actionable intelligence, which would be propagated to relevant stakeholders and citizens. Following are the key intangibles that should be addressed by the proposed interventions:

HDSCL is considering the appointment of an agency to set up these priority initiatives identified under the Smart City mission which will include city operation center (COC) and Smart

Elements like Solid Waste Management System, City Wi-Fi, Smart Parking, Smart Poles, and City Surveillance.

Main objective of the project is to break silos in the city with in the departments and across the departments. Also to install appropriate check points for solutions implemented, so that the services delivered to the public are to the at most satisfaction of public.

Following city-wide domains will be covered under the scope of this project through ICT interventions.



While a few of these will be implemented throughout the scope of this RFP the others will be integrated with the State level centralized Integrated Command and Control Centre to generate the Common Operating Picture. This will be detailed in the following sections.

2.0 Project Scope of Work

There are two parts of establishment of ICCC:

Centralized City operation platform:

Centralized city operation platform along with Data Center, Disaster recovery (DC/DR) and IoT Platform will be provided by the KUIDFC through vendor/ MSI appointed through open tender process. The city operation platform, compute and storage required for all the smart cities in Karnataka will be provided by this MSI or State Vendor.

Physical City ICCC:

Each smart city has to implement, integrate and operationalize all the smart solutions/ components of the city. These smart ICT solutions like Smart Parking, Smart Solid Waste Management etc. have to be implemented by City vendor(s) to be appointed by each city SPV through open tender process. Establishing the physical build of City command center with Video wall, local video storage, networking components etc. will they be responsibility of city vendor.

These solutions will be integrated with City operation platform with an integrated operations and dashboard application. This application/city operation platform will be provided by the vendor selected by KUIDFC.

The LSI will be required to integrate already implemented video surveillance services in the city by police department and services which are proposed to be implemented under this project.

HDSCL intends to select a Local System Integrator (SI) for city of Hubballi-Dharwad by following competitive bidding process to design, develop, implement and maintain the Smart City System for a period of five years including Go Live and O&M phase on turnkey basis. This document contains the following details:

- Scope of work that will be assigned to the LSI as part of this project
- Other terms and conditions of the envisaged Smart City System

LSI will establish city operation center as Integrated Smart City System for Hubballi-Dharwad comprising of various project modules/components packaged under 3 levels of intervention:

2.1 Level 1: Integrate and View

Certain components will be integrated using direct feeds, dashboards and sharing of alerts/ actionable inputs for integrate and view operations, such as:

1. City Surveillance System (Police and Traffic)
2. Smart Governance

3. People Empowerment Platform
4. Emergency and Disaster Management
5. Intelligent Transport Management System
6. Smart Energy
7. Smart Water

2.2 Level 2: Integrate Command and Control

1. Smart Parking & Payment System
2. Smart Poles
3. CCMS for LED Street Lights
4. GIS Based Property Management System

2.3 Level 3: Implement, Command, Control and Fully Operate

1. City Operation Center (COC) or City ICCC
2. Smart IT Solid Waste Management
3. Geographical Information System (GIS)

Following table describes all the solutions to be integrated phase wise and layer wise:

SL No.	Projects	Implementation	Integration	Phase
1	City Operation Centre (COC) or City ICCC	YES	YES	Phase- I and II
2	Smart IT Solid Waste Management	YES	YES	Phase- I
3	Geographical Information System (GIS)	YES	YES	Phase- I and II
4	Electrical SCADA	NO	YES	Phase- II
5	Surveillance System – Police and Traffic	NO	YES	Phase- I
6	Intelligent Transport Management System	NO	YES	Phase- I
7	SMART Parking & Payment System	NO	YES	Phase- II
8	Smart Poles	NO	YES	Phase- I
9	CCMS for LED Street Lights	NO	YES	Phase-II
10	GIS based Property Management	NO	YES	Phase- II

11	Smart Governance	NO	YES	Phase- II
12	People Empowerment Platform	NO	YES	Phase- I and II
13	Water SCADA	NO	YES	Phase- II
14	Emergency and Disaster Management	YES	YES	Phase- II
15	Any other sensors/systems	NO	YES	Phase-II

LSI shall be responsible to carry out the detailed survey prior to submission of bid for the complete solution component requirement in order to finalize infrastructure requirement, network bandwidth requirement, operational & administrative challenges etc.
The subsequent sections detail out the solution and scope with respect to each of the solution component. LSI shall note that the activities defined within scope of work mentioned are indicative and may not be exhaustive. LSI 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 RFP and factor the same in its response.

The scope of the project for LSI includes implementation of identified smart ICT solutions including establishment of city based city operation center integrated with state level centralized ICCC and integrate the already implemented ICT solutions with ICCC. Scope also includes conducting a detailed assessment of current state of city services being provided and accordingly plan, design a comprehensive technical architecture of city operation center (COC) and integrate it with ICCC so that relevant current and future ICT project may be integrated with ICCC.

As part of scope the LSI is expected to integrate various other ICT initiatives of the city with ICCC. These ICT initiatives may be from other departments' services like Water, Electricity, Police, and Transport etc.
The LSI shall have the overall responsibility to design, build, implement, operate, and maintain the project for a period of five years including Go-Live and O&M.
Specifically, Following are the main activities to be carried out by LSI:

- Project Planning, execution and Management
- Assessment and Gap analysis of requirement for all smart city components under scope.
- Solution Design, System Customization and development for all components mentioned in this volume.
- ICT items Procurement, deployment and commissioning
- Site Preparation including LAN Networking

- Application and general awareness Training
- Business Process Reengineering for the selected applications/ services, if required
- STQC Certification
- UAT & Go live
- Capacity Building
- Technical Support
- Operation & Maintenance (O&M) after Go-Live (Total 5 Years)

2.4 Finalization of the detailed Technical Architecture for smart city network

LSI will be required to review the Technical Architecture suggested in the Tender and finalize the detailed architecture for the overall system, incorporating findings of site survey exercise. All the components of the Technical Architecture should:

- At least comply with the published e Governance standards, frameworks, policies and guidelines available on http://egovstandards.gov.in (updated from time-to-time); and
- Be of leading industry standards and /or as per standards mentioned in Volume - III

2.5 Finalization and submission of a detailed technical architecture

LSI shall submit the detailed Technical Architecture and description of each sub-components, along with the bid, which should take into consideration following guiding principles:

- **Scalability** - Important technical components of the architecture must support scalability to provide continuous growth to meet the growing demand of the city (s). The system should also support vertical and horizontal scalability so that depending on changing requirements from time to time, the system may be scaled upwards. There must not be any system imposed restrictions on the upward scalability in number of field devices, or other smart city components. Main technology components requiring scalability are storage, bandwidth and computing performance (IT Infrastructure).

  The architecture should be scalable (cater to increasing load of internal and external users and their transactions) and capable of delivering high performance till the system is operational.

  The Applications proposed for various vertical solutions shall be capable of handling 200% growth for the next 5 years. LSI shall clearly quantify the expansion capabilities of the application software without incurring additional cost.

- **Availability -** The architecture components should be redundant and ensure that there is no single point of failures in the key solution components. Considering the high sensitivity of the system, design should be in such a way as to be resilient to technology sabotage. To take care of remote failure, the systems need to be configured to mask and recover with minimum outage. The LSI shall make the provision for high availability for all the services of the system. Redundancy has to be considered at the core components level. The SLA for various solutions is explained in section 9.0**.**
- **Security**- The architecture must adopt an end-to-end security model that protects data and the infrastructure from malicious attacks, theft, natural disasters etc. LSI must make provisions for security of field equipment as well as protection of the software system from hackers and other threats. Attacks and theft should be controlled and well supported (and implemented) with the security policy. The virus and worm attacks should be well defended with gateway level Anti-virus system, along with workstation level Anti-virus mechanism. There should also be an endeavor to make use of the SSL/VPN technologies to have secured communication between Applications and its end users. Furthermore, all the system logs should be properly stored & archived for future analysis and forensics whenever desired. The authority would carry out the security audit of the entire system upon handover and at regular interval during O&M period.

  Field equipment installed through this Project would become an important public asset. During the contract period of the Project the LSI shall be required to repair / replace any equipment if stolen / damaged/faulty. Appropriate insurance cover must be provided to all the equipment supplied under this project.

  The systems implemented for project should be highly secure, considering that it is intended to handle sensitive data relating to the city and residents of the city. The overarching security considerations are described below:

  - The security services used to protect the solution shall include: Identification, Authentication, Access Control, Administration and Audit and support for industry standard protocols.
  - The solution shall support advanced user authentication mechanisms including digital certificates and biometric authentication.
  - Security design should provide for a well-designed identity management system, security of physical and digital assets, data and network security, backup and recovery and disaster recovery system.
  - The solution should provide for maintaining an audit trail of all the transactions and should also ensure the non-repudiation of audit trail without impacting the overall performance of the system.

- The overarching requirement is the need to comply with ISO 27001 standards of security.
- The application design and development should comply with OWASP top 10 principles
- All the field devices will be X.509 certified for compliance to policy change management and to ensure that there is no default password.

- **Manageability** - Ease of configuration, ongoing health monitoring, and failure detection are vital to the goals of scalability, availability, and security and must be able to match the growth of the environment. Network should be auto/manual configurable for various future requirements for the ease of maintenance / debugging.
- **Interoperability** - The system should have capability to take feed from cameras installed by private / Govt. at public places, digitize (if required) & compress (if required) this feed & store as per requirements.
- **Open Standards** - Systems should use open standards and protocols to the extent possible
- **Single Sign On**- The application should enable single-sign-on so that any user once authenticated and authorized by system is not required to be re-authorized for completing any of the services in the same session. For employees of the department concerned, the browser based application accessed on the intranet, through single-sign-on mechanism, will provide access to all the services of the departments concerned (based on their roles and responsibilities), Help module, basic and advanced reporting etc. Similarly, for external users (citizens, etc), based on their profile and registration, the system shall enable single-sign on facility to apply for various services, make payments, submit queries /complaints and check.
- **Support for PKI based Authentication and Authorization-** The solution shall support PKI based Authentication and Authorization, in accordance with IT Act 2000, using the Digital Certificates issued by the Certifying Authorities (CA). In particular, 3 factor authentications (login id & password, biometric and digital signature) shall be implemented by the SI for officials/employees involved in processing citizen services.
- **Interoperability Standards**- Keeping in view the evolving needs of interoperability, especially the possibility that the solution shall become the focal point of delivery of services, and may also involve cross-functionality with the e-Government projects of other departments / businesses in future, the solution should be built on Open Standards. The LSI shall ensure that the application developed is easily integrated with the existing applications. The code does not build a dependency on any proprietary software, particularly, through the use of proprietary 'stored procedures' belonging to a specific database product. The standards should:

- At least comply with the published e-Governance standards, frameworks, policies and guidelines available on http://egovstandards.gov.in (updated from time-to-time); and
- Be of leading industry standards and /or as per standards mentioned in Volume III.

All the key personnel working on the Project should be on direct payroll of the SI/OEM/Consortium partner. If the work is sub-contracted, the sole responsibility of the work shall lie with the LSI. The LSI shall be held responsible for any delay/error/non-compliance/penalties etc. of its subcontracted vendor. The details of the sub-contracting agreements (if any) between both the parties would be required to be submitted to city and approved by the Authority before resource mobilization.

GIS Integration- LSI shall undertake detail assessment for integration of all the Field level ICT interventions proposed with the to-be implemented Geographical Information System (GIS). The GIS platform as well as the utilities required to create layers shall be provided by the MSI. LSI will utilise the MSI provided utility/platform.

- **SMS Gateway Integration**- LSI shall carry out SMS Integration of the SMS services procured by MSI. LSI should develop necessary applications to send mass SMS to groups/individuals.
- **Application Architecture**

1. The applications designed and developed for the departments concerned must follow best practice and industry standards. In order to achieve the high level of stability and robustness of the application, the system development life cycle must be carried out using the industry standard best practices and adopting the security constraints for access and control rights. The various modules / application should have a common Exception Manager to handle any kind of exception arising due to internal/ external factors. Standards should (a) at least comply with published e-Governance standards, frameworks, policies and guidelines available on http://egovstandards.gov.in (updated from time-to-time); and (b) be of leading industry standards and /or as per standards mentioned in Volume III.
2. The modules of the application are to be supported by the Session and Transaction Manager for the completeness of the request and response of the client request. The system should have a module exclusively to record the activities/ create the log of activities happening within the system / application to avoid any kind of irregularities within the system by any User / Application.
3. LSI shall design and develop the Smart City System as per the Functional and System requirement specifications finalized.

The Modules specified will be developed afresh based on approved requirement.

2.6 Roles & Responsibilities of MSI & LSI

Master System Integrator (MSI): The MSI is the bidder identified through a tender process for the set-up of centralized Data Centre at KMDS & Disaster Recovery (DR) on cloud and also provides the Integrated City Operations platform and GIS platform.

Local System Integrator (LSI): The LSI is the bidder identified through a tender process for the setup of Integrated Command and Control Centre (ICCC) at the city level and also for the implementation of city specific applications.

Third Party Application Service Provider (TPA – SP): The TPA-SP is the bidder identified through tender process for the implementation of other Smart City Projects whose application is hosted at the centralized Data Centre and is required to be integrated with the command and control centre

The indicative list pertaining to the roles & responsibilities of the LSI, MSI and any other third party service provider are as listed below. It is recommended that the LSI refer to the MSI RFP for further detailed understanding on the roles & responsibilities of the respective stakeholder

No.	Activity	MSI	LSI	TPA-SP
1.	Procurement, deployment and commissioning of IT Infrastructure (ex: Servers) at KMDS & DR	√		
2.	Procurement and installation of the OS & licensing for City-level application at KMDS & DR		√	√
3.	Estimating the requirement for storage and compute required at KMDS & the DR for City-level application		√	√
4.	Provisioning of rack space at KMDS & DR for the requirement of the city	√		
5.	Hosting the City-level application at the servers in KMDS (production) & DR		√	√
6.	Back-up to secondary storage devices at DC & DR	√		
7.	DR setup for ICOP	√		
8.	DR setup for City-level application	√		
9.	Integration (development, testing and staging) between City-level application and the ICCC application at KMDS	√	√	√
10.	Information/Data flow between DC & DR	√	√	

11.	Integration (development, testing and staging) between City-level application and the ICCC application at DR in case of DC failure	√	√	√
12.	Ensure the availability of IT Infrastructure at DC (KMDS)	√		
13.	Ensure the availability of ICOP Application	√		
14.	Ensure the availability of City-level Application		√	√
15.	Customization, development and functional testing of ICOP	√		
16.	User Acceptance testing of ICOP		√	
17.	Ensuring the availability of GIS platform	√		
18.	Updating the data layers (relevant to City-level project) at GIS		√	
19.	Network connectivity between field devices and KMDS		√	√
20.	Network connectivity between KMDS and ICCC facility	√		
21.	Network connectivity between KMDS and DR	√		
22.	Scheduling & communicating the planned down time at Data Centre	√		
23.	Coordination & assistance for planned down time for the respective applications at Data Centre	√	√	√
24.	Provision of DNS	√		
25.	Procure, Install, Commission and Operate the Centralized Helpdesk	√		
26.	Integration between external applications and City-level application		√	√
27	Ensure the availability of field devices		√	√
28	Network connectivity to the DR for video storage		√	
29	Define functional specifications for the data coming from the field devices to the IoT platform		√	√
30	Implementation of Business logic at the IoT platform for the data coming from field devices	√		
31	Ensure data flow from cameras/ field devices to the Video Storage		√	√

32	Integration (development, testing and staging) between field devices and the IoT platform at KMDS	√	√	√
33	Integration (development, testing and staging) between field devices and the IoT platform at DR in case of DC failure	√	√	√

2.7 Other expectations for Local System Integrator

1. LSI shall engage early in active consultations with the Authority, City Police and other key stakeholders to establish a clear and comprehensive project plan in line with the priorities of all project stakeholders and the project objectives.
2. LSI shall assess existing infrastructure's current ability to support the entire solution and integrate the same with the proposed solution wherever applicable and possible
3. LSI shall judiciously evaluate the resources and time planned for undertaking the current state assessment, given the overall timelines and milestones of the project.
4. LSI shall be responsible for supply of all the Products/equipment such as optical fibre cable (if required), Network, Hardware, Software, Devices, etc. as indicated (but not limited to) in the tentative Bill of Materials included in the RFP and their appropriate quantity & capacity.
5. LSI shall be responsible for supply of passive components indicated in the Bill of Materials Section of the RFP viz. Housings, Fibre Patch Cords, Racks etc.
6. Validate / Assess the re-use of the existing infrastructure if any with Authority site
7. Supply, Installation, and Commissioning of entire solution at all the locations.
8. LSI shall provide the bandwidth required for Edge devices to CCC or DC, as the case may be. The Bandwidth requirement shall be analyzed and procured by the LSI at its own cost / risk.
9. LSI shall Install and commission connectivity across all designated locations.
10. LSI shall ensure high availability, reliability and redundancy of the network elements to meet the Service Level requirements.
11. LSI shall be responsible for upgradation, enhancement and provisioning additional supplies of network (including active / passive components), hardware, software, etc. as requisitioned by Authority.
12. LSI shall ensure that the infrastructure provided under the project shall not have an end of life within 60 months from the date of bidding.
13. LSI shall ensure that the end of support is not reached during the concurrency of the contract and 5 years thereafter.
14. LSI shall ensure compliance to all mandatory government regulations as amended from

time to time.

15. The LSI shall ensure that all the peripherals, accessories, sub-components required for the functionality and completeness of the solution, including but not limited to devices, equipment, accessories, patch cords (fibre), cables, software, licenses, tools, etc. are provided according to the requirements of the solution.
16. Authority shall not be responsible if the LSI has not provisioned some components, subcomponents, assemblies, sub-assemblies as part of Bill of Materials in the RFP. The LSI shall have to provision these & other similar things to meet the solution requirements at no additional cost and time implications to Authority.
17. All the software licenses that the LSI proposes shall be perpetual software licenses along with maintenance, upgrades and updates for the currency of the contract. The software licenses shall not be restricted based on location and Authority shall have the flexibility touse the software licenses for other requirements if required.
18. LSI shall ensure there is a 24x7 comprehensive onsite support for duration of the contract for respective components to meet SLA requirement. The LSI shall ensure that all the OEMs have an understanding of the service levels required by Authority. LSI is required to provide the necessary MAF (Manufacturer Authorization Form) as per the format provided in the RFP in support of OEMs active support in the project.
19. Considering the criticality of the infrastructure, LSI is expected to design the solution considering the RFP requirement of no single point of failure with high level of redundancy and resilience to meet the network uptime requirements.
20. LSI shall be responsible for periodic updates & upgrades of all equipment, cabling and connectivity provided at all locations during the contract period.
21. LSI shall be responsible for setting up interiors of building with necessary physical infrastructure including provisioning for network, power, rack, etc. at all the locations.
22. LSI is expected to provide following services, including but not limited to:
    I. Provisioning hardware and network components of the solution, in line with the proposed authority's requirements
    II. Size and propose for network devices (like Router, switches, security equipment including firewalls, IPS / IDS, routers, etc. as per the location requirements with the required components/modules, considering redundancy and load balancing in line with RFP.
    III. Size and provision the WAN bandwidth requirements across all locations considering the application performance, data transfer, and other requirements for smart city initiatives.
    IV. Liaise with service providers for commissioning and maintenance of the links.
    V. Furnish a schedule of delivery of all IT/Non-IT Infrastructure items.

VI. All equipment proposed as part of this RFP shall be rack mountable.

VII. Authority may at its sole discretion evaluate the hardware sizing document proposed by the SI. The. SI needs to provide necessary explanation for sizing to the Authority.

VIII. Complete hardware sizing for the complete scope with provision for upgrade.

IX. Specifying the number and configuration of the racks (size, power, etc.) that shall be required at all the locations.

X. The LSI shall provide for all required features like support for multiple routing protocols, congestion management mechanisms and Quality of Service support.

XI. The LSI shall ensure that all active equipment (components) are Simple Network Management Protocol (SNMP) V3 compliant and are available for maintenance/management through SNMP from the date of installation by a Network Monitoring System.

23. LSI shall directly interact with electricity boards for provision of mains power supply at all desired locations for any Field Infrastructure solution. The Hubballi-Dharwad Smart City shall facilitate, if any documentation is required from its side. LSI shall be responsible for provisioning of requisite electricity power and its recurring charges (during operational phase). LSI may provision the same under appropriate heads in the commercial bid.
24. Prior to starting the site clearance, the LSI shall carry out survey of field locations as specified in this Volume, for buildings, structures, fences, trees, existing installations, etc. The Hubballi-Dharwad Smart City shall be fully informed of the results of the survey and the amount and extent of the demolition and site clearance shall then be agreed with the HDSCL.
25. Lightning Proof Measures

I. The LSI shall comply with lightning-protection and anti –interference measures forsystem structure, equipment type selection, equipment earthing, power, signal cables laying.

II. Corresponding lightning arrester shall be erected for the entrance cables of powerline, video line, data transmission cables. All crates shall have firm, durable shell. Shell shall have dustproof, antifouling, waterproof functions; capable to bear certain mechanical external force.

III. Signal separation of low and high frequency; equipment protective field shall be connected with their own public equal power bodies; small size/equipment signal lightning arrester shall be erected before the earthling.

IV. The Internal Surge Protection Device for Data Line Protection shall be selected asperzone of protection described in IEC 62305, 61643-11/12/21, 60364-4/5. Data lineprotection shall be used for security system, server data path and other communication equipment.

V. Data line protection shall be installed as per zone defined in IEC 62305.
    a. Type 1 device shall be installed between zone 0B and zone 1.
    b. Type 2 devices shall be installed before the equipment in zone 2 and 3.

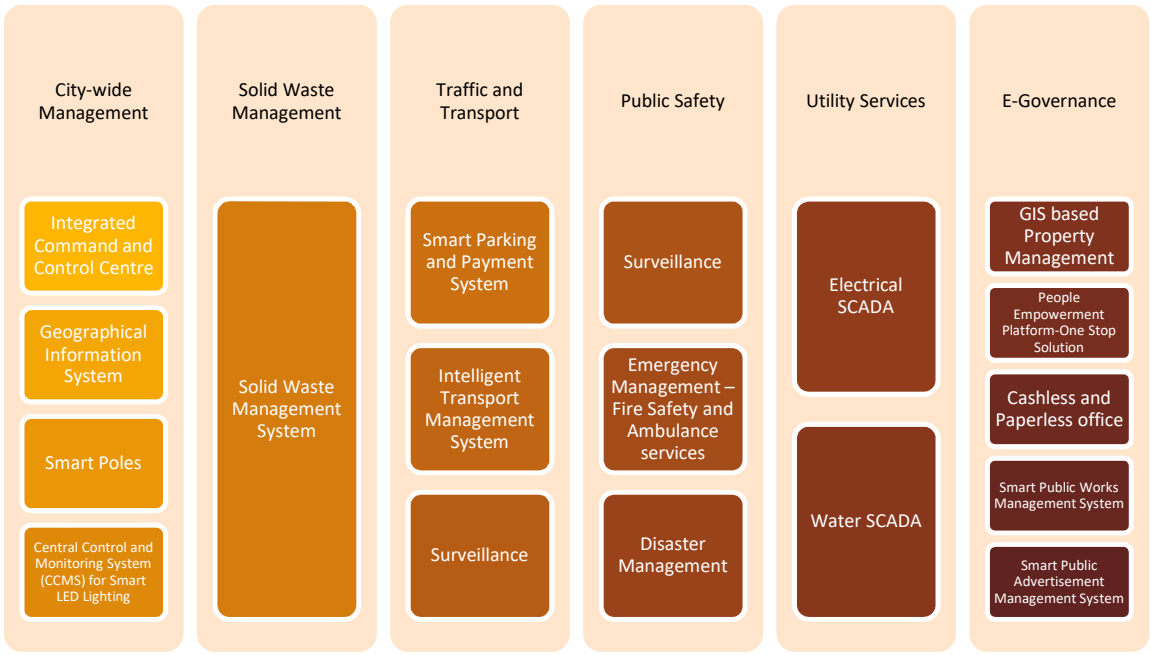
26. After signing of contract, the Systems Integrator needs to deploy the team proposed for the project and ensure that a Project Inception Report is submitted to Hubballi-Dharwad Smart City Limited which should cover following aspects:
    I. Names of the Project Team members, their roles & responsibilities
    II. AS-IS Assessment of the existing ICT Infrastructure at departments in-scope
    III. Approach & methodology to be adopted to implement the Project (which should bein line with what has been proposed during bidding stage, but may have valueadditions / learning in the interest of the project).
    IV. Responsibility matrix for all stakeholders
    V. Risks the SI anticipates and the plans they have towards their mitigation.
    VI. Detailed Project Plan, specifying dependencies between various project activities /sub-activities and their timelines.
27. Feasibility Report for all ICT projects mentioned in the RFP should be conducted. Local SystemIntegrator should provide as part of feasibility report the detailed To-Be designs (layout plans) specifying the following:
    - High Level Design (including but not limited to):
        a. Application architecture documents
        b. ER diagrams and other data modelling documents
        c. Logical and physical database design
        d. Data dictionary and data definitions
        e. Application component design including component deployment views, control flows, etc.
        f. Field equipment deployment architecture
    - Low Level Design (including but not limited to)
        a. Application flows and logic including pseudo code o GUI design (screen design, navigation, etc.)
        b. Database architecture, including defining data structure, data dictionary as per standards laid-down by Government of India/ Government of Karnataka
    - Location of all field systems and components proposed at the junctions/other locations,
    - Height and foundation of Poles, cantilevers, gantry and other mounting structures for other field devices
    - Location of Junction Box
    - Location of PoP

- Electrical power provisioning

28. Any functionality not expressly stated in this document but required to meet the needs of the organization to ensure successful operations of the system shall be carried out by the LSI via a mutually agreed change request.

2.7.1 Components and Service Overview

The Local System Integrator (LSI) should ensure the successful implementation of the proposed "City Operation Centre, Smart Elements in Hubballi-Dharwad city and integrate all these solution with centralized city operation platform / Integrated Command and Control Center", develop the Concept of Operations (CONOPS), provide capacity building support to city authorities and Operate and maintain the solution as per the scope of services described below. Any functionality not expressly stated in this document but required to meet the needs of the HDSCL to ensure successful operations of the system shall essentially be under the scope of the SI and for that no extra charges shall be admissible. SI shall implement, integrate and deliver the following systems and components with provisioning of ICT infrastructure:



Integration: Integration of various ICT solutions with ICCC/ City operation platform will be the joint responsibility of both the vendors:

1. **Data Center, IoT Platform and city operation platform provider (MSI at tate Level)**

State level MSI has to ensure that the data transmitted from sensors is seamless received and processed at IOT platform and available for visualization at city operation platform. State vendor has to apply business logic as per the functional requirement (Use cases) of the user.

2. ICT Solution Provider (LSI at City Level)

City level SI has to ensure that the all the IOT devices and system application hosted at data center work as per the SLAs. Data required for IOT platform and city operation platform has to be sent in the most flexible manner as per the requirement of state vendor. If required, an interface needs to be developed for data transmission to IOT platform/city operation platform in the required format.

Note*: It is recommended that the LSI go through the MSI RFP for a detailed understanding on the scope of work MSI

2.7.2 Solution Architecture

Functionally, Integrated Command and Control Centre is a city level initiative and originally is planned to establish it in each smart city. Since almost all city level services are same in nature, an indicative architecture of the solution envisaged under the "Integrated Command and Control Center and Smart Elements" scope is given below.

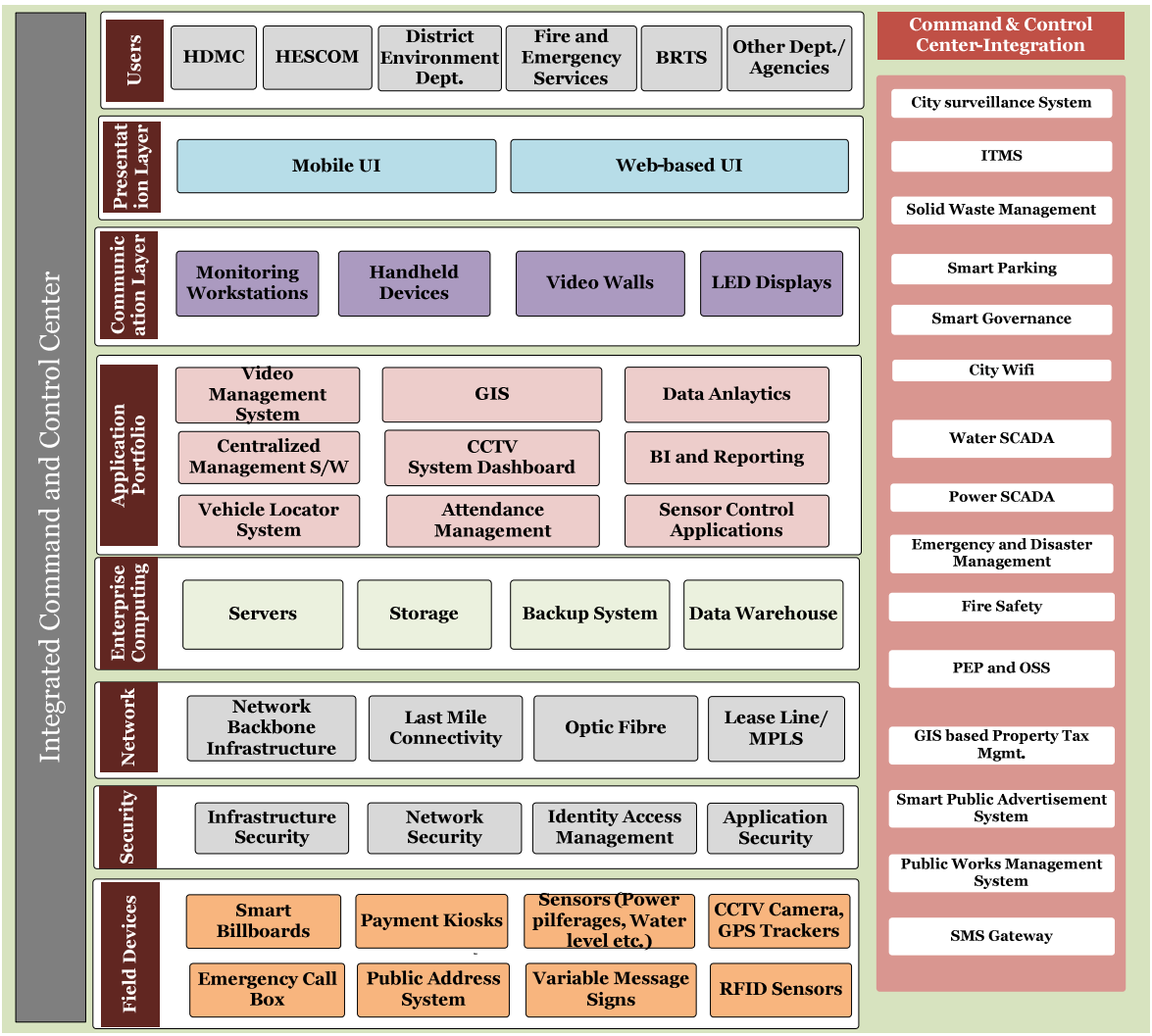


Figure 2 Solution Architecture

a. Field Device Layer

The field devices layer will contain display devices or bi-directional (input & output) devices connected to the network which will be used by citizens to consume - and for administrators to provide - actionable information. Such field devices include digital messaging boards, environmental data displays, public address system etc.

This would also comprise of the sensors which will help the city administration gather information about the ambient city conditions or capture information from the edge level devices like cameras, environment sensors, GPS sensors, emergency call boxes, etc.

b. Security Layer

As ambient conditions, actuators and display devices are now connected through a network and send data to business applications, security of the entire system becomes paramount:

- Infrastructure security- including policies for identity and information security policies
- Network security- including policies and practices adopted to prevent and monitor unauthorized access, misuse, modification, or denial of a computer network and network-accessible resources, etc.
- Identity and Access Management – including user authentication, authorization, SSL & Digital Signatures
- Application security- including Hosting of Government Websites and other Cloud based services, Adoption of Technical Standards for Interoperability Framework and other standards published by Government of India for various e-Governance applications
- End device security, including physical security of all end devices such as display boards, emergency boxes, kiosks etc.

Following security parameters should be included for all smart elements, but not limited to:

- User/administrator audit log activity (logon, user creation, date-time of PA announcements, voice recording etc.)
- Secured data storage (storage of video/image/voice/location/data captured by various smart elements)
- SSL/TLS encryption for web and mobile application based interfaces for sensitive data transfer
- Protection against Denial of Service (DoS) and Interference attacks to public Wi-Fi Devices

c. Network Layer

The secured network layer will serve as the backbone for the project and provide connectivity to gather data from sensors, share the data with business applications and transmit messages to display devices and actuators. It will support the Wi-Fi services and other smart elements (sensors and displays) at given locations. The network layer will be scalable such that additional sensors, actuators, display devices can be seamlessly added and more Wi-Fi spots created in future. Provisioning of bandwidth is included in the scope of the MSI; however, network connectivity at the city level, from the field devices is in the scope of LSI.

This layer would be integrating with provisions available for Network Connectivity within the city which includes.

- Lease line/MPLS connectivity
- Internet connectivity procured

d. Enterprise Computing Layer

The business applications will need the appropriate hosting infrastructure considering their criticality to deliver services. The IT Infrastructure required for hosting will include Storage,

Compute and Processing capabilities that are aligned with the non-functional requirements for the business applications.

e. Applications Layer

The Applications layer will contain data aggregation and management systems (rules engines, alerting systems, diagnostics systems, control systems, messaging system, events handling system), and reporting / dashboard system to provide actionable information to city administrators and citizens. This layer would comprise of the applications developed to receive data from field devices for each city domain. Applications in this layer will integrate with the ICCC solution to share data and also generate advanced analytics through correlations. This will be an evolving layer with applications added as and when newfunctions are identified by the stakeholders.

f. Integration Layer

While aspects of ambient conditions within the city will be gathered through various sensors deployed, some city specific data will come from other government and non-government agencies. It is through the integration layer – that data will be exchanged to and from the under lying architecture components and other data from system developed by government (such as police department, meteorological department, street lights department, water department, irrigation department, transport organizations within Hubballi-Dharwad etc.) and non-government agencies. The various integrations have been listed below:

1) City Surveillance System
2) ITMS
3) Solid Waste Management
4) Smart Parking
5) Smart Governance
6) City Wi-Fi
7) Water SCADA
8) Power SCADA
9) Emergency and Disaster Management
10) Fire Safety
11) PEP-OSS
12) GIS Based Property Tax Management System
13) Smart Public Advertisement System
14) Public Works Management System
15) SMS Gateway etc.

g. Communication Layer

This layer defines the various presentation channels and includes the following –

1) Monitoring Workstations
2) Handheld Devices
3) Video Walls
4) LED Displays

h. Presentation Layer

There will be two modes of presentation to the users accessing the ICCC system –

1) Mobile UI – mobile based UI shall be for the senior management officials who would be accessing the system for very quick and faster flow of information exchange. This would cover less of the functions of the system as it would be largely designed for accessing by the senior management.
2) Web-based UI – web-based UI for the other officials who would be accessing the system for the information required for their respective departments

i. Integrated Command and Control Center Layer

This is the overarching layer that integrates with the business applications that receive data from field devices. The Integrated Command and Control Centre application presents a Common Operating Picture which will enable citizens and administrators alike to get a holistic view of city operations. The application will integrate with the GIS layer to represent the real-time operational state on the map for easy visualization.

2.8 Scope of services

2.8.1 Implementation and Integration Services

The solutions identified for implementation and/or integration are as per the table in section 2.3.

The LSI's scope of work shall include but will not be limited to the following broad areas. Details of each of these broad areas have also been outlined in Section 4.

1. **Assessment, Scoping and Survey Study:** Conduct a detailed assessment, scoping study and develop a comprehensive project plan, including:
    a. Assess existing systems, street infrastructure and connectivity within the city for the scope items mentioned in Section3.
    b. Identify delivery dependencies across various city-wide projects being executed under the Smart Cities Mission or other State/Centre funded schemes and accommodate that in the project plan.
    c. Conduct site survey for finalization of detailed technical architecture, gap analysis and project plan
    d. Conduct site surveys to identify need for site preparation activities
    e. Obtain site Clearance obligations & other relevant permissions

f. Develop the Concept of Operations (CONOPS) for carrying out city operations efficiently between the ICCC and various city departments/agencies.

2. **Design, Supply, Installation, Commissioning and Testing of the components listed above**
   a. **Phase I:** Implementation and Integration of Integrated Command and Control Centre and SmartElements
   b. **Phase II:** Integration of other ICT systems with Integrated Command and Control Centre
3. **Operation and Maintenance Phase -**

   The LSI will also be responsible for supply of IT solution for the management of hardware and application software, networking, installation, Training, Maintenance and operations of the solution for remaining years in the 5 years period from the Go Live date of implemented solutions for Hubballi-Dharwad in an efficient and effective manner. Considering Phase 1 will Go-Live after 9 months (Refer Section 6), Warranty period of the product supplied under project i.e. hardware, software, IT/Non-IT etc., will be considered after phase wise Go-Live.
4. Integrate with provisions available for Network Connectivity within the city which includes**:**
   a. Fiber optic network
   b. Lease line/MPLS connectivity
   c. Internet connectivity procured through a separate tender
5. Provisioning Hardware and Software Infrastructure which includes design, supply, installation, and commissioning of IT Infrastructure at Integrated command control center. This consist of:
   a. Basic Site preparation services
   b. IT Infrastructure including hardware and license
   c. Command Center infrastructure including operator workstations, IP phones, joystick controller etc.
   d. Establishment of LAN and WAN connectivity at command center limited to scope of infrastructure procured for the project.
   e. Application integration services with other HDSCL applications
6. Capacity Building for HDSCL and any other department which includes preparation of operational manuals, training documents and capacity building support, including:
   a. Training of the city authorities, department personnel and operators on operationalization of the system
   b. Support during execution of acceptance testing.
   c. Preparation and implementation of the information security policy, including policies on backup and redundancy plan
   d. Preparation of revised KPIs for performance monitoring of various urban utilities monitored through the system envisaged to be implemented

e. Developing standard operating procedures for operations management and other services to be rendered by ICCC
f. Preparation of system documents, user manuals, performance manuals, Operation manual etc.

2.8.2 Assessment, Site Survey and project plan

After signing of contract, the LSI needs to deploy local team (based out of Hubballi-Dharwad) proposed for the project and ensure that a Project Inception Report is submitted to HDSCL which should cover following aspects:

1. Names of the Project Team members, their roles and responsibilities
2. AS-IS Assessment of the existing ICT Infrastructure at departments in-scope
3. Approach and methodology to be adopted to implement the Project (which should be in line with what has been proposed during bidding stage, but may have value additions / learning in the interest of the project).
4. Responsibility matrix for all stakeholders
5. Risks the SI anticipates and the plans they have towards their mitigation
6. Detailed project plan specifying dependencies between various project activities / sub-activities and their timelines
7. Installation locations geo mapped preferably on google earth to visually identify the geographical area.
8. The LSI shall conduct a comprehensive As-Is study of the existing infrastructure of Solid Waste Management System, Locations of Public Wi-Fi Hot Spots, Smart Poles Locations to establish the key performance indicators (KPIs) for the project. The KPIs of the study shall be included in the survey.
9. The LSI shall study the existing business processes, functionalities, existing management systems and applications including MIS reporting requirements.

Additionally, the LSI should provide detailed designs specifying the following:

1. High Level Design (including but not limited to) Application architecture, Logical and physical database design, Data dictionary and data definitions, ER diagrams and other data modelling documents and Physical infrastructure design for devices on the field
2. Concept of Operations for the TO-BE state that covers – Layout of the ICCC, Staffing Requirements, Standard Operating Procedures, Operations Model for 24/7 coverage, Roles and Responsibilities
3. Application component design including component deployment views, control flows, etc.
4. Low Level Design (including but not limited to) Application flows and logic including pseudo code, GUI design (screen design, navigation, etc.), Database architecture,

including defining data structure, data dictionary as per standards laid-down by Government of India/ Government of Karnataka.

5. Location of all field systems and components proposed at the junctions, (KML /KMZ file plotted on GIS platform like google earth etc.)
6. Location of Network Provider's Point of Presence (PoP)
7. Design of Cables, Ducts routing, digging and trenching
8. Electrical power provisioning
9. **Open Standards -** System should use open standards and protocols to the extent possible without compromising on the security
10. **Convergence** - HDSCL has already initiated many projects which have state of the art infrastructure at field locations deployed under them. The City Surveillance Infrastructure should be made scalable for future convergence needs. Under the smart city program, HDSCL has envisaged to create a state of the art infrastructure and services for the citizens of Hubballi-Dharwad, hence it is imperative that all infrastructure created under the project shall be leveraged for maximum utilization. Hence the LSI is required to ensure that such infrastructure will allow for accommodation of equipment's being procured under other smart city projects. The procedure for utilization of the infrastructure will be mutually agreed between the HDSCL and LSI.
11. Sub-contracting / Outsourcing shall be allowed only for the work which is allowed as mentioned in this clause with prior written approval of HDSCL. However, even if the work is sub-contracted / outsourced, the sole responsibility of the work shall lie with the LSI. The LSI shall be held responsible for any delay/error/non-compliance etc. of its sub-contracted vendor. The details of the sub-contracting agreements (if any) between both the parties would be required to be submitted to HDSCL. Sub-contracting / outsourcing would be allowed only for work such as:

    i. Field Surveys required for the projects in scope
    ii. Passive Networking & Civil Work during implementation,
    iii. FMS staff for non- IT support during post-implementation

2.8.3 Site Clearance obligations & other relevant permissions

Prior to starting the site clearance, the LSI shall carry out survey of field locations for buildings, structures, fences, trees, existing installations, etc. The HDSCL shall be fully informed of the results of the survey and the amount and extent of the demolition and site clearance, if required, shall then be agreed with the HDSCL.

2.8.4 Integrated Command and Control Centre

The LSI has to implement, integrate and operationalize all the smart components at centralized command and control center with an integrated operations and dashboard application that will

integrate various Smart City components implemented in this project. ICCC platform and data center service will be provided by State level MSI.

The Bidder will be required to integrate already implemented services / IT Solutions in the city and also scope to integrate services which are proposed to be implemented by any of the line departments, City Corporation or smart city SPV in near future.

The scope of the project for LSI includes implementation of identified smart ICT solutions including establishment of city ICCC and integrate the implemented solutions with ICCC. LSI Scope also includes conduct a detailed assessment of current state of city services being provided and accordingly plan, design a comprehensive technical architecture of ICCC so that relevant current and future ICT project may be integrated with ICCC. Design and establishment of data center is not in the scope of LSI. Data center services (hosting etc.) and city operation platform will be provided by KUIDFC (through MSI). For various ICT solutions to be implemented, the LSI has to provide edge devices, network connectivity (Sensor to Data Centre) and application software and other required components (except data center part). Compute and storage components of the solution will be provided by KUIDFC. From City ICCC to KMDS data center, connectivity will be provided by KSWAN (10 MBPS). Internet connectivity at City ICCC and KMDS will also be provided by KSWAN with 4 MBPS uplink and 4 MBPS downlink.

As part of scope the LSI is expected to integrate various ICT initiatives of the city with ICCC. These ICT initiatives may be from other departments' services like Water, Electricity, Police, and Transport etc.

The LSI shall have the overall responsibility to design, build, implement, operate, and maintain the project (at city level) for a period of five years.

Following table provides the scope, objective and the high level scope for implementation of City Integrated Command and Control Centre:

Feature	Objective	High Level Scope
City Integrated Command and Control Center (City ICCC)	Key Objectives of the City ICCC: • To serve as a centralized decision making center which supports and strengthens coordination in response to incidents/emergency situations • To serve as central information, communication, incident management hub for HDSCL • To provide integration points for other existing or proposed command	Setting up city ICCC with 150operators control room and operations and Maintenance of the command center for contract duration.

Feature	Objective	High Level Scope

	center from other government agencies e.g. Police, Disaster, etc.
	• To serve as the centralized monitoring & decision making hub for managing equipment, devices, resources and assets
	• City ICCC will enable city administration and its stakeholders in the following:
	  • Effective decision making
	  • Delivering effective governance by aggregating various data feeds from sensors and systems
	  • Providing interface/ dashboards to generate alert & notifications in real time
	  • Quick and effective response to emergency or disaster situation	

The graphic below shows some of the features and projects to be integrated with ICCC. Some of these are already functional and some are the projects envisaged in future. City ICCC platform will be provided by KUIDFC.

The following table captures the scope that has to be delivered through the ICCC solution:

		Function	Relevant CCC Use Cases	Data Feed Frequency	Dataset Required	Visualize	Monitor	Communicate	Coordinate	Control	Report
PHASE 1	1	Solid Waste Management	Show position of Fleet on the city map	Real-time	Real-time/Near real-time location of the Fleet						
			Display type of fleet vehicle	Batch (Quarterly)	Categorized information of various fleet types available in the city						
			Show status of Garbage collection by ward	Real-time	Real-time/Near real-time status of Garbage collection in each ward						
			Receive and Display Surveillance Feed	Real-time	Real-time/Near real-time feed of Surveillance Cameras						
	2	Public Transport (BRTS)	Show position of Buses on the bus route	Batch (Quarterly)	Documentation of Bus Routes						
				Real-time	Real-time/Near real-time location of the Buses						
			Monitor Bus Shelters through Surveillance	Real-time	Real-time video feed from Bus Shelters						
	3	Traffic and Police	Show location of traffic lights	Batch (Quarterly)	Location coordinates of traffic light installations at junctions						
			Show Status of Traffic Lights	Real-time	Real-time/Near real-time status of traffic lights downtime						
	4	Gardens	Identify Location of Parks/Gardens	Batch (Quarterly)	Location coordinates of Parks/Gardens						
			Display amenities at the Parks/Gardens	Batch (Quarterly)	Documented details of amenities available						
	5	Housing & Slums	Display details of the Housings and Slums	Batch (Quarterly)	Documented details of Number of Households in the Housing/Slum						

PHASE 2	6	Electricity / Power	Identify location of Energy Assets	Batch (Quarterly)	Location coordinates of Energy Assets							
			Show the Energy Network on GIS map	Batch (Quarterly)	Location of Energy network (pipelines) across the city							
			Identify status of Energy Assets (Sub-stations, Transmission network etc)	Real-time	Real-time/Near real-time status of energy assets downtime							
			Display heatmap of high energy usage areas	Batch (Daily)	Meter Readings from various Commercial and Residential installations with their location details							
			Forecast Demand	Batch (Daily)	Energy usage across 5 previous years							
	7	Smart Poles	Identify location of Smart Poles	Batch (Quarterly)	Location coordinates of Smart Poles							
			Show Status of Smart Poles - Wifi Hotspots	Real-time	Real-time/Near real-time status of Wifi Hotspots functioning							
			Show Status of Smart Poles - Panic Button/Emergency Call Box	Real-time	Real-time/Near real-time status of Panic Button/Emergency Call Box functioning							
			Show Status of Smart Poles - Public Address System	Real-time	Real-time/Near real-time status of PAS functioning							
			Show Status of Smart Poles - Environmental sensors	Real-time	Real-time/Near real-time status of Environmental Sensors functioning							
			Show Status of Smart Poles - Smart Billboards	Real-time	Real-time/Near real-time status of Smart Billboards functioning							
			Show Status of Smart Poles - Surveillance	Real-time	Real-time/Near real-time status of Surveillance Cameras functioning							

			Show Status of Smart Poles - LED Lights	Real-time	Real-time/Near real-time status of LED Lights functioning							
			Show Status of Smart Poles - Solar Panel	Real-time	Real-time/Near real-time status of Solar Panel functioning							
			Receive and Display Surveillance Feed	Real-time	Real-time/Near real-time feed of Surveillance Cameras							
			Receive and Display Environmental Sensor Feed	Real-time	Real-time/Near real-time feed of Environmental Sensors							
			Broadcast message on PAS	Real-time	Message to be broadcast on PAS							
			Play music on PAS	Real-time	Music tracks to be played on PAS							
			Receive and Send messages through Panic Button/Emergency Call Box	Real-time	NA							
	8	Smart Parking	Identify location and number of Parking Slots	Batch (Quarterly)	Location coordinates and Information of Parking facilities							
			Show availabiltiy status of Parking Slots	Real-time	Real-time/Near real-time status of Parking Occupancy (2-wheeler and 4-wheeler)							
			Show Revenue Collections by each Parking Facility	Real-time	Real-time/Near real-time status of Parking Fee Collections (2-wheeler and 4-wheeler)							
	9	Street Lights	Identify location of Street Lights	Batch (Quarterly)	Location coordinates of Street Lights							
			Control Street Lights status	Real-time	Real-time/Near real-time status of street lights functioning							
			Show Status of Street Lights	Real-time	Real-time/Near real-time status of street lights functioning							

	10	Property Taxes (HDMC-Revenue)	Show the Properties on GIS map	Batch (Quarterly)	Location geo-fenced coordinates of Properties							
			Display heatmap of tax collections by each ward	Batch (Weekly)	Tax collections data by each ward							
	11	E-Governance	Show Population by each ward	Batch (One time upload)	Base Population data based on latest census							
				Batch (Monthly)	Birth and Death data at a regular frequency							
			Show location of HD One centres	Batch (Quarterly)	Location coordinates of HD Once centres							
			Transmit information to citizens through PEP-OSS	Real-time	Data/Information that has to be broadcast to citizens							
			Show status of Grievances by Ward	Batch (Daily)	Details of Grievances received at HDMC							
			Show location of Public Advertisement Boards	Batch (Quarterly)	Location coordinates of Public Advertisements							
			Show Public Advertisements availability status	Batch (Daily)	Booking status of Public Advertisements							
			Display heatmap of advertisement tax collections by each ward	Batch (Weekly)	Tax collections data by each ward							
			Show location of Public Works	Batch (Daily)	Location coordinates of Public Works being executed							
	12	Disaster Management	Identify Disaster Impact Area on map	Real-time	Coordinates to Geofence the Disaster Zone							
			Respond to Disaster Situation	Real-time	Documented Standard Operating Procedures							
	13	Emergency Management	Identify Location of Fire Hydrants	Batch (Quarterly)	Location coordinates of Fire Hydrants							

			Show position of Fleet on the city map	Real-time	Real-time/Near real-time location of the Fleet							
			Display type of fleet vehicle	Batch (Quarterly)	Categorized information of various fleet types available in the city							
			Respond to Emergency Situation	Real-time	Documented Standard Operating Procedures							
	14	Water	Identify location of Water Assets	Batch (Quarterly)	Location coordinates of Water Assets							
			Show the Water Network on GIS map	Batch (Quarterly)	Location of water network (pipelines) across the city							
			Identify status of Water Assets (Overhead Tanks, Pumps etc)	Real-time	Real-time/Near real-time status of Water assets downtime							
			Display heatmap of high water usage areas	Batch (Daily)	Meter Readings from various Commercial and Residential installations with their location details							
			Identification of Non-Revenue water	Batch (Quarterly)	Water inflow details across the water network							

All the hardware and software scopes related to ICCC will be the responsibility of the bidder.

3. Layered View of ICT Solutions

3.1 Level 1: Integrate and View

Certain components will be integrated using direct feeds, dashboards and sharing of alerts/ actionable inputs for integrate and view operations, such as:

1. City Surveillance System (Police and Traffic)
2. Smart Governance
3. People Empowerment Platform
4. Disaster and Emergency Management
5. Intelligent Transport Management System
6. Electric SCADA
7. Water SCADA

3.2 Level 2: Integrate Command and Control

1. SMART Parking & Payment System
2. Smart Poles
3. CCMS for LED Street Lights
4. GIS Based Property Management System
5. Sewerage and Storm Water Drainage System

3.3 Level 3: Implement, Command, Control and Fully Operate

1. Integrated Command and Control Center (ICCC)
2. Smart IT Solid Waste Management
3. Geographical Information System (GIS)

4. Detailed Scope of Work

Level 1: Integrate and View

4.1 City Surveillance System

The city of Hubballi-Dharwad has been under video surveillance through cameras deployed across the city by the Police and Traffic departments. While some of these cameras are not functioning, the remaining cameras provide a potential for the live video to be shared with ICCC for monitoring functions of other departments too (Black spot monitoring, Event Management, Green Corridor management etc.). In addition to these existing cameras, new set of cameras are being deployed at various spots at the city to monitor SWM waste disposal lifecycle. Further, additional cameras are being deployed as part of the Smart Poles project. In essence, all these cameras have to be integrated with the existing VMS at the Police and Traffic data centre. All this will be monitored closely to identify incidents (pre-incident and post-incident).

At present there are two CCTV control centers in Hubballi-Dharwad city. One is for traffic management which is managed by traffic police and another is to control law and order. ICCC has to be integrated with both of these control centers for live viewing of the feed through ICCC.

Traffic: To manage the traffic, 45 CCTV cameras are installed at various traffic junctions in the city. They are connected through RF to control room. Control room is on the third floor of office of the Assistant Commissioner. The overall system is installed by Trinity Software Solution.

Law and Order: Another control room is in the office of Commissioner of Police. Under this project CCTV cameras are installed on towers. There are 22 towers installed at important place of the city. Each tower has 4 cameras hence there are total 88 cameras connected to control room. Here too, the cameras are connected to control room through RF. Camera make is HIKVISION.

It is envisaged to integrate both the control centers with ICCC so that operator at ICCC can watch live feed of any camera sitting in the city ICCC. Video may also be stored at city ICCC or City Operation Center as per the user's requirement. Following are some of the use cases for integration:

Department / Function	Relevant ICCC Use Cases	Data Feed Frequency	Dataset Required
Traffic and Police	Show location of traffic lights	Batch (Quarterly)	Location coordinates of traffic light installations at junctions

	Show Status of Traffic Lights	Real-time	Real-time/Near real-time video feed of traffic junctions

4.2 Smart Governance

An initiative to move towards digital operations is underway at HDMC. The systems being implemented through this e-Governance initiative need to be integrated with the ICCC to generate insights. In most cases, correlating the e-Governance datasets with GIS map provides insightful intelligence that can be used to optimize municipal operations at HDMC. The key objective of this project is to implement multiple e-government solutions to automate the functioning of HDMC and its departments. Following are the e-governance solutions that need to be covered are:

a. Paperless office at HDMC

b. Smart Property Taxes Management System

c. People empowerment Platform/One Stop Mobile App & Web based solution

d. Smart Public Works Management System

e. Smart Public Advertisement Management System.

All above solutions have to be integrated with ICCC for report and monitoring purpose so that Dashboard can be seen and & Reports are generated at Integrated Command & Control Centre. ICCC will be required to integrate with the backend system of all these 4 initiatives to monitor the performance of the application.

Along with this ICCC should be able to show the utilization by citizens of various services being delivered by these E-Governance modules in the form of a Dashboard.

All the information received from the application will also go into the Analytical layer which will help in decision making for city authorities, better planning and running of operations.

Department / Function	Relevant ICCC Use Cases	Data Feed Frequency	Dataset Required
E-Governance	Show Population by each ward	Batch (One time upload)	Base Population data based on latest census
	Show the details of birth & death registered	Batch (Monthly)	Birth and Death data at a regular frequency
	Show location of HD One centres	Batch (Quarterly)	Location coordinates of HD One centres
	Transmit information to citizens through PEP-OSS	Real-time	Data/Information that has to be broadcast to citizens
	Show status of Grievances by Ward	Batch (Daily)	Details of Grievances received at HDMC

	Show location of Public Advertisement Boards	Batch (Quarterly)	Location coordinates of Public Advertisements
	Show Public Advertisements availability status	Batch (Daily)	Booking status of Public Advertisements
	Display heat map of advertisement tax collections by each ward	Batch (Weekly)	Tax collections data by each ward
	Show location of Public Works	Batch (Daily)	Location coordinates of Public Works being executed

4.3Emergency and Disaster Management

The city's Emergency and Disaster Management function could gain heavily from the surveillance feeds available at ICCC through cameras installed across the city while responding to critical incidents. Such live feed from the incident site can be used to guide the Field Operations team on the relevant actions that can be taken to recover the situation.

Apart from Fire emergency the department also responds to all type of emergencies whenever required by other departments. Departments runs awareness campaign to take precautionary measures to avoid any kind of fire emergency. Currently response to distress calls is manual. Assessment of equipment and man power required is carried out only after physical inspection of accident site.

GPS tracking of vehicles (Fire Engines) is planned. The project is being implemented at state level. It is expected that GPS will be installed and monitoring will start in Hubballi-Dharwad district in next 6 months.

Daily roll call to check water level of fire tender is done manually. There is no system to monitor live water levels of fire tenders. There is no linkage between estimating water requirement and intensity of accident. There are three fire stations in Hubballi-Dharwad district. Following are the details of assets fire department owns in the Hubballi-Dharwad City.

Assets Type	Hubballi	Dharwad	Amaragol
Fire Engines (fire tender)- with 4500 litre capacity (fire tender)	2	2	2
Varuna Vehicle (Small one)	1	0	-
Two Wheelers (MIST Technology	1	1	-
Advance Rescue Van	-	0	1
Water Tank of 16000 Litre	-	0	1
Sky Lift/ Ladder	-	0	1

Scope of work for LSI includes the integration of vehicle GPS monitoring with the ICCC. It is also envisaged that two operators will be sitting in the ICCC to respond to emergencies in the city. By this, department will be able to respond to the needs in emergency in quickly and efficiently. For example the intensity of fire can be seen through nearest CCTV camera and accordingly vehicle, manpower or any other resources can be planned to respond to the particular situation.

Department / Function	Relevant ICCC Use Cases	Data Feed Frequency	Dataset Required
Emergency and Disaster Management	Identify Disaster Impact Area on map	Real-time	Coordinates to Geofence the Disaster Zone
	Respond to Disaster Situation	Real-time	Documented Standard Operating Procedures
	Identify Location of Fire Hydrants	Batch (Quarterly)	Location coordinates of Fire Hydrants
	Show position of Fleet on the city map	Real-time	Real-time/Near real-time location of the Fleet
	Display type of fleet vehicle	Batch (Quarterly)	Categorized information of various fleet types available in the city
	Respond to Emergency Situation	Real-time	Documented Standard Operating Procedures

4.4Intelligent Transport Management System

Overall ITMS system of Hubballi-Dharwad city can be divided into two parts:

1. Hubballi-Dharwad is currently implementing BRTS (Bus Rapid Transport System) and is expected to be operational by early 2018. The BRTS initiative involves the deployment of ITMS solution to monitor the operations at the BRTS Control Centre. The MSI should be able to integrate with the proposed ITMS solution and deliver the capability of representing the buses on the GIS map, showing their location in real-time.

2. Hubballi-Dharwad City wide ITMS solution: This is a city wide initiative that will be implemented by North-Western Karnataka Road Transport Corporation for city buses in Hubballi-Dharwad in the coming 6 months. The city buses will be fitted with GPS sensors and can be tracked in real-time. LSI and MSI (State Vendor) should be able to integrate the solution implemented in the city. Primarily integrating means the capability of representing the buses on GIS map, showing their location on GIS map in real time and creating real time/ non real time reports/ Dashboard at ICCC.

   In addition to the above, there will be a provision to monitor the bus shelters through video surveillance installed. While BRTS stations will be deploying cameras as part of

the ongoing BRTS project, there will be new cameras installed through the Smart Poles initiative at City Bus stops.

Department / Function	Relevant ICCC Use Cases	Data Feed Frequency	Dataset Required
Intelligent Transport Management System (ITMS)	Show position of Buses on the bus route	Batch (Quarterly)	Documentation of Bus Routes
		Real-time	Real-time/Near real-time location of the Buses
	Monitor Bus Shelters through Surveillance	Real-time	Real-time video feed from Bus Shelters

4.5Smart Energy / Power

SCADA stands for Supervisory Control and Data Acquisition system. SCADA is a system of software and hardware elements, allows organizations to:

- Control processes locally or remotely
- Monitor, gather and process real time data
- Directly interact with edge devices like sensors and through Human Machine Interface (Software)
- It also records events as log file

Key applications of SCADA systems in city context are in Water and Power supply. Power system deals with power generation, transmission and distribution sectors, monitoring becomes the main aspects. SCADA also helps in better planning of power supply, demand and optimum utilization of power system resources.

In Hubballi-Dharwad, there is no SCADA implemented in the city power supply network currently. SCADA is implemented only at substation level by KPTCL. All the other systems are under Restructured Accelerated Power Development and Reforms (RAPDRP) project similar to other states including billing software.

Asset mapping is done on GIS MAP (Arc GIS). All Active components are mapped in GIS. There are 30, 000 transformers and 2, 40, 000 connections. Following are the initiative taken up by the department:

1. For implementation of smart meters tender is called by the Head Officer for Smart meter implementation for 3 cities- Hubballi, Dharwad and Belagavi.
2. There is one helpdesk for citizen (1912) which is being operated manually.

3. At city level one more new project is envisaged whereas city is divided into 12 zones and each zone will have one Maruti Van to address the complaint. GPS will be installed and vehicle monitoring will be done at city level to measure turnaround time for one complaint. Internally mapping of consumers of 12 areas is done with 12 vans. There will be no central station for vans. The vans will stay at the grievance site only after rectification.

LSI and MSI (State Vendor) are expected to integrate above mentioned current solutions and also the upcoming SCADA system in the city.

Functional Specifications: It is envisaged that whenever the power SCADA system is implemented in the department, the whole of the power supply network can be seen on the GIS map at ICCC.

1. Using data of SCADA system heat map can be seen and future demand forecast can be done.
2. By creating database of assets of the department assets can be located on GIS MAP in real time which may help in better operations of department.
3. ICCC should be a single point grievance cell for all types of complaint of the citizen.
4. ICCC should be a single window for all types of utilities application for citizen.

HESCOM would be using SCADA system to oversee the performance of its energy network in the future. This energy network and important energy assets need to be represented on the GIS map on the ICCC solution. Further, integration with SCADA system should give the operators at ICCC the capability to monitor the energy network operations in real-time and also periodically generate heat maps and dashboards to identify high energy use patterns.

Department / Function	Relevant ICCC Use Cases	Data Feed Frequency	Dataset Required
Smart Energy	Identify location of Energy Assets	Batch (Quarterly)	Location coordinates of Energy Assets
	Show the Energy Network on GIS map	Batch (Quarterly)	Location of Energy network (pipelines) across the city
	Identify status of Energy Assets (Sub-stations, Transmission network etc)	Real-time	Real-time/Near real-time status of energy assets downtime
	Display heatmap of high energy usage areas	Batch (Daily)	Meter Readings from various Commercial and Residential installations with their location details
	Forecast Demand	Batch (Daily)	Energy usage across 5 previous years

4.6Smart Water

Hubballi-Dharwad has a 2000 km of pipeline network and approximately 1.5 Lakh connections. As part of 24x7 water supply project, the city plans to implement 600-700 kilometers network of 24x7 water supply with 40,000 connections. There is no SCADA system implemented in Hubballi-Dharwad as of now and this will also be implemented through the 24x7 project. While bulk water meters and water quality sensors will also be deployed through the 24x7 project, the Quality control of water at treatment plant is monitored online . With regard to billing, two separate billing softwares are used for Hubballi and Dharwad.

The 24x7 project is of 12 years with 4 years for execution time and 8 years of operation and monitoring.

It is envisaged that whenever the water SCADA system is implemented in the department, the whole of the water supply network can be seen on the GIS map at ICCC. This integration will be the responsibility of state-level SI (for ICCC) and the city-level SI will facilitate and coordinate the same.

Department / Function	Relevant ICCC Use Cases	Data Feed Frequency	Dataset Required
Smart Water	Identify location of Water Assets	Batch (Quarterly)	Location coordinates of Water Assets
	Show the Water Network on GIS map	Batch (Quarterly)	Location of water network (pipelines) across the city
	Identify status of Water Assets (Overhead Tanks, Pumps etc)	Real-time	Real-time/Near real-time status of Water assets downtime
	Display heatmap of high water usage areas	Batch (Daily)	Meter Readings from various Commercial and Residential installations with their location details
	Identification of Non-Revenue water	Batch (Quarterly)	Water inflow details across the water network

Level 2: Integrate Command and Control

4.7Smart Parking & Payment System

Different type of ICT interventions (CCTV cameras, sensors, handheld fee collection machines etc.) will be installed on individual parking slot to uniquely identify the occupancy of these parking slots. Data of each parking location will come to the ICCC from the Smart Parking application. HDMC/public can monitor the real-time data of occupancy of parking slots. Detailed requirements which are to be integrated for smart parking are listed below.

a. Consolidating all city parking information onto a single operations platform.

b. ICCC will be required to receive feeds on the status of parking across the city which are managed under the smart parking project (feeds received from all the edge devices of the parking solution). These feeds will provide information of available, non-available parking slots, functional and non-functional parking slots. ICCC will be required to receive video feeds at city ICCC from the parking areas on real-time basis as per requirement. These video feeds will help monitor assets of HDMC. All the information received is to be plotted on the GIS map. ICCC should be able to trigger the commands/alerts (if required) to the respective parking solution.

c. The Parking availability status, at all times, should be available through the PEP-OSS mobile app for citizens. This should be driven by an integration between ICCC and PEP-OSS.

d. Should provide parking availability, revenue collection information on dashboard received from various sources on real time basis.

e. The platform should be able to gather data feed from the Smart Parking solution irrespective of the make, model, and communication protocols that the field devices operate upon.

Department / Function	Relevant ICCC Use Cases	Data Feed Frequency	Dataset Required
Smart Parking and Payment	Identify location and number of Parking Slots	Batch (Quarterly)	Location coordinates and Information of Parking facilities
	Show availabiltiy status of Parking Slots	Real-time	Real-time/Near real-time status of Parking Occupancy (2-wheeler and 4-wheeler)
	Show Revenue Collections by each Parking Facility	Real-time	Real-time/Near real-time status of Parking Fee Collections (2-wheeler and 4-wheeler)

4.8 Smart Poles

The basic premise of carpeting an area with high speed telecom service in urban centres is that it is more economical to the community to provide the service as a utility rather than to have individual households and businesses pay private firms for such a service. Such networks are capable of enhancing city management and public safety, especially when used directly by city employees in the field. They can also be a social service to those who cannot afford private high-speed services. When the network service is free and a small number of clients consume a majority of the available capacity, operating and regulating the network might prove difficult. HDMC intends to provide a cost effective and easy access to internet through multiple devices for all residents and commuters.

Intelligent pole popularly known as Smart pole combines the capabilities of telecom connectivity and LED lighting in a city, These poles are much refined and advance version of conventional Corporation Street Light pole, Apart from having the basic luminaire (LED Light) it has various other Smart components integrated essential for better civic management & providing better telecom communication channels. Leveraging on the telecom capability there are various other Smart components /Features can be integrated to Smart pole.

Major Components Envisaged to be integrated with Smart Pole can be categories as below

1) LED lights
2) CCTV Surveillance Cameras
3) Wi-Fi Access Points
4) Environmental Sensors
5) SMART Bill Boards
6) Public Address System
7) Panic Button/Emergency Call Box

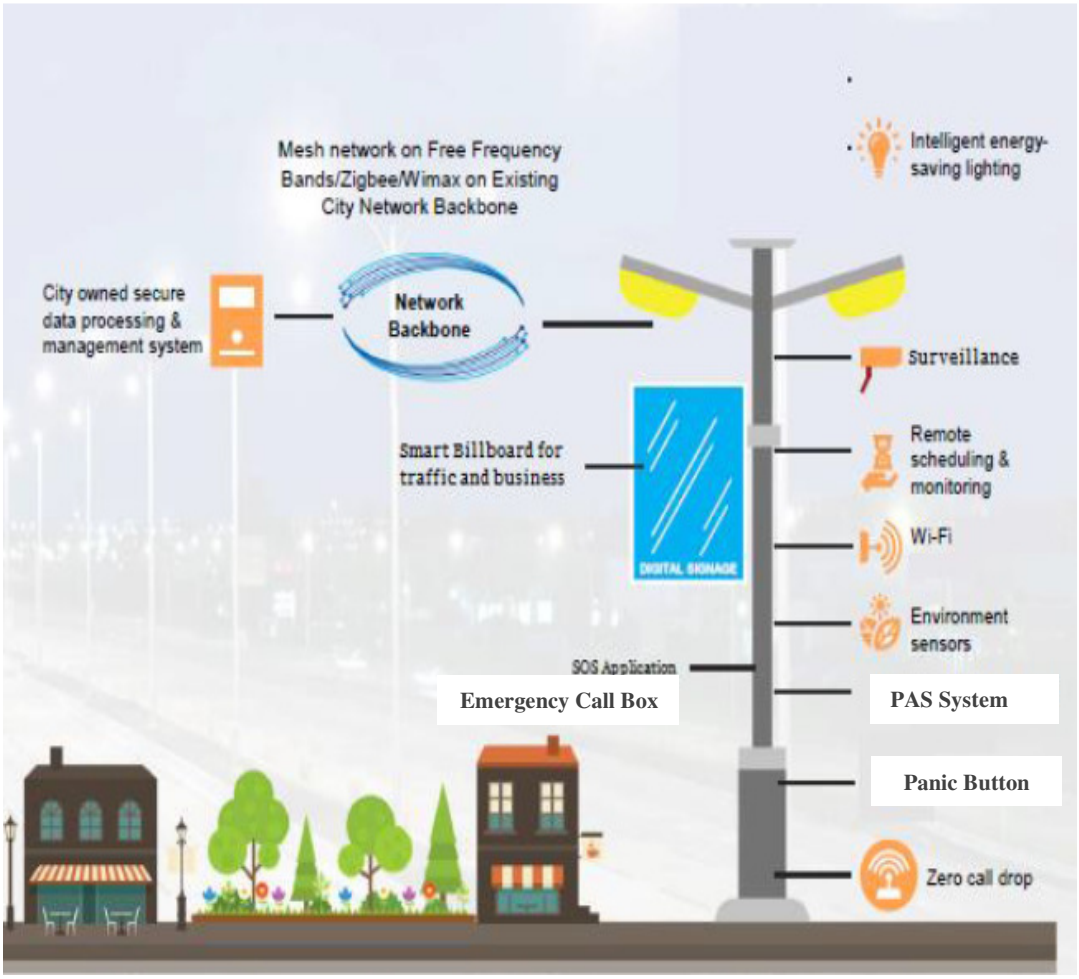


Figure 3 Component Diagram

The scope of work for the selected MSI will include Integration of the various components with ICCC.

1) **Smart Pole Location on GIS Map**: System should be able to show the Smart poles on a GIS Map with clear demarcation of Functional component installed.

2) **Wi-Fi Hotspots**: MSI to integrate the ICCC with City Wi-Fi system through the Smart Pole Control Solution and should be able to show the active/inactive Wi-Fi hotspot, with a further drill down with below mentioned details (these details are not limited, MSI may add further drill down)

    - Access Point Availability
    - Number of users connected
    - Data Upload/Download
    - Incident reporting for any Network Breach
    - Average speed per access point and total for per hotspot
    - Average speed per user per access point and total for per hotspot

- Number of paid users active

(These information should be available to fetch reports for the Day/Month/Year)

3) **Panic Button/Emergency Call Box** – ICCC to integrate with City Panic Button interfaces through the Smart Pole Control Solution and should be able to generate alarm and trigger ticket to concern authority for subsequent action. Also two way communication from Emergency call box to be established over IP phone to ICCC.
4) **Public Address System** – Public address system shall be use to meet the below mentioned requirements of the city
    - Important Announcement from command and control center
    - Play music through PAS system with support from multiple input device, with music player, streamer and announcement.
5) **Environmental sensors** – Data feed from various Environmental sensors through the Smart Pole Control Solution should be available at the ICCC. The key inputs from sensors like Temperature, Humidity, CO, CO2, NO2, SO2, PM10, and PM2.5 are monitored. Further, awareness within the city increased based on dynamic inputs received from sensors and display output to various interfaces including city application, multi-services ,Integration with GIS map
6) **Smart Billboards** – Integration with SMART Bill boards through the Smart Pole Control Solution provides the capability to provide feed to individual SMART Bill boards from command and control center. This feed can be video or still images. System should support various formats of media for individual or group level bill boards.
7) **Surveillance Cameras –** Integration of ICCC with Video Management Solution should help monitor live feeds from cameras deployed across the city. MSI to deploy the adequate storage to store the camera feed 30 days of storage for all camera feeds.
8) **LED Lights** – MSI to integrate with existing CCMS of LED lights. It should allow to monitor and control from central ICCC.

Department / Function	Relevant ICCC Use Cases	Data Feed Frequency	Dataset Required
Smart Poles	Identify location of Smart Poles	Batch (Quarterly)	Location coordinates of Smart Poles
	Show Status of Smart Poles - Wifi Hotspots	Real-time	Real-time/Near real-time status of Wifi Hotspots functioning
	Show Status of Smart Poles - Panic Button/Emergency Call Box	Real-time	Real-time/Near real-time status of Panic Button/Emergency Call Box functioning

	Show Status of Smart Poles - Public Address System	Real-time	Real-time/Near real-time status of PAS functioning
	Show Status of Smart Poles - Environmental sensors	Real-time	Real-time/Near real-time status of Environmental Sensors functioning
	Show Status of Smart Poles - Smart Billboards	Real-time	Real-time/Near real-time status of Smart Billboards functioning
	Show Status of Smart Poles - Surveillance	Real-time	Real-time/Near real-time status of Surveillance Cameras functioning
	Show Status of Smart Poles - LED Lights	Real-time	Real-time/Near real-time status of LED Lights functioning
	Show Status of Smart Poles - Solar Panel	Real-time	Real-time/Near real-time status of Solar Panel functioning
	Receive and Display Surveillance Feed	Real-time	Real-time/Near real-time feed of Surveillance Cameras
	Receive and Display Environmental Sensor Feed	Real-time	Real-time/Near real-time feed of Environmental Sensors
	Broadcast message on PAS	Real-time	Message to be broadcast on PAS
	Play music on PAS	Real-time	Music tracks to be played on PAS
	Receive and Send messages through Panic Button/Emergency Call Box	Real-time	NA

4.9 CCMS for LED Street Lights

The city is implementing LED street lights across the city and this will be controlled and monitored through the Central Control and Monitoring System (CCMS) that will be implemented as part of the initiative. This application will be integrated with ICCC to enable central monitoring of the LED street light infrastructure. The CCMS application will be used to monitor the status of 54131 lights across the city. The data feed from filed sensors will be arriving at the CCMS and an integration between the CCMS database and the ICCC application will be established to represent the live-status on the Common Operating Picture at ICCC.

The integration with CCMS should help realize the following functional use-cases for driving efficiency in operations.

- The format of the data packet (JSON/XML) that will be shared by the CCMS application needs to be consistent with the data model within ICCC database.

- Detail the API that should be available from the CCMS application that integrates with the ICCC application in order to share the data in the prescribed format at the prescribed frequency.
- Test the integration between the applications and ensure frequency of update is configured for optimum operational efficiencies
- Document the schedule of planned application downtimes (for CCMS) that could impact the operations at ICCC.

Department / Function	Functional Use Cases	Data Feed Frequency	Dataset Required
Street Lights	Identify location of Street Lights	Batch (Quarterly)	Location coordinates of Street Lights
	Control Street Lights status	Real-time	Real-time/Near real-time status of street lights functioning
	Show Status of Street Lights	Real-time	Real-time/Near real-time status of street lights functioning

4.10GIS Based Property Management System

GIS based property system will be installed in the city as part of a central initiative. Timelines and data are currently unavailable.

Note: The LSI will be responsible for creating the data layers from the data that comes from GIS survey. The LSI and MSI (State Vendor) will be responsible for successful integration of GIS based property Management System with City operational Platform.

Department/ Function	Functional Use Cases	Data Feed Frequency	Dataset Required
Property Taxes (HDMC-Revenue)	Show the Properties on GIS map	Batch (Quarterly)	Location geo-fenced coordinates of Properties
	Display heat map of tax collections by each ward	Batch (Weekly)	Tax collections data by each ward

4.11 Any Other Sensor

The city will go for further field devices in the near, medium and long-term future. These should be brought on the ICCC platform to enhance the city services. For example, an integration could be sought in the future with cameras in Private and Public institutions. This should be possible at ICCC provided the cameras are ONVIF compliant. The solution has to be built on an Open Design so that such needs of the city can be accommodated.

Level 3: Implement, Command, Control and Fully Operate

4.12 Integrated Command and Control Center (ICCC)

4.12.1 Overview

The Bidder has to implement, integrate and operationalize all the smart components at centralized command and control center with an integrated operations and dashboard application that will integrate various Smart City components implemented in this project. City operation platform and data center services will be provided by MSI. Following are the key components of Integrated Command and Control Center:

1. ICCC application or city operation platform
2. IOT Platform
3. ICT Solutions of city (Sensor Layer)

ICCC platform receives data feeds from various IoT devices and these IoT devices will be the part of some of the ICT solution implemented in the city. For example, these IoT devices may be light sensors of Smart Light solution, sensor of bins under solid waste management, Wi-Fi Access points, Environmental Sensors of Smart pole solution.

From an implementation perspective ICCC design will be of centralized architecture. There will be single common IoT platform, city operation platform and Data center for all the Smart cities in the state of Karnataka. Implementation of ICCC will be at two levels:

- Common Data Center for Karnataka Smart Cities hosted at KMDS
    - Common Data Center to host Common Digital Platform managing sensors and controllers for all current and future cities, to connect with State Smart City Data Center (KMDS) through State KSWAN Network
    - Separate instances of Smart City Digital Platform for each City at data center
    - Common Disaster Recovery Center for Karnataka State Smart Cities
- Each city to have its
    - City Operation Room
    - Video Surveillance Infrastructure Connected to servers at city control room
    - Visualization Layer Management Components

Following are the key features of this design:

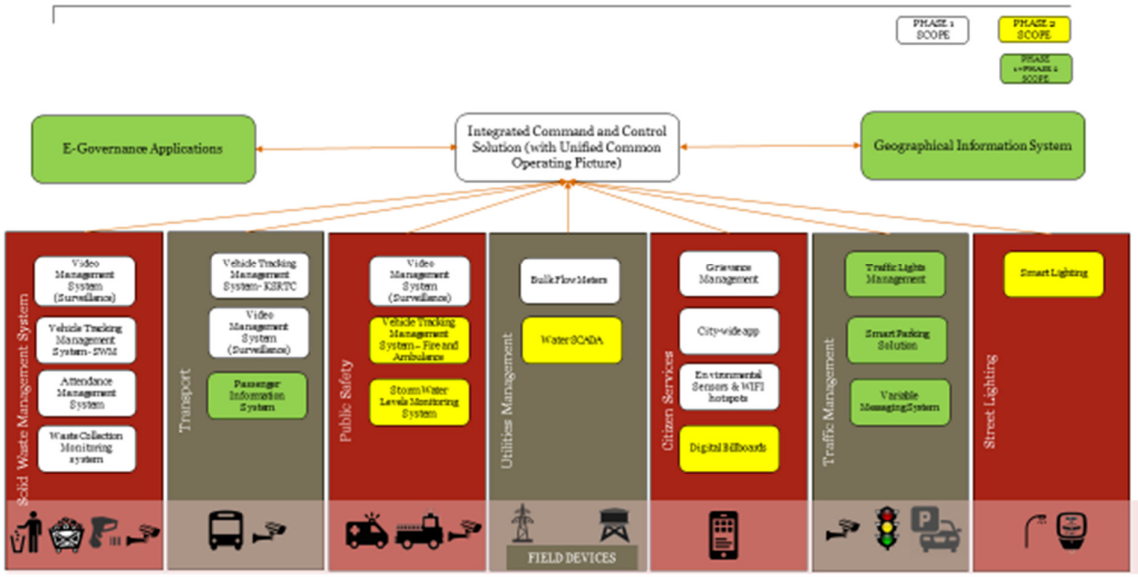
- Common repository of data, to leverage the benefit of consolidation of ICT infrastructure

- The Disaster Recovery Center shall be taken up on cloud based technology and MeitY guidelines may be followed for the same, along with Business Continuity Plan (BCP) in place
- Cities may have a local Command Center and an optimal server room setup to meet any specific localized requirements of storing/hosting data (video)
- The common facility shall work on a "Hub and Spoke" architecture, connected with all Smart City ICT assets, infrastructure and applications
- State level Common GIS and Analytics Layer may be created in the future.

The Bidder has to implement, integrate and operationalize all the smart components at centralized command and control center with an integrated operations and dashboard application that will integrate various Smart City components implemented in this project. City operation platform and data center services will be provided by KUIDFC through MSI.

The Bidder will be required to integrate already implemented services in the city and also scope to integrate services which are proposed to be implemented by any of the line departments, City Corporation or smart city SPV in near future.

Following figure shows the operational model envisaged for ICCC:



4.12.2 IT Infrastructure at ICCC

1. It is proposed that the KUIDFC will provide the IT hardware infrastructure at the DC (KMDS) for successful operations of the systems. The DC will be hosted at KMDC. The ICCC has been envisaged to be established in an approximate area of 10000 Square

Feet at upcoming Iconic Building, Hubballi-Dharwad. LSI has to ensure that redundancy is provided for all the key components to ensure that no single point of failure affects the performance of the overall system. It will be LSI's responsibility to supply, Install and Commission of IT Infrastructure including site preparation in ICCC. A secured data center environment will be provided to the LSI at the KMDS through KUIDFC (MSI).

2. The LSI should also provision for IT Infrastructureat city operation center to store video feeds from Surveillance Cameras that will be deployed across Hubballi-Dharwad with a retention period of 7 days. City operation center will be established in Hubballi Dharward at suitable space identified by HDSCL. The LSI shall provide system integration services to customize and integrate the applications procured through the project. The system applications proposed by the LSI should have open APIs and should be able to integrate and share the data with other third party systems already available or coming up in the near future.

3. The bill of material proposed by the successful LSI will be approved by HDSCL for its supply and installation.

4. The LSI shall be required to submit a detailed installation report post installation of all the equipment/system software at approved locations for different environments as required in the SDLC cycle. The report shall be utilized during the acceptance testing period of the project to verify the actual quantity of the equipment supplied and commissioned under the project.

4.12.3 Responsibility Matrix

#	Key Activities	Successful Bidder	HDMC	HDSCL	Network Vendors	Electricity Providers	Other Utilities	Other Departments	PMC	Existing ICT Vendors at
	Project Inception Phase									
1	Project Kick Off	R/A	C	C	I	I	I	I	C	I
2	Deployment of manpower	R/A	C	C	I	I	I	I	C	I
Requirement Phase										
3	Assess the requirement of IT Infrastructure and Non IT Infrastructure	R/A	C	C	C	C	C	C	C	C

#	Key Activities	Successful Bidder	HDMC	HDSCL	Network Vendors	Electricity Providers	Other Utilities	Other Departments	PMC	Existing ICT Vendors at
4	Assessment of Business processes	R/A	C	C	I	I	I	C	C	I
5	Assessment of requirement of Software requirements	R/A	C	C	I	I	I	C	C	I
6	Assess the Integration requirement	R/A	C	C	C	C	I	C	C	C
7	Assess the connectivity requirement all locations (including Building)	R/A	C	C	C	I	I	C	C	I
8	Assessment the Network laying requirement	C	C	C	R / A	I	I	C	C	I
9	Assessment of training requirement	R/A	C	C	I	I	I	C	C	I
Design Phase										
10	Formulation of Solution Architecture	R/A	C	C	C	I	I	C	C	I
11	Creation of Detail Drawing	R/A	C	C	C	I	I	C	C	I
12	Detailed Design of Smart City Solutions	R/A	C	C	C	I	I	C	C	I
13	Development of test cases (Unit, System Integration and User Acceptance)	R/A	C	C	C	I	I	C	C	I
14	Preparation of final bill of quantity and material	R/A	C	C	C	C	I	C	C	I

#	Key Activities	Successful Bidder	HDMC	HDSCL	Network Vendors	Electricity Providers	Other Utilities	Other Departments	PMC	Existing ICT Vendors at
15	CONOPS + SoP preparation	R/A	C	C	C	C	C	C	C	I
Development Phase										
16	Physical Infrastructure setup	R/A	C	C	I	I	I	I	C	I
17	Procurement of Equipment , edge devices, COTS software (if any), Licenses	R/A	C	C	I	I	I	I	C	I
18	IT and Non IT Infrastructure Installation	R/A	C	C	I	I	I	I	C	I
19	Development, Testing and Production environment setup	R/A	C	C	I	I	I	I	C	I
20	Software Application customization (if any)	R/A	C	C	I	I	I	I	C	I
21	Development of Bespoke Solution (if any)	R/A	C	C	I	I	I	I	C	I
22	Data Migration	R/A	C	C	I	I	I	I	C	I
23	Integration with Third party services/application (if any)	R/A	C	C	I	I	I	I	C	I
24	Unit and User Acceptance Testing	R/A	C	C	I	I	I	I	C	I
25	Implementation of Solutions	R/A	C	C	I	I	I	I	C	I
26	Preparation of User Manuals , training	R/A	C	C	I	I	I	I	C	I

#	Key Activities	Successful Bidder	HDMC	HDSCL	Network Vendors	Electricity Providers	Other Utilities	Other Departments	PMC	Existing ICT Vendors at
	curriculum and training materials									
27	Role based training(s) on the Smart City Solutions	R/A	C	C	I	I	I	I	C	I
Integration Phase										
28	SoP implementation	R/A	C	C	C	C	C	C	C	I
29	Integration with GIS	R/A	C	C	C	C	C	C	C	I
30	Integration of solutions with Command and Control Centre	R/A	C	C	C	C	C	C	C	I
Go –Live										
31	Go Live	R/A	C	C	I	I	I	I	C	I
Operation and Maintenance										
32	Operation and Maintenance of IT, Non IT infrastructure and Applications	R/A	C	C	I	I	I	I	C	I
33	SLA and Performance Monitoring	R/A	C	C	I	I	I	I	C	I
34	Logging, tracking and resolution of issues.	R/A	C	C	I	I	I	I	C	I
35	Application enhancement	R/A	C	C	I	I	I	I	C	I
36	Patch & Version Updates	R/A	C	C	I	I	I	I	C	I
37	Helpdesk services (L2 and L3 support)	R/A	C	C	I	I	I	I	C	I

Note: All decisions will be taken by HDSCL which will be abided by all the stakeholders in the above matrix.

R/A = Responsible/Accountable

C = Consulted

I = Informed

4.12.4 Scope of Work of LSI/MSI

The roles & responsibilities of the LSI & MSI are defined in section 2.6 of this RFP.

Integration: Integration of various ICT solutions with ICCC/ City operation platform will be the joint responsibility of both the vendors (LSI and MSI):

Data Center, IoT Platform and city operation platform provider (State Level): State level MSI has to ensure that the data transmitted from sensors is seamlessly received and processed at IoT platform and available for visualization at city operation platform. State vendor has to apply business logic as per the functional requirement (Use cases) of the user.

ICT Solution Provider (City Level): City level LSI has to ensure that the all the IOT devices and system application hosted at data center work as per the SLAs. Data required for IoT platform and city operation platform has to be sent in the most flexible manner as per the requirement of state vendor. If required, an interface needs to be developed for data transmission to IOT platform/city operation platform in the required format.

4.12.5 Project Timelines

T1-Date of Signing the Contract

A. Activity		Individual phases of the activities	Timeline
		Phase-I (270 Days)	
1	Resource Mobilization	• Resource Mobilization	T1+15 Days
2	Implementation of ICT Solid Waste Management Application, and Fire emergency management (GPS installation for fire vehicle tracking)	• Inception Report • SOPs and Use-Cases for integration of individual ICT application with Common Command and Control Application	T1+30 Days
		Procurement of the hardware & software infrastructure required for : • Implementation of Solution Components • Set-up of Command and Control Centre	T1+45 days
		FRS, SRS for implementation and integration of individual ICT application with Common Command and Control Application	T1+60 Days
		*Data Centre, DR & Common Operating Platform availability (Note: * - In the scope of MSI)	T1+60 days

		Installation & Commissioning of field devices and H/W , S/W required at the Command and Control Centre	T1+90 days
		Development and Testing of standalone application	T1+120 Days
		Testing of Application Integration	T1+150 Days
		Completion of Integration with UAT sign off	T1+ 180 Days
3	Integration of Common Command and Control Application (SOPs, Use Cases, FRS, SRS, Integration Testing) with	ICT Solid Waste Management Application	T2+270 days
		City Surveillance (Police Feed)	
		Intelligent Public Transport System	
		Intelligent Traffic Management	
		Smart Parking	
		VMS	
		e-Governance	
		Geographical Information System (GIS)	
4	Phase I operationalization & Go-Live	Go-Live	T1+270 days
Phase – II (271-450 Days)			
5	Phase II Implementation of Geographical Information System (GIS)	SOPs and Use-Cases for integration of individual ICT application with Common Command and Control Application	T1+300 Days
		Procurement of the residual/ additional hardware & software infrastructure required from phase I	T1+315 days
		FRS, SRS for implementation and integration of individual ICT application with Common Command and Control Application	T1+345 Days
		Installation & Commissioning of field devices	T1+360 days
		Development and Testing of standalone application	T1+390 Days
		Testing of Application Integration	T1+420 Days
		Completion of Integration with UAT sign off	T1+ 450 Days
6	Integration of Common Command and Control Application (SOPs, Use Cases, FRS, SRS, Integration Testing) with	Integration of City surveillance (Other than police feed) with City ICCC. Provision to see live feeds at authorized places.	T1+ 450 Days (271-450 Days)
		Street Light Control	
		Digital Signage (ABD Area)	
		Variable Messaging System (ABD Area)	
		Geographical Information System (GIS)	
		e-Governance	
		Water SCADA	
		Fire, Emergency and Disaster Management	

7	Phase II operationalization & Go-Live	Go-Live	T1+450 days

4.13 Smart IT Solid Waste Management

4.13.1 Scope of Work

The scope of work for the selected LSI will include supply, installation and implementation of Web based tracking and monitoring system with RFID, camera surveillance and GPS combined with integration with existing systems at HDMC. Along with that, it will also include the post implementation support and maintenance of RFID, camera surveillance and GPS Tracking and Monitoring solution.

Presented below is the Situational Assessment across the SWM Lifecycle:

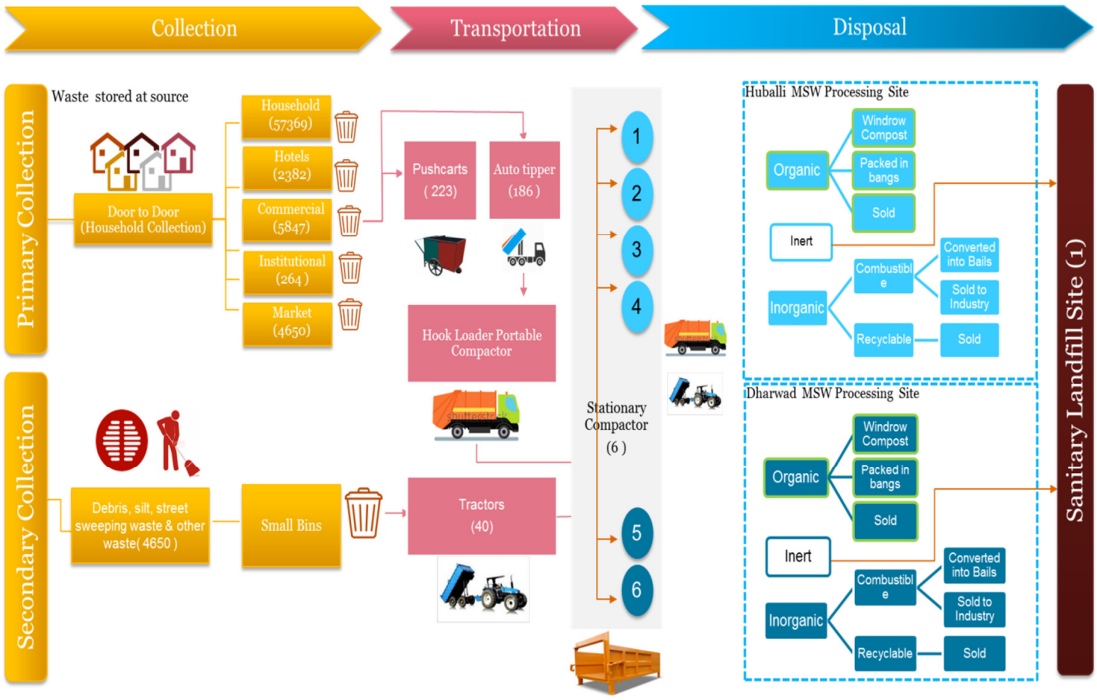


Figure 4 Situational Assessment

The proposed solution will map to this lifecycle in the following manner:

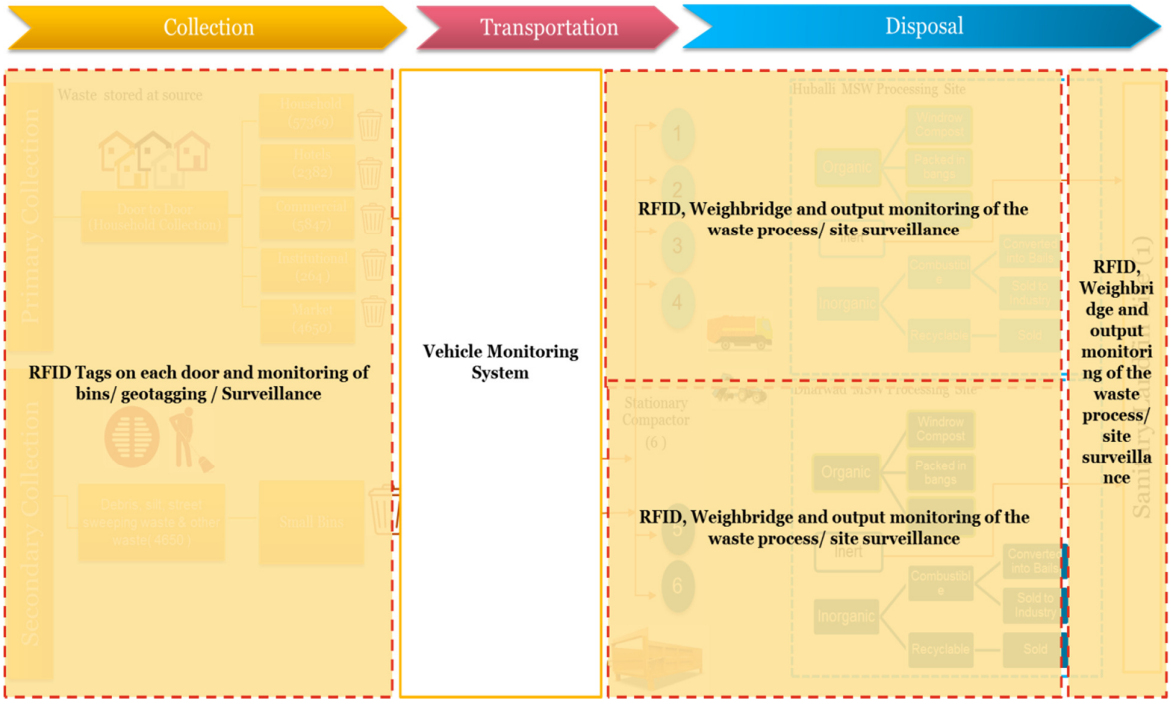


Figure 5 Lifecycle of SWM

The overall Smart SWM Solution being proposed for HDMC will include multiple ICT components that will work together to deliver value:

Smart Integrated SWM

1. Door to Door RFID based monitoring
2. Vehicle tracking and monitoring (Existing)
3. Weighbridge monitoring (Existing)
4. Remote staff attendance(Existing)
5. Work allocation to staff (Existing)
6. Smart bin monitoring
7. Dashboards
8. Call center management
9. Datacenter

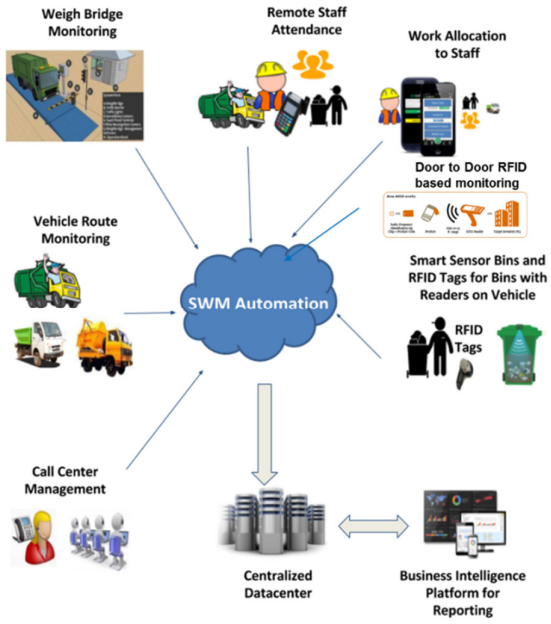


Figure 6 Smart SWM Components

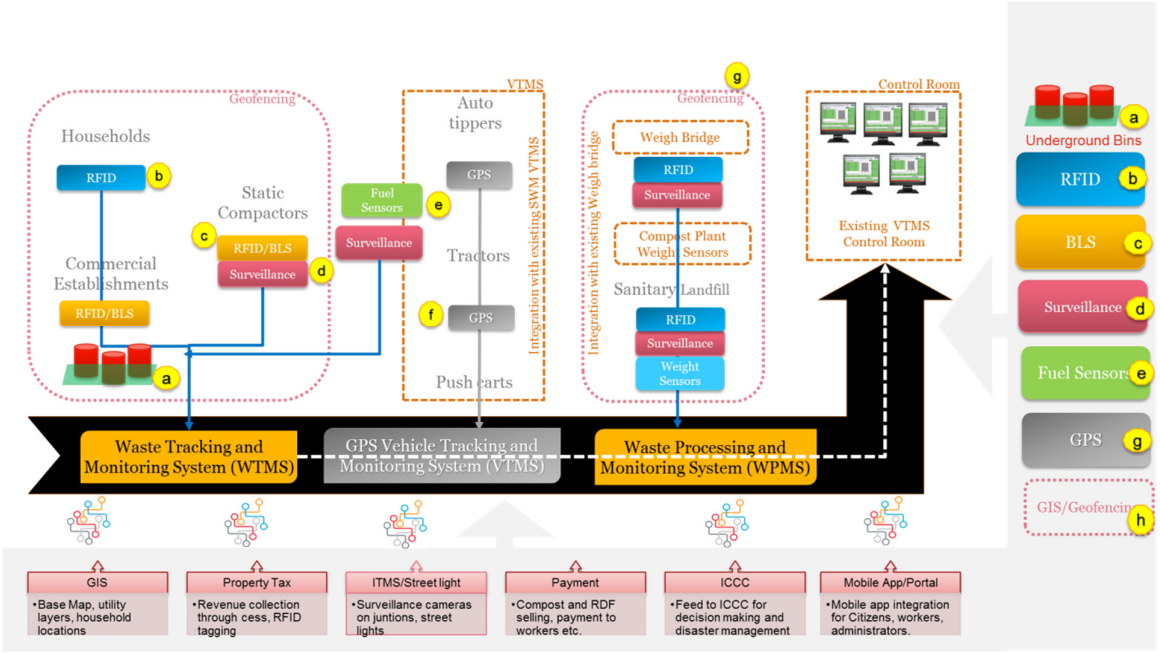


Figure 7 Operational Model

The scope of work for the selected SI will include supply, installation and implementation of Web based tracking and monitoring system with RFIDs, camera based surveillance combined with integration of existing systems with HDMC. Along with that, it will also include the post implementation support and maintenance of RFIDs, camera surveillance, Tracking and Monitoring solution.

End-to-End Solution to implement and to provide Support Services & Maintenance.

1. Implementation of "Door to Door Collection Monitoring System"
    a. Supply and installation RFID tags on each households and handheld RFID readers.
    b. Design and integrate Door to Door Tracking of waste collection and Monitoring System
2. Design and Integrate "Bin Monitoring System"
3. Integration with Vehicle Tracking Monitoring System (data feed access would be provided by HDMC)
4. Integrating data feed from MSW processing plant at both location (Hubballi and Dharwad). (data feed access would be provided by HDMC)
5. Sizing of Hardware, software and network devices required in the data Centers for using the Integrated SWM.

6. Design, Development, Supply, and Deployment & Implementation of Web Based Application software integrated with GPS, RFID devices, weighbridge application, Existing VTMS, MSW processing site operation and Call Centre Management and complaint management modules.
7. Maintenance of RFID and after warranty period including the replacement of devices in cases of damage, new vehicle or any other change.
8. Maintenance of web based application for Integrated SWM., during and after warranty period.
9. Provide resources for support, maintain and administering the system.
10. Provide training to HDMC resources for operating the tracking system.
11. Integration of ISWM with ICCC

4.13.2 Components of the proposed architecture

Details and role of the components of the expected solution architecture will be as follows:

a. RFID

Only Bins and Households of HDMC will be installed with an RFID tag to identify each object associated with the tag. Each tag will contain a unique identification code. This will help in the tracking of the bins individually. The RFID readers will be installed in each vehicle which will read the radio frequency signals of the tags installed on the bins from which the garbage is collected. The information pertaining to the collection of the garbage and the garbage bins being covered will be sent to the tracking device for creating the reports about the bins covered by the garbage collection vehicles giving the identification code of each bin being covered.

b. Information transmission

The information will be collected by the tracking device and this information will be sent to the tower using the GPRS signal for the transmission of the information. The GPRS tower will communicate with the data center using the transfer protocol to transfer the information collected from the various vehicles. The HDMC data center will be equipped with the database server and the application server to collect the data and to produce the reports. The central server will also have digital maps which will allow seeing HDMC user about the location of the vehicles on that map. The HDMC data center will post the information over the internet which will then be visible to the HDMC users through mobiles or computers.

All the information will now be available over the internet and physical checking will be eliminated. The routing can now be given to the drivers using this system and tracking can be done automatically instead of having multiple check points.

4.13.3 Geocoding / surveying of the following components shall be done by the SI

a. Households
b. Garbage Collection points
c. Processing sites
d. Vehicle routes
e. Bin locations
f. Departmental Offices
g. Landfills/Dumping grounds
h. Transfer stations
i. Motor loading chowkies
j. Department workshops
k. Ward offices
l. Others (as per HDMC request)

The accuracy of these locations should be 3 to 5 meters. The SI shall use these locations over the maps and shall deliver the same to HDMC in formats like ESRI formats or any other standard GIS format. The GIS Platform and the base map layer shall be made available by the MSI (Master System Integrator). The MSI is the bidder identified through a tender process for the set-up of centralized Data Centre at KMDS & Disaster Recovery (DR) on cloud and also provides the Integrated City Operations platform and GIS platform.However the SI shall use other Base Map services till the time GIS Base Map from MSI is completely ready for use. Also the geo-coded locations mapped on the initial base map should be migrated by the SI once the GIS Base Map is available from the MSI. The migration should be completed in not more than 10 days from the day migration commences.

4.13.4 Technical Specifications of SWM Components

RFID Reader Specifications

Parameter	**Specification**
Protocol	ISO18000-6B ISO18000-6C EPC GEN2
Frequency Range	Standard ISM 902 928MHz or ISM 865 868MHz

Operation Mode	FHSS
RF Power	0~30dBm, software adjustable
Reading Speed	Software Programmable Average Reading per 64Bits <6ms
Reading Mode	Timing or Touch, Software Programmable
Communication Mode with central server	TCP/IP and GPRS
Data Input Port	Trigger input one time
Reading Range	Max 12 m

UHF Passive RFID Tag Specification

Parameter	**Specification**
Type	ABS
Supported Transponders	ISO18000-6B ISO18000-6C EPC GEN2
Frequency Range	ISM 920~925MHz(china) ISM 902~928MHz (FCC), ISM865~868MHz
Operation Mode	Fixed Frequency or FHSS Software Programmable
Memory capacity	The tag should support ISO18000-6B protocol standard 2K Bits storage capacity, 1728 Bits (216bytes) writable user area; MR6730B metal supports EPC C1 GEN2 (ISO18000-6C), with 96Bits writable EPC Code area, 512Bits writable user area, and 32Bits password area.
Reading Rate	Software Programmable, Average Reading per 64Bits <10ms
Tags material	Metal material
Reading Range	>12 m related to reader and antenna(the farthest distance can reach to more than 15m)
Operation Temp	20°C 80°C

PTZ Camera

NO.	Camera Characteristics	Specification

1.	Requirement Overview	IP Camera should be a high-definition, full-functioned video endpoint with industry-leading image quality and processing power. The camera is capable of resolutions up to 1920 x 1080 at 30 frames per second (fps) while optimizing network usage with either H.264 or MJPEG compression.
2.	Sensor Type	1/3" progressive-scan CMOS with Vandal-Resistant Dome or better
3.	Max Resolution	1920 x 1080 @ 30 FPS or better
4.	Dynamic Range	120 dB or more
5.	Lens/Iris	4.3-129 mm or better
6.	Minimum illumination	● Color mode: 0.3 lux or better ● Black-and-white mode: 0.01 lux with illuminator active or better
7.	Day/Night Operation	Automatic with IR cut Filter
8.	Operating Frequency	Min 50 Hz
9.	High-speed Pan-Tilt functionality	360° endless pan range and a 180° tilt range
10.	Pan, tilt, manual and Preset speed: The speed shall be applicable for Manual, Tour and Preset Mode	Pan: 0.5° - 300°/s (auto), 0.5° - 100°/s (manual) Tilt: 0.5°-100°/s (auto), 0.5°-40°/s (manual)
11.	Compression	H.264 or better Baseline, Main and High Profiles, Motion JPEG
12.	Frame Rate and Bit Rate	25 FPS at all resolutions with Controllable Bit Rate/ Bandwidth and Frame Rate. In CBR Priority to be defined for Video quality or frame rate and the bandwidth upper limit shall not exceed the defined limit
13.	GOP/ GOV	Ability to change the GOP/GOV Length to optimize the bandwidth and storage
14.	Video streams	minimum 3 Streams (2 minor streams @ 720p and 1 major stream @ 1080p), H.264, 25 FPS"
15.	Day/Night	Automatic, manual, scheduled
16.	Local Storage	MicroSD – min 128 GB
17.	Motion Detection	Yes built in with multiple configurable areas in the video stream

18.	ONVIF	ONVIF
19.	Electronic Shutter	1/33000 s to 2 s or better
20.	Mount	Wall/ Pole Mount
21.	Backlight Compensation	Required
22.	Electronic Image Stabilization	Required
23.	Image Freeze on PTZ	Required
24.	Privacy Masks	minimum 10 configurable 3D zones or better
25.	Preset Positions	minimum 256 or better
26.	Image Flip	Yes Automatic
27.	Guard Tour	minimum 2 Nos
28.	Built In Heater & FAN	required
29.	Audio	Two way
30.	Alarm	Min 2 Alarm Input / Output ports or better
31.	On-screen directional indicator	Required
32.	Compression	The camera shall for its H.264 (or better) implementation support scene adaptive bitrate control, in order to lowering bandwidth and storage requirements. The camera shall support automatic dynamic GOP for optimal bitrate utilisation. The camera shall support automatic dynamic ROI to reduce bitrate in un-prioritized regions

33.	Event Triggers	The camera shall be able to send and received trigger directly from any other camera without interface of VMS. Live Stream Accessed, Motion Detection, Audio Detection, Network, Temperature, Manual Trigger, Virtual Inputs, Alarm Inputs, PTZ: Error, Moving, Preset Reached, Ready, Storage Disruption, Storage Recording, System Ready, User schedule
34.	Event Action	File upload via FTP, TTP and email Notification via email, HTTP and TCP Pre- and post-alarm video buffering, External output activation, PTZ preset, guard tour, Video recording to edge storage, Day/night mode, Overlay text
35.	Pixel counter / Region of Interest	Built In
36.	Edge Storage	Built in SD card slot with support up to 128 GB with Class 10 speed
37.	Storage	The Cameras shall have the feature to directly record the videos/ images onto NAS without any Software
38.	Protocols	At least IP, HTTP, HTTPS, SSL/TLS, TCP, ICMP, SNMPv1/v2c/v3 (MIB-II), RTSP, RTP, UDP, IGMP, RTCP, SMTP, FTP, DHCP, UPnP, ARP, DNS, DynDNS
39.	Text Overlay	Date & time, and a customer-specific text, camera name, graphical image etc
40.	Security	Password protection, IP address filtering, HTTPS encryption, IEEE 802.1Xa network access control, Digest authentication, User access log
41.	Firmware upgrade	The firmware upgrade shall be done though web interface, The firmware shall be available free of cost
42.	Logs	The camera shall provide minimum 200 logs of latest connections, access attempts, users connected, changes in the cameras etc.
43.	Interface	RJ 45, 100 Base TX
44.	Environmental Certification	IK10 and IP67-rated enclosure for outdoor mounting.
45.	Power Requirements	Power over Ethernet Plus (PoE+) IEEE 802.3at Type 2 Class 4, max. 24 W, Typical 9W; 24 V DC max. 30 W 24 V AC, max. 40 VA or better

46.	Operating Temperature & Humidity	-25 to 55°C or better 10–95% RH (condensing) or better
47.	Camera Tamper	The camera should support tamper feature when any of the following events occur and persist for a designated period: • The IP camera view is changed • The IP camera view is blocked • The IP camera view is substantially out of focus
48.	Quality of service (QoS)	Differentiated services code point (DSCP) marking and class of service (CoS) marking
49.	Certifications Safety	UL, CE, FCC
50.	Audio	Full duplex, line in and line out, G.711, G.726

Fuel Sensor Technical Specifications:

Parameter	Value
Level measurement range depending on modification, mm	0 to 2000
Inaccuracy for measuring the level,	% ±1
Baud rate, bits/s	2400 to 115200
Power supply voltage, VDC	7.0... 24.0
Useful current, mA,	maximum 100
Power consumption, W	<1
Ingress protection rating	IP57
Ambient temperature, °C;	from - 20 to +80
Relative humidity at 25 °C, %;	from 30 to 80
Atmospheric pressure, kPa	from 84 to 107
Operating mode	continuous
Overall dimensions, mm, maximum	150×150×(50+Level)
Weight, kg,	maximum 4
Average service lifetime, years,	5
Multi tank monitoring;	2 tanks
Fuel resolution	1024 levels
Universal data communication protocol;	data transmitting by GSM-GPRS network;

4.14 Geographical Information System (GIS)

GIS database creation:

The MSI (Master System Integrator) will create standard data formats in coordination with stakeholder and will provide it to LSI in which the data layers are required to develop city specific GIS application. The MSI will develop the GIS application for city using the data provided.

The LSI is responsible to collect the required data from concerned departments. The LSI is also responsible for data layer creation or mapping of ICT related assets and sensor systems (like locations of streetlight poles, CCTV cameras, utilities, Smart bus shelters, environment sensors). If this requires field survey, it needs to be done by LSI. If such a data is already available with city, it shall facilitate to provide the same to the MSI. The LSI has to regularly update the GIS data as per standard formats given by MSI.

For data creation and GIS application development activity, LSI will utilise the MSI provided utility/platform.

The scope of work for the selected LSI (city level) will include utilization of GIS system at HDMC & integrate it with all the necessary components under ICCC.It will also be the scope of selected MSI to develop component specific GIS layers/utilities as & when requested by HDSCL. The MSI will also be responsible to ensure that the GIS datasets are updated at regular frequency based on nature of datasets to ensure accuracy during the course of the entire project.

The State has procured the ArcGIS Enterprise server to provide a common map layer for information related to all the Smart Cities. The features of the ArcGIS enterprise system are as follows:

- The GIS application is scalable and robust with powerful GIS functionalities & capabilities.
- GIS application is web responsive that enables the user to view the application on different devices (tablets, smartphone, etc.) in such a way that it shall auto fit to any screen resolution.
- Department users can use GIS map viewer application that has readily available map browsing functionalities.

Details of the existing functionalities built in the software are as follows:

- A citizen portal which is a Single Window information portal for all the information related to the smart city
- A Map Visualization module which provides map view and navigation tools to public

- PoI based information module which allows public to access and analyze information in relation to selected Points of Interest like:
    - Education, Community Services, Culture, Health/Family, Sports and Recreation, Security, Emergency, Govt. offices
- Search and Query Module for users to search the map content based on the available attribute information provided in the GIS layers available
- Public Grievance Application module to enable a GIS based web application for public to report Grievances to client
- Social Media Integration Module

GIS Integration: The SI is required to carry out the seamless integration to ensure ease of use of GIS in the Dashboards at ICCC. If this requires field survey, it needs to be done by SI. If such a data is already available with city, it shall facilitate to provide the same. The SI is required to update GIS maps from time to time.

The data for the datasets at the ArcGIS platform is obtained from the following modes:

- Existing GIS dataset already available with the city authorities
- Existing dataset from Mapmyindia
- Data obtained from Smart City Mission projects
- Data to be gathered by the GIS Surveyor

The System Integrator will be required to undertake a detailed assessment for integration of all the Field level ICT interventions proposed with the existing Geographical Information System (GIS) using ArcGIS Platform. An indicative list of the GIS datasets that are relevant to ICCC operations is given below in the table.

Function/ Department	GIS Dataset	Existing GIS Dataset in the city	Existing Dataset from Map my India	Dataset that would be available through other SCM projects	Dataset that have to be gathered by GIS Surveyor
Solid Waste Management	Garbage secondary collection points and Landfill in city	Dumping Site/Land Fill/Waste Collection pick up points etc.			
	Location of Community Bins				
	Type of fleet vehicle				
	Location of toilets	Public Facilities at Public Spaces			

Function/ Department	GIS Dataset	Existing GIS Dataset in the city	Existing Dataset from Map my India	Dataset that would be available through other SCM projects	Dataset that have to be gathered by GIS Surveyor
Public Transport (BRTS)	BRTS Bus Routes on GIS Map	Public Transport Corridors			
	Location of BRTS Bus Stations	Stations/Depots/Service Areas etc.	Bus Stops (Point Feature), Bus Depots (Polygon)		
Traffic and Police	Location of traffic lights				
	Locations of existing surveillance cameras from Traffic and Police				
	Location of police stations		Police Station (Point Feature)		
Electricity / Power	Location of Energy Assets (Sub-stations, Transmission network etc.)	Electricity-Assets	Electric Substation (Point Feature)		
	Location of the Energy Network on GIS map	Electricity network - Lines			
Gardens	Location of Parks/Gardens		Parks/Gardens (Point Feature)		
	Amenities at each Park/Garden				
Housing & Slums	Location of Slums	Slums			
Smart Poles	Location of Smart Poles				
	Features on each Smart Pole				
Smart Parking	Location and number of Parking Slots		Parking (Point Feature) Parking Lots		
Street Lights	Location of Street Lights				
Property Taxes (HDMC-Revenue)	Properties on GIS map				
E-Governance	Population by each ward	Building Footprints			
	Location of important		Government Offices		

Function/ Department	GIS Dataset	Existing GIS Dataset in the city	Existing Dataset from Map my India	Dataset that would be available through other SCM projects	Dataset that have to be gathered by GIS Surveyor
	Government buildings		(Point Feature)		
	Location of Tourist Attractions	Heritage Sites	Tourist Spots (Point Feature), Heritage (Point Feature), ASI Protected Monuments (Point Feature)		
	Location of HD One centers				
	Location of Public Advertisement Boards				
Disaster Management	Location of highest Disaster Impact Areas in the city (Geo-fence)				
Emergency Management	Location of Fire Hydrants				
	Location of fire stations		Fire Station (Point Feature)		
	Amenities at the each Fire Station				
	Location of Health centers/Hospital		Medical (Point Feature)		
	Amenities at each Health Centre/Hospital				
	Type of fleet vehicle				
Water	Location of Water Assets	Water Supply Network - Assets	Pumping Stations – UGD, Water Treatment Plant (Point Feature), Reservoir/OHTS		
	Location of Water Network on GIS map	Water Supply Network - Lines			

Function/ Department	GIS Dataset	Existing GIS Dataset in the city	Existing Dataset from Map my India	Dataset that would be available through other SCM projects	Dataset that have to be gathered by GIS Surveyor
Sewerage	Location of Sewerage Assets (STPs, ETPs etc)	Sewerage System Network	Sewerage Treatment Plant (Point Feature)		
Storm Water	Location of Storm Water drains	Storm Water Infrastructur e			

4.15 Other ICT Components

Surveillance cameras for the following ABD projects need to be installed/commissioned and maintained by the bidder for the following projects:

ICT Components in the projects	Qty
Junction Improvement	17
Nehru Stadium	10
Tolankere Lakefront Development	15
MG Park	12

4.16 Other Expectations for LSI

1. LSI shall engage early in active consultations with the Authority, City departments and other key stakeholders to establish a clear and comprehensive project plan in line with the priorities of all project stakeholders and the project objectives.
2. LSI shall assess existing infrastructure's current ability to support the entire solution and integrate the same with the proposed solution wherever applicable and possible
3. LSI shall judiciously evaluate the resources and time planned for undertaking the current state assessment, given the overall timelines and milestones of the project.
4. LSI shall be responsible for supply of all the Products/equipment such as optical fibre cable, Network, Hardware, Software, Devices, etc. as indicated (but not limited to) in the tentative Bill of Materials included in the RFP and their appropriate quantity & capacity.
5. LSI shall be responsible for supply of passive components indicated in the Bill of Materials section of the RFP viz. Housings, Fibre Patch Cords, Racks etc.
6. Validate / Assess the re-use of the existing infrastructure if any with Authority site

7. Supply, Installation, and Commissioning of entire solution at all the locations.
8. LSI shall provide the bandwidth required for operationalizing each edge device to ICCC/DC as the case may be. The bandwidth requirement shall be analyzed and procured by the SI at its own cost / risk.
9. LSI shall Install and commission connectivity across all designated locations.
10. LSI shall ensure high availability, reliability and redundancy of the network elements to meet the Service Level requirements.
11. LSI shall be responsible for up gradation, enhancement and provisioning additional supplies of network (including active / passive components), hardware, software, etc. as requisitioned by Authority.
12. LSI shall ensure that the infrastructure provided under the project shall not have an end of life within 24 months from the date of bidding
13. LSI shall ensure that the end of support is not reached during the concurrency of the contract and 5 years thereafter.
14. LSI shall ensure compliance to all mandatory government regulations as amended from time to time.
15. The LSI shall ensure that all the peripherals, accessories, sub-components required for the functionality and completeness of the solution, including but not limited to devices, equipment, accessories, patch cords (fibre), cables, software, licenses, tools, etc. are provided according to the requirements of the solution.
16. Authority shall not be responsible if the LSI has not provisioned some components, sub-components, assemblies, sub-assemblies as part of Bill of Materials in the RFP. The LSI shall have to provision these & other similar things to meet the solution requirements at no additional cost and time implications to Authority.
17. All the software licenses that the LSI proposes shall be perpetual software licenses along with maintenance, upgrades and updates for the currency of the contract. The software licenses shall not be restricted based on location and Authority shall have the flexibility to use the software licenses for other requirements if required.
18. LSI shall ensure there is a 24x7 comprehensive onsite support for duration of the contract for respective components to meet SLA requirement. The LSI shall ensure that all the OEMs have an understanding of the service levels required by Authority. LSI is required

to provide the necessary MAF (Manufacturer Authorization Form) as per the format provided in the RFP in support of OEMs active support in the project

19. Considering the criticality of the infrastructure, LSI is expected to design the solution considering the RFP requirement of no single point of failure with high level of redundancy and resilience to meet the network uptime requirements.
20. LSI shall be responsible for periodic updates & upgrades of all equipment, cabling and connectivity provided at all locations during the contract period.
21. LSI shall be responsible for including provisioning for network, power, rack, etc. at all the locations.
22. LSI is expected to provide following services, including but not limited to:
    I. Provisioning hardware and network components of the solution, in line with the proposed authority's requirements
    II. Size and propose for network devices (like Router, switches, security equipment including firewalls, IPS / IDS, routers, etc. as per the location requirements with the required components/modules, considering redundancy and load balancing in line with RFP.
    III. Size and provision the WAN bandwidth requirements across all locations considering the application performance, data transfer and other requirements for smart city initiatives.
    IV. Size and provision the internet connectivity for Service Provider network and Network Backbone.
    V. Liaise with service providers for commissioning and maintenance of the links.
23. LSI shall directly interact with electricity boards for provision of mains power supply at all desired locations for any Field Infrastructure solution. The Hubballi-Dharwad Smart City shall facilitate, if any documentation is required from its side. SI shall be responsible for provisioning of requisite electricity power and its recurring charges (during operational phase). SI may provision the same under appropriate heads in the commercial bid.
24. Prior to starting the site clearance, the SI shall carry out survey of field locations as specified in Annexure- I (List of Locations), for buildings, structures, fences, trees, existing installations, etc. The Hubballi-Dharwad Smart City shall be fully informed of the

results of the survey and the amount and extent of the demolition and site clearance shall then be agreed with the HDSCL.

25. After signing of contract, the Systems Integrator (LSI) needs to deploy the team proposed for the project and ensure that a Project Inception Report is submitted to Hubballi-Dharwad Smart City Limited which should cover following aspects:

    I. Names of the Project Team members, their roles & responsibilities

    II. Approach & methodology to be adopted to implement the Project (which should be in line with what has been proposed during bidding stage, but may have value additions / learning in the interest of the project).

    III. Responsibility matrix for all stakeholders

    IV. Risks the SI anticipates and the plans they have towards their mitigation.

    V. Detailed project plan, specifying dependencies between various project activities/ sub activities and their timelines.

26. System Integrator should provide as part of feasibility report the detailed To-Be designs (Junction layout plans) specifying the following:

    I. High Level Design

        - Application Architecture documents
        - ER Diagrams and other data modelling documents
        - Logical and Physical database design

    II. Data Dictionary and data definitions

    III. Application component design including component deployment views, control flows, etc.

    IV. Field equipment deployment architecture

    V. Low Level Design (including but not limited to)

        - Application flows and logic including pseudo code o GUI design (screen design, navigation, etc.)
        - Database architecture, including defining data structure, data dictionary as per standards laid-down by Government of India/ Government of Karnataka

- Location of all field systems and components proposed at the junctions/other locations,
- Height and foundation of Poles, cantilevers, gantry and other mounting structures for other field devices
- Location of Junction Box
- Location of PoP
- Electrical power provisioning

27. Any functionality not expressly stated in this document but required to meet the needs of the organization to ensure successful operations of the system shall essentially be under the scope of the LSI and for that no extra charges shall be admissible.

4.17 Common Components

The bidder should estimate and provide estimated cost of extra service integration in terms of man month rate (Rate Card). The Rate card will be valid for 5 (five) years. This rate card will be for extra work only and it should not be the part of commercial bid.

4.17.1 City Network

There is no optical fibre network readily available for connecting all the solutions and ICCC in Hubballi-Dharwad.

4.17.1.1 Scope of Work

1. SI should tie up with an Internet Service Provider or Telecom Service Provider to provide connectivity from the Field Infrastructure to ICCC.
2. SI should use public internet for transmission of information between fields infrastructures to the core router of ICCCrequired. Security applications should be factored in to avoid hacks at field infrastructure level.
3. For various ICT solutions to be implemented, the LSI has to provide edge devices, network connectivity (Sensor to Data Centre) and application software and other required components (except data center part).
4. Connectivity from City ICCC to KMDS data center, will be provided by KSWAN (10 MBPS).
5. Internet connectivity at City ICCC and KMDS will also be provided by KSWAN with 4 MBPS uplink and 4 MBPS downlink.
6. SI should estimate the bandwidth requirement for connectivity between ICCC and Data Center and the same shall be clearly provisioned in the technical proposal with detailed

calculations. The connectivity between ICCC and Datacenter shall be through Karnataka State Wide Area Network (KSWAN). The bandwidth provisioned needs to adhere to the following minimum benchmark requirements:

I. Latency should be less than 40 ms

II. Jitter should be less than 10% of one-way latency

III. Packet loss should be less than 0.5%

7. The SI shall meet the parameters of video feed quality, security & performance. SI should factor the same while designing the solution.

4.17.1.2 Technical Specifications:

ICT Solution	Field Level Devices	Connectivity	Data Time Collection
ICT based SWM	1) GPRS/GSM Devices 2) GPRS – Attendance Management System 3) Weigh Bridge Sensors	GPRS Public Internet	Real Time
Intelligent Transport system	1) GPRS/GSM 2) VMS at Bus Stops	GPRS	15-20 Seconds
Smart Poles	1) Environmental Sensors 2) VMS 3) PAS 4) Digital Billboards 5) CCTV Camera	Public Internet	Continuous
Intelligent Traffic Management System	1) Traffic Signals 2) Vehicle Detections Sensors 3) VMS 4) PAS	Public Internet	Continuous
SCADA (Water and Electric)	SCADA Sensors	RFID / GSM	Once in every 6 Hours

4.17.1.3 Security Requirements for Network as a Service:

1. Every field device should be authenticated in the IoT Platform before being able to access to the network resources

I. Field device should use X.059 certificate based authentication

II. Certificate Authority chosen should be mutually agreed upon

III. Along with X.509 certification, Device should also support authentication

4.17.2 Integrated Command and Control Center (ICCC)

4.17.2.1 Overview

Integrated Command and Control Centre's main objective is to break silos between departments and in departments, make process integrated to serve public in an efficient manner. As part of Smart City Hubballi-Dharwad –it is proposed to build one common operation center. This center will provide an integrated view of all ICT projects identified in this document, its primary focus is to serve as a decision support engine for city administrators in day to day operations or during emergency situations.

This City ICCC or city operation center, shall leverage information provided by various departments and provide a comprehensive response mechanism to the day-to-day challenges across the city. City ICCC shall be fully integrated, web-based solution that provides seamless incident – response management, collaboration and geo-spatial display. Various ICT projects shall be able to use the data and intelligence gathered from operations of other elements so that civic services are delivered more efficiently and in an informed fashion.

LSI shall develop ICT solution application module for the smooth operation of City ICCC, and shall deploy support and maintenance manpower at the City ICCC.

4.17.2.2 Scope of Work

1. HDSCL has already identified a location to host city operation center or city ICCC, LSI should inspect the location and factor in the amount of work needed to build ICCC in the bid document
2. LSI should provide a universal dashboard to view all applications in a consolidated manner onGIS map provided by HDSCL and also general KPI View.
3. LSI should be able to provide Unified view for each Departments on GIS map provided by HDSCL and general KPI views.
4. LSIshould be able to project this information on the video wall
5. KPI's which need to be tracked and project on the video wall shall be during inception stage
6. Key KPI for each domain needs to be tracked based on HDSCL's requirement, which willbe decided post award of work by the HDSCL's.

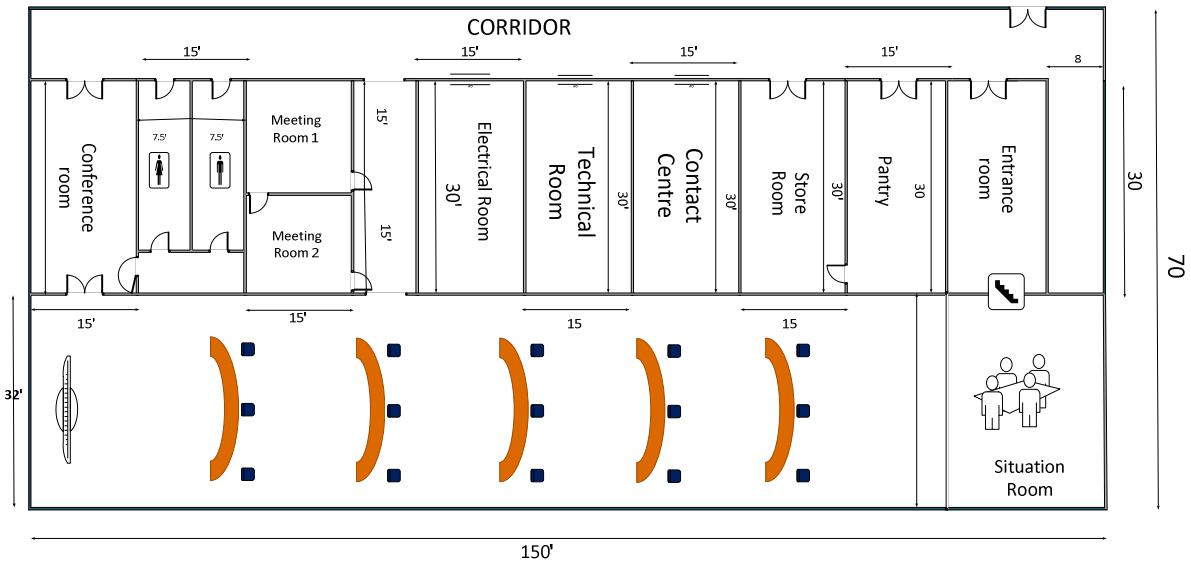
7. KPI's list should be given in the proposal, this would be indicative and a detailed list of KPI's need to be furnished by SI during feasibility study.
8. KPI's should include from the following categories
    I. Process KPI
    II. KPI's which measure the efficiency of the integrated processes
    III. Event Based KPI
9. System should be capable of creating new KPI's on the fly.
10. LSI should setup a dedicated helpdesk to support the field infrastructure laid out as part of the RFP.

4.17.2.3 Indicative Layout of ICCC

The ICCC Facility is planned to be implemented in a new facility that will be constructed at Court Circle, Hubballi. This new building (currently called the Iconic Building) will have a dedicated space for housing the ICCC facility. The approach to the ICCC Facility will be based on the following basic tenets:

- Spacing should be provided for teams from different departments
- Design of the City ICCC should be as per the ISO 11064 standards

Below is an indicative layout of the ICCC at Iconic Building:



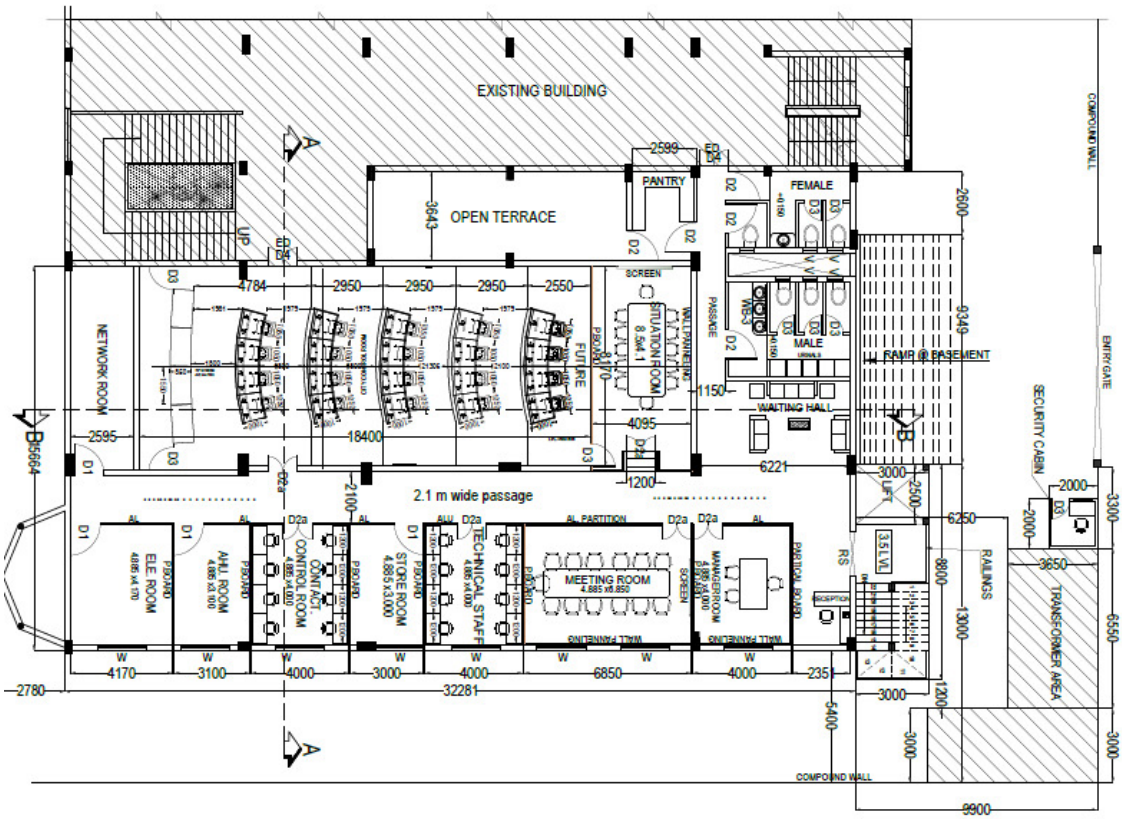
Note: MAP not to scale

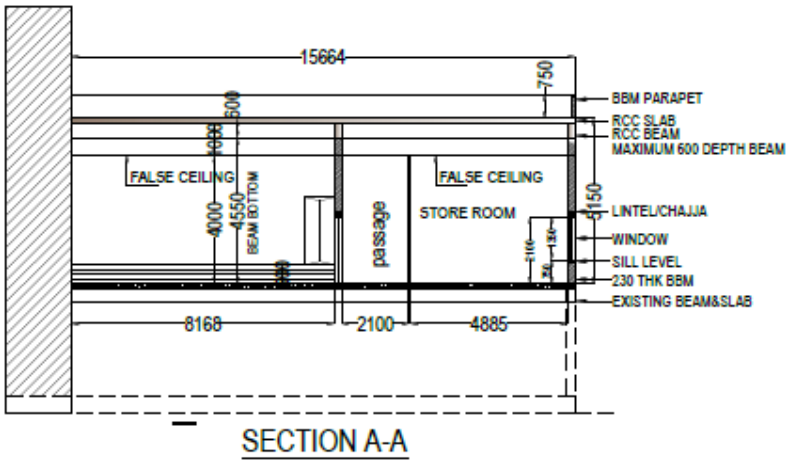
The following table illustrates the floor area that is being considered in the ICCC facility:

Component	Area (Sq.ft.)
City control room	4800
Meeting room (1 or 2)	500
Contact center room	500
Technical support room	750
War room separated with glass glazing from City control room	300
Electrcial room	700
Store room	700
Washrooms	300
Pantry	300
Entrance for telecom component (Fibre cabling etc)	500
Conference room	300
Total Area	**9650**
Room Height	**8 m**

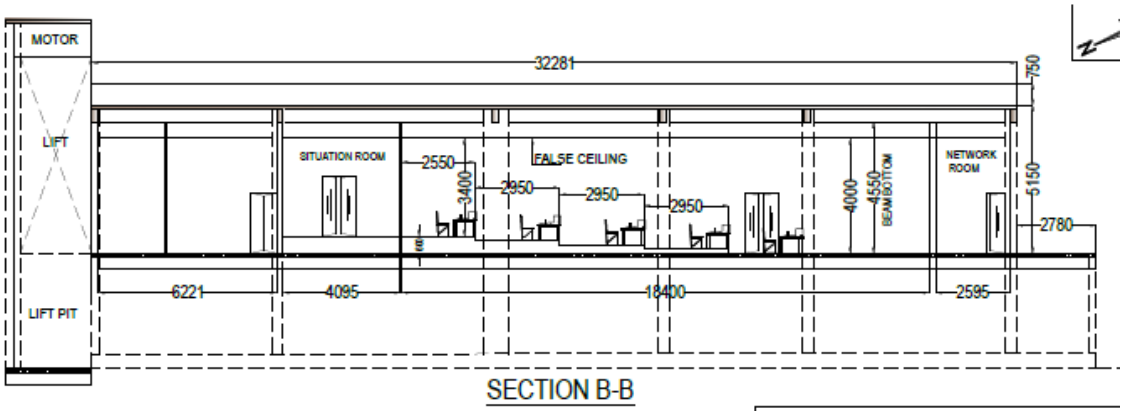
Considering that Iconic building construction will take time, HDSCL has identified a location at Convention Centre (near Cotton Market) where the ICCC facility will be hosted temporarily. The LSI will be expected to establish the ICCC facility here initially and once the Iconic Building is ready, the same will have to be migrated seamlessly to the new campus.

This temporary facility will house the essential components and will be having the following indicative layout.


EXISTING BUILDING
OPEN TERRACE
PANTRY
FEMALE
MALE
WC
SCREEN
PASSAGE
SITUATION ROOM
8.5x4.1
FUTURE
WALL PANELLING
WAITING HALL
RAMP @ BASEMENT
NETWORK ROOM
2.1 m wide passage
ELE ROOM
AHU ROOM
CONTROL ROOM
STORE ROOM
TECHNICAL STAFF
MEETING ROOM
4.885 x5.850
MANAGER ROOM
RECEPTION
PARTITION BOARD
LIFT
3.5 LVL
RAILINGS
TRANSFORMER AREA
SECURITY CABIN
ENTRY GATE
COMPOUND WALL
B5664
2780
32281
9900


15664
750
500
4000
4550
BEAM BOTTOM
FALSE CEILING
FALSE CEILING
STORE ROOM
passage
3150
BBM PARAPET
RCC SLAB
RCC BEAM
MAXIMUM 600 DEPTH BEAM
LINTEL/CHAJJA
WINDOW
SILL LEVEL
230 THK BBM
EXISTING BEAM&SLAB
8168
2100
4885

SECTION A-A



It must be noted that the LSI will be responsible for the ICT components for ICCC only (at both the facilities) while the non-ICT components will be facilitated through a different vendor.

4.17.2.4 ICCC Platform- Functional Specifications

The ICCC platform will be provided by MSI (KUIDFC). The Proposed Integrated Command and Control Center Platform (ICCCP) shall have IoT Platform Software (Data Normalization software) &ICCC Software functionalities;All applications which will have field infrastructure like – Smart Water, Smart Transport, Smart Traffic, Solid waste management etc., proposed to be built as part of Smart City initiative shall pass information processing via IoT Platform.

IoT Layer must integrate lots of Services in the current scenario and must deliver an architecture which will be future scalable and can accommodate more Services / Utility Solution Integration.IoT shall be a Common layer and is required for the Normalization of the data from different edge applications. This layer will aggregate and integrate utilities & sensors data so as to ensure that Device management, Analytics, Reporting, Dash Boarding and Integration of the Different Authorities data can be performed from a single operational screen. This layer shall also integrate with different Independent Software Vendor (ISV) applications hosted at Data Centre or at Cloud to provide the completeness of the solution.

4.17.2.5 Technical Specifications:

Technical Specifications for IT Infrastructure

- Central Level Data Centre: KUIDFC shall provide the location to house the compute and storage infrastructure, at the Karnataka Municipal Data Society, Bangalore. Data center will be established by state vendor based on the compute and storage requirement given by each city.
- City Operation Centre (City Level): The LSI (City vendor) needs to provision for necessary IT infrastructure including Storage for Video feeds (only for ICT-SWM solution) at city level.
- Various ICT equipment to be provisioned and maintained by the LSI at the City Operation Center Site is given below.

4.17.2.5.1 Video Wall

Sl No.	Item	Specifications
1.	Display Wall Screen Size	70"
2.	Projection Technology	DLP Rear Projection
3.	Native Resolution per cube	1920x1080
4.	Aspect Ratio	16:9
5.	Light Source	LED
6.	Brightness	on screen brightness Minimum 300 cd/m2
7.	Brightness Uniformity	95%
8.	Contrast ratio	Typical 1600:1
9.	Connectivity	The screen should have accessibility and adjustable low inter screen gap < 1 mm to give seamless viewing experience.
10.	Full viewing angle	180°
11.	Lifetime	Normal mode: 60 000h
12.		Eco mode: 80 000h
13.	Inputs	DVI-D
14.	Power	100 - 240 VAC, 60 - 50Hz, (below values are for 230V; 110V +5%)
Operating conditions		
15.	Humidity 5)	Up to 80% non-condensing
16.	Temperature	10°C-40°C | 50°F-105°F
Storing conditions		
17.	Temperature	0°C-40°C | 32°F-105°F

18.	Remote management through IP	Remote management through IP for parameter adjustment. Each cube should have built-in web server
19.	Access	Front / Back

4.17.2.5.2Video Wall Controller

Sl.NO	Item	Specifications
1.	Display controller	Controller to be able to control minimum 12 cubes
2.	Redundant Controller	The controller should be based on the latest architecture.
3.	Platform	Windows 10 Pro or Linux
4.	Processor	Latest x86 Processor (64 bit) Multi core processor, 3 GHz
5.	RAM	32 GB
6.	HDD	1 TB (7200 rpm)
7.	Chassis Type	19" Rack mount industrial chassis
8.	Network	2 Network Ports
9.	Resolution Support For Outputs	Minimum 1920 x 1080 or higher
10.	Scalability	The system should be able to add additional inputs as required in the future
11.	Control	The system should have the capabilities of interacting (Monitoring & Control) with various applications on different network through the single Operator Workstation. It shall be possible to launch layouts, change layouts in real time using Tablet
12.	Redundancy	Redundant Hot Swappable HDD in RAID 1 Configuration
13.	Redundancy	Redundant Hot Swappable Power Supply
14.	Keyboard & Mouse Extension	Keyboard and Mouse along with mechanism to extend them to 20 Mtrs. operator desk from display controller to be provided
15.	24 x 7 operation	The controller shall be designed for 24 x 7 operation
16.	Others	The Video Wall and the Controller should be of the same make to ensure better performance and compatibility
17.	OEM Certification	All features and functionality should be certified by the OEM. The Display Modules, Display Controller & Software should be from a single OEM.

4.17.2.5.3Display Wall Management Software

Sl. No.	Item	Specifications
1.	Layouts	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.

2.	Sources	The software should be able display multiple sources anywhere on video wall in any size.
3.	Remote Viewing	The video wall content will be able to show live on any remote display Mobile with IE
4.	User management	Key features of Video Wall management Software
		• Central configuration database
		• Browser based user interface
		• Auto-detection of network sources
		• Online configuration of sources, displays and system variables
5.	Software features	Video Wall Control Software shall allow commands on wall level or cube level or a selection of cubes :
		• Switching the entire display wall on or off.
		• Setting all projection modules to a common brightness target, which can be either static (fixed) or dynamic to always achieve maximum (or minimum) common brightness between projection modules.
		• Fine-tune color of each cube
6.	Client & Server based Architecture	Should support Multiple clients / Consoles to control the Wall layouts
7.	Collaboration	The Software should be able to share layouts comprising of multiple sources with workstations / Displays over LAN for remote monitoring
8.	Scaling	Software should enable the user to display multiple sources (both local & remote) up to any size and anywhere on the display walls (both local & remote).
9.	Display	The software should be able to create layouts and launch them as and when desired
10.	Remote Control	The Display Wall and sources (both local & remote) should be controlled from Remote PC through LAN without the use of KVM Hardware.
11.	Support of Meta Data	Software should support display of Alarms
12.	Authentication	The software should provide at least 2 layer of authentication

13.	Scenarios	Software should able to Save and Load desktop layouts from Local or remote machines
14.	Layouts Configuration	Can be pre-configured or changed in real time.
15.	Sharing & Collaboration	It should be possible to share the layouts over LAN/WAN Network with Display in Meeting room or on Remote Workstations connected on LAN/WAN Network.
16.	OEM Certification	All features and functionality should be certified by the OEM.
		The Display Modules, Display Controller & Software should be from a single OEM.

4.17.2.5.4Monitoring Workstations (High End PC)

S.No.	PARAMETER	Details
1	Processor	Latest X86 64-bit based Multi core processor (3GHz) or better
2	Chipset	Latest series 64bit Chipset
3	Motherboard	OEM Mother board logo embossed
4	Memory	16 GB DDR4 2400 Mhz DDR4 Memory with 4 DIMM Slot expandable utpo 64 GB
5	Hard Disk Drive	2 TB SATA 6.0-Gb/s Hard Drive 7200 RPM, with Flash Cache of 64GB SSD. Provision for installing 4 more drives
6	Optical Drive	Super Multi DVD Writer
7	Graphics	Integrated HD Graphics or higher
8	Audio	High Definition Audio (all ports should be stereo)
9	Ethernet	Integrated Gigabit (10/100/1000 NIC) RJ- 45 Ethernet controller with PXE & Wake On LAN support
10	Slots	2 PCI/PCIe slots, one should be X16
11	Ports	6 nos. - USB3.0 ports, 4 nos. - USB2.0 ports (with at least 4 on the front side) or more
		USB keyboard and mouse ports
		1 nos - RJ45 network connector
		1 nos Displayport
		Rear Line In/Line Out jacks Front 3.5 mm head phone output and microphone in jack

12	PTZ joystick controller (with 2 of the workstations in SCOC)	• PTZ speed dome control for IP cameras • Minimum 10 programmable buttons • Multi-camera operations • Compatible with all the camera models offered in the solution • Compatible with VMS /Monitoring software offered
13	Monitor	Two monitors of 22" TFT LED monitor, Minimum 1920 x1080 resolution, 5 ms or better response time, TCO 05 (or higher) certified
14	Keyboard	104 Keys USB Keyboard (same make as PC)
15	Mouse	2 Button USB Optical Mouse (same make as PC)
16	Security	TPM 2.0 Security, BIOS controlled electro-mechanical internal chassis lock for the system. Power-On password (via BIOS), Administrator password (via BIOS), Setup password (via BIOS)
17	Operating System	64 bit pre-loaded OS with recovery disc
18	Compliance and Certification	ROHS and Windows, All Linux platform. Certification Energy Star version/ BEE star, EPEAT Qualified, UL FCC
19	System Volume	System Volume must be less than 8 liters.
20	Antivirus	Advanced antivirus, antispyware, desktop firewall, intrusion prevention (comprising of a single, deployable agent) which can be managed by a central server. (Support, updates, patches and errata for the entire contract/ project period)
21	Power Supply	SMPS; Minimum 400-watt Continuous Power Supply with Full ranging input and APFC. Power supply should be 90% efficient with EPEAT Gold certification for the system.

4.17.2.5.5Television

Sl. No	**Parameters**	**Specifications**
1	Technology	LCD –LED Back Lit
2	Size in inches	55"
3	Native Resolutions	1920x1080
4	Brightness	400 Nits or high
5	Viewing angle	178° x 178° or more

6	Minimum Input Ports	• 1-USB with Auto Playback, • 3-HDMI, • 1-VGA • 1-Rs232 • 1-RJ45 • 1- CVBS/Component-1
7	Smart Features	Built in Wi-Fi & Miracast/Screen Sharing ,SNMP support, Wake on LAN,Built in SOC
8	Audio (Capacity of Speaker)	Minimum 10 Watts x 2 or more speakers
9	Power Consumption	100 Watts (Max)
10	Power Type	Built-in Power
11	Energy Saving Feature	Yes
12	Certification	• Latest Energy Star Certification, • UL,FCC
14	Box Should Contain	LED Display unit, Table Top Stand and Other Required Cables (Remote Control, Power Cable)
15	Wall Mount installation	Required

4.17.2.5.6Software for Videoconferencing

Sl. No	Parameter	Specifications
1	Native Applications	Should support Windows, macOS, Android, iOS, watchOS and WebRTC.
2	Video Codecs	Should support Native: Support for SVC and AVC on H.264
		Should support Video streams resolution, compression ratio and frame rate are chosen dynamically and independently for every participant in a conference based on the selected layout, bandwidth, connection quality, endpoint's performance and its hardware capabilities.
3	Layouts	Should support this Various layouts for video and content on single or multiple screens chosen interactively by users.
4	Video Resolution	Should support Native for 1-on-1 video calls: 720p30, 480p, 360p, 180p.
		Should support Native for multipoint conferences: 720p30, 480p, 360p, 180p per stream.

		Via built-in gateway with SVC: server outputs 9 layouts with resolution up to 720p30 per conference.
5	Content Resolution	Should support Content sharing: identical to source up to 1080p. Slideshow up to 1280x1024.
6	Audio Codec	Should support Opus / Speex Wideband HD Audio, Speex, iSAC, G7xx.
7	Protocols	Should support TCP-based protocol, WebRTC, SIP, H.323, BFCP, H.239, and RTSP.
8	Encryption	Should support AES-256, TLS. Via WebRTC: SRTP DTLS.
9	Team Meeting	Use Symmetric Conference: Each participant sees all other participant's videos on screen
10	Board Meeting	Use Role-based Conference: Up to 6 speaker videos at a time, Videos of speakers seen by all other participants.
11	Training & Lectures	Use Asymmetric Conference: 1 speaker's Video to all receiving participants, speaker sees all, participants do not see each other
12	Privacy and security	Server works in Private Network, in LAN/WAN/VPN, even without Internet connection
13	General Features	Screen Sharing (Desktop + Application Sharing), Private & Secure Chat, File Transfer, Scheduling of Conferences ,
		Mobile users can start/join conference , Any User can start Group or Point2Point conference

4.17.2.5.7 Office Desktop

Product Details	Specifications
Form Factor	Desktop
No. of Processors	1
No of Cores	4 or higher
Processor Configuration	Latest X86 64-bit based Multi core processor (Released in 2017)
Resolution	1920 x 1080 or higher
Chipset	Compatible with processor
RAM Type	DDR4
RAM Size	min 16 GB
Type of Hard Disk Drive	SATA
No. of Hard Disk Drives	Min 1

No. of DIMM Slots	Min 1
No. of PCIe Slots Gen 3.0 (x 1)	Min 1
No. of PCIe Slots Gen 3.0 (x 16)	Min 1
Operating System	Windows 10 or higher
Networking Interface	Integrated Gigabit 10/100/1000
Wi-Fi Connectivity	Yes
VGA Port	Available
HDMI Port	Available
Display Port	Available
RJ45	Available
No. of USB 2.0 Port	Min 2
No. of USB 3.0 Port	Min 2
Optical Drive	1
Display (antiglare, LED-backlit)	Integrated
Display Type	Normal
Display Size	21.5 or higher
Display Resolution (Full HD or better)	1366X768 or better
Keyboard	Standard Keyboard
Mouse	Optical Scroll Mouse
Safety Certifications	IEC:60950-1 / IS:13252 EPEAT Gold Energy Star / BEE 5 Star
Security	Integrated panel lock, Power-On password (via BIOS), Administrator password (via BIOS), Setup password (via BIOS), TPM 2.0
Hard Disk Drive Size	1024 GB
Availability of Bundled Software	System Health monitoring Tool with H/W box
ROHS Compliance	Yes
TCO Compliance (for Monitors)	TCO-06

4.17.2.5.8IP PABX

Sl. No.	IPPBX Specifications
1.	Extensions - unlimited support
2.	Number of Simultaneous Calls Supported - upto 1024

3.	Call Logging
4.	Call Reporting
5.	Call Forward on Busy or No Answer
6.	Call Routing by DID
7.	Auto Attendant / Digital Receptionist
8.	Voicemail/ Music on Hold
9.	Central Phonebook
10.	Call by Name
11.	Call Parking / Pickup
12.	Call Transfer
13.	Call Queuing
14.	Call Recording
15.	MWI – Message Waiting Indicator
16.	Supports Popular SIP Phones
17.	Supports SIP Trunks / Gateways
18.	Intercom/ Paging
19.	Ring Extension & Mobile Simultaneously
20.	Extensive Codec Support (G711, G722, GSM, Speex / OPUS , ILBC, G729)
21.	Automatic Pickup on Busy
22.	Call Recordings Management
	Management and Scalability
23.	Web-based Management Console
24.	Automated Provisioning of Devices
25.	Real Time Web-based System Status
26.	Integrated Web Server
27.	Easy Backup and Restore
28.	SBC to Configure Remote Extensions
29.	VMware / Hyper-V Compatibility
30.	Scheduled Backup
31.	Scheduled Restore
32.	Inbuilt Fail Over Functionality
	Unified Communications
33.	Setting Up Conference Calls
34.	See the Presence of Your Colleagues
35.	Receive Voice Mail via Email
36.	Receive Faxes via Email as PDF

37.	Integrated Fax Server - Proposed solution to enable the end user to send and receive Fax using the unified communication gateway.
38.	Integrate Offices
39.	Advanced Forwarding Rules
	Mobility
40.	Android Client
41.	iOS Client
42.	Windows Phone Client
43.	CTI Support
44.	Seamlessly Create Conference Calls
45.	Users can Configure their Own Extension
46.	Provisioning by Email
	IP Phone Management
47.	Automatic Plug & Play Phone Provisioning
48.	Manage IP Phones Network Wide from Console
49.	Restart Phones Remotely
50.	Update & Manage Firmware Network Wide
	Gateway- Key Features
51.	Flexible SIP and Protocols configuration enable services providers and enterprises to seamlessly connect in hybrid networks
52.	Routing Features: Call routing and translation (from PCM to IP or reversely)
53.	Coder support: G.711A,G.711U, G.729 A/B,G723 (optional),G722, GSM, iLBC, RFC 2833,RF 3261,SIPINFO,INBOUND
54.	IP protocols: TCP/UDP, HTTP, ARP/RARP, DNS, NTP, TFTP, TELNET, STUN and more IP protocols
55.	Interworking/Digit transmission: T.38 real-time fax, T.38 – G.711 interworking, Digit transmission via RFC 2833 (SIP)
56.	Power Requirements/ Consumption: AC Power Supply Range 100 – 240 VAC, Consumption- 15W(Normal Conditions)
57.	IP Interfaces: Dual redundant 2 *100 Base-T Ethernet for VoIP payload and signaling
58.	Signaling Protocols: TDM Signaling Protocols, ISDN PRI, MF R2, SS7 ISUP, SS7 MTP1~3, SS7 SIGTRAN
59.	QoS: Adaptive jitter buffer, Packet loss compensation, Configurable Type of Service (ToS) fields for packet prioritization and routing
60.	Safety: Compliant with international standards

61.	30/60 simultaneous SIP sessions with multimedia transcoding, and 30/60 channels of ISDN signaling
62.	Integrated transcoding support for voice, tone and faxing

4.17.2.5.9IP phones

Sl. No	Parameter	Specifications
1	Display	4.3" or bigger, 480 x 272-pixel color LED display with backlight, LED indication and status information. Dual color (red, Green)
2	Integral switch	Dual-port Gigabit Ethernet , Power over Ethernet (IEEE 802.3af), class 3
3	Speaker Phone	Yes
4	Headset	Wired, Cushion Padded Dual Ear-Speaker, Noise Cancelling headset with mouthpiece microphone, port compatibility with IP Phone
5	VoIP Protocol	SIP v1 (RFC2543), v2 (RFC3261)
6	POE	IEEE 802.3af or better and AC Power Adapter (Option)
7	Supported Protocols	DHCP, DNS, SNTP, SRTP
8	Codecs	GSM_FR, G.723, G.729AB, G.726-32 iLBC, G.722, G.711(A/μ)
9	Speaker Phone	Full duplex speaker phone with echo cancellation Speaker on/off button, microphone mute
10	Volume Control	Easy decibel level adjustment for speaker phone, handset and ringer
11	Phonebook/Address book	Upto 99 entries Call history: dialed/received/missed/forwarded
12	Call Logs	Access to missed, received, and placed calls. (Minimum 20 overall)
13	Clock	Time and Date on display - can set automatically or manually
14	Ringer	Ring tone selection/provisioning
15	Directory Access	XML/LDAP remote phonebook
16	QoS	QoS: 802.1p/Q tagging (VLAN), Layer 3 ToS DSCP
17	Network Security	AES encryption for configuration file

4.17.2.5.10 Multifunction Printer

Sl . No	Parameters	Specifications
1	Speed	1000Mbps
2	Ports	48 Gigabit Ports, 4 SFP Ports
3	Type	Layer 2
4	Manageability	Centrally Manageable with required software
5	Architecture	Shall be 1RU, 19" Rack Mountable
		24 RJ-45 autosensing 10/100/1000 ports with 2 SFP Ports
		All ports shall be compliant on Gigabit Copper Ports
		1 RJ-45 (serial RS-232C) or USB micro-B console port.
		Packet buffer size of minimum 1.5 MB to support video/streaming traffic and huge file transfers (like medical scan documents etc)
		Shall have switching capacity for providing non-blocking performance on all Gigabit ports.
6	Resiliency	IEEE 802.1D Spanning Tree Protocol, IEEE 802.1w Rapid Spanning Tree Protocol and IEEE 802.1s Multiple Spanning Tree Protocol
		IEEE 802.3ad Link Aggregation Control Protocol (LACP) up to eight links (ports) per group
		Layer 2 Features
		MAC address table size of 16000 entries
		Shall support up to IEEE 802.1Q and minimum 512 VLANs simultaneously
		Shall support GARP VLAN Registration Protocol or equivalent feature to allow automatic learning and dynamic assignment of VLANs
		Shall support Jumbo frames to improve the performance of large data transfers
		Internet Group Management Protocol (IGMP)
		Multicast Listener Discovery (MLD) snooping
		IEEE 802.1AB Link Layer Discovery Protocol (LLDP) and LLDP-MED (Media Endpoint Discovery)

		IPv6 host and Dual stack (IPv4/IPv6) support to provide transition mechanism from IPv4 to IPv6
7	QoS and Security Features	Access Control Lists for traffic filtering
		Source-port filtering or equivalent feature to allow only specified ports to communicate with each other
		Traffic prioritization based on IP address, IP Type of Service (ToS), Layer 3 protocol, TCP/UDP port number, source port, and DiffServ
		Shall support traffic classification into eight priority levels mapped to two or four queues using Weighted deficit round robin (WDRR) queuing
		Shall support traffic rate-limiting per port
		IEEE 802.1x to provide port-based user authentication with multiple 802.1x authentication sessions per port
		Media access control (MAC) authentication to provide simple authentication based on a user's MAC address
		Web-based authentication to provide a browser-based environment to authenticate clients that do not support the IEEE 802.1X supplicant
		Concurrent IEEE 802.1X and Web or MAC authentication schemes per port
		Port security to allow access only to specified MAC addresses
		MAC address lockout to prevent particular configured MAC addresses from connecting to the network
		STP BPDU port protection to prevent forged BPDU attacks
		STP Root Guard to protect the root bridge from malicious attacks or configuration mistake
8	Management Features	Configuration through the CLI, console, Telnet, SSH and browser-based management GUI (SSL)

		SNMPv1, v2, and v3 and Remote monitoring (RMON) support
		sFlow (RFC 3176) or equivalent for traffic analysis
		TFTP and Secure FTP support
		Dual flash images to provide independent primary and secondary operating system files
		Multiple configuration files to allow multiple configuration files to be stored to a flash image
		RADIUS/TACACS+ for switch security access administration
		Simple Network Time Protocol (SNTP) or equivalent support
		Environmental Features
		Shall support IEEE 802.3az Energy-efficient Ethernet (EEE) to reduce power consumption
		Operating temperature of 0°C to 45°C
		Safety and Emission standards including EN 60950; IEC 60950; VCCI Class A; FCC part 15 Class A

4.17.2.5.11 PTZ camera for outdoor Surveillance

NO.	Camera Characteristics	Specification
51.	Requirement Overview	IP Camera should be a high-definition, full-functioned video endpoint with industry-leading image quality and processing power. The camera is capable of resolutions up to 1920 x 1080 at 30 frames per second (fps) while optimizing network usage with either H.264 or MJPEG compression.
52.	Sensor Type	1/3" progressive-scan CMOS with Vandal-Resistant Dome or better
53.	Max Resolution	1920 x 1080 @ 30 FPS or better
54.	Dynamic Range	120 dB or more
55.	Lens/Iris	4.3-129 mm or better

56.	Minimum illumination	● Color mode: 0.3 lux or better ● Black-and-white mode: 0.01 lux with illuminator active or better
57.	Day/Night Operation	Automatic with IR cut Filter
58.	Operating Frequency	Min 50 Hz
59.	High-speed Pan-Tilt functionality	360° endless pan range and a 180° tilt range
60.	Pan, tilt, manual and Preset speed: The speed shall be applicable for Manual, Tour	0.5° - 350°/s or better
61.	Compression	H.264 Baseline, Main and High Profiles, Motion JPEG
62.	Frame Rate and Bit Rate	25 FPS at all resolutions with Controllable Bit Rate/ Bandwidth and Frame Rate. In CBR Priority to be defined for Video quality or frame rate and the bandwidth upper limit shall not exceed the defined limit
63.	GOP/ GOV	Ability to change the GOP/GOV Length to optimize the bandwidth and storage
64.	Video streams	minimum 4 Streams @ 1920x1080, H264, 25 fps
65.	Day/Night	Automatic, manual, scheduled
66.	Local Storage	MicroSD – min 128 GB
67.	Motion Detection	Yes built in with multiple configurable areas in the video stream
68.	ONVIF	ONVIF
69.	Electronic Shutter	1/33000 s to 2 s or better
70.	Mount	Wall/ Pole Mount
71.	Backlight Compensation	Required
72.	Electronic Image Stabilization	Required

73.	Image Freeze on PTZ	Required
74.	Privacy Masks	minimum 10 configurable 3D zones or better
75.	Preset Positions	minimum 256 or better
76.	Image Flip	Yes Automatic
77.	Guard Tour	minimum 2 Nos
78.	Built In Heater & FAN	Required
79.	Audio	Two way
80.	Alarm	Min 2 Alarm Input / Output ports or better
81.	On-screen directional indicator	Required
82.	Compression	The camera shall for its H.264 implementation support scene adaptive bitrate control, in order to lowering bandwidth and storage requirements. The camera shall support automatic dynamic GOP for optimal bitrate utilisation. The camera shall support automatic dynamic ROI to reduce bitrate in un-prioritized regions
83.	Event Triggers	The camera shall be able to send and received trigger directly from any other camera without interface of VMS. Live Stream Accessed, Motion Detection, Shock Detection, Audio Detection, Network, Temperature, Manual Trigger, Virtual Inputs, Alarm Inputs, PTZ: Error, Moving, Preset Reached, Ready, Storage Disruption, Storage Recording, System Ready, User schedule

84.	Event Action	File upload via FTP, SFTP, HTTP and email Notification via email, HTTP and TCP Pre- and post-alarm video buffering, External output activation, PTZ preset, guard tour, Video recording to edge storage, Day/night mode, Overlay text
85.	Pixel counter	Built In
86.	Edge Storage	Built in SD card slot with support up to 128 GB with Class 10 speed
87.	Storage	The Cameras shall have the feature to directly record the videos/ images onto NAS without any Software
88.	Protocols	At least IP, HTTP, HTTPS, SSL/TLS, TCP, ICMP, SNMPv1/v2c/v3 (MIB-II), RTSP, RTP, UDP, IGMP, RTCP, SMTP, FTP, DHCP, UPnP, ARP, DNS, DynDNS, SOCKS, NTP, CIFS/SMB. IPv4 & IPv6 and Bonjour
89.	Text Overlay	Date & time, and a customer-specific text, camera name, graphical image etc
90.	Security	Password protection, IP address filtering, HTTPS encryption, IEEE 802.1Xa network access control, Digest authentication, User access log
91.	Firmware upgrade	The firmware upgrade shall be done though web interface, The firmware shall be available free of
92.	Logs	The camera shall provide minimum 200 logs of latest connections, access attempts, users connected, changes in the cameras etc.
93.	Interface	RJ 45, 100 Base TX
94.	Environmental Certification	IK10 and IP67-rated enclosure for outdoor mounting.
95.	Power Requirements	Power over Ethernet Plus (PoE+) IEEE 802.3at Type 2 Class 4, max. 24 W, Typical 9W; 24 V DC max. 30 W 24 V AC, max. 40 VA or better
96.	Operating Temperature & Humidity	-25 to 55°C or better 10–95% RH (condensing) or better

97.	Camera Tamper	The camera should support tamper feature when any of the following events occur and persist for a designated period: •The IP camera view is changed •The IP camera view is blocked •The IP camera view is substantially out of focus
98.	Quality of service (QoS)	Differentiated services code point (DSCP) marking and class of service (CoS) marking
99.	Certifications Safety	UL, CE, FCC
100.	Audio	Full duplex, line in and line out, G.711, G.726

4.17.2.5.12 Fixed Dome Camera for Indoor Surveillance

Fixed Dome Camera for Indoor Surveillance	
Parameter	**Minimum Specifications or better**
Make	<to be provided by the bidder>
Model	<to be provided by the bidder>
Video Compression	H.264
Video Resolution	1920 X 1080
Frame rate	Min. 25 fps
Image Sensor	1/3" Progressive Scan CCD / CMOS
Lens Type	Varifocal, IR Correction Full HD lens compatible to camera imager
Lens#	Auto IRIS 5-50 mm
Multiple Streams	Dual streaming with 2nd stream at minimum 720P at 30fps at H.264 individually configurable
Minimum Illumination	Colour:0.5 lux, B/W: 0.05 lux (at 30 IRE) or Better
IR Cut Filter	Automatically Removable IR-cut filter
Day/Night Mode	Colour, Mono, Auto
S/N Ratio	≥ 50 dB
Auto adjustment + Remote Control of Image settings	Color, brightness, sharpness, contrast, white balance, exposure control, backlight compensation, Gain Control, Auto back focus

Wide Dynamic Range	True WDR upto 80 db
Audio	Full duplex, line in and line out, G.711, G.726
Local storage	Minimum 32 GB Memory card in a Memory card slot. In the event of failure of connectivity to the central server the camera shall record video locally on the SD card automatically. After the connectivity is restored these recordings shall be automatically merged with the server recording such that no manual intervention is required to transfer the SD card based recordings to server.
Protocol	HTTP, HTTPS, FTP, RTSP, RTP, TCP, UDP, RTCP, DHCP, ONVIF Profile S &G
Security	Password Protection, IP Address filtering, User Access Log, HTTPS encryption
Intelligent Video	Motion Detection & Tampering alert
Alarm I/O	Minimum 1 Input & Output contact for 3rd part interface
Operating conditions	As per City Conditions
Casing	NEMA 4X / IP-66 rated & IK 10
Certification	UL/EN, CE,FCC
Power	802.3af PoE (Class 0) and 12VDC/24AC

4.17.2.5.13 Guidelines for Control Room Design and Setup

#	Parameters	Quantity
1	Wall Size for Video Wall	Video-wall with Single Controller
2	Cube Size	70" Inch each
3	Workstations	As per BOQ

General Requirements and Specifications for Console System

The following specifications detail the minimum requirements of the Console System. Bidders must respond on the enclosed chart. This allows for a point-by-point technical response stating compliance, taking exception or providing requested information. Bids submitted without this chart will be considered non-responsive.

- Vendor shall supply the following to obtain project level approval

- Copy of ISO 9001:2008 Certification & ISO 14001:2004
- Copy of Green guard certifications for full console.
- Copy of FSC certification (Forest Stewardship Council) for Wood Components. Certificate for compliance towards sustainable forest initiative ensuring wood used is from sustainable forest harvesting.
- The console(s) design shall be proven in service.
- The consoles shall be of modular design, facilitating future equipment retrofits and full reconfigurations without major modification to structure or exterior elements.
- The consoles shall have rigid independent frames.
- Mechanical fasteners shall connect adjacent modules to maintain perfect alignment.
- Depending upon the evolution of needs and technology, the construction shall provide easy and fast removal and installation of all equipment items.
- The console frame shall have the sit stand actuator mechanisms incorporated into the structural frame and these actuator mechanisms will not be free standing on the floor.
- The console frame shall have provisions for leveler legs to be incorporated into the frame. In addition, the frame will be pre-designed to install optional anti-vibration dampers (upon request) or anchoring brackets for applications where vibration is a factor or for applications located in seismic zones.
- The console frame structure shall have fully integrated cable management. The base structure will have a minimum of 2 lateral raceways; the transition from the base to the work surface will have a minimum of 2 vertical raceways; and the work surface will have a lateral raceway location depending on the size of equipment being mounted in the console.
- The cable raceways shall be continuous throughout the entire console layout thus allowing uninterrupted cable management.
- The console design shall be acoustically acceptable and minimize noise reflection.
- Consoles shall be properly finished to prevent glare and reflection.
- No sharp edges shall be present that may lead to injury to the operators.
- The color of the console shall be such that users can work for a long duration without eye strain or other stress.
- The console finish shall be resistant to rubbing and liquids, impact-proof and easy to clean.
- The surface of the work area shall be non-scratch able
- The work surface should be smooth and level and take into consideration all accepted human factor criteria, including view, reach distances, keyboard height and knee well space. The work surface height shall be adjustable.

- Full console sit to stand height adjustment shall be available via an electric actuator. The top section of the console raises both the upper viewable equipment and the work surface together.
- Detailed CAD (PDF format) drawings of console and equipment layouts for coordination of site measurements, architectural, mechanical, and electrical project elements for each console type will be provided.
- All Board Cladding (Laminates) must be 1MM & the Laminate supplier must be Green Guard Certified, Certificates of which must be provided on request.
- Renderings of consoles and room must be provided on request.
- Pre-production review, to include a drawing submittal and component listing complete with samples of selected finish materials must be provided on request.
- Samples of the following material components, which demonstrate workmanship, shall be provided upon request:
    - Work surface sample.
    - Sample panel construction and finish materials.

Modular Control Desk

Bidder should refer the control desk design for any clarification of items.

Structure

a. Console System must be of modular design. The Console design shall address the functional, ergonomic and aesthetic requirements of the particular working environment while complying with accepted human factor design and ergonomic standards for viewing distance, angle, keyboard height, and knee space requirements.
b. Standard top height of modular control desk shall be 750 mm in sitting position and have to go till 1100 mm for Standing Position. The Console Table Top / Working Surface should be made in 12mm Solid Acrylic Panel (ASS) Cladded on 25mm MDF Board. Drawing is enclosed.
c. Size of modular control desk shall be as per drawing and it should have arrangement for placing of 2 workstations monitor for 2 Users on each control desk.
d. The Basic Structure should consist of Extruded AL Profiles (6063T6 grade) binded by Top & Bottom (min 2mm) MS Frames formed in such a way as to provide maximum buckling and torsion resistance. The Front & Back Panels should be openable / removable (with Locks) made of laminated MDF Board in min thickness of 18mm. The front Shutter will be of Toughed Glass (min. 4mm Thick) cladded on 18 mm MDF and Back shutter in 18 mm MDF Boards with Fan for Heat decapitation.

e. The Side Panels should be fixed type, made in 26mm MDF Board Cladded on 18mm MDF Board. All panels must be attached to the frame with concealed fasteners. Console access panels (Front & Rear Panels) must be removable without the use of tools. The Front panel should be positioned in such a way that there should be sufficient leg space (min of 400mm from the front edge of the Table Top).
f. All sheet metal / aluminum parts must be finished with electrostatic powder coating with average of min 80 microns over all surfaces.
g. Console frame shall have provisions for leveler legs to be incorporated into the frame.

Work Surface

a. Console Table Top should be made of 12mm Solid Acrylic Panel (ASS) over 25mm MDF Board, with no sharp Edges. The work surface platform shall have smooth edges and transitions, thus avoiding sharp corners or potential rib catchers for operator safety.

Modular Rear Wall (Slat Wall)

a. Wall should be of min 86 mm (Height) and approx. 200-300 mm high from the Monitor Base.
b. Modular walls shall be made of 2mm thick Extruded Aluminum (6063T6 aluminum alloy).
c. It should have high Load bearing capacity. Minimum weight carrying capacity has to be 20 KGs per Meter.

Monitor Arms

a. It shall be capable for mounting all type of existing LCD monitor with dimensions between 17" to 27" using suitable adopter/additional base plate, if required any.
b. Vendor shall provide the suitable adopter/additional base plate for mounting the existing LCD monitors.
c. It shall allow the rotate/ tilt/ raise/the monitors as well as fix their adjustment.
d. The monitor arm should be Articulating monitor arm

Miscellaneous

a. There shall be a closed cabinet (02 no in one Modular Control Desk) below the modular control desk for placing of CPU. Cabinet should have proper cooling system. CPU needs to be accessible from front as well as rear side of control desk for easy working and maintenance.
b. The cabinet shutters shall be of Butt Hinged type with 18mm thick MDF.

c. Rear shutters of each console should have provision of Airflow opening for cooling and heat dissipation effect.
d. Rear panel shall have ventilation fans mounted on it.
e. It shall have proper arrangement for flow of cables i.e. LAN Cable, Power cable, VGA cable, Mouse cable, Keyboard etc.
f. Design of control desk shall allow cables from the floor cable channel.
g. Control desk shall be equipped with individual power distribution unit (PDU) (06 no for one Modular Control Desk) and capable of being switched on/off individually. Power supply socket should be dual type i.e. Universal type.
h. All bolts must be of SS material to avoid rust due to environment.

Prospective View of Control Desk

Prospective View of Control Room

4.17.2.5.14 MPLS Router

Sr. No	Specifications
1	**Architecture**
1.1	Router shall have advanced Multi-Service Architecture delivering high-performance routing, switching, security, voice and mobility
1.2	Router shall be based on Multi-core RISC-based or equivalent processor
1.3	The router shall have three onboard 10/100/1000 Mbps Copper LAN ports (RJ-45) which shall support routed mode as well
1.4	The router shall have Interface card slots supporting for interface cards - 1Gbps, 10Gbps Ethernet
1.5	The router shall have one USB interface and 1 RJ-45 console port
1.6	The router shall be configured with 2 GB DDR3 SDRAM expandable to 4GB
1.7	The router shall support redundant power supply
1.8	The router shall support Service Modules to port applications like virtualization, optimization etc
2	**Performance**
2.1	The router shall have up to 2.5 Mpps forwarding throughput
2.2	40 Mpps of backplane capacity

2.3	The router shall have embedded hardware encryption accelerator to improve encryption performance
2.4	Routing table size of 500000 entries (IPv4), 200000 entries (IPv6)
2.5	Minimum 1Gbps of IPSec encryption performance
3	**Features (Any licenses required shall be included from Day 1)**
3.1	The router shall support the following WAN Protocols - PPP, HDLC, PPPoE, ISDN etc
3.2	The router shall support the following IP Routing Protocols (IPv4) - Static Routing, RIP, OSPF, BGP, and IS-IS
3.3	The router shall support the following IP Routing Protocols (IPv6) - Static Routing, RIPng, OSPFv3, BGP+, and IS-ISv6
3.4	The router shall support Multicast routing protocols for IPv4 and IPv6 - PIM-DM, PIM-SM and Source-Specific Mode (SSM)
3.5	The router shall support Multicast Source Discovery Protocol (MSDP) for inter-domain multicast applications
3.6	The router shall support Multicast Border Gateway Protocol (MBGP)
3.7	The router shall support policy routing for increased performance and security
3.8	The router shall have QoS features including Traffic policing, shaping, Congestion management, congestion avoidance etc
3.9	The router shall have embedded security capabilities like Firewall, IPSec, ACL Filtering etc
3.10	The router shall provide IPv6 transition mechanisms like NAT-PT, Tunneling etc
3.11	Dynamic VPN Capability for ease of VPN deployment
3.12	The router shall support Multiprotocol Label Switching (MPLS) Layer 3 VPN, Layer 2 VPN, MPLS QoS, Martini draft and Kompella-draft technologies
3.13	Layer-2 features like Spanning Tree Protocol (STP), VLANs, IGMP, Port mirroring etc
3.14	All the advanced software features shall be enabled from Day 1 (Routing, Security, Voice, MPLS etc) to avoid any additional licensing complexity or cost in future
4	**Management & Other features**
4.1	SNMP V1/V2c/V3, RMON/sFlow
4.2	RADIUS/TACACS+ for management security
4.3	Integrated console port provided with console cable
4.4	TR069 protocol support for Zero-touch deployment
4.6	Shall analyze network performance and service quality, such as jitter, delays etc. by sending test packets

4.7	Operating temperature 0°C to 40°C
4.8	19" Rack mountable (any hardware required shall be offered)
4.9	Shall have Green initiative by providing support for RoHS and WEEE regulations
4.10	Maximum power rating of 140 Watts

4.17.2.5.15 Access Switch/ L2 Switch

Sl . No	Parameters	Specifications
1	Port Speed	1000Mbps
2	Ports	48 Gigabit Ports, 4 SFP Ports
3	Type	Layer 2
4	Manageability	Centrally Manageable with required software
5	Architecture	Shall be 1RU, 19" Rack Mountable
		48 RJ-45 autosensing 10/100/1000 ports with 4 SFP Ports
		All ports shall be compliant on Gigabit Copper Ports
		1 RJ-45 (serial RS-232C) or USB micro-B console port.
		Packet buffer size of minimum 1.5 MB to support video/streaming traffic and huge file transfers (like medical scan documents etc)
		Shall have switching capacity for providing non-blocking performance on all Gigabit ports.
6	Resiliency	IEEE 802.1D Spanning Tree Protocol, IEEE 802.1w Rapid Spanning Tree Protocol and IEEE 802.1s Multiple Spanning Tree Protocol
		IEEE 802.3ad Link Aggregation Control Protocol (LACP) up to eight links (ports) per group
		Layer 2 Features
		MAC address table size of 16000 entries
		Shall support up to IEEE 802.1Q and minimum 512 VLANs simultaneously
		Shall support GARP VLAN Registration Protocol or equivalent feature to allow automatic learning and dynamic assignment of VLANs
		Shall support Jumbo frames to improve the performance of large data transfers
		Internet Group Management Protocol (IGMP)

		Multicast Listener Discovery (MLD) snooping
		IEEE 802.1AB Link Layer Discovery Protocol (LLDP) and LLDP-MED (Media Endpoint Discovery)
		IPv6 host and Dual stack (IPv4/IPv6) support to provide transition mechanism from IPv4 to IPv6
7	QoS and Security Features	Access Control Lists for traffic filtering
		Source-port filtering or equivalent feature to allow only specified ports to communicate with each other
		Traffic prioritization based on IP address, IP Type of Service (ToS), Layer 3 protocol, TCP/UDP port number, source port, and DiffServ
		Shall support traffic classification into eight priority levels mapped to two or four queues using Weighted deficit round robin (WDRR) queuing
		Shall support traffic rate-limiting per port
		IEEE 802.1x to provide port-based user authentication with multiple 802.1x authentication sessions per port
		Media access control (MAC) authentication to provide simple authentication based on a user's MAC address
		Concurrent IEEE 802.1X and Web or MAC authentication schemes per port
		Port security to allow access only to specified MAC addresses
		MAC address lockout to prevent particular configured MAC addresses from connecting to the network
		STP BPDU port protection to prevent forged BPDU attacks
		STP Root Guard to protect the root bridge from malicious attacks or configuration mistake
8	Management Features	Configuration through the CLI, console, Telnet, SSH
		SNMPv1, v2, and v3 and Remote monitoring (RMON) support

		sFlow (RFC 3176) or equivalent for traffic analysis
		TFTP and Secure FTP support
		Dual flash images to provide independent primary and secondary operating system files
		Multiple configuration files to allow multiple configuration files to be stored to a flash image
		RADIUS/TACACS+ for switch security access administration
		Simple Network Time Protocol (SNTP) or equivalent support
		Environmental Features
		Shall support IEEE 802.3az Energy-efficient Ethernet (EEE) to reduce power consumption
		Operating temperature of 0°C to 45°C
		Safety and Emission standards including EN 60950; IEC 60950; VCCI Class A; FCC part 15 Class A

4.17.2.5.16 Data Center Switch/ Core Switch

#	Parameter	Minimum Specifications
1.	Ports	28/48 x 10/100/1000 Base-TX /FX Ethernet ports and extra 2 numbers of 10Gbps SFP+/XFP ports • FX/TX Splits for a switch as per location requirement All ports can auto-negotiate between 10Mbps/ 100Mbps/ 1000Mbps, half-duplex or full duplex and flow control for half-duplex ports. Switch should have Internal redundant power supply from day 1
2.	Switch type	Layer 3
3.	MAC	Support 8K or 16K MAC address. (as per solution offered)
4.	Forwarding rate	Packet Forwarding Rate should be 70.0 Mbps or better

5.	Port Features	Must support Port Mirroring, Port Trunking and 802.3ad LACP Link Aggregation port trunks
6.	Flow Control	Support IEEE 802.3x flow control for full-duplex mode ports.
7.	Protocols	• Support 802.1D, 802.1S, 802.1w, Rate limiting • Support 802.1X Security standards • Support 802.1Q VLAN encapsulation, IGMP v1, v2 and v3 snooping • 802.1p Priority Queues, port mirroring, DiffServ • Support based on 802.1p priority bits with at least 8 queues • DHCP support & DHCP snooping/relay/optional 82/ server support • Shaped Round Robin (SRR) or WRR scheduling support. • Support for IPV6 ready features with dual stack • Support up to 255 VLANs and up to 4K VLAN IDs • Support IGMP Snooping, IGMP Querying and Multicasting Should support Loop protection and Loop detection, Should support Ring protection (when used in aggregation location)
8.	Access Control	• Support port security • Support 802.1x (Port based network access control). • Support for MAC filtering. Should support TACACS+ and RADIUS authentication
9.	VLAN	• Support 802.1Q Tagged VLAN and port based VLANs and Private VLAN • The switch must support dynamic VLAN Registration or equivalent Dynamic Trunking protocol or equivalent
10.	Protocol and Traffic	• Network Time Protocol or equivalent Simple Network Time Protocol support • Switch should support traffic segmentation Traffic classification should be based on user-definable application types: TOS, DSCP, Port based, TCP/UDP port number

11.	Management	• Switch needs to have RS-232/USB console port for management via a console terminal/PC • Must have support SNMP v1,v2 and v3 • Should support 4 groups of RMON Should have accessibility using Telnet, SSH, Console access, easier software upgrade through network using TFTP etc. Configuration management through CLI, GUI based software utility and using web interface

4.17.2.5.17 Server/ Networking Rack

Parameter	Minimum Requirement Specifications
Type	• 19" 42U racks mounted on the floor • Floor Standing Server Rack - 42U with Heavy Duty Extruded Aluminum Frame for rigidity. Top cover with FHU provision. Top & Bottom cover with cable entry gland plates. Heavy Duty Top and Bottom frame of MS. Two pairs of 19" mounting angles with 'U' marking. Depth support channels - 3 pairs with an overall weight carrying Capacity of 500Kgs. • All racks should have mounting hardware 2 Packs, Blanking Panel. • Stationery Shelf (2 sets per Rack) • All racks must be lockable on all sides with unique key for each rack • Racks should have Rear Cable Management channels, Roof and base cable access
Wire managers	• Two vertical and four horizontal
Power Distribution Units	• 2 Per Rack • Power Distribution Unit - Vertically Mounted, 32AMPs with 25 Power Outputs. (20 Power outs of IEC 320 C13 Sockets & 5 Power outs of 5/15 Amp Sockets), Electronically controlled circuits for Surge & Spike protection, LED readout for the total current being drawn from the channel, 32AMPS MCB, 5 KV AC isolated input to Ground & Output to Ground
Doors	• The racks must have steel (solid / grill / mesh) front / rear doors and side panels. Racks should NOT have glass doors / panels. • Front and Back doors should be perforated with at least 63% or higher perforations. • Both the front and rear doors should be designed with quick release hinges allowing for quick and easy detachment without the use of tools.
Fans and Fan Tray	• Fan 90CFM 230V AC, 4" dia (4 Nos. per Rack) • Fan Housing Unit 4 Fan Position (Top Mounted) (1 no. per Rack) – Monitored - Thermostat based - The Fans should switch on based on the Temperature within the rack. The temperature setting should be factory settable. This unit should also include - humidity & temperature sensor

Metal	• Aluminum extruded profile
Side Panel	• Detachable side panels (set of 2 per Rack)

4.17.2.5.18 LED Display

Sl. No	Parameters	Specifications
1	Technology	LCD –LED Back Lit
2	Size in inches	55"
3	Native Resolutions	1920x1080
4	Brightness	400 Nits or high
5	Viewing angle	178° x 178° or more
6	Minimum Input Ports	• 1-USB with Auto Playback, • 3-HDMI, • 1-VGA • 1-Rs232 • 1-RJ45 • 1- CVBS/Component-1
7	Smart Features	Built in Wi-Fi & Miracast/Screen Sharing ,SNMP support, Wake on LAN,Built in SOC
8	Audio (Capacity of Speaker)	Minimum 10 Watts x 2 or more speakers
9	Power Consumption	100 Watts (Max)
10	Power Type	Built-in Power
11	Energy Saving Feature	Yes
12	Certification	• Latest Energy Star Certification, • UL,FCC
14	Box Should Contain	LED Display unit, Table Top Stand and Other Required Cables (Remote Control, Power Cable)
15	Wall Mount installation	Required

4.17.2.5.19 EMS Specifications

Following is the EMS Specification

Following discusses the acceptance criteria to be adopted for system as mentioned below,

- Functional Requirements: The system developed/customized by LSI shall be reviewed and verified by the agency against the Functional Requirements signed-off between Authority / Concerned Department and LSI. Any gaps, identified as severe or critical in nature, shall be addressed by LSI immediately prior to the deployment of the system in production. One of the key inputs for this testing shall be the traceability matrix to be developed by the LSI from system. Apart from Traceability Matrix, agency may develop its own testing plans for validation of compliance of system against the defined requirements. The acceptance testing w.r.t. the functional requirements shall be performed by both independent third party agency (external audit) as well as the select internal department users (i.e. User Acceptance Testing).
- Infrastructure Compliance Review: Third party agency shall perform the Infrastructure Compliance Review to verify the conformity of the Infrastructure supplied by the LSI against the requirements and specifications provided in the RFP and/or as proposed in the proposal submitted by LSI. Compliance review shall not absolve LSI from ensuring that proposed infrastructure meets the SLA requirements.
- Security Review: The software developed/customized for system shall be audited by the agency from a security & controls perspective. Such audit shall also include the IT infrastructure and network deployed for system. Following are the broad activities to be performed by the Agency as part of Security Review. The security review shall subject the system for the following activities:
    a) Audit of Network, Server and Application security mechanism
    b) Assessment of authentication mechanism provided in the application/components/modules
    c) Assessment of data encryption mechanisms implemented for the solution
    d) Assessment of data access privileges, retention periods and archival mechanisms
    e) Server and Application security features incorporated etc.
- Performance: Performance is another key requirement for system and agency shall review the performance of the deployed solution against certain key parameters defined in SLA described in this RFP and/or agreement between Authority and LSI. Such parameters include request-response time, work-flow processing time, concurrent sessions supported by the system, Time for recovery from failure, Disaster Recovery drill etc. The performance review also includes verification of scalability provisioned in the system for catering to the requirements of application volume growth in future. The following shall be applicable to the components in KMDS data center for base line analysis of response of the applications that complete the operations of Hubballi-Dharwad:
    a) The LSI must provide System and Database Performance System for all applications
    b) The LSI must provision for End-User response time monitoring and transaction based deep-dive analysis for Web based applications.
    c) The LSI must provision for Integrated Performance Management System for Monitoring Networks, Systems & Databases.
    d) The LSI must provide a Traffic Analysis and Reporting System for deep-dive diagnostics

- Availability: The system should be designed to remove all single point failures. Appropriate redundancy shall be built into all the critical components to provide the ability to recover from failures. The agency shall perform various tests including network, server, security, DC/DR failover tests to verify the availability of the services

in case of component/location failures. The agency shall also verify the availability of services to all the users in the defined locations. The LSI would need to provide an Infrastructure Fault Management System for the following functions:

I. Infrastructure Fault Analysis
   a. The proposed solution must automatically discover manageable elements connected to the network and map the connectivity between them. The Network Fault Management consoles must provide the topology map view from a single central console.
   b. The proposed system must support multiple types of discovery including IP range discovery, Seed router based discovery & Trap-Based Discovery
   c. The system should provide discovery & inventory of heterogeneous physical network devices like Layer-2 & Layer-3 switches, Routers and other IP devices and do mapping of LAN & WAN connectivity with granular visibility up to individual ports level.
   d. The system must be able to support mapping and modelling of the infrastructure grouped by network connectivity, physical location of equipment and user groups or departments
   e. The system should support maps grouped by network topology, geographic locations of the equipment and user group/departments. These should help in understanding physical Network, virtual Network services and the relationships between them.
   f. The system must provide visualization tools to display network topology and device to device connectivity. The system must also be able to document connectivity changes that were discovered since the last update.
   g. The proposed solution must provide a detailed asset report, organized by vendor name and device, listing all ports for all devices. When a report is run the administrator must have an option of specifying the number of consecutive days the port must be ―unused in order for it to be considered ―available.
   h. The proposed solution should provide out of the box root cause analysis with multiple root cause algorithms inbuilt for root cause analysis.
   i. It should have a strong event correlation engine which can correlate the events on the basis of event pairing, event sequencing etc.
   j. The system must be able to “filter-out” symptom alarms and deduce the root cause of failure in the network automatically.
   k. The proposed solution must support architecture that can be extended to support multiple virtualization platforms and technologies

II. Configuration Management for Critical Network Device
   a. The system should be able to clearly identify configuration changes as root cause of network problems
   b. The proposed fault management solution must able to perform real-time or scheduled capture of device configurations
   c. The proposed fault management solution must able to store historical device configurations captured in the database and thereby enable comparison of current device configuration against a previously captured configuration as well as compare the current configuration against any user-defined standard baseline configuration policy.

III. Advanced IP Services Management for technologies like QoS and Multicast
   a. The proposed solution should be able to support response time agents to perform network performance tests to help identify network performance bottlenecks.

b. The proposed solution should be able to monitor QoS parameters configured to provide traffic classification and prioritization for reliable VoIP transport. The proposed solution should discover and model configured QoS classes, policies and behaviours.
c. The proposed solution should provide the ability to discover, map & monitor multicast sources & participating routers wherein the system should be able visualize the distribution tree in the topology map.

IV. Infrastructure-based SLA Management and Integration Requirements
a. The proposed service management system should provide a detailed service dashboard view indicating the health of each of the departments / offices in the organization and the health of the services they rely on as well as the SLAs.
b. The system must be capable of managing 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.
c. Root cause analysis of infrastructure alarms must be applied to the managed Business Services in determining service outages. SLA violation alarms must be generated to notify whenever an agreement is violated or is in danger of being violated.
d. The system must 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 must be available.
e. The proposed NMS should provide unified workflow between the fault and performance management systems including bi-directional and context-sensitive navigation
f. The system must support seamless bi-directional integration to helpdesk or trouble ticketing system
g. The proposed network fault management system should integrate with the helpdesk system by updating the Asset with CI information to support viewing history or open issues in helpdesk on the particular managed asset and associate an SLA to the ticket in the helpdesk

- Manageability Review: - The agency shall verify the manageability of the system and its supporting infrastructure deployed using the Enterprise Management System (EMS) proposed by the LSI. The manageability requirements such as remote monitoring, administration, configuration, inventory management, fault identification etc. shall have to be tested out.
- SLA Reporting System: - LSI shall design, implement/customize the Enterprise Management System (EMS) and shall develop any additional tools required to monitor the performance indicators listed under SLA prescribed in this RFP. The Acceptance Testing & Certification agency shall verify the accuracy and completeness of the information captured by the SLA monitoring system implemented by the LSI and shall certify the same. The EMS deployed for system, based on SLAs, shall be configured to calculate the monthly transaction-based pay out by Authority to LSI. The LSI may provide an end to end Service Level Management System for the Data center and Network Infrastructure to do the following:
  1. Provide end-to-end, comprehensive, modular and integrated management of IT infrastructure components to maximize the availability of IT services and SLA performance

2. The management system needs to aggregate events and performance information from the domain managers and tie them to service definitions. This capability is critical for the administrators to have a complete view of the performance and availability of various application services being managed
3. The proposed tools should automatically document problems and interruptions for various IT services offered and integrate with the service level management system for reporting on service level agreements (SLAs)
4. The system must be capable of managing 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.
5. Provide a detailed service dashboard view indicating the health of each of the departments / offices in the organization and the health of the services they rely on as well as the SLAs.
6. Provide a high level view for executives and other users of the system using a real time business services Dashboard.
7. 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.
8. Support for a User Definition Facility to define person(s) or organization(s) that uses the business Services or is a party to a service level agreement contract with a service provider or both. The facility must enable the association of Users with Services and SLAs.
9. The Service Level Agreements (SLAs) definition facility must support defining a set of one or more service Guarantees that specify the Service obligations stipulated in an SLA contract for a particular time period (weekly, monthly, and so on). Guarantees supported must 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
10. SLA violation alarms must be generated to notify whenever an agreement is violated or is in danger of being violated.
11. 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 must be available.
12. A historical reporting facility that will allow for the generation of on-demand and scheduled reports of Business Service related metrics with capabilities for customization of the report presentation.

4.17.2.5.20 AAA Specifications

1. AAA server to be hosted on leading OS platform Windows, RHEL, SUSE, CentOS
2. AAA should have LDAP for authentication and RDBMS for accounting.
3. Leading directory solution should be leveraged like Active Directory
4. Leading RDBMS software like MySQL, MSSQL, Oracle, IBM DB2 to be leveraged
5. Thin clients to be served by web servers like IIS, Apache or other industry leading web servers
6. Solution should have been lab tested for AAA transactions per second required for Hubballi-Dharwad smart city

4.17.2.5.21 O&M of all the IT hardware items

In the commercial bid template price for O&M of all the IT hardware is asked. O&M of hardware includes warranty, guarantee, necessary support and uplift.

All the IT/Electronic equipment should meet Limit 'B' of EMI/EMC specifications to mitigate the effect of EMI/EMC because of equipment functioning in close proximity.

4.17.2.5.22 Supply of Line Items in Phases

The City ICCC is being setting up in the building which will be available when the vendors comes on board. After 18 months the city ICCC will be shifted to another physical location. Considering this all the line items will be supplied in two phases.

Phase-I: Immediately after contract agreement is signed.

Phase- II: 18 Months after the contract agreement. Bidder has to supply the items of phase II at the cost mentioned in the commercial bid. Following are the line items which will be supplied after 18 months of contract signing.

- Access Control Switch
- CCTV Camera system
- Fire and Smoke Detector System

Note: If the Phase II starts after 18 months of contract signing then it will be considered at change request and payment will be made as per mutual understanding between HDSCL and bidder.

4.12.1 Other Important Technical Details and Design Parameters

4.12.1.1 Production and DR Data Center

Data Center Deployment model

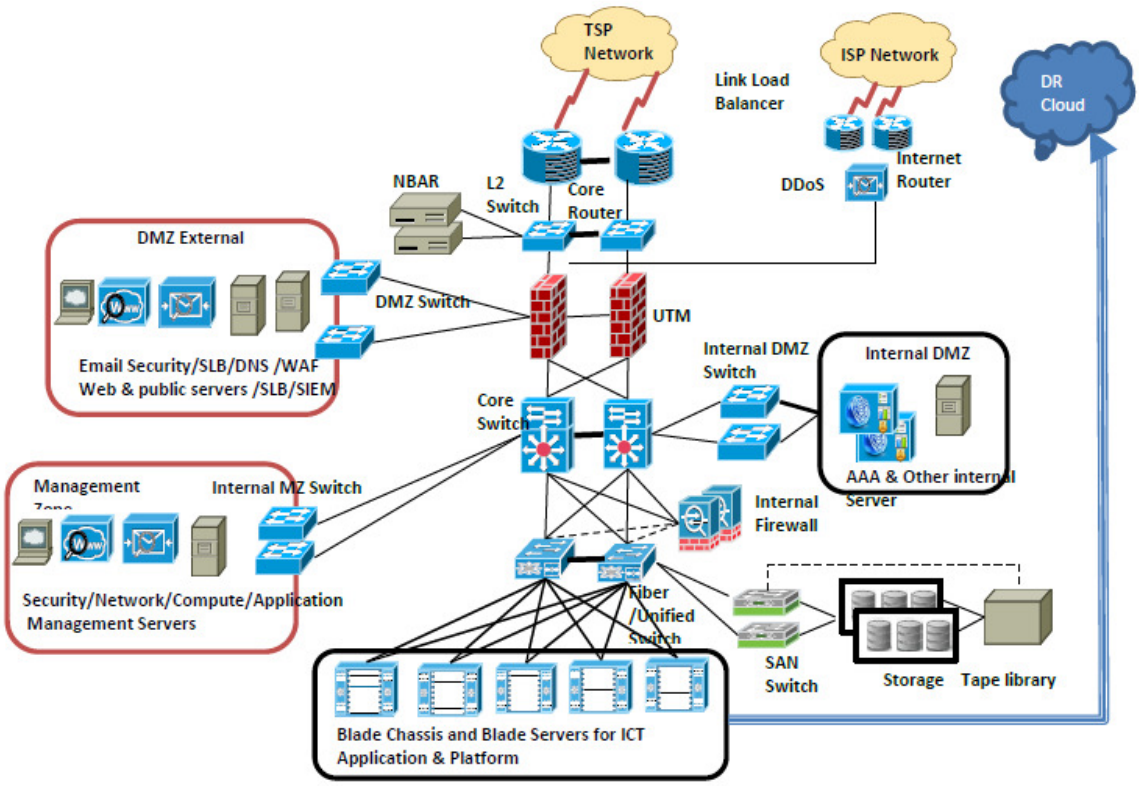
A common data center for all the smart cities of Karnataka is being built up by KUIDFC at KMDS premises. Cost of building the DC and DR will be equally shared by cities. It will be a full-fledged Tier III data center. The city shall use the Karnataka Municipal Data Society (KMDS) Data Centre for hosting the compute and storage of the city's ICCC, on a "managed service" basis. The existing infrastructure of the KMDS like firewall, Intrusion Prevention System (IPS), electricity and other requisite facilities will be utilized by HDSCL.

As it is proposed to have a converged architecture for all smart cities, there will be a common hardware and software platform viz. storage, compute, database, OS etc. and

allocation of the hardware and software will be done dynamically by KMDS, based on city requirements.

Data Centre Architecture:

The indicative architecture of centralized data center at KMDS is given below:



MSI shall be responsible for building the Centralized datacenter to meet the TIER III Standards. MSI shall design the centralized datacenter to achieve high availability, Security as per MoUD/MeitY guidelines and Scalability to meet the future requirements of the Authority. The disaster recovery (DR) to be provisioned on cloud as per MoUD guidelines. There is no provision of DR of videos feeds being stored at city level.

The Centralized Datacenter is proposed to be built to host the smart cities applications in the state of Karnataka. The smart city applications are proposed to be integrated into the Integrated Command Control Center(ICCC)/Integrated city operation Platform (ICOP). The ICOP will have multi-tenant feature to accommodate multiple cities within the application.

As per the indicated designed mentioned, security aspects like E-Mail security and DNS security etc. will be taken care by MSI. LSI does not need to cater for all the components which are already covered under the scope of MSI. This will ensure DC and DR as optimal

cost solution. For more understanding on this vendors may reach out to KUIDFC for seeking clarifications.

Database and Operating system for hosting city application at DC will be procured by LSI.

For future city applications development and integration DB and OS requirements should be mentioned in the respective RFPs.

As per the Govt. of India policy, Open source Software and tools are preferred

Disaster Recovery:

The DR centre will be on cloud basis for the initial 2 years from the go-live date and after establishment of State's own DR centre, the same shall be migrated to the State DR Centre.

The Cloud service provider will only provide compute and storage infrastructure, the LSI shall be responsible for all Operating System (OS), database and application hosting on the cloud. The LSI shall quote onetime migration cost for shifting of the OS, database and application from Cloud to the State DR centre, which shall be operated once State DR centre is established.

The Recovery Point Objective (RPO) and Recovery Time Objective (RTO) shall be application specific and the same shall be finalized after due consultation with the Stakeholders. As per the Ministry of Electronics and Information Technology (MeitY), the RPO shall be less than or equal to 2 hours and RTO shall be less than or equal to 4 hours. The key transaction data shall have RPO of 15 minutes.

The DR Service provider shall follow Ministry of Electronic and Information Technology (MEITY) guidelines.

4.12.1.2 Backup and Data Retention Policy

In today's business world, information is created and stored electronically on the computer. Therefore, the importance of creating and implementing a Backup and Data Retention Policy becomes more complicated, but extremely important in order to protect against cases of future litigation. A data retention policy provides for the systematic review, retention and destruction of data received or created in the course of business. A data backup and retention policy will identify on what media and when the backup will be taken and data that need to be maintained and contain guidelines for how long certain data should be kept.

In India there is no central act which laid down provisions related to data retention laws.

But there are different policies/guidelines issued by different agencies. It is primarily based on the type of data and use of data. In a similar way data backup and retention guidelines/ policy for data related to smart cities may be drafted.

Following are the specific applications, their related data and number of days that data to be retained, backup frequency will be daily and incremental.

SL No.	System Description	Backup Frequency	No of days data can be retained
1.	Smart IT Solid Waste Management System	Daily Incremental, weekly full, half yearly full and yearly full	1 Year
2.	Any other wherever financial transactions is taking place		1 Year
3.	Video Feeds at City Level		7 days
4.	Any other sensors/systems		30 Days

This data retention will be applicable only for the applications which are being developed and hosted and Data center, not for the applications which will be integrated with ICCC. Applications which are being integrated through APIs, their database being maintained at their primary data center not DC at KMDS.

BACKUP:

Physical media of back up should be Tape Library only. There should be no back up on hard disk drive.

4.12.1.3 Scope & Functional Specifications

- LSI is required to co-locate all the hardware/software and related items as per the design offered for the smart city infrastructure including SLA monitoring and Help desk management, in a Tier III or above data Center complying with standard guidelines as per Telecommunications Infrastructure UPTIME/TIA-942.
- The Data center shall be available for 24x7x365 operation.
- The smart city infrastructure shall have built in redundancy and high availability in compute and storage to ensure that there is no single point of failure.

5. Handholding and Training

In order to strengthen the staff, structured capacity building programs shall be undertaken for multiple levels in the organizational hierarchy like foundation process/ soft skills training to the staff for pre-defined period. Also, refresher trainings for Command Control Centre/City Operation Staff and designated Authorities & Police staff shall be a part of Capacity Building. It is important to understand that training needs to be provided to each and every staff personnel of such operation centres. These officers shall be handling emergency situations with very minimal turnaround time.

- LSI shall prepare and submit detailed Training Plan and Training Manuals to Authority/authorized entity for review and approval.
- Appropriate training shall be carried out as per the User Training Plan prepared in detail stating the number of training sessions to be held per batch of trainees, course work for the training program, coursework delivery methodologies and evaluation methodologies in detail.
- LSI shall be responsible for necessary demonstration environment setup of all ICT solutions in this RFP to conduct end user training. End user training shall include all the equipment including but not limited to all the applications and infrastructure at Operation centres, data centres & field Locations. End user training shall be conducted at a centralized location or any other location as identified by Authority with inputs from the SI.
- LSI shall conduct end user training and ensure that the training module holistically covers all the details around hardware and system applications expected to be used on a daily basis to run the system.
- LSI shall impart operational and technical training to internal users on solutions being

  implemented to allow them to effectively and efficiently use the surveillance system.
- LSI shall prepare the solution specific training manuals and submit the same to Authority for review and approval. Training Manuals, operation procedures, visual help-kit etc. shall be provided in English language.
- LSI shall provide training to selected officers of the Authority covering functional, technical aspects, usage and implementation of the products and solutions.
- LSI shall ensure that all concerned personnel receive regular training sessions, from time to time, as and when required. Refresher training sessions shall be conducted on a regular basis.

- An annual training calendar shall be clearly chalked out and shared with the Authority
  along with complete details of content of training, target audience for each year etc.
- LSI shall update training manuals, procedures manual, deployment/Installation guides etc. on a regular basis (Quarterly/ Biannual) to reflect the latest changes to the solutions implemented and new developments.
- The LSI shall ensure that training is a continuous process for the users. Basic computer awareness, fundamentals of computer systems, basic, intermediate and advanced application usage modules shall be identified by the LSI.
- Systematic training shall be imparted to the designated trainees that shall help them to understand the concept of solution, the day-to-day operations of overall solution and maintenance and updating of the system to some extent. This shall be done under complete guidance of the trainers provided by the LSI.
- Time Schedule and detailed program shall be prepared in consultation with [the Authority] and respective authorized entity (Police). In addition to the above, while designing the training courses and manuals, LSI shall take care to impart training on the key system components that are best suited for enabling the personnel to start working on the system in the shortest possible time.
- LSI is required to deploy a Master Trainer who shall be responsible for planning, designing and conducting continuous training sessions.
  LSI shall be responsible for necessary demonstration environment setup of all ICT solutions in this RFP to conduct end user training. End user training shall include all the equipment including but not limited to all the applications and infrastructure at Operation centers, data centers& field Locations. End user training shall be conducted at a centralized location or any other location as identified by Authority with inputs from the MSI.
  • LSI shall conduct end user training and ensure that the training module holistically covers all the details around hardware and system applications expected to be used on a
  daily basis to run the system.
  • LSI shall impart operational and technical training to internal users on solutions being implemented to allow them to effectively and efficiently use the surveillance system.
  • LSI shall prepare the solution specific training manuals and submit the same to Authority for review and approval. Training Manuals, operation procedures, visual help-kit etc. shall be provided in English language.

Considering that the COP and DC are provided by the MSI it is essential for MSI also to be part of the training to impart sufficient knowledge regarding the same. The engaging authority for MSI will be KMDS

- Training sessions and workshops shall comprise of presentations, demonstrations and hands-on mandatorily for the application modules.
- Authority shall be responsible for identifying and nominating users for the training.

  However, LSI shall be responsible for facilitating and coordinating this entire process.
- LSI shall be responsible for making the feedback available for the Authority/authorized entity to review and track the progress, In case, after feedback, more than 30% of the respondents suggest that the training provided to them was unsatisfactory or less than satisfactory then the SI shall re-conduct the same training at no extra cost.

Type of Trainings

- Following training needs is identified for all the project stakeholders:

1. **Basic IT training:** This module shall include components on fundamentals of:
   - Computer usage,
   - Network,
   - Desktop operations,
   - User admin,
   - Application installation,
   - Basic computer troubleshooting etc.
2. **Initial Training as part of Project Implementation**

- Functional Training
  - Basic IT skills
  - Software Applications (City Operation Centre and Command & Control Centre)
  - Networking, Hardware Installation
  - Centralized Helpdesk
  - Feed monitoring
- Administrative Training
  - System Administration Helpdesk, FMS, BMS Administration etc.
  - Master trainer assistance and handling helpdesk requests etc.
- Senior Management Training
  - Usage of all the proposed systems for monitoring, tracking and reporting,

- MIS reports, accessing various exception reports

3. Post Implementation Training

- Refresher Trainings for the Senior Management
- Functional/Operational training and IT basics for new operators
- Refresher courses on System Administration
- Change Management programs

6. Project Implementation Timelines

List of the broad activities to be carried out by the Systems Integrator and the timelines from the date of Work Order are given in the table below. "T1" stands for the Date of signing the contract.

B. Activity		Individual phases of the activities	Timeline
		Phase-I (270 Days)	
1	Resource Mobilization	• Resource Mobilization	T1+15 Days
2	Implementation of ICT Solid Waste Management Application, and Fire emergency management (GPS installation for fire vehicle tracking)	• Inception Report • SOPs and Use-Cases for integration of individual ICT application with Common Command and Control Application	T1+30 Days
		Procurement of the hardware & software infrastructure required for : • Implementation of Solution Components • Set-up of Command and Control Centre	T1+45 days
		FRS, SRS for implementation and integration of individual ICT application with Common Command and Control Application	T1+60 Days
		*Data Centre, DR & Common Operating Platform availability (**Note**: * - ***In the scope of MSI***)	T1+60 days
		Installation & Commissioning of field devices and H/W , S/W required at the Command and Control Centre	T1+90 days
		Development and Testing of standalone application	T1+120 Days
		Testing of Application Integration	T1+150 Days
		Completion of Integration with UAT sign off	T1+ 180 Days

3	Integration of Common Command and Control Application (SOPs, Use Cases, FRS, SRS, Integration Testing) with	ICT Solid Waste Management Application	T2+270 days
		City Surveillance (Police Feed)	
		Intelligent Public Transport System	
		Intelligent Traffic Management	
		Smart Parking	
		VMS	
		e-Governance	
		Geographical Information System (GIS)	
4	Phase I operationalization & Go-Live	Go-Live	T1+270 days
Phase – II (271-450 Days)			
5	Phase II Implementation of Geographical Information System (GIS)	SOPs and Use-Cases for integration of individual ICT application with Common Command and Control Application	T1+300 Days
		Procurement of the residual/ additional hardware & software infrastructure required from phase I	T1+315 days
		FRS, SRS for implementation and integration of individual ICT application with Common Command and Control Application	T1+345 Days
		Installation & Commissioning of field devices	T1+360 days
		Development and Testing of standalone application	T1+390 Days
		Testing of Application Integration	T1+420 Days
		Completion of Integration with UAT sign off	T1+ 450 Days
6	Integration of Common Command and Control Application (SOPs, Use Cases, FRS, SRS, Integration Testing) with	Integration of City surveillance (Other than police feed) with City ICCC. Provision to see live feeds at authorized places.	T1+ 450 Days (271-450 Days)
		Street Light Control	

		Digital Signage (ABD Area)	
		Variable Messaging System (ABD Area)	
		Geographical Information System (GIS)	
		e-Governance	
		Water SCADA	
		Fire, Emergency and Disaster Management	
7	Phase II operationalization & Go-Live	Go-Live	T1+450 days

7. Project Deliverables

#	Key Activities	Deliverables
Project Inception Phase		
1	Project Kick Off	1. Project Development Plan 2. Risk Management and Mitigation Plan
2	Deployment of manpower	
Requirement Phase		
3	Assess the requirement of IT Infrastructure and Non IT Infrastructure	1. Functional Requirement Specification Document 2. System Requirement Specification document (SyRS) 3. Requirements Traceability Matrix 4. Site Survey Report
4	Assessment of Business processes	
5	Assessment of requirement of Software requirements	
6	Assess the Integration requirement	
7	Assess the connectivity requirement for field locations (including Building)	
8	Assessment the Network laying requirement	
9	Assessment of training requirement	
Design Phase		
10	Formulation of Solution Architecture	1. Final Bill of Quantity 2. HLD documents 3. LLD documents 4. Application architecture documents. 5. Concept of Operations (CONOPS) 6. Technical Architecture documents. 7. Network Architecture documents. 8. ER diagrams and other data modeling documents. 9. Logical and physical database design. 10. Data dictionary and data definitions. 11. GUI design (screen design, navigation, etc.). 12. Test Plans 13. SoPs 14. Change management Plan
11	Creation of Detail Drawing	
12	Detailed Design of Smart City Solutions and CONOPS (Concept of Operations)	
13	Development of test cases (Unit, System Integration and User Acceptance)	
14	Preparation of final bill of quantity and material	
15	SoP preparation	
16	Helpdesk setup	1. IT and Non IT Infrastructure Installation Report 2. Completion of UAT and closure of observations
17	Procurement of Equipment , edge devices, COTS software (if any), Licenses	
18	IT and Non IT Infrastructure Installation	

#	Key Activities	Deliverables
19	Development, Testing and Production environment setup	report 3. Training Completion report 4. Application deployment and configuration report
20	Network connectivity (All activities other that bandwidth provisioning)	
21	Software Application customization	
22	Development of Bespoke Solution (if any)	
23	Integration with Third party services/application (if any)	
24	Unit and User Acceptance Testing	
25	Preparation of User Manuals , training curriculum and training materials	
26	Role based training(s) on the Smart City Solutions	
Integration Phase		
27	SoP of implementation	1. Integration Testing Report
28	Integration with GIS and Command and Control Centre	
29	Other Integrations	
Go –Live		
30	Go Live	1. Go-Live Report
Operation and Maintenance		
31	Operation and Maintenance of IT, Non IT infrastructure and Applications	1. Detailed plan for monitoring of SLAs and performance of the overall system 2. Fortnightly Progress Report 3. Monthly SLA Monitoring Report and Exception Report 4. Quarterly security Report 5. Issues logging and resolution report
32	SLA and Performance Monitoring	
33	Logging, tracking and resolution of issues.	
34	Application enhancement	
35	Patch Updates	
36	Helpdesk services	

8. Payment Terms and Schedule

1. The request for payment shall be made to the Authority in writing, accompanied by invoices describing, as appropriate, the services performed, and by the required documents submitted pursuant to general conditions of the contract and upon fulfilment of all the obligations stipulated in the Contract.
2. Due payments shall be made promptly by the Authority, generally within Forty Five (45) days after submission of an invoice or request for payment by SI
3. The currency or currencies in which payments shall be made to the SI under this Contract shall be Indian Rupees (INR) only.
4. All remittance charges shall be borne by the SI.
5. In case of disputed items, the disputed amount shall be withheld and shall be paid only after settlement of the dispute.
6. Any penalties/ liquidated damages, as applicable, for delay and non-performance, as mentioned in this RFP document, shall be deducted from the due payments of the respective milestones.
7. Taxes, as applicable, shall be deducted / paid, as per the prevalent rules and regulations

8.1 Payment Schedule

Payment to LSI after successful completion of the target milestones (including specified project deliverables), shall be made as under:

	Scope of Work	**Payment Terms**	**Required Documentation for release of Payment**
A. Application Development			
1	Upon finalization of SRS, FRS & SDD	10% of CAPEX value of City Specific Application	• HLD documents • LLD documents • Application architecture documents • Technical Architecture documents. • Network Architecture documents. • ER diagrams and other data modeling documents. • Logical and physical database design. • Data dictionary and data definitions. • GUI design (screen design, navigation, etc.). • Test Plans • SoPs • Change management Plan
2	Development of Application	30% of CAPEX value of City Specific Application	Application deployment and configuration report

3	Integration with ICOP Platform	30% of CAPEX value of City Specific Application	Integration Testing Report
4	System Acceptance & Go-Live	30% of CAPEX value of City Specific Application	System Go-live Certificate by Authority
	B. Hardware Components		
1	Design & Supply of all the components as per the Volume II of the RFP.	30 % of the Capex Value of the Hardware Components	• Equipment Delivery Challans • As-built Drawings
2	Installation & Commissioning of all the components as per the Volume II of the RFP.	40 % of the Capex Value of the Hardware Components	• Configuration Document • Self-Certification by LSI for Completion. • Manuals for each equipment • Verification Document by the Authority / Representatives
3	System Acceptance & Go-Live	30% of CAPEX value of Hardware Components	System Go-live Certificate by Authority
	C. Operation & Maintenance Period		
1	Operations & Maintenance phase for a period of 60 months from the date of Go Live.	OPEX Value in equal quarterly installments	• EMS Reports measuring the Uptime of the H/W Components, Application. • Resolution per ticket opened and SLA Measurement Report

9. SERVICE LEVELS

The purpose is to define the levels of service provided by LSI to the Authority for the duration of the contract.

- Start a processthat monitors the aspect of performance.
- Intimate the authority on the drops of performance below the threshold defined by the Authority
- Help Authority control the levels and performance of MSI's services

The Service Levels are between the Authority and LSI.

9.1 Service Level Agreements & Targets

- This section is agreed to by Authority and LSI as the key performance indicator for the project. This may be reviewed and revised according to the procedures detailed in Clause 64- SLA Change Control.
- The following section reflects the measurements to be used to track and report system's performance on a regular basis. The targets shown in the tables Clause 61 of this RFP are for the period of contract.
- The procedures in Clause 26 shall be used if there is a dispute between Authority and LSI on what the permanent targets should be.

9.2 Service Level Monitoring

- Service Level parameters defined in Clause 61 shall be monitored on a periodic basis, as per the individual parameter requirements. The Authority will arrange for providing appropriate web based SLA measurement and monitoring tools with requisite number of credentials. The LSI needs to provide all requisite access to the Authorities designated personnel for configuring all the associated components with the SLA management software. Authority shall also have the right to have an independent technical auditor, third party appointed by the authority for monitoring the Service levels. LSI shall be expected to take immediate corrective action for any breach in SLA. In case issues are not rectified to the complete satisfaction of Authority, within a reasonable period of time defined in this RFP, then the Authority shall have the right to take appropriate penalizing actions, or termination of the contract.
- Performance Penalty for not meeting a measurement parameter for any two months in consecutive quarters shall result in twice the penalty percentage of that respective measurement parameter in the third quarter for all the three months at the discretion of the Authority.
- Maximum Penalty applicable for any quarter shall not exceed 10% of the 'applicable fees' for the respective quarter.
- Three consecutive quarterly deductions of 10% of the applicable fee on account of any reasons shall be deemed to be an event of default and termination as per Clause 48 of this Section of RFP respectively and the consequences as provided in Clause 49 of this section of RFP shall follow at the discretion of the Authority.
- The payment to the agency shall be on Quarterly basis as stated in the RFP.
- For purposes of the SLA, the definitions and terms as specified in the document along with the following terms shall have the meanings set forth below:

    a) "Total Time" - Total number of hours in the quarter (or the concerned period) being considered for evaluation of SLA performance.

b) "Uptime" – Time period for which the specified services/ outcomes are available in the period being considered for evaluation of SLA.

c) "Downtime"- Time period for which the specified services/ components/ outcomes are not available in the concerned period, being considered for evaluation of SLA, which would exclude downtime owing to Force Majeure & Reasons beyond control of the successful bidder.

d) "Scheduled Maintenance Time" - Time period for which the specified services/ components with specified technical and service standards are not available due to scheduled maintenance activity. MSI is required to take at least 10 days prior approval from the authority for any such activity. The scheduled maintenance should be carried out during non-peak hours (like post mid-night, and should not be for more than 4 hours. Such planned downtime would be granted max 4 times a year.

e) "Incident" - Any event / abnormalities in the service being rendered, that may lead to disruption in normal operations and services to the end user.

9.3Measurement & targets

9.3.1 Implementation phase related performance levels

	Activity		Individual phases of the activities	Timeline	Penalty for delay
Phase-I (270 Days)					
1	Resource Mobilization	•	• Resource Mobilization	T1+15 Days	Delay of one week, 0.05% of Contract Value Delay of Two week, 0.075% of Contract Value Subsequent delay will result in deduction of 0.1% of Contract Value
2	Implementation of ICT enabled Solid Waste Management Application, Smart Parking, Intelligent Traffic Management System, VMS, Smart meters , environmental		• Inception Report • SOPs and Use-Cases for integration of individual ICT application with Common Command and Control Application	T1+30 Days	0.5% of the Total Capex for the activity per week of delay or part thereof upto maximum of 10% of the Capex.

	Activity		Individual phases of the activities	Timeline	Penalty for delay
	sensors, Digital bill boards, Wi-hotspots, Command and Control Center, PIS		Procurement of the hardware & software infrastructure required for : • Implementation of Solution Components • Set-up of Command and Control Centre	T1+45 days	0.5% of the Total Capex for the activity per week of delay or part thereof upto maximum of 10% of the Capex.
			FRS, SRS,LLD, HLD, CONOPS, for implementation and integration of individual ICT application with Common Command and Control Application	T1+60 Days	0.5% of the Total Capex for the activity per week of delay or part thereof upto maximum of 10% of the Capex.
			Installation & Commissioning of field devices and H/W , S/W required at the Command and Control Centre	T1+90 days	0.5% of the Total Capex for the activity per week of delay or part thereof upto maximum of 10% of the Capex.
			Development and Testing of standalone application	T1+120 Days	0.5% of the Total Capex for the activity per week of delay or part thereof upto maximum of 10% of the Capex.
			Testing of Application Integration	T1+150 Days	0.5% of the Total Capex for the activity per week of delay or part thereof upto maximum

	Activity		Individual phases of the activities	Timeline	Penalty for delay
					of 10% of the Capex.
			Completion of Integration with UAT sign off	T1+ 180 Days	0.5% of the Total Capex for the activity per week of delay or part thereof upto maximum of 10% of the Capex.
3	Integration of applications at Common Operating platform		ICT Solid Waste Management Application	T1+270 days	0.5% of the Total Capex for the activity per week of delay or part thereof upto maximum of 10% of the Capex.
			City Surveillance (Police Feed)		
			Intelligent Public Transport System		
			Intelligent Traffic Management		
			Smart Parking		
			VMS		
			e-Governance		
			Smart Water Meters		
			Digital Bill Boards		
			Wi-Fi Hotspots		
			Fire & Emergency Management		
			Geographical Information System (GIS)		
4	Phase I operationalization & Go-Live		Go-Live	T1+270 days	
Phase – II (271-450 Days)					
5	Phase II implementation of Physical infrastructure for Smart Parking, ICT		Procurement of the residual/ additional hardware & software	T1+315 days	0.5% of the Total Capex for the activity per week of delay or part thereof

	Activity		Individual phases of the activities	Timeline	Penalty for delay
	enabled Solid Waste Management, Intelligent Traffic Management System, VMS, Digital bill boards, Wi-hotspots, PIS, Network components for city surveillance		infrastructure required from phase I		upto maximum of 10% of the Capex.
			Installation & Commissioning of field devices	T1+360 days	0.5% of the Total Capex for the activity per week of delay or part thereof upto maximum of 10% of the Capex.
6	Integration of applications at Common Operating platform		Integration of City surveillance (Feed from other cameras installed in the city apart from the police feed) with City ICCC.	T1+ 450 Days	0.5% of the Total Capex for the activity per week of delay or part thereof upto maximum of 10% of the Capex.
			Emergency and Disaster Management		
			Smart Street Lighting		
			e-Governance		
			Water SCADA		
			Geographical Information System (GIS)		
7	Phase II operationalization & Go-Live		Go-Live	T1+450 days	0.5% of the Total Capex for the activity per week of delay or part thereof upto maximum of 10% of the Capex.

9.3.2 Operation & Maintenance Period Penalty

Sl No	Measurement	Definition	Target	Penalty
1.	CCC H/W Infrastructure including 1. Work Stations 2. Video Wall 3. CCTV Cameras 4. Phones	Overall CCC Components Availability will be measured by following formula: Component Availability (%) = (Total minutes during the month – Planned downtime - Downtime minutes during the month) *100 / Total minutes during the month Total Time shall be measured 24x7 basis for CCC. Measurement Tool: Reports from EMS preferably open source, under the scope of LSI,	>=99.982%	a) <99.982% to >= 99.9% - 1% of QP b) <99.9% to >= 99.75% - 2% of QP c) Subsequently, for every 0.25% drop in SLA criteria - 2% of QP upto maximum of 10% of the QP d) Beyond 10% will be treated as Events of Default as per the Section B clause 47 of Volume III and occurrence of the same in consecutive two Quarters will lead to Termination of the Contract as per Section B, clause 48 of the Volume III.
2.	Availability of city Specific Smart Application Software 1. Variable Message System 2. Environmental Sensors 3. Intelligent Traffic 4. Smart Parking 5. Smart SWM 6. Smart Meters 7. Environmental sensors 8. Integrated Operation Platform 9. Digital Bill boards 10. Wi-Fi Hotspots	Availability of each Application to be measured separately and penalty will be calculated accordingly. The Uptime will be measured by following formula: Component Availability (%) = (Total minutes during the month – Planned downtime - Downtime minutes during the month) *100 / Total minutes during the month Total Time shall be measured 24x7 basis for CCC.	>=99.982%	a) <99.982% to >= 99.9% - 1% of QP b) <99.9% to >= 99.75% - 2% of QP c) Subsequently, for every 0.25% drop in SLA criteria - 2% of QP upto maximum of 10% of the QP d) Beyond 10% will be treated as Events of Default as per the Section B, clause 47 of Volume III and occurrence of the same in consecutive two Quarters will lead to Termination of the Contract as per Section B, clause 48 of the Volume III of the RFP.

Sl No	Measurement	Definition	Target	Penalty
		Measurement Tool: Reports from EMS tool in the scope of MSI		
3.	Availability of field infrastructure including 1. GPS/GSM Unit 2. GPS based handheld/ Mobile Device 3. Environmental Sensors 4. Bulk Flow Meters 5. Traffic Controllers 6. Variable Message System/ PIS 7. Cameras 8. Wi-Fi Hotspots 9. Digital Bill boards 10. Water meters/ Sensors 11. Other Equipment	Availability of each Application to be measured separately and penalty will be calculated accordingly. The Uptime will be measured by following formula: Component Availability (%) = (Total minutes during the month – Planned downtime - Downtime minutes during the month) *100 / Total minutes during the month Total Time shall be measured 24x7 basis for CCC. Measurement Tool: Reports from EMS	>=99.982%	a) <99.982% to >= 99.9% - 1% of QP b) <99.9% to >= 99.75% - 2% of QP c) Subsequently, for every 0.25% drop in SLA criteria - 2% of QP upto maximum of 10% of the QP d) Beyond 10% will be treated as Events of Default as per the Section B, clause 10of Volume III and occurrence of the same in consecutive two Quarters will lead to Termination of the Contract as per Section B, clause 48 of the Volume III.
4.	**Camera feed and quality wherever required**			
5a	Ratio of Live cameras v/s Total Cameras at any point of time (To be measured every 1 hour)	Number of live working cameras divided by total number of cameras Measurement Tool: Log from VMS tools wherein alerts to the control room shall be generated on non-functioning of camera	>=99.982%	a) <99.982% to >= 99.9% - 1% of QP b) <99.9% to >= 99.75% - 2% of QP c) Subsequently, for every 0.25% drop in SLA criteria - 2% of QP upto maximum of 10% of the QP d) Beyond 10% will be treated as Events of Default as per the Section B, clause 47 of Volume III and occurrence of the same

Sl No	Measurement	Definition	Target	Penalty
				in consecutive two Quarters will lead to Termination of the Contract as per Section B clause 48 of the Volume III.
5b	Average Frame rate maintained for viewing	Average frame rate is 25 FPS to be maintained by all cameras calculated on a Monthly Basis Measurement tool: Log from VMS	>=99.982%	a) <99.982% to >= 99.9% - 1% of QP b) <99.9% to >= 99.75% - 2% of QP c) Subsequently, for every 0.25% drop in SLA criteria - 2% of QP upto maximum of 10% of the QP d) Beyond 10% will be treated as Events of Default as per the Section B, clause 47 of Volume III and occurrence of the same in consecutive two Quarters will lead to Termination of the Contract as per Section B clause 48 of the Volume III.
5c	Average Frame rate maintained for Recording	Average frame rate is 12.5 FPS to be maintained by all cameras calculated on a Monthly Basis Measurement tool: Log from VMS	>=99.982%	a) <99.982% to >= 99.9% - 1% of QP b) <99.9% to >= 99.75% - 2% of QP c) Subsequently, for every 0.25% drop in SLA criteria - 2% of QP upto maximum of 10% of the QP d) Beyond 10% will be treated as Events of Default as per the Section B clause 47 of Volume III and occurrence of the same in consecutive two

Sl No	Measurement	Definition	Target	Penalty
				Quarters will lead to Termination of the Contract as per Section B, clause 48 of the Volume III.
	Video stream Latency	Time required for transmission of video feed from one point to another applicable to each camera. The Penalty will be calculated on the average time calculated over the Quarter. Measurement tool: Report from EMS	≤40ms	a) <40ms to >= 42 ms- 1% of QP b) <42ms to >= 44 ms - 2% of QP c) Subsequently, for every ms drop in SLA criteria - 1% of QP upto maximum of 10% of the QP d) Beyond 10% will be treated as Events of Default as per the Section B clause 47 of Volume III and occurrence of the same in consecutive two Quarters will lead to Termination of the Contract as per Section B clause 48 of the Volume III.
	Change of Screen from one camera Source to another	Time required for transmission of screen from one camera source to another Measurement tool: Log from VMS	≤2s	a) <2s to >= 3s- 1% of QP b) <3s to >= 4 s - 2% of QP c) Subsequently, for every second drop in SLA criteria - 1% of QP upto maximum of 10% of the QP d) Beyond 10% will be treated as Events of Default as per the Section B clause 47 of Volume III and occurrence of the same in consecutive two Quarters will lead to

Sl No	Measurement	Definition	Target	Penalty
				Termination of the Contract as per Section B clause 48 of the Volume III.
	Video Feed Query Retrieval Response Time	Time taken for receiving response to a query raised for video feed Measurement tool: Log from VMS	≤10s	a) <10s to >= 12s- 1% of QP b) <12s to >= 14 s - 2% of QP c) Subsequently, for every second drop in SLA criteria - 1% of QP upto maximum of 10% of the QP d) Beyond 10% will be treated as Events of Default as per the Section B clause 47 of Volume III and occurrence of the same in consecutive two Quarters will lead to Termination of the Contract as per Section B clause 48 of the Volume III.

9.3.3 Measurement of Response and Resolution

9.3.3.1 Deducts for Non Performance (Penalty) for Critical Components:

MTTR per Quarter	Fixed Penalty for Breach upto 2 hours buffer.	Additional penalty for every Delayed hour
1-2 Calls not meeting MTTR .	1% of Quarterly Payment	0.1 % of Quarterly Payment
3-5 calls not meeting MTTR	5% of Quarterly Payment	0.1 % of Quarterly Payment
6-10 calls not meeting MTTR	10 % of Quarterly Payment	0.1 % of Quarterly Payment
>10 Calls not meeting MTTR	will be treated as Events of Default as per the Section B clause 47 of Volume III and	

MTTR per Quarter	Fixed Penalty for Breach upto 2 hours buffer.	Additional penalty for every Delayed hour
	occurrence of the same in consecutive two Quarters will lead to Termination of the Contract as per Section B clause 48 of the Volume III.	

The Critical Component includes

- **Server H/W**
- **Storage**
- **Networking Components**
- **Security Components**
- **CCC Room H/W**
- **OS and Databases**
- **All the city Specific applications**

9.3.3.2 Deducts for Non Performance (Penalty) for Non- Critical Components:

MTTR per Quarter	Fixed Penalty for Breach upto 6 hours buffer.	Additional penalty for every Delayed hour
1-2 Calls not meeting MTTR .	0% of Quarterly Payment	0.1 % of Quarterly Payment
3-5 calls not meeting MTTR	1% of Quarterly Payment	0.1 % of Quarterly Payment
6-10 calls not meeting MTTR	5 % of Quarterly Payment	0.1 % of Quarterly Payment
10-14 Calls not meeting MTTR	10 % of Quarterly Payment	
>15 Calls not meeting MTTR	will be treated as Events of Default as per the Section B clause 47 of Volume III and occurrence of the same in consecutive two Quarters will lead to Termination of the Contract as per Section B clause 48 of the Volume III.	

The Non-Critical Component includes

- **Camera**
- **GPS**

- **Other City Specific Field Level Components**

9.4Reporting Procedures

- LSI representative shall prepare and distribute Service level performance reports in a mutually agreed format by the 5th working day of subsequent month. The reports shall include "actual versus target" Service Level Performance, a variance analysis and discussion of appropriate issues or significant events. Performance reports shall be distributed to Authority management personnel as directed by Authority.
- Also, LSI may be required to get the Service Level performance report audited by a third-party Auditor appointed by the Authority.

9.5Issue Management Procedures

General

This process provides an appropriate management structure for the orderly consideration and resolution of business and operational issues in the event that quick consensus is not reached between Authority and LSI.

Implementing such a process at the beginning of the outsourcing engagement significantly improves the probability of successful issue resolution. It is expected that this pre-defined process shall only be used on an exception basis if issues are not resolved at lower management levels.

Issue Management Process

- Either Authority or LSI may raise an issue by documenting the business or technical problem, which presents a reasonably objective summary of both points of view and identifies specific points of disagreement with possible solutions.
- Any unresolved issues/disputes concerning the Project/Contract between the Parties shall first be referred in writing to the Project Manager for his consideration and resolution. If the Project Manager is unable to resolve any issue/dispute within 5 days of reference to them, the Project Manager shall refer the matter to the Program Management Committee. If the Program Management Committee is unable to resolve the issues/disputes referred to them within 15 days the unresolved issue/dispute shall be referred to Steering Committee/high powered committee/Project Implementation Committee for resolution. The Steering Committee within 30 days of reference to them shall try to resolve the issue/dispute.
- If the Steering Committee fails to resolve a dispute as per the above clause, the same shall be referred to arbitration. The arbitration proceedings shall be carried out as per the Arbitration procedures mentioned in Clause 26 of this section of RFP.

9.6Service Level Change Control

General

It is acknowledged that this **Service levels may change as Authority'sbusiness needs evolve over the course of the contract period**. As such, this document also defines the following management procedures:

a. A process for negotiating changes to the Service Levels

b. An issue management process for documenting and resolving particularly difficult issues.

c. Authority and LSI management escalation process to be used in the event that an issue is not being resolved in a timely manner by the lowest possible level of management.

   Any changes to the levels of service provided during the term of this Agreement shall be requested, documented and negotiated in good faith by both parties. Either party can request a change.

Service Level Change Process: The parties may amend Service Level by mutual agreement in accordance. Changes can be proposed by either party. Unresolved issues shall also be addressed. SI's representative shall maintain and distribute current copies of the Service Level document as directed by Authority. Additional copies of the current Service Levels shall be available at all times to authorized parties.

Version Control/Release Management: All negotiated changes shall require changing the version control number. As appropriate, minor changes may be accumulated for periodic release or for release when a critical threshold of change has occurred.

10.0 Integration Capabilities

1) The ICCC will aggregate various data feeds from sensors and systems and further process information out of these data feeds to provide interface /dashboards for generating alert and notifications in real time.

2) The ICCC would also equip city administration to respond quickly and effectively to emergency or disaster situation in city through Standard Operating Procedures (SOPs) and step-by-step instructions. The ICCC shall support and strengthen coordination in response to incidents/emergencies/crisis situations.

3) Single Dashboard for City Infrastructure Management & Smart City Services for Smart Lighting, Parking System, GIS Services and Other Services of Municipality work visualized real time on 2D/3D map of City. This dashboard can be accessed via web application as well as mobile app. The various information that may be accessed from the system but not limited to are as below:

   - Visual alerts generated by any endpoint that is part of the city infrastructure e.g. Surveillance cameras, City lights or any other sensors that manages various city management use cases. (integration with existing city surveillance project by Ahmedabad Traffic police)
   - Access information of water management resources (Disaster management cell at Hubbali - Dharwad will provide the details)
   - Information about waste management resources
   - Various citizen services e.g. Land records, Municipality tax, billing etc.
   - City environmental data
   - Take action based on events generated by any city infrastructure device

4) The system shall provide reporting & audit trail functionalities to track all the information and monitor operator interactions with the system and to impart necessary training to the users

5) Sample Use Cases describing the need of integrated systems are:
   a. **Urban Flooding Scenario**: The water level sensors (used for flood detection on streets) will send the ambient water levels accumulated on the street to the CCC through the available connectivity. The CCC shall baseline the existing water level and rainfall prediction with erstwhile flood levels to generate an alert for flooding. This alert will then be passed over to the citizens through the variable messaging displays and public address system to warn them of possible flooding in a locality.

b. **Evacuating Hazardous places in event of fire**: As soon as the Command Center is intimated of a fire through any of the available channels, Fire tenders shall be dispatched to the location along with guidance for shortest path to the accident site. The Fire tender's journey time shall be optimized by providing the best possible green corridor through ATCS (area Traffic Control System). Event trigger shall be also sent to nearest Police Station & nearby hospitals. IP based public address system will be triggered to vacate the nearby fuel stations (if there is any) to reduce the extent of casualty. Information will be passed over trauma centers in the vicinity to prepare for increased number of emergency care patients.

11.0 Other Requirements

Security: In no circumstances this data accumulated and processed by Command and Control should be compromised. Hence provisions will be made to keep all the data stored in this platform highly secured with required Security framework implementation. The platform will be hosted in Data center (KMDS) at location decided by HDSCL.

12.0 Annexure- I: List of Locations

List of locations for Surveillance Cameras

S. No.	Name of Location	Total Cameras
East PS 12		
	Sarvodaya Cross	2
	Desai Cross	1
	Court Cross	1
	Brundavan Circle	1
	K C Circle	1
	Pinto	2
	Chitagubbi Circle	1
	Neligen Road Cross	1
	Kamaripeth Cross	1
	Gadag Road Under Bridge	1
North PS 14		
	ACP Office Cross	1
	Laxmi WI Bridge	1
	Shanbhag Cross	1
	MT Mill	1
	Vanivillas Cros	1
	Hosur	2
	Mafsal Depot Cross	1
	Akshay Parl Cross	1
	Shirur Park Cross	1
	Bhagat Singh Circle	1
	Sharad Bhavan	1
	Unkal Cross	1
	Srinagar Cross	1
South PS 08		
	Ganesh Peth Cross	1
	New English Cross	1
	Old HBL Durgad Bail	1

	Bankapur Circle	2
	Indi Pump	2
	Ahimsa Circle Near Old Hubballi Durga Bail	1
East PS 02		
	Kamaripeth PS Cross	1
	Gadag Road Railway Under Bridge	1
North PS 05		
	Shirpur Park Cross	1
	Bhagat Singh Circle	1
	Sharada Bhavan	1
	Unkal Cross	1
	Shri Nagar Cross	1
South PS 01		
	Old Hubballi Durgad Bail	1
Dharwad PS 03		
	Saptapur Bhavi Cross	1
	DWD C. B. T. Bus Stop	1
	Kamat Hotel	1
Dharwad PS 12		
	Toll Naka Cross	2
	Court Cross	2
	Jublee Circle	2
	Vivekananda Cross	1
	Old SP Office Cross	1
	KCD Circle	1
	CBT Bus Stop	1
	Saptapur Bhavi Cross	1
	Kamat Hotel	1
	Total Surveillance Cameras	57

List of locations for Watch Towers

S. No.	Name of Location	Total Cameras
	East PS 02	
	Sarvodaya Circle	4
	KC Circle	4
	North PS 04	
	Shanbag Cross	4
	Kshya Park Cross	4
	Airport	4
	Akshya Colony	4
	South PS 10	
	New English School	4
	Bankapur Chowk	4
	Indi Pump	4
	Gabbur Bypass	4
	Nekar Nagr Circle	4
	Banatikatti Circle	4
	New Durgad Bail Circle	4
	Hubballi C. B. T.	4
	Mukeri Galli	4
	Dakappa Circle	4
	Dharwad PS 06	4
	Shivaji Circle	4
	Jublee Circle	4
	Tejashwini Nagr	4
	Line Bajar	4
	Bhusappa Chowk	4
	K. C. C. Circle	4
	Total Watch Tower Cameras	88

List of Locations for SMART Parking & MLCP

Following is the list of locations for on-street parking:

Package No.	Road	Parking Stretch	Length	Pvt. Parking	Tendered Length	Vehicle Type
Package 2	Kopikkar Road	Kathariya Shop to Geetanjali Shop	48		48	Two wheeler
		Geetanjali Shop to Shri Tailar	108	8	100	Four wheeler
		Karavali Hotel Cross to Setlight Building	120		120	Four wheeler
		Setlight buidling to Axid Battery	50	9	41	Two wheeler
		Axid Battery to Vennessions Cross	76	4	72	Four wheeler
Package 3	Bradway	Metrani Building to Durgad bail Auto Stand	38		38	Four wheeler
Package 4	Coin Road	Kathariya Shop to New Sukhsagar Hotel	106		106	Two wheeler
		Shreyas Hospital to Sudarshan Takies	20		20	Two wheeler
Package 5	Durgad bail	Sarround Durgad bail circle	120		120	Four wheeler
Package 7	Station Road	Parag cross to Jain temple	60		60	Two wheeler
		Roopam Takies to Jain Temple	105	5	100	Four wheeler
		Jain Temple to Shrungar Taikes	105	10	95	Two wheeler
		Chandrakala Taikes to Ayanagar Bekary	54		54	Four wheeler
		Ayanagar Bekary to Onida Show room	50		50	Two wheeler
		Onida Show room to Sai Mobile Shop	36	6	30	Four wheeler
		Sai Mobile shop too Ganeshpet Police station	29		29	Two wheeler
		Ranajeet Trading Company to Niranjan Cycle Shop	46		46	Four wheeler

		Niranjan Cycle shop to Bakalegalli shop	46		46	Two wheeler
Package 9	Subhas Road	Gheesulal Shop to Rege shop	16		16	Two wheeler
		Gheesulal Shop opp	30		30	Four wheeler
		Busstand circle to Kandkur Shop cross	82		82	Two wheeler
		Marudar Aravatagi to Shivsagar hotel	34		34	Four wheeler
		Shahar police station gate to Police quarters gate	70		70	Four wheeler
		Super market first gate to Super market second gate	67		67	Four wheeler
		KCC bank to gandhi chowk	84		84	Two wheeler
		Naveen footwear to Vijayalaxmi gift centre	25		25	Four wheeler
		KCC bank to social library	60	10	50	Two wheeler
		Manisha saree centre to Kamat hotel	65		65	Two wheeler
		Silection center shop to Uday shooting shop	67		67	Four wheeler
		Mahendrakar Saree centre to Vernekar Jewlers	28		28	Two wheeler
		New show track to paste sweets shop	11		11	Two wheeler
		Shivsagar Hotel to Durga hotel	41		41	Two wheeler
Package 10	Railway station Road Dharawad	BDO office to court circle	152		152	Two wheeler
		BDO office to court circle	142		142	Two wheeler
	Laxmi Talkies Road	Laxmi talkies to Sangam circlle	123		123	Two wheeler
	SBI Road	Basappa Khanavali to Bhaigani samaj	85		85	Two wheeler
	cosmos club road	Court circle to kittel college road	45		45	Two wheeler

Following is the list of locations for MLCP:

Type of Parking	Location

Multi-level Car Parking	Court Circle

Following is the tentative list of locations for other (Off Street) Parking facilities:

Hubballi Junction Railway Station

Supermarket at Dharwad

Iconic Building

Janatha Bazaar

MG Market

Details about MLCP and Off Road parking is shown below:

Equipment Details	MLCP	Off - Street				
	Court Circle	Supermarket at Dharwad	Iconic Building	MG Market	Janata Bazaar	Railway Station
Entry Barrier	✓	✓	✓	✓	✓	✓
Exit Barrier	✓	✓	✓	✓	✓	✓
Handheld Ticketing Dispenser	✓	✓	✓	✓	✓	✓
Parking Sensors	✓	✓	✓	✓	✓	✓
Variable Messaging Board	✓	✓	✓	✓	✓	✓
Display and Guidance System	✓	×	×	×	×	×
Controllers	✓	✓	✓	✓	✓	✓
Emergency Call Boxes	✓	✓	✓	✓	✓	✓
Parking Management System	✓	✓	✓	✓	✓	✓
Integration with ICCC	✓	✓	✓	✓	✓	✓
Web Portal and Mobile Application Development	✓	✓	✓	✓	✓	✓

List of Potential Locations for SMART Poles

Sr. No	Location	Rationale
1	Glass House	Tourist Place
2	HDMC Hubballi	Public Building
3	Unkel Lake	Tourist Place
4	Tolankere lake	Tourist Place
5	court complex Hubballi	Public Building
6	Court Complex Dharwad	Public Building
7	DC Office	Public Building
8	Railway Station, Hubbali	Vibrant Corridor from Airport to Railway Station
9	Railway Station, Dharwad	Anticipated High Foot fall area
10	Ambedkar Circle	Vibrant Corridor from Airport to Railway Station
11	City Bus Stop Near Railway Station	Vibrant Corridor from Airport to Railway Station
12	In front of Lamington School	Vibrant Corridor from Airport to Railway Station
13	In front of HDMC	Vibrant Corridor from Airport to Railway Station
14	Mini Vidhana Soudha/Police Head Quarters	Vibrant Corridor from Airport to Railway Station
15	Chenamma Circle - Near Bus Stand	Vibrant Corridor from Airport to Railway Station
16	Chenamma Circle - opposite to Sai Mandir	Vibrant Corridor from Airport to Railway Station
17	Opposite old bus stand	Vibrant Corridor from Airport to Railway Station
18	Basava Vana	Vibrant Corridor from Airport to Railway Station
19	Swimming pool Complex-East	Vibrant Corridor from Airport to Railway Station
20	Traffic Light near IT Park	Vibrant Corridor from Airport to Railway Station
21	IT park	Vibrant Corridor from Airport to Railway Station
22	Hosur Junction	Vibrant Corridor from Airport to Railway Station
23	Near Bannimara stop, Gokul Road	Vibrant Corridor from Airport to Railway Station
24	Near KSRTC Depot	Vibrant Corridor from Airport to Railway Station

Sr. No	Location	Rationale
25	KSRTC Depot	Vibrant Corridor from Airport to Railway Station
26	KSRTC Bus stand (New)	Vibrant Corridor from Airport to Railway Station
27	Ravinagar Gokul Road	Vibrant Corridor from Airport to Railway Station
28	Ravinagar Gokul Road	Vibrant Corridor from Airport to Railway Station
29	Basaveshwarnagar	Vibrant Corridor from Airport to Railway Station
30	Manjunath Nagar Cross	Vibrant Corridor from Airport to Railway Station
31	Water Tank Nehru Nagar	Vibrant Corridor from Airport to Railway Station
32	Near Airport	Vibrant Corridor from Airport to Railway Station
33	Near Airport	Vibrant Corridor from Airport to Railway Station
34	Near Airport	Vibrant Corridor from Airport to Railway Station
35	Nehru Ground	Anticipated High Footfall area
36	Janta Market	Anticipated High Footfall area
37	MG Market	Anticipated High Footfall area
38	Supermarket at Dharwad	Anticipated High Footfall area
39	HDMC Office in Dharwad	Public Building
40	Ward No. 34, 35, 46, 36, 38, 39, 40, 56, 44, 41, 42, 43, 59	ABD Wards, hotspot to be installed outside ABD area
41	Ward No. : 1, 3, 17, 20, 22, 23, 24, 25, 28, 30, 31, 37, 48, 50, 63, 65, 66	Improvement and Development of the lives of all.
42	Rest of the 37 wards.	Improvement and Development of the lives of all.
43	BRTS Stations	headed by BRTS, anticipated high foot-fall area