# RFP FOR SELECTION OF LOCAL SYSTEM INTEGRATOR FOR IMPLEMENTATION OF INTEGRATED COMMAND AND CONTROL CENTRE AND SMART ELEMENTS IN SHIVAMOGGA

**Volume II: Scope of Work**

**RFP No.: SSCL/CR/147/2017-18**

**Dated: March 2018**

## Contents

# 1. Introduction

### 1.1Bidding Data Sheet

| Particulars | Details |
|---|---|
| **Name of Purchaser** | Shivamogga Smart City Limited (SSCL) |
| **Name of the Engagement** | Selection of Local System Integrator for implementation of ICT solutions and establishment of Integrated Command and Control Center (ICCC) for Shivamogga Smart City |
| **Release Date of RFP by SSCL** | 20/03/2018 |
| **Last date & time for submission of Pre-Bid Queries** | 08/04/2018 by 18:00 Hrs |
| **Pre-Bid Meeting** | 10/04/2018 at 11.30Hrs<br>Shivamogga Smart City Office<br>Shivamogga<br>Karnataka- xxxxxx |
| **Last date (deadline) for submission of the bid (e-Procurement portal)** | 19/05/201818:00 Hrs |
| **Opening of the Bid responses** | 21/05/201818:00 Hrs |
| **Validity of Proposal** | Bid must remain valid up to 180 (One Hundred & Eighty) days from the last date of submission of bid extendable upon request by authority |
| **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. |

| Particulars | Details |
|---|---|
| **Address of Communication** | To,<br>The Managing Director<br>Shivamogga Smart City Office<br>Shivamogga<br>Karnataka- xxxxxx<br>Phone-0xxx- xxxxxxx<br>Email - …… |
| **Tender Fees** | As indicated in the e-procurement portal (INR Rs. 7,500) |
| **Earnest Money Deposit / Bid Security** | INR 44.00 Lakhs (INR 44,00,000/-) |

***Note*** :SSCL reserves the right to change any schedule of bidding process.

### 1.2 Project Objectives

One of the primary objectives of ShivamoggaSmart City Limited (SSCL) 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, ShivamoggaSmart 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.

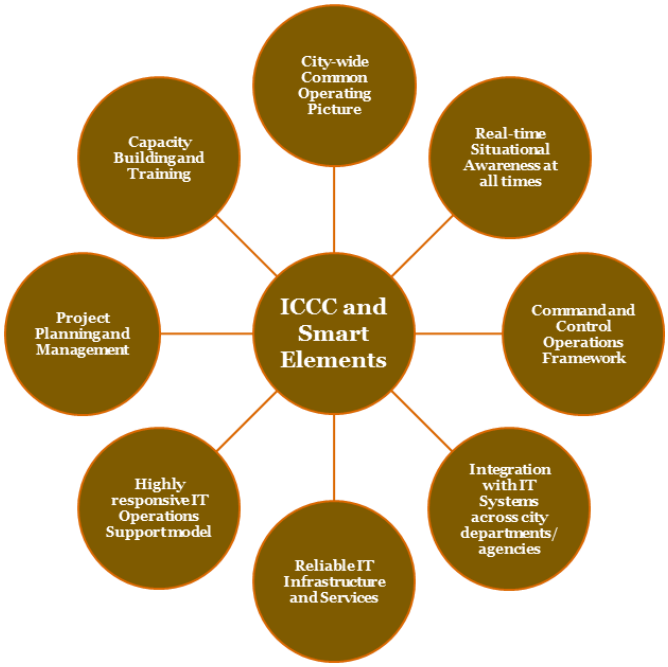


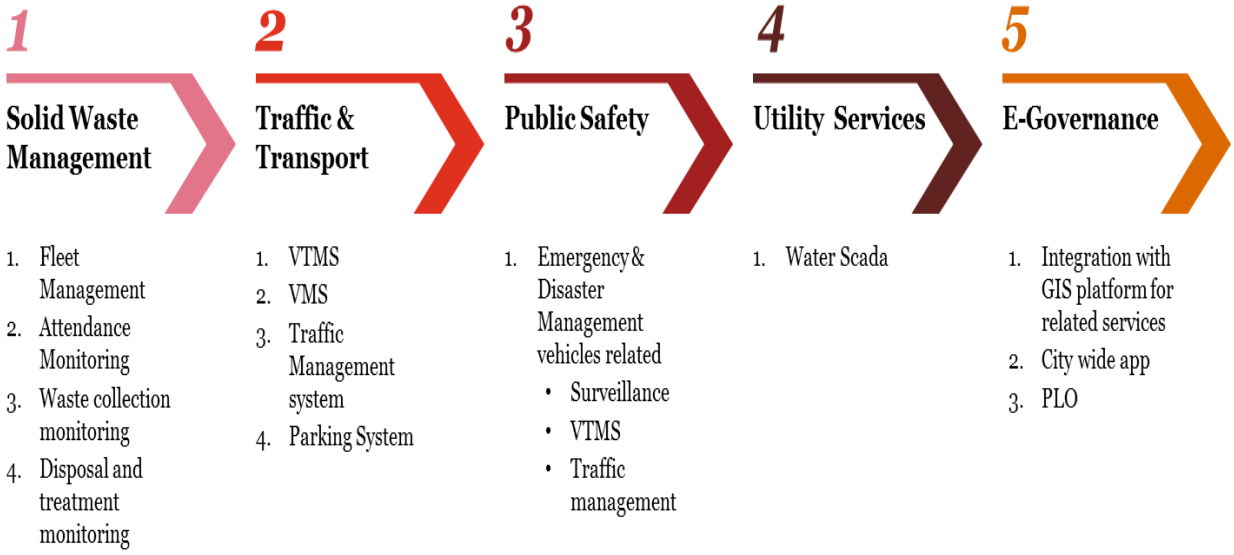
**Figure -1 ICCC and its Components**

The key objective of this project is to establish a collaborative framework where input from different functional departments of ShivamoggaMunicipal 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:

SSCL 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, 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. 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 Intelligent Traffic & Transport management, 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 (LSI).

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 MSI / State Vendor 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.

SSCLintends to select a Local System Integrator (LSI) for city of Shivamoggaby following competitive bidding process to design, develop, implement and maintain the Smart City System for a period of five years on turnkey basis. This document contains the following details:

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

LSI willestablish city operation center as Integrated Smart City System for Shivamoggacomprising 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. Intelligent Public Transport System
2. City Surveillance System
3. e-Governance

### 2.2 Level 2: Integrate Command and Control

1. Geospatial Database Management System
2. Emergency and Disaster Management System (Future integration)
3. Smart Lighting (Future Integration)

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

1. Smart Water
2. ICT components inPoles
3. Intelligent Traffic Management System
4. Smart Parking
5. ICT based Solid waste Management

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

| Sl. No | System Description | Implementation | Integration | Phase |
|---|---|---|---|---|
| 1 | Intelligent Public Transport System | × | √ | Phase I |
| | Passenger Information System | √ | √ | Phase I & II (Existing Bus Shelters in Phase I and Smart Bus Shelters in Phase II) |
| 2 | Smart Parking System | √ | √ | Phase I & II |
| 3 | Intelligent Traffic management System | √ | √ | Phase I & II |
| 4 | Smart IT Solid Waste Management System | √ | √ | Phase I&II |
| 5 | Surveillance System – Police and Traffic | × | √ | Phase I |
| 6 | Geographical Information System | × | √ | Phase I & II |

| | | | | |
|---|---|---|---|---|
| **7** | Smart Governance (other e-Governance related applications) | × | √ | Phase I & II |
| **8** | Integrated Command and Control Centre | √ | × | Phase I |
| **9** | Emergency & Disaster management | × | √ | Phase II |
| **10** | Smart Street Lighting | × | √ | Phase II |
| **10** | Water SCADA and Smart Water Meters | √ | √ | Phase I & II(Bulk water flow meters in Phase I and Water SCADA in Phase II) |
| **11** | Environmental Sensors | √ | √ | Phase I |
| **12** | Digital Billboards | √ | √ | Phase I& II |
| **13** | Wifi Hotspots | √ | √ | Phase I&II |
| **14** | Any other sensors/systems/services* | × | √ | Phase II |

*These other services will be additional work and will be taken up as “Change request”.

MSI and 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 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 integrated 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, 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 from the date of successful commissioning.

Specifically, Following are the main activities to be carried out by LSI:

1. Project Planning, execution and Management
2. Assessment and Gap analysis of requirement for all smart city components under scope.
3. Solution Design, System Customization and development for all components mentioned in this volume.
4. ICT items Procurement, deployment and commissioning
5. Site Preparation including required civil work, LAN Networking
6. Application and general awareness Training
7. Business Process Reengineering for the selected applications/ services, if required
8. STQC Certification
9. UAT & Go live
10. Capacity Building
11. Technical Support
12. Operation & Maintenance (O&M) for 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:

(a) 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

(b) Be of leading industry standards and /or as per standards mentioned in the technical specifications.

### 2.5 Finalization and submission of a detailed technical architecture

MSI shall submit the detailed Technical Architecture and description of each subcomponents, 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 are 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 are explained Section 9 of the RFP.
- **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 LSI 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:

  (a) 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

  (b) Be of leading industry standards and /or as per standards mentioned in the technical specifications

  All the key personnel working on the Project should be on direct payroll of the LSI/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 existing Geographical Information System (GIS) using ArcGIS Platform. LSI is required to carry out the seamless integration to ensure ease of use of GIS in the Dashboards in Command Control Centers. 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.

  LSI is to check the availability of such data and it's suitability for the project. LSI is required to update GIS maps from time to time.

- **SMS Gateway Integration- L**SI 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 the technical specifications

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

## 2.6 Roles and 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 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 Materialssection 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 smart city initiative. 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 oflife 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, 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 contractfor respective components to meet SLA requirement. The LSI shall ensure that all the OEMshave an understanding of the service levels required by Authority. LSI is required to providethe necessary MAF (Manufacturer Authorization Form) as per the format provided in theRFP in support of OEMs active support in the project.
19. Considering the criticality of the infrastructure, LSI is expected to design the solutionconsidering the RFP requirement of no single point of failure with high level ofredundancyand 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 the locations.
22. LSI is expected to provide following services, including but not limited to:

- Provisioning hardware and network components of the solution, in line with the proposed authority's requirements
- 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
- Size and provision the WAN bandwidth requirements across all locations considering the application performance, data transfer, and other requirements for smart city initiatives.
- Liaise with service providers for commissioning and maintenance of the links.
- Furnish a schedule of delivery of all IT/Non-IT Infrastructure items
- All equipment proposed as part of this RFP shall be rack mountable.
- Authority may at its sole discretion evaluate the hardware sizing documentproposed by the LSI. The. LSI needs to provide necessary explanation for sizing to the Authority
- Complete hardware sizing for the complete scope with provision for upgrade
- Specifying the number and configuration of the racks (size, power, etc.) that shall be required at all the locations.
- The LSI shall provide for all required features like support for multiple routingprotocols, congestion management mechanisms and Quality of Service support.
- The LSI shall ensure that all active equipment (components) are Simple NetworkManagement Protocol (SNMP) V3 compliant and are available for maintenance/management through SNMP from the date of installation by a NetworkMonitoring 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 ShivamoggaSmart 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 for buildings, structures, fences, trees, existing installations, etc. The ShivamoggaSmart 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 SSCL.

25. Lightning Proof Measures
    - The LSI shall comply with lightning-protection and anti –interference measures forsystem structure, equipment type selection, equipment earthing, power, signal cables laying.
    - 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.
    - 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.
    - 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.
    - Data line protection shall be installed as per zone defined in IEC 62305.
        I. Type 1 device shall be installed between zone 0B and zone 1.
        II. Type 2 devices shall be installed before the equipment in zone 2 and 3.
26. After signing of contract, the Local Systems Integrator needs to deploy the team proposed for the project and ensure that a Project Inception Report is submitted to Shivamogga Smart City Limited which should cover following aspects:
    - Names of the Project Team members, their roles & responsibilities
    - 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).
    - Responsibility matrix for all stakeholders
    - Risks the LSI anticipates and the plans they have towards their mitigation.
    - 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)
    - Application architecture documents
    - ER diagrams and other data modelling documents

- Logical and physical database design
- Data dictionary and data definitions
- Application component design including component deployment views, control flows, etc.
- Field equipment deployment architecture

- 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

28. Any functionality not expressly stated in this document but required to meet the needs of the authority 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 "Command and Control Centre, Smart Elements in Shivamoggacity and integrate all these solutions 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 SSCL 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. LSI shall implement, integrate and deliver the following systems and components with provisioning of ICT infrastructure:


From Implementation perspective ICCC design will be of centralized architecture. There will be single common IOT platform, city platform and Data center for all the 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 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 may 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 be allowed to 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

From procurement perspective it is envisaged that following will be procured at the state level by Karnataka Urban Infrastructure Development Finance Corporation (KUIDFC), nodal agency for implementation smart cities in the state of Karnataka,

- Data Center and Disaster Recovery,
- IOT platform
- City operation platform

At city level, procurement will be done for ICT solution components only, like application of particular solution, edge devices and network connectivity from edge devices to designated points. The network connectivity and designated points will vary from solutions to solutions. Connectivity may be through GPRS, RF, or Leased Line network and data may be transmitted within the city or directly to KMDS data center. City solution will be hosted at the state level data center planned at Karnataka Municipal Data Society (KMDS).

**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 (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.

2. **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.

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.

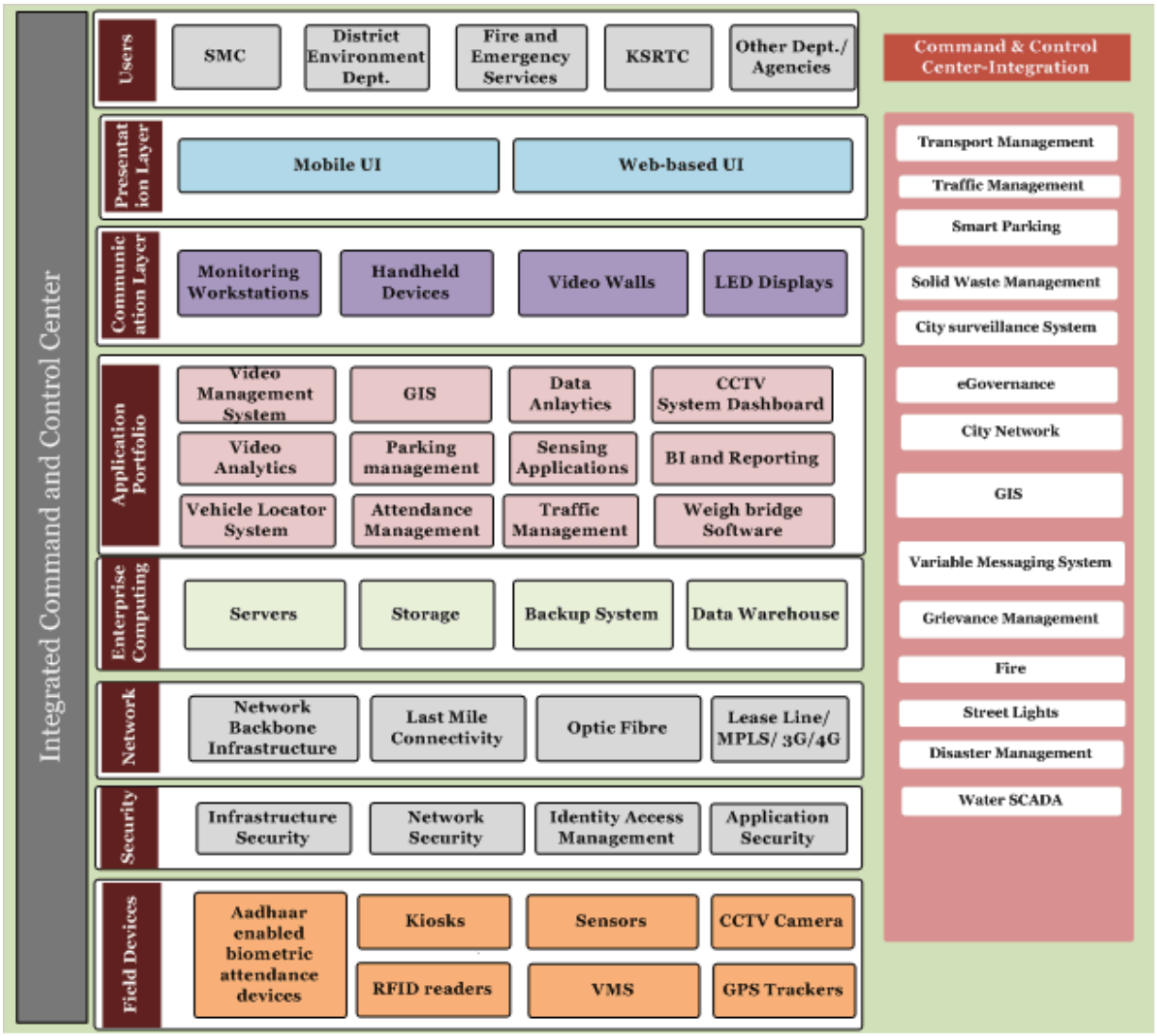



**Figure: Solution Architecture**

#### 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, 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, 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. The city has an existing OFC network. The scope of the LSI includes

- **Phase I**: AS-IS takeover O&M of Police network and perform NOC operations from ICCC + Add redundancy by laying ring at peripheral network ends of five OFC lines laid + WiFi access points at 20 locations + Router upgrade at DC office
- **Phase 2**: Taking OFC underground in ABD area+ Lay 12 core additional OFC in ABD area estimated to be 35 Kms

**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, street lights department, water department transport organizations within Shivamogga , etc.) and non-government agencies. The various integrations have been listed below:

1) City Surveillance System
2) Intelligent Public Transport System

3) Smart Parking (MLCP)
4) e-Governance
5) City Network
6) Water SCADA
7) Disaster Management
8) Grievance Management

**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 the RFP.

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 section 3.

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 which includes:

**a)** Implementation and Integration of Integrated Command and Control Centre and Smart Elements

**b)** Integration of other ICT systems with Integrated Command and Control Centre

**3. Operation and Maintenance Phase** - The selected vendor 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 year period (The Total Project Period includes Go-Live timelines) from the Go Live date of implementedafter 9 months (Refer Section 7), the O&M period of Phase 1 will commence after Go-Live and will be for a period of 4 Years 3 Months (5 Years of project duration minus implementation period) Refer Phase 1. 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) Existing Fiber optic network

b) Internet connectivity procured as part of this 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 server, storage, other required hardware, application portfolio, licenses

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 SSCL applications

**6.** Capacity Building for SSCL 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 of revised KPIs for performance monitoring of various urban utilities monitored through the system envisaged to be implemented

d) Developing standard operating procedures for operations management and other services to be rendered by ICCC

e) 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 Shivamogga) proposed for the project and ensure that a Project Inception Report is submitted to SSCL which should cover following aspects:

1. Names of the Project Team members, their roles and responsibilities
2. 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).
3. Responsibility matrix for all stakeholders
4. Risks the LSI anticipates and the plans they have towards their mitigation
5. Detailed project plan specifying dependencies between various project activities / sub-activities and their timelines
6. Installation locations geo mapped preferably on google earth to visually identify the geographical area
7. LSI Should publish a detailed assessment of the as-is state at various departments under the scope.
8. LSI Should submit a confirmation towards the agreement on the scope.

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** - SSCL has already initiated many projects which have state of the art infrastructure at field locations deployed under them. Under the smart city program, SSCL has envisaged to create a state of the art infrastructure and services for the citizens of Shivamogga, 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 SSCL 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 SSCL. 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 SSCL. 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 SSCL 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 SSCL.

### 2.8.4 Integrated Command and Control Centre

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. ICCC platform and data center service will be provided by 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.

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 SCOPE | 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 | | | | | | |
| | | ICT components on Poles | Show Status of Poles with ICT components- Wifi | Real-time | Real-time/Near real-time status of Wifi Hotspots | | | | | | |

| | | Function | Relevant CCC Use Cases | Data Feed Frequency | Dataset Required | Visualize | Monitor | Communicate | Coordinate | Control | Report |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Hotspots | | functioning | | | | | | |
| | | | Show Status of Poles with ICT components - 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 | | | | | | |
| | | | Receive and Display Environmental Sensor Feed | Real-time | Real-time/Near real-time feed of Environmental Sensors | | | | | | |
| | 3 | Smart Parking | Identify location and number of Parking Slots | Batch (Quarterly) | Location coordinates and Information of Parking facilities | | | | | | |
| | | | Show availability status of Parking | Real-time | Real-time/Near real-time status of Parking | | | | | | |

| | | Function | Relevant CCC Use Cases | Data Feed Frequency | Dataset Required | Visualize | Monitor | Communicate | Coordinate | Control | Report |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Slots | | Occupancy (2-wheeler and 4-wheeler) | | | | | | |
| | 4 | 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 | | | | | | |
| | 5 | Public Transport | Show position of Buses on the bus route | Real-time | Documentation of Bus Routes | | | | | | |
| | | | | | Real-time/Near real-time location of the Buses | | | | | | |

| | | Function | Relevant CCC Use Cases | Data Feed Frequency | Dataset Required | Visualize | Monitor | Communicate | Coordinate | Control | Report |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Display the bus schedule at the PIS | Real-time | Real-time/Near real-time location of the Buses | | | | | | |
| | 6 | Traffic and Police | Show location of traffic lights | Batch (Quarterly) | Location coordinates of traffic light installations at junctions | | | | | | |
| | | | Monitor Status of Traffic Lights | Real-time | Real-time/Near real-time status of traffic lights downtime | | | | | | |
| | 7 | Variable Message System | Show location of VMS | Batch (Quarterly) | Location coordinates of VMS | | | | | | |
| | | | Monitor Status of Variable Message Signboard | Real-time | Real-time/Near real-time status of VMS | | | | | | |
| | | | Display messages on Variable Message | Real-time | Message details for display on VMS | | | | | | |

| | | Function | Relevant CCC Use Cases | Data Feed Frequency | Dataset Required | Visualize | Monitor | Communicate | Coordinate | Control | Report |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Signboard | | | | | | | | |
| | | | Receive and Display Surveillance Feed | Real-time | Real-time/Near real-time feed of Surveillance Cameras | | | | | | |
| | 8 | 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 | | | | | | |
| | 9 | E-Governance | Show Population by each ward | Batch (One time upload) | Base Population data based on latest census | | | | | | |
| | | | Show the number of births and deaths recorded | Batch (Monthly) | Birth and Death data at a regular frequency | | | | | | |
| | | | Show location of | Batch | Location | | | | | | |

| | | Function | Relevant CCC Use Cases | Data Feed Frequency | Dataset Required | Visualize | Monitor | Communicate | Coordinate | Control | Report |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Shivamogga One centers | (Quarterly) | coordinates of Shivamogga One centers | | | | | | |
| | | | Show status of Grievances by Ward | Batch (Daily) | Details of Grievances received at SMC | | | | | | |
| | | | 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 | | | | | | |
| | 10 | Disaster Management | Identify Disaster Impact Area on map | Real-time | Coordinates to Geo-fence the Disaster Zone | | | | | | |
| | | | Respond to Disaster Situation | Real-time | Documented Standard Operating Procedures | | | | | | |
| | 11 | Emergency Management | Identify Location | Batch | Location | | | | | | |

| | | Function | Relevant CCC Use Cases | Data Feed Frequency | Dataset Required | Visualize | Monitor | Communicate | Coordinate | Control | Report |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | of Fire Hydrants | (Quarterly) | 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 | | | | | | |
| | 12 | 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 | | | | | | |

| | | Function | Relevant CCC Use Cases | Data Feed Frequency | Dataset Required | Visualize | Monitor | Communicate | Coordinate | Control | Report |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 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. Intelligent Public Transport System
2. City Surveillance System
3. e-Governance

## 3.2 Level 2: Integrate Command and Control

1. Geospatial Database Management System
2. Emergency and Disaster Management System (Future integration)
3. Smart Lighting (Future integration)

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

1. Smart Water
2. ICT components at poles
3. Intelligent Traffic Management
4. Smart Parking
5. ICT enabled Solid Waste Management

# 4. Detailed Scope of Work

## Level 1: Integrate and View

### 4.1 Intelligent Public Transport System

#### 4.1.1 Overview

The public transportation facilities in the city comprise of Government owned city buses, privately owned city buses and auto rickshaws. The existing Government owned buses in the city are equipped with Passenger Information System (PIS) inside the buses. This project foresees tracking and monitoring the city buses with a scope to also display the bus related information at the bus shelters on need basis. The Passenger Information System (PIS) facilitates the commuter with information regarding the bus schedule thereby assisting them in planning the travel. The PIS may also be used for advertisement purposes. The information displayed at the PIS, along with the advertisements, will have to be controlled and monitored from the ICCC.

The PIS will be provided at the authorized Bus Shelters in the city, the details of which are gathered from the DC office. , the details of which are covered in the DPR for Bus Shelters (as part of ABD Projects).The list of the authorized bus-shelters in the city is will be gathered from the RTO office.

The Karnataka State Road Transport Corporation (KSRTC) monitors almost 2000 buses with additional 500 buses outsourced to KPIT for monitoring purposes. KSRTC facilitates integrated Vehicle Tracking and Monitoring System (VTMS) at Bengaluru, for all the 2000 buses. The VTMS application is hosted at the Karnataka State Data Centre (KSDC) located in VikasaSoudha and the control centre is at the KSRTC office located in Satellite Bus Stop, Mysore Road, Bengaluru.

The city buses of Shivamogga are JNNURM buses with Vehicle Tracking Units (VTU's) operated and maintained by KPIT. There are 40 such intra-city buses. The information regarding the current bus location is processed in the VTU. However, the bus related information is not tracked and monitored at a central location for a common dashboard view. KSRTC is in the process of integrating the buses monitored by the VTU of KPIT, at the VTMS of KSRTC.

#### 4.1.2 Scope of Work

The scope of the LSI for Intelligent Public Transport System is:

- To integrate with the VTMS of KSRTC and provide real-time information about vehicles, such as location, speed and direction of vehicles, scheduled arrival and departure times of the vehicles, information about delays etc.
- To track & monitor any buses/ transport vehicles (future requirement) fitted with GPS devices. These devices will be required and that send data in the required format to the Vehicle Tracking and Monitoring System (VTMS) implemented as part of the ICCC project.

- To facilitate the bus information display at the Passenger Information Systems (current and future requirements). The PIS requirement is quantified for 40 locations. The details of the locations will be shared by the time the vendor is on-board.
- To represent the buses on GIS map showing their location on real time.
- The LSI should provide a mobile application for the citizen to track the bus in real time. The application should be compatible on Android, IOS and Windows platforms.
- The mobile application should facilitate the citizen to view the locations of the bus shelters/ bus stands, bus terminals along with the routing information on a map
- The mobile application should be able to provide the details regarding the bus route, bus schedule, bus fare, estimated time of arrival (ETA), etc. in a real time mode.

### 4.1.3 Functional Specifications

Following are the use cases for integration:

| Department / Function | Relevant ICCC Use Cases | Data Feed Frequency | Dataset Required |
|---|---|---|---|
| Public Transport | Show position of Buses on the bus route | Real-time | Documentation of Bus Routes |
| | | | Real-time/Near real-time location of the Buses |
| | Display the bus schedule at the PIS | Real-time | Real-time/Near real-time location of the Buses |

The Functional Specifications for PIS are as follows:

- The PIS shall include all the components that are directed towards passengers. “Passengers” & “commuters” in this context would also mean the commuters, prospective commuters who enquire about the bus services, persons who arrive at the bus stands to receive passengers. The terms passenger and commuter is used interchangeably.
    - ETA/ D in real time Application will be fetched from KSRTC application and also developed by the vendor for the in-house VTMS application, by consulting all the stakeholders. This real time information, including information regarding incidents/ cancellation/ delays, should be available at the mobile application, ICCC and identified Bus shelters.
    - Vendor shall ensure smooth coordination and integration for the above
- LED Board at the Bus shelters will have the following functional specifications:

- Display of PIS in a display unit at bus stand/ shelters shall be configurable based on bus stand and platform (integrated bus terminal). Single unit should display services of more than one platform.
- One location may have one or multiple displays that should be managed from the control centre.
- Information Display units will be supplied and mounted appropriately, configured and commissioned by the vendor.
- PIS information shall be displayed both in Kannada and English alternatively (single or two language shall be configurable).
- At all these bus stands, display units will receive/display transmitted contents from the central system through a gateway.
- Display systems needs to support full color display for streaming advertisements, Digital display of text, images and video on LED screens both in English and Kannada.
- Displayed messages must be readable in high bright, day light.
- Display system in addition to the display of information from Transport system shall be capable of displaying advertisements and multimedia content at the bus stops and may need to alternate between Passenger information and Advertisements.
- The frequency and period of information display on PIS display shall be configurable from central location for advertisements and other transit information.
- All displays for PIS will have a configurable refresh rate, ideally 1 minute or less.
- The system should support displaying advertisements approved by SSCL on all the LED boards configurable from a central server.
- The network connectivity at the bus terminals shall be provided by the vendor.
- The content layout at the display should be configurable.

**4.1.4 Technical Specifications**

Display System Technical Requirement (PIS)

- Management of display will be carried out from ICCC
- Display information should be pushed/ pulled from central server on real time basis, while other information can be scheduled during non-peak hours.
- Display units shall be mounted on a rugged enclosure to withstand harsh environmental conditions with reasonable physical security.
- Display will be located at a convenient height to have a clear view of the message of next arrival bus.

**Display Hardware Specification**

- One integrated tamper proof casing for complete PIS unit addressing physical security considerations
- Provision of hardware infrastructure, network, etc required to run PIS and advertisements on LED display units
- Aesthetic requirements such as fonts, colors, rows per page, display time to be remotely configurable and displayed for at least 10 sec before Arrival

**Minimum Specifications for display units**

- Type of Display & Screen Size - Full Color, LED Display, Day Light Readable Min – 40 inches
- Min & max viewing distance and angle of viewing (where the display screen looks DOT-FREE) - Viewing distance 20 - 100 meters
- Minimum 60°V – 110°H
- Pixel pitch & configuration – 10 MM & 1 r/g/b
- Environmental specifications - Temperature: 0 to +55 deg C; Sealing: IP 65 (Front), IP 54 (Rear), Humidity : 95 % RH
- Minimum life of the display system – 100,000 hrs
- Power supply – 90 V to 250 V AC
- Display format - Multimedia content, Text in Kannada & English with presentation in tables, Fixed and scrolling Text

### 4.2 City Surveillance

#### 4.2.1 Overview

The city of Shivamogga has been under video surveillance through cameras deployed across the city by the Police and Traffic departments. These 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, etc). In addition to these existing cameras, new set of cameras are being deployed at various spots at the city. Further, additional cameras are being deployed as part of the Traffic Management, Surveillance and Solid waste management projects. In essence, all these cameras have to be integrated with the existing Video Management System at the Police control room. The feed from all of these cameras will be monitored closely to identify incidents (pre-incident and post-incident).

### 4.2.2 Scope of Work

At present there is a CCTV control center in Shivamogga city which is managed by police department to control law and order. ICCC has to be integrated with the control center for live viewing of the feed at ICCC.

Closed Circuit Television (CCTV) is installed in the city of Shivamogga for surveillance through 3 MP fixed lens cameras and 2 MP PTZ outdoor cameras at 55 different locations of the city with central monitoring station at the office of 'The Superintendent of Police, The District Police Office', Shivamogga. M/s Blue Star Limited is the System Integrator for the existing city surveillance set-up in the city. The existing Video Management Server is used only to monitor and capture the video feed.

The scope of the project for the Local System Integrator (LSI) will be to:

- To integrate the control room of the Police Department with the ICCC to receive real time feeds from the cameras installed at various locations in the city
- ICCC should also be able to trigger the commands / alerts (if required) to the respective command centre.
- Overall solution is split into two phases:
    - **Phase I**: AS-IS takeover O&M of Police network and perform NOC operations from ICCC + Add redundancy by laying ring at peripheral network ends of five OFC lines laid + WiFi access points at 20 locations + Router upgrade at DC office
    - **Phase 2**: Taking OFC underground in ABD area+ Lay 12 core additional OFC in ABD area estimated to be 35 Kms
- The LSI should also provision for future needs, for video feed from other cameras, to be integrated at the ICCC. The cabling cost for connecting to the OFC network, for such future integration are to be discovered as part of the ICCC RFP
- The indicative list of cameras for integration at the ICCC is as mentioned below. The feed from any cameras, existing or proposed, will be routed to the police control room. The ICCC will be provided with a view of feed from police control room.

| Sl.No | Component | Qty |
|---|---|---|
| 1 | Fixed camera at Landfill Site | 5 |
| | ANPR camera at Landfill site | 1 |
| 2 | ANPR cameras at city entry exit points | 18 |
| | Fixed cameras at city entry exit points | 18 |
| 3 | Cameras to be replaced - Fixed | 16 |

| | | |
|---|---|---|
| | Cameras to be replaced – PTZ | 12 |
| 4 | Additional cameras – Fixed | 22 |
| **Total** | | **92** |

### 4.2.3 Functional Specifications

It is envisaged to integrate the police control room with ICCC so that operator at ICCC can watch live feed of any camera sitting in the city ICCC.Following are some of the use cases for integration:

| | | | |
|---|---|---|---|
| Traffic and Police | Receive and Display Surveillance Feed | Real-time | Real-time/Near real-time feed of Surveillance Cameras |

### 4.2.4 Technical Specifications

**Optical Fiber Network**

| S.N. | Specifications |
|---|---|
| 1 | OFC being supplied for the project will adhere to ITU-T G.655 standards for Non-zerodispersion shifted Metal-free unarmored optical fiber cable conforming to TECspecification GR/OFC-07/02. Jul 2007 or latest and the raw material used in its manufacturewill conform to TEC Specification TEC/GR/TX/ORM 01/04 Sep 09 or latest. |
| 2 | Technical Specifications of HDPE Pipe. The HDPE pipe will conform to TEC specificationGR/CDS - 08/02 Nov 2004 and latest amendments thereof or better. The HDPE pipe usedwill be of 40 mm outer diameter with minimum wall thickness of 3.5 mm. |
| 3 | 100% of the network shall be built underground through an appropriate methodology whichis non-disruptive, quick to deploy and does not disturb the existing electrical and othercabling installed in the median. |
| 4 | 100% of the network shall be built underground through Horizontal Direction Drilling(HDD) Method only. The minimum depth shall be maintained at 35 cm to 60 cm for theentire network (However detailed drawings to be approved by SMC before executing on ground) |

| | |
|---|---|
| 5 | Alternate methods like Open Trenching/Aerial Cabling/Moiling/Wall Installations etc. shallbe allowed only in exceptional cases like bridges, flyovers, subways, crossings, waterbodies, or any location where underground drilling is not possible. Approvals shall beissued by the highest levels of the governing board for these exception requests. |
| 6 | Manholes (MH) and Hand Holes (HH) shall be installed at every alternate interval of 250Meters. |
| 7 | All the MH and HH shall be pre-fabricated types. |
| 8 | The proposed Core layer shall consider 25 % more fibre length than surface length, 15% for looping in chambers, 5% for modulation, 1% for splice joint preparation & remaining 4% for wastage. |
| 9 | 96 Core Optical Fiber Cable shall consist of 12 Fiber per tube and shall have total 8numbers of tubes. |
| 10 | In cases of bridge/flyover/culvert etc. crossings, GI Pipes of 200mm Diameter shall only beused. |
| 11 | Electronic Route Markers (ERM) shall be installed in each MH/HH for robust records and location detections. |
| 12 | For exceptional cases of Open Trenching, minimum depth shall be 0.3 m to 0.4m in medianof the street. All the ducts shall be encased in a DWC Pipe of 200mm Outer Diameter. |
| 13 | For exceptional cased of Aerial Cabling, 48F ADSS cable shall only be used. Distance between poles shall not be more than 50-60 meters and height of installation shall not be less than 5 meters. |

**Access Layer Switch**

- Minimum 8 10/100/1000 TX PoE/PoE+, 2x SFP Ports (*expected to have 4xSFP Ports in certain locations)
- May require higher port density at some locations, depending upon site conditions
- May require fiber ports at some locations, depending upon site conditions/distances.
- Should support IPV4,IPV6, 802.1Q VLAN, DHCP, IGMP, SNMP, loop protection and detection, support ring protection, end point authentication, NTP
- Should support port security, support Port based network access control
- Power per port should be sufficient to operate the CCTV cameras/edge devices connected

- IP 30 or equivalent Industrial Grade Rating(to be housed in Junction box) Due to the nature of the network device, and harsh environmental conditions at site locations, the network device implemented shall be easily serviced or replaced when defective or damaged. The access switch shall also be placed in an enclosure that provides protection from humidity, moisture and airborne substances, rain, wind, dust, high temperature, roadside pollutants, vandalism, pests, and theft of equipment.
- Should support IGMP Snooping V1, V2, V3 MLD Snooping V1, V2
- Switch needs to have RS-232/USB console port for management via a console terminal or PC Web GUI NTP Syslog for log capturing SNMP V1,V2,V3
- Managed Outdoor Industrial grade switch with industrial grade power supply (AC/DC)

**Access Points**

| S.N. | Parameter | Specifications |
|---|---|---|
| 1. | Features | The wireless solution should be based on dual radio. |
| | | 802.11 a/b/g/n/ac/ 3x3:3 MIMO Wave2, dual radio , access point |
| | | The Access Point should have single 10/100/1000 Ethernet interfaces |
| | | The AP should be able to handle security, mesh, RF Management, QOS , roaming, local forwarding without the need for a controller so as to increase performance of the WLAN network |
| | | 802.11 a/b/g/n/ac. Access Point should be able to power up using standards 802.3 af/at POE input. |
| | | All 2.4 GHz (2.4000GHz to 2.4835GHz) bands authorized in G.S.R. (45E) |
| | | Radio 2: 2.4GHz: Chan 1-13 (2412-2472 MHz) 5GHz: All channels from 5200 MHz to 5825 MHz Actual operating frequencies depend on national regulatory limits |
| | | Maximum available transmit power: 2.4GHz: 21dBm per chain, 5.0GHz: 20dBm per chain |
| | | Antenna configuration: 1x1, 1x2, 2x2, 3x3 |
| 2. | Antenna Characteristics | Internal Antenna Gain or equivalent or better RF coverage as per planning |
| | | 2.4 GHz-2.5 GHz : 4 dBi |
| | | 5.150 GHz- 5.875 GHz : 5dBi |

| | | |
|---|---|---|
| 3. | Operating temperature | -10 to +60°C or better |
| 4. | Storage Temperature | -20 to 70°C or better |
| | Regulatory | FCC certified |
| | | CE Mark / WPC Compliance |
| 5. | Enclosure | Should be IP67 rated or higher for outdoor application |
| 6. | AP Characteristics | Able to be powered over 802.3af/at standard Power-over-Ethernet (PoE). Auto sensing, 10/100/1000 on the network port |
| | | 6 SSIDs per AP |
| | | On Demand Channel Scan, Auto Channel Select |
| | | Capable of multi-function services including: data access, intrusion detection, intrusion prevention, location tracking, real-time non-disruptive packet capture, RF monitoring with no physical touch and no additional cost |
| | | The AP should proactively probe other rates to determine if greater throughput is available, intelligently adjusting its selection tables to favor higher performance. The AP should support mesh backhaul feature in which the root AP will determine if its wired connection is down and take action correspondingly. AP should support Self-Healing, Self-forming, dynamic path selection Wireless MESH function |
| | | Automatic neighbor detection and route determination |
| | | AP will provide make before break handovers |
| | | The wireless meshing AP shall support low hop latency (< 1 ms per hop) under clear channel conditions and high SNR |
| | | MESH link should support AES encryption on the MESH link |
| | | MESH link should support extending corporate network with VLAN Tags and VLAN priority tags to the remote site |
| | | A wireless meshing AP with redundant links shall select an alternative route within 100 ms |
| | | AP shall provide external antenna options |
| | | Wi-Fi alliance 802.11ac certified APs |

**Firewall (Internal/ External)**

| # | Description |
|---|---|
| | **General and Performance Specifications.** |
| 1. | The Firewall should have integrated Firewall and VPN functionality. |
| 2. | Firewall packet handling performance should be adequate to deliver the required throughput. |
| 3. | Firewall should have a redundant power supply. |
| | **Operational Modes.** |
| 4. | The Firewall should support Layer 2 (Transparent) mode and Layer 3 mode. |
| 5. | Firewall should support static NAT; Policy based NAT and PAT (Port Addressed Translation). |
| | **Firewall.** |
| 6. | Firewall should provide TCP reassembly for fragmented packet protection. |
| 7. | Firewall should support integration with URL/Content filtering systems. |
| | **VPN.** |
| 8. | Firewall should be capable of dynamic routing on VPN. |
| 9. | Firewall should support client based SSL/TLS as well as IPSec VPN Tunnels. |
| | **High Availability.** |
| 10. | Firewall should support Active/Passive High Availability. |
| 11. | Firewall should support Active/Active High Availability. |
| 12. | Firewall should support Stateful failover of firewall sessions. |
| 13. | Firewall should support device failure detection. |
| 14. | Firewall should support link failure detection. |

| | |
|---|---|
| 15. | Firewall should support authentication for all members. |
| 16. | Firewall should support encryption of all traffic. |
| | **Routing.** |
| 17. | Support for OSPF and BGP routing protocol |
| 18. | Firewall should support static routes |
| 19. | Should support Multicast with features like RPF, IGMP/ IGMP Proxy, and PIM. |
| | **IPv6 Support** |
| 20. | Should support dual stack IPv4 / IPv6 Firewall and VPN. |
| 21. | Support for IPv4 to/from IPv6 translations or tunneling. |
| 22. | Should support Virtualization (Virtual Firewall, Security zones and VLAN). |
| | **Firewall Management** |
| 23. | Firewall should support Web based (HTTP and HTTPS) configuration and management. |
| 24. | Firewall should support Command Line Interface using console and SSH. |
| 25. | Firewall should support management via VPN tunnel on any interface. |
| | **Logging.** |
| 26. | Should support Syslog server logging. |
| 27. | Should have support for SNMP V1 to V3. |
| 28. | Support for voice protocols: H.323, SIP, and NAT/ ALG for H.323/ SIP. |
| 29. | Firewall should have Automated certificate enrolment (SCEP). PKI Support. |
| | **Administration.** |
| 30. | Firewall should support multilevel administration privilege. |
| 31. | Firewall should support software upgrades using secure web Interface |

| | |
|---|---|
| 32. | Firewall should support Command Line Interface using console SSH. |

**Network Rack**

| S No | Parameters | Minimum Requirements |
|---|---|---|
| 1 | Maximum Height | 534.00 mm |
| 2 | Maximum Width | 600.00 mm |
| 3 | Maximum Depth | 913.00 mm |
| 4 | Maximum Mounting Depth | 913.00 mm |
| 5 | Rack Height | 12U |
| 6 | Rack Width | 19” |
| 7 | Colour | Black |
| 8 | Front Door | 16 gauge |
| 9 | Rear Door | 18 gauge |
| 10 | Roof | 18 gauge |
| 11 | Side Panels | 18 gauge |

**Fixed cameras (High Definition)**

| Sl.No | Parameter | Minimum Specifications or better |
|---|---|---|
| 1. | Video Compression | H.264 or better |
| 2. | Video Resolution | 1920 X 1080 |
| 3. | Frame rate | Min. 25 fps |
| 4. | Image Sensor | 1/3” Progressive Scan CCD / CMOS |
| 5. | Lens Type | Varifocal, C/CS Mount, IR Correction |
| 6. | Lens# | Auto IRIS<br>8 – 40 mm, F1.4 |
| 7. | Minimum Illumination | Colour: 0.5 lux, B/W: 0.1 lux (at 30 IRE) |
| 8. | IR Cut Filter | Automatically Removable IR-cut filter |
| 9. | Day/Night Mode | Colour, Mono, Auto |
| 10. | S/N Ratio | ≥ 50 dB |
| 11. | Auto adjustment + Remote Control of Image settings | Colour, brightness, sharpness, contrast, white balance, exposure control, backlight compensation, Gain Control |

| | | |
|---|---|---|
| 12. | Wide Dynamic Range | On/Off |
| 13. | Audio | Audio Capture Capability |
| 14. | Local storage | Should support MicroSD -min 128 GB |
| 15. | Protocol | HTTP, HTTPS, FTP, RTSP, RTP, TCP, UDP, RTCP, DHCP |
| 16. | Security | Password Protection, IP Address filtering, User Access Log, HTTPS encryption |
| 17. | Operating conditions | 0 to 50°C |
| 18. | Casing | NEMA 4X / IP-66 rated |
| 19. | Certification | UL / CE / FCC / EN |

**4.3 e-Governance**

**4.3.1 Overview**

The State of Karnataka & the City Municipal Corporation has implemented various e-governance initiatives that shall be integrated and made available in the form of a dash board at the ICCC. The details of the modules are as follows:

- Lodge Your Grievance (Jananihata)
- Trade License (Vyapara)
- Building Licenses
- Birth and Death Registration
- Shivamogga One services

**4.3.2Scope of Work**

All above solutions have to be integrated with ICCC for report and monitoring purpose so that Dashboard view of the services can be provided at ICCC. Further, reports are also 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. API's for the above said module will be provided to the LSI for integration with the ICCC. The ICCC should provide a dashboard view of the citizen utilization of various services being delivered by these E-Governance modules. 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.

***4.3.3 Functional Specifications***

**Use Cases for e-Governance**

- Show statistics of births and deaths month-wise and year-wise
- Allow for navigation to links of services hosted in Shivamogga One
- Show grievances of citizens by ward/departments
- Show statistics of licenses attained by year/month
- Allow for online approval and submission of forms by citizens

Following are the use cases identified for integration:

| 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 Shivamogga One centres | Batch (Quarterly) | Location coordinates of HD One centres |
| | Show status of Grievances by Ward | Batch (Daily) | Details of Grievances received at SMC |
| | 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 |

#### *4.3.4 Technical Specifications*

- The API's of the applications will be enabled for integration at the ICCC. KUIDFC will provide the necessary support to enable the AP's of the applications hosted at MRC data centre. LSI will be responsible for integration with the APIs.
- Access to the API(s) should be secured using API keys.
- Software should support security standards: OAuth 2.0, HTTPS over SSL, and key management to help protect the data across all domains.
- Should support security features built for many of its components by using HTTPS, TLS for all its public facing API implementations.
- Should support OWASP

## Level 2: Integrate, Command and Control

## 4.4 Geospatial Database Management

### 4.4.1 *Overview*

The broad scope of LSI shall be:

- Creation of GIS data layers
- Collection of required GIS/CAD data from various line departments and conversion to GIS ready format
- Mapping of ICT related or Smart city assets with detailed attribute details
- Provide the all required GIS data in standard format to MSI for Application Development
- To provide necessary API/Inputs to MSI to integrate various City wide applications.

The MSI will assess the existing GIS platform and either propose an upgrade or replacement with an equally competent or better GIS platform. The LSI should work in close coordination with the MSI and ensure that the requirements around GIS data layers relevant to Shivamogga are implemented on the proposed platform.

### 4.4.2 Scope of Work

#### 4.4.2.1 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 activity, LSI will use the advanced ArcGIS Desktop 10.5 software (1 No.) with Extensions (3D Analyst, Spatial Analyst, Network Analyst, Data Interoperability) and it is already available with city. Using the above said data, the MSI will develop the GIS application for the city.

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

- Existing dataset from Mapmyindia
- Data obtained from Smart City Mission projects
- Data to be gathered by the Local System Integrator (GIS Surveyor)

The Local 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 GIS Platform. The LSI will have to use OGC compliant services from the ESRI platform to integrate with different smart initiatives. An indicative list of the use cases and data sets proposed for integration by the Local System Integrator at the GIS platform are mentioned below.

| Sl. No | Department | GIS Dataset | Existing Dataset from Mapmyindia | Dataset that would be available through other SCM projects | Dataset that have to be gathered by LSI |
|---|---|---|---|---|---|
| 1 | Solid Waste Management | Location of Landfill site in the city | | | |
| | | Type of fleet vehicle | | | |
| | | Location of toilets | | | |
| 2 | PublicTransport | Bus Routes on GIS Map | | | |
| | | Location of Bus Stations | Bus Stops (Point Feature), Bus Depots (Polygon) | | |
| 3 | Traffic and Police | Location of traffic lights | | | |
| | | Locations of existing surveillance cameras from Traffic and Police | | | |
| | | Location of police stations | Police Station (Point Feature) | | |
| 4 | Smart Parking | Location and number of Parking Slots | Parking (Point Feature) Parking Lots | | |
| 5 | Street Lights | Location of Street Lights | | | |
| 6 | Property Taxes | Properties on GIS map | | | |
| 7 | E-Governance | Population by each ward | Ward Boundary (Polygon) | | |
| | | Location of important Government buildings | Government Offices (Point Feature) | | |
| | | Location of public works | Public works/ upcoming construction sites | | |

| | | | | | |
|---|---|---|---|---|---|
| | | Location of Tourist Attractions | Tourist Spots (Point Feature), Heritage (Point Feature), ASI Protected Monuments (Point Feature) | | |
| | | Location of Shivamogga One centres | | | |
| 8 | Emergency Management | Location of fire stations | Fire Station (Point Feature) | | |
| | | Location of Health centres/Hospital | Medical (Point Feature) | | |
| 9 | Water | Location of Water Assets | Pumping Stations –UGD, Water Treatment Plant (Point Feature), Reservoir/OHTS | | |
| 10 | Sewerage | Location of Sewerage Assets (STPs, ETPs etc) | Sewerage Treatment Plant (Point Feature) | | |
| 11 | Gardens | Location of Parks/Gardens | Parks/Gardens (Point Feature) | | |

#### 4.4.2.2 Integration with State Wide GIS Platform

City SI shall coordinate with MSI for any integration with GIS platform for Citywide applications which will be developed for different Smart Solutions and are not limited to Intelligent Traffic Management System or Intelligent Transport System, solid waste management system, Smart water, Smart Electricity, Solar, Smart Parking, Smart lighting and Smart Energy Management, Smart UGD and Emergency Management services, which will require real time location based GIS services shall be integrated to state wide GIS platform.

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

The MSI will assess the existing GIS platform and propose either an upgrade or replacement with an equally competent or better GIS platform. The LSI should work in close coordination with the MSI and ensure that the requirements around GIS data layers relevant to Shivamogga are implemented on the proposed platform.

### 4.5 Emergency and Disaster Management (Future Integration)

#### 4.5.1 Overview

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. The ICCC should also be able to trigger the commands / alerts (if required) to the respective command/controlcentre.

- The vehicles used for emergency and disaster management will form part of the in the Vehicle Tracking and Monitoring System (VTMS) solution offered by the Local System Integrator, in the future on need basis. The scope of the Local system integrator for the VTMS solution is as follows:
    - To provide a platform for Vehicle Tracking and Monitoring
    - To provide VTU or GPS devices for vehicles used in solid waste management, ambulances, fire engines, other corporation vehicles. The VTMS application should be capable of including the vehicles for tracking on a plug-in basis, independent of hardware or the platform.

– The VTMS application should also be scalable include tracking of any vehicles, in the future on need basis, that send data in standardized format

### 4.5.2 Scope of Work

Scope of work includes the integration of GPS monitoring and other ICT initiative of the department with the ICCC. It is also envisaged that two operator will be sitting in the ICCC to respond to emergencies in the city. By this, department will be able to respond to the needs of emergency in quick and efficient manner. 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.

The scope of the Local System Integrator will be to provide a VTMS platform that can include on a plug-in basis, the vehicles that are to be tracked. The VTMS solution implemented as part of the ICT enabled Solid Waste Management solution should also be able to scale to include other vehicles with GPS devices.The application should be independent of hardware or platform except for a standard data format.

Few observations regarding the Fire department are as follows:

- Apart from Fire emergency the department responds to all type of emergencies whenever required by other departments. Department 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.
- There are fire stations in Shivamogga, Bhadravathi, Sagara, Soraba, Shikaripura, Tirthahalli and Hosanagara Talukas in the district. Following are the details of assets of fire department in the city.

| Assets Type | Shivamogga |
|---|---|
| Water Tender | 1 |
| Water Lorry | 1 |
| Water Bowser | 1 |
| Quick Response Van | 1 |
| Medium Rescue Van | 1 |
| Agni | 1 |
| Ambulance | 1 |
| Towing Tender | 1 |
| Jeep | 1 |

| | |
|---|---|
| Motor Cycle | 1 |
| **Total** | **10** |

Additionally, the VTMS system should also include 5 ambulances for vehicle tracking and monitoring purposes.

### 4.5.3 Functional Specifications

Following are some of the use cases for integration.

| Department/ Function | Functional Use Cases | Data Feed Frequency | Dataset Required |
|---|---|---|---|
| Disaster Management/ Emergency 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 |

## 4.6 Smart Lighting(Future Integration)

### 4.6.1 Overview

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. The Implementation vendor on-boarded under the RFP for Street Lights, will be responsible for implementing the LED street lights solution in the city. This application will be integrated with ICCC to enable central monitoring of the LED street light infrastructure.

### 4.6.2 Scope of Work

The scope of the Local system integrator for the implementation of ICCC will be to:

- integrate the application for controlling and monitoring the street lights (including the dashboard, reports etc.) with the ICCC and to also facilitate the GIS integration for use cases identified
- send the details of a faulty street light, or any other issues, along with the latitude and longitude coordinates to the LED street lights software
- to discuss with the solution provider for LED street lighting system in Shivamogga and arrive at the format of the data packet (JSON/XMLetc) that will be shared by the CCMS application. The LSI is also required to ensure that the data packet shared 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.
- To refer to the RFP for LED street lighting, as and when tendered, to understand the scope of integartion

Information flow is bi-directional, from LED street lighting software application to ICCC and vice-versa. The ICCC should also be able to trigger the commands / alerts to the respective software.

### 4.6.3 Functional Specifications

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

| Functional Use Cases | Data Feed Frequency | Dataset Required |
|---|---|---|
| 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 |

## 4.7 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, 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.

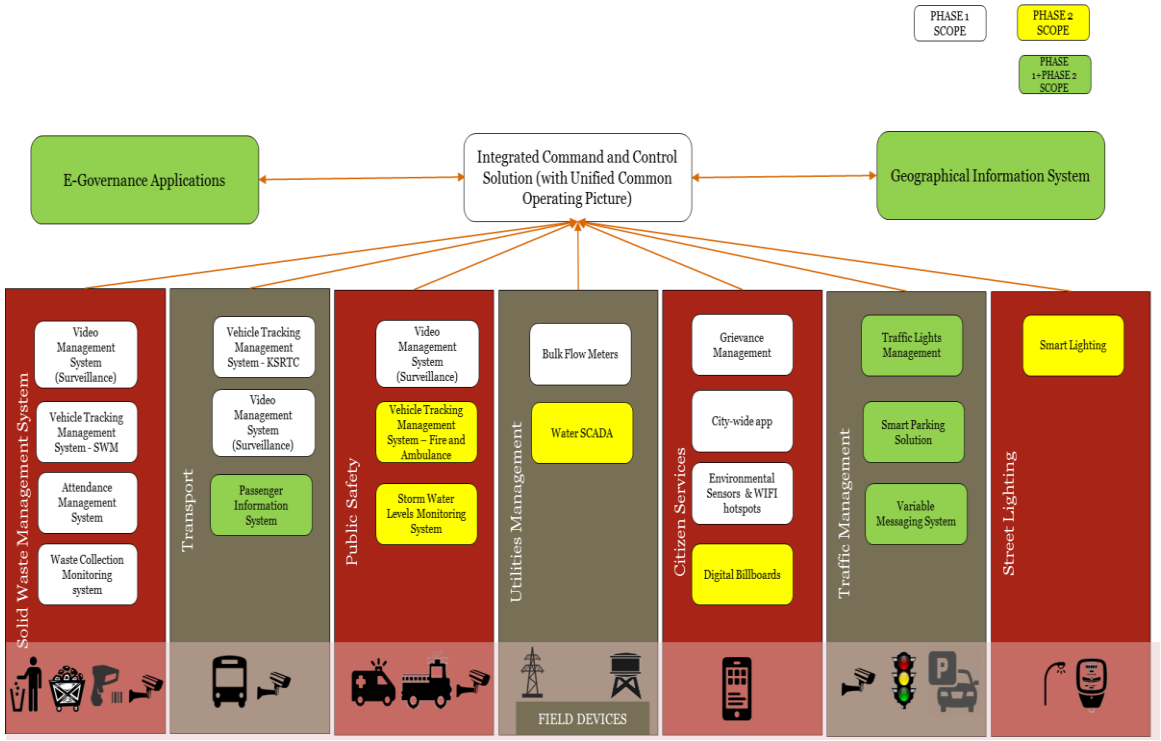
## Level 3: Implement, Command, Control and Fully Operate

### 4.8 Integrated Command and Control Center (ICCC)

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.

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:




#### 4.8.1 Overview

Integrated Command and Control Centre's main objective is to break silos between departments and to make processes integrated so as to serve public in an efficient manner. As part of Shivamogga Smart City project 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.

#### 4.8.1.1 IT Infrastructure at ICCC

1. It is proposed that MSI will provide the IT hardware infrastructure at the Karnataka Municipal Data Society (KMDS), which will form the Data Centrefor successful operations of the systems. The DC will be hosted at KMDS. The LSI is recommended to thoroughly go through the MSI RFP for a detailed understanding on the scope of the MSI>The ICCC has been envisaged to be established in an approximate area of 4050.72 Square Feet. The location for ICCC set-up is identified to be in the Shivamogga Smart City office premises, which is the ground floor of the SSCL office building.MSI 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 bythe MSI.
2. 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 SSCL for its supply and installation.
    a. Application & System Software (with necessary customization) – Smart IT Solid Waste Management Applications, Intelligent Traffic Management, Smart Parking, Smart meters, VMS, environment sensors etc

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.

#### 4.8.1.2 Responsibility Matrix

| | Key Activities | Successful Bidder | SMC | SSCL | Network Vendors | Electricity Providers | Other Utilities | Other Departme | PMC | Existing ICT |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Project Inception Phase** | | | | | | | | | |
| | Project Kick Off | R/A | C | C | I | I | I | I | C | I |
| | Deployment of manpower | R/A | C | C | I | I | I | I | C | I |
| **Requirement Phase** | | | | | | | | | | |
| | Assess the requirement of IT Infrastructure and Non IT Infrastructure | R/A | C | C | C | C | C | C | C | C |
| | Assessment of Business processes | R/A | C | C | I | I | I | C | C | I |
| | Assessment of requirement of Software requirements | R/A | C | C | I | I | I | C | C | I |
| | Assess the Integration requirement | R/A | C | C | C | C | I | C | C | C |
| | Assess the connectivity requirement | R/A | C | C | C | I | I | C | C | I |

| | Key Activities | Successful Bidder | SMC | SSCL | Network Vendors | Electricity Providers | Other Utilities | Other Departme | PMC | Existing ICT |
|---|---|---|---|---|---|---|---|---|---|---|
| | all locations (including Building) | | | | | | | | | |
| | Assessment the Network laying requirement | C | C | C | R / A | I | I | C | C | I |
| | Assessment of training requirement | R/A | C | C | I | I | I | C | C | I |
| **Design Phase** | | | | | | | | | | |
| | Formulation of Solution Architecture | R/A | C | C | C | I | I | C | C | I |
| | Creation of Detail Drawing | R/A | C | C | C | I | I | C | C | I |
| | Detailed Design of Smart City Solutions | R/A | C | C | C | I | I | C | C | I |
| | Development of test cases (Unit, System Integration and User Acceptance) | R/A | C | C | C | I | I | C | C | I |
| | Preparati | R/A | C | C | C | C | I | C | C | I |

| | Key Activities | Successful Bidder | SMC | SSCL | Network Vendors | Electricity Providers | Other Utilities | Other Departme | PMC | Existing ICT |
|---|---|---|---|---|---|---|---|---|---|---|
| | on of final bill of quantity and material | | | | | | | | | |
| | CONOPS + SoP preparation | R/A | C | C | C | C | C | C | C | I |
| **Development Phase** | | | | | | | | | | |
| | Helpdesk setup | R/A | C | C | I | I | I | I | C | I |
| | Physical Infrastructure setup | R/A | C | C | I | I | I | I | C | I |
| | Procurement of Equipment , edge devices, COTS software (if any), Licenses | R/A | C | C | I | I | I | I | C | I |
| | IT and Non IT Infrastructure Installation | R/A | C | C | I | I | I | I | C | I |
| | Development, Testing and Production environment setup | R/A | C | C | I | I | I | I | C | I |
| | Software Application customization | R/A | C | C | I | I | I | I | C | I |

| | Key Activities | Successful Bidder | SMC | SSCL | Network Vendors | Electricity Providers | Other Utilities | Other Departme | PMC | Existing ICT |
|---|---|---|---|---|---|---|---|---|---|---|
| | (if any) | | | | | | | | | |
| | Development of Bespoke Solution (if any) | R/A | C | C | I | I | I | I | C | I |
| | Data Migration | R/A | C | C | I | I | I | I | C | I |
| | Integration with Third party services/application (if any) | R/A | C | C | I | I | I | I | C | I |
| | Unit and User Acceptance Testing | R/A | C | C | I | I | I | I | C | I |
| | Implementation of Solutions | R/A | C | C | I | I | I | I | C | I |
| | Preparation of User Manuals, training curriculum and training materials | R/A | C | C | I | I | I | I | C | I |
| | Role based training(s) on the Smart City Solutions | R/A | C | C | I | I | I | I | C | I |
| **Integration Phase** | | | | | | | | | | |
| | SoP | R/A | C | C | C | C | C | C | C | I |

| | Key Activities | Successful Bidder | SMC | SSCL | Network Vendors | Electricity Providers | Other Utilities | Other Departme | PMC | Existing ICT |
|---|---|---|---|---|---|---|---|---|---|---|
| | implementation | | | | | | | | | |
| | Integration with GIS | R/A | C | C | C | C | C | C | C | I |
| | Integration of solutions with Command and Control Centre | R/A | C | C | C | C | C | C | C | I |
| **Go –Live** | | | | | | | | | | |
| | Go Live | R/A | C | C | I | I | I | I | C | I |
| **Operation and Maintenance** | | | | | | | | | | |
| | Operation and Maintenance of IT, Non IT infrastructure and Applications | R/A | C | C | I | I | I | I | C | I |
| | SLA and Performance Monitoring | R/A | C | C | I | I | I | I | C | I |
| | Logging, tracking and resolution of issues. | R/A | C | C | I | I | I | I | C | I |
| | Application enhancement | R/A | C | C | I | I | I | I | C | I |
| | Patch & Version | R/A | C | C | I | I | I | I | C | I |

| | Key Activities | Successful Bidder | SMC | SSCL | Network Vendors | Electricity Providers | Other Utilities | Other Departme | PMC | Existing ICT |
|---|---|---|---|---|---|---|---|---|---|---|
| | Updates | | | | | | | | | |
| | Helpdesk services | R/A | C | C | I | I | I | I | C | I |

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

R/A = Responsible/Accountable

C = Consulted

I = Informed

#### 4.8.1.3 Project Timelines

T1-Date of Signing the Contract

| | Activity | Individual phases of the activities | Timeline |
|---|---|---|---|
| | Phase-I (270 Days) | | |
| 1 | Resource Mobilization | • Resource Mobilization<br>• Inception Report | T1+15 Days |
| 2 | Implementation of ICT enabled Solid Waste Management Application, Smart Parking, Intelligent Traffic Management System, VMS, Smart meters , environmental sensors, Digital bill boards, Wi-hotspots, Command and Control Center, PIS | 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 :<br>• Implementation of Solution Components<br>• Set-up of Command and Control Centre | T1+45 days |
| | | FRS, SRS,LLD, HLD, CONOPS, for implementation and integration of individual ICT application with Common Command and Control Application | T1+60 Days |
| | | *Data Centre, DR & Common Operating Platform availability<br>(**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 applications at Common Operating platform | ICT Solid Waste Management Application | T1+270 days |
| | | 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 enabled Solid Waste Management, Intelligent Traffic Management System, VMS, Digital bill boards, Wi-hotspots, PIS, Network components for city surveillance | Procurement of the residual/ additional hardware & software infrastructure required from phase I | T1+315 days |
| | | Installation & Commissioning of field devices | T1+360 days |
| 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 |
| | | 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 |

#### 4.8.1.4 Scope of work

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

1. **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**.**
2. **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 MSI. If required, an interface needs to be developed for data transmission to IOT platform/city operation platform in the required format.

## 4.9 Smart IT Solid Waste Management

### 4.9.1 Scope of Work

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

Presented below is the solution for SWM Lifecycle:

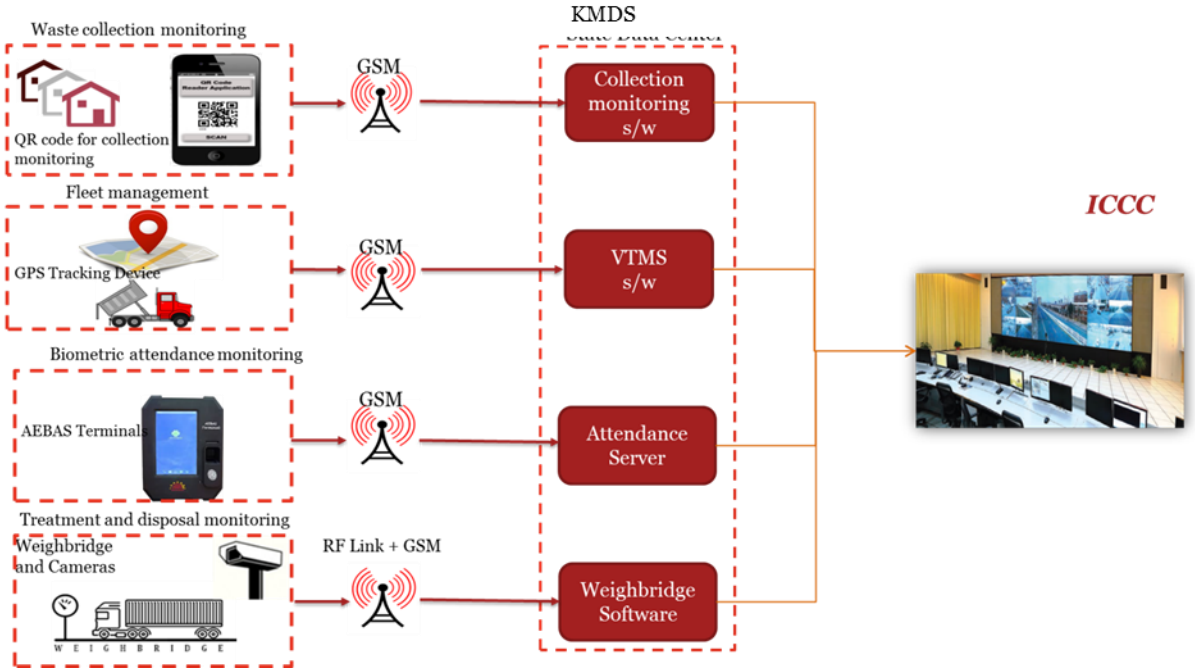



**Figure 2Solution overview**

The overall Smart SWM Solution being proposed for SMC will include multiple ICT components that will work together to deliver value. The scope of the Si will include End-to-End Solution to implement and to provide Support Services & Maintenance.

**ICT enabled Solid Waste Management:**

1. Door to Door QR code based monitoring
2. Vehicle Tracking and Monitoring
3. Weighbridge monitoring

4. Staff attendance monitoring (Aadhaar enabled biometric attendance monitoring)
5. Load sensors
6. Dashboards

**Solution Design:**

***Door to Door collection monitoring System***

The city is divided into 35 wards. The total waste generated is 120 TPD on an average. This includes waste collected from households, road sweeping and drainage silt

1. **Door-to-door collection:** The door to door collection process has been outsourced in the form of 41 packages. The total number of households in the city of Shivamogga, as per census 2011, is 76,009. Our estimated projection of the number of households currently is 84,397. The Pourakarmikas or the waste collection supervisors can monitor the status of waste segregation. If the waste is not collected/segregated, they may take the photos of such house hold and upload it through the city wide app.
2. **Monitoring of waste collection:** For monitoring this collection process, we propose tagging each household with a QR code. Suitable smart phones will be provided to the garbage collectors to read the code once they have collected the garbage. The same shall be collected through a software module (backend of the app) at the ICCC.The GPS tracking of the fleet shall also help in monitoring of the waste being collected from assigned wards.
3. **Integration with ICCC:** The information about the grievances/tickets will be fed to the ICCC.

*Vehicle Tracking Monitoring System*

The vehicles used by Shivamogga municipality for waste transportation are listed below:

| Type of Vehicle | No. of Vehicles |
|---|---|
| Auto tippers | 20 |
| Tipper trucks | 9 |
| Compactors | 4 |
| Dumper placer | 1 |
| Front and back hoe loaders | 3 |
| Twin bin auto tippers (Proposed) | 6 |

| | |
|---|---|
| **Total Vehicles** | **43** |

Table 22: Vehicle details of solid waste management facility

1. **Vehicle tracking**:Each of the vehicles will be fitted with a GPS tracker. The total number of vehicles that are to be tracked as part of the VTMS are
    a. **SWM vehicles**: 43
    b. **Police vehicles**: 29
    c. **Fire department vehicles** : 10
    d. **Ambulances**: 5

   In addition to the GPS tracker, weighing machines will be provided for waste collection at the primary collection vehicles and the secondary collection vehicles will be installed with load sensors. The technical and functional specifications are provided in the subsequent sections.

   **Note*:**The rates for load sensors will be discovered as part of the RFP for ICCC. However, the procurement of load sensors is subject to successful PoC by the LSI to the SSCL.

2. **Vehicle tracking & monitoring system (VTMS):** A software application will be developed to track the fleet movement and hosted at the State level Data Centre (KMDS).
3. **Integration with Arc GIS:** The VTMS should be integrated with the Arc GIS platform to view and track the fleet movement on map layer. Additionally, locations such as wards, lifting points, transfer stations along with the routes will be geo-tagged / geo-fenced and will be integrated on the map module
4. **Integration with ICCC:** The movement of the vehicles will be continuously tracked in the ICCC. Alerts will be generated for missed lifting points or deviation from the designated route.
5. **Mobile application:** The SWM officials (Health inspectors, environment engineers etc.) will be able to track the SWM fleet and also check the ETA of their arrival at the next lifting point/transfer station. Citizens will also be able to register a complaint if the waste is not collected at their household
6. **Network:**
    a. Connectivity between KMDS and the ICCC for VTMS is in the scope of MSI
    b. Connectivity between KMDS & Arc GIS (also hosted at KMDS) for VTMS on map module. The VTMS application will make periodic calls to ArcGIS application web services as and when view request is made by the user. Since both the applications are in KMDS no specific leased line is required. KMDS needs to enable ports and firewall rule between both applications.

c. Vehicle lat-long details will be sent by GPS devices to VTMS application hosted at KMDS. VTMS application will be accessed by Command and Control operators and departmental users.

*Weighbridge Monitoring*

1. **Camera based monitoring of entrance & exit** – 1 ANPR camera at the entrance to the land fill site is used to capture the number plate details of the vehicles carrying waste. Additional 5 cameras shall be installed for monitoring any act of vandalism or disruption in the landfill site on top of monitoring of regular activities
2. **Computerization of Weigh Bridges** – Electronic weighbridges shall be installed to measure the input being carried into by the incoming vehicles as well as to check the produced output after the compost generation. The same shall be fed into the weighbridge software for processing data date wise, truck wise, shift wise, etc. The same shall be passed on to ICCC for day-to-day monitoring of waste treatment, disposal and compost generation and for generation of daily, weekly & monthly reports.
3. The Local System integrator will also have to make a provision for inclusion of any additional weighbridges identified, in the future, to be monitored at the ICCC. The rates for weighbridge discovered as part of the ICCC RFP can be used for procurement of the additional weighbridges.
4. **Optional Installation of Electronic Barriers/Boom Gates** – They serve as the checkpoints for controlling the passage of vehicles in the sites
5. **Optional Installation of Smoke Detector** – Smoke Detectors can be installed to detect any occurrence of smoke due to fire caused by decomposition of waste or any other unwarranted activity of burning waste
6. **Tablet application**: The SWM officials at landfill site will be able to track the weight of vehicles and pass information through the app developed on the tablet
7. **Network:** One GSM sim will be required for the connectivity of the mobile device to the ICCC; necessary information will be shared with State level Data Center through APIs integrated with the application hosted on KMDS servers; RF Links shall be mounted on Mast for the network connectivity of surveillance cameras to the police control room.

*Aadhaar enabled Biometric attendance System (AEBAS)*

Aadhaar based biometric Authentication for the purpose of attendance would ensure that the attendance of all the PouraKarmika's will be visible in real time on the centralized attendance portal ensuring transparency and accountability to bring efficiency. AEBAS is an Online System where authentication of finger prints is done online through CIDR (Central Identities Data Repository), thus presence of Internet Connectivity is mandatory for the devices which are used

for marking attendance. Internet Connectivity from all service providers is supported in AEBAS. GPRS enabled tablets can be used for both finger print and IRIS based authentications.

A detail of the staff whose attendance is to be monitored is listed below:

**Table 1: Employee details of solid waste management department**

| Employee Category | Permanent Employees | Outsourced Employees |
|---|---|---|
| **Sweepers** | 179 | 231 |
| **Loaders** | - | 74 |
| **Helpers** | - | 11 |
| **Operators** | - | 4 |
| **Drivers** | 5 | 30 |
| **Total** | **184** | **350** |

1. **Fingerprint Input:** The client attendance module in the idle state would wait for user to enter his/her attendance id through touch screen in case of tablet based client or keyboard input in case of desktop based client. This attendance id shall be a unique identifier of the employee which is de-facto mapped to Aadhaar.
2. **Integration with ICCC:** The attendance data will be captured in the software application module and can be monitored at the ICCC
3. **Mobile application:** The SWM officials (Health inspectors, environment engineers etc.) will be able to monitor the attendance data of the employees
4. **Attendance Servers:** The Attendance server would createAadhaar Authentication request in xml or JSON, submit the request and receive the response in accordance with Aadhaar Authentication API latest requirements. It will mark in/out attendance, attendance system activation/deactivation and generate reports for the same.
5. **Network:** Application will be developed for the tablets and shall be hosted in KMDS. Data from tablet devices will be sent to application through GSM based internet connectivity.

*Weighing machines & Load sensors*

The weighing machines are used at primary collection vehicles and load sensors are used to secondary collection vehicles to measure the waste. The information regarding the waste collection is sent to the application server.

#### 4.9.1.1 Components of the proposed architecture

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

***Primary Collection***

Primary Collection from source shall be monitored by virtue of the city wide app wherein the citizens of Shivamogga will be raising grievance/lodge a complaint whenever their garbage is left as is and not collected on time. The GPS tracking of the fleet shall also help in monitoring of the waste being collected from assigned wards. Additionally QR codes will be placed on the doors of each household.

| Component Name | Description |
|---|---|
| **QR Code** | 1. Households to be tagged with QR code & numbered<br>2. To be printed on a waterproof material to prevent damage due to weather conditions |
| **Smart Phone** | 1. Any android, iOS and windows smart phone with a QR code reading app |
| **Weighing Machines** | 1. Weighing machine at 9 Primary Collection vehicles |
| **Load Sensors** | 1. Load sensors fitted into the 4 secondary vehicles to monitor the waste collected by them |

*Transportation*

| Component Name | Description |
|---|---|
| **GPS Vehicle Tracker** | 1. All the SWM vehicles to be fitted with GPS trackers to track their location and ETA |

*Treatment and Disposal*

| Component Name | Description |
|---|---|
| **Traffic Barrier** | 1. Entry exit of all vehicles is recorded using RFID Tags mounted on the Vehicles & Readers installed at the entrance/Exit |
| **Fixed Camera** | 1. To be fixed at the entrance/exit of treatment units and disposal sites to monitor the input and output |
| **ANPR Camera** | 1. To check the vehicle number |

| | |
|---|---|
| **Electronic weighbridge** | 1. To be fixed for weighing the vehicles for measuring the input as well as the produced output |

*Attendance Monitoring*

| Component Name | Description |
|---|---|
| **AEBAS Terminal** | 1. Biometric attendance monitoring using a handheld device (tablet) as the input device<br>2. To be used in outdoors as well<br>3. Aadhaar based authentication<br>4. Marking of time and attendance |

*Mobile App*

| Component Name | Description |
|---|---|
| **Mobile application** | 1. Track the status of waste collection and disposal<br>2. Track the attendance of workers<br>3. Track the vehicles for fleet management |

### 4.9.2 Functional Specifications

***Door to door QR based monitoring***

1. All vehicles & households should be Tagged with tamper proof QR code stickers& Numbered
2. Location of all the households are marked on the Map
3. Schedules & Routes are created as per current process for clearance of the waste
4. Data about Staff with Mobile number and location should be stored
5. QR code Data Logging should be enabled manually or automatically at the time of clearance of the waste
6. System should ensure that complete coverage of door to door and community collections served by vehicles
7. Solution should keep certain Checks as per environmental regulations, like minimum frequency of lifting garbage etc.

8. System should enable capturing of
    - Area information (Zone / Ward / Colony / Society)
    - Population details
    - Volume of the Solid waste which includes Wet & Dry waste (Recycled & Non Recycled)
    - Resources required
    - Collection procedure ( i.e. Primary : House to House & Secondary : Community Bin to Garbage transport centre or mix)

***Vehicle tracking and monitoring***

1. GPS tracking of the waste pick up vehicle for real time tracking
2. System should help in co-ordination between primary and secondary collection vehicles for transferring dump
3. Route Optimization will help in reduction of trip time, fuel saving and serving more locations
4. Record history of vehicle routes, attended sites and other details
5. Monitoring & Reporting Application - reports of vehicles, garbage collection status etc.
6. Alert / Alarm management
7. Real time management of missed garbage transfer
8. Daily report of Door-Door Collection efficiency combined with complaints raised by Public
9. Monitoring & Reporting Application - reports of vehicles, garbage collection statusetc.
10. Solution should be integrated into the GIS map
11. Garbage Collection Scheduling
    - Communication of route assignment to vehicles to pick-up the Garbage - Category wise like A: Highly in demand, B: Medium, C: Low Demand should be enabled to be passed on to the SWM department
    - Assignment of dynamic routes' information to SWM using the vehicle initial route and waste collected should be enabled

***Aadhaar Enabled Biometric Attendance System***

1. Should blend perfectly to match Aadhaar Certified Fingerprint and Iris scan
2. Gray scale finger image data may be stored, recorded, or transmitted in uncompressed – bit packed form.
3. The resolution of the image data formatted and recorded for interchange should be the scan resolution of the image.
4. Each record shall pertain to a single Aadhaar entry and shall contain an image

record (consisting of single view) for each of one or more fingers/iris scans; multiple fingers/iris scans (single image records).

5. Live-scan plain Finger Impression type should be used
6. Except the scanner driver, there should not be any requirement for loading any software/ license while plugging the scanner.
7. The scanner driver should be API enabled to ensure compatibility with any application
8. Should have inbuilt battery backup
9. Data retention should be provisioned in case of power failure
10. Should be able to mark time (hours) against the attendance of the worker

***Unified Dashboard View for Solid Waste Management***

1. A unified View should show the primary and secondary collection.
    a. Included all vehicles tracked.
    b. Collection Percentage achieved daily – co-relating with the final dumping processes
    c. Co-relation with the complaints raised / Area, along with photographic evidence
2. System should be capable of providing missed collection
3. System should be capable of marking areas where waste is generated or high to low basis
4. System should be capable of showing only a single selected process for a particular area
5. System should be capable of showing complaints raised by citizen tagged to a particular location.
6. System should be capable of showing CCTV footages from bulk waste generation points and inside the waste treatment plant
7. Unified view should be capable of being integrated with other departments
8. Unified View goal will be to improve waste collection efficiency using the field infrastructure deployed
9. Any other reports aiding to perform the same shall be in scope of LSI.
10. Monitoring of the vehicle in real time to improve per vehicle productivity & reduce non-compliance.
11. Usage and route planning optimization of garbage trucks.
12. Rapid management of vehicle breakdown and maintenance.
13. Centralized command control center for waste collection and transportation.
14. Efficient monitoring and management of waste.

15. Automated monitoring of transfer stations, processing centres for daily garbage inward, outward using weigh bridge automation.
16. Live-Tracking of all Municipal vehicles under the project
17. Access to vehicle historical Data
18. Trip history tracing for every vehicle during any given period
19. Reports to understand the Distance travelled, Trips completed, On-road vehicles, Idle points, Garbage collection efficiency etc. to be made available on regular basis.
20. Data backup to be available on Cloud/any redundant infrastructure.

Resource Utilization Dashboard

1. A report indicating the deployment and utilization of the resources shall be provided.
2. The statement shall include proposed organizational structure, employee deployment, equipment procurement and utilization, contracting services, utilization of office and other facilities.
3. List of all the employees deployed for this Project with name and designation with identity proofs.
4. Attendance details of employees with their utilization on a daily basis as well as leaves availed
5. Details of employees deployed on each of the route and with each vehicle with their names, identity, driving licenses of driver's etc.
6. Proposed organizational structure of the Vendors to implement and manage the project.

***Weighbridge Monitoring***

1. Camera based monitoring of entrance & exit
2. Camera based monitoring allow daily/weekly remote inspection from central office
3. Computerization of Weigh Bridges
4. Recording of the volume of garbage disposed on a daily basis

***Mobile app***

1. Citizens can post request for Garbage
2. Clearance, Complaints, Feedback with Location & Photos
3. Staff can post waste clearance report with location & Photos. Staff can take photos of households where waste is not segregated
4. Facilitates the user to track the vehicle routes through the VTMS
5. Daily updates on Schedules & Routes from Staff

6. Allow custom forms & Tickets for any process like Vehicle Maintenance, Staff shortage

*Weigh machines & Load Sensors*

1. Weigh machines are used to measure load at the primary collection vehicles
2. The weight from the weigh machines will be communicated to the server
3. Waste is transferred to the vehicles
4. Load sensors are to be placed in the secondary collection vehicles to measure the load
5. Waste is placed in the secondary vehicle and the weight is communicated through the GSM devices to the central server.

Note*: The waste measurement at the primary and secondary collection vehicles through the weighing machines and sensors will be performed as a PoC and subject to successful completion of the PoC, the SSCL/SMC will make a decision to implement the solution. The rates for the solution will be discovered in the RFP

***MIS***

Indicative list of MIS reports-

1. Monitor the deployment of pickup trucks and personnel based on the schedule originally drawn
2. Info on the use of Transfer Stations
3. How much garbage received?
4. Door to door collection, ward wise
5. Reports from Dashboard view for all activities
6. Reports of Ward Wise Weight Report
7. Information/Contact details of ward-wise health officers
8. Energy production report
9. Any other custom report as per department

### 4.9.3 Technical Specifications

***Technical Specifications for QR Code***

| # | Parameter | Minimum Specifications or better |
|---|---|---|
| 1 | Type | Sticker type |
| 2 | Material | Weatherproof White Inkjet Stickers with QR Code |
| 3 | Dimension | -3” by 2 |

### *Technical Specifications for GPS/GSM Tracker*

| # | Parameter | Minimum Specifications or better |
|---|---|---|
| 1 | Weight | Should Be Lightweight. |
| 2 | Housing | Aluminum Or Fiber Case |
| 3 | Operational Temperature | -25~70 |
| 4 | Storage Temperature | -40~80 |
| 5 | Power Consumption | <1 W (60ma~100ma) |
| 6 | Backup Power | 24 Hrs Minimum.(In Ideal Mode) |
| 7 | Input Voltage | 10~30v |
| 8 | Frequency | L1,1575.42 MHz |
| 9 | Protocol | Nmea 0183 V2.2 |
| 10 | Channels | 20 |
| 11 | Flash | 4mbit |
| 12 | Sensitivity | Tracking: -159dbm |
| 13 | Cold Start | 42seconds, Average |
| 14 | Warm Start | 38seconds, Average |
| 15 | Hot Start | 1 Seconds, Average |
| 16 | Reacquisition | 0.1 Seconds, Average |
| 17 | Accuracy | Position: 10meters, 2d Rms,5meters, 2d Rms,WaasEnabled Velocity: 0.1 M/S<br>Time: 1us Synchronized To Gps Time |
| 18 | Frequency Bands | Sim 340 Quad-Band: Gsm 850,Egsm 900,Dcs 1800,Pcs 1900. The Band Can Be Set By At Command, And Default Band Is Egsm 900 And Dcs 1800 ,Compliant To Gsm Phase 2/2+ |

| | | |
|---|---|---|
| 19 | Temperature Range | Normal Operation: -20 To +55<br>Restricted Operation: -25 To -20 And +55 To +70<br>Storage Temperature -40 To +80 |
| 20 | Data GPRS | GPRS Data Downlink Transfer: Max. 85.6 Kbps GPRS Data Uplink Transfer: Max. 42.8 Kbps Coding Scheme: Cs-1, Cs-2, Cs-3 And Cs-4 Sim340<br>Supports Protocols PAP (Password Authentication Protocol)<br>Usually Used For PPP Connections. Sim340 Integrates TCP/IP Protocol. Support Packet Switched Broadcast Control Channel (Pbcch)<br>Csd Transmission Rates: 2.4, 4.8, 9.6, 14.4 Kbps, Non-Transparent Unstructured Supplementary Services Data (Ussd) Support |
| 21 | SMS | Mt, Mo, Cb, Text And Pdu Mode Sms Storage: Sim Card Support Transmission Of Sms Alternatively Over CsdOr Gprs. User Can Choose Preferred Mode. |
| 22 | Sim Interface | Supported Sim Card: 1.8v ,3v |
| 23 | Two Serial Interfaces | Serial Port 1 Seven Lines On Serial Port Interface |
| 24 | Sim Application Toolkit | Supports Sat Class 3, Gsm 11.14 Release 98 |
| 25 | Real Time Clock | Implemented |
| 26 | Timer Function | Programmable Via At Command |
| 27 | Firmware Upgrade | Firmware Upgradeable Over Serial Interface |
| 28 | Internal Battery Cum Charger | Li-Ion Battery With Minimum 08 Hrs Backup When Idle And 04 Hrs When Continuously Used. With Appropriate Charger To Be Charged From Vehicle |
| 29 | Certification | Minimum IP65 & ARAI Certification |

***Technical Specifications for AEBAS***

| Parameter | Specification |
|---|---|

| | |
|---|---|
| Fingerprint template Compliance for minutiae data | ISO 19794(2) or UIDAI registered |
| Fingerprint template Compliance for image resolution | ISO 19794(2) or UIDAI registered |
| Image Acquisition Requirements | Setting level 31 or higher |
| Scan resolution pixels/centimetre (ppcm) | 197 |
| Scan resolution pixels/inch (ppi) | 500 |
| Pixel depth (bits) | 8 |
| Dynamic range (gray levels) | 200 |
| RAM (MB) | 512 |
| Certification | EFTS/F |
| Enrolment and Verification (other than just the image of the finger being captured) | Live Swipe |
| Impression type | Live-scan plain / Live-Scan Contactless may be considered for verification. |
| Light source dependability | No |
| High Resistance | To shock, abrasion and water |
| Algorithm should include | Image Quality Determination and Feature Generalization |
| Encryption of fingerprint template | Using unique foreign key |
| Image acquisition and storage | According to RBI guidelines |
| USB connectivity | Yes |
| Capture mode | Plain live scan capture; Auto capture with built-in quality check (incorporates NIST quality considerations) |
| Power | Through USB |

***Technical Specifications for Iris Scanner***

| **Parameter** | **Specification** |
|---|---|
| Iris template for image and data resolution | UIDAI registered |
| Mounting | Stand |

| | |
|---|---|
| Iris Diameter | 220 mm |
| Spatial Resolution | 4 Lp/mm – 65% |
| No. of Simultaneous captured eyes | 2 nos. |
| Special Spread | Power in any 100 nm band – 40 watt |

### *Technical specifications for Electronic Weighbridge*

| **Parameter** | **Specification** |
|---|---|
| Electronic Weigh Bridge specification | IS 9281 |
| Capacity | 100 Tons X 20 Kilograms |
| Load cell performance | Digital load cells conforming to OIML C5 accuracy |
| Junction Box | S.S. with IP 65 protected |
| Digital Indicator - Serial interface | RS 232/485/422 or RS 232/20mA |
| Digital Indicator – Internal Resolution | 16777216 |
| Display of Digital Indicator | Blue backlit, graphics up to 64 x 240 pixels up to 8 digits characters of size 17 mm x 10 mm |

### *Technical Specifications for Weight Sensors for Primary Vehicle*

| # | **Parameter** | **Minimum Specifications or better** |
|---|---|---|
| 1 | Load Capacity | 50 kg |
| 2 | Operating Temperature | 5°C to 55°C |
| 3 | Overload Indication | Yes |
| 4 | Overload Protection | Yes |
| 5 | DC Operated | 12 V with 8 Hours Battery Backup. |
| 6 | Stabilization Time | <5 Sec |
| 7 | Weighing Modes | Kg |
| 8 | Pan/Platform Material Type | SS |

| | | |
|---|---|---|
| 9 | Platform Size | 300x300m |
| 10 | Accuracy | 200 gms |

***Technical Specifications for Load Sensors for Secondary Vehicle***

| # | Parameter | Minimum Specifications or better |
|---|---|---|
| 1 | Load Capacity | 5 to 10 Tons |
| 2 | Operating Temperature | 5°C to 55°C |
| 3 | Overload Indication | Yes |
| 4 | Overload Protection | Yes |
| 5 | DC Operated | 12 V/24 V with 8 Hours Battery Backup. |
| 6 | Stabilization Time | <5 Sec |
| 7 | Weighing Modes | Kg/Ton |
| 10 | Accuracy | 10 Kg |

### 4.10 Smart Parking

#### 4.10.1 *Overview*

#### 4.10.2 *Scope*

The scope of the project to be covered under Smart Parking Project shall be to:

- Provide the infrastructure required for the Smart Parking solution at the parking lot (hand-held devices, boom barrier wherever applicable)
- Details of the parking locations are as follows:
    - On-Street & Off-Street parking locations

| Sl. No | Name Of Police Station | Name of parking location | On Street/Off Street |
|---|---|---|---|
| 1 | West Traffic Police Station | LLR Road | On Street |
| 2 | | Nehru Road | On Street |
| 3 | | B H Road | On Street |
| 4 | | Durgigudi Main Road | On Street |
| 5 | | Savarline Road | On Street |
| 6 | | JPN Road | On Street |

| | | | |
|---|---|---|---|
| 7 | | OT Road | On Street |
| 8 | | Jail Road | On Street |
| 9 | East Traffic Police Station | Nanjappa Hospital Back Side Conservancy | Off Street |
| 10 | | Max Hospital Front | Off Street |
| 11 | | ShivappaNayaka Circle To VeerashaivaKallyanaMantapa | On Street |
| 12 | | Gandhi Bazar 2nd Cross To Old Post Office Road | On Street |
| 13 | | Gandhi Bazar Entrance To Ramanna Shetty Park | On Street |
| 14 | | RTO Office Right Side | Off Street |

- Conservancies

| Conservancy No. | Locality | Width (m) | Length (m) | Proposed Activity | Cars | 2 wheelers | Cycles | Auto- |
|---|---|---|---|---|---|---|---|---|
| **4** | Nehru Road | 5.2 | 74 | Parking | 6 | 25 | - | - |
| **8** | LLR Road | 5.2 | 121.5 | Parking | 16 | 16 | - | - |
| **9** | Deendayal Marg | 5.2 | 121.5 | Parking | 16 | 16 | - | - |
| **10** | Deendayal Marg | 5.2 | 122 | Parking | 16 | 16 | - | - |
| **11** | Deendayal Marg | 4.3 | 125 | Parking | - | - | 15 | 30 |
| **55** | JPN Road | 5.4 | 117 | Parking | 15 | 16 | - | - |
| **56** | JPN Road | 5.4 | 147 | Parking | 15 | 49 | - | - |
| **95A** | 1st Cross Road | 5.5 | 170 | Parking | 23 | - | - | - |
| **96** | 1st Cross Road | 6.0 | 149 | Parking | 23 | - | - | - |
| **100** | 1st Cross Road | 6.0 | 125 | Parking | 16 | - | - | 10 |

- Provide the hardware and software required for a centralized view of all the parking lots

- Provide the backhaul network which acts as communication layer for real time data from sensors to reach data centre.
- Provide a citizen interface (mobile app (city wide app) and web interface) for guidance to parking lots.
- Undertake development, installation and maintenance of the hardware and software supplied, installed and commissioned by it as part of solution for a period of 5 years.
- Training of the parking subcontractors & Municipal Corporation staff.
- Integration with other parking management software implemented by different vendors in the city

### 4.10.3 *Functional Requirement*

***Identifying vehicles at Entry/Exit***

i. The smart parking solution should be able to count the number of vehicles entering and exiting any parking structure.

ii. The smart parking solution may use sensor based solutions to determine number of vehicles entering and exiting parking lots.

iii. The smart parking solution must geo-reference all the parking lots.

***Visibility of vacant parking spaces and Fare Revision***

i. The smart parking solution should report occupancy of parking lots to a central software application deployed at the Integrated Command Control Centre.

ii. The smart parking solution should enable SSCL/SMC to obtain real time situational awareness about the occupancy of parking lot through smart dashboard.

iii. The smart parking solution should enable citizens to obtain real time space availability via mobile app or web client.

***Ticketing***

i. The smart parking solution should enable SSCL/SMC or any other appointed third party to facilitate generation of parking receipts and tickets based on occupancy of parking lots.

ii. The solution will have provision for handheld devices through which parking receipts can be generated on payment of fees through card or cash.

iii. The ticket used by the LSI should be capable of capturing data that is easily retrievable at the exit.

iv. Should include the provisions for the following types of parking reservations:

   a. Walk-In Parking: This category of parking will include the citizens who drive in to the parking at any given point of time. The citizens can be provided with a QR

coded ticket or any other advanced technology as deemed fit by the Local System Integrator.

b. Pass Based Parking: There should be an option for users to buy monthly, quarterly or yearly passes for hassle free experience. The motorists opting for this category would be identified using RFID based, NFC based smart card or any other advanced technology as deemed fit by the Local System Integrator.

c. Premium Paid Parking: There should be an option for users to choose premium parking spaces for e.g.: near the entrance or exit. The corporate offices can also choose this option to reserve premium parking space for their employees. The motorists opting for this category would be identified using RFID based, NFC based smart card or any other advanced technology as deemed fir by the Local System Integrator

***Payment***

i. The payment collection can be done via cash (manually).

ii. The system must be tamperproof.

iii. Smart Cards shall be provided to regular users of the parking lots. The Smart Card must have the details of the user, the registered vehicle number and along with paper ticket, the LSI can propose a cost effective smart parking solution to include NFC enabled prepaid Smart Card System for premium customers and customers opting for monthly reserved parking passes.

iv. The NFC enabled smart card reader would be available at pay station and would automatically deduct the requirement payment towards parking.

***Compliance***

i. The LSI must ensure that all parking slots are individually and clearly marked. The smart parking solution should enable accounting and mapping of individual parking spots at selected locations.

***Accessibility of real time Parking space availability over Web client and Mobile App***

i. The smart parking solution should have a mobile and a web delivery channel for citizens to get real time parking availability.

ii. A mobile application and web based user interface should be provided with the following features:

a. The application should have citizen module and officer module.

b. The citizen should be able to see all the parking lots with exact available space in a real time mode.

c. While locating nearest parking lot, the most updated parking slot availability should be given to the user.

d. Through the citizen module, the user should be able to locate nearest parking lot. The same information must be made available on map with routing information.

e. The citizens should be able to generate MIS report to view their occupancy of parking lots over a defined time period.

f. The administrators should be able to generate MIS report to view occupancy, collection and other usage statistics over a defined time period.

***Integration***

i. **Hardware**: Integration information related to all Smart Parking components, including hardware components like Entry and Exit devices, barriers, handheld wireless devices, Smart Cards and software applications to perform parking related functions like payment, reporting, tracking, providing guidance etc. This information will be monitored and managed through the Smart Parking Solution.

ii. **Smart Card**: Integration with Smart Parking solution w.r.t identification of vehicle as well as recording time and deducting parking fees at the time of exit.

ii. **Integrated Command Control Centre:** Integration with ICCC for continuous monitoring and be able to respond for any failure of hardware components or any emergency situation at Parking lot. There should also be a provision to integrate with the parking management system of other locations. The system should be able to seamlessly integrate and fetch the parking details for monitoring and controlling at the ICCC.

iii. **Mobile App or web client**: Integration with Mobile App and web client to provide real time information on the availability of spaces in nearest or all parking lots.

***Accounting***

i. Application should be capable of analytics for providing details such as Usage and Vacancy periods, premium parking demand etc.

ii. The solution should be automated, reliable, cost effective, secure, scalable, environment friendly, energy efficient, and must entail minimum human intervention for day-to-day parking management.

iii. The smart parking solution should enable the above functions with minimum manual intervention

iv. The LSI would conduct a detailed Survey to study, validate and submit all updated documents, survey reports and maps as part of the proposed solution to SMC

v. The existing parking management contracts, wherever applicable would be honoured till the expiry of the contract. The existing Parking Contractors would be responsible for operating the smart solution being deployed by the LSI after undergoing training and continue to pay fixed parking revenue to SMC as per their contractual obligations.

vi. The LSI would be responsible for implementation and maintenance of all elements of Smart Parking initiatives for all existing and upcoming SMC parking slots for the entire duration of the project.

vii. The LSI will be responsible for all civil and installation work related to last mile connectivity, power supply extensions to devices, installing devices and equipment, and any other networking, communication, and infrastructure requirement related to Smart Parking

viii. The LSI shall provide comprehensive warranty for all hardware, software and networking components, both on-field and inside the ICCC (related to smart parking solution).

### 4.10.4 Technical Requirement

*Entry/Exit Barriers*

i. Movement transmission is done by ball-bearing-supported connecting rods

ii. Boom type - straight

iii. Opening/ closing time: from 0.8 secs. to 8 secs. Depending on the mounted arm (standard: 1-2 secs. For an arm of 3m.)

iv. Low maintenance rate: soft start and stop movements without arm oscillations

v. Emergency stop feature (optional)

vi. Optional UPS (Uninterrupted Power Supply) to continue operating when mains supply's fails (max. 100 up/ down movements)

vii. Operating temperature: -20 ºC to +55 ºC

viii. Single phase power supply: 220 V. ± 10% 50 Hz (110 V. ± 10% 60 Hz. optional)

ix. Operating consumption: 330 w. maximum

x. The Barrier unit must conform to ISO 9001 Quality Assurance Standard

xi. CE, certified

xii. Degree of Protection: IP34D

***Handheld Ticketing Dispenser***

i. The wireless handheld device should be able to dispense a ticket (with printed QR Code).

ii. The same device should be able to scan the same QR code ticket while leaving and generate and print receipt after receiving payment.

iii. The handheld should have the capability to allow personnel to enter the Unique Booking Code of the motorist.

iv. The handheld should also have NFC capabilities to be able to read NFC enabled Smart Card, Monthly passes, etc.

v. The handheld should be IP based and Wi-Fi enabled and should be monitored from the ICCC.

vi. The handheld device will have the basic parking metering and management application, which will be synced with the overall Parking Management System, and its data will be communicated back and forth from the ICCC.

***Parking Management and Guidance Solution***

i. The solution will be implemented in the Integrated Industry Standard Open Platform to manage, monitor and control Smart Parking initiative. Integrated Industry Standard Open Platform should have API based access to the Parking Management and Guidance System as well as the devices utilized for parking.

ii. The solution should be able to monitor and configure all devices with respect to parking (sensors, displays, and signal converters).

iii. It should control the system functionality and monitoring should be done from other computers and remotely.

iv. It should provide capability to create full report of exact location with respect to floors, areas, levels, etc. It should be customizable and update about occupation and movements of vehicles in real time.

v. It should provide real time monitoring of all system status.

vi. It should report alarms when devices are not connected or when any equipment failure occurs.

vii. The software should provide full graphical plan information of the car park with exact locations.

viii. The software should allow downloading the information and configuration of fields for maintenance purpose.

ix. The software application should have built in tools for third party integration to obtain real time information

x. Should provide access at user levels with passwords.

xi. The software should have historic log for available spaces, period of time.

xii. The software should be able to handle manual overriding of available spaces, special parking requirements for reserved spaces and handicapped lots.

### 4.11 Intelligent Traffic Management

#### 4.11.1 *Overview*

Traffic management comprises of the continuous process of monitoring the road network, assessing the state of the network based on the monitored information, determining what action should be taken and then implementing the traffic management intervention on the road network and then monitoring the road network for determining the effect of the intervention. In addition to these core operational functions, road network managers need to concern themselves with safety, environment and driver compliance with rules and regulations. The ultimate goal is to "Improve Traffic Quality".

#### 4.11.2 *Scope*

The selected Local System Integrator (LSI) will be responsible for the successful implementation of the proposed Intelligent Traffic Management System (ITMS) and provide capacity building support to city authorities as per the scope of services described below. The LSI shall implement and deliver the following systems and capabilities to be linked with command and control center.

1. Procurement, installation, commissioning of Intelligent Traffic Signalization at the junctions – 7 locations
2. Procurement, installation & commissioning of Signal Controller at 6 of the existing signalized junctions. This is to monitor and control the existing signals too at the ICCC
3. Procurement, installation & commissioning of Automated Number Plate Recognition (ANPR) at the city entry/ exit points – 9 locations
4. Traffic Signal Synchronization (future)
5. Integration of the e-challan system of Police Department (future integration), as and when ready.
6. Any new cameras (future integration), that send the data in a specified format, should be integrated at the ICCC
7. Procurement, installation and commissioning of the following will be included in the scope of the Local system integrator

a. 2 pelican signals on either side of the road in front of Mc Gann hospital. 3 additional pelican signals are also proposed for procurement. The locations for installation of these pelican signals will be identified at a later stage

b. VMS in the city. The VMS will be installed on smart roads. The locations and quantity of VMS required will be identified as part of a road survey. In the meantime the Local System Integrator should make provision for availability software infrastructure for information display at the VMS

8. Procurement of 29 GPS devices for police department vehicles (including 8 PCR vehicles). These vehicles are to be monitored at the ICCC as part of VTMS offered by the MSI. The vendor is required to procure, install and commission these devices.

9. The walky-talky units of the police/ traffic police department will have to be integrated at the ICCC

10. The vendor is required to provide 28 cameras at the following 11 locations. Any existing cameras at these locations will be replaced by the new cameras. The existing cameras will be removed and handed over to the police department with no additional cost to the department. In addition to the proposed cameras the vendor is also required to provide 22 fixed cameras to the police departmentThe additional cameras in possession of the police department may be used by the department on need basis..

| Sl.NO | Location | Fixed | PTZ | Status |
|---|---|---|---|---|
| 1. | Ashoka Circle | 2 | 2 | Existing location |
| 2. | Ameer Ahmed circle | 2 | 2 | Existing location |
| 3. | SN circle | 2 | 1 | Existing location |
| 4. | Karnataka Sangha Circle | - | 1 | Existing location |
| 5. | Shankar Mutt circle | 1 | - | Existing location |
| 6. | Usha Nursing Home | 2 | - | Existing location |
| 7. | Gopi Circle | 2 | 1 | Existing location |
| 8. | Vinobha Nagar Police Chowki | 2 | 3 | New location |
| 9. | Jail Circle | 1 | 1 | Existing location |
| 10. | Lakshmi Circle | 1 | - | Existing location |
| 11. | Alkola Circle | 1 | 1 | Existing location |

| | | | | |
|---|---|---|---|---|
| | **Total** | **16** | **12** | |

12. The feed from all the cameras, existing and proposed, is sent to the NVR at the police control room.

**Solution Design**

*Intelligent Traffic Signals*

The traffic intersections identified for Intelligent Traffic Systems are provided below. The existing signalized junctions (6 Nos) will be provided with a controller for central monitoring and control at the ICCC. There are a total of 9 non-signalized intersections. 7 of these intersections are considered for signalization, with 2 intersections remaining un-changed.

| S.No. | Traffic Intersections | Type of Junction | Requirement |
|---|---|---|---|
| 1 | Ashoka Circle-1 (Opposite KSRCT Stand) | Non signalized | Signalization |
| 2 | Ashoka Circle-2(Beside Pvt.Bus Stand) | Non signalized | Signalization |
| 3 | Ameer Ahmed Circle | Non signalized | Signalization |
| 4 | Karnataka Sanghe Circle | Signalized | Signal Controller |
| 5 | Basaveshwara Circle | Non signalized | Signalization not required |
| 6 | Mahaveer Circle (DC office circle) | Signalized | Signal Controller |
| 7 | Shivamurthy Circle | Signalized | Signal Controller |
| 8 | Usha Nursing Home | Signalized | Signal Controller |
| 9 | Alkola Circle | Non signalized | Signalization |
| 10 | IB Circle | Signalized | Signal Controller |
| 11 | Gopi Circle | Non signalized | Signalization |
| 12 | Jail Circle | Signalized | Signal Controller |
| 13 | Sarvajnya Circle (KEB Circle) | Non signalized | Signalization not required |
| 14 | Shankarmutta Circle/Hole Circle | Non signalized | Signalization |

The traffic flow at intersections will be monitored using existing surveillance cameras installed at these locations by the police department. Details of the surveillance cameras installed by the Police department are as follows:

| Sl.No | Locations | Camera | |
|---|---|---|---|
| | | Fixed | PTZ |
| 1 | Ashoka Circle-1 (Opposite KSRTC Stand) | 2 | 2 |
| 2 | Ashoka Circle-2(Beside Pvt.Bus Stand) | | |
| 3 | Ameer Ahmed Circle | 2 | 2 |
| 4 | Karnataka Sanghe Circle (Installation in progress) | | 1 |
| 5 | Basaveshwara Circle | | |
| 6 | Mahaveer Circle (DC office circle) | 2 | 1 |
| 7 | Shivamurthy Circle | 1 | 1 |
| 8 | Usha Nursing Home | 2 | |
| 9 | Alkola Circle | 1 | 1 |
| 10 | IB Circle | 1 | |
| 11 | Gopi Circle | 2 | 1 |
| 12 | Jail Circle | 1 | 1 |
| 13 | Sarvajnya Circle (KEB Circle) | 1 | 1 |
| 14 | Shankarmutta Circle/Hole Circle | 1 | |

*Automated Number Plate Recognition (ANPR) System*

The ANPR System shall enable monitoring of vehicle flow at strategic locations. The system shall support real-time detection of vehicles at the deployed locations, recording each vehicle, reading its number plate, database lookup from central server and triggering of alarms/alerts based on the vehicle status and category as specified by the database.

The ANPR is proposed at the city entry/ exit points by the Police department. The details of the locations for the ANPR cameras are as mentioned below. The existing cameras at these locations will be replaced with new cameras. The old cameras will be handed over to Police Department, without damage at no extra cost or can be re-installed at any strategic locations in discussion with the Traffic Police and the City police department

| Sl.No | Locations | Status of existing cameras | Network | Number of lanes |
|---|---|---|---|---|
| 1 | Gajanana Gate | (1 bullet camera) | Existing OFC cable available | 1 lane with passage for 2 vehicles simultaneously. |

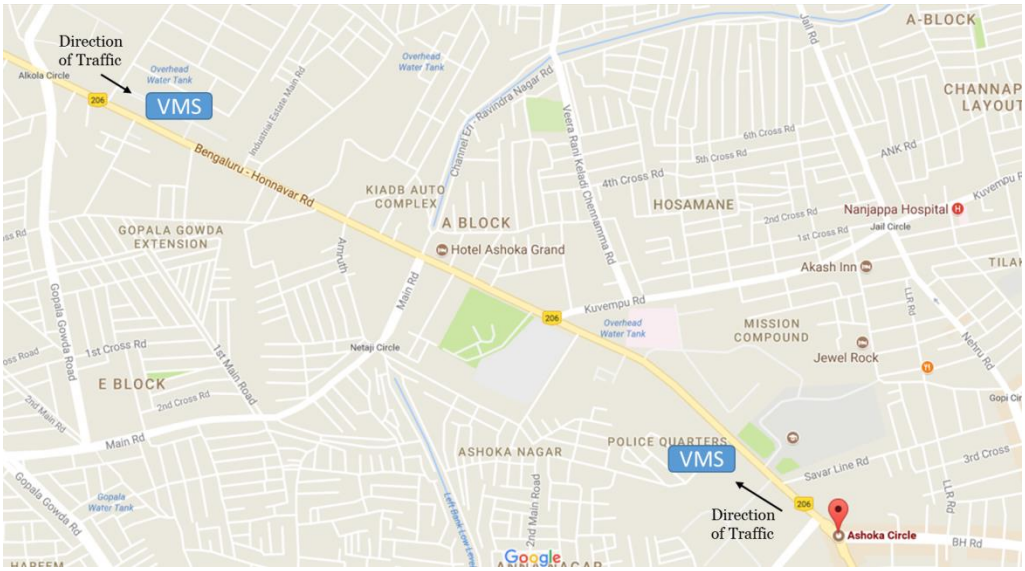
| | | | | |
|---|---|---|---|---|
| 2 | Bommanakatte | (1 bullet camera) | Existing OFC cable available | 1 lane with passage for 2 vehicles simultaneously. |
| 3 | Gadikoppa | (1 bullet camera) | Existing OFC cable available | 1 lane with passage for 2 vehicles simultaneously. |
| 4 | JNNC College Check Post | | OFC cable unavailable | 2 lane with passage for 4 vehicles simultaneously. |
| 5 | Chickle Check Post | | Existing OFC cable available | 1 lane with passage for 2 vehicles simultaneously. |
| 6 | MRS Check post | | Existing OFC cable available | 2 lane with passage for 4 vehicles simultaneously |
| 7 | NR pura Road | | Existing OFC cable available | 2 lane with passage for 4 vehicles simultaneously |
| 8 | Chowdeshwari Check Post | | Existing OFC cable available | 1 lane with passage for 2 vehicles simultaneously. |
| 9 | Sominakoppa | (1 bullet camera) | Existing OFC cable available | 1 lane with passage for 2 vehicles simultaneously. |

*Variable Messaging System*

The broad scope of work to be covered under this sub module will include the following, but is not limited to:

1. The LSI shall presently install IP based VMS boards at2 locations in the city of Shivamogga. These VMS boards shall have different characteristics depending upon the location and purpose of installation. VMS board displays are to be controlled by personnel from the ICCC. The purpose of the VMS boards is to provide the commuters with information about traffic conditions and alternate routes in case of high traffic on roads.

   The location for VMS is mentioned in the diagram below:




2. Additional locations for the set-up of VMS will be identified as part of the Smart Roads. The rates for VMS will be discovered as part of the RFP. The LSI will install the VMS at the locations subject to the readiness of the sites.

*Network Architecture*

Intelligent Traffic Management solution will comprise of traffic signal controller. Data from traffic signal controller can be sent through GSM or leased line. Each Traffic control system will be connected through the existing OFC network or will have either wireless access point, internet leased line or GSM connectivity.

### 4.11.3 *Functional requirement*

*Traffic Signal Controller*

1. The Traffic Signal Controller equipment is a 32 bit or 64 bit microcontroller with solid state traffic signal lamp switching module with the ability to programme any combination of traffic signal stages, phases and junction groups. The controller will ideally have a conflict monitoring facility to ensure that conflicting, dangerous are pre-flagged at the programming stage and these are disallowed even during manual override phase.
2. The Traffic Signal Controller will be controlled through the central traffic control center.
3. Site specific configuration data shall be stored in a non-volatile memory device (FLASH memory) easily programmable at the site through keypad or laptop. A minimum of 512KB flash memory and 128KB RAM shall be provided. Volatile memory shall not be used for storing the junction specific plans or signal timings.
4. All timings generated within a traffic signal controller shall be digitally derived from a crystal clock which shall be accurate to plus or minus 100 milliseconds.

5. The controller shall provide a real time clock (RTC) with battery backup that set and update the time, date and day of the week from the GPS. The RTC shall have minimum of 10 years battery backup with maximum time tolerance of +/- 2 sec per day.

**Police Panel**

The controller shall provide the following facilities in a separate panel with provision for lock and key arrangements for use by the Traffic Police.

1. **Four Hurry Call switches**: The Hurry Call mode will provide the means to force the controller to a defined stage, without violating safety clearances. A preemption input may be used to demand the Hurry Call mode to give right of way to emergency vehicles. It should be possible to configure the Hurry Call switches to any stage as per site requirements.
2. **One Forced Flash Switch**: Activation of this switch should force the signal to Flashing Amber / Flashing Red.
3. **One Auto / Manual Switch**: Activation of this switch should enable manual operation of the controller. Deactivation of the manual switch shall continue from the current stage without interruption.
4. **One Manual Advance Pushbutton Switch**: In manual operation mode, the stages appear in the sequence specified in the signal plan timetable. Activating the pushbutton switch shall terminate the currently running stage and start the next, without violating safety clearances.
5. **One Junction OFF Switch**: Activating this switch should put OFF all signal lamps. On deactivation of the switch the traffic signal controller shall resume its normal operation without violating any safety clearances.

**Modes of Operation**

The traffic signal controller shall have the following modes of operation:

1. **Fixed Time**: In fixed time (pre-timed) mode the traffic signal controller shall execute stage timings according to the site specific timetable maintained in the traffic signal controller FLASH memory. Cycle time remains constant in every cycle execution for a given time period.
2. **Transit Signal Priority (TSP) for city buses**: The traffic signal controller shall provide transit signal priority for buses in dedicated lane to ensure minimum stop delay at the intersection, without violating safety clearances.
3. The traffic signal controller shall accept commands for remote selection / de-selection of the following from the Central Computer at ICCC.

- Hurry Call
- Flashing Amber / Flashing Red
- Junction Off

If not reverted to the normal operation within the time period listed below, the traffic signal controllers shall timeout the commands and operate normally

- Hurry Call – 5 Minutes
- Flashing Amber / Flashing Red – 30 Minutes
- Junction Off – 30 Minutes

The traffic signal controller shall report the following to the Central Computer through the communication network every cycle or on an event as appropriate.

Green time actually exercised for each approach (stage preemption timing) against the Green running period set for the approach by the Central Computer

Mode of Operation -

- Lamp failure, if any
- Output short circuit, if any
- Detector failure, if any

Traffic Signal Controller Operating Parameters

Phases - The controller shall have facility to configure 32 Phases either for vehicular movement, filter green, indicative green, pedestrian movement or a combination thereof.

- It shall be possible to operate the filter green (turning right signal) along with a vehicular phase. The filter green signal shall flash for a time period equal to the clearance amber period at timeout when operated with a vehicular phase.
- The pedestrian phase signal shall be configured for flashing red or flashing green aspect during pedestrian clearance.
- It shall be possible to configure any phase to the given lamp numbers at the site.

- Stages – The controller shall have facility to configure 32 Stages.
  - **Cycle Plans** – The controller shall have facility to configure 24 Cycle Plans and the Amber Flashing / Red Flashing plan. It shall be possible to define different stage

switching sequences in different cycle plans. The controller shall have the capability for a minimum of 32 cycle-switching per day in fixed mode of operation.

- **Day Plans** – The controller shall have facility to configure each day of the week with different day plans. It shall also be possible to set any of the day plans to any day of the week. The controller shall have the capability to configure 20 day plans.
- **Special Day Plans** – The controller shall have facility to configure a minimum of 20 days as special days in a calendar year.
- **Starting Amber** – During power up the controller shall initially execute the Flashing Amber / Flashing Red plan for a time period of 3 Seconds to 10 Seconds. The default value of this Starting Amber is 5 Seconds. Facility shall be available to configure the time period of Starting Amber within the given limits at the site.
- **Inter-green** – Normally the inter-green period formed by the clearance Amber and Red extension period will be common for all stages. However, the controller shall have a facility to program individual inter-green period from 3 Seconds to 10 Seconds.
- **Minimum Green** – The controller shall allow programming the Minimum Green period from 5 Seconds to 10 Seconds without violating the safety clearances. It should not be possible to pre-empt the Minimum Green once the stage start commencing execution.
- **All Red** – Immediately after the Starting Amber all the approaches should be given red signal for a few seconds before allowing any right of way, as a safety measure. The controller shall have programmability of 3 Seconds to 10 Seconds for All Red signal.
- **Signal lamps monitoring** – The controller shall have inbuilt circuitry to monitor the lamp status
- **Green – Green Conflict Monitoring** – The controller shall have a facility to list all conflicting phases at an intersection. The controller should not allow programming of these conflicting phases in a Stage. A hardware failure leading to a conflict condition (due to faulty devices or short circuit in the output) shall force the signal into Flashing Amber / Flashing Red.
- Fixed Time mode with fixed offsets

Input and Output Facilities

- **Lamp Switching**: The controller shall have maximum 64 individual output for signal lamp switching, configurable from 16 to 32 lamps. The signal lamps shall be operating on appropriate DC/AC voltage of applicable rating
- **Power Saving**: The traffic signal controller shall have a facility to regulate the intensity of signal lamps during different ambient light conditions thereby saving energy.
- **Real-time Clock (RTC)**: The GPS receiver for updating time, date and day of the week information of the traffic signal controller should be an integral part of the traffic signal controller.
- The traffic signal controller shall update the date, time and day of the week automatically from GPS during power ON and at scheduled intervals.
- Manual entry for date, time and day of week shall be provisioned for setting the traffic signal controller RTC (Real Time Clock).
- It shall be possible to set the RTC from the Central Server when networked.
- Keypad (optional): The traffic signal controller shall have a custom made keypad or should have provision for plan upload and download using PC/laptop/Central Server
- Operator Display (optional): The traffic signal controller shall optionally have a LED backlit Liquid Crystal Display (LCD) as the operator interface.

*Count down Timer*

Countdown Timer shall be installed at each traffic junction. The functional requirements of a count –down timer are as follows:

1. Count Down Timer to be configured in Vehicular Mode.
2. The Vehicular countdown timer should be dual color,
    a. Red for Stop or STP
    b. Green color for Go
3. There should be alternate Red and Balance phase time for STOP or STP in Flashing
4. Alternate Green and Balance Phase Time for Go in Flashing

*Automated Number Plate Recognition (ANPR) System*

1. Vehicle Detection by Color:
    i. The system shall detect the color of all vehicles in the camera view during daytime and label them as per the predefined list of configured system colors. The system will store the color information of each vehicle along with the license plate information for each transaction in the database.

ii. The system shall have options to search historical records for post event analysis by the vehicle color or the vehicle color with license plate and date time combinations

2. Alert Generation

i. The system should have option to input certain license plates according to the hot listed categories like “Wanted”, “Suspicious”, “Stolen”, etc by authorized personnel.

ii. The system should be able to generate automatic alarms to alert the control room personnel for further action, in the event of detection of any vehicle falling in the hot listed categories.

3. Vehicle Status Alarm Module

i. On successful recognition of the number plate, system should be able generate automatic alarm to alert the control room for vehicles which have been marked as "Wanted", "Suspicious", "Stolen", "Expired". (System should have provision/expansion option to add more categories for future need).

ii. The Instantaneous and automatic generation of alarms. In case of identity of vehicle in any category which is define by user.

4. Vehicle Log Module

i. The system shall enable easy and quick retrieval of snapshots, video and other data for post incident analysis and investigations.

ii. The system should be able to generate suitable MIS reports that will provide meaningful data to concerned authorities and facilitate optimum utilization of resources. These reports shall include.

i. Report of vehicle flow at each of the installed locations for Last Day, Last Week and Last Month.

ii. Report of vehicles in the detected categories at each of the installed locations for Last Day, Last Week and Last Month.

iii. Report of Vehicle Status change in different Vehicle Categories.

iii. The system shall have Search option to tune the reports based on license plate number, date and time, site location as per the need of the authorities.

iv. The system shall have option to save custom reports for subsequent use. The system shall have option to export report being viewed to common format for use outside of the ANPRS or exporting into other systems.

v. The system should provide advanced and smart searching facility of License plates from the database. There should be an option of searching number plates almost matching with the specific number entered (up to 1 and 2 character distance)

5. Vehicle category editor

i. The system should have option to input certain license plates according to category like "Wanted", "Suspicious", "Stolen", “Expired" etc. by Authorized personnel.

ii. The system should have an option to add new category by authorized personnel.

iii. The system should have option to update vehicle status in specific category by authorized personnel. e.g. on retrieval of stolen vehicle, system entry should be changed from "Stolen" to "Retrieved".

iv. System should have option to specify maximum time to retain vehicle records in specific categories.

| Sl. No. | System Parameter |
|---|---|
| a. | **Information to be captured by Edge Devices**<br>It is important that the selection and placement of cameras is carefully done to ensure the:<br>• full coverage of the information at the filed, i.e capture of the image/video of the person inside the vehicle and<br>• accuracy of the information captured on the field, i.e Registration Number of the vehicle through ANPR Camera system for each vehicle identified for infraction.<br><br>The cameras should be rugged, durable & compact. These cameras need to work on 24 X 7 basis and transmit quality video feeds to the ICCC. City Police may take the regular review of the requirements for video resolution, FPS and may change these numbers to suit certain specific requirements (for example, there could be a situation when certain cameras are required to be viewed at higher FPS for specific period. It is estimated that not more than 5% of the cameras would be required to be viewed at higher FPS at a given point of time). |
| b. | **Information to be analyzed at ICCC**: The control centre shall allow an operator to view live / recorded video from any camera on the network. |
| c. | **Role Based Access to the Entire System**.<br><br>Various users should have access to the system using single sign on and/or should be role based. Different roles which could be defined (to be finalized at the stage of implementation) could be Administrator, Supervisor, Officer, Operator, etc. Apart from role based access, the system should also be able to define access based on location. Other minimum features required in the role based authentication systems are as follows:<br><br>a. The management module should be able to capture basic details (including mobile |

| Sl. No. | System Parameter |
|---|---|
| | number & email id) of the Police Personnel & other personnel requiring Viewing / Administration rights to the system. There should be interface to change these details, after proper authentication.<br>b. Rights to different modules / sub-modules / functionalities should be role based and proper log report should be maintained by the system for such access.<br>c. The system should be with login name & password enabled to ensure that only the concerned personnel are able to login into the system<br>d. There should be provision to specify hierarchy of operators / officers for control of the cameras from various locations.<br>e. Windows Active Directory/LDAP or any such system can be used to design role based access. |
| d. | The Evidence and ANPR camera should continuously record all footage in its field of view to be stored at the local base station. This should be extractable onto a portable device as and when required.The option of live viewing of evidence cameras from the locations shall be available at the Traffic Control Centre (TCC). The network should have the capability to provide the real time feed of the evidence camera to the TCC at the best resolution possible on the available network. ANPR Cameras shall cover single lane. For places where more than 2 lanes are to be monitored, the lane cameras are to be increased in proportion to the lane |
| e. | The system shall be equipped with IR Illuminator to ensure clear images including illumination of the Number Plate and capture the violation image under low light conditions and night time. Cameras with IR illuminators should be deployed at heights of 20 feet to allow HMV (High Motor Vehicles) to pass underneath it, and to minimize occlusion |
| 2 | **Recording & display information archive medium** |
| a. | The recording and display of information should be detailed on the snapshot of the infracting vehicle as follows: |
| i. | Computer generated unique ID of each violation |
| ii. | Date (DD/MM/YYYY) |
| iii. | Time (HH:MM:SS) |
| iv. | Equipment ID |

| Sl. No. | System Parameter |
|---|---|
| v. | Location ID |
| vi. | Carriageway or direction of vehicle |
| vii. | Lane Number of vehicle |
| viii. | Registration Number of violating vehicle |

*Variable Messaging System*

**Functional Specifications:**

The bidder is required to follow the Indian Road Congress (IRC) guidelines for VMS. The system requirements for VMS include but are not limited to the following:

- The system should be capable of displaying warnings, traffic advice, route guidance and emergency messages to motorists from the ICCC in real time.
- The VMS should display text and graphic messages using Light Emitting Diode (LED) arrays.
- The System should able to display failure status of any LED at ICCC.
- The System should support Display characters in true type fonts and adjustable based on the Operating system requirement.
- The VMS workstation at the ICCC should communicate with the VMS controller through the network. It should send out command data to the variable message sign controller and to confirm normal operation of the signboard. In return, the VMS workstation should receive status data from the VMS controller.
- VMS controllers should continuously monitor the operation of the VMS via the provided communication network.
- Operating status of the variable message sign should be checked periodically from the ICCC.
- It shall be capable of setting an individual VMS or group of VMS's to display either one of the pre-set messages or symbols entered into the computer via the control computer keyboard or by another means.
- It shall be capable of being programmed to display an individual message to a VMS or a group of VMS's at a pre-set date and time.
- A sequence of a minimum of 10 messages/pictures/ pre-decided sign or group of signs shall be possible to assign for individual VMS or group of VMS's.
- It shall also store information about the time log of message displayed on each VMS. The information stored shall contain the identification number of the VMS, content of the message, date and time at which displayed message/picture starts and ends.

- The central control computer shall perform regular tests (pre-set basis) for each individual VMS. Data communication shall be provided with sufficient security check to avoid unauthorized access.
- The content layout at the display should be configurable.

**Variable Message Signboard Application**

- Central Control Software allows controlling multiple VMS from one console.
- Capable of programming to display all types of Message/ advertisement having alphanumeric character in English, Kannada and combination of text with pictograms signs. The system should have feature to manage video / still content for VMS display.
- The system should have capability to divide VMS screen into multi-parts to display diverse form of information like video, text, still images, advertisements, weather info, city info etc. The system should also provide airtime management and billing system for paid content management
- Capable of controlling and displaying messages on VMS boards as individual/ group.
- Capable of controlling and displaying multiple font types with flexible size and picture sizes suitable as per the size of the VMS.
- Capable of controlling brightness & contrast through software.
- Capable to continuously monitor the operation of the Variable Message sign board, implemented control commands and communicate information to the ICCC via communication network.
- Real time log facility – log file documenting the actual sequence of display to be available at central control system.
- Multilevel event log with time & date stamp.
- Access to system only after the authentication and acceptance of authentication based on hardware dongle with its log.
- Location of each VMS will be plotted on GIS Map with their functioning status which can be automatically updated.
- Report generation facility for individual/group/all VMSs with date and time which includes summary of messages, dynamic changes, fault/repair report and system accessed logs, link breakage logs, down time reports or any other customized report.
- Configurable scheduler on date/day of week basis for transmitting pre-programmed message to any VMS unit.

- Various users should access the system using single sign on and should be role based. Different roles which could be defined (to be finalized at the stage of SRS) could be Administrator, Supervisor, Officer, Operator, etc.
- Apart from role based access, the system should also be able to define access based on location.
- Rights to different modules / Sub-Modules / Functionalities should be role based and proper log report should be maintained by the system for such access
- Components of the architecture must provide redundancy and ensure that there are no single points of failure in the key project components. To take care of remote failure, the systems need to be configured to mask and recover with minimum outage.
- The architecture must adopt an end-to-end security model that protects data and the infrastructure from malicious attacks, theft, natural disasters etc. provisions for security of field equipment as well as protection of the software system from hackers and other threats shall be a part of the proposed system. Furthermore, all the system logs shall be properly stored & archived for future analysis and forensics whenever desired.
- 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.
- System shall use open standards and protocols to the extent possible
- Facility to export reports to excel and PDF formats.

**Remote Monitoring**

- All VMS shall be connected/ configured to ICCC for remote monitoring through network for two way communication between VMS and control Room to check system failure, power failure & link breakage.
- Remote Diagnostics to allow identifying failure up to the level of failed individual LED.

### 4.11.4 *Technical Requirement*

***Intelligent Traffic Signal System***

**Key Features**

- Lowest power consumption for all colors
- Meets or exceeds intensity, color and uniformity specifications
- Temperature compensated power supplies

- Uniform appearance light diffusing
- Products shall be Intertek/ETL/EN/Equivalent certified
- All units operate on AC or DC as the per the suggested solution by LSI

**LED aspects**

- Red, Amber, Green-Full (300 mm diameter): Hi Flux
- Red, Amber, Green-arrow (300 mm diameter): Hi flux
- Red, Green-Pedestrian (300 mm diameter): Hi Flux and Hi Brite
- Animated Pedestrian-Red and Green Animated c/w countdown (200 mm) Hi Brite withdiffusions

**Poles for Traffic Signals**

- **Material** - GI Class 'B' pipe
- **Paint** - Pole painted with two coats of zinc chromate primer and two coats of golden yellow Asian apostolate paint or otherwise as required by architect and in addition bituminous painting for the bottom 1.5 m portion of pole.

**Cables for Traffic Signals**

- **No's of core -** 7 and 14 core 1.5 sq. mm. 3 Core 2.5 sq. mm.
- **Materials -** PVC insulated and PVC sheathed armored cable with copper conductor of suitable size as specified in BOQ.
- **Certification -** ISI Marked
- **Standards -** Indian Electricity Act and Rules
- **IS:1554 -** PVC insulated electric cables (heavy duty)

***Automated Number Plate Recognition (ANPR) System***

i. Technical Specifications: ANPR System

General Specifications:

- The system should be capable of generating a video and minimum 5 snapshots in any of the standard industry formats (MJPEG, JPG, avi, mp4, mov, etc) with atleast 10 frames per second.
- The system should be able to perform ANPR on all the vehicles passing the site and send alert on detection of any hot listed vehicle
- The system should have ANPR/ OCR to address the alpha numeric character of irregular font sizes

Network Camera

| # | Parameter | Minimum Specifications or better |
|---|---|---|
| 1. | Video Compression | H.264 |
| 2. | Video Resolution | 1920 X 1080 |
| 3. | Frame rate | Min. 30 fps |
| 4. | Image Sensor | 1/3” Progressive Scan CCD / CMOS |
| 5. | Lens Type | Varifocal, C/CS Mount, IR Corrected Full HD |
| 6. | Lens# | Auto IRIS<br>5~50mm/ 8 – 40 mm, F1.4 |
| 7. | Minimum Illumination | Colour: 0.5 lux, B/W: 0.1 lux (at 30 IRE) |
| 8. | Normal Horizontal Field of View | at least 3.5 Mtr. (One lane) |
| 9. | Typical Range | 30 Mtrs or better |
| 10. | IR Cut Filter | Automatically Removable IR-cut filter |
| 11. | Day/Night Mode | Colour, Mono, Auto |
| 12. | S/N Ratio | ≥ 50 Db |
| 13. | Auto adjustment + Remote Control of Image settings | Colour, brightness, sharpness, contrast, white balance, exposure control, backlight compensation, Gain Control, Wide Dynamic Range |
| 14. | Audio | Audio Capture Capability (G.711, G.726) |
| 15. | Local storage | Micro SDXC up to 128GB (Class 10) 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. |

| | | |
|---|---|---|
| 16. | Protocol | IPV4, IPV6, HTTP, HTTPS, FTP/SMTP, NTP, RTSP, RTP, TCP, UDP, RTCP, DHCP, UPnP, QoS, ONVIF Profile S |
| 17. | Security | Password Protection, IP Address filtering, User Access Log, HTTPS encryption |
| 18. | Operating conditions | 0 to 50°C (temperature), 50 to 90% (humidity) |
| 19. | Intelligent Video | Motion Detection & Tampering alert |
| 20. | Alarm I/O | Minimum 1 Input & 1 Output contact for 3rd part interface |
| 21. | Casing | NEMA 4X / IP-66 rated, IK10 |
| 22. | Certification | UL/EN, CE,FCC |

ii. Camera Housing: IP66 standard with sunshield vandal proof Housing

iii. Advanced Encryption Standard (AES) shall be followed for data encryption on site and at the CCC and its access will be protected by a password

iv. Direct extraction through any physical device like USB flash drive, portable hard disk etc shall be possible

v. The system should capture standard vehicle's number plate with an accuracy of at least 70% at day time and at least with an accuracy of 60% during the night time

6. System Requirement

i. **Local Server at Intersection**: The system must run on a Commercial Off the Shelf Server (COTS). Outdoor IP 66 Quad core processor based server should be able to cover at least 8 lanes. Temperature rating of the server should be at least 60 degree.

ii. **Operating system**: The system must be based on open platform and should run on Linux or windows Operating system.

iii. **Workstation:** Workstation must run on latest available OS.

***IR Illuminators***

The infrared illuminators are to be used in conjunction with the Fix Box / PTZ cameras specified above to enhance the night vision.

| # | Parameter | Minimum Specifications or better |
|---|---|---|

| # | Parameter | Minimum Specifications or better |
|---|---|---|
| | Range | Min. 100 mtrs |
| | Minimum Illumination | High sensitivity at Zero Lux |
| | Power | Automatic on/off operation |
| | Casing | NEMA 4X / IP-66 rated |
| | Operating conditions | -5° to 50°C |
| | Certification | UL / CE / FCC / EN |

***Pelican Signals***

| # | Parameter | Minimum Specifications or better |
|---|---|---|
| 1 | Working Supply | 24 VDC or 220 Volts ac as required by client |
| 2 | No. of Pedestrian call stations | 2 |
| 3 | Controller Outputs | 5 (3-aspect Vehicular signal and 2 Pedestrian signal) |
| 4 | Controller Inputs | 1. Push button for pedestrian Demand.<br>2. DIP Switch for plan selection.<br>3. A DIP Switch to select the auto/demand mode of operation.<br>4. A reset switch upon pressing of which the program restarts. 8 nos of pelican actuated inputs. |
| 5 | Electronic Design | Micro-controller based circuits for sequence programming, pedestrian call registration and timings. |
| 6 | Mode of operations | 1.Actuated mode<br>2. Automatic mode with continuous running cycle at prefixed times.<br>3. Manual mode with stage advancing at the press in controller of push button<br>4. Blinking Mode. |
| 7 | Lamp Switching devices | Solid state device with zero cross over detection |
| 8 | Output Input Isolation | Output switching isolated from control circuit by optical isolation |
| 9 | Programming Facility | 1.PC compatible by RS 232 port 2.Optional Key Board |
| 10 | Software | Windows based software for programming |
| 11 | Hardware | |
| | CPU | Microcontroller based |

| | | |
|---|---|---|
| | Memory | Built-in Non-Volatile EEPROM memory for Storage |
| | System Clock | 1. Built-in RTC with battery back-up<br>2. 16 x2 LCD Display Interface<br>3. Optional USB communication Port for PC/Laptop |
| 12 | Execution | The control unit with Programmer and Detector units is assembled in a standard cabinet.<br>The Switch-gear & SSRs are mounted in a panel.<br>Both the above assemblies are housed in an outdoor type Pedestal Box. |
| 13 | Protection | Auto shutdown on power fluctuation beyond the limit and auto start-up on restoration |

***Variable Messaging System( VMS)***

| # | Parameter | Description |
|---|---|---|
| **1.** | **Dimensions** | |
| A | Minimum 3.0m length X 1.5m height X 0.2m depth. (3000mm x 1500mm X 200mm approx) | |
| **2.** | **Colour LED** | Full Colour, class designation C2 as per IRC/EN 12966 standard |
| **3.** | **Luminance Class/Ratio** | L3 as per IRC/EN 12966 standards. |
| **4.** | **Luminance Control & auto Diming** | |
| a. | Should be automatically able to provide different luminance levels but shall also be controllable from the traffic centre using software. | |
| b. | Auto dimming capability to adjust to ambient light level (sensor based automatic control) | |
| c. | Photoelectric sensor shall be positioned at the sign front and sign rear to measure ambient light. Capable of being continually exposed to direct sunlight without impairment of performance. | |
| **5.** | **Contrast Ratio** | R3 as per IRC/EN 12966 standard |
| **6.** | **Beam Width** | B6+ as per IRC/EN12966 standards. |
| **7.** | **Pixel Pitch** | 12mm or better |

| | | |
|---|---|---|
| **8.** | **Picture Display** | |
| d. | At least 300mm as per IRC /EN 12966 standards | |
| e. | Full Matrix: Number of lines & characters adjustable, active area: 2.88mX1.2m atleast | |
| f. | Synchronized Dot to Dot display. | |
| a. | Capable of displaying real time message generated by ICCC. | |
| b. | Special frontal design to avoid reflection. | |
| c. | Display shall be UV resistant | |
| **9.** | **Viewing Angle** | B6+ as per IRC/EN12966 standard- Viewing angle shall ensure message readability for motorists in all lanes of the approach road |
| **10.** | **Viewing Distance** | Suitable for readability from 150 Mtrs. or more at the character size of 240mm, from moving vehicles. |
| **11.** | **Self-Test** | |
| a. | VMS shall have self-test diagnostic feature to test for correct operation. | |
| b. | Display driver boards shall test the status of all display cells in the sign even when diodes are not illuminated. | |
| c. | All periodic self-test results shall be relayed to the Interim ICCC/ICCC in real time to update the status of the VMS | |
| **12.** | **Alarms** | |
| a. | Door Open sensor to Inform Control room during unauthorized access | |
| b. | LED Pixel failure detection alarm | |
| **13.** | **Flicker** | Refresh Frequency should not be less 90 Hz. No visible flicker to naked eye. |

| | | |
|---|---|---|
| **14.** | **Multiple Data Communication interface/Port** | RJ45 Ethernet, RS232, RS 485, FC port and any other suitable |
| **15.** | **Communication (connectivity)** | Wired & GPRS based wireless technology with 3G upgradable to 4G capability. |
| **16.** | **Ambient Operating Temperature** | The system should be capable of working in ambient temperature range of 0°C to 55°C. |
| **17.** | **Humidity (RH)** | Operating ambient humidity: 10% - 95% Rh or better. |
| **18.** | **Protection against Pollution/dust/water** | Complete VMS should be of IP 65 protection level from front and IP54 from side and rear. As per EN60529 or equivalent Standard. |
| **19.** | **Power** | |
| a. | 170-250V AC (more than 90% power factor) or DC as per equipment requirement. | |
| b. | Protection for overvoltage/fluctuation/drop of the nominal voltage (50%) shall be incorporated. | |
| c. | The enclosure shall contain at least two 15 Amp VAC (industrial grade) outlet socket for maintenance purpose. | |
| **20.** | **Power Back-up & its enclosure** | UPS for one hour power back-up with auto switching facility. The enclosure of UPS and battery should be pole mountable with IP 65 protected housing and lockable. |
| **21.** | **Material for VMS frame** | at least 2mm aluminum or Non-corrosive, water resistant or better. Frame of the VMS should be black & Powder coated. |
| **22.** | **Mounting, Installation and finishes** | |
| a. | Mounting structure shall use minimum 6Mtrs. High Cylindrical GI Pole (Class B) or suitable structure with 5.5 mtr. Minimum vertical clearance under the VMS sign from the Road surface. | |

| | | |
|---|---|---|
| b. | The mounting shall be capable of withstanding road side vibrations at site of installation. | |
| c. | It shall be provided with suitable walkway for maintenance access. | |
| d. | The sides interior and rear of enclosures shall be provided in maintenance free natural aluminium finish. All enclosure shall be flat and wipe clean. | |
| e. | Rugged locking mechanism should be provided for the onsite enclosures and cabinets. | |
| f . | For Structural safety, the successful bidder has to provide structural safety certificate from qualified structural engineers approved/ certified by Govt. Agency. | |
| **23.** | **Wind Load** | WL9 as per EN12966 to withstand high wind speeds and its own load. |
| **24.** | **Cabling, connections and Labelling.** | |
| a. | All cable conductors shall be of ISI marked for quality and safety. It shall be of copper insulated, securely fastened, grouped, wherever possible, using tie warps approximately every 10-20 Cms or cable trays. | |
| b. | All connections shall be vibration-proof quick release connections except for power cables terminating in terminal blocks, which shall be screwed down. | |
| c. | All terminal block shall be made from self-extinguishing materials. Terminations shall be logically grouped by function and terminals carrying power shall be segregated from control signal terminals. | |
| d. | All cables shall be clearly labelled with indelible indication that can clearly be identified by maintenance personnel using “As built : drawings”. | |
| e. | Lightening arrester shall be installed for safety on each VMS. | |
| f. | The successful bidder has to provide safety certificate from qualified Electrical engineers approved/certified by Govt. Agency. | |

| | | |
|---|---|---|
| **25.** | **Local Storage in VMS** | Embedded VMS controller should be capable to store atleast 100 messages and symbols/pictograms to allow display to run in isolated mode on a predefined structures/timings, in case of connectivity failure. |

### 4.12 ICT components at Poles

#### 4.12.1 *Overview*

The ICT components at the poles will comprise of the following components. The Local system integrator is required to come up with strategic plan about the placement of these components at various poles in the city.

a) **Environmental Sensors**
b) **Digital billboards**
c) **Wi-Fi- Hotspots**

#### 4.12.2 *Scope of Work*

The LSI is required to set-up the smart components on poles at strategic locations in the city. The locations will have to be identified by the LSI and have to be approved by SSCL. The LSI should facilitate monitoring and controlling of the sensors, bill boards, wi-hotspots from a centralized Control Solution Application

a) **Environmental Sensor**: Data feed from various Environmental sensors through the application 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.LSI would setup environmental sensors at the 5 identified poles and shall also integrate with the existing air quality monitoring station at Karnataka State Pollution Control Board (KSPCB)
b) **Digital Bill Boards**: Integration with SMART Bill boards through the application 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. LSI to consider minimum of 5 poles and 16 smart bus shelters in the City of Shivamogga for providing digital information panel.

c) **Wi-Fi Hotspots**: LSI is required to integrate the ICCC with Wi-Fi system through the Control Solution Application 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, LSI 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)

### 4.12.3 *Functional Specifications*

Following are some of the use cases for integration.

| | | | |
|---|---|---|---|
| ICT components at Poles | Show Status of Poles – Wi-Fi Hotspots | Real-time | Real-time/Near real-time status of Wi-Fi Hotspots functioning |
| | Show Status of Poles - Environmental sensors | Real-time | Real-time/Near real-time status of Environmental Sensors functioning |
| | Show Status of Poles - Smart Billboards | Real-time | Real-time/Near real-time status of Smart Billboards functioning |
| | Receive and Display Environmental Sensor Feed | Real-time | Real-time/Near real-time feed of Environmental Sensors |

***Environmental Sensors***

- The environment sensors shall be integrated with ICCC to capture and display/ provide feed on Temperature, Humidity, Pollutants like SoX, NoX, CoX, etc PM2.5, PM10, Noise Pollution. The data it collects is location-marked.
- Various environment sensors shall sense the prevailing environment conditions and send the data to ICCC where real time data resides and the same shall be made available to various other departments and applications for decision making.
- Then this information is relayed instantaneously to signage – large, clear, digital display screens which communicates to the citizens the prevalent environmental conditions.
- The data should be collected in a software platform that allows third party software applications to read that data..
- LSI can also make use of Variable messaging displays wherever possible.
- The sensor management platform should allow the configuration of the sensor to the network and location details etc.

| No. | Minimum Requirement |
|---|---|
| 1. | The environment sensors should be have the following capabilities |
| 2. | They should be ruggedized enough to be deployed in open air areas on streets and parks |

| | |
|---|---|
| 3. | They should be able to read and report at least the following parameters<br>• Temperature<br>• Relative Humidity<br>• Ambient Light<br>• Noise<br>• CO<br>• NO2<br>• So2<br>• O3<br>• PM 2.5<br>• PM 10<br>• UVa<br>• UVb<br>• CO2 |
| 4. | Sensor should be able to communicate its data using wireless technology (GSM/WIFI) |
| 5. | Data should be collected in a software platform that allows third party software applications to read that data. Data Buffer Capacity up to 3 years |
| 6. | Data Capture Frequency – 30 seconds |
| 7. | Li-Ion Battery Backup of 4 hours |
| 8. | Aesthetic & Elegant Aerodynamic design |
| 9. | Stabilization Time on power outages < 10 minutes |
| 10. | LEDs on the enclosure for easy visual indications |

| | |
|---|---|
| 11. | Software Solution<br>a) Solution to enable APIs for mobile & Web services<br>b) APIs to provide<br>a. Status of Devices<br>b. NAQI Colour Schema as per NAQI, India<br>c) Lead pollutant contributing to NAQI<br>d) Architecture to support computation of new parameters such as<br>a. Now Cast NAQI<br>b. Zonal Limits of pollutants if any |
| 12. | Data Analytics<br>a. lead pollutants, trends & Source level apportionments<br>b. Integration and analysis of various northbound API's including traffic / parking & Environment to derive insights. |
| 13. | The sensor management platform should allow the configuration of the sensor to the network and also location details etc. |

*Digital Bill boards*

SSCL will have rights for usage of advertisement display boards for a minimum of 20 minutes per hour per day. Further, SSCL may step in for displaying new/information for public convenience in case of any natural calamity, emergency etc.

*Wi-Fi Hotspots*

- The LSI is responsible for setting up of Wi-Fi Hotspot including supply installation and O&M of all the required hardware and software as per the technical specification and scope of work of the RFP.
- Detailed list of locations along with the no. of Access points at each location will be shared with the successful LSI.

- System should support features such as user authentication, access etc. through OTP (One Time Password) on mobile no. & email. It should be capable to put a cap on the user session and amount of data consumed which shall be 200 mb/day , regulate bandwidth besides allowing users to buy in the extras usage access, if desired by SSCL.
- Thereby it shall be required to be integrated with SMS Gateway along with a payment gateway and centralized billing mechanism.
- The proposed solution should be inclusive of all the components like WLAN Controller, Authentication, Authorization and Accounting (AAA), RADIUS, SMS Gateway, Payment Gateway.
- The proposed solution should be fully secured and as per WPC regulations/guidelines. LSI is responsible for keeping log of users by storing minimum required information like Phone No, MAC & IP addresses, access time, duration, data consumed etc.
- The proposed solution should allow firmware/ patch upgrade and monitoring from a central location.

### 4.12.4 *Technical Specifications*

*Environmental Sensors*

| Parameter | Minimum Specifications or Better |
|---|---|
| Communication | 3G/4G |
| Measurement Principle | Device should be capable of measuring<br>• Temperature<br>• Humidity<br>• Ambient Light<br>• Sound<br>• CO<br>• CO2<br>• NO2<br>• NOX |

| | |
|---|---|
| Component Measurement Range | • NO2 upto 10ppm<br>• CO upto 100 ppm<br>• SO2 upto 2000 ppm<br>• O3 upto 1000 ppb<br>• PM 2.5 0 to 250 micro gms / cu.m<br>• PM 10 0 to 450 micro gms / cu.m<br>• Weather Parameters<br>o Temperature 0 to 100 Deg. C<br>o Relative Humidity upto 100%<br>• Light upto 10,000 Lux<br>• Noise 40 to 120 db(A)<br>• UVaupto 15 mW/ cm2<br>• UVbupto 15 mW/ cm2<br>• CO2 upto 5000 ppm |
| Rain Water Measurement | • Rainfall in millimeters (mm), both in quantity and intensity. |
| Repeatability | ±0.5% Full Scale |

*Digital Bill boards*

| No | Minimum Specifications or Better |
|---|---|
| 1 | Smart Billboard should be able to house small cell or limited macro main remote telecom sites and site build solution with space for all necessary equipment and functions that radio sites in mobile networks require. This should be self -contained, multi-application intelligent site that is aesthetically unique and functionally viable. |
| 2 | Height of smart billboard should be of 9-10 metre height |
| 3 | It should provide Space for telecom equipment, should be able to support 2G, 3G, LTE, Wi-Fi, 5G etc. |

| | |
|---|---|
| 4 | It should have ability to house power plant and battery |
| 5 | It should have provision for incoming power input cables and fibre connectivity |
| 6 | It can be Floor or Ground Mounted |
| 7 | It should be Vandal Proof |
| 8 | It should have display of minimum 60 inch. |
| 9 | It should be Aesthetical & Camouflaged finish with respect to environment |

*Wi-Fi Hotspots*

- WLAN Controller

| # | Parameter | Specifications |
|---|---|---|
| 1. | Hardware | Redundancy Features: Controller Must support Active: Active and Active: Standby. Same license should be shared by both the controller. |
| 2. | General Feature Requirements | Ability to map SSID to VLAN. |
| 3. | | Should support automatic channel selection – interference avoidance (Co-channel management, Adjacent Channel Management, Channel reuse management).<br>Internal / External Captive Portal. |
| 4. | Auto Deployment of APs at different locations | Access points can discover controllers on the same L2 domain without requiring any configuration on the access point. |
| 5. | | Access points can discover controllers across Layer-3 network through DHCP or DNS option |
| 6. | System Architecture | Centralized MAC addresses filtering |
| 7. | | Should support onboard/ external DHCP server |
| 8. | | Controller should support Onboard / External AAA server |
| 9. | | The proposed architecture should be based on controller based Architecture with thick AP deployment. While Encryption / decryption of 802.11 packets should be performed at the AP. |
| 10. | | Support roaming between access points deployed on same subnet and different subnets |
| 11. | QoS features | Per user bandwidth Rate Limiting |

| | | |
|---|---|---|
| 12. | | Self-healing (on detection of RF interference or loss of RF coverage) |
| 13. | | Should support per user, per device, and per application/TCP-port prioritization |
| 14. | | Dynamic load balancing to automatically distribute clients to the least loaded 802.11 channel and AP; load balancing must not require any client specific configurations or software |
| 15. | | Adaptive RF management that provides the capability to pause channel scanning / adjust RF scanning intervals based on application and load presence. |
| 16. | | Capability to provide preferred access for —fast clients over —slow clients (11n vs. 11g) in order to improve overall network performance. |
| 17. | | Support advanced multicast features with multicast rate optimization, multi-channel use and IGMP snooping |
| 18. | RF Management | Should be able to load balance clients across channels and access points |
| 19. | | Should be able to load balance clients based on client count |
| 20. | | Should be able to load balance clients based on effective throughput on AP |
| 21. | | Should be able to use client and throughput as a measure to load balance between bands |
| 22. | Inline Security Features | Should allow authenticated client devices to roam securely from one access point to another, within or across subnets, without any perceptible delay Security during re association. |
| 23. | | Controller should support AES-128 and AES-256 encryption, with site-to-site and client-to-site VPN capabilities; should have provision to supports IPSEC/GRE tunnels |

- Access Point

| # | Parameter | Specifications |
|---|---|---|
| 1. | Features | The wireless solution should be based on dual radio. |
| 2. | | 802.11 a/b/g/n/ac / 2x2:3 MIMO Wave1/Wave2, dual radio , access point |
| 3. | | The Access Point should have single 10/100/1000 Ethernet interfaces |

| | | |
|---|---|---|
| 4. | | The AP should be able to handle security, mesh, , RF Management, QOS , roaming, local forwarding without the need for a controller so as to increase performance of the WLAN network |
| 5. | | 802.11 a/b/g/n/ac Access Point should be able to power up using standards 802.3 af/at POE input. |
| 6. | | All 2.4 GHz (2.4000GHz to 2.4835GHz) bands authorized in G.S.R. (45E) |
| 7. | | Radio 2: 2.4GHz: Chan 1-13 (2412-2472 MHz) 5GHz: All channels from 5200 MHz to 5825 MHz Actual operating frequencies depend on national regulatory limits |
| 8. | | Maximum available transmit power: 2.4GHz: 21dBm per chain, 5.0GHz: 20dBm per chain |
| 9. | | Antenna configuration: 1x1, 1x2, 2x2, 3x3 |
| 10. | Antenna Characteristics | InternalAntenna Gain or equivalent or better RF coverage as per planning |
| 11. | | 2.4 GHz-2.5 GHz : 4 dBi |
| 12. | | 5.150 GHz- 5.875 GHz : 5dBi |
| 13. | Operating temperature | -10 to +60°C or better |
| 14. | Storage Temperature | -20 to 70°C or better |
| 15. | Regulatory | FCC certified |
| 16. | | CE Mark / WPC Compliance |
| 17. | Enclosure | Should be IP67 rated or higher for outdoor application |
| 18. | AP Characteristics | Able to be powered over 802.3af/at standard Power-over-Ethernet (PoE). Auto sensing, 10/100/1000 on the network port |
| 19. | | 16 BSSIDs per AP |
| 20. | | On Demand Channel Scan, Auto Channel Select |
| 21. | | Capable of multi-function services including: data access, intrusion detection, intrusion prevention, location tracking, real-time non-disruptive packet capture, RF monitoring with no physical touch and no additional cost |
| 22. | | The AP should proactively probe other rates to determine if greater throughput is available, intelligently adjusting its selection tables to favor higher performance. The AP should support mesh backhaul feature in which the root AP will determine if its wired |

| | | |
|---|---|---|
| | | connection is down and take action correspondingly. AP should support Self-Healing, Self-forming, dynamic path selection Wireless MESH function |
| 23. | | Automatic neighbor detection and route determination |
| 24. | | AP will provide make before break handovers |
| 25. | | The wireless meshing AP shall support low hop latency (< 1 ms per hop) under clear channel conditions and high SNR |
| 26. | | MESH link should support AES encryption on the MESH link |
| 27. | | MESH link should support extending corporate network with VLAN Tags and VLAN priority tags to the remote site |
| 28. | | A wireless meshing AP with redundant links shall select an alternative route within 100 ms |
| 29. | | AP shall provide external antenna options |
| 30. | | Wi-Fi alliance 802.11ac certified APs |

### 4.13 Smart meters

#### 4.13.1 *Overview*

The Local System Integrator should set up an Integrated Information Management System (IIMS) at the command and control for collection of data directly from the AMR bulk flow meters, chlorine and turbidity monitoring at WTP by way of GSM/GPRS installed in various locations of the water distribution systems.

The IIMS shall help the city to perform the following:

Monitor and record the following:

a) Raw water Out flow at the Intake or Jack well,
b) Raw Water In Flow at the WTP
c) Turbidity of the water at the WTP
d) Clear Water Out Flow at the WTP
e) pH content of clear water at the WTP
f) Pure Water Out Flow at the Pump house

The Local System Integrator should make a provision to integrate the Supervisory Control and Data Acquisition (SCADA) system for water Supply distribution network at the ICCC as a future integration requirement. Further integration at the GIS platform will also be the scope of the Local System Integrator.

### 4.13.2 *Scope*

The scope of work for the Local System Integrator includes procurement, installation and integration with ICCC for the following:

- bulk water flow meters to monitor the transmission losses
- sensors for turbidity and pH monitoring at the WTP
- integration with water SCADA (in the future)

The details of the locations where bulk water flow meters are to be installed are as follows:

- Sensors to be installed at the water inlet and outlet sides of the Water Treatment Plant (WTP):
  - pH sensors – 2 Nos
  - Chlorine content measurement sensors – 2 Nos
  - Turbidity measurement sensors – 2 Nos
- Details of the locations where Bulk water flow meters are to be installed

| III | **Electromagnetic Bulk Flow meters (To be Proposed under Smart city)** | | |
|---|---|---|---|
| 1 | 1000 mm dia | 1 | At delivery side of 700 HP Raw water pumps, Gajnurheadworks. |
| 2 | 650 mm dia | 1 | At delivery side of 270 HP Pure water pumps for RM 7, KR water works. |
| 3 | 550 mm dia | 2 | At delivery side of 150 HP & 240 HP Pure water pumps for RM 8 & 10, KR water works. |
| 4 | 500 mm dia | 1 | At delivery side of 150 HP Pure water pumps for RM 9, KR water works. |
| 5 | 150 mm dia | 1 | Inlet to the GLSR at MRS Double tank. |
| 6 | 200 mm dia | 1 | At delivery side of 50 HP Pure water pumps for RM 9 at MRS Double tank. |
| 7 | 200 mm dia | 1 | At delivery side of 15 HP Pure water pumps for RM 8 at DD UrsExtention IPS. |
| 8 | 150 mm dia | 2 | At Inlet & Delivery side of 50 HP Pure water pumps for RM 10 at Malligenahalli. |
| 9 | 500 mm dia | 1 | Inlet to the GLSR at Circuit house IPS. |

Functional use cases for the

| | | | |
|---|---|---|---|
| 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 heat map 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 |

### 4.13.3 *Functional Specifications*

- Install data collection mechanism to monitor the water distribution network
- Set up IIMS and ensure 24x7, 365 days availability of the system
- Ensure timely back up of database
- Perform initial configuration of the systems and database conversion
- Trouble shoot the database and application modules
- The system shall support secure communication over Radio Frequency, Ethernet, Global Packet Radio System, Optical Fiber Cable, Wi-Fi, SMS, HTTP, SHTTP, FTP for both short range and long range communication.

- The system shall support both real time and offline data collection, transmission mechanism. The offline mode shall be used when the networks seize to exist and data is collected and transmitted in batch when the communication network resumes. The system shall also support data dump to flash drives which then can be uploaded to the system where connectivity prevails.

**Bulk Flow metering:**

a) Raw water Out flow at the Intake or Jack well: Flow Rate, Flow volume
b) Raw Water In Flow at the WTP: Flow Rate, Flow volume
c) Clear Water Out Flow at the WTP: Flow Rate, Flow volume
d) Pure Water Out Flow at the Pump house: Flow Rate, Flow volume

**WTP Monitoring:**

a) pH at the WTP
b) Turbidity at the WTP
c) Chlorine at WTP
    - The data collection mechanism at each of the above points shall be through GPRS/GSM mechanism.
    - IIMS shall continuously record the data and make it available for any statistical analysis.

#### 4.13.4 *Technical Specifications*

- Software should be web based application
- Software should be for commercial/bulk water meters with reading method (manual, wireless, data loggers)
- Software should hold all the information associated with the physical installation of the meter. This includes meter type, serial number, reference number, GPS location, installation date, expected collection/reading method.
- Software should display different types of reports like, read meter's details, wireless meters, manually reads, unread meters along with its GPS locations (GPS location will be recorded during installation of water meter).
- Software should facility to download the data in form of XLS or CSV file.
- The software (admin) should have facility to update account details like meter serial number, address, GPS location.

### 4.14 Other ICT Components

The software solution should be scalable and modular in structure and should be able to integrate other future IT initiative of ShivamoggaSmart City. 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.

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.

**4.15 Network Connectivity**

- MSI shall provide Leased line/MPLS connectivity between DC and DR of 100Mbps bandwidth.
- KMDS shall provide required MPLS and Internet bandwidth to the Datacenter and also to the Smart Cities command Centers sourced from KSWAN

**4.16 Common Components**

**4.16.1 *City Network***

Currently, the Police department has deployed 40 Kms of OFC in the city and is in the process of installing OFC for another 19 kms. Considering the existing and OFC in progress the city has an overall network of 59 Kms of OFC. All OFC lines collate at common point at police control room. A total of five direct OFC overhead lines have been laid. The current O&M support is not sufficient as SLA's are not enforced. The existing 90 cameras deployed by the police department and the additional 20 cameras to be deployed by the police department are connected to OFC. The current OFC layout has no redundancy. The Manpower Rate of overhead OFC is Rs 17/Meter.

The OFC overlap identified in ABD area is as follows:

- Line 1: NewMandali (500~1kms from KSRTC bus stand will be overhead)
- Line 2: Tunganagara (1.5 Kms will be overhead)
- Line 3: Vinobanagara police chowki to Medarkere (1.5 kms will be overhead)
- Line 4&5: Lakshmi Theater to Usha Nurshing Home to railway station (Can be moved UG)
- Total 77 cameras comes in ABD area

*Scope of Work*

The scope of the local system Integrator is :

- Phase I: AS-IS takeover O&M of Police network and perform NOC operations from ICCC + Add redundancy by laying ring at peripheral network ends of five OFC lines laid + WiFi access points at 20 locations + Router upgrade at DC office
- Phase 2: Taking OFC underground in ABD area+ Lay 12 core additional OFC in ABD area estimated to be 35 Kms

*Technical Specifications:*

| ICT Solution | Field Level Devices | Connectivity | Data Time Collection |
|---|---|---|---|
| ICT based SWM | 1) GPRS/GSM Devices<br>2) GPRS – Attendance Management System<br>3) Weigh Bridge Sensors | GPRS<br>Public Internet | Real Time |
| Intelligent Transport system | 1) GPRS/GSM<br>2) PIS at Bus Stops | GPRS | 15-20 Seconds |
| Smart Poles | 1) Environmental Sensors<br>2) Digital Billboards<br>3) Wi-Fi hotspots | Public Internet | Continuous |
| Intelligent Traffic Management System | 1) Traffic Signals<br>2) ANPR<br>3) VMS | OFC/GPRS | Continuous |
| SCADA (Water) | SCADA Sensors | RFID / GSM | Once in every 6 Hours |

*Security Requirements for Network as a Service:*

- Every field device should be authenticated in the IoT Platform before being able to access to the network resources
  - Field device should use X.059 certificate based authentication
  - Certificate Authority chosen should be mutually agreed upon
  - Along with X.509 certification, Device should also support authentication

### 4.16.2 *Integrated Command and Control Center (ICCC)*

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

*Scope of Work*

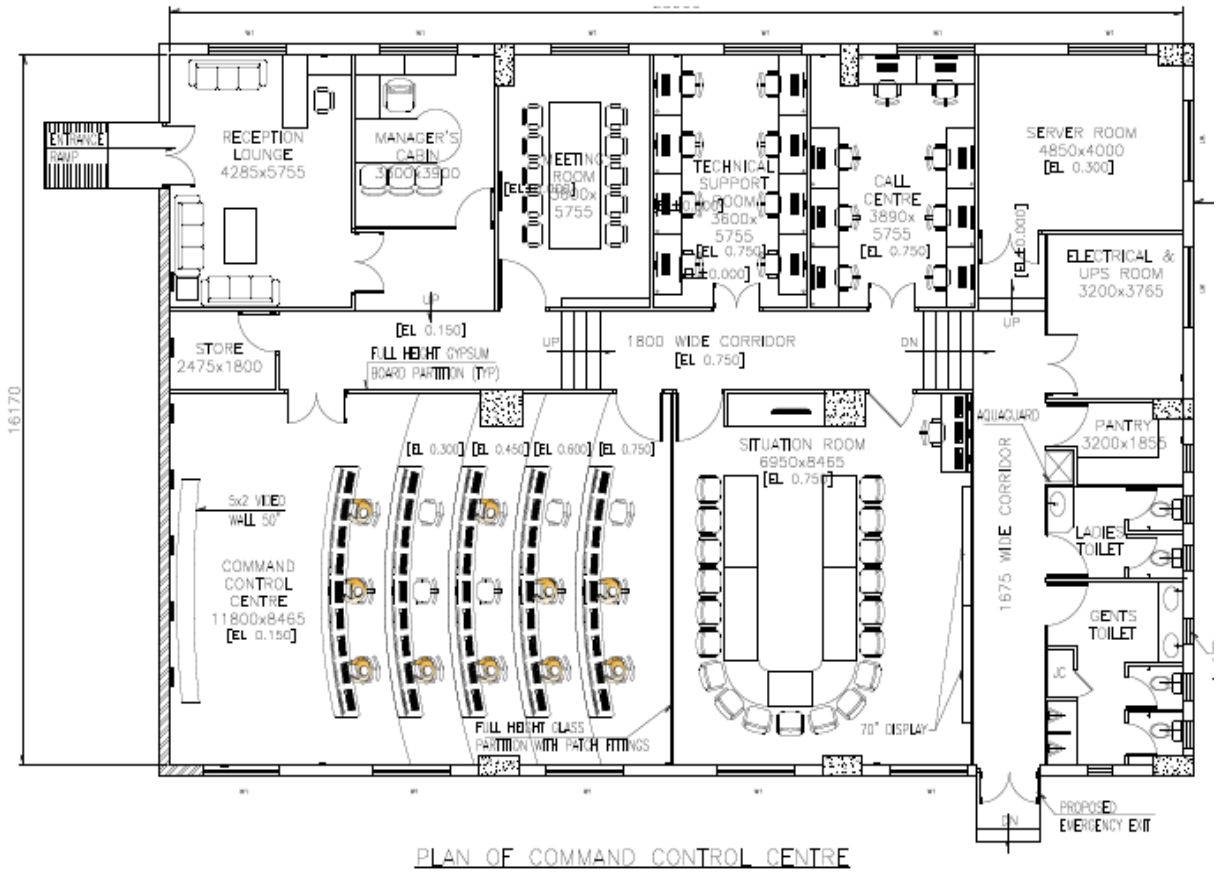
- SSCL has already identified a location to host city operation center or city ICCC, MSI should inspect the location and factor in the amount of work needed to build ICCC in the bid document
- MSI should provide a universal dashboard to view all applications in a consolidated manner onGIS map provided by SSCL and also general KPI View.
- MSI should be able to provide Unified view for each Departments on GIS map provided by SSCL and general KPI views.
- MSIshould be able to project this information on the video wall
- KPI's which need to be tracked and project on the video wall shall be during inception stage
- Key KPI for each domain needs to be tracked based on SSCL's requirement, which willbe decided post award of work by the SSCL's.
- 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 MSI during feasibility study.
- KPI's should include from the following categories
    - Process KPI

- KPI's which measure the efficiency of the integrated processes
- Event Based KPI

- System should be capable of creating new KPI's on the fly.
- LSI should setup a dedicated helpdesk to support the field infrastructure laid out as part of the RFP.

*Indicative Layout of ICCC*

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




PLAN OF COMMAND CONTROL CENTRE

Note: MAP not to scale

*ICCC Platform- Functional Specifications*

The ICCC platform will be provided by MSI. 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.

### *a. Video Wall Solution*

| Sl No. | Item | Specifications |
|---|---|---|
| 1. | Display Wall Screen Size | 50" |
| 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 front 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 Only |

*b. Video Wall Controller*

| Sl.NO. | Item | Specifications |
|---|---|---|
| 1 | Display controller | Controller to be able to control min 10 cubes |
| 2 | Redundant Controller | The controller should be based on the latest architecture. |
| 4 | Processor | Latest X86 – 64 bit multi core processor @3 GHz. Should support Windows 10 and/or Linux OS |
| 5 | RAM | 32 GB |
| | Hard Disk | 1 TB 7200 rpm |
| 6 | Chassis Type | 19" Rack mount industrial chassis |
| 7 | Network | 2 Network Ports |
| 8 | Resolution Support For Outputs | Minimum1920 x 1080 or higher |
| 11 | Scalability | The system should be able to add additional inputs as required in the future |
| 12 | 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 |
| 13 | Redundancy | Redundant Hot Swappable HDD in RAID 1 Configuration |
| 14 | Redundancy | Redundant Hot Swappable Power Supply |

| | | |
|---|---|---|
| 15 | Keyboard & Mouse Extension | Keyboard and Mouse along with mechanism to extend them to 20 Mtrs. operator desk from display controller to be provided |
| 16 | 24 x 7 operation | The controller shall be designed for 24 x 7 operation |
| 17 | Others | The Video Wall and the Controller should be of the same make to ensure better performance and compatibility |
| 18 | OEM Certification | All features and functionality should be certified by the OEM.<br>The Display Modules, Display Controller & Software should be from a single OEM. |

*c. Display Wall Manager*

| 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. |
| 6. | | • Fine-tune color of each cube |
| 7. | Client & Server | Should support Multiple clients / Consoles to control the Wall |

| | | |
|---|---|---|
| | based Architecture | layouts |
| 8. | Collaboration | The Software should be able to share layouts comprising of multiple sources with workstations / Displays over LAN for remote monitoring |
| 9. | 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). |
| 10. | Display | The software should be able to create layouts and launch them as and when desired |
| 11. | Remote Control | The Display Wall and sources (both local & remote) should be controlled from Remote PC through LAN without the use of KVM Hardware. |
| 12. | Support of Meta Data | Software should support display of Alarms |
| 13. | Authentication | The software should provide at least 2 layer of authentication |
| 14. | Scenarios | Software should able to Save and Load desktop layouts from Local or remote machines |
| 15. | Layouts Configuration | Can be pre-configured or changed in real time. |
| 16. | 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 |
| 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. |

### *d. Guidelines for Control Room Design and Setup*

| # | Parameters | Quantity |
|---|---|---|

| | | |
|---|---|---|
| 1 | Wall Size for Video Wall | Video-wall with Single Controller |
| 2 | Cube Size | 50 Inch Each for each operator |
| 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**

- 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.
- 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 mm Solid Acrylic Panel (ASS) Cladded on 25mm MDF Board. Drawing is enclosed.
- 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.
- 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.
- 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).
- All sheet metal / aluminum parts must be finished with electrostatic powder coating with average of min 80 microns over all surfaces.
- Console frame shall have provisions for leveler legs to be incorporated into the frame.

**Work Surface**

- 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)**

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

**Monitor Arms**

- 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.
- Vendor shall provide the suitable adopter/additional base plate for mounting the existing LCD monitors.
- It shall allow the rotate/ tilt/ raise/the monitors as well as fix their adjustment.
- The monitor arm should be Articulating monitor arm

**Miscellaneous**

- 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.
- The cabinet shutters shall be of Butt Hinged type with 18mm thick MDF.
- Rear shutters of each console should have provision of Airflow opening for cooling and heat dissipation effect.
- Rear panel shall have ventilation fans mounted on it.
- It shall have proper arrangement for flow of cables i.e. LAN Cable, Power cable, VGA cable, Mouse cable, Keyboard etc.
- Design of control desk shall allow cables from the floor cable channel.
- 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.
- All bolts must be of SS material to avoid rust due to environment.

**Prospective View of Control Desk**

**Prospective View of Control Room**

*e. Multi-functional 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 |

*f. Work station (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 nosDisplayport |
| | | 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<br>• Minimum 10 programmable buttons<br>• Multi-camera operations<br>• Compatible with all the camera models offered in the solution<br>• 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) |
| 17 | Security | TPM 2.0 Security, BIOS controlled electro-mechanical internal chassis lock for the system.<br>Power-On password (via BIOS), Administrator password (via BIOS), Setup password (via BIOS) |
| 18 | Operating System | 64 bit pre-loaded OS with recovery disc |
| 19 | Compliance and Certification | ROHS and Windows, All Linux platform.<br>Certification Energy Star version/ BEE star, EPEAT Qualified, UL FCC |
| 20 | System Volume | System Volume must be less than 8 liters. |
| 21 | 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) |
| 22 | 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. |

### *g. IP Phone*

| 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 1000 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 |

### *h. Television*

| Sl.No | Parameter | Specification |
|---|---|---|
| 1 | Technology | LCD –LED Back Lit or better |
| 2 | Size in inches | 55”inch diagonal or better |
| 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,<br>• 3-HDMI, |

| | | |
|---|---|---|
| | | • 1-VGA<br>• 1-Rs232<br>• 1-RJ45<br>• 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,<br>• UL,FCC |
| 13 | Box Should Contain | LED Display unit, Table Top Stand and Other Required Cables (Remote Control, Power Cable) |
| 14 | Wall Mount installation | Required |

*i. LED Display*

| Sl.No | Parameter | Specification |
|---|---|---|
| 1. | Technology | LCD –LED Back Lit or better |
| 2. | Size in inches | 55”inch diagonal or better |
| 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,<br>• 3-HDMI,<br>• 1-VGA<br>• 1-Rs232<br>• 1-RJ45<br>• 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,<br>• UL,FCC |
| 13. | Box Should Contain | LED Display unit, Table Top Stand and Other Required Cables (Remote Control, Power Cable) |
| 14. | Wall Mount installation | Required |

### *j. 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 |
| 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 |

### *k. Software for Video Conferencing Unit*

| Sl. No | Parameter | Specifications |
|---|---|---|
| 1 | Native Applications | Should support Windows, macOS, Linux, Android, iOS, watchOS and WebRTC. |
| 2 | Video Codecs | Should support Native: VP8 SVC. Via build-in gateway: H.264 AVC, H.263, |
| | | 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: 2160p30, 1080p, 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 layers 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 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 |

### *l. IPBX system*

| 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, 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 |
| 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,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 |

*m. 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<br>● 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 | 0.5° - 350°/s or better |
| 11. | Compression | H.264 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 4 Streams @ 1920x1080, H264, 25 fps |
| 15. | Day/Night | Automatic, manual, scheduled |

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|---|---|---|
| 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 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 |

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|---|---|---|
| 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, 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 |
| 34. | 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, |
| 35. | Pixel counter | 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, SOCKS, |
| 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 |
| 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 |

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|---|---|---|
| 46. | Operating Temperature & Humidity | -25 to 55°C or better<br>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:<br>• The IP camera view is changed<br>• The IP camera view is blocked<br>• 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 |

*n. Fixed Camera*

| Sl.No | Parameter | Minimum Specifications or better |
|---|---|---|
| 1. | Video Compression | H.264 or better |
| 2. | Video Resolution | 1920 X 1080 |
| 3. | Frame rate | Min. 25 fps |
| 4. | Image Sensor | 1/3” Progressive Scan CCD / CMOS |
| 5. | Lens Type | Varifocal, C/CS Mount, IR Correction |
| 6. | Lens# | Auto IRIS<br>8 – 40 mm, F1.4 |
| 7. | Minimum Illumination | Colour: 0.5 lux, B/W: 0.1 lux (at 30 IRE) |
| 8. | IR Cut Filter | Automatically Removable IR-cut filter |
| 9. | Day/Night Mode | Colour, Mono, Auto |
| 10. | S/N Ratio | ≥ 50 dB |
| 11. | Auto adjustment + Remote Control of Image settings | Colour, brightness, sharpness, contrast, white balance, exposure control, backlight compensation, Gain Control |
| 12. | Wide Dynamic Range | On/Off |

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|---|---|---|
| 13. | Audio | Audio Capture Capability |
| 14. | Local storage | Should support MicroSD -min 128 GB |
| 15. | Protocol | HTTP, HTTPS, FTP, RTSP, RTP, TCP, UDP, RTCP, DHCP |
| 16. | Security | Password Protection, IP Address filtering, User Access Log, HTTPS encryption |
| 17. | Operating conditions | 0 to 50°C |
| 18. | Casing | NEMA 4X / IP-66 rated |
| 19. | Certification | UL / CE / FCC / EN |

*o. Access/ L2 Switch (48 port Gigabit Switch)*

| 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 |
| | | 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 |

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|---|---|---|
| | | 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 |

*p. 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 |

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| 1.4 | The router shall have minimum six WAN Interface card slots supporting LAN/WAN/Voice interface cards - Ethernet, V.35, ISDN BRI/PRI, E1/T1, Voice FXS/FXO, 3G Module etc in addition to the ports mentioned above |
| 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 Gbps 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 0ºC to 45ºC |
| 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 |

### *q. Server / Networking Rack specifications*

| Parameter | Minimum Requirement Specifications |
|---|---|
| Type | • 19” 42U racks mounted on the floor<br>• 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.<br>• All racks should have mounting hardware 2 Packs, Blanking Panel.<br>• Stationery Shelf (2 sets per Rack)<br>• All racks must be lockable on all sides with unique key for each rack<br>• 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<br>• 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.<br>• Front and Back doors should be perforated with at least 63% or higher perforations.<br>• 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)<br>• Fan Housing Unit 4 Fan Position (Top Mounted) (1 no. per Rack) – Monitored<br>- 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) |

*r. Core switch/ Data Center Switch*

| # | Parameter | Minimum Specifications |
|---|---|---|
| 1. | Ports | • 10/100/1000 Base-TX Ethernet ports/FX and extra 2 numbers of Base-SX/LX ports should be one either 24 or 48<br>• FX/TX Splits for a switch as per location requirement<br>All ports can auto-negotiate between 10Mbps/ 100Mbps/ 1000Mbps, half-duplex or full duplex and flow control for half-duplex ports.<br>Switch should have Internal redundant power supply from day 1<br>The switch should support dedicated stacking ports with stacking bandwidth of minimum 80 Gbps. It should be possible to stack minimum 8 switches as part of the same virtual stack. |
| 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<br>• Support 802.1X Security standards<br>• Support 802.1Q VLAN encapsulation, IGMP v1, v2 and v3 snooping<br>• 802.1p Priority Queues, port mirroring, DiffServ<br>• Support based on 802.1p priority bits with at least 8 queues<br>• DHCP support & DHCP snooping/relay/optional 82/ server support<br>• Shaped Round Robin (SRR) or WRR scheduling support.<br>• Support for IPV6 ready features with dual stack<br>• Support up to 255 VLANs and up to 4K VLAN IDs<br>• Support IGMP Snooping, IGMP Querying and Multicasting<br>Should support Loop protection and Loop detection, Should support Ring protection (when used in aggregation location) |
| 8. | Access Control | • Support port security<br>• Support 802.1x (Port based network access control).<br>• Support for MAC filtering.<br>Should support TACACS+ and RADIUS authentication |
| 9. | VLAN | • Support 802.1Q Tagged VLAN and port based VLANs and Private VLAN<br>• 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<br>• Switch should support traffic segmentation<br>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<br>• Must have support SNMP v1,v2 and v3<br>• Should support 4 groups of RMON<br>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 |

### 4.16.3 *City Wide APP*

*Overview*

All smart city components will have a mobile/browser facing interface. This will have a consolidated view which will be provided to public. This application should be able to provide all KPI's as applicable to public.

The Citizen app is a one-stop solution for citizens that bring citizen relevant, real time & interactive city information to help plan their day, and in turn crowd sources inputs from citizens to enhance the services to suit the citizens needs better.

*Scope*

The city wide app can be used to view real-time data on their mobile phones / tablets for a variety of details. The app will be a one-stop solution for citizens that bring citizen relevant, real time & interactive city information to help plan their day, and in turn crowd sources inputs from citizens to enhance the services to suit the citizens needs better. The mobile app interface will provide interface with following, but not limited to, ICT solution components of Shivamogga Smart City:

The mobile app will have a consolidated view which will be provided to public. This application should be able to provide all KPI's as applicable to public. The scope of the project for the Local System Integrator (LSI) is to develop a mobile application with the following modules:

i. **Intelligent Public Transport System:**

   The application should be integrated with VTMS and fetch the following details for present and future requirements

   - Bus route details
   - Estimated time of arrival

These details will be provided to citizens at front end of the mobile application through suitable GUI when requested.

**ii. Smart Parking**

- App will be integrated with smart parking management software.
- The database of parking slots will be provided to the LSI on real time bases through smart parking management software/database.
- The application has to provide details of vacant parking slots for selected (by citizen) parking locations through suitable GUI.

**iii. ICT based solid waste management**

- This mobile app will be integrated with ICT based solid waste management module.
- The Pourakarmikas can also take photo of the non-segregated waste
- Citizen can request for clearance of garbage in their wards/home.
- Citizen should be able to take photograph of site and share with authorities while raising a complaint.
- Application should be able to capture the Lat-Long details of site picture taken and sent through application.
- There should be a facility to generate a unique service request number for each complaint raised by citizen.
- Information of ward wise health officer will be available in database of ICT SWM software. The app will have to fetch this information from database and display at GUI on request by users.

**iv. GIS**

- This App will have all the functionalities of the Smart Map being developed on ARC GIS platform for the City. This can be achieved by way of taking API from the said application.
- LSI shall undertake detail assessment for integration of all the Field level ICT interventions proposed with the existing Geographical Information System (GIS) using ArcGIS Platform. LSI is required to carry out the seamless integration to ensure ease of use of GIS in the mobile application. 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. LSI is to check the availability of such data and it's suitability for the project. LSI is required to update GIS maps from time to time.

**v. Other Services**

- Complaint registration & status tracking (Integration with Janahitha of MRC through APIs)
- Utility Bill payments (integration with Shivamogga one)
- Special government messages to citizens, tourists on notification basis.
- Special services for citizens such as information on Voter ID and Aadhar cards.
- Allows users to report Panic or danger which will be reported to the government and police officials for immediate help.
- Citizens / Tourists will also be provided with Current Weather information and Weather history on a date range and future weather information based on reliable weather sources.

*Functional Specifications*

- Application should have an appropriate administration interface to load information and track usage
- Application should have analytics installed to check the usage and functionality accessed
- Application should have notifications facility
- Application should be able to conduct poll as and when required.
- Application should be built in such a way that future integrations and enhancements can be done easily.

*Technical Specifications*

- Mobile application be developed in Android and IOS (native based)
- Browser based application should be developed in general platforms as chosen by LSI – it could be in java /. net
- The application should have integration layer and should be able to pull information necessary from system

## 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.
- MSI 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 MSI.
- MSI and 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.
- MSI and 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.
- MSI and LSIshall 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.
- MSI and LSIshall 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 MSI.
- 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, MSI and 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.
- MSI and LSI is required to deploy a Master Trainer who shall be responsible for planning, designing and conducting continuous training sessions.
- 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 MSI and LSI 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 Local 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.

| | Activity | Individual phases of the activities | Timeline |
|---|---|---|---|
| | Phase-I (270 Days) | | |
| 1 | Resource Mobilization | • Resource Mobilization<br>• Inception Report | T1+15 Days |
| 2 | Implementation of ICT enabled Solid Waste Management Application, Smart Parking, Intelligent Traffic Management System, VMS, Smart meters , environmental sensors, Digital bill boards, Wi-hotspots, Command and Control Center, PIS | 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 :<br>• Implementation of Solution Components<br>• Set-up of Command and Control Centre | T1+45 days |
| | | FRS, SRS,LLD, HLD, CONOPS, for implementation and integration of individual ICT application with Common Command and Control Application | T1+60 Days |
| | | *Data Centre, DR & Common Operating Platform availability<br>(**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 applications at Common Operating platform | ICT Solid Waste Management Application | |
| | | City Surveillance (Police Feed) | |
| | | Intelligent Public Transport System | |
| | | Intelligent Traffic Management | |

| | | | |
|---|---|---|---|
| | | Smart Parking | T1+270 days |
| | | 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 enabled Solid Waste Management, Intelligent Traffic Management System, VMS, Digital bill boards, Wi-hotspots, PIS, Network components for city surveillance | Procurement of the residual/ additional hardware & software infrastructure required from phase I | T1+315 days |
| | | Installation & Commissioning of field devices | T1+360 days |
| 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 |
| | | 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 |

## 7. Project Deliverables

| # | Key Activities | Deliverables |
|---|---|---|
| **Project Inception Phase** | | |
| **1** | Project Kick Off | 1. Project Development Plan<br>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<br>2. System Requirement Specification document (SyRS)<br>3. Requirements Traceability Matrix<br>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<br>2. HLD documents<br>3. LLD documents<br>4. Application architecture documents.<br>5. Concept of Operations (CONOPS)<br>6. Technical Architecture documents.<br>7. Network Architecture documents.<br>8. ER diagrams and other data modeling documents.<br>9. Logical and physical database design.<br>10. Data dictionary and data definitions.<br>11. GUI design (screen design, |
| **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 | |

| # | Key Activities | Deliverables |
|---|---|---|
| | | navigation, etc.).<br>12. Test Plans<br>13. SoPs<br>14. Change management Plan |
| **16** | Helpdesk setup | 1. IT and Non IT Infrastructure Installation Report<br>2. Completion of UAT and closure of observations report<br>3. Training Completion report<br>4. Application deployment and configuration report |
| **17** | Procurement of Equipment , edge devices, COTS software (if any), Licenses | |
| **18** | IT and Non IT Infrastructure Installation | |
| **19** | Development, Testing and Production environment setup | |
| **20** | Network connectivity (All activities other that bandwidth provisioning) | |
| **21** | Software Application customization | |
| **22** | Development of Bespoke Solution (if any) | |
| **24** | Integration with Third party services/application (if any) | |
| **25** | Unit and User Acceptance Testing | |
| **26** | Preparation of User Manuals , training curriculum and training materials | |
| **27** | Role based training(s) on the Smart City Solutions | |
| **Integration Phase** | | |
| **28** | SoP of implementation | 1. Integration Testing Report |
| **29** | Integration with GIS and Command and Control Centre | |
| **30** | Other Integrations | |
| **Go –Live** | | |
| **31** | Go Live | 1. Go-Live Report |
| **Operation and Maintenance** | | |
| **32** | Operation and Maintenance of IT, Non IT infrastructure and Applications | 1. Detailed plan for monitoring of SLAs and performance of the overall system |
| **33** | SLA and Performance Monitoring | |

| # | Key Activities | Deliverables |
|---|---|---|
| **34** | Logging, tracking and resolution of issues. | 2. Fortnightly Progress Report<br>3. Monthly SLA Monitoring Report and Exception Report<br>4. Quarterly security Report<br>5. Issues logging and resolution report |
| **35** | Application enhancement | |
| **36** | Patch Updates | |
| **37** | Helpdesk services | |

# 8. Payment Terms and Schedule

- 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.
- Due payments shall be made promptly by the Authority, generally within thirty (30) days after submission of an invoice or request for payment by LSI
- The currency or currencies in which payments shall be made to the LSI under this Contract shall be Indian Rupees (INR) only.
- All remittance charges shall be borne by the LSI.
- In case of disputed items, the disputed amount shall be withheld and shall be paid only after settlement of the dispute.
- 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.
- 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:

| No. | Scope of Work | Timelines | Payment |
|---|---|---|---|
| 1. | Upon finalization of SRS, FRS & SDD | T+2 months | • 10% of the Total Capex Value |
| 2. | Phase I operationalization & Go-Live | T + 9 months | • 90% of the Phase I capex value |
| 2a | Goods / Product Delivery for Phase I | T + 9 months | • 60% |
| 2b | Phase I Operationalization & Go Live | | • 40% |
| 3 | Phase II operationalization & Go-Live | T+15 months | • 20% Of the contract Value |
| 3a | Goods / Product Delivery for Phase II | T+15 | • 60% |

| | | | |
|---|---|---|---|
| 3b | Phase II<br>Operationalization & Go Live | months | • 40% |
| 4 | Operations & Maintenance phase for a period of 60 months from the date of<br>Go Live of phase I | T1 + 60 months | • OPEX Value in equal quarterlyinstalments |

**Note:**

- T is the date of signing of contract
- T1 is the date of Go Live of the last phase.

# 9. Service Level Agreements

The purpose is to define the levels of service provided by LSI to the designated authority for the duration of the contract. The benefits of this are:

- Start a process that monitors the aspect of performance
- Intimate the authority on the drops of performance below the threshold defined by the Authority
- Help the designated authority control the levels and performance of LSI's services

The Service Levels are between the Authority and LSI

### *9.1 Service Level Agreements & Targets*

- This section is agreed to by the designated authority and LSI as the key performance indicator for the project. This may be reviewed and revised according to the procedures detailed in Clause-Service Level 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 following tables are for the period of contact.
- The procedures in Clause –Service Level Change Controlshall be used if there is a dispute between the designated authority and LSI on what the permanent targets should be.

### *9.2 Service Level Monitoring*

I. Service Level parameters defined in Clause Measurements and Targets 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.

II. 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.

III. Maximum Penalty applicable for any quarter shall not exceed 10% of the 'applicable fees' for the respective quarter.

IV. 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 Termination of the RFP vol III respectively and the consequences as provided in Clause Consequences of Termination of RFP vol III shall follow at the discretion of the Authority.

V. The payment to the agency shall be on Quarterly basis as stated in the RFP.

VI. 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:

- "Total Time" - Total number of hours in the quarter (or the concerned period) being considered for evaluation of SLA performance.
- "Uptime" – Time period for which the specified services/ outcomes are available in the period being considered for evaluation of SLA.
- "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.
- "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.
- "Incident" - Any event / abnormalities in the service being rendered, that may lead to disruption in normal operations and services to the end user.

### *9.3 Measurements and Targets*

#### *9.3.1 Implementation phase related performance*

Timely delivery of the Scope of Work

| | Activity | Individual phases of the activities | Timeline | Penalty for delay |
|---|---|---|---|---|
| | Phase-I (270 Days) | | | |
| 1 | Resource Mobilization | • Resource Mobilization<br>• Inception Report | T1+15 Days | Delay of one week, 0.05% of Contract Value<br>Delay of Two week, 0.075% of Contract Value<br>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 sensors, Digital bill boards, Wi-hotspots, Command and Control Center, PIS | 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. |
| | | Procurement of the hardware & software infrastructure required for :<br>• Implementation of Solution Components<br>• 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 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 enabled Solid Waste Management, Intelligent Traffic Management System, VMS, Digital bill boards, Wi-hotspots, PIS, Network components for city surveillance | Procurement of the residual/ additional hardware & software infrastructure required from phase I | T1+315 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 | 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<br>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 O&M period measurements*

| Sl No | Measurement | Definition | Target | Penalty |
|---|---|---|---|---|
| **1.** | CCC H/W Infrastructure including<br>1. Work Stations<br>2. Video Wall<br>3. CCTV Cameras<br>4. Phones | Overall CCC Components Availability will be measured by following formula:<br>Component Availability (%) = (Total minutes during the month – Planned downtime - Downtime minutes during the month) *100 / Total minutes during the month<br>Total Time shall be measured 24x7 basis for CCC.<br>Measurement Tool: Reports from EMSpreferably open source, under the scope of LSI, | >=99.982% | a) <99.982% to >= 99.9% - 1% of QP<br>b) <99.9% to >= 99.75% - 2% of QP<br>c) Subsequently, for every 0.25% drop in SLA criteria - 2% of QP upto maximum of 10% of the QP<br>d) Beyond 10% will be treated as Events of Default as per the Section B clause 10 of Volume III and occurrence of the same in consecutive two Quarters will lead to Termination of the Contract as per Section B, clause 11 of the Volume III. |
| **2.** | Availability of city Specific Smart ApplicationSoftware<br>1. Variable Message System<br>2. Environmental Sensors<br>3. Intelligent Traffic<br>4. Smart Parking<br>5. Smart SWM<br>6. Smart Meters<br>7. Environmental sensors | Availability of each Application to be measured separately and penalty will be calculated accordingly. The Uptime will be measured by following formula:<br>Component Availability (%) = (Total minutes during | >=99.982% | a) <99.982% to >= 99.9% - 1% of QP<br>b) <99.9% to >= 99.75% - 2% of QP<br>c) Subsequently, for every 0.25% drop in SLA criteria - 2% of QP upto maximum of 10% of the QP<br>d) Beyond 10% will be treated as Events of |

| | | | | |
|---|---|---|---|---|
| | 8. Integrated Operation Platform<br>9. Digital Bill boards<br>10. Wi-Fi Hotspots | the month – Planned downtime - Downtime minutes during the month) *100 / Total minutes during the month<br>Total Time shall be measured 24x7 basis for CCC.<br>Measurement Tool: Reports from EMS tool in the scope of MSI | | Default as per the Section B, clause 10 of Volume III and occurrence of the same in consecutive two Quarters will lead to Termination of the Contract as per Section B, clause 11 of the Volume III of the RFP. |
| **3.** | Availability of field infrastructure including<br>1. GPS/GSM Unit<br>2. GPS based handheld/ Mobile Device<br>3. Environmental Sensors<br>4. Bulk Flow Meters<br>5. Traffic Controllers<br>6. Variable Message System/ PIS<br>7. Cameras<br>8. Wi-Fi Hotspots<br>9. Digital Bill boards<br>10. Water meters/ Sensors<br>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:<br>Component Availability (%) = (Total minutes during the month – Planned downtime - Downtime minutes during the month) *100 / Total minutes during the month<br>Total Time shall be measured 24x7 basis for CCC.<br>Measurement Tool: Reports from EMS | >=99.982% | a) <99.982% to >= 99.9% - 1% of QP<br>b) <99.9% to >= 99.75% - 2% of QP<br>c) Subsequently, for every 0.25% drop in SLA criteria - 2% of QP upto maximum of 10% of the QP<br>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 11 of the Volume III. |
| **4.** | **Camera feed and quality wherever required** | | | |
| **5a** | Ratio of Livecameras 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- | >=99.982% | a) <99.982% to >= 99.9% - 1% of QP<br>b) <99.9% to >= 99.75% - 2% of QP<br>c) Subsequently, for every 0.25% drop in SLA criteria - 2% of QP upto maximum of 10% of the |

| | | | | |
|---|---|---|---|---|
| | | functioning of camera | | QP<br>d) Beyond 10% will be treated as Events of Default as per the Section B, clause 10 of Volume III and occurrence of the same in consecutive two Quarters will lead to Termination of the Contract as per Section B clause 11 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<br>Measurement tool: Log from VMS | >=99.982% | a) <99.982% to >= 99.9% - 1% of QP<br>b) <99.9% to >= 99.75% - 2% of QP<br>c) Subsequently, for every 0.25% drop in SLA criteria - 2% of QP upto maximum of 10% of the QP<br>d) Beyond 10% will be treated as Events of Default as per the Section B, clause 10 of Volume III and occurrence of the same in consecutive two Quarters will lead to Termination of the Contract as per Section B clause 11 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<br>Measurement tool: Log from VMS | >=99.982% | a) <99.982% to >= 99.9% - 1% of QP<br>b) <99.9% to >= 99.75% - 2% of QP<br>c) Subsequently, for every 0.25% drop in SLA criteria - 2% of QP upto maximum of 10% of the QP<br>d) Beyond 10% will be treated as Events of |

| | | | | |
|---|---|---|---|---|
| | | | | Default as per the Section B clause 10 of Volume III and occurrence of the same in consecutive two Quarters will lead to Termination of the Contract as per Section B, clause 11 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.<br>Measurement tool: Report from EMS | ≤40ms | a) <40ms to >= 42 ms- 1% of QP<br>b) <42ms to >= 44 ms - 2% of QP<br>c) Subsequently, for every ms drop in SLA criteria - 1% of QP upto maximum of 10% of the QP<br>d) Beyond 10% will be treated as Events of Default as per the Section B clause 10 of Volume III and occurrence of the same in consecutive two Quarters will lead to Termination of the Contract as per Section B clause 11 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<br>Measurement tool: Log from VMS | ≤2s | a) <2s to >= 3s- 1% of QP<br>b) <3s to >= 4 s - 2% of QP<br>c) Subsequently, for every second drop in SLA criteria - 1% of QP uptomaximum of 10% of the QP<br>d) Beyond 10% will be treated as Events of Default as per the Section B clause 10 of Volume III and occurrence of the same in consecutive two |

| | | | | |
|---|---|---|---|---|
| | | | | Quarters will lead to Termination of the Contract as per Section B clause 11 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<br>b) <12s to >= 14 s - 2% of QP<br>c) Subsequently, for every second drop in SLA criteria - 1% of QP upto maximum of 10% of the QP<br>d) Beyond 10% will be treated as Events of Default as per the Section B clause 10 of Volume III and occurrence of the same in consecutive two Quarters will lead to Termination of the Contract as per Section B clause 11 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 10 of Volume III and occurrence of the same in consecutive two Quarters will lead to Termination of the | |

| | | |
|---|---|---|
| | Contract as per Section B clause 11 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 10 of Volume III and occurrence of the same in consecutive two Quarters will lead to Termination of the Contract as per Section B clause 11 of the Volume III. | |

The Non-Critical Component includes

- Camera
- GPS
- Other City Specific Field Level Components

### *9.4 Reporting 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 City

SPV Authority or personnel as directed by the designated authority along with monthly invoice.

- The service levels monitored through the monitoring tool shall be audited and checked by an independent engineer nominated by SSCL

### *9.5 Issue 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 the designated authority and Bidder.

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.

**A) Issue Management Process**

- Either the designated 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 the RFP Volume III.

### *9.6 Service Level Change Control*

**A) General**

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

- A process for negotiating changes to the Service Levels
- An issue management process for documenting and resolving particularly difficult issues.
- The designated authority and Bidder 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 mutualagreement in accordance. Changes can be proposed by either party .Unresolved issues shall also be addressed. LSI's representative shall maintain and distribute current copies of the Service Level document as directed by the designated 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 requirechanging 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. 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 Shivamoggawill 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:

- ***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.

- ***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 centres in the vicinity to prepare for increased number of emergency care patients.

# 11. 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. Further the platform will provide an open standards based integration Bus with API Management, providing full API lifecycle management with governance and security.