CHAPTER-2:

SCOPE OF WORK AND TECHNICAL

REQUIREMENTS

2.0   Introduction

A Model Communication Network that is capable of converging Voice, Data & Video applications with features elaborated below is planned over SWR. The said network shall be designed, installed, configured, and commissioned so as to support all the present and upcoming applications in the foreseeable future duly ensuring a reliable, modular,scalable, manageable and secure network with high availability & low latency

- Adoption of IP MPLS backhaul to leverage the benefits it offers.
- Elimination of PD-Mux, Routers and Modems by transferring all circuits on the IP MPLS network.
- As part of this up gradation, existing 36 obsolete Exchanges will be merged and said number will be brought down to 7.
- Provision of VOIP based Train Control Communication System (TCCS), thereby improving the quality of speech and reliability.
- Transfer of Voice and Data Circuits such as Exchange, UTS/PRS, FOIS/COIS/CMS, etc presently working on E1/voice channel to Ethernet. Transfer of Data Circuits of SCADA from E1 to Ethernet
- Provide connectivity to subordinate and sub divisional officers through redundant path on OFC for adoption of mission critical applications like Railnet-Office, E-DAS, IPAS, IMMS, UMID, HRMS, etc.
- Provision of Network Monitoring System (NMS) that shall monitor the entire network and every node connected to it and provision of EMS for IP MPLS,TCCS & IP Exchange for configuration.
- Creation of Integrated Divisional, Zonal level Network Management System (NMS) and these will be operated as Network Operation Centers (NOC)
- Provide servers running critical applications with load balancing and fail over capability at two separate locations.
- Upgrading man power skills by providing on site training from OEM
- Integration with existing VSS equipment, VoIP based TCCS and SIP based Exchanges.
- To design the system to optimize the cost and improve availability so as to use same network infrastructure to be shared for number of services with required security features and with ring/protection path and VPN network

The Converged Network shall have Federated and Multi tenant architecture

The Work comprises of following components/sub-works

1	Provision of Multiprotocol Level Switching / Internet Protocol based Technology over Bengaluru ,Mysuru & Hubballi divisions.
2	Provision of SIP based IP Server Exchanges
3	Provision of Video Surveillance System at 228 Stations over SWR
4	Provision of VOIP based Train Control Communication System (TCCS) over Bengaluru ,Mysuru & Hubballi divisions

Existing SDH systems at stations (STM-1 and PD Mux) will be replaced with latest IP MPLS technology that ensures higher bandwidth, reduced Latency, improved Traffic engineering. Quality of Service can be defined for different applications based on priority of same.

Apart from optimising the number of exchanges on the Zonal Railway, the proposed network will also eliminate redundant equipment being utilized for data circuits and improve availability and reduce the cost of procurement and maintenance considerably. This will cover Video Surveillance system at all A, B, D and E category stations.

Brief :

The set up for proposed Converged network at four tiers as under has been standardized and layout for the same is enclosed

Zonal /Divisional HQ & other Server locations

A/B category stations /RPF out posts

D/E category stations

F category station

The equipment including the modular and hybrid interfaces to be used for different categories of stations, divisional and Zonal HQ locations

Comprehensive IP numbering scheme for the entire network has to be developed.

Under IP MPLS the following is planned

Label Edge Router (LER) at all the Stations with 2x10 G configuration

Label Switch Router at Junction/Important Stations with 8X10G configuration (Optical/Ethernet 1G port for Voice/Data Circuits and E1 card for Existing Circuits)

Layer 3 Switch at every station for creating a VLAN for catering number of applications.

EMS/NMS Server for configuration/Monitoring of equipment.

Voice Based TCCS

Communication Server in 1+1 configuration with one server at each Data Centre.

Event Logger, Voice Logger & NMS server in 1+1 configuration with one server at each Data Centre.

Controller console and Test Room Console in Control Office

Work Stations for Telecom Testroom.

Voip Control Phone at all stations

EC on Gateway

Video Surveillance System(VSS).

VMS, VAS, FRS and Storage server at all the A & B Category Stations/ RPF post.

Clustering of D & E Category stations to nearest RPF Post for Servers, Storage and Monitoring.

Work Stations for RPF Thana, Officers and Security Control.

Integrated VMS server along with redundant VMS, VAS and FRS server kept at Data Centre.

Disaster recovery storage for 15 days planned at Data Centre.

Firewalls, Routers & Switches are planned for the Data Centre.

Fire alarm and Detection System for Data Centers.

Exchanges

SIP Server with 1+1 configuration for Main Exchanges at Divisions and Intercom Exchanges at Divisions and HQ.

96/48/24 port Gateways at wayside stations in order to replace satellite Exchanges.

Video and Voice IP phones for officers at HQ, Division and Wayside stations

IP Phones for Station Masters

EMS server for configuration and management.

This chapter includes detailed scope of the work of IP MPLS, Exchange, TCCS and VSS in sequence along with drawings, plans, schemes, locations where equipment to be installed, details of existing infrastructures. This Project includes developing a reliable, scalable, manageable and secure network with high availability & low latency to support in the foreseeable future, all voice, data and video applications over SWR. Adoption of IP MPLS backhaul is to leverage the benefits it offers. Edge Data Centre is planned for distributed storage and

computing, to enhance availability and low latency. All servers running critical applications shall have the load balancing and fail over capability and shall be located at two separate locations.

As part of this project, 36 obsolete Exchanges will be merged and said number will be brought down to 6 main SIP exchanges. GM and DRM intercoms will also be New/Upgraded/Augmented with SIP based technology. VOIP based Train Control Communication System (TCCS) will be provided, thereby improving the quality of speech and reliability. Data Circuits such as UTS/PRS, FOIS/COIS/CMS,PRI etc presently working on E1/voice channel will be transferred to Ethernet. In future, Data Circuits of SCADA will be transferred from E1 to Ethernet. Integrated Video Surveillance System (VSS) in federated architecture duly locating storage and computing resources suitably at Edge Data Centre/ RPF posts is planned, thereby optimizing the bandwidth requirement and ensuring low latency.

Connectivity will be provided to subordinate and sub divisional officers through redundant paths on OFC for adoption of mission machine critical applications like E-Office, E-DAS, IPAS, IMMS, UMID, HRMS, IREPS, UDM, Video Conferencing etc. Network/Element Monitoring System (NMS/EMS) will be provided that shall monitor/Configure the entire network and every node connected to it. The plan is to strengthen the Zonal and Divisional RAILNET by eliminating all unmanageable switches which are to the extent of 80% at present and extending connectivity through OFC with redundant paths. Elimination of STMs, Routers and Modems by transferring all circuits on the IP MPLS network is planned. Along with implementation of this project, man power skills development is also part of this work.

The overall scope of work includes following (Detailed scope of IP MPLS, Exchange, TCCS and VSS are given further below):

i) Planning, Design, Supply, Installation, fixing, Configuring, Testing, Commissioning, Integration with Existing VSS, IP Exchange & TCCS Infra, Operation and Maintenance of the IP MPLS, TCCS, SIP Exchange, and IP based video surveillance system at various Railway Stations of A1, A, B, D, E and F category of South Western Railways.

The system shall comply with RDSO Specification for IP MPLS Document No STT/TAN/IP-MPLS/2020 Ver-1 with latest Amendment, for VSS RDSO/SPN/TC/65/2021 Rev. 6.0 with latest Amendment, For TCCS RDSO/SPN/TC/99/2012 Rev. 2.0 with latest Amendment. RDSO Specification for Lan Extender, Media Gateway etc However, in case of any conflict on the solution design parameters, system functional requirements and technical specification of a system/item between RDSO specification and the tender conditions, the tender conditions will prevail over above mentioned RDSO specification. **These documents can be downloaded from RDSO Website https://rdso.indianrailways.gov.in/Directorate/Telecommunication Draft specification and List of Specification.**

ii) The bidder should prepare a site plan showing exact location of different type of Routers,cameras, switches,Gateways etc. at various Stations/locations like for cameras, parking areas, entrance/exit points, platforms, yards, waiting halls, ticket counters, offices, foot over bridges, circulating areas etc. as per site requirement in consultation with Railways after the proper site survey. The proposed site plan should have an optimum number of cameras so as to cover Railway Station from a security point of view. Installation of the MPLS, TCCS, SIP Gateways & VSS systems at Railway Stations shall be carried out **only as per Drawings & Plans approved by Railways**.

iii) Supply of complete hardware components for the proposed solution (Routers,cameras, servers, storage systems, PC workstations, LFD, manageable switches,SIP Phones,Controller Consoles etc.) including AMC and Warranty.

iv) Supply of any other equipment/infrastructure or services required for the proper installation, testing, commissioning, operation and maintenance of IP MPLS,TCCS,SIP Exchange and video surveillance solution as per the approved design.

v) Supply of all software/licenses for the solution including peripheral applications, middleware, environmental software or any other related software/licenses as required in the proposed solution (Including AMC and Maintenance/Warranty).

vi) Seamless integration of the server(s), cameras, network devices, storage hardware, Gateways, IP Phones, Consoles, NMS/EMS and software etc.

vii) Remote operation and monitoring of a cluster of stations from Data Centers, RPF Thana/Post, S&T Control Room, Divisional HQ and Zonal HQ through the Railway's TCP/IP-MPLS network. Bidders may also be required to

extend fiber/network connectivity from the nearest station OFC Room to Stations, PRS/UTS Room, Offices & RPF Thana/Post.

viii) Integration of CCC application with existing VMS, proposed VMS, VA and EMS at API/SDK and application level with hardware software and licences.

ix) Integration of TCCS application with existing TCCS and EMS at API/SDK and application level.

x) Integration and Augmentation of IP Exchange application with existing SIP based Exchange and EMS at API/SDK and application level.

xi) Railway will only give connectivity to POP not further.

xii) To identify, develop and deliver the training (On site/OEM factory) to the Railways staff for the MPLS/TCCS/SIP Exchange/VSS System.

xiii) To demonstrate the functioning of all the modules of software and features of hardware components as and when required by Railways.

xiv) Video Analytics should also include additional capabilities in addition to the capabilities mentioned in RDSO Specification. Details given in Detailed Technical Specification in Chapter 3.

xv) Integration of the proposed VSS system with the existing VSS system provided by RCIL. For integration existing LAN infra can be used. The selected bidder shall integrate the proposed VSS infra with the existing VSS infra (including software, server, storage etc.). The cost of licences including installation, configuration & commissioning required for integration for VMS and VAS for existing VSS cameras will be paid by Railways and is covered in schedule item of CCC Control Command Center. No additional cost other than covered in CCC will be paid.

The selected bidder is also free to integrate existing VMS and new VMS. However, the selected bidder shall ensure that integration of existing VSS infra and the proposed VSS infra is seamlessly working as per the terms and condition of the tender documents.

xvi) Integration of existing TCCS & existing IP Exchanges in the proposed system

xvii) Preparation of Digital Network topology of MPLS/TCCS/VSS at station showing make, model, IP address, connectivity etc (including existing TCCS/VSS infra).

xviii) Data Center And Disaster Recovery should be planned in each Divisions with Edge Routers, Firewall, Switches in two tier Network connection, Smoke & Fire detection, Fire Extinguisher,Smart Racks, Server and UPS Power supply as per Scope of work .

xix) Replacement of **all consumable items including batteries** of UPS and all OFC/CAT-6 links between network devices (camera/switches/servers) failed due to manufacturing defects/ bad workmanship should be attended/ supplied by the contractor (at no additional cost to Railway) during Maintenance period.

xx) Provision of a Qualified manpower required for maintaining IP MPLS, TCCS, SIP Exchange, VSS as per SLA during Maintenance supervision period of 36 months without any additional cost to Railway.

xxi) One Support Engineer should be available at each division during office working hours to diagnose, advise and rectify the faults/failures. Technical support should be 24x7 on phone or any means of communication during the maintenance period of 36 months.

xxii) After the completion of contract duration, the successful bidder shall hand over all the components,software etc of the IP MPLS/TCCS/SIP Exchange/video surveillance system in working condition to Railways.

xxiii) Earth resistance less than 1 Ω for maintenance free earthing during complete project duration including AMC.

2.0.1 Quality Assurance Programme and Implementation Methodology

The bidder with quality assurance should prepare Implementation Methodology covering:

a)   Schedule of Type Test/ Acceptance Test/Inspection, supply, installation, SAT (Site Acceptance Test), trial runs, commissioning, integration etc.

b)   Allocation of manpower for different activities during execution of work and maintenance.

c)   Submission of PERT chart indicating completion of various activities separately for each sub-work within targeted time frame.

2.0.2 Manufacturing, Supply and Storage of Equipment

The bidder will be fully responsible for Manufacturing, Inspection and supply of Equipment/cards/interfaces/software/licenses and all related items for installation and commissioning of the network including the following:

a)   Spares required for Commissioning, maintenance supervision & maintenance period, AMC shall be maintained by the Contractor at his own cost. (List of spares given in Chapter 1)
b)   All necessary software,cables and connectors etc required.
c)   The bidder shall be responsible for transportation and storage of equipment and all other items required for Installation and Commissioning of the network to Railway stores at UBL/SBC/MYS sites as advised.

2.0.3 Support from Railways

● For IP MPLS/Train Control Communication/SIP based Exchange/Video Surveillance System (VSS) at Railway Stations, the Dy Chief Signal and Telecom Project Hubballi shall be the executing Officer Head of the project. The Dy CSTE/P/UBL/SBC/MYS shall nominate an officer and supervisor as an authorized representative(s) for this project. The successful bidder shall take all instructions/approvals etc. for the project from Dy CSTE/P or his nominated authorized representative.

● Drawing & Plans for installation of stations shall be submitted by the contractor to Railway for approval of Railway. A schedule for submission of station wise drawings /plans by the Contractor & their clearance by the Railway shall be drawn so as to avoid bunching of documents and to ensure that the time taken for approval is minimized. Such plans shall be prepared after a joint survey of stations in the format adopted by Railway. The Railway, after receiving drawings & plans, will arrange to scrutinize the drawings/plans and offer their remarks if required, within 7 working days of submission . Contractor shall ensure compliance within the next 5 working days, after receiving it from the Railway. Thereafter, Railway will communicate the approval within the next 07 working days. Installation at stations shall be carried out as per Railway's approved drawings & plans only.

● At Category A, B D and E stations, number of cameras shall be as per site requirement based on duly approved drawings after site survey. Before commencement of the work at a station, the bidder has to take approval for camera locations. Camera locations drawing that will be signed by the nominated representatives of Railways.

● The Railway will provide free access to Railway premises in connection with carrying out the project related activities. However, prior permission/valid temporary ID card may be issued to the concerned persons by the Project Coordinator of RAILWAY and duly countersigned by the concerned Railway officer.For execution of projects, Railway will permit the bidder to use the available Railway Land temporarily on the same terms & conditions as applicable.

● Space will be arranged by Indian Railways for Installation and Commissioning of the project.
● Indian Railways will permit the installation of infrastructure at stations, as cleared by site Engineer subject to non interference with the existing devices and to the rail users.

● If required by special order, the successful bidder would be allowed to carry out the work even at night.
● Railways shall facilitate the interfacing of Points of Presence installed by the successful bidder to connect with the Railway OFC Network at each Railway Station.
● Temporary depots for tools and equipment of any kind can only be opened within the Railway's premises during installation phase only after getting prior permission from the authorized Railway personnel as per Railway's terms and conditions.
● Railway will provide 2 fibers for connecting LER and LSR Router at each station for creating IP MPLS Network
● Railway will provide Raw 230 Volt AC and -48 DC Power supply for the Equipment.
● Railway will provide space for installation of the equipment in the Rack wherever Rack are not catered.
● Railway will provide access to the server where integration is required to be done.
● Railway will provide access to the existing infra where integration is required to be done.

2.0.4 Bidder's Responsibility

The bidder will be responsible for all the activities mentioned in Scope of Work. Bidder will also responsible for the following activities

- Planning, designing and drawing of systems at stations Edge Data Center, Divisional, Zonal HQ. Preparation of Drawings & Plans clearly showing Active infra (Routers, Servers, Cameras, Switches, UPS, Rack etc.) and passive infra (OFC, power cable, CAT etc.) for railway's approval and their modifications as per railway requirements. (Note: In addition to the proposed infra under this project, existing LAN infra and existing infra shall be clearly depicted in the drawings with different colors & plans prepared by the selected contractor for Railways approval, showing the extent of their utilization in the proposed system at stations).
- It shall be the responsibility of the Supplier to transport the equipment to site for the Installation & Commissioning.
- Installation, Integration, Testing, Trial Run and Commissioning of Network/System
- The bidder shall be fully responsible for Quality Assurance of equipment & other network elements and supervision of following:
    a) Installation and integration of the above said equipment/ items as per System design
    b) Integration with existing network/system
    c) Testing of the Network/System as specified in the document
    d) Trial run of the network/system
    e) Commissioning of Network/system
    f) Maintenance of the system during the maintenance period and AMC.

2.0.5 Final Commissioning

The Project shall be considered to be commissioned only after successful completion of the SAT, trial Run, successful completion of 36 months of Maintenance Supervision after issue of PAC and after issue of Final Acceptance Certificate (FAC).

Any item of bidder's goods/services not specifically mentioned, but considered essential for completion/commissioning of the work in all respects shall be deemed to be included in the scope of work. Any additional item, if required for completion of work, shall be required to be supplied by the bidder free of cost.

2.0.6 General System Guidelines

a) Bidder shall be responsible for the successful completion of the project.
b) If during the course of execution of the work any discrepancy or inconsistency, error or omission in any of the provisions of the contract is discovered, the same shall be referred to the Purchaser/Engineer who shall give his decision in the matter and issue instructions directing the manner in which the work is to be carried out. The decision of the Purchaser/Engineer shall be final and conclusive and the bidder shall carry out the work in accordance thereof.

2.0.7 Technical Response

The technical response shall be fully comprehensive and detailed and will include detailed guaranteed specifications of the equipment and systems to be supplied. Marginal performance shall not be accepted.

2.0.8 Features and Capabilities of Equipment

The specifications contain the necessary requirements of the Railway with regard to the features and capabilities of the equipment to be offered by the bidders. These will be carefully studied and commented upon by the bidder.

2.0.9 Compliance to Technical Requirements

2.0.9.1 Clause by Clause Compliance

In the offer, the bidder shall include statement of clause by clause compliance of the tender document and sufficient documentation such that Railway can validate the compliance statements.

2.0.9.2 Unclear Statements

In case of unclear statements for compliance of any specific requirement, Railway will interpret that particular requirement as being "NON COMPLIANT."

2.0.10 Existing Communication in Railways

An understanding of the existing communication system of Indian Railways .The different communication circuits that are in use can be classified as Operational, Administrative and Data.

2.0.10.1 Operational Communication

These are circuits provided for the safe and punctual operation of trains. Hence they cover train traffic management, crew management and various aspects related to train operations at stations. These circuits have a geographical spread over the area of a Section control covering about 20 block stations on the average. This section briefly describes them.

A) Section Control

Section Control is a communication system that is used for effecting precedence and crossing in train operations. A Section controller plans the precedence and crossing of trains in a section of track covering about 20 stations. These plans are communicated to the station masters who implement them. It is a unique conference call where the section controller is always off-hook. Any of the stations in the section can lift the phone handset and get connected to the conference call. Further, only the section controller is provided with the facility to call a station. One of the most important features of this conference-like call is that, whenever the section control calls the station, an audible ring is activated at the station. The ring is provided, irrespective of the fact whether the phone at the station is off-hook or on-hook.
This communication is geographically spread over all the stations located in that section. The circuit originates at the Divisional HQ.

B) TPC/TLC/EC

Traction Power control, Traction Loco Control, are used for operation and maintenance of traction power distribution and OHE while TLC is used for Loco interception, power change and crew management. Emergency Communication is the communication system used in the event of any emergency that provides a means for an authorized personnel to talk to a person in the divisional control from anywhere in the block-section of the controlled section. This is done using a special phone call Portable Control Phone (PCP) available with only authorised railway personnel like guards, drivers etc. Hence this communication is of vital importance in event of accidents/unusuals.
This communication is geographically spread over all the stations located in the division. The circuit originates at the Divisional HQ.

C) Block Communication

The absolute block system ensures spatial segregation of trains in a section of track. This is one of the most important circuits used in conjunction with block instruments for movement of trains between adjacent block stations. These are point to point dedicated circuits. The block communication is an exclusive point to point communication that connects two adjacent stations.

D) LC Gate communication

The level-crossing gates are provided with a telephone so that the gateman can talk to the station masters. The station master exchanges information with regards to train movements in the block section. This is required for coordination for gate control. The gate telephone works on a nominated quad of the 6-Quad cable laid between stations. There is a point to multi point circuit that connects the station to the gated LC that is within control of the station. The geographical spread is typically within a block section on either side of a station.

E) BPAC/SSBPAC

Communication circuits are also required for the purpose of Block Proving by Axle Counters (BPAC). This system is used to eliminate the requirement of manual check for the last vehicle clearing the block section. It is one of the most important circuits that enhances the line capacity and is very vital for the train working.

The BPAC circuits are working on the 6-Quad and OFC and are point to point circuits connecting adjacent BPAC equipment and are spread over a block section.

F) Data Logger

Data Loggers are used for logging of relay states in the stations. The Data-logger communication system is used to gather the data loggers data at a central location of storage and analysis. The conventional network as per extant scheme of RDSO is a non-IP network and instead it as a daisy chain connecting the data loggers provided at each station and the Divisional HQ with 2Mbps Circuit. This arrangement loads each data logger to act as transport nodes of Data on the network in addition to its primary function of event logging, alarm generations etc.

2.0.10.2   Administrative Communication
2.0.10.2.1   Exchanges (Existing & Future Inter-connectivity)

Railways has a Railway telephony network that spans across all the zones and divisions. It also covers most of the important sub divisional locations. Telephone exchanges are provided at each of these locations. An STD network has also been established interconnecting all the zonal and divisional exchanges using IP Based Next Generation Network (NGN)/PRI on 2 Mbps Circuit.

2.0.10.3   Data Communication

Various data communication networks exist on Indian Railways.

A) UTN

Unified Ticketing Network (UTN) is the ticketing network utilised to issue tickets to Railway passengers both reserved and unreserved. It spans most of the stations on Railway today over a separate IP network.
The WAN interface of the UTN uses E1 circuits built through Railways'/RCIL/BSNL SDH equipment provided at the stations as well as hired E1 channels from BSNL/MTNL.

B) FOIS Network

This is also a separate IP network which is used for operational purposes. This network was created for Freight Operation Information System, it is also providing connectivity to the users for other management applications viz, Parcel Management systems, Control Office Application, Crew Mgt System etc...

This network connects important Freight/Commercial stations to the central servers located in various locations including Zonal / Divisional hqrs and CRIS at Delhi. The WAN interfaces of this network also uses E1 circuits built through the SDH equipment provided at the stations as well as hired E1 channels from BSNL/MTNL.

C) RC/SCADA

The SCADA/RC are circuits that are dropped for operation of Traction power distribution and control. The

SCADA control is located in the divisional office in RE territories. These are used for operation of the switchgear available at traction Substations/Sectioning Posts/Sub sectioning posts, AT etc. These are low bandwidth real time applications that are critical for operation of traction switchgear and hence critical for trains operation in RE areas.

The SCADA system is located in the divisional HQ. Connectivity of the existing network is provided through E1 on STM-1 or VF channels built over PD Muxes at the nearest station which in turn uses E1 circuits built over SDH network and last mile is through 6- Quad/PIJF/OFC cables.

D) Video Surveillance

Video surveillance at the station is connected through Railtel STM-4 Network from the station cameras to the storage and monitoring locations to Divisional HeadQuarters.

E) Railnet

Railnet is the Enterprise Wide Area network of Indian Railways. It is a general purpose network to serve the administrative and management requirements of Railways as well as to connect to the Internet . It is available to all the officers and supervisors in the field and has become a vital component of day to day working. It is engineered as an L3-VPN using the IP MPLS architecture of RCIL. The network spans over all the Zonal Railway Hqrs, Divisional Railway Hqrs, production units, workshops, training institutes, stores, depot, important stations etc.

F) Wi-Fi Service

Railways have started providing free WiFi services to its passengers at the stations.It is supposed to become a very attractive facility being provided to our passengers. A separate TCP/IP WiFi network is available at the stations to cater for this requirement.

G) Media for Communication Circuits

Railways has provided its own communication system. The media being used is 6- Quad copper cable and OFC. The 6 Quad cable is laid along the track and is terminated at all the station and LC gates. It is used for connecting the Block instruments, LC gates, Emergency communication sockets and for BPAC. It can also be used for low speed data connectivity to the block-sections using phantom arrangements. The 6 Quad cable is laid and maintained departmentally. Besides this 6 Quad is also used by the SP/SSPs for extending SCADA in RE territories.

24 fibre OFC is laid along the Railway routes and is maintained by RailTel. Of the 24, 4 fibres are used by Railways. These 4 fibres are terminated at all the stations to serve for short-haul systems using STM-1 on 2 fibres . The NMS for STM - 1 equipment are provided at the Test room of the respective divisions and are manned by Railway staff. The rest 20 fibres are used by RailTel and are terminated at the long haul PoPs of RailTel. These POPs are also the locations where STM - 4 bandwidth is extended for Railway use. RailTel is using STM-16, DWDM, OTN etc for their long haul communication. RailTel also has an MPLS -IP/ TP network that is used to deliver Internet Bandwidth to Railways and also bandwidth for interconnecting the Railway.

Railways has adopted SDH technology for its short haul and long haul communication requirements. The long haul communication network is managed by RailTel while the short haul communication is maintained and managed by Railways. STM-1 equipment are provided at all the stations on the Railways in which the following terminations are provided: - i) 14 or 21 E1s for drop/insert of required E1 circuits for PD Mux, WAN interfaces for UTN/FOIS networks. ii) 4 to 8 Fast Ethernet (IEEE 10 BASE-T) circuits to cater to Ethernet end users e.g DSLAMs to extend Railnet at remote stations. STM-4/16/64 equipment are provided for RailTel's long haul network in which generally the following terminations are provided: i) E1 Circuit bank for meeting E1 customers ii) Ethernet Circuit Bank of different bandwidth capacities for Ethernet users. iii) STM-1 terminations for branch off routes etc. or bulk customers

2.1 Internet Protocol/ Multi Protocol Label Switching Network (IP-MPLS)

2.1.1 Scope of work

IP-MPLS Network is based on a converged, service oriented architecture to support all applications. It provides high redundancy, assured QoS and robust agility in the network. IP-MPLS technology is proposed to be adapted as the telecommunication backbone of Railways. As a converged network, it shall support all railway applications like Control communication, PRS/UTS, FOIS/COIS/CMS, Data logger, SCADA, Exchange PRI and network for Wi-Fi, VSS and RAILNET regardless of their criticality over a common network infrastructure, with no compromise in performance and security. The network's flexible IP/MPLS VPN service capability supports IP Ethernet and SDH communications in both point-to-point and multipoint manner to meet the communications requirements of different applications. Each application is carried over a dedicated VPN, segregated from all other VPNs. Taking over route redundancy requirements of IP routers at each station by MPLS nodes. MPLS network should support 10G bandwidth and can be upgraded to 100G and even more to support seamless communication and low latency between multiple applications on this converged network. Migration of all Data networks presently working on Mux/ Modem etc to full Ethernet based IP network, progressing towards manageable communication network. Through NMS/EMS, monitoring and management of end network devices can converge at a centralized location. As a result, a converged network can greatly improve operations efficiency when compared to legacy purpose built networks. Above scope of work includes Designing, Planning of network topology, IP address scheme over SWR.

2.1.2 IP-MPLS Routers & Interfaces Configuration

1) The SDH equipment at all the wayside SDH equipment rooms and other divisional and zonal locations shall be replaced with IP-MPLS routers. These IP-MPLS routers shall be Label Edge Router (LER) with/without Label Switch Router (LSR) depending on fibre path terminations at that location.

2) LER shall provide the following minimum interfaces:

a) 2x10G (optical) to connect to the adjacent stations.
b) 16xE1 (G.703) for working various TDM circuits of stations utilising PDMux as well as directly.
c) 4x1GbE (copper) to connect various networks at stations.
d) 4x1GbE (optical) to connect various networks at stations optically.

3) All wayside LERs will have the following :
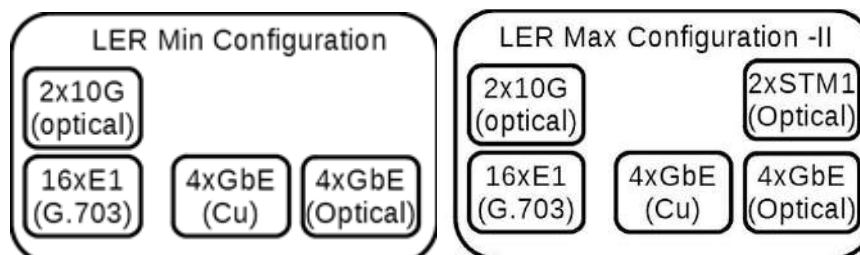
4) Should be possible to upgrade the equipment to have a total of 32xE1 (G.703) ports by way of adding / replacing interface cards or should be possible to add 2xSTM-1 (channelized, optical) ports. Thus by way of adding / replacing interface cards / ports .

5)   At the junction stations where there are more than two fiber path terminations, an additional Label Switch Router (LSR) should be used. The LSR should be equipped with 8x10G (optical) ports. The LER in the junction stations shall be provided with STM-1 interface to connect with the existing STM.

6)   The schematic of an MPLS-PoP where fiber from three directions are terminating is shown below:
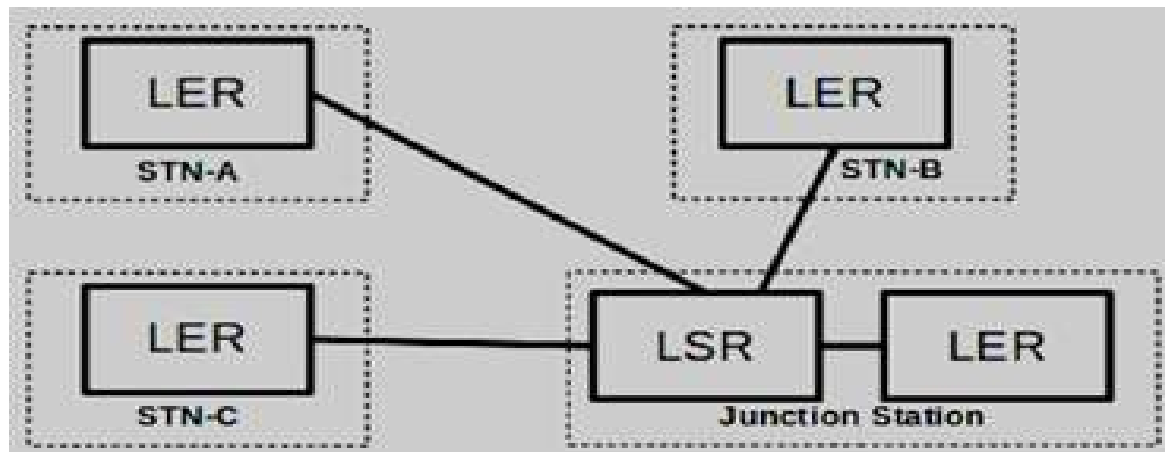
7)   The LSR will thus cater to junction stations having fiber coming from up to seven directions.

8)   In case of more fiber directions, another LSR shall be used.

9)   In case the number of TDM ports increase at a wayside, and a new LER router is required to be placed in an MPLS-PoP, then an LSR shall be provided in the PoP and the old LER as well as the new LER should be connected to the LSR. This is shown in the diagram below:
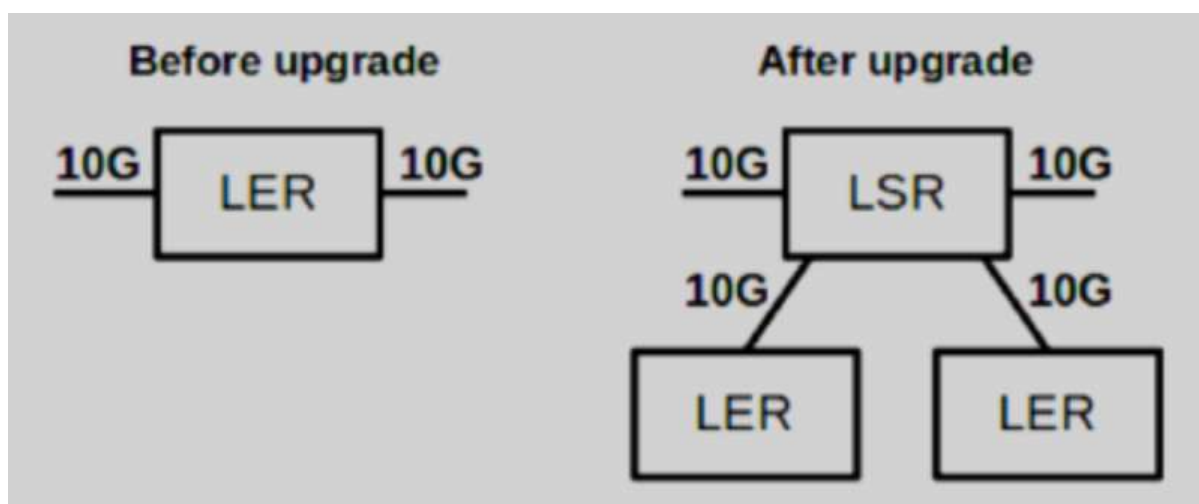
10) In case an LER is to be added at a junction station, the LER shall be added to the LSR.

11)   All interfaces of LER/LSR configuration to be done as per Railway requirement at Site and if required integrate with existing STM/PD Mux.

2.1.3 NMS & NOC Architecture

a) NMS

Network monitoring and provisioning system Hardware and Software will be deployed at Divisional HQ locations. Zonal HQ, Section HQ will get Workstations to Manage the network of their own area through workstation terminal from the same NMS

b) NOC

1. Zone HQ NOC capabilities:

a. Single point of contact for the interdivisional and interzonal issues.
b. Node installations, troubleshooting and updating for zonal nodes.

c. Service provisioning for zonal nodes.

d. Overall Performance reporting and improvement recommendations.

e. Patch management and whitelisting.

f. Backup management

2. DIV HQ NOC capabilities:

a. Troubleshooting and updating.
b. Field support.
c. Node installations, troubleshooting and updating.
d. Service provisioning.
e. Performance reporting and improvement recommendations.
f. Patch management and whitelisting.
g. Backup management.

PROPOSED MPLS NETWORK DIAGRAM OF SWR

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2.1.4 IP MPLS Network tentative implementation scheme and migration plan

A Division is the basic operational unit of the Railways and all the activities of all departments are initiated, implemented, coordinated and monitored and hence is the basic aggregation layer for the communication bandwidth. Most circuits originate from Divisional HQ and terminate at each of the stations in the Division, adjacent divisional HQ, Zonal HQ and the internet gateway. Also in the event of any emergency or unusual, all activities are controlled and monitored from the Divisional HQ.

Considering the various services and applications used by the division, it is desirable that servers for running the various services and applications relevant to the Division are located in the Divisional HQs in suitable Data Centers. This will also serve to address latency and response time issues besides optimizing bandwidth utilization.

The existing network carries crucial communication circuits that cover train operations and Railway working. Broad migration strategy is outlined below:

1) Creation of a Divisional NOC at Hubballi, Bengaluru, Mysuru and Zonal NOC at SWR HQ for NMS/EMS of the unified telecom network and make it operational.

2) Standardizing the MPLS equipment including the interfaces to be used for different categories of circuits at stations, divisional and zonal HQ locations including the IP numbering scheme and integrating with existing IPs of working applications. List of LER & LSR at Various Stations of SWR is enclosed below.

3) The IP-MPLS routers shall be installed in existing OFC equipment rooms at all stations and should work efficiently in similar environmental conditions. These shall be called MPLS-PoPs (MPLS point of presence).

4) Stations are provided with STM-1 Make of Tejas-100 or 1400 or Fibcom connected with PD Mux on 2Mbps of Webfil/PunCom/Coral Make etc.PRS/UTS/FOIS/COIS/CMN Data Network are provided with Router of Cisco Make connected on 2 Mbps circuits.

A section wise availability of E1 Details of SDH networks is prepared (enclosed below) specifically covering services being offered by the existing SDH network. Each of these services will be mapped to the MPLS network as an E1 circuit, MPLS VPN (L3/L2) and at MPLS boundary locations STM-1 interface with SDH network depending upon the application. LSRs shall be connected with existing Railway's/Railtel/BSNL SDH network through STM/Ethernet interface.

5) The communication network shall consist of MPLS rings of smaller and larger sections connected to every station in the section terminating at a junction station. The station to station MPLS connectivity shall be on 10G optical interface. Suitable VPNs shall be defined for segregation of the network.

6) Data networks such as PRS/UTS/FOIS etc are currently using IP routers at each station, with at least 2 active WAN interfaces using E1 circuits, to provide route redundancy. After the introduction of MPLS nodes at all stations, route redundancy function will no longer be required to be provided by these IP routers as that job will then be vested to the MPLS node itself for all the VPNs at that station. However the existing IP router will be retained to define the perimeter of the users' LAN for its end points and to connect their respective VPNs through Ethernet ports of the MPLS equipment there. Hence these IP routers will need only 2 Ethernet ports, one to connect the MPLS node for upstream connectivity and other for the LAN connectivity for the L2 switch already available there for the end points, terminals etc. The scheme is shown in the diagram below:

Typical scheme for extending a VPN service e.g UTN, FOIS, Railnet, CCTV etc at Stn X using small Edge router and its LAN connections for End points.
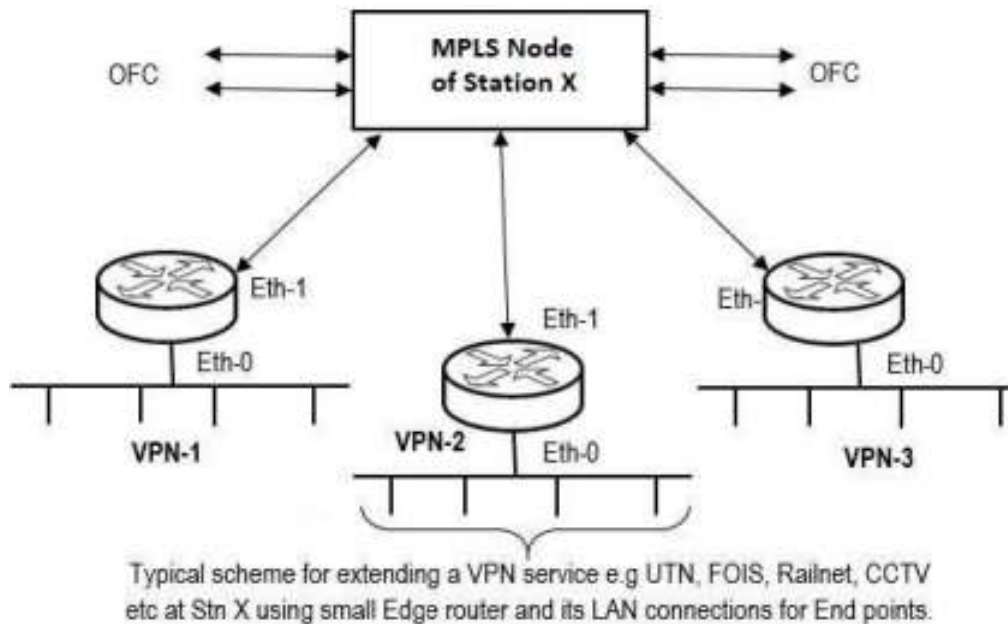
Existing & Tentative architecture of the PRS/UTS Network
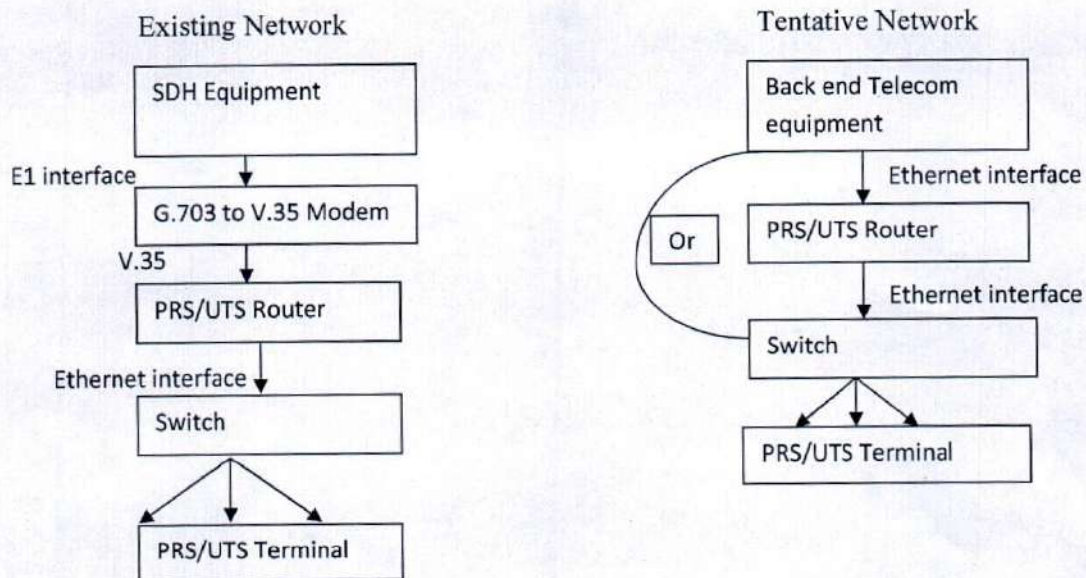
7) The Data networks for PRS, SCADA etc will have to be migrated to a full IP network and these circuits can be transferred to Ethernet interfaces during the migration as per site requirement.

8) IP exchange installation will simplify extending Railway phones to stations. All exchange replacement should work on OFC and LAN cabling so as to cover the connectivity to all subordinate offices/depots etc.

9) At stations where Railnet / Internet is being extended through Modem the same can be migrated to Ethernet.

10) The IP-MPLS migration must be done control section wise. Section control of unimportant branch lines should be migrated first to train telecom personnel of division on IP-MPLS and LAN working.

12) Divisional MPLS network shall be connected with RCIL's MPLS network using 1G interface at required

locations in the division wherever there is no feasibility RailTel Network, BSNL Network to be used .

14) Each of the divisions shall form an MPLS domain in itself and connect to RCIL/adjacent division's MPLS network using Border Gateway Protocol. Border Gateway Protocol (BGP) is an Internet Engineering Task Force (IETF) standard, and the most scalable of all routing protocols. BGP is the routing protocol of the global Internet, as well as for Service Provider private networks.

15) The existing IP addressing working for various applications to be integrated with the IP MPLS Network.

16) During the implementation of MPLS, the existing SDH network shall also work in parallel, till the MPLS network is stabilized and fully operational.

DATA CENTER FOR CONVERGED COMMUNICATION NETWORK OVER SWR

MPLS BACKBONE

HQ/SWR
VSS WORK STATION

UBL DIVISION-DATA CENTER
- (LSR) IP MPLS ROUTER — OFC ROOM
- RAIL NET SWITCH
- NGFW FIREWALL — OFC
- IP MPLS ROUTER (LER)
- 10KVA UPS / DG 10KVA
- 24 PORT L2 SW (2x4X10 Cu+ 4 X 10 SFP) VSS
- DM, DCC, TDMA, CCC, FSC, EGG
- INTEGRATION NMS SERVER, REDUNDANT NMS SERVER, REDUNDANT FRB SERVER, REDUNDANT VMS SERVER, DISASTER RECOVERY STORAGE
- WORK STATION AT TEST ROOM
- 24 PORT L2 SW (2x4X1G Cu+ 4 x 1G SFP) VOIP TCCS
- VOIP TCCS SERVER (1+1), VOICE LOGGER, NMS SERVER
- VOIP TCCS NMS CLIENT AT TEST ROOM
- 24 PORT L2 SW (2x4X1G Cu+ 4 x 1G SFP) SIP EXCHANGE
- SIP EXCHANGE SERVER, NMS SERVER
- SIP EXCHANGE NMS CLIENT AT EXCHANGE
- 24 PORT L2 SW (2x4X10 Cu+ 4 x 10 SFP) IP MPLS
- IP-MPLS NMS SERVER
- IP MPLS NMS CLIENT AT TEST ROOM / AT EXCHANGE

GDG-DATA CENTER
- (LSR) IP MPLS ROUTER — OFC ROOM
- RAIL NET SWITCH
- NGFW FIREWALL — OFC
- IP MPLS ROUTER (LER)
- 10KVA UPS / DG 10KVA
- 24 PORT L2 SW (24X1G Cu+ 4 x 1G SFP) VOIP TCCS
- VOIP TCCS SERVER
- 24 PORT L2 SW (24X10 Cu+ 4 x 1G SFP) IP MPLS SIP EXCHANGE
- SIP EXCHANGE SERVER

SBC DIVISION-DATA CENTER
- (LSR) IP MPLS ROUTER — OFC ROOM
- RAIL NET SWITCH
- NGFW FIREWALL — OFC
- IP MPLS ROUTER (LER)
- 10KVA UPS / DG 10KVA
- 24 PORT L2 SW (2x4X10 Cu+ 4 X 10 SFP) VSS
- DM, CCC, TDMA, CCC, FSC, EGG
- INTEGRATION NMS SERVER, REDUNDANT NMS SERVER, REDUNDANT FRB SERVER, REDUNDANT VMS SERVER, DISASTER RECOVERY STORAGE
- WORK STATION AT TEST ROOM
- 24 PORT L2 SW (2x4X1G Cu+ 4 x 1G SFP) VOIP TCCS
- VOIP TCCS SERVER (1+1), VOICE LOGGER, NMS SERVER
- VOIP TCCS NMS CLIENT AT TEST ROOM
- 24 PORT L2 SW (24X1G Cu+ 4 x 1G SFP) SIP EXCHANGE
- SIP EXCHANGE SERVER, NMS SERVER
- SIP EXCHANGE NMS CLIENT AT EXCHANGE
- 24 PORT L2 SW (24X1G Cu+ 4 x 10 SFP) IP MPLS
- IP-MPLS NMS SERVER
- IP MPLS NMS CLIENT AT TEST ROOM / AT EXCHANGE

BWT-DATA CENTER
- (LSR) IP MPLS ROUTER — OFC ROOM
- RAIL NET SWITCH
- NGFW FIREWALL — OFC
- IP MPLS ROUTER (LER)
- 10KVA UPS / DG 10KVA
- 24 PORT L2 SW (24X1G Cu+ 4 x 1G SFP) VOIP TCCS
- VOIP TCCS SERVER
- 24 PORT L2 SW (24X1G Cu+ 4 X 10 SFP) SIP EXCHANGE
- SIP EXCHANGE SERVER

HAS-DATA CENTER
- (LSR) IP MPLS ROUTER — OFC ROOM
- RAIL NET SWITCH
- NGFW FIREWALL — OFC
- IP MPLS ROUTER (LER)
- 10KVA UPS / DG 10KVA
- 24 PORT L2 SW (24X1G Cu+ 4 x 1G SFP) VOIP TCCS
- VOIP TCCS SERVER
- 24 PORT L2 SW (24X1G Cu+ 4 x 1G SFP) IP MPLS
- SIP EXCHANGE SERVER

MYS DIVISION-DATA CENTER
- (LSR) IP MPLS ROUTER — OFC ROOM
- RAIL NET SWITCH
- NGFW FIREWALL — OFC
- IP MPLS ROUTER (LER)
- 10KVA UPS / DG 10KVA
- 24 PORT L2 SW (2x4X1G Cu+ 4 x 1G SFP) VSS
- DM, DCC, TDMA, CCC, FSC, EGG
- INTEGRATION NMS SERVER, REDUNDANT NMS SERVER, REDUNDANT FRB SERVER, REDUNDANT VMS SERVER, DISASTER RECOVERY STORAGE
- WORK STATION AT TEST ROOM
- 24 PORT L2 SW (2x4X1G Cu+ 4 x 1G SFP) VOIP TCCS
- VOIP TCCS SERVER (1+1), VOICE LOGGER, NMS SERVER
- VOIP TCCS NMS CLIENT AT TEST ROOM
- 24 PORT L2 SW (24X1G Cu+ 4 x 1G SFP) SIP EXCHANGE
- SIP EXCHANGE SERVER, NMS SERVER
- SIP EXCHANGE NMS CLIENT AT EXCHANGE
- 24 PORT L2 SW (24X1G Cu+ 4 x 10 SFP) IP MPLS
- IP-MPLS NMS SERVER
- IP MPLS NMS CLIENT AT EXCHANGE / AT TEST ROOM

NOTE:

1. IP MPLS	UBL	
NMS SERVER	TEST ROOM AT UBL, MYS, SBC	
CLIENTS		
2. SIP EXCHANGE		
EXCHANGE SERVER	UBL, GDG, SBC, BWT, MYS, HAS	
	EXCHANGE AT UBL, SBC, MYS	
CLIENTS		
3. TCCS		
TCCS SERVER	UBL, GDG, SBC, BWT, MYS, HAS	
NMS SERVER	UBL SBC, MYS	
CLIENT	TEST ROOM AT UBL, SBC, MYS	
4. VSS		
VSS SERVER	UBL, SBC, MYS	
WORK STATION	TEST ROOM AT UBL, SBC, MYS	

04 Nov 21

CONVERGED COMMUNICATION NETWORK AT 'A' & 'B' CATEGORY STATION

MPLS BACK BONE 10G

STN–Y

STN–X

CLOCK ROOM — VAS
PARCEL ROOM — VAS
LADIES WAITING HALL — VAS
GENTS WAITING HALL — VAS
PARKING AREA
CONCOURSE
ENTRY
EXIT
FOB
VAS (multiple)
PLATFORM–1
PLATFORM–2
PLATFORM–3

UTS/PRS
BOOKING OFFICE — VAS
AGGREGATOR SWITCH

RELAY ROOM — VAS
SM PANEL ROOM — VAS
TCCS
SIP PHONE
RAILNET
TPC
AGGREGATOR SWITCH

FOIS
LOBBY

OFC ROOM
E1 LER
L3 SWITCH
BPAC
DATALOGGER
UFSBI/SSBPAC(D)
PD MUX

VAS SERVER
FRS SERVER
STORAGE
10KVA UPS
10KVA UPS
RPF POST

SUB-OFFICE
RAILNET
SIP PHONE
TPC
RC
SP/SSP/TSS

GATEWAY
EXCHANGE

Legend:
PTZ CAMERA (2 NOS)
BULLET CAMERA (28 NOS)
DOME CAMERA (5 NOS)
4K UHD CAMERA (2 NOS)
OFC
3CX2.5SQ MM POWER CABLE
STP CAT 6 POWER CABLE

06 Aug 21

NOTE:
MPLS ROUTER (LER) (16 E1 + 4 x 1G Cu+4 x 1G SFP) — IPMPLS
24 PORT L3 SWITCH (24 x 1G POE + 4 x1G SFP) – (1 NOS) (OFC ROOM)
8 PORT POE SWITCH (8 x 1G POE + 2 x1G SFP) – (12 NOS) (FIELD SWITCH)(STATION) — TCCS & VSS
24 PORT L2 SWITCH (24 x 1G POE + 4 x1G SFP) – (1 NOS)(RPF)
24 PORT L2 SWITCH (24 x 1G SFP + 4 x 10G SFP)– (02 NOS) (AGGREGATOR SWITCH)(STATION) — VSS
24 PORT L2 SWITCH
24/48/96 GATEWAY — EXCHANGE

CONVERGED COMMUNICATION NETWORK AT 'D' & 'E' CATEGORY STATION

MPLS BACK BONE 10G

STN—X
STN—Y

Legend:
- PTZ CAMERA (2 NOS)
- BULLET CAMERA (28 NOS)
- DOME CAMERA (5 NOS)
- 4K UHD CAMERA (2 NOS)
- OFC
- 3CX2.5SQ MM POWER CABLE
- STP CAT 6 POWER CABLE

06 Aug 21
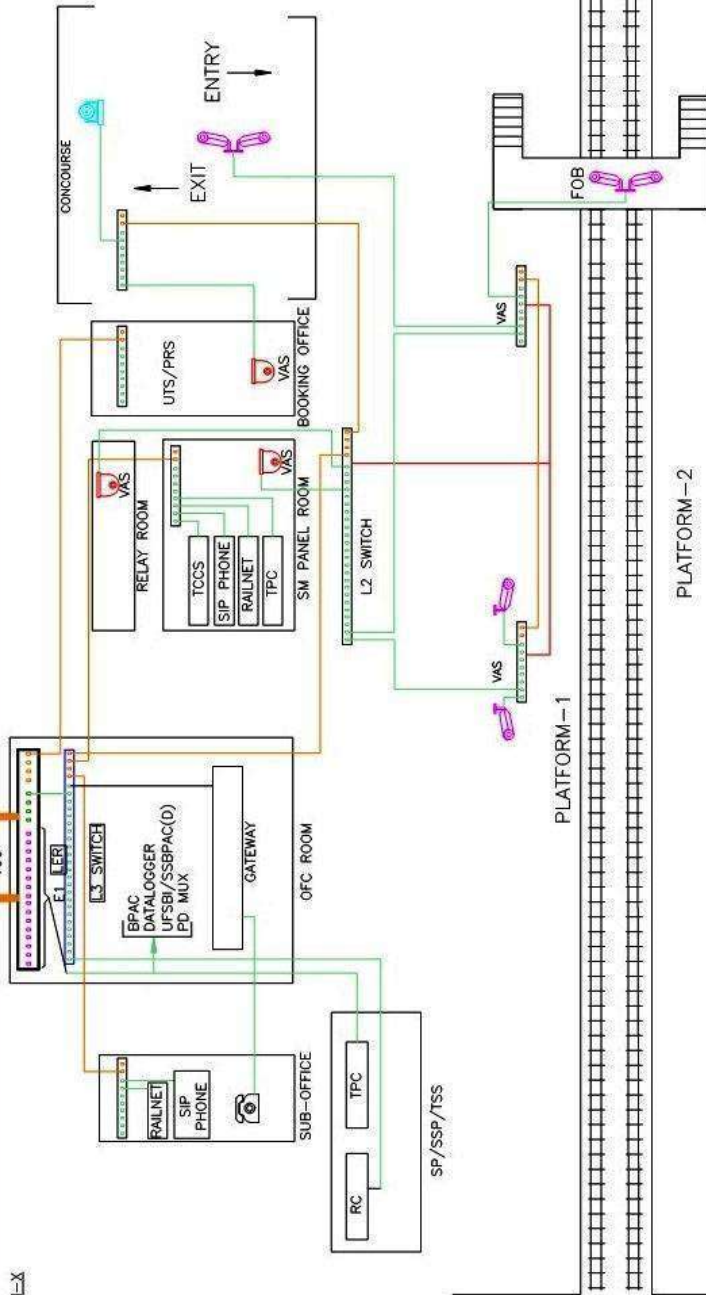
NOTE:
- MPLS ROUTER (LER) (16 E1 + 4 x 1G Cu+4 x 1G SFP)
- 8 PORT POE SWITCH (8 x 1G POE + 2 x1G SFP) – (12 NOS) (FIELD SWITCH)
- 24 PORT L2 SWITCH (24 x 1G POE + 4 x1G SFP) – (1 NOS)
- 24 PORT L3 SWITCH (24 x 1G POE + 4 x1G SFP) – (1 NOS)

CONCOURSE
ENTRY
EXIT
FOB
VAS
UTS/PRS
BOOKING OFFICE
RELAY ROOM
TCCS
SIP PHONE
RAILNET
TPC
SM PANEL ROOM
L2 SWITCH
PLATFORM—1
PLATFORM—2
OFC ROOM
10G
E1
LER
L3 SWITCH
BPAC
DATALOGGER
UFSBI/SSBPAC(D)
PD MUX
GATEWAY
SUB—OFFICE
RAILNET
SIP PHONE
TPC
RC
SP/SSP/TSS

CONVERGED COMMUNICATION NETWORK AT 'F' CATEGORY STATION

MPLS BACK BONE 10G

STN—Y

STN—X

CONCOURSE

RELAY ROOM

TCCS
SIP PHONE
RAILNET
TPC

SM PANEL ROOM

10G

E1 LER
L2 SWITCH

BPAC
DATALOGGER
UFSBI/SSBPAC(D)
PD MUX

OFC ROOM

RC
TPC

SP/SSP/TSS

PLATFORM—1

PLATFORM—2

FOB

OFC

STP CAT 6 POWER CABLE

NOTE:

MPLS ROUTER (LER) (16 E1 + 4 × 1G Cu+4 × 1G SFP)

8 PORT POE SWITCH (8 × 1G POE + 2 ×1G SFP) – (12 NOS) (FIELD SWITCH)

24 PORT L2 SWITCH (24 × 1G POE + 4 ×1G SFP) – (1 NOS)

01 Jul 21

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2.1.5 List of Stations with LER and LSR details

Below list of stations also includes stations having existing Infra of SDH Network.Each IP MPLS Location of LER and LSR in Divisions and Neighbouring Stations of Central Railway Southern Railway & South Central Railway is given below. The LER will be placed in 124 locations including Data Centers at Hubli and Gadag. LSR will be placed in 17 locations with multiple OFC path

2.1.5.1 UBL Division

Sl.No	Station	Stn Code	LER	LSR
1	Miraj (CR)	MRJ	1	
2	Vijayanagar	VJR	1	
3	Shedbal	SED	1	
4	Ugarkhurd	UGR	1	
5	Kudachi	KUD	1	
6	Chinchli	CNC	1	
7	Raybag	RBG	1	
8	Chikodi Road	CKR	1	
9	Ghatprabha	GPB	1	
10	Gokak Road	GKK	1	
11	Pachchapur	PCH	1	
12	Suldhal	SUL	1	
13	Sulebhavi	SBH	1	
14	Sambre	SXB	1	
15	**Belagavi**	**BGM**	**1**	**1**
16	Desur	DUR	1	
17	Khanapur	KNP	1	
18	Gunji	GNJ	1	
19	**Londa**	**LD**	**1**	**1**
20	Tinaighat	TGT	1	
21	Castle Rock	CLR	1	
22	Caranzol	CRZ	1	
23	Dudhsagar	DDS	1	
24	Sonalium	LIM	1	
25	Kulem	QLM	1	
26	Kalem	KM	1	
27	Sanvordem	SVM	1	
28	Chandargao	CNR	1	
29	Madgaon	MAO	1	
30	Majorda	MJO	1	
31	Cansaulim	CSM	1	

32	Sankaval	SKVL	1	
33	**Vasco Da Gama**	**VSG**	**1**	**1**
34	Shivathan	SVTN	1	
35	Devarayi	DEV	1	
36	Nagargali IBS	NAG	1	
37	Tavargatti	TVG	1	
38	**Alnavar**	**LWR**	**1**	**1**
39	Ambewadi	AVA	1	
40	Kasanhatti	KHST	1	
41	Kambarganvi	KBI	1	
42	Mugad	MGD	1	
43	Kyarkop	KRKP	1	
44	**Dharwad**	**DWR**	**1**	**1**
45	Navalur	NVU	1	
46	**Hubli West Bypass**	**UBL-W**	**1**	**1**
47	Unkal	UNK	1	
48	**Hubballi Jn**	**UBL**	**1**	**1**
49	**Hubballi East Bypass**	**UBL-E**	**1**	**1**
50	Kusagal	KUG	1	
51	Hebsur	HBS	1	
52	Navalgund Road	NVD	1	
53	Annigeri	NGR	1	
54	Hulkoti	LKT	1	
55	Binkadakatti	BKIT	1	
56	**Gadag**	**GDG**	**2**	**1**
57	Kanaginhal	KGX	1	
58	Harlapur	RLP	1	
59	Sompur Road	SOQ	1	
60	Bhanapur	BNP	1	
61	Bannikoppa	BNA	1	
62	Koppal	KBL	1	
63	**Ginigera**	**GIN**	**1**	**1**
64	Gangavati	GGVT	1	
65	Chikkabenakal	CKBK	1	
66	Munirabad	MRB	1	
67	**Hosapete**	**HPT**	**1**	**1**
68	Vyasankeri	VYS	1	

69	**Vyas Colony**	**VC**	**1**	**1**
70	Hagaribommanahalli	HBI	1	
71	Kottur	KTY	1	
72	Ramagad	RMGD	1	
73	Yeshwantnagar	YTG	1	
74	Swamihalli	SMLI	1	
75	Kariganuru	KGW	1	
76	Papinayakanahalli	PKL	1	
77	Bayaluvaddigeri	BYO	1	
78	Gadiganuru	GNR	1	
79	**Toranagallu**	**TNGL**	**1**	**1**
80	Bannihatti	BNHT	1	
81	Nandihalli	NDH	1	
82	Ranjitpur	RNJP	1	
83	Daroji	DAJ	1	
84	Kudatini	KDN	1	
85	Kollagallu IBS		1	
86	Ballari Cant	BYC	1	
87	**Ballari Jn**	**BAY**	**1**	**1**
88	Obalapuram	OBM	1	
89	Somalapuram	SLM	1	
90	**Rayadurg**	**RDG**	**1**	**1**
91	Kadiridevarapalli	KRYP	1	
92	Kalyandurg	KYND	1	
93	Hombal	HBL	1	
94	Balganur	BLR	1	
95	Mallapur	MLP	1	
96	Holealur	HLAR	1	
97	Lakhmapur	LKY	1	
98	Badami	BDM	1	
99	Guledagudda Road	GED	1	
100	**Bagalkot**	**BGK**	**1**	**1**
101	Khajjidoni	KJDI	1	
102	Mugalolli	MGL	1	
103	Jadarama Kunti	JRKT	1	
104	Almatti	LMT	1	
105	Wandal	WDL	1	

106	Basavana Bagewadi Road	BSRX	1	
107	Kudgi	KDGI	1	
108	Mulvad	MVD	1	
109	Jumnal	JML	1	
110	**Vijayapura**	**BJP**	**1**	**1**
111	Minchnal	MNL	1	
112	Nimbal	NBL	1	
113	Indiroad	IDR	1	
114	Lachyan	LHN	1	
115	Tadval	TVL	1	
116	HOTGI	HG	1	
117	South Hubli	UBLS	1	
118	Kundgol	KNO	1	
119	Saunshi	SNH	1	
120	Gudgeri	GDI	1	
121	Yalvigi	YLG	1	
122	Savanur	SVNR	1	
123	Karajgi	KJG	1	
124	Hubballi Data Center	UBL	2	
	Total		**126**	**17**

2.1.5.2 In the SBC division, LER will be placed in 106 locations including the Data Center at SBC and BWT and LSR in 13 locations across SBC.

Sl. No	Station	Stn Code	LER-1	LSR-1
1	Yeliyur	Y	1	
2	Mandya	MYA	1	
3	Hanakere	HNK	1	
4	Maddur	MAD	1	
5	Shettihalli	SET	1	
6	Channapatna	CPT	1	
7	Ramanagaram	RMGM	1	
8	Bidadi	BID	1	
9	**Hejjala**	**HJL**	**1**	**1**
	IRIDM	**HJL/IRIDM**	**1**	
10	Kengeri	KGI	1	
11	Nayandahalli	NYH	1	
12	**KSR Bengaluru**	**SBC**	**1**	**1**
	Malleswaram	**MWM**	**1**	
13	**Yesvantpur**	**YPR**	**1**	**1**

14	**Chikbanavar**	**BAW**	**1**	**1**
15	Gollahalli	GHL	1	
16	Dodbele	DBL	1	
17	Nidavanda	NDV	1	
18	Hirehalli	HHL	1	
19	Kyatsandra	KIAT	1	
20	**Tumakuru**	**TK**	**1**	**1**
21	Mallasandra	MLSA	1	
22	Nittur	NTR	1	
23	Gubbi	GBB	1	
24	Sampige Road	SPGR	1	
25	Nelamangala	NMGA	1	
26	Solur	SOLR	1	
27	Thippasandra	TASA	1	
28	Kunigal	KIGL	1	
29	Yediyur	YY	1	
30	B.G Nagar	BGNR	1	
31	Hirisave	HISE	1	
32	Shravanabelagola	SBGA	1	
33	Channarayapatna	CNPA	1	
34	D.Samu dravali	DSVS	1	
35	Shantigrama	SIGA	1	
36	**Bengaluru Cant**	**BNC**	**1**	**1**
37	Bengaluru East	BNCE	1	
38	**Baiyyappanahalli 'RRI'**	**BYPL**	**1**	**1**
39	Third Coach Terminal BYPL	SMVB	1	
40	Krishnarajapuram	KJM	1	
41	Krishnarajapuram DSL	KJM DSL	1	
42	Satellite Goods Terminal	SGT	1	
43	**Whitefield**	**WFD**	**1**	**1**
44	Devangonthi	DKN	1	
45	Malur	MLO	1	
46	Byatarayana Halli IBS	BFW	1	
47	Tyakal	TCL	1	
48	Maralahalli IBS	MZV	1	
49	**Bangarpet**	**BWT**	**1**	**1**
50	Varadapur	VRDP	1	
51	Bisanattam	BSM	1	
52	Gudupalli	GDP	1	
53	Kuppam	KPN	1	

54	Mulanur	MAR	1	
55	Patchur	PU	1	
56	Somanayakkanapatti	SKPT	1	
57	Jolarpettai	JTJ	1	
58	Hebbal	HEB	1	
59	Banaswadi	BAND	1	
60	Karmelaram	CRLM	1	
61	Heelalige	HLE	1	
62	Anekal Road	AEK	1	
63	Maranayakana halli	MNKH	1	
64	Hosur	HSRA	1	
65	Kelamangalam	KMLM	1	
66	Periya Naga Thunai	PRNT	1	
67	Rayakottai	RYC	1	
68	Marandahalli	MZU	1	
69	Palakkodu	PCV	1	
70	**Dharmapuri**	**DPJ**	**1**	**1**
71	Sivadi	SZV	1	
72	Toppur	TPP	1	
73	Karuvalli	KVLR	1	
74	Omallur	OML	1	
75	Kolar	KQZ	1	
76	Srinivasapura	SVS	1	
77	Chintamani	CMY	1	
78	Sidlaghatta	IDT	1	
79	Chikballapur	CBP	1	
80	Devanahalli	DHL	1	
81	Lottegollahalli	LOGH	1	
82	**Yelahanka**	**YNK**	**1**	**1**
83	Channasandra	CSDR	1	
84	Rajanukunte	RNN	1	
85	Doddaballapur	DBU	1	
86	Oddarahalli	ORH	1	
87	Makalidurga	MKL	1	
88	Thondebhavi	TDV	1	
89	Gauribidanur	GBD	1	
90	Vidurashwatha	VWA	1	
91	Devarapalli	DPE	1	
92	**Hindupur**	**HUP**	**1**	**1**
93	Malugur	MLU	1	

94	Chakarlapalli	CPL	1	
95	Rangepalli	REPI	1	
96	**Penukonda**	**PKD**	**1**	**1**
97	Makkajipalli	MKJ	1	
98	Nagasamudram	NGM	1	
99	Dharmavaram	DMM	1	
100	Basampalle	BSPL	1	
101	SSPN	SSPN	1	
102	Narayanapura	NRYP	1	
103	Marikuppam	MKM	1	
104	Bangalore Data Center	DC	1	
105	Kamasamudram	KSM	1	
106	Someshwara	SMWA	1	
	Total		**106**	**14**

2.1.5.3 In MYS Division, LER will be placed in 95 locations including the Data Center at MYS and HAS and LSR in 08 locations across MYS.

Sl.No	Station	Stn Code	LER-1	LSR-1
1	Chamaraja Nagar	CMNR	1	
2	Nanjangud	NTW	1	
3	Kadakola	KDO	1	
4	Ashokapuram	AP	1	
5	**Mysuru Jn.**	**MYS**	**1**	**1**
6	MBBC	MBBC	1	
7	Belagula	BLGA	1	
8	Sagarakatte	STE	1	
9	Krishnaraja Nagar	KRNR	1	
10	Hosa Agrahara	HAH	1	
11	Akkihebbalu	AKK	1	
12	Mandagere	MGF	1	
13	Holenarsipura	HLN	1	
14	Mavinakere	MVC	1	
15	**Hassan**	**HAS**	**1**	**1**
16	Koravangala	KRVL	1	
17	Bageshpura	BGPA	1	
18	Habanghatta	HHT	1	
19	Alur	ALUR	1	
20	Ballupete	BLLT	1	
21	Sakleshpur	SKLR	1	
22	Donigal	DOGL	1	
23	Kadagaravalli	KGVL	1	

24	Yedakumari	YDK	1	
25	Shrivaglu	SVGL	1	
26	Subrahmanya Road	SBHR	1	
27	Yedamangala	YDM	1	
28	Narimogaru	NRJ	1	
29	Kabakaputtur	KBPR	1	
30	Neralakatte	NRF	1	
31	Bantawal	BNTL	1	
32	Padil	PADIL	1	
33	Mangalore	MAQ	1	
34	**Arsikere**	**ASK**	**1**	**1**
35	Banavar	BVR	1	
36	Devanur	VNR	1	
37	Ballekere	BLKR	1	
38	**Kadur**	**DRU**	**1**	**1**
39	Sakkaraya Patna	SHYP	1	
40	Chikkamagaluru	CMGR	1	
41	**Birur**	**RRB**	**1**	**1**
42	Nagavangala	NVF	1	
43	Ajjampur	AJP	1	
44	Shivani	SHV	1	
45	Hosdurga Road	HSD	1	
46	Ramagiri	RGI	1	
47	Holalkere	HLK	1	
48	**Chikjajur**	**JRU**	**1**	**1**
49	Sasalu	SLU	1	
50	Mayakonda	MYK	1	
51	Kodaganur	KAG	1	
52	Tolahunse	THN	1	
53	Davangere	DVG	1	
54	**Amaravathi Colony**	**AVC**	**1**	**1**
55	Harihar	HRR	1	
56	Kumarapatnam	KMPS	1	
57	Chalgeri	CLI	1	
58	Ranibennur	RNR	1	
59	Devaragudda	DAD	1	
60	Haveri	HVR	1	
61	Byadgi	BYD	1	
62	Shivapura	SPV	1	
63	Tarikere	TKE	1	

64	Masarahalli	MSS	1	
65	Bhadravati	BDVT	1	
66	**Shivamogga**	**SMET**	**1**	**1**
67	Kumsi	KMSI	1	
68	Anandapuram	ANF	1	
69	Sagar Jambagaru	SRF	1	
70	Talguppa	TLGP	1	
71	Amirtapura	AMC	1	
72	Haliyuru	HLV	1	
73	Chitradurga	CTA	1	
74	Balenahalli	BAHI	1	
75	Challakere	CHKE	1	
76	Thalaku	THKU	1	
77	Bommagundanakere	BOMN	1	
78	Molakalmuru	MOMU	1	
79	Teligi	TLGI	1	
80	Harapanahalli	HPHI	1	
81	Bennehalli	BEHI	1	
82	Honnavalli Road	HVL	1	
83	Tiptur	TTR	1	
84	Kardi	RDI	1	
85	Banasandra	BSN	1	
86	Ammasandra	AMSA	1	
87	MNGT	MNGT	1	
88	Naganahalli	NHY	1	
89	Shrirangapattana	S	1	
90	Pandavapura	PANP	1	
91	Byadarahalli	BDRL	1	
92	Adihalli	ADHL	1	
93	Arasalu	ARU	1	
94	Chamarajapuram	CMJ	1	
95	Mysore Data Center	DC	1	
	Total		**95**	**8**

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	Station Name	Pd MUX	UTS/ PRS	FOIS /COIS/C MS	Data Log ger	BP AC	SCA DA	UF SBI	SSBP AC D	RAILN ET	Exch ange	Remarks	Total
	Hubballi Division E1 Details												
1	Tinaighat	2	1		2	2	2	2				Up & Down 2 e1 for each direction	11
2	Londa	3	2	1	3	3	3	3		10		3 direction	28
3	Shivathan	2			2	2	2	2					10
4	Devarai	2	2		2	2	2	2					12
5	Nagargalli	2			2	2	2	2					10
6	Tavarghatti	2	2		2	2	2	2					12
7	Alnawar	3	4		3	3	3	3		1			20
8	Ambewadi	2	1	1	2	2	2	2					12
9	Kashinahatti	2			2	2	2	2					10
10	Kambharganvi	2	2		2	2	2	2					12
11	Mugad	2	2		2	2	2	2					12
12	Kyarakoppa	2	2	1	2	2	2	2					13
13	Dharwad	2	4	1	2	2	2	2		2	1		18
14	Navalur	2	2	1	2	2	2	2		2			15
15	Unakal	2	2		2	2	2	2					12
16	Hubli Center Cabin	2			2	2	2	2					10
17	Hubli West Cabin	2			2	2	2	2					10
18	Hubli East Cabin	2			2	2	2	2					10
19	Kusugal	2	2		2	2	2	2					12
20	Hebsur	2	2		2	2	2	2					12
21	Shivathan	2	2		2	2	2	2					12
22	Annigeri	2	2		2	2	2	2					12
23	Hulkoti	2	2		2	2	2	2					12
24	Binkadakatti	2	2		2	2	2	2					12

No	Name												
25	Gadag	3	3	3	3	3	3	3		10	1	3 direction	32
26	Kanaginahal	2	2		2	2	2	2					12
27	Harlapur	2	2		2	2	2	2					12
28	SompurRoad	2	2		2	2	2	2					12
29	Bannikoppa	2	2	1	2	2	2	2					13
30	Bhanapur	2	2		2	2	2	2					12
31	Koppal	2	3	1	2	2	2	2					14
32	Ginigera	3	2	1	2	3	3	3				3 direction	17
33	Munirbad	2	2	1	2	2	2	2					13
34	Hospete	3	10	14	3	3	3	3		10	1	3 direction	50
35	Miraj	2			2	2	2	2					10
36	VijayNagar	2	2		2	2	2	2					12
37	Shedbal	2	2		2	2	2	2					12
38	Ugharkurd	2	2	1	2	2	2	2					13
39	Kudachi	2	3		2	2	2	2					13
40	Chinchli	2	2		2	2	2	2					12
41	Raybag	2	2	1	2	2	2	2					13
42	Chikkodi Road	2	2		2	2	2	2					12
43	Ghataprabha	2	5		2	2	2	2					15
44	Gokak Road	2	2		2	2	2	2					12
45	Pachapur	2	2		2	2	2	2					12
46	Suldhal	2	2		2	2	2	2					12
47	Sulebhavi	2	2		2	2	2	2					12
48	Sambre	2	2		2	2	2	2					12
49	Belagavi	3	8	5	2	2	2	2		10	1		35
50	Desur	2	2	1	2	2	2	2					13
51	Khanapur	2	2		2	2	2	2					12
52	Gunji	2	2	1	2	2	2	2					13
53	Castlerock	2	2	3	2	2	2	2		5	1		21
54	Carenzol	2			2	2	2	2					10

55	Dudhsagar	2			2	2	2	2					10
56	Sonalium	2			2	2	2	2					10
57	Kulem	2	1		2	2	2	2					11
58	Kalem	2	2	1	2	2	2	2					13
59	Sanvordem	2	2	1	2	2	2	2					13
60	Chandergao	2	2		2	2	2	2					12
61	Madgaon	2			2	2	2	2			1		11
62	Cansaulim	2	2		2	2	2	2					12
63	Sankaval	2	2	1	2	2	2	2					13
64	Vasco da gama	2	3	1	2	2	2	2		4	1		19
65	Hombal	2	2		2	2	2	2					12
66	Balganur	2	2		2	2	2	2					12
67	Mallapur	2	2		2	2	2	2					12
68	Hole Alur	2	3		2	2	2	2					13
69	Lakmapur	2	2		2	2	2	2					12
70	Badami	2	2		2	2	2	2					12
71	Guledagudda Road	2	2		2	2	2	2					12
72	Bagalkot	3	3	3	3	3	3	3		2		3 direction	23
73	Mugalolli	2	2		2	2	2	2					12
74	Jadramkunte	2	2		2	2	2	2					12
75	Almatti	2	3		2	2	2	2					13
76	Wandal	2	2		2	2	2	2					12
77	Basavan Bagewadi Road	2	2		2	2	2	2					12
78	Kudgi	2	2	2	2	2	2	2					14
79	Mulvad	2	2		2	2	2	2					12
80	Jumnal	2	2		2	2	2	2					12
81	Vijayapura	2	8	3	2	2	2	2		10	1		32
82	Minchnal	2	2		2	2	2	2					12

83	Nimbal	2	2		2	2	2	2					12
84	Indiroad	2	2		2	2	2	2		1			13
85	Lachchan	2	2		2	2	2	2					12
86	Tadval	2	2		2	2	2	2					12
87	Hotgi	2			2	2	2	2					10
88	Hubli South	2	2		2	2	2	2					12
89	Kundgol	2	2		2	2	2	2					12
90	Sanshi	2	2		2	2	2	2					12
91	Gudigeri	2	2		2	2	2	2					12
92	Yelvigi	2	2		2	2	2	2					12
93	Savanuru	2	2		2	2	2	2					12
94	Karjagi	2	2		2	2	2	2					12
95	Kariganur	2	2	1	2	2	2	2					13
96	Papanayakanahalli	2	2	1	2	2	2	2					13
97	Bayaluvoddigeri	2	2		2	2	2	2					12
98	Gadiganuru	2	2		2	2	2	2					12
99	Toranagallu	2	3	3	2	2	2	2		1		3 direction	17
100	Daroji	2	2	1	2	2	2	2					13
101	Kuditini	2	2	1	2	2	2	2					13
102	Bellary cant	2	2	1	2	2	2	2					13
103	Bellary	2	6	3	2	2	2	2		10	1		30
104	Kalyanadurga	2	2		2	2	2	2					12
105	Kadradevarapally	2	2		2	2	2	2					12
106	BanniHatti	2		1	2	2	2	2					11
107	NandiHalli	2		1	2	2	2	2					11
108	RanjitPur	2		1	2	2	2	2					11
109	Vyasanakeri	2		1	2	2	2	2					11
110	Vyasacolony	2		1	2	2	2	2					11
111	Ramagad	2		1	2	2	2	2					11

SL NO	Station Name	Pd MUX	UTS/PRS	FOIS/COIS/CMS	Data Logger	BPAC	SCADA	UFSBI	SSBPACD	RAILNET	Exchange	TPASS	TRI	CCTV	MAPPLE	Total
112	Yeshwanthnagar	2		1	2	2	2	2								11
113	SwamiHalli	2			2	2	2	2								10
114	Obalapuram	2	2		2	2	2	2								12
115	Somalapuram	2	2		2	2	2	2								12
116	Rayadurga	2	2		2	2	2	2								12
117	Hagaribommnahalli	2	2		2	2	2	2								12
118	Kottur	2	2		2	2	2	2								12
119	Chikbenekal	2	2		2	2	2	2								12
120	Gangavati	2	2		2	2	2	2								12
121	Karatagi	2			2	2	2	2								10
122	Exchange	13		12							78	10				113
123	Testroom	26	9		8		4								13+13 NP & PP for PD Mux	47

SBC Division E1 Details																
SL NO	Station Name	Pd MUX	UTS/PRS	FOIS/COIS/CMS	Data Logger	BPAC	SCADA	UFSBI	SSBPACD	RAILNET	Exchange	TPASS	TRI	CCTV	MAPPLE	Total
1	Yeliyur	2	2	0	2	2	2	0	0	1	0	0	0	0	0	**11**
2	Mandya	2	4	1	2	2	2	0	0	2	0	0	0	0	0	**15**
3	Hanakere	2	2	0	2	2	2	0	0	0	0	0	0	0	0	**10**
4	Maddur	2	2	1	2	2	2	0	0	0	0	0	0	0	0	**11**
5	Settihalli	2	2	1	2	2	0	0	0	0	0	0	0	0	0	**9**
6	Channapatna	2	3	0	2	2	2	0	0	0	0	0	0	0	0	**11**
7	Ramanagaram	2	2	0	2	2	2	0	0	0	0	0	0	0	0	**10**
8	Bidadi	2	2	1	2	2	2	0	0	0	0	0	0	0	0	**11**
9	Hejjala	2	2	0	2	2	2	0	0	0	0	0	0	0	0	**10**
10	IRIDM/ HJL	2	2	0	0	0	0	0	0	1	1	1	0	0	0	**7**
11	Kengeri	2	3	0	2	2	2	0	0	0	0	0	0	0	0	**11**
12	Nayandahalli	2	3	0	2	2	2	0	0	0	0	0	0	0	0	**11**
13	KSR Bengaluru	18	0	34	14	0	10	0	0	14	17	0	1	1	3	**112**

No	Station															Total
14	Malleshwaram	0	2	0	0	0	0	0	0	0	0	0	0	0	0	**2**
15	Yeshvantpur	4	5	1	2	2	2	0	0	2	1	0	0	1	0	**20**
16	Chikbanavar	4	2	0	2	5	2	0	0	0	0	0	0	0	0	**15**
17	Gollahalli	2	3	0	2	4	2	0	0	0	0	0	0	0	0	**13**
18	Dodbele	2	2	0	2	4	2	0	0	0	0	0	0	0	0	**12**
19	Nidavanda	2	2	0	2	4	2	0	0	0	0	0	0	0	0	**12**
20	Hirehalli	2	2	0	2	4	2	0	0	0	0	0	0	0	0	**12**
21	Kyatsandra	2	2	0	2	4	2	0	0	0	0	0	0	0	0	**12**
22	Tumakuru	2	2	1	2	4	2	0	0	2	0	0	0	0	0	**15**
23	Mallasandra	2	2	0	2	2	2	0	0	0	0	0	0	0	0	**10**
24	Gubbi	2	2	0	2	2	2	0	0	0	0	0	0	0	0	**10**
25	Nittur	2	2	0	2	1	2	0	0	0	0	0	0	0	0	**9**
26	Sampige Road	2	3	0	2	0	2	0	0	1	0	0	0	0	0	**10**
27	Nelamangala	2	2	0	2	2	0	0	0	0	0	0	0	0	0	**8**
28	Solur	2	2	0	2	2	0	0	0	0	0	0	0	0	0	**8**
29	Thippasandra	2	2	0	2	2	0	0	0	0	0	0	0	0	0	**8**
30	Kunigal	2	2	0	2	2	0	0	0	1	1	0	0	0	0	**10**
31	Yediyuru	2	2	0	2	2	0	0	0	0	0	0	0	0	0	**8**
32	B.G Nagar	2	2	0	2	2	0	0	0	0	0	0	0	0	0	**8**
33	Hirisave	2	2	0	2	2	0	0	0	0	0	0	0	0	0	**8**
34	Shravanabelagola	2	2	0	2	2	0	0	0	0	0	0	0	0	0	**8**
35	Chennarayaapatna	2	2	0	2	2	0	0	0	0	0	0	0	0	0	**8**
36	D.Samudravali	2	2	0	2	2	0	0	0	0	0	0	0	0	0	**8**
37	Shantigrama	2	2	0	2	2	0	0	0	0	0	0	0	0	0	**8**
38	Hassan	2	1	1	2											**6**
39	Bengaluru Cant	2	2	1	2	0	0	0	0	2	1	0	0	0	1	**11**
40	Bengaluru East	0	2	0	2	0	0	0	0	0	0	0	0	0	0	**4**
41	Baiyyappanahalli RRI	6	4	1	2	2	0	0	0	1	0	0	0	0	0	**16**
42	Third Coach Terminal BYPL	2	2	2	2	0	0	0	0	3	1	0	0	0		**12**
43	Krishnarajapuram	2	4	1	2	0	0	0	0	1	0	0	1	0	1	**12**
44	Krishnarajapuram DSL	2	2	4	0	0	0	0	0	3	1	0	0	0	1	**13**
45	Satellite Goods Terminal	2	0	2	2	0	2	0	0	2	0	0	0	0	0	**10**

46	Whitefield	2	2	0	2	0	0	0	0	1	1	0		0	1	**9**
47	Devangonthi	2	2	1	2	0	0	0	0	0	0	0	0	0	2	**9**
48	Malur	2	2	2	2	2	0	1	0	0	0	0	0	0	1	**12**
49	Byatrayanhalli	2	0	0	2	4	0	2	0	0	0	0	0	0	0	**10**
50	Tyakal	2	2	0	2	4	0	2	0	0	0	0	0	0	0	**12**
51	Maralahalli	2	0	0	2	4		2	0	0	0	0	0	0	0	**10**
52	Bangarpet	4	7	2	3	4	2	1	0	2	1	0	0	0	0	**26**
53	Varadapur	2	0	0	2	3	0	1	0	0	0	0	0	0	0	**8**
54	Kamasamudram	2	0	0	2	2		2	0	0	0	0	0	0	0	**8**
55	Bisanattam	2	2	0	2	2		2	0	0	0	0	0	0	0	**10**
56	Gudupulli	2	2	0	0	2	0	2	0	0	0	0	0	0	0	**8**
57	Kuppam	2	3	0	2	2	0	1	0	1	1	0	1	0	0	**13**
58	Mulanur	2	2	0	2	4	0	0	0	0	0	0		0	0	**10**
59	Patchur	2	2	0	2	2	0	0	0	0	0	0	0	0	0	**8**
60	Somanayakkanapatti	2	2	0	2	4	0	0	0	0	0	0	0	0	0	**10**
61	Jolarpetti	2	0	0	0	2	0	0	0	0	0	0	0	0	0	**4**
62	Hebbal	4	2	0	2	1	0	0	0	0	0	0	0	0	0	**9**
63	Banaswadi	4	2	1	2	1	0	0	0	1	0	0	0	0	0	**11**
64	Karmelaram	4	3	0	2	4	2	0	0	0	0	0	0	0	0	**15**
65	Heelalige	4	2	0	2	4	2	0	0	0	0	0	0	0	0	**14**
66	Anekal Road	4	2	0	2	4	2	1	0	0	0	0	0	0	2	**17**
67	Maranayakanahalli	4	0	1	2	4	0	0	0	0	0	0	0	0	0	**11**
68	Hosur	4	3	1	2	4	2	1	0	0	0	0	0	1	1	**19**
69	Kelamangalam	4	2	0	2	4	2	0	0	0	0	0	0	0	1	**15**
70	Periyanagathunai	4	2	0	2	4	2	0	0	0	0	0	0	0	0	**14**
71	Rayakkottai	4	2	0	2	4	2	1	0	0	0	0	0	0	1	**16**
72	Marandahalli	4	2	0	2	4	2	0	0	0	0	0	0	0	0	**14**
73	Palakkodu	4	2	0	2	4	2	0	0	0	0	0	0	0	0	**14**
74	Dharmapuri	4	6	1	2	4	2	0	0	2	1	0	0	0	1	**23**
75	Sivadi	4	2	0	2	4	2	0	0	0	0	0	0	0	0	**14**
76	Toppur	4	2	0	2	4	2	0	0	0	0	0	0	0	0	**14**
77	Karuvalli	4	2	0	2	4	2	0	0	0	0	0	0	0	0	**14**
78	Omallur	4	0	0	0	2	0	0	0	0	0	0	0	0	0	**6**
79	Kolar	2	2	1	2	0	0	2	0	0	0	0	0	0	0	**9**

80	Srinivasapura	2	2	0	2	0	0	2	0	0	0	0	0	0	0	**8**
81	Chintamani	2	2	0	2	0	0	2	0	0	0	0	0	0	0	**8**
82	Sidlagatta	2	2	0	2	0	0	2	0	0	0	0	0	0	0	**8**
83	Chikballapur	2	3	0	2	0	0	2	0	0	0	0	0	0	0	**9**
84	Devanahalli	2	2	0	2	2	0	1	0	0	0	0	0	0	0	**9**
85	Lottegollahalli	2	2	0	2	2	0	0	2	0	0	0	0	0	0	**10**
86	Yelahanka	2	6	1	2	4	2	0	2	2	0	0	0	0	3	**24**
87	Chennasandra	2	2	0	2	1	0	0	0	0	0	0	0	0	1	**8**
88	Rajankunti	2	2	0	2	2	2	0	0	0	0	0	0	0	0	**10**
89	Dodballapur	2	4	1	2	1	2	1	0	0	0	0	0	0	0	**13**
90	Oddarahalli	2	2	0	2	0	2	1	0	0	0	0	0	0	0	**9**
91	Makalidurga	2	2	0	2	0	2	0	0	0	0	0	0	0	2	**10**
92	Thondebhavi	2	2	1	2	2	2	0	0	0	0	0	0	0	1	**12**
93	someshwara	2	0	0	2	0	2	0	0	0	0	0	0	0	0	**6**
94	Gauribidanur	2	3	0	2	2	0	0	0	0	0	0	0	0	0	**9**
95	Vidurashwatha	2	0	0	2	0	2	0	0	0	0	0	0	0	0	**6**
96	Devarapalle	2	2	0	2	2	2	0	0	0	0	0	0	0	0	**10**
97	Hindupur	2	9	1	2	2	2	0	0	0	1	0	0	0	0	**19**
98	Malugur	2	2	0	2	2	2	0	0	0	0	0	0	0	0	**10**
99	Chakarlapalli	2	2	0	2	2	2	0	0	0	0	0	0	0	0	**10**
100	Rangepalli	2	3	0	2	2	2	0	0	0	0	0	0	0	0	**11**
101	Penukonda	2	3	1	2	6	2	0	0	0	0	0	0	0	0	**16**
102	Makkajipalli	2	2	0	2	4	2	0	0	0	0	0	0	0	0	**12**
103	Nagasamudram	2	2	0	2	4	2	0	0	0	0	0	0	0	0	**12**
104	Dharmavaram	2	0	0	0	4	2	0	0	0	0	0	0	0	0	**8**
105	Basampalle	2	2	0	2	2	2	0	0	0	0	0	0	0	0	**10**
106	SSPN	2	3	1	2	2	2	0	0	1	0	0	0	2	0	**15**
107	Narayanapura	2	2	0	2	4	2	0	0	0	0	0	0	0	0	**12**
108	Marikuppam	2	1	0	0	0	0	0	0	0	0	0	0	0	0	**3**
109	Coromandel															
110	Oorgaum															
111	Champion															

Division	Station Name	PD Mux	UTS/PRS	FOIS/COIS/CMS	Data logger	UFSBI	BPAC	SCADA	RAILNET	Exchange PRI	MAPPLE mux	RC	MSDAC	CCTV	VOIP	Total
									MYS Division E1 Details							
1	MYS	13	7	19	18			2	12	8	1			30	15	125
2	AP	2	2		2		1									7
3	KDO	2	2		2		2									8
4	NTW	2	2	1	2		3									10
5	CMNR	1	2		2		2									7
6	MYS CABIN	2			2		2									6
7	MNGT	2		1	2		1		1							7
8	MBBC	2			2		2									6
9	BLGA	2	2		2		2									8
10	STE	2	2		2		2									8
11	KRNR	2	3		2		2				1					10
12	HAH	2	2		2		2									8
13	AKK	2	2		2		2									8
14	MGF	2	2		2		3									9
15	HLN	2	2		2		3									9
16	MVC	2	2		2		3									9
17	NHY	2	2		2		1									7
18	S	2	2		2		2					2				10
19	PANP	2	3		2		2									9
20	BDRL	2	2													4
21	Y	2														2
22	HAS	6	6	1	2		3			1			2	10		31
23	ALUR	2			2											4
24	BLLT	2			2											4
25	SKLR	2	3	1	3				4							13
26	DOGL	2			2				1				1			6
27	KGVL	2			2				1				1			6
28	YDK	2			2				1							5
29	SVGL	2			2											4
30	SBHR	2	3	1	2											8
31	YDM	2	1		2											5

#	Code															Total
32	NRJ	2	2		2											6
33	KBPR	2	3		3				1							9
34	NRF	2			2											4
35	BNTL	2	2		2											6
36	PDL	3														3
37	MAQ	2														2
38	KRVL	2			2		2								3	9
39	BGPA	2	2		2		2								3	11
40	HHT	2	2		2		2								3	11
41	ASK	2	4	2	2	1	2			1	2				3	19
42	ADHL				2	4									3	9
43	HVL	2	2		2	5	2								3	16
44	TTR	2	3		2	4	2								3	16
45	RDI	2	2		2	1	2								3	12
46	BSN	2	2	1	2		2								3	12
47	AMSA	2	2	1	2		2								3	12
48	SPGR	3	3		1		2								3	12
49	BVR	2	2		2		1				4				3	14
50	VNR	2	1		2		1				4				3	13
51	BLKR	2	1		2		1				4				3	13
52	DRU	2	3		2		2				2				3	14
53	SHYP	2	2		2		3								3	12
54	CMGR	2	2	1	2		2								3	12
55	SPV	2	1		2		2								3	10
56	TKE	2	2		2		2								3	11
57	MSS	2	1		2		2								3	10
58	BDVT	2	2	1	2		3								3	13
59	SMET	2	3	3	2		4			1				5	3	23
60	KMSI	2	2		2		4								3	13
61	ANF	2	2		2		4								3	13
62	SRF	2	2		2		4								3	13
63	TLGP	2	1	1	2		2								6	14
64	RRB	6	9		2		1			1						19
65	NVF	2	1		2		1									6
66	AJP	2	2		2		2									8

No.	Code														Total
67	SHV	2	2		2		1								7
68	HSD	2	3		2										7
69	RGI	2	2		2										6
70	HLK	2	3		2										7
71	JRU	2	6	4	2	2	3	2			1				22
72	SLU	2	2	1	2	2								5	14
73	MYK	2	2		2	2									8
74	KAG	2	2		2	2									8
75	THN	2	2		2	2									8
76	DVG	2	11		2	1	2		1	1	1			5	26
77	AVC	2	3	1	2	1	3								12
78	HRR	2	5	1	2	1	1			1					13
79	KMPS	2			2		2								6
80	CLI	2	2		2		2								8
81	RNR	2	5	1	2		2		1						13
82	DAD	2	2		2	1	2								9
83	BYD	2	2		2		2								8
84	HVR	2	6	2	2		2								14
85	KJG	2													2
86	KTY	2													2
87	BEHI	2	3		2		4								11
88	HPHI	2	2		2		4								10
89	TLGI	2	3		2	1	4								12
90	MMEC	1		1										5	7
91	BBNH	3			2	2	3								10
92	AMC	2	2		2	2	2								10
93	HLV	2			2		3								7
94	CTA	2	6	2	2	2	4	2	1					5	26
95	BAHI	2	1		2	2	3	3							13
96	CHKE	2	2		2	2	2	4							14
97	THKU	2	1		2	2	2	2							11
98	BOMN	2	2		2	2	2	2							12
99	MOMU	2	2		2	2	2	3							13
100	RDG	2													2

2.2 IP based Exchange using SIP Protocol

SIP based Exchange shall comply with TEC specification of IP PABX with MEDIA GATEWAY No. : TEC/ GR/SW/PBX-005/01/SEP-16 or latest,

2.2.1 Scope of the Work

Currently, there are a total 36 (TDM/IP)exchanges working on TDM over SWR. Out of 36, there are 14, 12, 10 exchanges in Hubballi (UBL), Bangalore (SBC) and Mysore (MYS) respectively. In UBL, IP server exchange work is in progress at Division main exchange of Coral Make with open Source architecture. In SBC, IP server exchange is available for DRM I/C of Tadiran Make. In MYS, IP server exchange is available at Division main exchange of Tadiran Make.Details of existing infra are given in this booklet. It is planned to replace TDM exchanges with IP server exchanges and Gateways. At SBC, Main Exchange is of Coral Tadiran TDM Exchange and it is connected to way side station exchange with PRI to Yeshvantpur, Bangarpet, Hindupur ,Dharmapuri, Baiyyappanahali, Kuppam Hejjala, Bengaluru Cant and Kunigal same to be retained with TDM Exchange. New SBC IP Exchange should be connected to TDM Exchange through two PRI Gateway.   And all the other exchanges will be replaced with server gateway architecture (Main   server to be placed at HQ and Divisions , standby server at designated place/station and gateways to be provided at the way stations.) The Exchange which has been provided at UBL is of Coral Telecom make and MYS Exchange is of Tadiran Make. New Exchange has to be provided at SBC.   All three exchanges have to be integrated through SIP trunks or by configuring all subscribers of three Divisions at Hubballi,Bengaluru & Mysuru Exchange in cluster mode/one or two by using existing servers with each division. Administrators should access their divisions only.   SIP phones and gateways presently working shall be configured as it is. Presently total main exchange subscribers 7400 over all SWR zone working.

At SBC SIP Intercom Exchange of Tadiran Make is available, the same has to be upgraded/augment to accommodate additional numbers of Bengaluru Cantonment as per Schedule. New Intercom Exchange has to be provided at UBL, MYS for DRM Intercom and at UBL HeadQuarter for GM Intercom. Presently, total 300 Intercom subscribers working over all SWR zones. It is left to the choice of the tenderer to either upgrade the licenses of existing OEMs or remove the existing licenses and provide the tenderer's own perpetual licenses and software in existing hardware. Also the tenderer can provide new hardware and licenses for remaining users and integrate with the existing exchange without affecting the features . Same applies for the Main exchange of UBL & MYS. In case of failure of link between Server and Gateway, the Gateway should work independently as an Exchange. The gateway should have a minimum dual ethernet port and Dual power supply input(96 port ,48 port,24 Port). The Gateways provided by Tenderer shall be compatible and seamlessly integrate with existing SIP exchanges and almost all features of the main exchange should work on it.

2.2.2 Scheme for SIP Main Exchange

   ● Main SIP exchange will be in configuration at Hubballi in UBL division, Mysore in MYS division and   Bangalore in SBC division.
   ● Servers will be interconnected through IP MPLS backbone through Ethernet.
   ● Server is planned to work on -48V DC with SMPS based power supply
   ● PHODs/HODs/Branch Officers will be provided with video phones.
   ● Remaining officers posted in the field will be provided with IP phones.
   ● All Station masters will be provided with IP phones.
   ● All office staff and supervisors will be provided with analog phones through Gateway.
   ● All the way station exchanges Gateways will be connected through IP MPLS on Ethernet.
   ● All way station subscribers will be connected through 96/48 port FXS gateways. -48 volt DC and 24 port FXS Gateway -48 Volt DC or 230 Volt AC . power supply will be provided by railways at OFC room/ Exchange buildings.
   ● Few way station/office subscribers will be connected through 8 port FXS gateways. AC Power Supply should be extended through UPS. UPS catered on schedule.
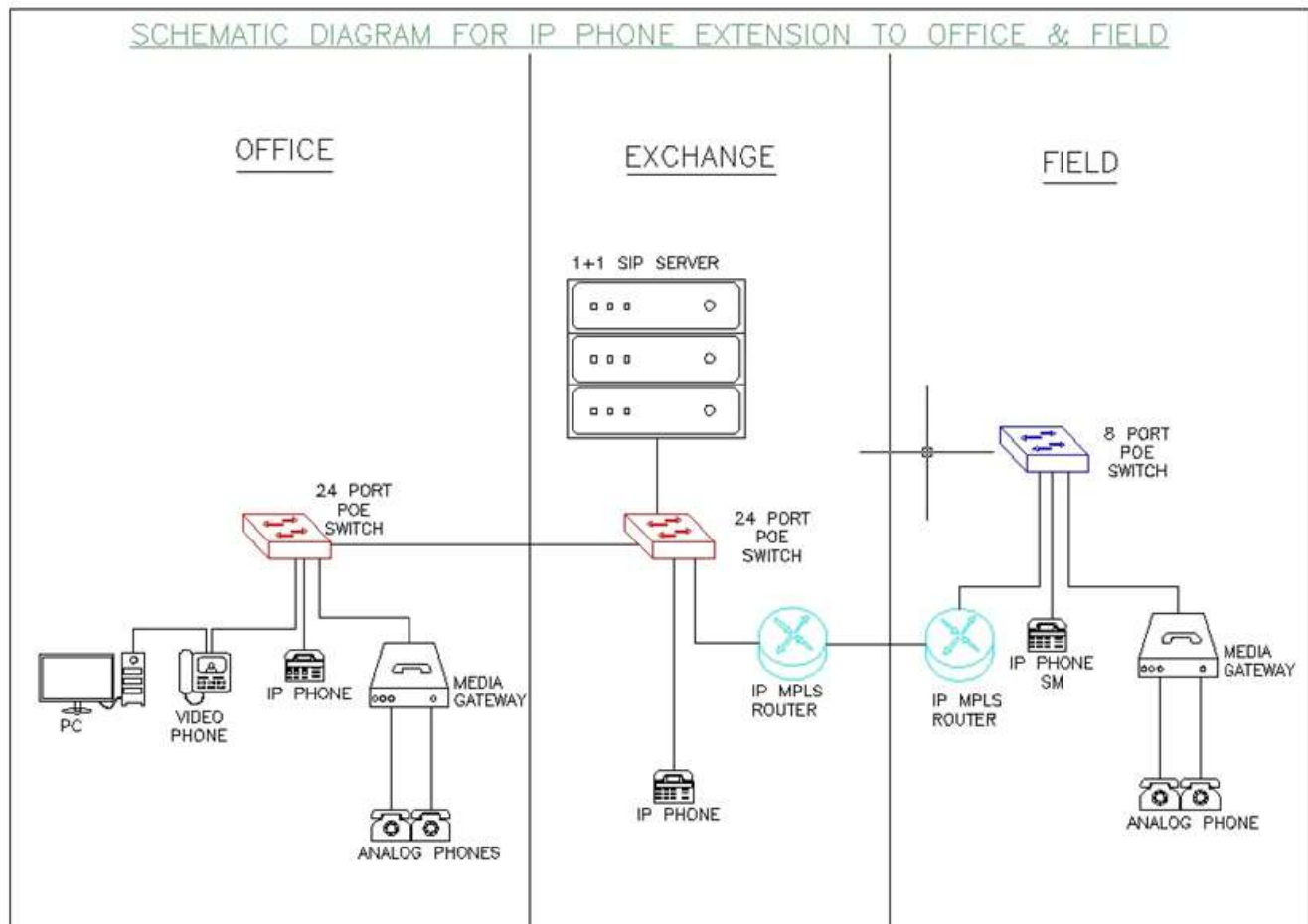
- All the IP phones will be connected through POE switches.
- All the connectivity between switches are planned over OFC/UTP media.
- At way stations, Station master IP phones will be directly connected through POE switches. In case the SM room is far away more than 100 meters, then a separate switch with laying of Cat/OFC from OFC Room or UPS supply is planned or power supply may be extended from OFC UPS to that switch, as per site condition.
- The BSNL lines are connected through FXO gateways.
- All the 3 divisions and other zones to be connected with SIP trunk licenses or cluster mode/one or two servers for division.
- Mobility and soft phone features are also planned.
- Exchange is planned with user license and should support exchanges working on open hardware architecture.
- All FXS/FXO gateway to be terminated by suitable patch panel or krone module with all necessary accessories.
- Railnet will be extended on same network
- All SIP phones need to be configured on the existing LAN network or as per site condition.
- Other Zonal Railway Exchanges to be connected through PRI or SIP Trunks.
- Divisional Exchanges to be connected to Railtel NGN through PRI/SIP Trunks.
- BSNL DID/DOD should be connected through PRI/SIP Trunks.
- Cat 6 and Telecom cable are laid at Zonal/Divisional offices for LAN and Analog phones connection. At the side station telecom cable is available for analog phone extensions.
- Some location new cable OFC/CAT cable has to be laid for new phones. And to connect inter divisional offices and residence OFC has to be laid.

Training shall be given to Railway officers, staff from maintenance point of view as well as operation point of view either at OEM premises or at site or at both the places. Sets of training manual in hard copies and soft copies containing details of technical specifications, installation and commissioning, troubleshooting & maintenance schedule etc. or as specified by the purchaser shall be supplied along with the equipment.

2.2.3 Scheme for Intercom exchange

- UBL and MYS divisions are to be provided with a server for DRM intercom.
- Server is planned for the GM intercom at HQ.
- Existing Intercom servers at SBC will be upgraded to augment or integrated with new hardware to cater new subscribers.
- IP phones are planned for all branch officers in division and all PHOD/CHOD/HOD in HQ.

Inter Connectivity Diagram of Exchanges of Divisions over SWR

SCHEMATIC DIAGRAM FOR IP PHONE EXTENSION TO OFFICE & FIELD
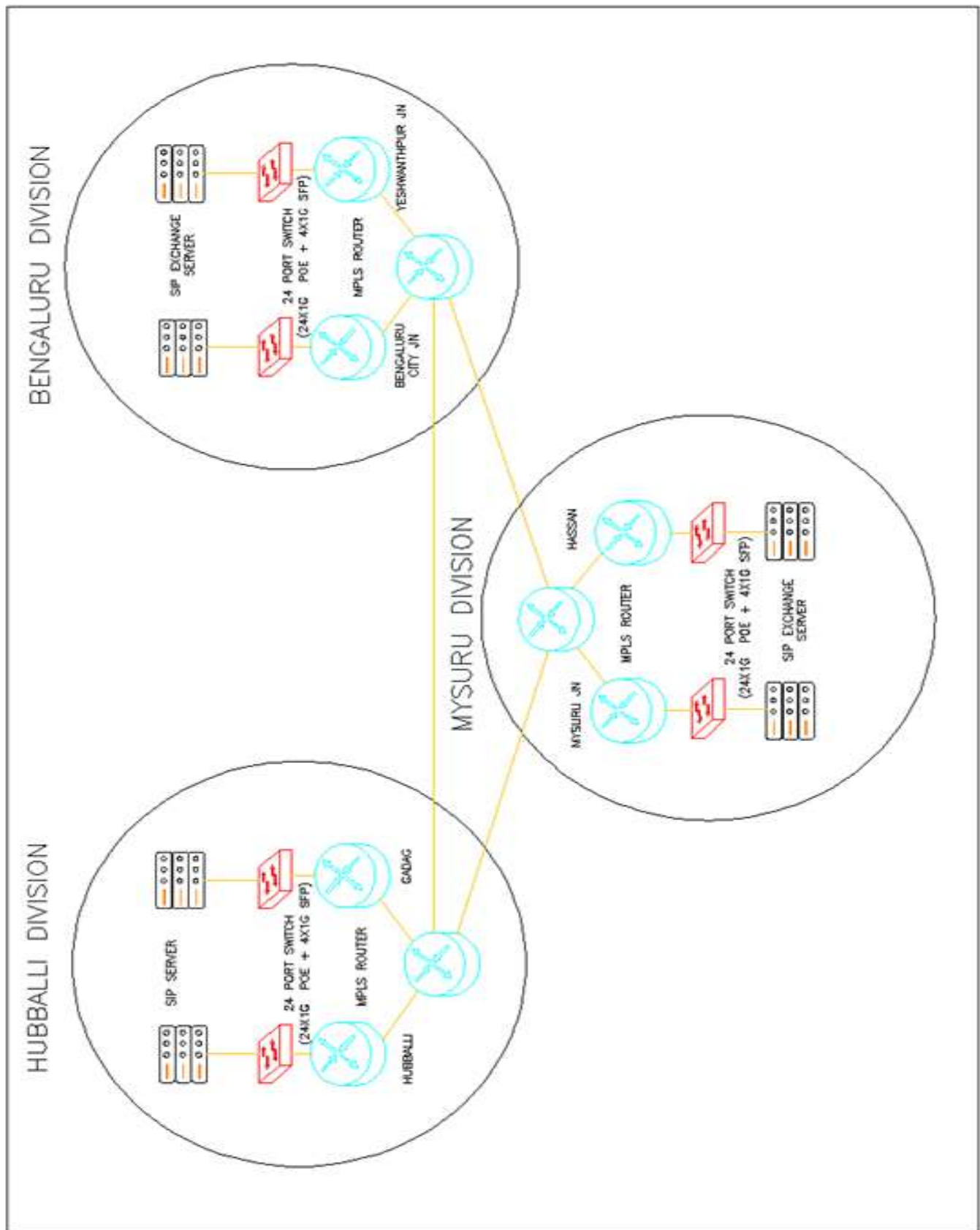
2.2.4 IP telephony system Architecture

SIP based Unified Communication Server. The System shall be the latest State-of-the-Art New Generation SIP based server for Converged IP Telephony Deployment. The IP telephony system must be based on a pure IP technology that is a software only solution. The IP telephony system must support unified communication (UC) server & gateways architecture for SIP,and Analog trunks connectivity. The system must be capable of supporting Analog, IP Telephones, and SIP based video desk phones. The IP-PBX system offered should employ VOIP Technology with IP as Core Switching Technology. It should be based on server & media gateway architecture, meet all the relevant TEC/DoT guidelines. It is so designed and built to operate efficiently with utmost reliability with all the components rated for continuous round the clock operation.

2.2.5   Communication Server capabilities

1. The Server based IP PBX system shall be designed with IP at the core and shall be built on LAN/WAN network, seamlessly & securely interconnecting its Core Server(s), Media-Gateway(s)and its Programming & Management platform(s) shall meet the functional & technical requirements of tender document. Embedded or appliance server based solutions will not be accepted.

2. An IP PBX system based on the server and Gateway architecture shall be capable of supporting Analog and IP phones with a unified numbering plan of any make.

3. The IP PABX system proposed by the bidder should be "IPv6" ready tested with SIP Trunk and SIP terminal from Day1 and OEM should submit IPV6 test certification.

4. The communication server must build up a highly reliable and open Standard architecture running on a latest 64 Bit Windows/ Linux operating system on Enterprise grade COTS Server only.

5. The System architecture shall be Server based IP PBX of industrial standard to facilitate a Distributed architecture with centralized call control over the IP backbone. It should support Geographical redundancy. It should consist of Active-Active servers with redundant hot swappable independent power supply and shall automatically change over to another without any substantial delay without disconnecting any services. In case of failure of one Active server the entire load can be taken over another active server without disconnecting ongoing calls. There must be no restriction on the number of endpoints being backed up in case one server fails.

6. The communication servers must work in an Active-Active redundancy mode. It should be possible to define servers load balancing mode. All servers should work together in load balancing mode with defined user capacity i.e., all servers should be active with call processing with predefined SIP phones / gateways register on any of the servers for load distribution. Provision of the Cluster adjacent server to take the load of the failed server along with load of gateway and end points without disconnecting ongoing calls. Database replication in all servers should be automatic and real time.

7. Media gateway should continue to work independently in case of Network Connectivity failure. Also in such case ,configuration shall be done ,if possible, in such a way that communication among gateways within the division can take place . Once the Media gateway works in survival mode, it should provide all standard features.
8. The offered communication server should provide communication solutions over IP. The IP Phones should register directly on the server, not on any Gateway / Gatekeeper cards. No restrictions may evolve in terms of quality of service, reliability and security.

9. Quality of service and monitoring options should recognize functional restrictions within the IP network and solve them in a flexible manner.

10. The IP PBX should support Open Standard architecture. The system should work with SIP Phones and media gateways (FXS/FXO/PRI) from the same OEM .It should also support third party SIP phones and media gateways of third parties so that the system can be scaled horizontally in Future.

11. The offered communication server should provide multiple IP gateways to implement voice features and applications for IP networks. Therefore this architecture should be able to build up standalone systems, IP distributed Architecture and complex networks uniquely based on identical structures.

12. The IP distributed architecture with Intelligent Branch Solutions should allow the connection of Remote sites / Buildings by a cost effective IP infrastructure and at the same time benefit from central applications and a central management.

13. Providing different solutions to support the availability of voice services.

14. Support of CTI-Link according to CSTA.

15. Support of the following different standards concerning the connection of VoIP-terminals
   a. Voice encoding the standards: G.711, G.729A, G.723.1 and any other standard codes.
   b. The Server should support QOS standards Level 2: IEEE 802.1p/Q and Level 3: TOS / Diff server and or any other approved standards.
   c. Echo suppression complaint with G.168 or better
   d. DTMF recognition complaint with Q.24 or better
   e. NAT-Traversal (Network address translators) or better
   f. STUN –Protocol (Simple Traversal of UDP through NATs) or better.

16. Provide open interfaces and standard protocols for current and future applications
17. Enable networking of systems via TDM and IP infrastructures.
18. Distribution of system components and of remote plant components respectively over IP Infrastructures.
19. Integration of speech and data for multimedia workflow applications.
20. Encryption of signalling and language data of VoIP terminals and VoIP gateways.
21. Administration through network management systems.

22. The offered system must have Session Initiation Protocol (SIP) as core Trunk to provide interface connections to ITSP/ SIP Service Providers, 3rd party applications such and other IP based Communication Systems.

23. The server system should support the Cluster/two or more (min 5 nos) communication servers over an IP infrastructure. The system should offer maximum availability (99.99%), with the switchover of call control processing functions to an alternate or redundant Server (or softswitch control point) in the event of significant fault. The redundancy scheme should conform to the model used in most computer systems: the complete "mirroring" of the information (both static and dynamic data.). There should not be any proxy server to achieve this functionality. The switch over between 2 redundant call control Servers should not interrupt existing and established communications. The complete set of programs and software modules must be duplicated in real time in all geographic redundant Servers. In case of failure of the main Server (hardware or software), the standby Server must take over the control of existing and established communications instantaneously.

24. The management Platform must provide a backup mechanism for all critical system information in both a manual and an automatic/scheduled archival.

25. The Offered Communication server may be supplied with Voice agents,Voice logger, IVR ports and 1 Supervisor.

26. Call center solutions should be configured as per Railway site requirement. (e.g. dial 1 for Railnet complaint, 2 for telephone complaint, 3 electrical complaint, 4 Qtrs complaint. Etc.or as decided by the Railway.

27. The Server should be integrated with Existing Exchanges and gateways for Seamless Communication.

28. The server should Support multi Party Audio & Video conferences .

29. Server should support the latest SIP applications.

30. Server to Gateway should be configured in LAN network, not to use SIP trunk.

Tenderer can suggest their own scheme of efficient working duly fulfilling all the requirements given in the scope of the work. Final decision shall be taken by Railways.

2.2.6 Location of Gateways to connect analog phone to SIP Exchange

2.2.6.1 UBL Division

Sl. No	Station	Stn Code	96 Port G/W	48 Port G/W	24 Port G/W	8 Port G/W
	SPARE		**2**	**2**		**1**
1	Kudachi	KUD				1
2	Ghatprabha	GPB				1
3	Belagavi	BGM	1			
4	Londa	LD		1		
5	Castle Rock	CLR	1			
6	Sanvordem	SVM		1		
7	Vasco Da Gama	VSG	1			
8	Alnavar	LWR				1
9	Dharwad	DWR		1		
10	Hubballi Jn	HBQ	12	6	1	
11	Annigeri	NGR				1
12	Gadag	GDG	1			
13	Koppal	KBL				1
14	Munirabad	MRB				1
15	Hosapete	HPT	2			
16	Toranagallu	TNGL		1		

17	Ballari Jn	BAY	2			
18	Bagalkot	BGK		1		
19	Vijayapura	BJP	1			
	TOTAL		**23**	**13**	**1**	**7**

2.2.6.2   SBC DIvision

Sl. No	Station	Stn Code	96 Port G/W	48 Port G/WAC/DC	24 Port G/W	8 Port G/W
	SPARE		**2**	**1**	**3**	**1**
1	Mandya	MYA			1	
2	Maddur	MAD				1
3	Channapatna	CPT				1
4	Bidadi	BID				1
5	Hejjala/IRIDM	HJL		2		
6	Kengeri	KGI				1
7	KSR Bengaluru	SBC	10	5		
8	Yeshvantpur	YPR	2			
9	Chikbanavar	BAW				1
10	Tumakuru	TK			1	
11	Kunigal	KIGL	1			
12	Bengaluru Cant	BNC	4	2		
13	Baiyyappanahalli	BYPL				1
14	Third Coach Terminal BYPL	SMVB		3		
15	Krishnarajapuram	KJM			1	
16	Krishnarajapuram DSL	KJM DSL	1	2		
17	Whitefield	WFD	1			
18	Bangarpet	BWT	1	1		
19	Kuppam	KPN	1			
20	Banaswadi/shed	BAND				2
21	Hosur	HSRA			1	
22	Dharmapuri	DPJ	1			
23	Yelahanka	YNK			1	
24	Doddaballapur	DBU				1
25	Hindupur	HUP	1			
26	Penukonda	PKD				1
27	SSPN	SSPN				1
28	Satellite goods terminal	SGT			1	
	TOTAL		**25**	**16**	**9**	**12**

2.2.6.3 MYS Division

Sl. No	Station	Stn Code	96 Port G/W	48 Port G/W	24 Port G/W	8 Port G/W
	SPARE		**1**	**2**	**2**	**2**
1	Mysuru Jn.	MYS	3	1	4	4
2	MBBC	MBBC			1	
3	Krishnaraja Nagar	KRNR				1
4	Hassan	HAS		3		2
5	Subrahmanya Road	SBHR			1	
6	Kabakaputtur	KBPR			1	
7	Arsikere	ASK	1	1		3
8	Kadur	DRU				1
9	Birur	RRB	1			1
10	Chikjajur	JRU			**1**	
11	Davangere	DVG	1			2
12	Harihar	HRR	1			
13	Ranibennur	RNR				1
14	Haveri	HVR				1
15	Bhadravati	BDVT				1
16	Shivamogga	SMET	1			1
17	Chitradurga	CTA		1		1
18	Tiptur	TTR				1
19	VRC		1	1		2
20	MYS -SHOP		1	1	2	2
	TOTAL		**11**	**10**	**12**	**26**

Note;- Tentative Gateway plan it may increase/Decrease based on site latest condition or any new site may get added.

2.2.7   Details of SIP Server/Exchange Existing at Divisions.

2.2.7.1 At Hubli

a) HPE make Server (Model no. ProLiant DL20) HA 1+1 configuration, Following is the configuration(s):

S.N	Component	Product Code	Qty
1	CPU	Intel® Xeon® E-2136 (6-Cores,3.3GHz, 12MB Cache, 85W)	2
2	Memory	32GB DDR4 ECC RDIMM (Total Memory)	1
3	Drives	4x1 TB SATA 3 / 7200RPM – 3.5" enterprise disk	4
4	OS & S/W	Linux Debian 10 (64-bit)	1
5	Storage	4x1 TB Storage	1
6	Software	Coral IRIS IVDX Cloud	
7	SIP phones	Video and Non Video	250
8	Total Extensions	Including SIP phones	3350
9	Date of	Work is in progress	

		Installation		
	10	IP Phone Make	Coral and Grand stream	250
	11	Gateway Make	Coral, 48 Port	10

2.2.7.2 At Mysuru

b) DELL PowerEdge R630   HA 1+1 configuration, Following is the configuration(s):

S.N	Component	Product Code	Qty
1	CPU	Intel Xeon processor E5-2600	2
2	Memory	8GB	1
3	OS & S/W	Linux (Centos)	
4	Storage	2x300 GB Sata HDD	
5	Software	Tadiran make : Aeonix	
6	SIP phones License	Proprietary	45
7	SIP phones License	Non Proprietary	175
8	Gateway License	For Analog extension	300
9	Total Extensions	Including SIP phones Working in MYS Division	1050
10	PRI license		60
11	Date of Installation	2017	

Work in Progress/awarded at Arsikere (MYS Division): Following details will be carried out

c)

S.N	Component	Product Code	Qty
1	Server		1
2	Tadiran Gateway user license		600
3	SIP license	Non proprietary SIP Phone	15
4	SIP Trunk		60
5	IP net license		60
6	Date of Installation	Work is in Progress	

2.2.7.3   At Bangalore (Intercom)

d) Dell make - R230, 1+1 Server Following is the configuration(s):

S.N	Component	Product Code	Qty
1	CPU	Intel® Xeon® processor E3-1200	2
2	Memory	8 GB RAM DDR3	
3	OS & S/W	Linux	
4	Storage	1 TB SATA Hard Disk	1
5	Software	Tadiran Aeonix	
6	SIP phones license		100
7	SIP trunk License		10
8	Gateway user license		24
9	Date of Installation	2018	
10	Total Subscribers Working in SBC Division	Excluding Intercom subscribers	2800

2.3   VoIP based Train Control Communication(TCCS)

Scope of work to provide control Communication from Head Quarter Controller to Station Master by VoIP based SIP Phone and administrative circuit like Exchange phone on SIP Phone and Emergency Control circuit through gateway.Details are given and should be done as per RDSO Specification RDSO/SPN/TC/99/2012 Rev.2 or latest.There are a total 5 Control Boards in the UBL Division and in the near future will be extended with one more board. In SBC there are 4 Control Boards,In MYS there are a total 3 Control Boards in that Board No III(Birur to Sampige Road, Kadur-Chikmagalur, Birur-Talguppa & Arsikere-Hassan Section) is provided with VoIP based Train Control Communication and has to be integrated by adding two new boards on existing server and three boards on new server.The existing Boards are working on DTMF based Communication on 64 Kbps channel on omni Bus circuits.This circuit is called as control circuit for providing communication between Station Master to Section Controller at Head Quarter.

Existing TCCCS System for The Board Number III of Mysuru Division is Provided by VoIP based TCCS for 28 Stations by Creative Communication as per RDSO Specification RDSO/SPN/TC/99/2012 Rev.2 .Communication Server in 1+1 Configuration with 28 user licences ,Voice logger,NMS of HP Make Servers with Controller, Test Room Consoles and VoIP control Phones for Station Master of Fanvil Make and Event logger with 100 licenses.

2.3.1 SCOPE OF WORK

1. The main aim of the work is to provide VoIP based Train Control Communication System with IP Networking in 124 Stations(5 Boards) in Hubballi Division,106 Stations(4 Boards) in Bengaluru Division and 75 Stations(2 Boards) section of Mysuru Division.

2. The various components of the VoIP based train control communication system shall comply with all the functional and general requirements as brought out in clauses of RDSO specification or otherwise mentioned in Tender schedule or Technical specifications in tender document.

3. Since it is a highly technical nature of work and anything left out from the tender schedule and scope of work and required for successful commissioning of the system, the tenderer shall arrange at their own cost.

4. Contractor has to make necessary modifications if required as per site requirement or as per demand from other departments for smooth working of control communication. No additional payment will be made by Railway.

5. Necessary training has to be arranged by the contractor for maintenance and modifications in the system.

6. The entire work to be carried out as per instruction of site engineer.

7. Transportation of materials and men to the works spot shall be arranged by the Contractor.

8. All Kinds of Software(SDK & API) along with licences shall be handed over to Railways after completion of the work.

VoIP Based Train Control Communication System - Schematic Drawing
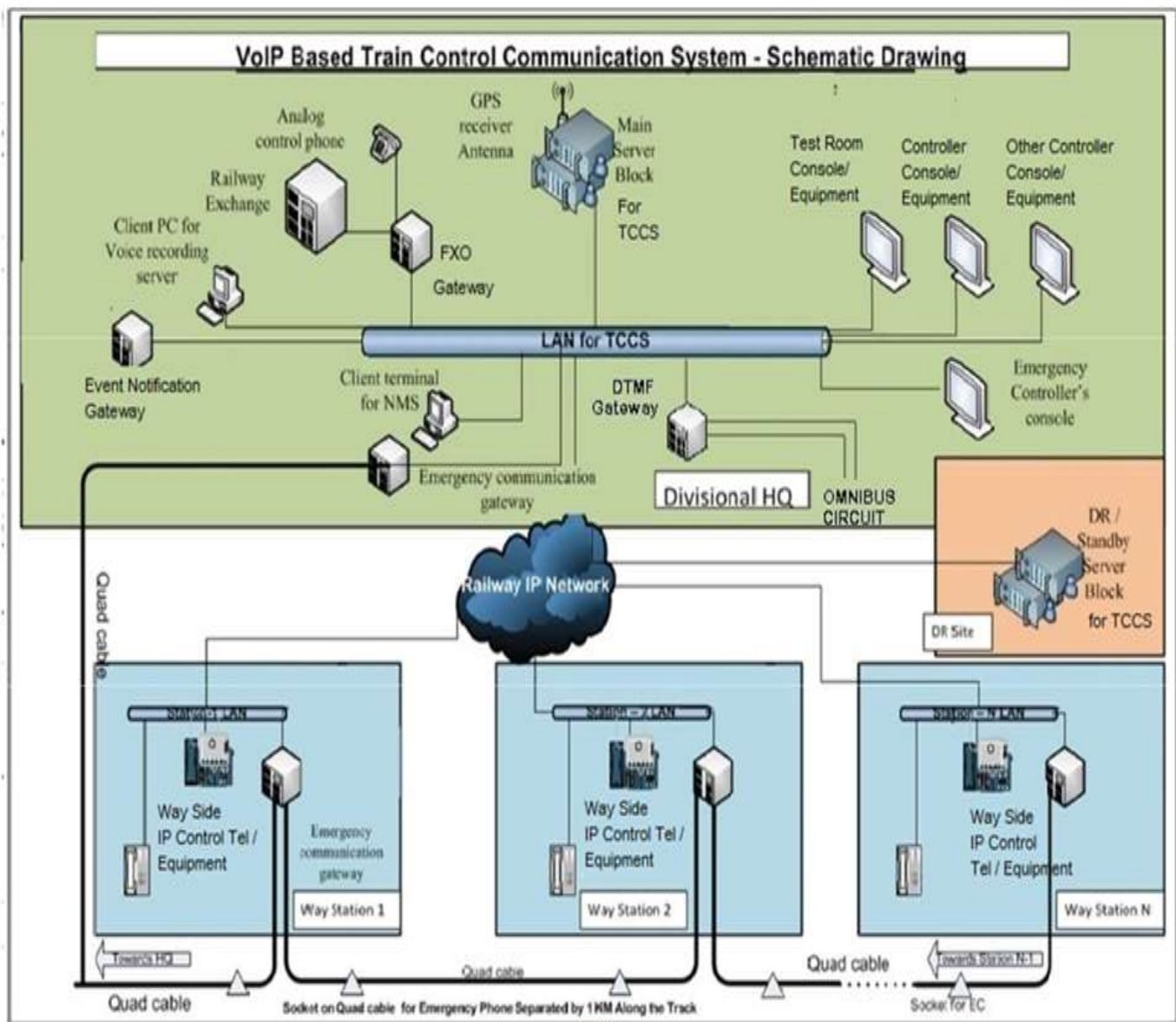
2.3.2 Servers have to be placed at two different locations in Division as decided by the Railways
1. The supply of products and installation should be conforming to specification of RDSO   Spec No. RDSO/SPN/TC/99/2012 REV.2 or latest.

2. Contractor should submit the Detailed Network diagram including the details of all servers, clients, way side station equipment and control office equipment of VOIP Train Control Communication System. The Network Diagram shall be approved by the competent authority (Railways) before supplying any networks equipment, servers and any other items.

3. Hardware components of Communication server, Network Management server, Voice Recording server and any other server as far as possible shall be of the same make to have uniformity in maintenance or replace the whole system by migrating to its own system on his own cost hardware support will be given by Railway.

4. The portable Maintenance Terminal, Desktop client PC and any other desktop/portable client PC as far as possible shall be of the same make to have uniformity in maintenance.

5. Controller console Equipment, Test Room console/Equipment, Wayside IP telephone, Event Notification Gateway, FXO Gateway, Emergency Communication Gateway, Mobile Application for event notification hardware components and software applications as far as possible shall be from the same OEM/Reputed Make of VOIP Train Control Communication System.

6. All the Network components required for installation such as switches shall be of the same make as far as possible unless otherwise approved by Railways.

7. Training shall be given to Railway officers, staff from maintenance point of view as well as operation point of view either at OEM premises or at site or at both the places. Sets of training manual in hard copies and soft copies containing details of technical specifications, installation and commissioning, troubleshooting & maintenance schedule etc. or as specified by the purchaser shall be supplied along with the equipment.

8. This VOIP based Train control communication should work parallely along with the existing control communication system until VOIP based Train control communication stabilizes and all the users are familiar with its working and operation. After that the existing control communication system shall be disconnected or continued as standby control as desired by railways.

9. Railway will provide only stabilised -48V DC/ non stabilised 230 V AC supply for VOIP system

10. Instruction Manual, Measuring Instruments & Spares:
a) System Provider shall submit following documents for each SubSystem/Module as supplied by Subsystem Provider/Manufacturer along with each System. These documents shall be submitted in 04 (four) Hard Copy and 4 (four) CD/storage device.
b) Operating Instruction Manual
c) Maintenance & Troubleshooting.
d) Technical manual including installation check list and detailed configuration instructions. System provider shall submit complete details of the test and measuring equipment required for testing and servicing to the purchaser.
e) System provider shall submit a list of the recommended spares for the system.

2.3.3 TCCS sections

Train Control Communication Based on VoIP is to be implemented across SWR. The existing sections running on DTMF/VoIP Control equipment are given below.

Location Sl.No.	STN Sl.No.	Divn	Section	Station name
CONTROL SECTION -I BELGAVI -MIRAJ,BAGALKOT-HOTGI SECTION (Excluding Hotgi)				
1	1	Hubballi	Belagavi-Miraj	Vijayanagar
2	2	Hubballi		Shedbal
3	3	Hubballi		Ugar Khurd
4	4	Hubballi		Kudachi
5	5	Hubballi		Chinchli
6	6	Hubballi		Raybag
7	7	Hubballi		Chikodi Road
8	8	Hubballi		Ghatprabha
9	9	Hubballi		Gokak Road
10	10	Hubballi		Pachhapur
11	11	Hubballi		Suldhal
12	12	Hubballi		Sulebhavi
13	13	Hubballi		Sambre
14	14	Hubballi		Belagavi
15	1	Hubballi	Bagalkot-Hotgi Section (Excluding Hotgi)	Bagalkot
16	2	Hubballi		Mugalolli

17	3	Hubballi		Jadramakunti
18	4	Hubballi		Almatti
19	5	Hubballi		Wandal
20	6	Hubballi		Basavana Bagewadi Road
21	7	Hubballi		Kudgi
22	8	Hubballi		Mulvad
23	9	Hubballi		Jumnal
24	10	Hubballi		Vijayapura
25	11	Hubballi		Minchnal
26	12	Hubballi		Nimbal
27	13	Hubballi		Indi Road
28	14	Hubballi		Lachyan
29	15	Hubballi		Tadwal
CONTROL SECTION -II DHARWAD-KOPPAL				
30	1	Hubballi		Dharwad
31	2	Hubballi		Navalur
32	3	Hubballi		UBL WEST BYPASS
33	4	Hubballi		Unkal
34	5	Hubballi		Hubballi
35	6	Hubballi		Hubballi East
36	7	Hubballi		Hubballi South
37	8	Hubballi		UBL EAST BYPASS
38	9	Hubballi		Kusugal
39	10	Hubballi		Hebsur
40	11	Hubballi		Navalgund Road
41	12	Hubballi	**Dharwad - Koppal**	Annigeri
42	13	Hubballi		Hulkoti
43	14	Hubballi		Binkadakatti
44	15	Hubballi		Gadag West
45	16	Hubballi		Gadag East
46	17	Hubballi		Gadag
47	18	Hubballi		Kanginhal
48	19	Hubballi		Harlapur
49	20	Hubballi		Sompur road
50	21	Hubballi		Bannikoppa
51	22	Hubballi		Bhanapur
52	23	Hubballi		Koppal
CONTROL SECTION -III DHARWAD-BELAGAVI-LONDA -CASTLEROCK				
53	1	Hubballi		Desur
54	2	Hubballi	**Belagavi -Londa**	Khanapur
55	3	Hubballi		Gunji
56	4	Hubballi		Londa

57	5	Hubballi	**Londa – Castlerock**	Tinaighat
58	6	Hubballi		Shivathan
59	7	Hubballi		Devaraya
60	8	Hubballi		Tavargatti
61	9	Hubballi	**Dharwad - Londa**	Alnavar
62	10	Hubballi		Kashanhatti
63	11	Hubballi		Kambarganvi
64	12	Hubballi		Mugad
65	13	Hubballi		Kyarkop
CONTROL SECTION -IV CASTLEROCK-VASCO, GADAG-BAGALKOT				
66	1	Hubballi		Castlerock
67	2	Hubballi		Caranzol
68	3	Hubballi		Dudhsagar
69	4	Hubballi		Sonalium
70	5	Hubballi		Kulem
71	6	Hubballi	**Castlerock-Vasco-Da-Gama**	Kalem
72	7	Hubballi		Sanvordem
73	8	Hubballi		Chandargao
74	9	Hubballi		Cansaulim
75	10	Hubballi		Sankaval
76	11	Hubballi		Vasco-da-gama
77	12	Hubballi		Hombal
78	13	Hubballi		Balganur
79	14	Hubballi		Mallapur
80	15	Hubballi	**Bagalkot-Gadag (Ex- Bagalkot, Gadag)**	Hole-Alur
81	16	Hubballi		Lakhmapur
82	17	Hubballi		Badami
83	18	Hubballi		Guledagudda Road
CONTROL SECTION -V KOPPAL -BELLARY-RAYADURG-TORANAGALLU-RANJITPUR-HOSPET- SWAMY HALLI-HOSPET-KOTTUR-AMARAVATHI COLONY				
84	1	Hubballi	**Koppal-Bellary**	Ginigera
85	2	Hubballi		Munirabad
86	3	Hubballi		Hosapete B Cabin
87	4	Hubballi		Hosapete A Cabin M/L
88	5	Hubballi		Hosapete C Cabin M/L
89	6	Hubballi		Hosapete D Cabin B/L
90	7	Hubballi		Kariganuru
91	8	Hubballi		Papinayakana Halli
92	9	Hubballi		Bayaluvoddigeri
93	10	Hubballi		Gadiganuru
94	11	Hubballi		Toranagallu

95	12	Hubballi		Toranagallu Byepass
96	13	Hubballi		Daroji
97	14	Hubballi		Kudatini
98	15	Hubba		Ballari Cant.
99	16	Hubballi		Ballari Bypass
100	17	Hubballi		Ballari Jn
101	18	Hubballi	**Toranagallu - Ranjitpura (Toranagallu excluded)**	Bannihatti
102	19	Hubballi		Nandihalli Sdg
103	20	Hubballi		Ranjitpura
104	21	Hubballi	**Ballari-Raydurg (Ballari Excluded)**	Obalapuram
105	22	Hubballi		Somalapuram
106	23	Hubballi		Rayadurg
107	24	Hubballi	**Hosapete- Swamihalli (Hosapete Excluded)**	Tungabhadradam
108	25	Hubballi		Vyasanakeri
109	26	Hubballi		Vyasa colony
110	27	Hubballi		Ramgad
111	28	Hubballi		Yeshwanth nagar
112	29	Hubballi		Swamihalli
113	30	Hubballi		Kotturu
114	31	Hubballi	**Hospet - Ballari**	Kalyandurga
115	32	Hubballi		Kadridevarapali
116	33	Hubballi	**Koppal - Ballari**	Chickbenikal
117	34	Hubballi		Gangavathi
118	159	Hubballi	**Hubli - Karajigi**	Karajgi
119	160	Hubballi		Savanur
120	161	Hubballi		Yelvigi
121	162	Hubballi		Gudgeri
122	163	Hubballi		Saunshi
123	164	Hubballi		Kundagol
Mysuru Division				
Control Section -I				
1	1	Mysuru	**Mysuru -Chamaraj Nagar**	Chamarajanagar
2	2	Mysuru		Nanjangud Town
3	3	Mysuru		Kadakola
4	4	Mysuru		Ashokapuram
			Hassan - Mangaluru	Chamrajpuram
5	5	Mysuru		Hassan
6	6	Mysuru		Alur
7	7	Mysuru		Balupet

8	8	Mysuru			Sakleshpur
9	9	Mysuru			Donigal
10	10	Mysuru			Kadagaravalli
11	11	Mysuru			Yedakumeri
12	12	Mysuru			Shrivagilu
13	13	Mysuru			Subrahmanya Road
14	14	Mysuru			Yedamangala
15	15	Mysuru			Narimogaru
16	16	Mysuru			Kabakaputtur
17	17	Mysuru			Neralakatte
18	18	Mysuru			Bantawal
19	19	Mysuru			Mysuru Jn.
					Mysuru New Goods Terminal
20	20	Mysuru	Mysuru -Hassan		Belagola Bypass Cabin
21	21	Mysuru			Belagula
22	22	Mysuru			Sagarakatte
23	23	Mysuru			Krishna Raja Nagar
24	24	Mysuru			Hosa Agrahara
25	25	Mysuru			Akkihebbalu
26	26	Mysuru			Mandagere
27	27	Mysuru			Holenarsipur
28	28	Mysuru			Mavinakere
29	29	Mysuru			Mysuru New GoodsTerminal
30	30	Mysuru	Hassan-Arsikere		Habhanghatta
31	31	Mysuru			Bageshpura
32	32	Mysuru			Koravangala
CONTROLSECTION -II BIRUR(Excl)-CHIKJAJUR-HARIHAR-HUBLI-RAYADURG (EXCL)					
33	1	Mysuru	Birur-Chikjajur		Nagavangala
34	2	Mysuru			Ajjampur
35	3	Mysuru			Shivani
36	4	Mysuru			Hosdurga Road
37	5	Mysuru			Ramagiri
38	6	Mysuru			Holalkere
39	7	Mysuru	Chikjajur-Harihar		Chikjajur
40	8	Mysuru			Sasalu
41	9	Mysuru			Mayakonda
42	10	Mysuru			Kodaganur
43	11	Mysuru			Tolahunse
44	12	Mysuru	Harihar- Haveri		Amaravathi Colony
45	13	Mysuru			Davangere
46	14	Mysuru			Harihar

47	15	Mysuru		Kumarapatnam
48	16	Mysuru		Chalgeri
49	17	Mysuru		Ranibennur
50	18	Mysuru		Devargudda
51	19	Mysuru		Byadgi
52	20	Mysuru		Haveri
53	21	Mysuru	**Kotturu -Harihar**	Kotturu
54	22	Mysuru		Bennihalli
55	23	Mysuru		Harappanahalli
56	24	Mysuru		Telgi
57	25	Mysuru	**Chikjajur- Rayadurg**	Bedara Bommana Halli
58	26	Mysuru		Amritapura
59	27	Mysuru		Haliyuru
60	28	Mysuru		Chitradurga
61	29	Mysuru		Balenahalli
62	30	Mysuru		Challakere
63	31	Mysuru		Talaku
64	32	Mysuru		Bommagundanakere
65	33	Mysuru		Molakalmuru
CONTROLSECTION-III TUMKUR-ARSIKERE-BIRUR-TALAGUPPA-KADUR-CHIKMAGALUR already provided VoIP based TCCS that has to be integrated with other Boards.				
66	1	Mysuru	**Arsikere- Tumakuru**	Mallasandra
67	2	Mysuru		Gubbi
68	3	Mysuru		Nittur
69	4	Mysuru		Sampige Road
70	5	Mysuru		Ammasandra
71	6	Mysuru		Banasandra
72	7	Mysuru		Kardi
73	8	Mysuru		Tiptur
74	9	Mysuru		Honavalli Road
75	10	Mysuru		Adihalli
76	11	Mysuru	**Arsikere-Birur**	Arsikere
77	12	Mysuru		Banavar
78	13	Mysuru		Devanur
79	14	Mysuru		Ballekere
80	15	Mysuru		Kadur
81	16	Mysuru	**Kadur - Chikkamagaluru**	Sakharaya Patna
82	17	Mysuru		Chikkamagaluru
83	18	Mysuru	**Birur-Talaguppa**	Birur
84	19	Mysuru		Sivapur
85	20	Mysuru		Tarikere
86	21	Mysuru		Masarahalli

87	22	Mysuru		Bhadravati
88	23	Mysuru		Shivamogaa Town
89	24	Mysuru		Anandapuram
90	25	Mysuru		Kumsi
91	26	Mysuru		Sagar Jambagaru
92	27	Mysuru		Talguppa
Bengaluru Division				
CONTROLSECTION-I BENGALURU-JOLARPETTAI-MARIKUPPAM				
1	1	Bengaluru		KSR Bengaluru
2	2	Bengaluru		Bengaluru Cant
3	3	Bengaluru		Bengaluru East
4	4	Bengaluru		Baiyyappanahalli ' W '
5	5	Bengaluru		Baiyyappanahalli ' RRI '
6	6	Bengaluru		Baiyyappanahalli ' A '
7	7	Bengaluru		Baiyyappanahalli Yard
8	8	Bengaluru		Krishnarajapuram
9	9	Bengaluru		Whitefield Panel Cabin
10	10	Bengaluru		Satellite Goods Terminal yard
11	11	Bengaluru		KJM Diesel shed
12	12	Bengaluru		Devangonthi
13	13	Bengaluru	**Bengaluru - Jolarpettai**	Malur
14	14	Bengaluru		Byatrayanahalli
15	15	Bengaluru		Tyakal
16	16	Bengaluru		Maralahalli
17	17	Bengaluru		Bangarapet
18	18	Bengaluru		Varadapur
19	19	Bengaluru		Kamasamudram
20	20	Bengaluru		Bisanattam
21	21	Bengaluru		Gudupulli
22	22	Bengaluru		Kuppam
23	23	Bengaluru		Mulanur
24	24	Bengaluru		Patchur
25	25	Bengaluru		Somanayakkanapatti
CONTROL SECTION-II CHANNASANDRA-YELAHANKA-DHARMAVARAM(EXCL)				
28	1	Bengaluru	**Bengaluru- Dharmavaram**	Channasandra
29	2	Bengaluru		Yelahanka
30	3	Bengaluru		Rajanukunte
31	4	Bengaluru		Doddaballapur
32	5	Bengaluru		Oddarahalli
33	6	Bengaluru		Makalidurga

34	7	Bengaluru		Thondebhavi
35	8	Bengaluru		Someshwara
36	9	Bengaluru		Gauribidanur
37	10	Bengaluru		Vidurashwatha
38	11	Bengaluru		Devarapalli
39	12	Bengaluru		Hindupur
40	13	Bengaluru		Malugur
41	14	Bengaluru		Chakarlapalli
42	15	Bengaluru		Rangepalli
43	16	Bengaluru		Penukonda
44	17	Bengaluru		Makkajipalli
45	18	Bengaluru		Nagasamudram
46	19	Bengaluru		Narayanapura
47	20	Bengaluru		Sri Satya Sai Prashanthi Nilayam
48	21	Bengaluru		Basampalle
CONTROLSECTION -III BENGALURU-MYSURU-TUMAKURU				
49	1	Bengaluru		Nayandahalli
50	2	Bengaluru		Kengeri
51	3	Bengaluru		IRIDM
52	4	Bengaluru		Hejjala
53	5	Bengaluru		Bidadi
54	6	Bengaluru		Ramanagaram
55	7	Bengaluru		Channapatna
56	8	Bengaluru	**Bengaluru- Mysuru**	Shettihalli
57	9	Bengaluru		Maddur
58	10	Bengaluru		Hanakere
59	11	Bengaluru		Mandya
60	12	Bengaluru		Yeliyur
60	12	Bengaluru		Byadarahalli
61	13	Bengaluru		Pandavapura
62	14	Bengaluru		Shrirangapattana
63	15	Bengaluru		Naganahalli
61	13	Bengaluru		Malleswaram
62	14	Bengaluru		Yesvantpur
63	15	Bengaluru		Yesvantpur Bye-Pass
64	16	Bengaluru		Chikbanavar
65	17	Bengaluru		Gollahalli
66	18	Bengaluru	**Bengaluru- Tumakuru**	Dodbele
67	19	Bengaluru		Nidavanda
68	20	Bengaluru		Hirehalli
69	21	Bengaluru		Kyatsandra

70	22	Bengaluru		Tumakuru
71	23	Bengaluru		Mallasandra
72	24	Bengaluru		Gubbi
73	25	Bengaluru		Nittur
74	26	Bengaluru		Sampige Road
CONTROLSECTION -IV YESWANTHAPUR-OMALUR -YELAHANKA-KOLAR-BANGARPET-NELAMAGALA -HASSAN				
75	1	Bengaluru		Nelamangala
76	2	Bengaluru		Solur
77	3	Bengaluru		Thippasandra
78	4	Bengaluru		Kunigal
79	5	Bengaluru		Yediyur
80	6	Bengaluru	**Hassan- Chikbanavar**	B.G.Nagar
81	7	Bengaluru		Hiresave
82	8	Bengaluru		Shravanabelagola
83	9	Bengaluru		Shantigram
84	10	Bengaluru		Samudravalli
85	11	Bengaluru		Channarayapattana
86	12	Bengaluru		Devanahalli
87	13	Bengaluru		Chikballapur
88	14	Bengaluru	**Yelahanka-Kolar**	Sidlaghatta
89	15	Bengaluru		Chintamani
90	16	Bengaluru		Srinivasapura
91				Kolar
92	17	Bengaluru		Lottegollahalli
93	18	Bengaluru		Hebbal
94	19	Bengaluru		Banaswadi
95	20	Bengaluru		Karmelaram
96	21	Bengaluru		Heelalige
97	22	Bengaluru		Anekal Road
98	23	Bengaluru		Hosur
99	24	Bengaluru	**Yesvantpur (EXCL)-Omalur**	Kelamangalam
100	25	Bengaluru		Periya Naga Thunai
101	26	Bengaluru		Rayakottai
102	27	Bengaluru		Marandahalli
103	28	Bengaluru		Palakkodu
104	29	Bengaluru		Dharmapuri
106	30	Bengaluru		Shivadi
107	31	Bengaluru		Toppur
108	32	Bengaluru		Karavalli

109	36	Bengaluru			Marikuppam
110		Bengaluru	**BWT-MKM**		Oorgaum
111		Bengaluru			Champion
112		Bengaluru			Coromandel

2.3.4 Details of Train Control Communication System Existing at Mysuru:

HPE Proliant DL360 Gen10 Server 1+1 Active - Active, Following is the configuration(s):

S.N	Component	Product Code	Qty
1	CPU	Intel® Xeon® 2.2 GHz, 8 Core	2
2	Memory	32 GB DDR4	
3	OS & S/W	Linux (Centos)	
4	Storage	4x1.2 TB	
5	Software	Creative Proprietary (Infinity 2.0)	
6	Station license	SIP Control phones	28
7	Port License		200
8	Conference License	1:4	1
9	Notification Gateway License	1:4	1
10	NMS device license	One pack of 100 nodes (Bundled), Server with windows 2016 OS	1
11	Voice logger	One pack of 100 nodes (Bundled), Server with windows 2016 OS	1
12		Deleted	
13	Date of installation	2020	

2.4 Video Surveillance System

2.4.1 Scope of Work

The scope of work includes Supply, Installation, Testing, Commissioning, Integration (with existing VSS Infra), operation and maintenance of IP based Video Surveillance System at Railway Stations of Indian Railways as per RDSO/SPN/TC/65/2021 ver. 06 or Latest.

The Bids must be complete with all equipment and required accessories along with necessary power systems including standard Uninterrupted Power Supply for the entire equipment, all type of connectors, patch leads, mounting, reinforcement (cable/wire) and fitting hardware, plugs, sockets and any hardware/software, etc. as required for complete installation & commissioning of the System under this contract in federated architecture.

VSS work has to be carried out at 14 A & B category (1 + 13) stations and 214 D & E category (47 + 167) stations over SWR. VMS server with external storage for cameras of A & B category stations will be provided at each A & B category station (5 in UBL, 5 in SBC and 4 in MYS). VMS server with external storage for cameras of D & E(UBL-71,SBC-69 & MYS-74) category stations will be provided at in charge IPF posts which are mostly at A & B category stations (Hubballi, Bellary, Gadag, Vijayapura, Belgavi, Vasco de Gama in UBL division, Mandya, Yeshwantpur, Hindupur, Dharmapuri, Bangalore, Bangalore Cantonment, Bangarpet, Bypannahalli in SBC, Mysuru, Hassan, Arsikere, Shimoga town, Davangere in MYS). VMS, VAS, FRS server & Storage shall be provided at RPF Post. Integrated VMS for one Division along with one Redundant Server in N+1 configuration shall be kept at the Data center in each Division. Redundant VAS Server & FRS Servers shall be provided at the Data Center in each Division. No Separate licence for cameras for VMS, VAS & FRS is catered for redundant or fail over server and it is clubbed in the main bundle license and it is considered that one camera licence for monitoring,storage,viewing,analytics & face recognition etc, covers multiple locations like RPF Thane,DC/DR, Divisional & Zonal Security control. Location of server and storage is tentative, if any better scheme is proposed, the same shall be approved by Railways. Network Storage server has to be planned at each RPF Thane for 30 days for D & E Category stations and 15 days storage for all the A,B, D & E category stations at DC.

2.4.2 GENERAL REQUIREMENTS INCLUDING CYBER SECURITY

- The Video Surveillance System shall be based on non-proprietary open architecture where the Video Management Software, Video Recording Software, Artificial Intelligence (AI) enabled Video Analytics Software and Face Recognition Software can work and integrate with any make of IT hardware like Server, Storage, Workstation, Network Video Recorder and Switches etc.
- Profile "S" defines interoperability between Video Management Software/NVR and Camera. Profile "G" defines interoperability between Video Management Software/NVR and SD (memory) Card in the Camera.
- Software Development Kit (SDK) of all Hardware is to be shared with the purchaser for integration purposes.
- The System i.e. IP Cameras, Network Video Recorders and Software (Video Management and Video Recording) shall be compliant to global standards ONVIF Profile "S" & "G" for the interface of network video products (ONVIF – Open Network Video Interface Forum). The quoted camera models should appear on the ONVIF
- Conformant products under Device List & quoted Video Management Software/NVR should appear under conformant Client List on the ONVIF website and a confirmation certificate for the offered models should be available at the time of supply. It should be confirmed from ONVIF Website at the

time of supply while offered for inspection.

● In case ONVIF "S" and / or "G" certifications are not available, then to fulfill requirement of interoperability between Video Management Software / NVR and Camera and interoperability between Video Management Software / NVR and SD (memory) Card in the Camera, certification from Indian bodies i.e. TEC / TSEC, STQC, BIS or any accredited lab by them or any other Government / NABL accredited lab, is a mandatory requirement to be submitted by the OEM / Vendor at the time of supply while offered for inspection.

IP Camera and Software (Video Management, Video Recording and Artificial Intelligence (AI) enabled Video Analytic Software) may be from the same manufacturer or from different manufacturers. In case, IP Cameras and Softwares are from different manufacturers, then all features of Cameras shall be available through the Software for viewing, recording and analytics.

● Required number of licenses shall be provided by OEM/Vendor for Video Management, Video Recording, Artificial Intelligence (AI) enabled Video Analytics and Face Recognition Software as required by the purchaser as per site requirement. Licenses related compliance shall be ensured by the purchaser depending upon the requirement.

● Only Server based solution can be accepted for Video Management and Video Recording for the implementation schemes as per Schematic Diagram-1, Schematic Diagram-2 of RDSO Specification no. RDSO/SPN/TC/65/2021 as applicable. Software capabilities (as per Clause no. 18.1, 18.2 and 18.3 of RDSO Specification no. RDSO/SPN/TC/65/2021) and Storage capacities (as per clause no. 12.0 of RDSO Specification no. RDSO/SPN/TC/65/2021) shall be provided.

Note:

● i. The Storage shall be external (as per clause no. 12.0 of RDSO Specification no. RDSO/SPN/TC/65/2021) when a Server based solution is provided Specially for D&E category stations. Also for A & B category station, storage can be external or internal.

● ii. DELETED

● The Video Recording and Management System shall provide secured recording for evidence purposes and user authentication to protect data integrity.

● Redundant Servers may be provided if specified by the purchaser as per Schematic Diagram-1 and Schematic Diagram-2. The Redundancy System shall support a defined number of Servers in N+1 configuration (Value of N to be specified by the purchaser) so that the recording and playback availability is not affected in case of failure of any Server. The recording of the last 30 days at any given point of time should be available through redundant Server in case of a Server failure.

● For data stored and computed at Cloud as per Schematic Diagram-3, the Cloud shall provide for protection of data and operation.

● The equipment shall be able to work in the temperature range and humidity as specified in the corresponding clauses of the specification. Purchaser may specify any other temperature requirement and humidity as per site requirement.

● To ensure security of VSS (Camera & Software) from vulnerabilities & breaches and discourage false undertaking from OEMs, security auditing and testing of equipment including source code of camera and software shall be carried out from STQC (Ministry of Electronics & Information Technology) or any other Government Agency from the list of CERT-In empanelled Information Security Auditing Organization. In order to ensure security of network and other IT equipment of VSS system, before bulk supply and installation, purchaser should ensure that security auditing and testing at the time of POC (Proof of Concept) as well as at the time of completion of project are conducted or as specified by the purchaser. In case any security breach is found in the system at any stage including at POC level, immediate strict penal action is to be initiated by the purchaser.

● OEMs must submit a declaration certificate regarding their genuinity, have their own manufacturing setups and IPR for the hardware(s)/software(s), and shall not have 3rd party manufacturing from any company blacklisted in India or abroad (due to proven backdoor access and data vulnerability) or any company sharing land border with India. The Intellectual Property Rights (IPR) of all manufactured final

product and source code of all software including camera firmware, switch firmware, FRS algorithm, Command Control Centre Software etc. should not reside in countries sharing land borders with India, until unless specifically allowed by the Government of India and is registered with the Competent Authority of Government of India. Proof of IPR & source code residing in which country and requisite permission & registration with Competent Authority of Govt. of India, as applicable to comply with the above, shall be provided by the OEMs. The purchaser should ensure that latest Public Procurement Policy & other related orders issued by Government of India are followed. In case any breach or false declaration is found at any stage, immediate strict penal action is to be initiated by the purchaser.

- OEM need to confirm that the equipment, like Cameras etc., shall not be installed with standards like - GB28181, GB/T28181-2011, GB/T 28181-2011, GBT 28181- 2011, GBT28181-2011, GB/T28181-2016, etc., protocols/standards and there shall be no option in the camera web page/settings to activate or deactivate such protocols/standards any of their version(s) or any such protocol which allow certain organizations to bypass all security parameters and look into the devices directly.

- The MAC address of all cameras should not be registered in the name of any OEM/ company/ entity sharing land border with India until unless specifically allowed by the Government of India.

- Mean Time Between Failure (MTBF) calculated at 40°C for each type of camera should not be less than 1,00,000 hours for which OEM shall submit complete and detailed test reports issued from Govt. / NABL Accredited Test Labs / 3rd party test house of International repute such as UL, TUV etc.

- There shall be provision to view any camera from the Divisional, Zonal Headquarters and from the Railway Board at the time of emergency or whenever desired.

2.4.3 The location wise scheme is elaborated below

2.4.3.1 Scheme at A & B category station

- Around 40 cameras for A & B category stations as per station requirement which include 4 UHD, 3 PTZ, 27 Bullet and 6 Dome Cameras (approximately).
- UHD cameras for all Entry/Exit of station and each platform.
- PTZ cameras for parking area, circulating area, and FOB.
- Dome cameras for offices , waiting hall, booking counter, relay room, panel room, parcel offices,
- Bullet cameras for platforms and entrance.
- One VMS server with storage for cameras at A & B category stations and VMS server for all cameras at D & E category stations with external storage under IPF in charge jurisdiction.
- Video analytics shall be provided for all cameras except PTZ. Face recognition shall be provided for all UHD cameras.
- One workstation with 2 Nos 55" LFD screen to monitor the cameras at A/B category and additional workstation with 2 no of 55" LFD screen to monitor cameras at D & E category station.
- All the cameras will be provided with edge storage of 128 GB.
- Total 5 or 6 Field POE switches 8+2 ports (8x 1G Copper + 2x 1G optical) at each platform. Two Aggregator switches 24+4 ports (24x 1G optical + 4x 10G optical) at platform 1 and all field switches at each platform will be connected in ring to these two Aggregator switches. One switch 24+4 ports (24x 1G Copper + 4x 1G optical) at RPF post.
- All the cameras will be connected to POE Switch using STP Cable and POE Switch will be connected through OFC to the Aggregator switch in Ring protection.
- Two Panic buttons at each platform which will be provided at A & B category stations.
- Two parallel 10 KVA UPS for feeding power to cameras from the centre location and servers at the station.

2.4.3.2 Scheme at D & E category stations
- 10 cameras (1 PTZ, 3 Dome and 6 Bullet) will be provided.
- PTZ cameras will be provided at circulating areas/ Entry.
- Dome cameras will be provided at waiting hall, Panel room, Relay room and Booking counter)
- Bullet cameras will be provided at Platforms/ FOB/ Entry/ Exit.

- 1 Field POE 8 port switches (8x 1G Copper + 2x 1G optical) at each platform.
- All the cameras will be connected to the nearest Server location
- 3 KVA UPS will be provided for feeding power to cameras at each station.
- Video Analytics Software shall be provided for all cameras except PTZ at D & E categories stations.
- No FRS software will be provided for cameras at D & E category stations
- 1G bandwidth will be made available through IP-MPLS or will be hired from RailTel till the completion of IP MPLS Work by Railways.

2.4.3.3 Scheme at RPF post

- One VMS server with 30 Days storage for cameras at A/B category stations and VMS server with 30 days external storage for all cameras at D & E category stations under IPF incharge jurisdiction.
- There are 6 IPF incharges at Hubballi, 8 at Bangalore and 5 at Mysuru this will vary as demand of Divisions requirements.
- All the D & E category stations will be monitored for the stations which are coming under their jurisdiction
- One workstation with 2 Nos 55" LFD screen to monitor the cameras at A/B category and additional workstation with 2 no of 55" LFD screen to monitor cameras at D & E category station.
- One 42U rack will be provided for housing all the rack mounting servers and switches.
- Two 10 KVA UPS for cameras will be provided with 8 to 10 hours backup.
- 2 Nos AC of 2 Ton AC will be provided.

2.4.3.4 Scheme at OFC hut
- MPLS router will be provided at OFC hut.
- 1G port will be used for streaming of Video for Divisional HQ and Zonal HQ.
- At A & B category stations, one 24 Port manageable Switch (24 Copper + 4 optical) at RPF post will be connected to L3 switch in OFC Hut. At D & E category stations, one 8 Port manageable Switch (8 Copper + 2 optical) will be connected to 8 Port switches at the station.

2.4.3.5 Scheme at Data Centre

- Redundant VMS server, FRS server and VAS Server for n+1 arrangement will be provided.
- Disaster Recovery Storage for 15 days for all cameras in the division.
- 42 U SmartRack will be provided for housing Server & Switch.
- Will be connected to Railnet through NGFW for viewing on Railnet Network.
- Camera feed will be extended to PCSC/Sr DSC/DRM from the Data center,which can be viewed on a Workstation.
- Two numbers of 10 KVA UPS will be provided for backup.
- Data center will be provided with 1G bandwidth from the wayside stations from each direction..
- False flooring and False roofing will be provided for power cable and data cable respectively.
- 2 Nos 2 Ton AC will be provided.

2.4.3.6 Scheme at Divisional Security control & Zonal Security control Room

- Required number of workstation will be provided which will be connected to Servers at Data centre and stations
- 2X2 Video wall will be provided at the Divisional Security controls & Zonal Security control Room.

2.4.3.7   Existing VSS Network

Railways has commissioned (or in process of implementation) VSS work at some railway stations. Railway stations covered under the scope of work have been further clubbed together as a cluster according to location of their controlling RPF thana and in this RFP such clusters have been referred as "RPF Thana/Chowkiwise cluster stations (including station where RPF/Thana/Chowki is located and stations being recorded at that particular RPF Thana/Chowki)". Details of controlling RPF Thana/Chowki are given in 2.4.11. This infrastructure (existing) is required to be integrated with the proposed infrastructure covered under the scope of present tender. List of stations covered under the scope of present tender is mentioned in 2.4.13. It is pointed out that bidders are required to provide additional infrastructure at railway stations (as per the scope of the Tender), where Railway has already provided infra. Indicative list of cameras required to be provided at each category of stations is mentioned in 2.4.14 . Divisional Control Offices covered under present Tender are at UBL, SBC & MYS divisions and Zonal Control Offices are at UBL.

It is pointed out that the bidder is required to integrate the existing A & B VSS Infrastructure along with the proposed VSS infra under the scope of this tender.

2.4.4 PROPOSED ARCHITECTURE FOR VIDEO SURVEILLANCE SYSTEM

2.4.4.1 Architecture Overview

To implement Video Surveillance Solution (VSS), each station should have robust, secure and scalable network architecture implemented which will cover all platforms and other areas such as waiting halls, ticket counters, entry, exit, refreshment area, and foot over bridge, parking area etc. of a railway station. Actual locations of switches in the proposed VSS solution will depend on the location of cameras decided by Railways.

In addition to robust, secure and scalable network architecture on railway stations, fully secure network architecture will be required at RPF Thana/Post and Datacenter(s). Existing LAN Infra and existing VSS infra at stations is also required to be integrated with the proposed VSS infra at stations and Thana/posts, without any additional cost to Railway for the items not covered in the SOQ. This network will work as a platform for implementation of Video Management, Video Recording and storage, Video Analytics and Facial Recognition System etc., which are part of infrastructure for IP Video Surveillance Service. Same network architecture can be used for deployment of and other services as per the requirements of Railways.

As this is a highly visible project for the Indian Government, Ministry of Railways and Railway, therefore, the proposed architecture must be secure end to end so as to ensure by the selected contractor to eliminate any unauthorized misuse of recorded video or video clips of VSS System.

2.4.4.2 Architecture of VSS/CCTV System for stations

Tentative architecture of VSS/CCTV system at stations will be as per schematic diagram-1 & 2, Diagram-1 for A & B category stations and   Diagram 2 for D & E category stations connection to nearby RPF Thana as mentioned in RDSO specification no. RDSO/SPN/TC/65/2021 Rev.6.0 .

Diagram - 1

Diagram - 2
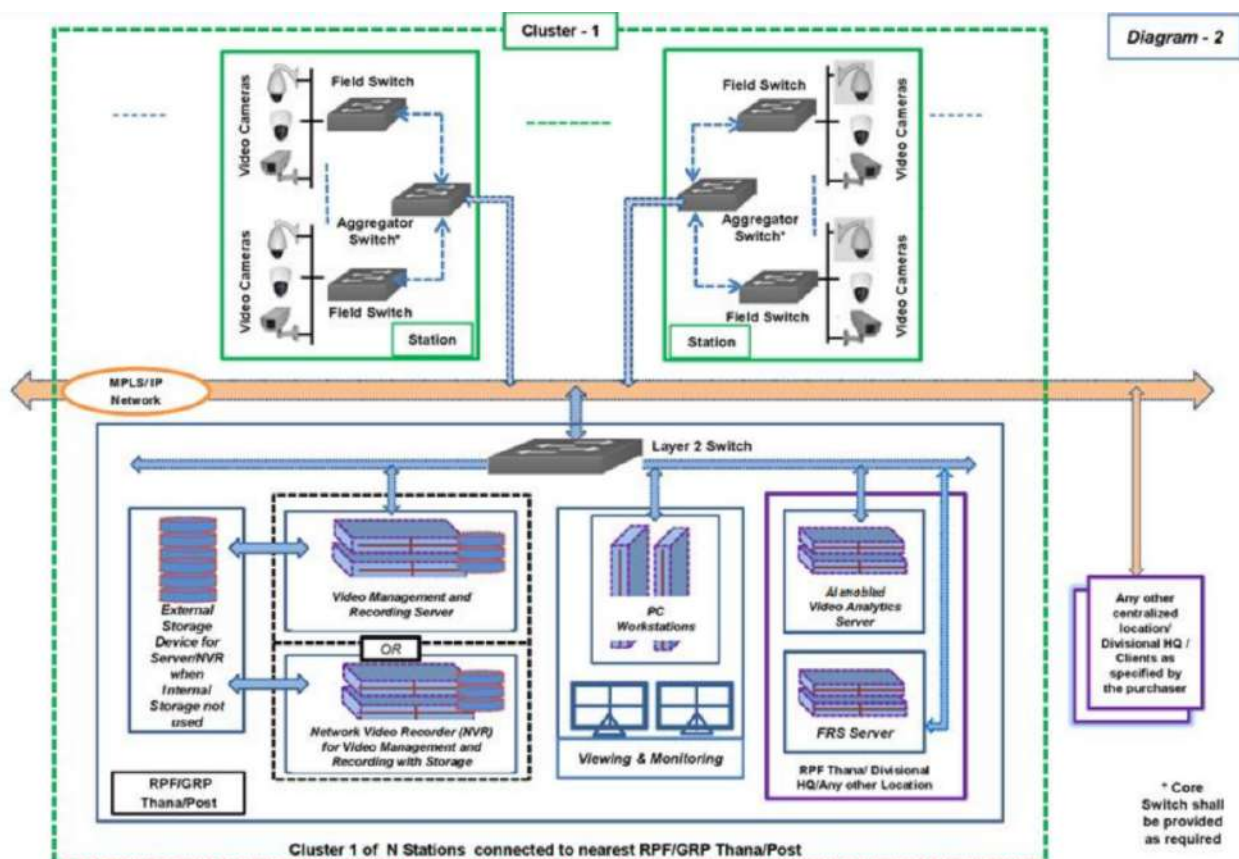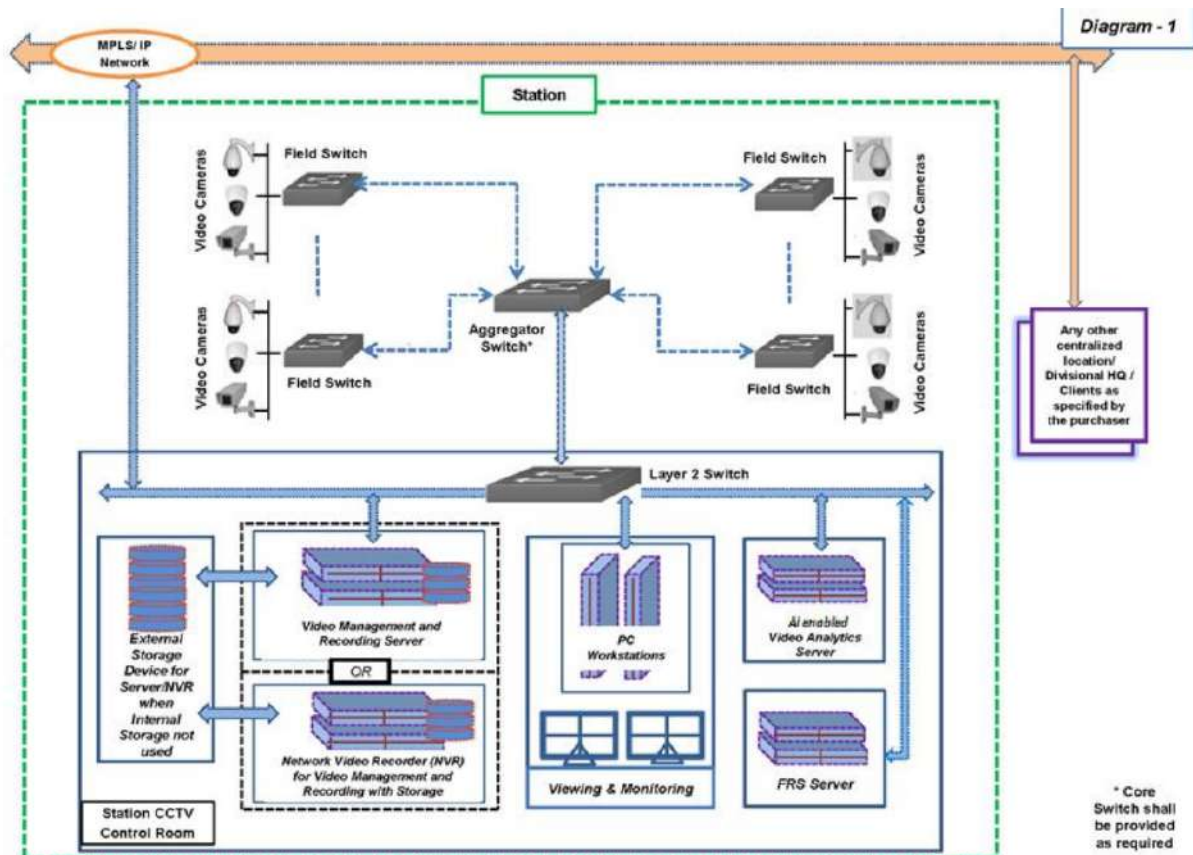
2.4.5 Power and Fiber Distribution Design for Railway Stations

A 4 sq.mm 3 core power cable shall be terminated from UPS System at each platform to each Switch location. Two numbers of 12 core OFC will start from 24/12 ports FMS at RPF post and will terminate to two numbers of Aggregation Switches at PlatForm 1. All Field switches at each platform will be connected through OFC cable in ring configuration with either ends connected with two Aggregation switches at Platform 1. Suitable number of spares should be kept at each platform and additional 12 core OFC cable may be laid, if required. Further, IP Cameras will connect on CAT-6 STP cables to these Field POE switches.

Bidders can suggest any better design for optimum and reliable wiring scheme. However, the Railway Engineer decision will be final.

2.4.6 Network Design for Different Type of Stations

Indian Railway has A1, A, B,C, D & E Category Stations. Each type of stations has typically physical platforms as per following:

SN	Category of Stations	Nos. of Physical Platform
1	A Type	5 nos.
2	B Type	3 nos.
3	D Type	2 nos.
4	E Type	2 nos.

Each platform will be having approx. 4 to 6 nos. of 8 port PoE Access Switches (Field Switch)to cover the entire length of the platform. 2 cores out of 12 core OFC cable will start from the 1st Aggregation switch connecting one Field switch of the 1st platform and will terminate to the 2nd Aggregation switch. Another 2 cores out of 12 core OFC cable will start from the 1st Aggregation switch connecting the second Field switch of 1st platform and will terminate to the 2nd Aggregation switch. Similarly all Field switches at each platform will be connected to both Aggregation switches.

By this way, all Field Switches of a given platform will form a ring topology with two numbers of Aggregation Switch at a central location in Ring architecture with 12 core single mode fiber. Any additional 12 core OFC cable to be laid as per requirement, if required at a given location.

These aggregation switches on each platform will connect to Layer 2 Switch at RPF post (A and B Type Stations) in a ring topology with 12 core single mode fiber. This ring topology will provide a redundant path to aggregation switches in case a fiber cut happens incidentally. At D & E category station, all Field switches will be connected with 24 port Layer 2 switch at Platform 1 and the same will be connected to MPLS Router at OFC hut.

Further IP Surveillance Cameras connected on Cat 6 STP cables to these Access Switches (Field Switches). And shielding of CAT 6 Cable should be earthed.

Camera Mount/Racks installed/Fixed in the Platform Shelter should be isolated from the Pole/Platform Structure through insulators.

Earthing and B & C Class Protection has to be provided at each RPF Thane.And any suggestion for avoiding failure due to lighting can be suggested.

If there is a requirement to connect Access Switches (Field Switches) for platform extension, any other locations or any other services, aggregation switches will have sufficient ports available.

2.4.6.1 Tentative Network Diagram for A & B type station is given as:

PROPOSED CAMERA LAYOUT FOR VSS PROJECT 'A' & 'B' CATEGORY 03 PLATFORM STATION (2 ISLAND)

NOTE:

- 8 PORT SWITCH (8 x 1G POE + 2 x1G SFP) – (12 NOS) (FIELD SWITCH)
- 24 PORT SWITCH (24 x 1G POE + 4 x1G SFP) – (1 NOS)
- 24 PORT SWITCH (24 x 1G SFP + 4 x 10G SFP)– (02 NOS) (AGGREGATOR SWITCH)
- BULLET CAMERA (28 NOS)
- 24 PORT L3 SWITCH
- PTZ CAMERA (2 NOS)
- DOME CAMERA (5 NOS)
- 4K UHD CAMERA (2 NOS)
- OFC
- 3CX2.5SQ MM POWER CABLE
- STP CAT 6 POWER CABLE

2.4.6.2 Tentativenetwork diagram for D & E type station is given as:

PROPOSED CAMERA LAYOUT FOR VSS PROJECT AT 'D' & 'E' PLATFORM STATION

01 Jul 21
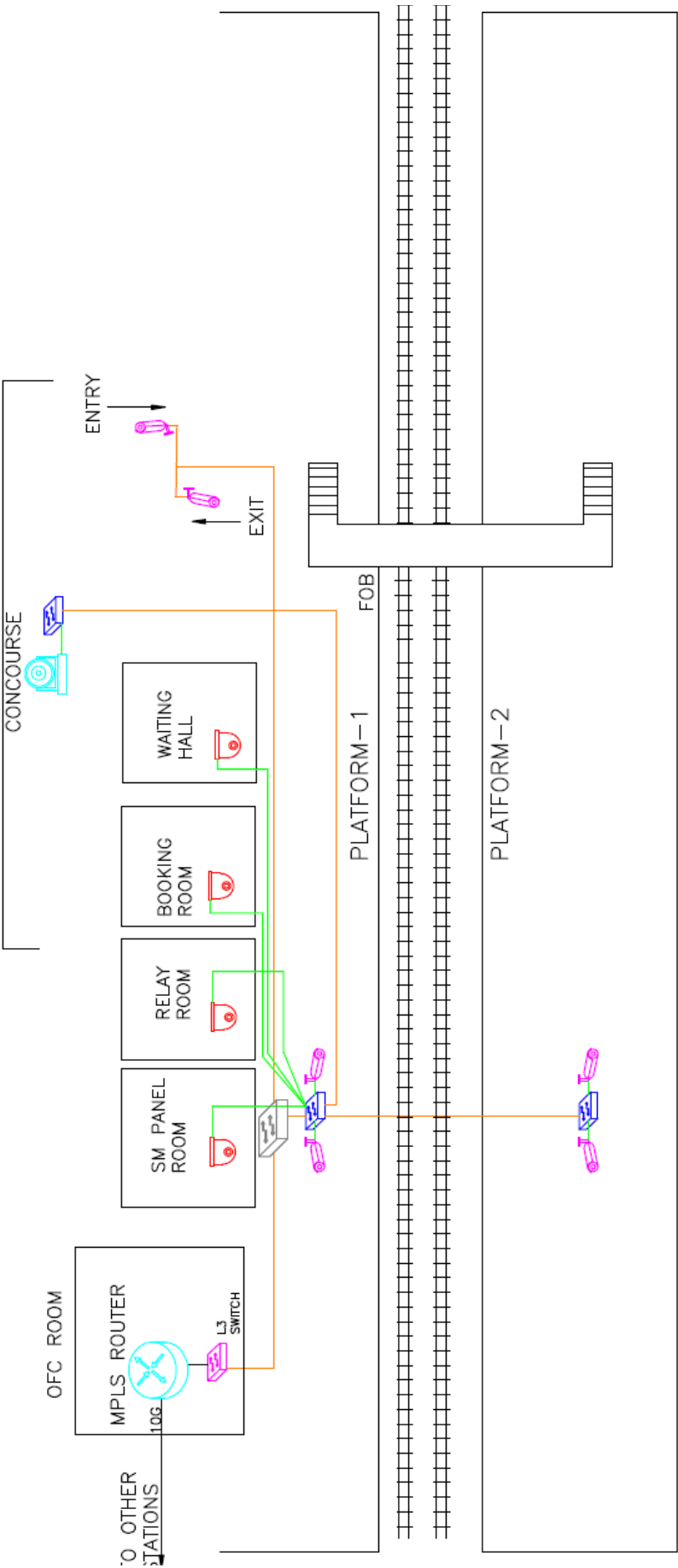
24 PORT SWITCH (24 × 1G POE + 4 ×1G SFP) — (1 NOS)

8 PORT SWITCH (8 × 1G POE + 2 ×1G SFP) — 2 NOS

BULLET CAMERA (06 NOS)

PTZ CAMERA (1 NOS)

DOME CAMERA (4 NOS)

24 PORT L3 SWITCH

NOTE:

OFC

STP CAT 6 POWER CABLE

2.4.6.3   Network layout at Railway Datacenters and RPF Thana/Post

At Railway Data Centers (Hubballi ,Bengaluru and Mysuru)
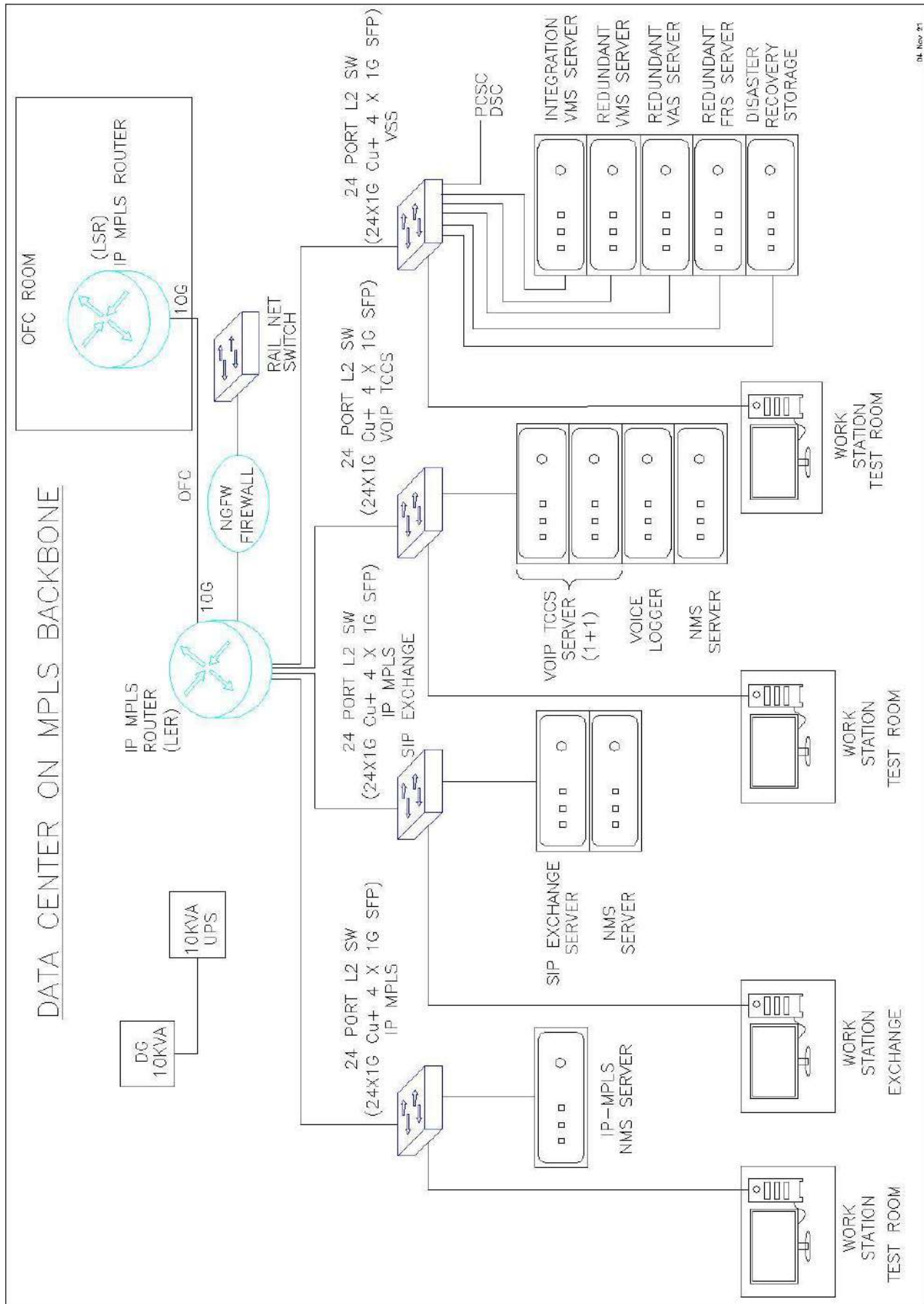
2.4.7 Surveillance VPN on Railway Backbone

A separate VPN instance will be created on IP MPLS Network for different types of services (Control,Surveillance, etc). Router/ Layer 3 switch will separate these services in form of unique VLANs and maintain logical segregation between these services. This will maintain each service separately from traffic flow and QoS implementation perspective and improve network performance along with securing and isolating these services from each other.

A separate VPN instance may be created on switch for Railway Protection Force(RPF) users in addition to mentioned services in all type stations. Railway Protection Force users will have a secure client for monitoring stations through IP surveillance cameras.

This network architecture must have features like port security, DHCP snooping, Dynamic ARP inspection, IP Source guard, BPDU Guard and Spanning tree root guard. These features will enable the network to implement the first level of network security at these switches as a protection from sniffing and reconnaissance attacks.

This network architecture must have loop avoiding features like MSTP/RSTP to implement dual homing/redundancy successfully.

IP Video Surveillance System is traffic hungry and delay sensitive service. To ensure proper functioning of this project, network architecture must have features like Multicast VLAN Registration, IP SLA, Auto-QoS, Auto Ports configuration to detect end device type connected to port and configuring QoS automatically on the basis of device. Network should have an IPv4 and IPv6 port and a time based access list with time ranges.
  Data Centre Architecture including networking, computing, storage, management, and security is planned
  as described below:

In each Data Centre, there will be IP MPLS Routers (to be provided by Railway) interfacing towards the RailTel/Railway MPLS network

The routers will work as a Gateway Router from the network towards the Datacenter.

There will be a Spine and Leaf/Two-tier Architecture Core/Aggregation and Access Switching Layer. This architecture accommodates a north-south traffic pattern where client data comes in from a WAN or the Internet to be processed by a server in the data center and is then pushed back out of the data center.

Data Centre Core and Aggregation layer—Provides the high speed packet switching backplane for all flows going in and out of the data center. Provide important functions such as Layer 2 domain definitions, spanning tree processing, and default gateway redundancy. Server-to-server multi tier traffic flows through the aggregation layer and can use services, such as firewall, to optimize and secure applications.

Data Centre Access layer—Where the servers physically attach to the network. The server components consist of rack servers, core/blade servers with integral switches, core/blade servers with pass through cabling, clustered servers. The access layer network infrastructure consists of fixed configuration stackable switches (Top of Rack/End of ROW). Switches provide both Layer 2 and Layer 3 topologies.

Resiliency is achieved by load balancing the network traffic between the tiers, Security is achieved by placing firewalls between the tiers.

2.4.9 Installation of Panic Button and Associated VMS Requirements for Stations

2.4.9.1 The VMS software shall include required licenses to support Alarm Input monitoring and Output activation for the proposed IP Cameras.

2.4.9.2 Two numbers of Panic Buttons shall be installed at each Platform. The potential free contact of the Panic Button shall be connected to the Alarm Input of the IP Fixed or PTZ Camera installed nearby wherein Panic Button is in the Field of View of the Camera.

2.4.9.3 Once the Panic Button is activated by any person in distress, an alarm shall appear on the VMS along with the pop up of the associated camera on the operator workstation.And audio and Visual alarm in RPF Thane. The Visual alarm should be a flasher light and the audio alarm should be buzzer with an acknowledged button.In case, the associated camera is a PTZ type, the camera shall move and zoom on to the Panic Button to see the person in distress.

2.4.9.4 Panic Button shall be installed at the average person's height at the platform.

2.4.10 List of Divisional Controls and Zonal Headquarter Controls having existing VSS Infra (Either installed or under Installation)

S N	Location (Division/Headquarter)	Railway Zone	Qty of PC Work-station	Qty of Format Display	Qty of GUI License (VMS)
1	Bangalore	SWR	1	2	1
2	Mysore	SWR	1	2	1
3	Hubli	SWR	1	2	1
4	SWR Hqrs		1	2	1
	Total		04	08	4

2.4.11 Details of Existing VSS Stations/RPF Thanas having existing VSS Infra (Either installed or under Installation)

S N	Name of Controlling RPF Thana/Post (Cluster)	Name of Station	Stn Code	Cat Stn	Dome	Fixed Box Type	PTZ	4K UHD	VMS SW	UPS (2x10KVA)	Server with 36TB usa-	station with1 KVA	LFD 55"	Rack 19" 42U	Switch Type-I II
1	Hubli	Hubli	UBL	A		18	1		19	0	1		1	1	
2	Shimoga Town	Shimoga Town	SMET	A	6	27	3	4	40	1	1	1	2	1	1
3	Bangalore Cantt.	Bangalore Cantt.	BNC	A	5	20	1	3	29	1	1	1	2	1	1
4	Krishnaraja-puram	Krishnaraja-puram	KJM	A	4	22	1	3	30	1	1	1	2	1	1
5	Bangarpet	Bangarpet	BWT	A	5	25	2	4	36	1	1	1	2	1	1
6	Belgaum	Belgaum	BGM	A	6	27	3	4	40	1	1	1	2	1	1
7	Bellary	Bellary	BAY	A	6	27	3	4	40	1	1	1	2	1	1
8	Hassan	Hassan	HAS	B	6	27	3	4	40	1	1	1	2	1	1
9	Ssp Nilayam	Ssp Nilayam	SSPN	A	6	17	0	2	25	1	1	1	2	1	1
10	Vasco-Da-Gama	Vasco-Da-Gama	VSG	A	6	27	3	4	40	1	1	1	2	1	1
11	Birur	Birur	RRB	B	4	16	2	3	25	0.5	1	1	2	1	1
12	Kengeri	Kengeri	KGI	A	4	10	2	0	16	0.5	1	1	2	1	1
13	Vijayapu-ra/Bijapur	Bijapur	BJP	A	5	16	2	3	26	0.5	1	1	2	1	1
14	Davangere	Davangere	DVG	A	5	16	2	3	26	1	1	1	2	1	1
15	Gadag	Gadag	GDG	B	5	16	2	3	26	0.5	1	1	2	1	1
16	Hospet	Hospet	HPT	A	4	16	2	3	25	0.5	1	1	2	1	1
17	Banaswadi	Banaswadi	BAND	B	4	16	2	3	25	0.5	1	1			1
18	Yeswanthpur	--	YPR	A1	0	2	35	0	37		1		4		
19	Bengaluru	--	SBC	A1	0	0	71	0	71		1		4		
20	Mysuru	--	MYS	A		50					1		4		1

2.4.12 Make/model of Equipment/System already installed at RPF Thana/Post

Following are the technical details of existing VSS infra available at stations:

S. No	Item name (make)	RDSO Specification
1	Camera (CP Plus)	SPECIFICATION NO. RDSO/SPN/TC/65/2016 Revision 4.0
2	Server cum Storage (Netweb)	SPECIFICATION NO. RDSO/SPN/TC/65/2016 Revision 4.0
3	Large format Display (LG)	SPECIFICATION NO. RDSO/SPN/TC/65/2019 Revision 5.0
4	Workstation (Dell)	SPECIFICATION NO. RDSO/SPN/TC/65/2019 Revision 5.0
5	VMS Software (HFCL)	SPECIFICATION NO. RDSO/SPN/TC/65/2019 Revision 5.0
6	Rack (19" 42U)	RailTel specification
7	Switch (D-link) –Type-III	
	UPS (Make - ProstarM)	

2.4.12.1 Camera

CP plus make cameras {(i) Full HD Fixed Dome (Model No.: - CP-UNC- VB21FL3-VMD), (ii) Full HD Bullet Type (Model No.: CP-UNC-TB21ZL6S- VMD), (iii) Full HD PTZ camera (Model No.: CP-UNP-F3021L20-DAP), (iv)4k UHD Bullet Type (Model No.: CP-UNC-TB81ZL6-VMDS)}as per RDSO specification no. RDSO/SPN/TC/65/2019 Revision 4.0.

2.4.12.2 Server cum Storage

Netweb make Server (Model no. Tyrone Camarero DS300TR-28RL) as per RDSO specification no. RDSO/SPN/TC/65/2019 Revision 4.0. Following is the configuration(s):

a)   In Phase-IB and Phase-IB(V) VSS Work

S.N	Component	Product Code	Qty
1	CPU	Intel® Xeon® E5-2620 v4 (8-Cores, 2.1GHz, 20MB Cache, 85W)	2
2	Memory	32GB DDR4 ECC RDIMM (Total Memory)	1
3	Drives	1 TB SAS 7200 RPM (3.5")	4
		6TB SAS 3.0 12.0Gb/s 7200RPM – 3.5"	3
4	OS & S/W	CentOS 7.0 Enterprise Linux (64-bit)	1
5	Storage	36 TB Usable Storage	1

b)   In Phase-IA VSS Work

SN	Component	Product Code	Qty
1	CPU	Intel® Xeon® E5-2620 v4 (8-Cores, 2.1GHz,20MB Cache, 85W)	2
2	Memory	32GB DDR4 ECC RDIMM (Total Memory)	1
3	Drives	1 TB SAS 7200 RPM (3.5")	4
4	OS & S/W	CentOS 7.0 Enterprise Linux (64-bit)	1

5	Storage	36 TB Usable Storage	1

2.4.12.3 Large Format Display

LG makes a Large format Display (55") as per RDSO specification no. RDSO/SPN/TC/65/2019 Revision 5.0.

2.4.12.4 PC Workstations

Dell Make PC Workstation (Model DELL Precision 3430 SFF & 3431 SFF) as per RDSO specification no. RDSO/SPN/TC/65/2019 Revision 5.0 with all amendments (Windows-10 Pro-2019 is installed).

2.4.12.5 Video Management Software

HFCL make Video Management Software (M3S$^+$ VMS) as per RDSO specification no. RDSO/SPN/TC/65/2019 Revision 5.0 with all amendments.
All the Warranty and Long Term Maintenance (AMC) support/obligation of existing Infra installed will be done by the existing vendors only.

2.4.13 Annexure-I - List of Divisional and Headquarter Control Offices covered under present tender

SN	Railway Zone	Headquarters	Divisional Control Office
1	South western Railway	Hubballi	Hubballi, Mysuru and Bengaluru

List of VSS Stations where work is proposed						
S.N	Name of Station	Railway	Stn Code	Division	State	Cat
A & B Category stations						
1	Dharwad	SWR	DWR	UBL	Karnataka	A
2	Bagalkot	SWR	BGK	UBL	Karnataka	B
3	Toranagallu	SWR	TNGL	UBL	Karnataka	B
4	Londa	SWR	LD	UBL	Karnataka	B
5	Koppal	SWR	KBL	UBL	Karnataka	B
6	Tumkur	SWR	TK	SBC	Karnataka	B
7	Hindupur	SWR	HUP	SBC	AP	B
8	Yelahanka	SWR	YNK	SBC	Karnataka	B
9	Mandya	SWR	MYA	SBC	Karnataka	B
10	Hosur	SWR	HSRA	SBC	TN	B
11	Haveri	SWR	HVR	MYS	Karnataka	B
12	Bhadravati	SWR	BDVT	MYS	Karnataka	B
13	Harihar	SWR	HRR	MYS	Karnataka	B
14	Arsikere	SWR	ASK	MYS	Karnataka	B
D category stations						

1	Byadgi	SWR	BYD	MYS	Karnataka	D
2	Chamarajanagar	SWR	CMNR	MYS	Karnataka	D
3	Chamarajapuram	SWR	CMJ	MYS	Karnataka	D
4	Chikjajur	SWR	JRU	MYS	Karnataka	D
5	Chitradurga	SWR	CTA	MYS	Karnataka	D
6	Holenarsipur	SWR	HLN	MYS	Karnataka	D
7	Kabakaputtur	SWR	KBPR	MYS	Karnataka	D
8	Kadur	SWR	DRU	MYS	Karnataka	D
9	Krishnanarajanagar	SWR	KRNR	MYS	Karnataka	D
10	Nanjangud Town	SWR	NTW	MYS	Karnataka	D
11	Ranibennur	SWR	RNR	MYS	Karnataka	D
12	Subramanya Road	SWR	SBHR	MYS	Karnataka	D
13	Tarikere	SWR	TKE	MYS	Karnataka	D
14	Tiptur	SWR	TTR	MYS	Karnataka	D
15	Yalvigi	SWR	YLG	MYS	Karnataka	D
16	Baiyappanahalli	SWR	BYPL	SBC	Karnataka	D
17	Bangalore East	SWR	BNCE	SBC	Karnataka	D
18	Champion	SWR	CHU	SBC	Karnataka	D
19	Channapatna	SWR	CPT	SBC	Karnataka	D
20	Chikbanavar	SWR	BAW	SBC	Karnataka	D
21	Coromandel	SWR	COL	SBC	Karnataka	D
22	Dharmapuri	SWR	DPJ	SBC	Tamilnadu	D
23	Gauribidanur	SWR	GBD	SBC	Karnataka	D
24	Karmelarum	SWR	CRLM	SBC	Karnataka	D
25	Kuppam	SWR	KPN	SBC	Andhra	D
26	Maddur	SWR	MAD	SBC	Karnataka	D
27	Malleswaram	SWR	MWM	SBC	Karnataka	D
28	Malur	SWR	MLO	SBC	Karnataka	D
29	Nayandahalli	SWR	NYH	SBC	Karnataka	D
30	Oorgaum	SWR	OGM	SBC	Karnataka	D
31	Pandavapura	SWR	PANP	SBC	Karnataka	D
32	Penukonda	SWR	PKD	SBC	Andhra	D
33	Ramanagaram	SWR	RMGM	SBC	Karnataka	D
34	Srirangapatna	SWR	S	SBC	Karnataka	D
35	Whitefield	SWR	WFD	SBC	Karnataka	D
36	Almatti	SWR	LMT	UBL	Karnataka	D
37	Alnavar	SWR	LWR	UBL	Karnataka	D
38	Badami	SWR	BDM	UBL	Karnataka	D
39	Ghatprabha	SWR	GPB	UBL	Karnataka	D
40	Gokak Road	SWR	GKK	UBL	Karnataka	D
41	Indi Road	SWR	IDR	UBL	Karnataka	D

42	Kudachi	SWR	KUD	UBL	Karnataka	D
43	Munirabad	SWR	MRB	UBL	Karnataka	D
44	Rayadurg	SWR	RDG	UBL	Karnataka	D
45	Raybagh	SWR	RBG	UBL	Karnataka	D
46	Sanvordem Curchorem	SWR	SVM	UBL	Goa	D
47	Ugar Khurd	SWR	UGR	UBL	Karnataka	D
E category stations						
48	Adihalli	SWR	ADHL	MYS	Karnataka	E
49	Ajjampur	SWR	AJP	MYS	Karnataka	E
50	Akkihebbalu	SWR	AKK	MYS	Karnataka	E
51	Ammasandra	SWR	AMSA	MYS	Karnataka	E
52	Amritapura	SWR	AMC	MYS	Karnataka	E
53	Anandapuram	SWR	ANF	MYS	Karnataka	E
54	Ashokapuram	SWR	AP	MYS	Karnataka	E
55	Bageshpura	SWR	BGPA	MYS	Karnataka	E
56	Balenahalli	SWR	BAHI	MYS	Karnataka	E
57	Ballekere	SWR	BLKR	MYS	Karnataka	F
58	Banasandra	SWR	BSN	MYS	Karnataka	E
59	Banavar	SWR	BVR	MYS	Karnataka	E
60	Bantwal	SWR	BNTL	MYS	Karnataka	E
61	Belagola	SWR	BLGA	MYS	Karnataka	E
62	Bommagundanakere	SWR	BOMN	MYS	Karnataka	E
63	Chalgeri	SWR	CLI	MYS	Karnataka	E
64	Challakere	SWR	CHKE	MYS	Karnataka	E
65	Devanur	SWR	VNR	MYS	Karnataka	E
66	Devaragudda	SWR	DAD	MYS	Karnataka	E
67	Donigal *	SWR	DOGL	MYS	Karnataka	E
68	Gubbi	SWR	GBB	MYS	Karnataka	E
69	Gudigeri	SWR	GDI	MYS	Karnataka	E
70	Habbanghatta	SWR	HHT	MYS	Karnataka	E
71	Holalkere	SWR	HLK	MYS	Karnataka	E
72	Honnavalli Road	SWR	HVL	MYS	Karnataka	E
73	Hosa Agrahara	SWR	HAH	MYS	Karnataka	E
74	Hosadurga Road	SWR	HSD	MYS	Karnataka	E
75	Kadagaravalli	SWR	KVGL	MYS	Karnataka	E
76	Kadakola	SWR	KDO	MYS	Karnataka	E
77	Karajgi	SWR	KJG	MYS	Karnataka	E
78	Kardi	SWR	RDI	MYS	Karnataka	E
79	Kodaganur	SWR	KAG	MYS	Karnataka	E
80	Kumsi #	SWR	KMSI	MYS	Karnataka	F
81	Kundagol	SWR	KNO	MYS	Karnataka	E

82	Mallasandra	SWR	MLSA	MYS	Karnataka	E
83	Mandagere	SWR	MGF	MYS	Karnataka	E
84	Masarahalli	SWR	MSS	MYS	Karnataka	E
85	Mavinakere	SWR	MVC	MYS	Karnataka	E
86	Mayakonda	SWR	MYK	MYS	Karnataka	E
87	Molakalmuru	SWR	MOMU	MYS	Karnataka	E
88	Nagavangala	SWR	NVF	MYS	Karnataka	E
89	Narimogaru	SWR	NRJ	MYS	Karnataka	E
90	Nittur	SWR	NTR	MYS	Karnataka	E
91	Ramagiri	SWR	RGI	MYS	Karnataka	E
92	Sagara Jambagaru	SWR	SRF	MYS	Karnataka	E
93	Sagarakatte	SWR	STE	MYS	Karnataka	E
94	Sakleshpur	SWR	SKLR	MYS	Karnataka	E
95	Sampige Road	SWR	SPGR	MYS	Karnataka	E
96	Sasalu	SWR	SLU	MYS	Karnataka	E
97	Saunshi	SWR	SNH	MYS	Karnataka	E
98	Savanur	SWR	SVNR	MYS	Karnataka	E
99	Shivani	SWR	SHV	MYS	Karnataka	E
100	Sirivagilu *	SWR	SVGL	MYS	Karnataka	E
101	Shivapura	SWR	SPV	MYS	Karnataka	E
102	Talaguppa	SWR	TLGP	MYS	Karnataka	E
103	Thalaku	SWR	THKU	MYS	Karnataka	E
104	Tholahunse	SWR	THN	MYS	Karnataka	E
105	Yedamangala	SWR	YDM	MYS	Karnataka	E
106	Yedakumeri *	SWR	YDK	MYS	Karnataka	E
107	Anekal Road	SWR	AEK	SBC	Karnataka	E
108	Basampalle	SWR	BSPL	SBC	Andhra	E
109	Bidadi	SWR	BID	SBC	Karnataka	E
110	Bisanattam	SWR	BSM	SBC	Karnataka	E
111	Byadarahalli	SWR	BDRL	SBC	Karnataka	E
112	Byatarayana Halli	SWR	BFW	SBC	Karnataka	E
113	Chakarlapalli	SWR	CPL	SBC	Andhra	E
114	Channasandra	SWR	CSDR	SBC	Karnataka	E
115	Chikballapur	SWR	CBP	SBC	Karnataka	E
116	Devanahalli	SWR	DHL	SBC	Karnataka	E
117	Devangonthi	SWR	DKN	SBC	Karnataka	E
118	Devarapalli	SWR	DPE	SBC	Karnataka	E
119	Doddaballapur	SWR	DBU	SBC	Karnataka	E
120	Dodbele	SWR	DBL	SBC	Karnataka	E
121	Golhalli	SWR	GHL	SBC	Karnataka	E
122	Gudupalli	SWR	GDP	SBC	Andhra	E

123	Hanakere	SWR	HNK	SBC	Karnataka	E
124	Hebbal	SWR	HEB	SBC	Karnataka	E
125	Heelalige	SWR	HLE	SBC	Karnataka	E
126	Hejjala	SWR	HJL	SBC	Karnataka	E
127	Hirehalli	SWR	HHL	SBC	Karnataka	E
128	Kamasamudram	SWR	KSM	SBC	Karnataka	E
129	Karuvalli	SWR	KVLR	SBC	Tamilnadu	E
130	Kelamangalam	SWR	KMLM	SBC	Tamilnadu	E
131	Kolar	SWR	KQZ	SBC	Karnataka	E
132	Kyatsandra	SWR	KIAT	SBC	Karnataka	E
133	Makkajipalli	SWR	MKJ	SBC	Andhra	E
134	Makalidurga	SWR	MKL	SBC	Karnataka	E
135	Marikuppam	SWR	MKM	SBC	Karnataka	E
136	Mulanur	SWR	MAR	SBC	Andhra	E
137	Naganahalli	SWR	NHY	SBC	Karnataka	E
138	Nagasamudram	SWR	NGM	SBC	Andhra	E
139	Narayanapuram	SWR	NRYP	SBC	Andhra	E
140	Nidvanda	SWR	NDV	SBC	Karnataka	E
141	Oddarahalli	SWR	ORH	SBC	Karnataka	E
142	Palakkodu	SWR	PCV	SBC	Tamilnadu	E
143	Peria naga thunai	SWR	PRNT	SBC	Tamilnadu	E
144	Putchur	SWR	PU	SBC	Tamilnadu	D
145	Rajanukunte	SWR	RNN	SBC	Karnataka	E
146	Rayakottai	SWR	RYC	SBC	Tamilnadu	E
147	Shettihalli	SWR	SET	SBC	Karnataka	E
148	Sivadi	SWR	SZV	SBC	Tamilnadu	E
149	Somanayakanpatti	SWR	SKPT	SBC	Tamilnadu	E
150	Someswara	SWR	SMWA	SBC	Karnataka	E
151	Thondebhavi	SWR	TDV	SBC	Karnataka	E
152	Toppur	SWR	TPP	SBC	Tamilnadu	E
153	Tyakal	SWR	TCL	SBC	Karnataka	E
154	Vidurashwatha	SWR	VWA	SBC	Karnataka	E
155	Yeliyur	SWR	Y	SBC	Karnataka	E
156	Amargol	SWR	AGL	UBL	Karnataka	E
157	Annigeri	SWR	NGR	UBL	Karnataka	E
158	Balaganur	SWR	BLR	UBL	Karnataka	E
159	Bannikoppa	SWR	BNA	UBL	Karnataka	E
160	Basavana Bagewadi Road.	SWR	BSRX	UBL	Karnataka	E
161	Bhanapur	SWR	BNP	UBL	Karnataka	E
162	Cansaulim	SWR	CSM	UBL	Goa	E
163	Castle Rock	SWR	CLR	UBL	Karnataka	E

164	Chandragoa	SWR	CNR	UBL	Goa	E
165	Chikodi Road	SWR	CKR	UBL	Karnataka	E
166	Chinchili	SWR	CNC	UBL	Karnataka	E
167	Daroji	SWR	DAJ	UBL	Karnataka	E
168	Desur	SWR	DUR	UBL	Karnataka	E
169	Devarayi	SWR	DEV	UBL	Karnataka	E
170	Gadiganur	SWR	GNR	UBL	Karnataka	E
171	Ginigera	SWR	GIN	UBL	Karnataka	E
172	Guledgudda Road	SWR	GED	UBL	Karnataka	E
173	Gunji	SWR	GNJ	UBL	Karnataka	E
174	Harlapur	SWR	RLP	UBL	Karnataka	E
175	Hebsur	SWR	HBS	UBL	Karnataka	E
176	Holealur	SWR	HLAR	UBL	Karnataka	E
177	Hombal	SWR	HBL	UBL	Karnataka	E
178	Hulkoti	SWR	LKT	UBL	Karnataka	E
179	Jadramakunti	SWR	JRKT	UBL	Karnataka	E
180	Jumnal	SWR	JML	UBL	Karnataka	E
181	Kalem	SWR	KM	UBL	Goa	E
182	Kambarganvi	SWR	KBI	UBL	Karnataka	E
183	Kanginhal	SWR	KGX	UBL	Karnataka	E
184	Khanapur	SWR	KNP	UBL	Karnataka	E
185	Kudatini	SWR	KDN	UBL	Karnataka	E
186	Kulem	SWR	QLM	UBL	Goa	E
187	Kusugal	SWR	KUG	UBL	Karnataka	E
188	Kyarkoppa	SWR	KRKP	UBL	Karnataka	E
189	Lachyan	SWR	LHN	UBL	Karnataka	E
190	Lakhmapur	SWR	LKY	UBL	Karnataka	E
191	Mallapur	SWR	MLP	UBL	Karnataka	E
192	Minchinal	SWR	MNL	UBL	Karnataka	E
193	Mugad	SWR	MGD	UBL	Karnataka	E
194	Mugalolli	SWR	MGL	UBL	Karnataka	E
195	Mulwad	SWR	MVD	UBL	Karnataka	E
196	Nagargali	SWR	NAG	UBL	Karnataka	E
197	Navalur	SWR	NVU	UBL	Karnataka	E
198	Nimbal	SWR	NBL	UBL	Karnataka	E
199	Obalapuram	SWR	OBM	UBL	Karnataka	E
200	Pachhapur	SWR	PCH	UBL	Karnataka	E
201	Sambre	SWR	SXB	UBL	Karnataka	E
202	Sankval	SWR	SKVL	UBL	Goa	E
203	Shedbal	SWR	SED	UBL	Karnataka	E
204	Shivanahalli	SWR	SVHE	UBL	Karnataka	E

205	Somalapuram	SWR	SLM	UBL	Karnataka	E
206	Sompur Road	SWR	SOQ	UBL	Karnataka	E
207	Suldhal	SWR	SUL	UBL	Karnataka	E
208	Sulebhavi	SWR	SBH	UBL	Karnataka	E
209	Tadwal	SWR	TVL	UBL	Karnataka	E
210	Tavargatti	SWR	TVG	UBL	Karnataka	E
211	Tinaighat	SWR	TGT	UBL	Karnataka	E
212	Unkal	SWR	UNK	UBL	Karnataka	E
213	Vijayanagar	SWR	VJR	UBL	Karnataka	E
214	Wandal	SWR	WDL	UBL	Karnataka	E

2.4.14 List of Stations for VSS implementation along with their RPF post and tentative number of cameras.

The work shall be carried out at following 14+214 Stations:

Hubballi Division (5+77) Stations, Bengaluru Division(5+70)Stations & Mysuru Division(4+67)Stations:

Sl No	RPF Post	Name of the Station	Stn Code	Category of station	Dome	Bullet	PTZ	4K UHD
				Hubli Division				
1		Vijayanagar	VJR	E	3	6	1	
2		Shedbal	SED	E	3	6	1	
3		Ugarkhurd	UGR	D	3	6	1	
4		Kudachi	KUD	D	3	6	1	
5		Chinchli	CNC	E	3	6	1	
6		Raybag	RBG	D	3	6	1	
7		Chikodi Road	CKR	E	3	6	1	
8		Ghatprabha	GPB	D	3	6	1	
9		Gokak Road	GKK	D	3	6	1	
10	PC BGM	Pachchapur	PCH	E	3	6	1	
11		Suldhal	SUL	E	3	6	1	
12		Sulebhavi	SBH	E	3	6	1	
13		Sambre	SXB	E	3	6	1	
14		Desur	DUR	E	3	6	1	
15		Khanapur	KNP	E	3	6	1	
16		Gunji	GNJ	E	3	6	1	
17		Londa	LD	B	7	28	3	4
18		Devarayi	DEV	E	3	6	1	
19		Tavargatti	TVG	E	3	6	1	
20		Nagargalli	NAG	E	3	6	1	
21		CastleRock	CLR	E	3	6	1	
22		Tinaighat	TGT	E	3	6	1	
23		Kulem	QLM	E	3	6	1	
24	PC VSG	Kalem	KM	E	3	6	1	
25		Sanvordem	SVM	D	3	6	1	
26		Chandargao	CNR	E	3	6	1	

27		Cansaulim	CSM	E	3	6	1	
28		Sankaval	SKVL	E	3	6	1	
29		Alnawar	LWR	D	3	6	1	
30		Kambarganvi	KBI	E	3	6	1	
31		Mugad	MGD	E	3	6	1	
32		Kyarkop	KRKP	E	3	6	1	
33		Dharwad	DWR	B	7	40	4	6
34		Navalur	NVU	E	3	6	1	
35		Unkal	UNK	E	3	6	1	
36	PC UBL	Kusagal	KUG	E	3	6	1	
37		Kundgol	KNO	E	3	6	1	
38		Saunshi	SNH	E	3	6	1	
39		Gudgeri	GDI	E	3	6	1	
40		Yalvigi	YLG	D	3	6	1	
41		Savanur	SVNR	E	3	6	1	
42		Karajgi	KJG	E	3	6	1	
43		Amargol	AGL	E	3	6	1	
44		Hebsur	HBS	E	3	6	1	
45		Annigeri	NGR	E	3	6	1	
46		Hulkoti	LKT	E	3	6	1	
47		Kanaginhal	KGX	E	3	6	1	
48		Harlapur	RLP	E	3	6	1	
49	PC GDG	Sompur Road	SOQ	E	3	6	1	
50		Bhanapur	BNP	E	3	6	1	
51		Bannikoppa	BNA	E	3	6	1	
52		Koppal	KBL	B	7	28	3	4
53		Ginigera	GIN	E	3	6	1	
54		Sisvinhalli	SVHE	E	3	6	1	
55		Munirabad	MRB	E	3	6	1	
56		Gadiganuru	GNR	E	3	6	1	
57		Toranagallu	TNGL	B	6	25	3	4
58	PC BAY	Daroji	DAJ	E	3	6	1	
59		Kudatini	KDN	E	3	6	1	
60		Obalapuram	OBM	E	3	6	1	
61		Somalapuram	SLM	E	3	6	1	
62		Rayadurg	RDG	E	3	6	1	
63		Hombal	HBL	E	3	6	1	
64		Balganur	BLR	D	3	6	1	
65		Mallapur	MLP	E	3	6	1	
66		Holealur	HLAR	E	3	6	1	
67		Lakhmapur	LKY	E	3	6	1	
68	PC BJP	Badami	BDM	E	3	6	1	
69		Guledagudda Road	GED	E	3	6	1	
70		Bagalkot	BGK	B	7	28	3	4
71		Mugalolli	MGL	D	3	6	1	
72		Jadarama Kunti	JRKT	E	3	6	1	

73		Almatti	LMT	D	3	6	1	
74		Wandal	WDL	E	3	6	1	
75		Basavana Bagewadi Road	BSRX	E	3	6	1	
76		Mulvad	MVD	D	3	6	1	
77		Jumnal	JML	E	3	6	1	
78		Minchnal	MNL	E	3	6	1	
79		Nimbal	NBL	E	3	6	1	
80		Indiroad	IDR	D	3	6	1	
81		Lachyan	LHN	E	3	6	1	
82		Tadval	TVL	E	3	6	1	
SBC Division								
1		Yeliyur	Y	E	3	6	1	
2		Mandya	MYA	B	6	28	3	4
3		Hanakere	HNK	E	3	6	1	
4		Maddur	MAD	D	3	6	1	
5	**PC MYA**	Settihalli	SET	E	3	6	1	
6		Channapatna	CPT	D	3	6	1	
7		Ramanagaram	RMGM	D	3	6	1	
8		Bidadi	BID	E	3	6	1	
9		Hejjal	HJL	E	3	6	1	
10		Nayandahalli	NYH	D	3	6	1	
11	**PC SBC**	Malleshwaram	MWM	D	3	6	1	
12		Channasandra	CSDR	E	3	6	1	
13		Golhalli	GHL	E	3	6	1	
14		Dodbele	DBL	E	3	6	1	
15		Chikbanawar	BAW	D	3	6	1	
16		Tumkur	TK	B	6	28	3	4
17		Nidvanda	NDV	E	3	6	1	
18		Hirehalli	HHL	E	3	6	1	
19		Kyatsandra	KIAT	E	3	6	1	
20		Mallasandra	MLSA	E	3	6	1	
21		Nittur	NTR	E	3	6	1	
22		Gubbi	GBB	E	3	6	1	
23		Sampige Road	SPGR	E	3	6	1	
24	**PC YPR**	Adihalli	ADHL	E	3	6	1	
25		Yelahanka	YNK	B	6	40	4	6
26		Devanahalli	DHL	E	3	6	1	
27		Chikballapur	CBP	E	3	6	1	
28		Rajankunti	RNN	E	3	6	1	
29		Dodballapur	DBU	D	3	6	1	
30		Oddarahalli	ORH	E	3	6	1	
31		Makalidurga	MKL	E	3	6	1	
32		Tondebhavi	TDV	E	3	6	1	
33		Someswara	SMWA	E	3	6	1	
34		Gouribidanur	GBD	E	3	6	1	

35		Viduraswatha	VWA	E	3	6	1	
36		Bengulur East	BNCE	D	3	6	1	
37		Whitefield	WFD	D	3	6	1	
38	PC BNC	Devangonthi	DKN	E	3	6	1	
39		Mallur	MLO	E	3	6	1	
40		Byatarayanahalli	BFW	E	3	6	1	
41		Tycal	TCL	E	3	6	1	
42		Kuppam	KPN	D	3	6	1	
43		Kamasamudram	KSM	D	3	6	1	
44		Bisanattam	BSM	D	3	6	1	
45		Gudupalli	GDP	E	3	6	1	
46		Mulanur	MAR	E	3	6	1	
47	PC-BWT	Patchur	PU	E	3	6	1	
48		Somanayakkanap atti	SKPT	E	3	6	1	
49		Champion	CHU	D	3	6	1	
50		Coromonal	COL	D	3	6	1	
51		Ooregaum	OGM	D	3	6	1	
52		Marikuppam	MKM	E	3	6	1	
53		Baiyyappanahalli	BYPL	D	3	6	1	
54		Hebbal	HEB	E	3	6	1	
55	PC-BYPL	Anekal	AEK	E	3	6	1	
56		Heelalige	HLE	E	3	6	1	
57		Karmelaram	CRLM	D	3	6	1	
58		Dharmapuri	DPJ	D	3	6	1	
59		Hosur	HSRA	B	6	28	3	4
60		Kelamangalam	KMLM	E	3	6	1	
61		Periyanagathunai	PRNT	E	3	6	1	
62		Royakkottai	RYC	E	3	6	1	
63	PC-DPJ	Palakkodu	PCV	E	3	6	1	
64		Sivadi	SZV	E	3	6	1	
65		Toppur	TPP	E	3	6	1	
66		Karuvalli	KVLR	E	3	6	1	
67		Kolar	KQZ	E	3	6	1	
68		Hindupur	HUP	B	6	25	3	4
69		Devarapalle	DPE	E	3	6	1	
70		Chakarlapalli	CPL	D	3	6	1	
71		Penukonda	PKD	E	3	6	1	
72	PC-HUP	Makkajipalli	MKJ	E	3	6	1	
73		Nagasamudram	NGM	E	3	6	1	
74		Basampalle	BSPL	E	3	6	1	
75		Narayanapura	NRYP	E	3	6	1	
			Mysuru Division					
1		Chamarajanagar	CMNR	D	3	6	1	
2	PC MYS	Nanjangud Town	NTW	D	3	6	1	
3		Kadakola	KDO	E	3	6	1	

4	PC DVG	Ashok puram	AP	E	3	6	1	
5		Naganahalli	NHY	D	3	6	1	
6		Srirangapatna	S	E	3	6	1	
7		Pandavapura	PANP	E	3	6	1	
8		Byadarahalli	BDRL	D	3	6	1	
9		Belagola	BLGA	D	3	6	1	
10		Sagarkatte	STE	E	3	6	1	
11		Krishnarajanagar	KRNR	E	3	6	1	
12		Hosaagrahara	HAH	E	3	6	1	
13		Akkihebbalu	AKK	E	3	6	1	
14		Mandagere	MGF	E	3	6	1	
15		Holenarsipur	HLN	E	3	6	1	
16		Mavinkare	MVC	E	3	6	1	
17		Chamarajapuram	CMJ	D	3	6	1	
18	PC HAS	Bageshpura	BGPA	D	3	6	1	
19		Habbanghatta	HHT	E	3	6	1	
20		Sakleshpur	SKLR	E	3	6	1	
21		Donigal	DOGL	E	3	6	1	
22		Kadagaravalli	KVGL	E	3	6	1	
23		Yedakumari	YDK	E	3	6	1	
24		Serivagal	SVGL	E	3	6	1	
25		Subramanya Road	SBHR	E	3	6	1	
26		Yedamangal	YDM	E	3	6	1	
27		Narimogaru	NRJ	E	3	6	1	
28		Kabakaputtur	KBPR	D	3	6	1	
29		Bantwal	BNTL	E	3	6	1	
30	PC ASK	Arsikere	ASK	B	6	28	3	4
31		Honnavalli Road	HVL	E	3	6	1	
32		Tiptur	TTR	D	3	6	1	
33		Kardi	RDI	E	3	6	1	
34		Banasandra	BSN	E	3	6	1	
35		Ammasandra	AMSA	E	3	6	1	
36		Banvara	BVR	E	3	6	1	
37		Devanur	VNR	E	3	6	1	
38		Ballikere	BLKR	E	3	6	1	
39		Kadur	DRU	D	3	6	1	
40		Nagavangala	NVF	E	3	6	1	
41		Ajjampur	AJP	E	3	6	1	
42	PC DVG	Shivni	SHV	E	3	6	1	
43		Hosadurga Road	HSD	E	3	6	1	
44		Ramagiri	RGI	E	3	6	1	
45		Holalkere	HLK	E	3	6	1	
46		Chikjajur	JRU	D	3	6	1	
47		Sasulu	SLU	E	3	6	1	
48		Mayakonda	MYK	E	3	6	1	

49		Kodaganur	KAG	E	3	6	1	
50		Tholahunse	THN	E	3	6	1	
51		Harihar	HRR	B	6	28	3	4
52		Chalgeri	CLI	E	3	6	1	
53		Ranibennur	RNR	E	3	6	1	
54		Devargudda	DAD	E	3	6	1	
55		Haveri	HVR	B	6	28	3	4
56		Byadagi	BYD	D	3	6	1	
57		Chtradurga	CTA	D	3	6	1	
58		Amaritpura	AMC	E	3	6	1	
59		Balenahalli	BAHI	E	3	6	1	
60		Chalkeri	CHKE	E	3	6	1	
61		Thalaku	THKU	E	3	6	1	
62		Bommagundanakere	BOMN	E	3	6	1	
63		Molakalmuru	MOMU	E	3	6	1	
64	PC SMET	Talguppe	TLGP	E	3	6	1	
65		Sagarajambagaru	SRF	E	3	6	1	
66		Anadpuram	ANF	E	3	6	1	
67		Kumsi	KMSI	E	3	6	1	
68		Bhadravathi	BDVT	B	6	28	3	4
69		Masarahalli	MSS	E	3	6	1	
70		Sivapura	SPV	E	3	6	1	
71		Tarekere	TKE	D	3	6	1	

The Engineer in-charge can change i.e add or delete or modify the location/station/Quantity/RPF Monitoring station, as per the Railway requirements while execution of the work.

2.4.15 General Parameters

- Implementation scheme for the Video Surveillance system will be RPF Thana/ Post Clustered based architecture as mentioned in RDSO specification no. RDSO/SPN/TC/65/2021 Rev 6.0 or latest will all amendments. For implementation of the proposed system, RPF Thana/ Post would be receiving video feeds from a group of stations based on jurisdiction of that respective RPF Thana/ Post through MPLS/ IP network for Video Management (Viewing and Monitoring) and Video Recording. Therefore, the bidder is required to propose a cluster based solution at RPF Thana/Post locations on the basis of following design parameters.

- TCCS as mentioned in the RDSO specification as per grouping of Station for the Boards

- IP MPLS as RDSO TAN as per Station coming under the Divisions

- Exchange as per Tec specification Main Exchanges will be connected to wayside Gateways.

Bidders are required to study the existing Infra deployed at many stations before planning their solution. Proposed solution to be integrated with existing IP Exchange,TCCS,VSS System deployed at Stations/Exchange. Bidders may use existing Servers, Storage at Stations/S & T Control Room/Exchange as per their solution and integrate present setup.

Following assumptions have been considered while calculating the SOQ. Quantities of following major items, however, same may vary during implementation:

SN	Item/Location	Assumptions
1)	**Cameras**	
i)	Identified Locations for PTZ Type Cameras	One for each Platform end and One for Parking Area/Taxi Stand
ii)	Identified Locations for Bullet Type Cameras	To cover Platform area and Foot Over Bridges
iii)	Identified Locations for Fixed Dome Type Cameras	Waiting Halls, Ticketing counters, Relay Room,SM Room etc.
iv)	Identified Locations for 4K UHD Bullet Type Camera	Each entry and Exit Gate of the Station.
2)	**RPF Thana/Post (Local monitoring Center)**	
i)	Location for Local Monitoring Center	Nearest RPF Thana of that Station (UBL-6,SBC-8 & MYS-5)
ii)	Number of PC workstation	2(one each for A&B and one for D & E Category stations)
iii)	Number of LFD Monitor	4(Two each for A&B and Two for D & E Category stations)
iv)	Number of PTZ Controller enabled Digital Keyboard	1
v)	Video Management and Recording Software as per Cameras	For all cameras installed in the stations with inbuilt Server storage at A & B Category stations.Network storage for cluster of D & E category stations at nearest RPF Thane and DC.
vi)	Video Analytic Software as per Cameras	For all cameras or as decided by the Railway at each of the RPF Thana with Redundancy Server at DC as per RDSO Specification.
vii)	Facial Recognition System Software as per Cameras	For each entry and exit points of A/B category Stations i.e. with 4K UHD Cameras. FRS licenses will support both online and offline mode (same licenses supplied for entry/exit cameras for online mode will be used for the remaining cameras at stations in offline mode).
viii)	Analytic Servers with Redundancy	For all the cameras or as decided by the Railway at each Stations of the RPF Thana with Redundancy Server at DC as per RDSO Specification
ix)	Facial Recognition Servers	For UHD cameras of A and B Category stations provided at Entry & exit of stations with FRS software installed at stations of the RPF Thana.
x)	External Storage Requirement	Storage for 30 days at A & B Category and 15 Days Storage at DC. Storage required at Division(UBL-6,SBC-8 & MYS-5)RPF Posts.
3)	**Divisional Monitoring Center**	
i)	Location for Divisional Monitoring Center	At Divisional Control Offices
ii)	Number of PC workstation	1
iii)	Video Wall 2X2 Matrix of 55''	1
iv)	Number of PTZ Controller enabled Digital Keyboard	1
4)	**Zonal Monitoring Center**	
i)	Location for Zonal Monitoring Center	At Zonal Control Office
ii)	Number of PC workstation	1
iii)	Video Wall 2X2 Matrix	1
iv)	Number of PTZ Controller enabled Digital Keyboard	1
5)	**DC-DR for VSS**	
i)	VMS Cum VA Server with Redundancy	All alerts, video on demand from RPF/ Thana/ Post VMS will be stored at this site. There will be no viewing at this level. Video Management cum Analytic server with 1:1 redundancy (HA mode) in Data center
ii)	FRS Server including DB with Redundancy	In Data Center

iii)	Storage Requirement	All processed alerts will be stored at the data center where 240 TB of storage has been envisaged in the RFP.And 15 days storage for all the cameras
6)	**Command Control Centre (CCC)**	Integration with existing VSS infra and installation of New VSS with provision of Workstation,LFD,Software and licences etc.
	IP MPLS	
7)	Label Edge Router(LER)	At all the way Side Stations
8)	Label Switching Router(LSR)	At Major/Junction Stations
	PC Workstation	At S&T Test Room
	NMS & EMS Hardware & Software	EMS will be installed at DC and DR for monitoring the network of IP MPLS & NMS for Equipment installed/ planned to be installed at Railway Stations,OFC Room,DC,DR,Office,Exchange etc. This centralized EMS will be common for all the stations under scope of work (including for existing infra).
	VoIP based TCCS	
10)	Communication Server in 1+1 Configuration	1+1 DC & one in DR
11)	Event Logger	One in each DC & DR Location
12)	TCCS Voice Logger	One in each DC & DR Location
13)	NMS for TCCS	One in each DC & DR Location
14)	SIP Control Phones	In all the Way Stations
15)	SIP Exchange Phones	In all the Way Stations SM Room and Offices.
16)	Emergency Gate Way	In all the Way Stations for Emergency Communication Circuit.
17)	Desktop & Portable Clients	For Maintenance and Supervisors staff of the Control office of Division.
18)	Mobile App for Event Logger	For Maintenance Staff of Divisions
	SIP Exchange	
19)	Call /Communication Server	Main Exchange at SBC & Intercom for DRM & GM of Division of UBL and MYS.And Augmentation of SBC DRM intercom to accommodate BNC Subscribers.
20)	Gateways 96/48/24/8 Ports	For Way Side Stations for providing analog Phone to Supervisors
21)	SIP Servers for Main Exchange	For Bengaluru Exchange
22)	SIP Server for DRM & GM intercom	For Hubballi & Mysuru
23)	NMS/Emergency console for SIP Exchange	For Hubballi,Bengaluru & Mysuru Exchanges
24)	SIP Phones	For all the officers

SN	Item/Location	Assumptions
9)	Switches	
i)	Layer 3 Switch	As per Field Requirement
ii)	Layer 2 Switch	As per Field Requirement
iii)	Aggregator Switch	As per Field Requirement
iv)	Field Switch	As per Field Requirement
10)	Next Generation Firewall	At Each DC
11)	Fire and Alarm Detection	At Each DC & DR
12)	Panic Switch	Two numbers at each Platform of Stations
13)	19" Smart Rack	3 Nos Rack For each Data Center
14)	19" 42U Server Rack	As per Field Requirement
15)	19" 42U Router Rack	As per Field Requirement
13)	19" 27U Router Rack	As per Field Requirement
14)	19" 9U Rack	As per Field Requirement
15)	19" 6U Rack	As per Field Requirement

16)	1KVA UPS	As per Field Requirement
17)	2KVA UPS	As per Field Requirement
18)	3 KVA UPS	For D & E Category Stations
19)	6 KVA UPS	For TCCS Servers
20)	2x 10KVA UPS	One Set of UPS for RPF Thana , DC & DR.
21)	48 Volt DC to AC Inverters	As per field requirements.
22)	12F FMS	As per Field Requirement
23)	24F FMS	As per Field Requirement
24)	AC Distribution Box	As per Field Requirement
25)	Diesel Generators	For DC & DR
26)	Furnitures	For RPF Thanes & Test Room
27)	Training	For maintenance & monitoring staff
28)	Man Power Support	1 Engineers for each Divisions during maintenance period
29)	Earthing and Surge Protection	As per field requirements.
30)	Transportations	As per field requirements

Note: Existing LAN Infra installed at Stations to be used by bidder as advised by Railway and integration to be done with existing Infra in consultation with Railway's engineer.