



**DRAFT SPECIFICATION  
FOR  
ACCIDENT SITE COMMUNICATION SYSTEM**

**SPECIFICATION No. RDSO/ SPN/ TC/55/2011  
Revision 2**

**TELECOM DIRECTORATE**

**RESEARCH DESIGNS AND STANDARDS ORGANISATION  
MINISTRY OF RAILWAYS MANAK NAGAR, LUCKNOW - 226001**

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<b>DOCUMENT DATA SHEET</b>
<b>SPECIFICATION</b>  <b>RDSO/SPN/TC/55/2011 Rev 2</b>
<b>TITLE OF DOCUMENT</b>  <b>DRAFT RDSO SPECIFICATION FOR ACCIDENT SITE COMMUNICATION SYSTEM.</b>
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<b>APPROVED BY</b>  <b>EXECUTIVE DIRECTOR/ TELECOM/ RDSO</b>
<b>ABSTRACT</b>  <b>THIS DOCUMENT SPECIFIES TECHNICAL SPECIFICATION OF ACCIDENT SITE COMMUNICATION SYSTEM.</b>

**DOCUMENT CONTROL SHEET**

NAME	ORGANIZATION	FUNCTION	LEVEL
DIRECTOR/TELECOM-III	RDSO	MEMBER	PREPARE
EXECUTIVE DIRECTOR / TELECOM	RDSO	-	APPROVE

**REVISIONS**

VERSION	REVISION	EFFECTIVE MONTH/YEAR
RDSO/SPN/TC/55-2005	FIRST ISSUE	NOV., 2005
RDSO/SPN/TC/55-2006	FIRST REVISION	AUGUST, 2006
RDSO/SPN/TC/55-2009, Rev. 0	SECOND REVISION	FEBRUARY, 2009
RDSO/SPN/TC/55-2009, Rev. 1	THIRD REVISION	FEBRUARY, 2009
RDSO/SPN/TC/55-2011, Rev.2	FOURTH REVISION	NOV., 2011

## I. SUMMARY

This document covers the requirements of communication system to be established at the site of accident/Unusual to enable transmission of Voice, data and video from site to control office/ other locations.

## II. SOURCE

- (i) Draft specification RDSO/SPN/TC/55/2005 was prepared by RDSO, Lucknow based on the experience gained by various Railways with the WLL exchange based accident site communication system.
- (ii) The specification has since been revised and now being revised based on the experience gained from the use of accident site equipment supplied for other than A route divisions.
- (iii) Whenever reference to any specification appears in this document, it shall be taken as a reference to the latest version of that specification unless the year of issue of the specification is specifically stated.

**1.0 Introduction:** Accident site communication system will cater for onsite wireless voice communication and also to provide voice, data and video connectivity of the accident site to Divisional HQ, Zonal HQ and Railway Board.

For video transmission a mesh Wi-Fi network will be created at the site and with video camera the video shall be wirelessly transmitted to the Multi service gateway.

The voice, data and video connectivity with remote locations will be provided through VSAT network. Indian Railways have established its own VSAT network including hub. Presently Indian Railways have hired bandwidth from transponder of INSAT-4CR (Ku Band) satellite. Hub for this VSAT network has been set at New Delhi by M/s Hughes. The network is in star topology.

The VSAT terminal to be used for Accident Site Communication shall be able to deliver bidirectional composite data traffic (Voice, Video and Data) at a speed of 2Mbps. However the actual working bandwidth may be limited in compliance of regulatory requirements.

The VSAT terminal will deliver the composite data traffic from site to the VSAT hub at New Delhi. From here the composite data traffic will be transported to Divisional HQ, Zonal HQ and Railway Board on existing MPLS network.

A video server shall be provided at New Delhi VSAT hub to enable web based access to live and stored videos.

**2.0 Schematic arrangement:** The general arrangement for the Accident site communication system is shown in Figure 1.

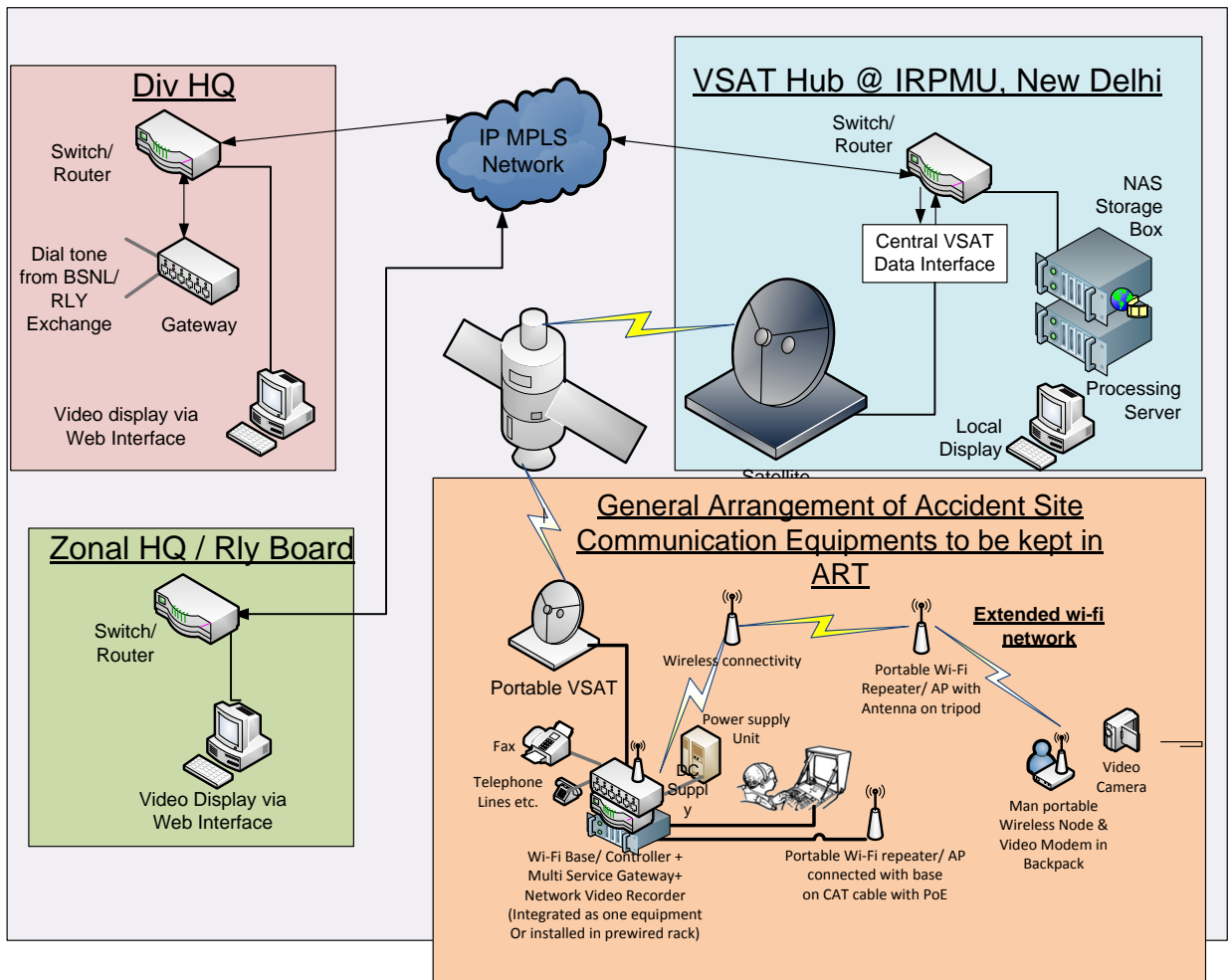


Figure 1: Complete Layout Diagram for Accident Site Communication System

**3.0 The system consists of following Components:**

**3.1 Equipments for accident site:**

- 3.1.1 Portable VSAT Terminal (Covered separately under RDSO specification No. RDSO/ SPN/ TC/85/2010, Revision 2)
- 3.1.2 Multi service Gateway with Network video recorder
- 3.1.3 Wi-Fi equipment to create wireless network at site.
- 3.1.4 Portable camera with inbuilt view finder and zoom facility.
- 3.1.5 Video modem with both Wi-Fi and Ethernet connectivity, in portable form factor
- 3.1.6 Power supply unit
- 3.1.7 Rugged laptop

- 3.1.8 Necessary cables
- 3.1.9 Fax machine
- 3.1.10 Analog telephones
- 3.2 Equipment at VSAT Hub
  - 3.2.1 Video server with storage
- 3.3 Equipments in Divisional HQ
  - 3.3.1 Multi service Gateway

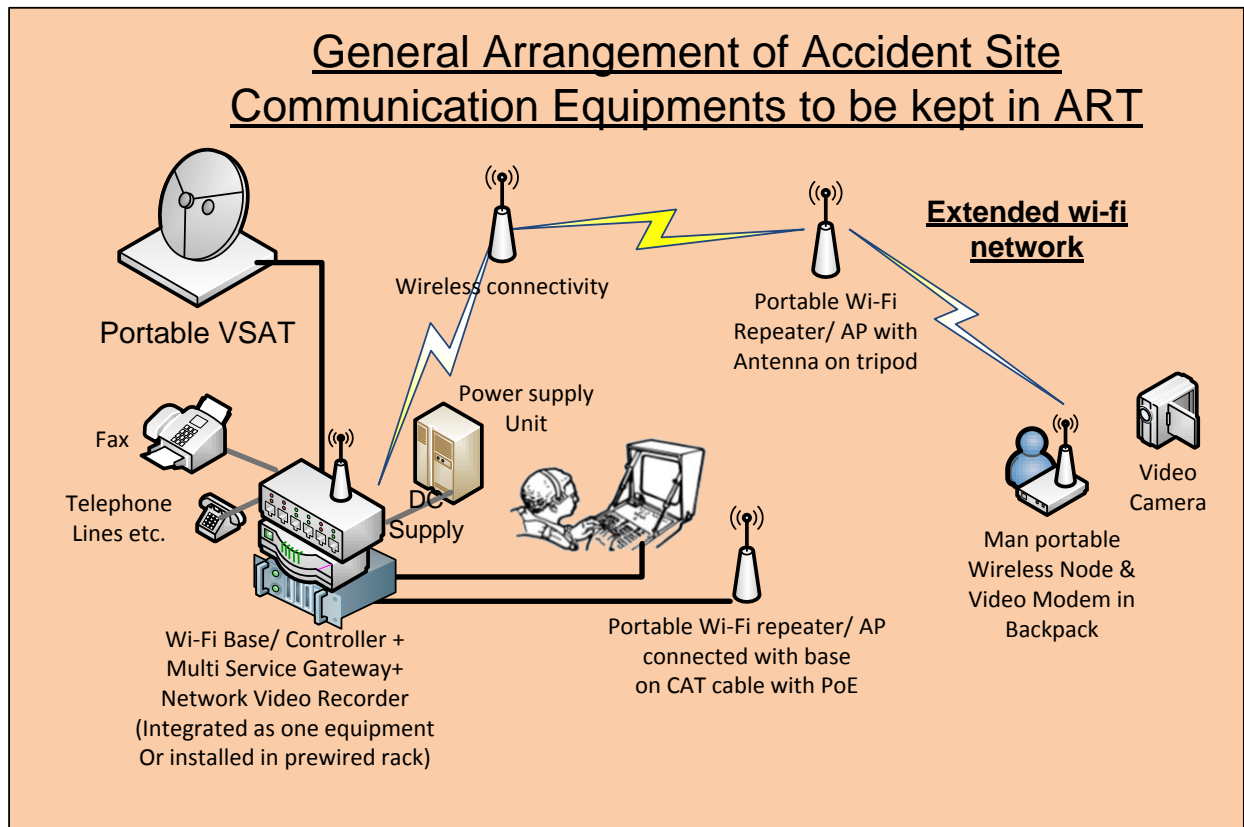
#### **4.0 General requirements:**

- 4.1 Multi service gateway shall enable
  - 4.1.1 Voice connectivity by providing FXS at site/ FXO at divisional HQ.
  - 4.1.2 IP connectivity for wireless units, laptop etc.
- 4.2 It shall be possible to extend dial tones of Railway Telephone exchange and Public (BSNL/ MTNL) telephone exchange from divisional head quarter to the site using FXS/ FXO interfaces on multi service gateways. It shall be possible to make and receive calls to and from subscriber of these exchanges. It shall also be possible to send and receive fax on the fax machine connected to FXS port at site.
- 4.3 Multi service gateways shall support hot line interfaces also. These interfaces shall provide hot line connection between the analog telephones provided at Divisional HQ and accident site. On this circuit, ring shall be extended just by lifting the handset. As a confirmation of ring, ring back tone shall also be provided.
- 4.4 Multiservice gateway shall have multiple Ethernet ports for connecting various devices on Ethernet ports on LAN side. These devices may be laptop, Wi-Fi base unit, Local network Video recorder (NVR), video modem etc.
- 4.5 Multiservice gateway's Ethernet WAN port shall provide connectivity to VSAT modem.
- 4.6 Multiservice gateway can be a single equipment or combination of router/ L3 Switch and IP PBX that can support FXS/FXO, subject to meeting the requirements of this documents.
- 4.7 Wi-Fi equipment shall setup wireless quickly and easily. It shall be possible to extend the coverage area by adding repeaters/ nodes/ access points.
- 4.8 The portable video camera with video modem and Wi-Fi network shall be compatible with each other. The live video and audio captured by the video camera shall be converted to suitable format and compressed by video modem and network video recorder unit either on Wi-Fi or on Ethernet. The video camera and video modem can be integrated also, provided the requirement of portability is met.

- 4.9 The live video/ audio feed from video modem and/ or IP camera can directly be given to the network video recorder through ports on Multi service gateway on CAT 6 cable in case the area to be covered is small and Wi-Fi network is not required to be set up.
- 4.10 The network video recorder shall stream the live video at a reduced resolution as per available bandwidth on satellite link to the video server provided at IRPMU Hub. The network video recorder shall also record video being streamed to the video server. This locally recorded video shall be in high resolution.
- 4.11 Laptop is provided at site for configuration purpose and to monitor the system performance.
- 4.12 The video transmitted from site shall be stored in the Video server with storage device provided at IRPMU hub. The video server shall allow viewing of live and recorded video and audio through internet browsers like internet explorer.
- 4.13 The video server at Hub shall allow recording and streaming of live video streams coming from multiple sites.
- 4.14 It shall be possible to access the internet using laptop connected on any of the Ethernet ports of the multiservice gateway or through wi-fi.
- 4.15 The system shall be plug and play and shall not require any configuration every time it is used. The configuration shall be done only during first deployment and backup for all the necessary configuration shall be taken for the purpose of restoration in case of need.
- 4.16 For equipments working on AC supply, the nominal frequency shall be 50 Hz. However they shall be capable of working on generator supply having frequency deviated from the nominal frequency.
- 4.17 All necessary software and hardware to achieve above functionality shall be part of the accident site communication system equipments even if it is not mentioned explicitly in this document.

## **5.0 Specification of Equipments at accident site.**

- 5.1 The general arrangement for accident site equipments is shown in Figure 2.



**Figure 2: General Arrangement at Accident Site**

**5.2 VSAT equipment:** It shall be as per relevant RDSO specification. All the other equipments covered in this specification shall be compatible with the VSAT terminal to provide the functionality as specified in Clause 4.0, General requirement, of this document.

**5.3 Multi Service gateway for accident site:**

- 5.3.1 It shall be fully interoperable with the Multi Service gateway provided at Divisional HQ.
- 5.3.2 It shall be IP based and shall support open protocols including SIP.
- 5.3.3 It should have fast Ethernet port connectivity either integrated or as standalone unit integrated within the enclosure and should have full IPV4 and IPV6 support with unicast and multicast switching and routing (for example, native support of IGMPv3). Also it should support advanced quality of services (QOS) to support critical applications like video transmission.
- 5.3.4 It must be modular in design with flexible configuration for easy extension of capacity by adding suitable module.
- 5.3.5 The system programming shall be based on GUI tool for easy configuration and also remote configuration with built in http server.



- 5.3.6 Requirements of interfaces on Multi service gateway:
- 5.3.6.1 Minimum 8 nos x Auto sensing duplex 10/100Mbps base TX Ethernet ports including minimum 4 nos x PoE port support. Out of these 8 ports, 2 ports to be WAN ports in case router is included as part of Multiservice gateway.
  - 5.3.6.2 It shall be possible to configure various devices i.e. Multi service gateway, Wi-Fi base station, video modem through laptop connected to one of these Ethernet ports.
  - 5.3.6.3 Laptop shall also be connected to the Ethernet port for browsing internet.
  - 5.3.6.4 FXS ports: 12 Numbers to connect 4 Railway telephones, 4 BSNL/ MTNL telephones and 4 hot lines. It shall be possible to configure these for hot line and auto telephones and to make 12 simultaneous calls.
  - 5.3.6.5 The numbering scheme for FXS/ FXO ports shall support working of Railway and BSNL/ MTNL phones with STD.
  - 5.3.6.6 Working of fax machine on FXS ports shall be supported. It shall be possible to send and receive fax on fax machine connected on FXS port.
  - 5.3.6.7 FXS port shall work for a loop resistance of 600 Ohms so as to enable working of telephones placed at a distance from the gateway and offering a loop resistance of maximum 600 ohms.
  - 5.3.6.8 It should be possible to deploy SIP Phones, Wireless IP Phones, Wi-Fi enabled smart phones in future in this platform in addition to analog phone which is used today
- 5.3.7 It shall support following protocols related to TCP/IP suit: IPv4, IPv6, TCP, UDP, RTP, RTCP, ICMP, HTTP, ARP, IGMP v3, NAT/PAT, NTP.
- 5.3.8 It shall support Ethernet, 802.1Q, 802.1p.
- 5.3.9 IP multicast support
- 5.3.10 QoS: Differentiated Services as per latest relevant RFC..
- 5.3.11 The systems/subsystems shall conform to EMC requirements as per IEC 61000 or equivalent EN or IEC 62236-4:2008- Part 4, CISPR 22 Class A or equivalent EN
- 5.3.12 It shall support various compression standards including ITU T G.711A law, G.729, G723.1 and iLBC.
- 5.3.13 It shall have features to ensure good quality voice using VoIP on satellite link, like echo cancellation, silence suppression, Voice Activity Detection (VAD) and Comfort Noise Generation (CNG)..
- 5.3.14 Multi-services gateway shall have either inbuilt or separate Network video recorder. If supplied as separate unit, it shall be supplied as prewired to the one of the 8 Ethernet ports and housed in a suitable rugged enclosure. This system shall be at least a two channel system and will be able to record

the video feed coming either from video modem or from IP camera or simultaneously from both. This feed shall come either on Wi-Fi or on Ethernet.

- 5.3.14.1 This Network video recorder must be capable of sending the same video feed in Low-resolution as per available bandwidth to the Video Server to be placed at IRPMU-New Delhi.
- 5.3.14.2 The resolution shall be programmable.
- 5.3.14.3 It shall be possible to view the video locally at site.
- 5.3.14.4 It shall also be possible to view live video through internet browsers like internet explorer.
- 5.3.14.5 The network video recorder shall also support management and recording of video feeds from major third party IP cameras and encoders and decoders. In case of IP camera it should be able to control PTZ cameras.
- 5.3.14.6 It shall support H.264, MPEG-4 and MJPEG.
- 5.3.14.7 It shall support Web Clients
- 5.3.14.8 It shall have sufficient Internal Storage and data protection.
- 5.3.14.9 It shall have Ethernet port for connection to multiservice gateway.
- 5.3.14.10 It shall be managed through Video Management Server or web interface.
- 5.3.14.11 It shall have Multicast support.
- 5.3.15 Power Supply for Multi service gateway:
  - 5.3.15.1 The multiservice gateway shall work as an integrated unit as far as power supply is concerned. It must work on both AC and DC power supplies.
  - 5.3.15.2 Power supply modules/ cards shall be field replaceable. Input AC supply voltage range: 100 V to 240 V Nominal freq. 50 Hz. Input DC supply voltage 12 V/ 24 V/ 48 V Nominal (range -10 % to +20%).
  - 5.3.15.3 It shall be possible to connect both AC and DC supplies to the equipment. DC supply shall take over in case of failure of AC supply.
  - 5.3.15.4 Cables for connecting AC and DC supplies with proper connectors at both ends shall be supplied. The cables shall have rugged connectors at both ends.
- 5.3.17 The Multiservice Gateway shall provide debug/ troubleshooting. This should allow basic troubleshooting for each equipment in the Multi Service Gateway either through a web-based UI accessible via laptop or through some other means. These should help field personnel in restoring the equipment to working condition from minor faults.

**5.4 Power Supply Unit for Accident site communication equipments:**

- 5.4.1 The power supply unit shall provide DC supply (12 V/ 24 V/ 48 V as required) to various accident site communication equipments. These are VSAT, multiservice gateway, network video recorder and Wi-Fi base station.
- 5.4.2 Its input AC supply range shall be 100 V to 275 VAC Freq 50 Hz nominal.
- 5.4.3 It shall have light weight Li-Ion batteries to provide a backup of at least 2 Hrs.
- 5.4.4 It shall have DC to DC converters to supply various DC voltage requires for communication systems i.e. VSAT equipment, multiservice gateway, network video recorder and Wi-Fi base station if all the systems are not working on same DC voltage.
- 5.4.5 It shall have all vital modules in 1+1 redundant mode. All DC to DC converters shall also have 1+1 redundancy.
- 5.4.6 It shall be able to work on float mode also thereby enabling charging while in use.
- 5.4.7 It shall have overvoltage protection on input side and overload and short circuit protection on output side.
- 5.4.8 It shall have indications to indicate healthy and faulty conditions of various modules.
- 5.4.9 It shall have sufficient protections on input and output side to make it suitable to work in 25 KV RE area and lightening prone areas.
- 5.4.10 It shall be of modular having various modules like charger, batteries, DC DC converters, protection modules, control cards etc. These modules shall be field replaceable.
- 5.4.11 It shall have rugged housing with rugged sockets and plugs complying IP 56 or or equivalent. The housing shall have good and smooth finish with no sharp edges and corners.
- 5.4.12 Necessary cables to connect various equipments shall be supplied with proper rugged connectors.

**5.5 Wireless Network at site:**

- 5.5.1 A wireless network shall be deployed at the accident site. This should be up and running, very quickly and should be self-supporting and scalable.
- 5.5.2 It shall be capable of working for long continuous hours. It shall be tested for continuous working for 48 hrs. There should not be any drop in performance for Video/ voice applications during this period.
- 5.5.3 One should be able to enhance benefit (in terms of increase in range or number of users) by adding of repeaters. The repeaters shall extend range

by connecting to other repeaters as well as provide coverage to nodes attached to it.

- 5.5.4 The network shall be capable of providing a route for live video streaming and any additional traffic owing to Wireless usage by registered laptop / smart phones with wi-fi for service personnel. The network shall support a data rate of minimum 2 Mbps in the specified range of 400 m..
  - 5.5.5 The network shall be secure. It shall support central configuration of management and security.
  - 5.5.6 The wireless network can make use of either a Wireless LAN controller or a Wireless LAN Mesh or Wireless Repeater or any such network topology. Wireless network topology implementation (including dual radios) can be vendor specific as long as the requirement of the wireless network is met.”IEEE 802.11b/g/n, IEEE 802.3u IEEE 802.1p (quality of service [QoS] priority), IEEE 802.1Q (VLAN), IEEE 802.11e (wireless QoS), IEEE 802.11i (security)
  - 5.5.7 Security: WEP/WPA/ WPA2, MAC address filtering
  - 5.5.8 Frequency 2.4 GHz/ 5.7-5.8 GHz ISM license free band.
- 5.6 **Wireless system components** : “The terms Central node/ Base station/ access point etc. can be used interchangeably depending upon a particular implementation/ technology employed by the vendor. Similarly the terms repeater/ wireless node/ wireless access point can be used interchangeably.”
- 5.6.1 **Base station/ Wireless controller/ Central node:**
    - 5.6.1.1 It shall be integrated with multiservice gateway.
    - 5.6.1.2 However if supplies as a separate unit, it shall be supplied housed in the enclosure with multiservice gateway and wired so that it is ready for use.
    - 5.6.1.3 In case of base station/ central node implementation, the base station/ central node shall have port to connect external antenna on a RF cable. The 3 meter long RF cable shall be supplied along with suitable connectors at both ends. In case of wireless controller implementation, one wireless access point shall be connected on fast Ethernet on CAT6 cable. Suitable antenna to provide EIRP of 36 dBm shall be provided. This arrangement shall provide wi-fi coverage near Multiservice gateway. This will enable availability of wi-fi network when Multi Service Gateway is powered on.”It shall support audio/video streaming from the video modem and/ or IP camera on Wi-Fi or cable.
    - 5.6.1.4 It shall also maintain a log of the, nodes, repeaters and MAC address of various devices accessing the network. The IP addressing shall be based on DHCP with addresses allocated by the base station.

- 5.6.1.5 The unit shall have web based user interface and can be controlled locally and remotely for its operation.
- 5.6.1.6 Should allow connection of authorized Wi-Fi devices like laptop, wireless access points, wireless video modem, IP camera, Wi-Fi phones etc. to be able to use the network. It should be able to prevent unauthorized access of rogue access points and user
- 5.6.1.7 Should do automatic channel and power setting for access points and repeaters
- 5.6.1.8 It shall show deployment of connected repeaters in the form of graph or otherwise.
- 5.6.1.9 Should support mobility of users/devices across the wi-fi network. There should not be any delay or drop in performance of video and voice during switchover.
- 5.6.1.10 RF power can be increased in combination with antenna to 36dBm EIRP
- 5.6.1.11 Range: 400 m for base station node (In line of sight) or between adjacent APs/ Repeater.
- 5.6.1.12 EMC: IEC 61000 or equivalent EN, CISPR 22 Class A or equivalent EN or EN 301 489-1 and FCC part 15.107, 15.109
- 5.6.1.13 It shall support connection of one repeater on CAT 6 cable on Ethernet port. This will enable placing two repeaters on either side of the track to ensure availability of network even if the other side is obstructed by the train. Similar arrangement shall be possible with wireless access point also. Power supply for this repeater/ access point shall be through PoE. In case of requirement of PoE+, adaptor to drive power over ethernet to be provided. This adaptor shall be suitable for outdoor use. The other antenna/ access point is covered in clause 5.6.1.3.”

#### 5.6.2 **Outdoor - Wireless Repeaters/ Wireless Access Points:**

- 5.6.2.1 These will be wireless, scalable interconnected nodes. These could be a mesh network or interconnected intelligent nodes which can route traffic to the base station with guaranteed QoS.
- 5.6.2.2 RF power can be increased to 36dBm EIRP Ad-Hoc or infrastructure mode.
- 5.6.2.3 Should support both Omni directional as well as directional antenna
- 5.6.2.4 Management: via http/ web user interface.
- 5.6.2.5 Each repeater/ wireless access point should be portable and self-sufficient having Li-Ion battery for ease in deployment and recovery.

- 5.6.2.6 Battery shall be of sufficient capacity to give backup of 5 Hrs.
- 5.6.2.7 Every equipment with battery should have one spare battery with equal capacity. External chargers shall be provided to charge extra batteries to enable replacement of discharged batteries at site.
- 5.6.2.8 EMC: IEC 61000 or equivalent EN, CISPR 22 Class A or equivalent EN or EN 301 489-1 and FCC part 15.107, 15.109.
- 5.6.2.9 Ingress protection for repeaters/ access points: IP 65 or equivalent

**5.6.3 Antenna & Portable Tripod specifications:**

- 5.6.3.1 Antennas shall be omni-directional / Sectoral to provide EIRP of upto 36 dBm in combination with Wi-Fi radio.
- 5.6.3.2 Antenna impedance 50 ohms.
- 5.6.3.3 Portable tripods shall be supplied with antennas/APs on which they shall be mounted.. The height of the tripod shall be adjustable so that the height could be increased to 8 ft. It shall be possible to reduce the height of tripod to enable easy storage occupying less space. The tripod shall be able to take load of antenna. The tripod shall have mounting arrangement for Wi-Fi radio and antenna. It shall be possible to use tripod on uneven ground also.
- 5.6.3.4 The length of the antenna should not be such that portability and physical stability is compromised. The arrangement shall be stable in windy conditions.
- 5.6.3.5 Suitable for outdoor use.

**5.6.4 Video Modem with Wi-Fi and battery :**

- 5.6.4.1 Video modem, outdoor Wi-Fi unit with suitable antenna and battery to be mounted in a backpack for transportability. The total weight shall not compromise portability on backpack. The backpack shall be rainwater proof. Video modem with built-in Wi-Fi features is preferable.
- 5.6.4.2 Battery shall be required for the video modem. It shall support continuous operation of video modem and Wi-Fi unit for at least 3 Hrs. There shall be indication for fully charged status of the battery. Also audio and visual indication regarding discharged condition of the battery shall be provided.
- 5.6.4.3 Battery charger for this battery should work on 100 to 240 VAC 50 Hz nominal frequency.
- 5.6.4.4 There shall be 2 sets of spare batteries with offline charger.

5.6.4.5 The Wi-Fi radio along with antenna shall be capable of providing EIRP of 30dBm. The antenna height may be adjustable by suitable arrangement to achieve maximum height to realize better gain. It shall be IP 65 or equivalent compliant.

5.6.4.6 The Wi-fi radio shall seamlessly work with the wireless network created at site using access points/ repeaters provided in this specification..

5.6.4.7 Connectivity between video modem and multiservice gateway shall be provided through cable also in addition to wifi connectivity. Suitable cable of length 90 meters with suitable rugged connectors shall be provided.

**5.6.4.8 Video Modem specification:**

5.6.4.8.1 Compression: H.264 / MPEG-4

5.6.4.8.2 Video Resolution: 640/480, 320/240, 160/120

5.6.4.8.3 Video Frame Rate: 5-30fps

5.6.4.8.4 Video bitrate: 200 kbps to 1 Mbps

5.6.4.8.5 Network protocols: RTP, UDP, TCP, IP, HTTP, IGMP, ICMP, SNMP, DHCP, NTP

5.6.4.8.6 Software upgrade: Flash ROM, Remote Programmable

5.6.4.8.7 Configuration: Web based.

5.6.4.8.8 Video Input: Analog Composite PAL and should be compatible with the Video camera. Necessary cables and adaptors should be provided.

5.6.4.8.9 Audio In: Compatible with the video camera.

5.6.4.8.10 Overlay: Time stamp and text description

5.6.4.8.11 Ethernet port: 10/100 BaseT Fast Ethernet, Auto Sensing. full Duplex RJ45

5.6.4.8.12 IP Multicast support

5.6.4.8.13 EMC: IEC 61000 or equivalent EN, CISPR 22 Class A or equivalent EN.

5.6.4.9 Ingress protection for video modem and wi fi unit: IP 65 or equivalent.

**5.6.5 Camera specification/ features:** Camera shall have following parameters.

5.6.5.1 HD Video Codec: MPEG4-AVC/H.264

5.6.5.2 SD Video Codec: MPEG2 or better.

5.6.5.3 Media Storage Capacity: Atleast 64 GB

5.6.5.4 Image Sensor: CMOS Sensor

5.6.5.5 Colour Viewfinder: Rotatable

5.6.5.6 Optical / Digital Zoom: 25x / 300x

5.6.5.7 USB Terminal: USB 2.0 High Speed

- 5.6.5.8 Interface: A/V compatible with video modem.
- 5.6.5.9 Image Stabilization
- 5.6.5.10 Quick Autofocus
- 5.6.5.11 Quick Startup feature enabling camera on and camera off by opening and closing of view finder panel.
- 5.6.5.12 Accessories: AC adaptor, two additional rechargeable Battery Packs, external charger, Component Video Cable, AV Cable, USB Cable, carrying case, tripod with adjustable height and weight less than 1.5 kg. The accessories shall be those which are offered by OEM of the camera.

5.6.6 **Rugged Laptop:** Minor variation from the parameters given below shall be acceptable. The following are minimum requirement, however if higher parameters are required for satisfactory functioning (like configuration, provisioning etc.) at site with respect to various equipments supplied, the same shall be supplied.

- 5.6.6.1 The laptop shall be suitable for various configuration required to be done. It may also be used for viewing and recording live video stream being transmitted to the video server. It shall be loaded with necessary software. One set of DVDs containing all the software loaded in laptop shall be provided for recovery purpose.
- 5.6.6.2 The laptop shall be of reputed band like Dell, Toshiba, HP, Panasonic, Sony etc. It shall have following minimum configuration: Processor: Intel core i3, Operating system: Windows 7 Professional 32 bit, , Memory 4.0 GB DDR3 SDRAM, HDD: 250 GB, Optical device: 8xDVD RW, wireless LAN, with carrying handle, carrying case, AC adapter, Interfaces: USB, Network 10/100 base T RJ 45, Li-Ion batteries, Video card: as required for various configurations and video applications in this spec.
- 5.6.6.3 The laptop shall be semi rugged with following features.
  - 5.6.6.3.1 Tough outer casing
  - 5.6.6.3.2 Water Resistant Keyboard
  - 5.6.6.3.3 Sunlight Readable LCD Screen
  - 5.6.6.3.4 Shock-mounted Removable HDD
  - 5.6.6.3.5 Vibration, Drop and Shock Resistant Build
  - 5.6.6.3.6 Storage : -15 to 70 °C
  - 5.6.6.3.7 Humidity 5% to 95 % non condensing.
- 5.6.6.4 The compliance of above shall be as per international standards.



5.7 **CAT 6 Cable:** CAT 6 cable wherever required shall be supplied from reputed manufacturer. The cables shall conform to ANSI/TIA/EIA-568-B.2-10.

## 6.0 Divisional HQ equipments:

### 6.1 Multi Service gateway for Divisional HQ:

- 6.1.1 It shall be fully compatible with the Multi Service gateway provided at Accident site.
- 6.1.2 It shall be IP based and shall support open protocols including SIP.
- 6.1.3 It should have fast Ethernet port connectivity either integrated or as standalone unit integrated within the enclosure and should have full IPV4 and IPV6 support with unicast and multicast switching and routing (for example, native support of IGMPv3). Also it should support advanced quality of services (QoS) to support critical applications like live video streaming
- 6.1.4 It must be modular in design with flexible configuration for easy extension of capacity by adding suitable module.
- 6.1.5 The system programming shall be based on GUI tool for easy configuration and also remote configuration with built in http server.
- 6.1.6 The unit shall be 19” rack mountable.
- 6.1.7 It shall have the following interfaces:
  - 6.1.7.1 Auto sensing duplex 10/100Mbps base TX Ethernet ports with PoE support: Minimum 4 Numbers. Out of these ports, 2 ports shall be WAN ports if router is included as part of Multi service gateway.
  - 6.1.7.2 FXO ports: 12 Numbers to connect 4 Railway telephones, 4 BSNL/ MTNL telephones and 4 hot lines. It shall be possible to configure these for hot line and auto telephones.
  - 6.1.7.3 The numbering scheme for FXS/ FXO ports shall support working of Railway and BSNL/ MTNL phones with STD.
  - 6.1.7.4 It should be possible to deploy SIP Phones, Wireless IP Phones, Wi-Fi enabled smart phones in future in this platform as an alternate to analog phone which is used today
- 6.1.8 Power Supply:
  - 6.1.8.1 Redundant power supply for critical component like L3 switch/ router.
  - 6.1.8.2 Working on DC supply in the range : (-) 48 V DC nominal (range -10% to + 20%)
- 6.1.9 It shall support following protocols related to TCP/IP suit: IPv4, IPv 6, TCP, UDP, RTP,RTCP, ICMP, HTTP, ARP, OSPF, IGMP v3, NAT/PAT, NTP
- 6.1.10 It shall support Ethernet, 802.1q, 802.1p.
- 6.1.11 QoS: Differentiated Services as per latest relevant RFC.

- 6.1.12 EMC: IEC 61000 or equivalent EN or IEC 62236-4:2008- Part 4, CISPR 22 Class A or equivalent EN .
- 6.1.13 It shall support various compression standards including ITU T G.711A law, G.729, G 723.1 and iLBC.
- 6.1.14 It shall have features to ensure good quality voice using VoIP on satellite link, like echo cancellation, silence suppression, Voice activity detection (VAD) and Comfort Noise Generation (CNG).
- 6.1.15 IP Multicast support

## **7.0 Equipment in VSAT Hub: Video server for video archival and Retrieval:**

- 7.1 All video streams transmitted from the accident site equipments, will be archived at a centralized server located at the VSAT hub at IRPMU. It shall provide a GUI for configuration, management and monitoring.
- 7.2 It shall record video from commonly used video codec/NVR/IP Cameras
- 7.3 The playback shall be on Window based/ Linux based/ Mac computers using web based interface
- 7.4 The centralized server will be a rack mounted server grade machine.
- 7.5 The server stores all streams with tagging for (a) source identifier of the video b) time-stamp of the video (c) location identifier of the video (d) any other parameter to classify/ease searching.
- 7.6 It shall be possible to view the live video streams in real time at divisional, zonal or Railway board using a browser and using any of the commonly available media player like window media player, VLC player etc.
- 7.7 It shall have live streaming and on-demand playback capabilities. Streaming capabilities: Live and on-demand streaming, up to 20 on demand and live viewers.
- 7.8 The server shall not require any manual intervention to start recording when any of the sites starts video streaming.
- 7.9 Advance Search tools: Searches for both exact matches and variants of the search form and returns results by relevance and date. Searches titles, tags and descriptions.
- 7.10 User access control: Security-based profiles include administrator and authorised viewer.
- 7.11 Export video sequences to external storage.
- 7.12 It will also be possible to view old archived footage from the stored video using the identifiers from any location.
- 7.13 All video streams will be stored in a highly compressed H.264/MPEG4 format for efficient storage in terms of space and speed of access.
- 7.14 The storage will be done on a rack mounted Network Attached Storage box.
- 7.15 The media server should be configured such that whenever any of the remote video streaming unit gets activated and starts sending in data, the server should start storing its content without any active intervention. The entire process should

be automated. The nomenclature of recorded file names should follow a logical method and should support some form of tagging from the operator/supervisor to aid in file retrieval. The entire process should be documented clearly.

- 7.16 It shall allow monitoring and recording of at least 10 simultaneous video streams.
- 7.17 Also should support recording in lower resolution for the available bit rate like 400kbps, 270kbps, etc
- 7.18 Security: System administrator controls the number of client users and their access levels. Every client user shall be required a username and a password. Log system shall record the user location, log on time and the duration of communication.
- 7.19 Specification for NAS:
  - 7.19.1 The Network Attached Storage (NAS) box will contain multiple hard disks to store videos.
  - 7.19.2 The hard disks in the NAS will be hot-swappable (replaced without shutting down the system).
  - 7.19.3 The NAS will provide high availability and high reliability for the content storage. The hard disks will be configured in RAID 5/6 configuration to provide redundancy and protection against hard disk failures.
  - 7.19.4 The hardware RAID controller will also facilitate faster access to the data. Effective usable NAS storage capacity will be 2TB.
  - 7.19.5 A periodic backup facility in tape drive, DVD, or any similar format should be possible for long term storage.
  - 7.19.6 NAS server specification: These are minimum specification. However if the server software requires higher specification, the same shall be supplied.
    - 7.19.6.1 Processor Type: Xeon (55xx/56 xx)
    - 7.19.6.2 Processors : 2
    - 7.19.6.3 RAM: 8 GB DDR3
    - 7.19.6.4 Form factor: Rack mounted 2 U
    - 7.19.6.5 NIC: Dual Gigabit Ethernet.
    - 7.19.6.6 Power supply : Redundant
    - 7.19.6.7 Total storage: 6 x 2 TB
    - 7.19.6.8 Hardware RAID: RAID 5/6
    - 7.19.6.9 Drives supported: 6
- 7.20 Video server specification: These are minimum specification. However if the server software requires higher specification, the same shall be supplied.
  - 7.20.1 Processor: Intel Xeon 3400 series or better
  - 7.20.2 RAM : Upto 16 GB, DDR3 (1333 MHz)
  - 7.20.3 Form factor: Rack Mounted.
  - 7.20.4 NIC: Dual Gigabit Ethernet
  - 7.20.5 Internal capacity: Upto 4 TB

- 7.20.6 OS Support: Microsoft windows Server or Linux compatibility (with respect to Drivers, software)
- 7.20.7 Redundant power supply.
- 7.21 Rack for server and NAS: The rack shall be from a reputed manufacturer with following specifications given below.
  - 7.21.1 Basic Frame: Steel folded
  - 7.21.2 Construction: Welded
  - 7.21.3 Top & Bottom Cover: Bolted to Frame with Cable entry exit cut outs
  - 7.21.4 Front Door: Lockable Perforated steel Door
  - 7.21.5 Rear Door: Lockable Steel Door perforated
  - 7.21.6 19" Mounting Angle: Formed Steel
  - 7.21.7 Std. Equipment Mounting: DIN Std. 10 mm Sq. Slots
  - 7.21.8 Standard Finish: Powder coated
  - 7.21.9 Standard Colour: Grey & Off white OR Black
  - 7.21.10 Standard Mounting: Caster wheels (2 with Brake & 2 without Brake)
  - 7.21.11 Rack Standard: Conforms to DIN 41494/ IEC 60297 or equivalent standard
  - 7.21.12 Static Load 750 Kg with casters
  - 7.21.13 Size: Usable height 42U, Usable width 19", Usable depth 1100mm.
  - 7.21.14 Cable Management
  - 7.21.15 Any other arrangement required for proper fixing of NAS server and Video server shall be provided.
- 8.0** Specification for Rugged Enclosure for housing Multiservice gateway for accident site, Network video recorder, Wi-Fi base unit are as follows.
  - 8.1 The enclosure shall have suitable arrangement for connecting various cables as required at site. The enclosure shall be suitable for outdoor use after connecting these cables and provide Ingress protection as per IP 55 or NEMA 4. Any ports which are exposed to outside shall be provided with IP 65 connectors.
  - 8.2 Design of the enclosure shall be such that it shall not obstruct easy connection of power supply and other cables.
  - 8.3 It shall have good smooth finish with no sharp edges.
  - 8.4 Indications of various devices housed inside shall be clearly visible. Any transparent material used for such purpose shall be scratch proof.
  - 8.5 Only passive cooling methods to be used.
  - 8.6 Mounts should be shock and vibration absorbent.

**9.0** Specification for connecting cable connectors (like RJ 45): The connectors supplied shall be suitable for outdoor use and shall be able to take load of long cables as required in this specification. The connectors shall conform to IP 65 or equivalent.

**10.0 Environmental parameters:**

10.1 Accident site equipments (i.e. Multi Service gateway for accident site, Wi-Fi base station/ controller, repeaters/ access point, Network video recorder, video modem and power supply unit) shall be rugged for transport by train and suitable for outdoor use. They can also be ruggedized using appropriate enclosure.

10.2 The above mentioned accident site equipments shall meet following environmental parameters. These requirements can be met with or without use of special enclosures.

10.2.1 Operational temperature: 0 to 55°C

10.2.2 Operational Humidity Upto 95% Non condensing.

10.2.3 Storage temperature range : -15°C to 70°C

10.3 The equipment shall be tested for following parameters as per IS 9000 or any other international standards. (Alternatively the equipments can be supplied enclosed in a ruggedized enclosure. In that case the equipments shall be tested while they are housed in the enclosure)

10.3.1 Dry Heat Test

10.3.2 Cold test

10.3.3 Damp heat Test (Cyclic): upper temp 40°C Humidity 95%

10.3.4 Damp heat test (steady state storage): 40°C Humidity 95%

10.3.5 Dust test:

10.3.6 Driving rain test:

10.3.7 Bump test (For clause 14.2 only): The equipment in packed condition inside containers shall be subject to bump test for 1000 Bumps, peak acceleration 40m/s<sup>2</sup>, pulse duration 6 ms, no of axes 3

10.3.8 Vibration Test: Amplitude ± 6 mm, constant displacement or 15m/Sec.2 constant acceleration. No. of axes 3, No of sweep cycle 20, Total duration 105 min.

10.4 The multiservice gateway for divisional HQ shall be suitable for working in temperature range of 0 to 40°C

**11.0 TESTS AND PERFORMANCE OF REQUIREMENT :**

11.1 The System Provider shall submit detailed brochures/ user manuals/ test certificates of various equipments proposed to be used, covering the parameters as given in Functional Requirements, Technical Requirements, Climatic Requirements, Vibration & Shock Requirements and EMI & EMC requirements of this specification.

- 11.2 In case Purchaser so desire any other test on the equipment shall be conducted by System Provider in presence of Purchaser's Representative to ascertain conformance.
- 11.3 At-least one equipment of each type should be tested for functional parameter by System Provider in presence of Purchaser's Representative. The tests shall be conducted as per Test Procedure proposed by manufacturer duly reviewed and approved by Purchaser.
- 11.4 The equipments tested as above shall be integrated to form one complete system by System Provider to demonstrate the workability of complete integrated system as an initial demonstration.
- 11.5 Once the workability of system has been proved as above, further supplies can be made by System Provider in consultation with Purchaser.

**12.0 INSTRUCTION BOOKS/MANUALS, MEASURING INSTRUMENTS & SPARES.**

- 12.1 System Provider shall submit following documents for each Sub-System/Module as supplied by Sub-System Provider/Manufacturer along-with each System. These documents shall be submitted in 2(two) Hard Copy and 1(one) CD.
  - 12.1.1 Operating Instruction Manual
  - 12.1.2 Maintenance & Troubleshooting
  - 12.1.3 Manual Technical Manual
- 12.2 System Provider shall submit complete details of the Test & Measuring Equipments required for Testing & Servicing to Purchaser.
- 12.3 System Provider shall submit a list of the recommended spares for a period of 5(five) years to Purchaser.

**13.0 Recommended supply list.** The following equipments which are covered in this specification shall make the recommended supply list for one system:

- 13.1 Multi service Gateway for accident site 1 No with 100 % spare power supply module/ cards for its various systems/ subsystems.
- 13.2 Wi-Fi equipment consisting of base unit/ wireless controller, antennas and repeaters:
  - 13.2.1 Base unit/ wired access point with wireless controller : 1 No with antenna.
  - 13.2.2 Repeater / wireless access point: 3 Numbers with antennas, batteries for repeaters/ wireless access point: 6 Nos, Battery charger 3 Nos.
  - 13.2.3 Tripods for mounting antenna and repeater/ access points: 4 Nos.
  - 13.2.4 CAT cable: CAT 6 cable with RJ 45 connectors at both ends 45 meters length for connecting base with one of the repeaters/ access point.
  - 13.2.5 RF cable 3 meter long with suitable rugged connectors at both ends for connecting one of the antenna to the base unit.
- 13.3 Portable camera with view finder and zoom facility: 1 No along with all the accessories as mentioned in this specification.
- 13.4 Video modem with both Wi-Fi and cable connectivity, in portable form: One set consisting of
  - 13.4.1 Video modem with Wi-Fi radio and collapsible antenna: 1No.
  - 13.4.2 Battery for video modem: 3 No, Charger for Battery: 1 No.
  - 13.4.3 Backpack (water proof) suitable for keeping video modem and battery: 1 No.

- 13.4.4 CAT cable: CAT 6 cable with rugged RJ 45 connectors at both ends 90 meters length for connecting video modem with multiservice gateway.
- 13.5 Rugged laptop: 1No
- 13.6 Power supply unit: 1 No.
- 13.7 Multi service Gateway for divisional head quarter. 1 No.
- 13.8 Equipment at VSAT Hub - Video server with storage : Total 1 No. This equipment shall be centralized equipment for all the field equipment irrespective of the number of systems procured.

**14.0 Containers for equipments:**

- 14.1 Suitable containers shall be supplied for keeping these equipments.
- 14.2 These containers shall protect the equipments from bumps during transport. The containers shall be tested as per clause 10.3.7.

**END OF DOCUMENT**