ITI LIMITED
Regd. & Corporate Office, ITI Bhavan,
Doorvaninagar, Bangalore - 560016

**CORRIGENDUM-10**

Ref: CRP20E001 06-08-2020

**Sub: Selection of an Experienced IT-Networking Partner for IT Infrastructure Implementation for ERP and other Future Digital Initiatives at NMDC Locations**

| Sl.No | Description | Existing | Revised |
|---|---|---|---|
| 1 | **Tender Submission date** | 07.08.2020 1200 HRS | 18.08.2020 1200 HRS |
| 2 | **Tender Opening date** | 07.08.2020 1500 HRS | 18.08.2020 1500 HRS |
| 3 | **Receipt of EMD at ITI** | Before 18.07.2020 1200 HRS | Before 17.08.2020 1730 HRS |
| 4 | **RFP – Annexure-II Technical Specifications *(Page No.8)*** | Technical Specifications | Revised Technical Specifications<br><br>*(Revised_Annexure_II_(B)_Technical Specifications.pdf uploaded on e-procurement portal)* |
| 5 | **RFP - Annexure-XII - Details of MAF Required *(Page No.53)*** | Details of MAF Required | Revised Details of MAF Required<br><br>*(Revised_MAF_List.xlsx uploaded on e-procurement portal)* |
| 6 | **RFP – Clause No.2 Eligibility Criteria *(Page No.8) & Annexure-XIII (Page No.54)*** | Nil | (m) Make and Models quoted by prospective bidders should meet specific criteria of performance, reliability as well as ruggedness as per spec in the RFP and ERP solutions of comparable size running on SAP HANA software should be running on these models in other organisations as detailed by NMDC. Customers References, PO copies and satisfactory completion certificates from end user to be provided The data sheet along with compliance to NMDC specification to be provided along with the bid<br><br>*(RevisedComplianceStatement.xls uploaded on e-procurement portal)* |
| | Please visit www.tenderwizard.com/ITILIMITED for further details. | | |

All other terms and conditions of the Tender Enquiry No. CRP20E001/1 dated 20-05-2020 stands un-altered.

Thanking you,

Yours faithfully
For ITI Limited

Dy. General Manager (MM) & CPIO

# Annexure – II (B): BoQ and Technical Specifications (Revised as on 06-08-2020)

# A. Bill of Quantity

## 1.1. DC & DR Hardware

| Sl. No. | DC Hardware Description | Qty | Technical Specs Page No. |
|---|---|---|---|
| 1 | SAP HANA Appliance S/4 – 3 TB | 2 | 15, 16-18 |
| 2 | SAP HANA Appliance SRM – 1.5 TB | 2 | 15, 16-18 |
| 3 | SAP HANA Appliance BW – 1.5 TB | 2 | 15, 16-18 |
| 4 | SAP HANA Appliance for Dev – 768 GB | 1 | 16-18 |
| 5 | SAP HANA Appliance for Quality - 3 TB | 1 | 16-18 |
| 6 | OS Cluster software | As applicable | 17 |
| 7 | Blade Enclosure (as per OEM solution for 24 blades) | As applicable | 18-21 |
| 8 | Blades for Application Servers - SAP Environment | 10 | 21-28 |
| 9 | Blades for ADS, Mail, Backup & Misc Servers | 4 | 23-28 |
| 10 | Blades for EMS Servers in HA 2+2 | 4 | 22-28 |
| 11 | SAN Storage | 1 | 28-31 |
| 12 | SAN Switches | 2 | 35-38 |
| 13 | Backup Device with Backup SW for disk backup | 1 | 31-35 |
| 14 | Tape Library with backup SW | 1 | 33-34 |
| 15 | Data Centre Core Switches | 2 | 38-39 |
| 16 | ToR Switch 24 SFP+ for DC | 4 | 39-41 |
| 17 | 1G Copper Switch for SAP HANA Backup – 24 ports | 1 | 44-46 |
| 18 | 1G copper switch for Management – 48 ports | 2 | 41-44 |
| 19 | Blades for Legacy Servers | 6 | 23-28 |

| Sl. No. | DR Hardware Description | Qty | Technical Specs Page No. |
|---|---|---|---|
| 1 | SAP HANA Appliance DB – 3 TB | 1 | 15, 16-18 |
| 2 | SAP HANA Appliance SRM – 1.5 TB | 1 | 15, 16-18 |
| 3 | SAP HANA Appliance BW – 1.5 TB | 1 | 15, 16-18 |

| | | | |
|---|---|---|---|
| 4 | Blade Enclosure (as per OEM solution for 7 blades) | As applicable | 18-21 |
| 5 | Blades for Application Servers - SAP Environment | 5 | 21-28 |
| 6 | Blades for ADS, Mail, Backup & Misc Servers | 2 | 23-28 |
| 7 | SAN Storage | 1 | 28-31 |
| 8 | SAN Switches | 2 | 35-38 |
| 9 | Backup Device with Backup SW for disk backup | 1 | 31-35 |
| 10 | Core Switches | 1 | 38-39 |
| 11 | ToR Switch for DR - 24 SFP+ | 2 | 39-41 |
| 12 | 1G copper switch for Management – 48 ports | 1 | 41-44 |

| Sl. No. | Local Server Hardware | Qty | Technical Specs Page No. |
|---|---|---|---|
| 1 | xMII Rack Servers | 6 | 46-50 |
| 2 | ADS, Antivirus & Patch Mgmt Servers (Rack servers) | 6 | 47-50 |

## 1.2. DC & DR Software

| Sl. No. | DC Software Description | Make & Model | Qty | Technical Specs Page No. |
|---|---|---|---|---|
| 1 | Operating System for App Servers | SUSE Linux for SAP 2Skt Unlimited Guest with HA | 10 | |
| 2 | OS for ADS, Mail, Backup & Misc Servers | WinSvr STD 2019 OLP Core Licenses | 4 | |
| 3 | OS for EMS Servers | WinSvr STD 2019 OLP Core Licenses | 4 | |
| 4 | Virtualization SW | VMWare vCentre Standard with 5 yrs | 1 | |
| 5 | | VMWare vSphere Enterprise Plus with 5 yrs | 48 | |
| 6 | OS for HQ & Plant Servers | WinSvr STD 2019 OLP Core Licenses | 3 | |
| 7 | OS for HQ & Plant Servers | SUSE Linux for SAP 2Skt Unlimited Guest OS | 3 | |

| | | | | |
|---|---|---|---|---|
| 8 | EMS | Enterprise management software | 1 | 50-56 |
| 9 | Microsoft Active Directory CAL licenses | Microsoft & Active Directory | 1000 | |

| Sl. No. | DR Software Description | Make & Model | Qty | Technical Specs Page No. |
|---|---|---|---|---|
| 1 | Operating System for App Servers | SUSE Linux for SAP 2Skt Unlimited Guest OS | 5 | |
| 2 | OS for ADS, Mail, Backup & Misc Servers | WinSvr STD 2019 OLP Core Licenses | 2 | |
| 3 | Virtualisation SW | VMWare vCentre Standard with 5 yrs | 1 | |
| 4 | | VMWare vSphere Enterprise Plus with 5 yrs | 14 | |

| Sl. No. | Local Server Software | Make & Model | Qty | Technical Specs Page No. |
|---|---|---|---|---|
| 1 | Operating System for xMII Servers | SUSE Linux for SAP 2Skt Unlimited Guest OS | 6 | |
| 2 | ADS, Antivirus & Patch Mgmt Servers operating system | Windows server 2019 standard operating system | 6 | |

## 1.3. Firewall

| Sl. No. | Network Components | UoM | Qty | Technical Specs Page No. |
|---|---|---|---|---|
| **WAN Network Interface**<br>**Firewalls: 5 Year Support** | | | | |
| 1 | Firewall – Type 1 | Nos. | 2 | 56-58 |
| 2 | Firewall – Type 2 | Nos. | 11 | 58-61 |
| 3 | Firewall – Type 3 | Nos. | 6 | 64-67 |
| 4 | Firewall – Type 4 | Nos. | 4 | 67-70 |

| | | | | |
|---|---|---|---|---|
| 5 | Firewall – Type 5 | Nos. | 20 | 70-73 |
| 6 | Firewall – Web Application Firewall | Nos. | 2 | 61-64 |
| 7 | Centralized Management, log and analysis license with 5 -year support. up to 100x firewall devices/administrative, supplied along with 5 years 24 x 7 support along with hardware appliance | Nos. | 1 | |
| 8 | Free of charge training to 20-people team of Network Engineers from NMDC to be provided by OEM at a centralized place covering all aspects of operations and maintenance of the Firewalls | Nos. | 1 | |

## 1.4. Switch, Indoor Wireless, NAC, EMS etc.

| Sl. No. | Network Components | UoM | Qty | Technical Specs Page No. |
|---|---|---|---|---|
| **Ethernet Switches and Access Points at NMDC Locations with 5 Year Support** | | | | |
| 1 | Core Switch - Type 1 | Nos. | 6 | 73-74 |
| 2 | Core Switch - Type 2 | Nos. | 1 | 74-76 |
| 3 | 10G-ER SM SFPs for distribution Switches to core Switches links | Nos. | 08 | |
| 4 | 10G-LR SM SFPs for distribution Switches to Access and Distribution Switches | Nos. | 64 | |
| 5 | Distribution Switch – Type 1 | Nos. | 7 | 76-77 |
| 6 | Distribution Switch – Type 2 | Nos. | 11 | 77-78 |
| 7 | 1G-LX SM SFPs for distribution Switches to Access Switches links | Nos. | 478 | |
| 8 | 10G-LR SM SFPs for distribution Switches to access Switches links | Nos. | 200 | |
| 9 | 1000BASE-T RJ45 SFP Transceiver | Nos. | 20 | |
| 10 | Access Switch – Type 1 | Nos. | 305 | 78-79 |

| | | | | |
|---|---|---|---|---|
| 11 | Access Switch (Industrial Grade) – Type 2 | Nos. | 153 | 79-80 |
| 12 | Access Point (Indoor) | Nos. | 300 | 81-82 |
| 13 | Wireless LAN Controller for Access Points, 5 year warranty & NBD support | Nos. | 10 | 82-84 |
| 14 | NAC licenses for switches and access points, 5 year warranty & NBD support | Nos. | 6 | 84-85 |
| 15 | OEM EMS for Integrated Monitoring of (Industrial, Access, Distribution and Core) Switches and Wireless Access Points, 5 year NBD support | Nos. | 6 | 86-88 |
| 16 | VM for installation of NAC and EMS - 4 CPU x86 cores, 64GB RAM, 500GB x 2 disks in failover RAID | Nos. | 6 | |
| 17 | Free of charge training to 20-people team of Network Engineers from NMDC to be provided by OEM at a centralized place covering all aspects of operations and maintenance of the Switches, APs, NAC, WLC, EMS | Nos. | 1 | |

## 1.5. WiFi

| Sl. No. | Network Components | UoM | Qty | Technical Specs Page No. |
|---|---|---|---|---|
| **Outdoor Wi-Fi Zone -** | | | | |
| | **At Dumper Platforms, PoL and Workshops** | | | |
| 1 | Outdoor (IP66 or better rated) 90~120 sector 802.11ac WLAN AP with Tilt bracket & PoE Injector, 5-year extended warranty to be included. AP with set of 2 antenna (for 240-degree coverage) to be included | Nos. | 58 | 88-90 |
| 2 | Supply & Installation of Tower / Pole, 5m, Galvanized steel, with grouting base and accessories with Lightning Arrestors | Nos. | 29 | |
| | **P2P Radio Links (for Workshop @ Bacheli)** | | | |

| | | | | |
|---|---|---|---|---|
| 1 | 5 GHz PTP Radio, Integrated High Gain Antenna (ROW) with power lead, 5-year extended warranty, IP66 or better rated | Nos. | 6 | |
| 2 | Coaxial Cable Grounding Kits for 1/4" and 3/8" Cable | Nos. | 12 | |
| 3 | LPU and Grounding Kit (1 kit per ODU) | Nos. | 6 | |
| 4 | POWER SUPPLY, 30W, 56V - Gbps support | Nos. | 6 | |
| 5 | Tilt Bracket Assembly | Nos. | 6 | |
| 6 | Supply & Installation of Tower / Pole, 15m, Galvanized steel, with grouting base and accessories with Lightning Arrestors | Nos. | 3 | |
| **Wi-Fi Zones and P2P links for mine coverage (Shovels, Dozers etc.) & weighbridges at KIOM** | | | | |
| | **Wi-Fi Zones** | | | |
| 1 | Outdoor (IP66 or better rated) 90~120 sector 802.11ac WLAN AP with Tilt bracket & PoE Injector, 5-year extended warranty to be included. AP with set of 2 antenna (for 240-degree coverage) to be included | Nos. | 84 | 88-90 |
| 2 | Supply & Installation of Tower / Pole, 5m, Galvanized steel, with grouting base and accessories with Lightning Arrestors | Nos. | 28 | |
| | **P2P Links** | | | |
| 1 | Coaxial Cable Grounding Kits for 1/4" and 3/8" Cable | Nos. | 92 | |
| 2 | LPU and Grounding Kit (1 kit per ODU) | Nos. | 46 | |
| 3 | 5 GHz PTP Radio, Integrated High Gain Antenna (ROW) with power lead, 5-year extended warranty, IP66 or better rated | Nos. | 46 | |
| 4 | POWER SUPPLY, 30W, 56V - Gbps support | Nos. | 46 | |
| 5 | Tilt Bracket Assembly | Nos. | 46 | |
| 6 | 1PPS GPS Sync generator | Nos. | 46 | |
| 7 | PoE Gigabit DC Injector, 15W Output at 30V, Energy Level 6 Supply | Nos. | 46 | |
| 8 | Supply & Installation of Tower / Pole, 15m, Galvanized steel, with grouting base and accessories (some will be mounted on Wi-Fi zone towers) | Nos. | 17 | |

| | | | | |
|---|---|---|---|---|
| 9 | Free of charge training to 20-people team of Network Engineers from NMDC to be provided by OEM at a centralized place covering all aspects of operations and maintenance of the Outdoor WAPs | Nos. | 1 | |
| **Point-to-Multipoint Radio for 5 network zones for Wi-Fi coverage (750m radius) at Weighbridges at KS-2 mines (for budgetary pricing only)** | | | | |
| 1 | PMP Radio, IP66 or better rated, 240-degrees coverage (may need 2 base stations if each unit provides only 120-degree coverage), with all accessories and 5-year extended warranty. | Nos. | 5 | |
| 2 | Remote radios for the PMP, 4 radios per zone, 240-degree coverage with all accessories and 5-year extended warranty | Nos. | 20 | |
| 3 | Supply & Installation of Tower / Pole, 5m, Galvanized steel, with grouting base and accessories, with Lightning arrestors | Nos. | 25 | |
| 4 | Supply & Installation of 15m Tower (3-legs), with all accessories for outdoor-Wi-fi AP installation, with Lightning arrestors | Nos. | 5 | |

## 1.6. Campus Backbone Cabling

| Sl. No. | Network Components | UoM | Qty | Technical Specs Page No. |
|---|---|---|---|---|
| **Campus Backbone Cabling** | | | | |
| 1 | 12-Core SM double jacketed Outdoor armoured cable | Meters | 189,500 | 91 |
| 2 | 6-Core SM double jacketed Outdoor armoured cable | Meters | 80,500 | 91 |
| 3 | 48-fiber 2U, rack mounted fiber optic patch panels, for terminating OSP cables, with fusion splice trays, fully loaded with Duplex-LC SM adapters and 48 numbers of LC SM pigtails (48 numbers per panel) | Nos. | 50 | 90-92 |

| | | | | |
|---|---|---|---|---|
| 4 | 24-fiber 1U rack mounted fiber optic patch panels, for terminating OSP cables, with fusion splice trays, fully loaded with Duplex-LC SM adapters and 24 numbers of LC SM pigtails (24 numbers per panel) | Nos. | 234 | 90-92 |
| 5 | LC-LC Duplex SM Patch Cords, 3 meter | Nos. | 626 | 91-92 |
| **Closed Steel Racks -** | | | | |
| 1 | 42U Racks as per specifications with vertical 2 PDUs, SNMP enabled (for Core Switches) | Nos. | 11 | 99-100 |
| 2 | 42U Racks as per specifications with vertical 2 PDUs, surge protected (for Distribution Switches) | Nos. | 21 | 99-100 |
| 3 | 24U Racks as per Specifications, with horizontal PDUs (IP Rated) | Nos. | 153 | 99-100 |
| 4 | 24U Racks as per Specifications, with horizontal PDUs only (Non-IP Rated) | Nos. | 227 | 99-100 |
| **Horizontal Cabling -** | | | | |
| 1 | 1U, 24-port Cat6A UTP Unloaded Jack Panel with rear Cable Support bar | Nos. | 9 | 94-95 |
| 2 | Cat6A UTP Patch Cord (7-feet) | Nos. | 462 | 93-94 |
| 3 | Cat6A UTP Information Outlet at DC Rack End | Nos. | 362 | 94 |
| 4 | 1-port Face Plate | Nos. | 161 | 98 |
| 5 | 45mm x 45mm Backbox | Nos. | 130 | |
| 6 | IP rated Backbox for Faceplates and Information Outlets | Nos. | 50 | |
| 7 | Cat6A UTP Cable | (305 Mtr.) Roll | 20 | 92-93 |
| 8 | Plugs for Modular Plug Terminated Links, for Wi-Fi APs and CCTV | Nos. | 275 | 95 |
| 9 | Cat6A UTP Information Outlet at End-User Rack End | Nos. | 100 | 94 |
| **Horizontal Cabling -** | | | | |
| 1 | 1U, 24-port Cat6 UTP Unloaded Jack Panel with rear Cable Support bar | Nos. | 234 | 97-98 |
| 2 | Cat6 UTP Patch Cord (7-feet) | Nos. | 5,600 | 96 |

| | | | | |
|---|---|---|---|---|
| 3 | Cat6 UTP Information Outlet at DC Rack-End | Nos. | 2,800 | 96-97 |
| 4 | 1-port Face Plate | Nos. | 1,401 | 98 |
| 5 | 45mm x 45mm Backbox | Nos. | 982 | |
| 6 | IP rated Backbox for Faceplates and Information Outlets | Nos. | 510 | |
| 7 | 1 Port Surface Mount Box | Nos. | 1,294 | 98 |
| 8 | Cat6 UTP Cable | (305 Mtr.) Roll | 472 | 95-96 |
| 9 | Cat6 UTP Information Outlet at End-User Rack-End | Nos. | 2,800 | 96-97 |
| **UPS** | | | | |
| 1 | Supply, Installation, Testing and Commissioning of 1 KVA UPS system (prefer 19' rack mountable unit) for Distribution and access Switches at Bacheli, Kirandul, Donimalai, Panna and Paloncha. 1KVA rating, SNMP manageable. Supply should include 30-minute battery back-up batteries of 65AH, 12V, SMF related electrical protection accessories and rack, 3-year on-site warranty and maintenance | Nos. | 259 | 101-105 |
| 2 | Supply, Installation, Testing and Commissioning of (N) 30KVA UPS System for Central Distributor to support core switches, Servers, WAN Optimizers, ILL load balancers, and other networking equipment along with 30-minutes battery back-up (about 40 batteries of 65AH, 12V, Lead Acid, SMF) along with Battery rack, MCB protection gear and all other accessories - Bacheli, Kirandul, Donimalai, Panna and Paloncha. UPS to be SNMP manageable. 30kVA rating. Supply should include 3-year on-site warranty and maintenance | Nos. | 5 | 105-109 |
| 3 | Supply & Installation of Grounding Pit and services- for servers and communication | Nos. | 14 | 101 |
| 4 | Supply & Installation of Lightning arrestors and grounding pit | Nos. | 14 | 101 |

## 1.7. OFC Laying

| Sl. No. | Network Components | UoM | Qty | Technical Specs Page No. |
|---|---|---|---|---|
| 1 | Installation (Trenching, cable pulling through HDPE pipes, Manholes every 2KMs or 2 right angle bends) Testing and Commissioning of Optical Fibre Links along with supply of ISI marked / TEC approved HDPE pipe | Meters | 270,000 | |
| 2 | Splicing & testing of OFC (Pigtails) | Nos. | 284 | |
| 3 | Installation of Racks, Earthing etc. | Nos. | 412 | |
| 4 | Installation, Testing, Commissioning and Certification of Horizontal Cable Links along with requisite Capping & Casing /PVC Conduits /HDPE Pipes | Nos. | 3,162 | |

## 1.8. Blank

## 1.9. One Time Charges for Co-location and Managed Services

| Sl. No. | Description | UoM | Qty | Technical Specs Page No. |
|---|---|---|---|---|
| 1 | Supply of 42 U, 800 mm x 1200 mm Server Rack. (DC-4, DR-2)<br>Supply of 42U, 800 mm x 1000 mm Server Rack (DC-6, DR-2) | Nos. | 14 | |
| 2 | **Powered On** Colocation Full Rack space. (6) KVA Rated with Bundled Power. (DC) | Nos. | 10 | |
| 3 | SS Cage with Biometric Access, CCTV Camera. | Lot | 1 | |
| 4 | **Powered On** Colocation Full Rack space. (6) KVA Rated with Bundled Power. (DR) | Nos. | 4 | |
| 5 | Copper Cross Connect Charges. Cat 6 | Nos. | 8 | |
| 6 | Seating Space in DC for OEM/ IP/ SI/ NMDC | Nos. | 1 | |
| 7 | **Colocation Managed Services** | Lumpsum | 1 | |

## 1.10. Colocation Services

| Sl. No. | Description | UoM | Qty | Technical Specs Page No. |
|---|---|---|---|---|
| 1 | Supply of 42 U, 800 mm x 1200 mm Server Rack. (DC-4, DR-2)<br>Supply of 42U, 800 mm x 1000 mm Server Rack (DC-6, DR-2) | Nos. | 14 | |
| 2 | **Powered On** Colocation Full Rack space. (6) KVA Rated with Bundled Power. (DC) | Nos. | 10 | |
| 3 | SS Cage with Biometric Access, CCTV Camera. | Lot | 1 | |
| 4 | **Powered On** Colocation Full Rack space. (6) KVA Rated with Bundled Power. (DR) | Nos. | 4 | |
| 5 | Copper Cross Connect Charges. Cat 6 | Nos. | 8 | |
| 6 | Seating Space in DC for OEM/ IP/ SI/ NMDC | Nos. | 1 | |

## 1.11. Managed Services

| Sl. No. | Description | UoM | Qty | Technical Specs Page No. |
|---|---|---|---|---|
| 1 | Colocation Managed Services | Lumpsum | 1 | 112-119 |

## 1.12. NOC

| Sl. No. | Network Components | Qty | UoM | Technical Specs Page No. |
|---|---|---|---|---|
| 1 | Desktop for NOC | 4 | Nos. | 119 |
| 2 | Console/Screen (LFD) for NOC room | 2 | Nos. | 119 |

**Note:** Seating arrangement to be provisioned by NMDC for 6 persons

## 1.13. BLANK

## 1.14. WAN - Bandwidth

| Sl. No. | Locations | MPLS | | | ILL | | Remarks |
|---|---|---|---|---|---|---|---|
| | | SP1 | SP2 | | SP1 | SP2 | |
| 1 | HQ | 50 | 50 | | 100 | 100 | |
| 2 | Kirandul | 50 | 50 | | 100 | 100 | |
| 3 | Bacheli | 50 | 50 | | 100 | 100 | |
| 4 | Donimalai | 50 | 50 | | 100 | 100 | |
| 5 | Panna | 10 | 10 | | 30 | 30 | |
| 6 | Paloncha | | | | 30 | | ADSL |
| 7 | Jagdalpur | 100 | 100 | | 50 | 50 | |
| 8 | R&D | | | | 30 | | ADSL |
| 9 | DC & DR | 100 | 100 | | | | |
| 10 | Kolkata | | | | 10 | | ADSL |
| 11 | Chennai | | | | 10 | | ADSL |
| 12 | Bhubaneshwar | | | | 10 | | ADSL |
| 13 | Raipur | 10 | 10 | | 10 | | ADSL |
| 14 | Vizag | 10 | 10 | | 10 | | ADSL |
| 15 | Delhi | 10 | 10 | | 10 | 10 | |
| 16 | Mumbai | | | | 10 | | ADSL |
| 17 | Bangalore | | | | 10 | | ADSL |
| 18 | DC | | | | 100 | | |

**Note:** Need for VSAT connectivity in case both the links goes down for any reason is to be considered for business continuity. MSP to provide unit price in case NMDC wishes to have this feature.

## B. Technical Specification

### 2.1. DC & DR Hardware

i) Hana Servers for DC & DR

*a) SAP S/4 HANA Prd Box*

| Sl. No. | Item | Description |
|---|---|---|
| 1 | **Make & Model** | |
| 2 | SAP HANA S/4 Prd Server | • SAP HANA Certified Appliance for >= 3TB<br>• Make & Model proposed should be available in the SAP HANA website.<br>• Document to be submitted along with the technical BOQ<br>• HANA Appliance should be fully factory configured |
| 3 | System | • SAP certified Single Node Scale-up HANA Box with latest Cascade lake CPU based server. |
| 4 | Processor | • 4 X Intel 8276 Platinum Processor, 28 Core, 2.2 Ghz |
| 5 | Memory | • 3 TB DDR4 RAM or more |
| 6 | Networking | • Minimum 8 X 10 Gbe Ethernet ports with SFP+ Modules for data and replication |

*b) SAP BW/4, SRM HANA Prd Boxes*

| Sl. No. | Item | Description |
|---|---|---|
| 1 | **Make & Model** | |
| 2 | SAP HANA BW & SRM Prd Server | • SAP HANA Certified Appliance for >= 1.5TB<br>• Make & Model proposed should be available in the SAP HANA website.<br>• Document to be submitted along with the technical BOQ<br>• HANA Appliance should be fully factory configured |
| 3 | System | • SAP certified Single Node Scale-up HANA Box with latest Cascade lake CPU based server. |
| 4 | Processor | • 2 X Intel 8276 Platinum Processor, 28 Core, 2.2 Ghz |
| 5 | Memory | • 1.5 TB DDR4 RAM or more |
| 6 | Networking | • Minimum 4 X 10 Gbe Ethernet ports with SFP+ Modules |

| | | |
|---|---|---|
| | | for data and replication |

*c) SAP HANA Quality Box*

| Sl. No. | Item | Description |
|---|---|---|
| 1 | **Make & Model** | |
| 2 | SAP HANA Quality Server in DC | • SAP HANA Certified Appliance for >= 3TB<br>• Make & Model proposed should be available in the SAP HANA website.<br>• Document to be submitted along with the technical BOQ<br>• HANA Appliance should be fully factory configured |
| 3 | System | • SAP certified Single Node Scale-up HANA Box with latest Cascade lake CPU based server. |
| 4 | Processor | • 4 X Intel 8276 Platinum Processor, 28 Core, 2.2 Ghz |
| 5 | Memory | • 3 TB DDR4 RAM or more |
| 6 | Networking | • Minimum 8 X 10 Gbe Ethernet ports with SFP+ Modules for data and replication |

*d) SAP HANA Dev Box*

| Sl. No. | Item | Description |
|---|---|---|
| 1 | **Make & Model** | |
| 2 | SAP HANA Dev Server in DC | • SAP HANA Certified Appliance for >= 768 GB<br>• Make & Model proposed should be available in the SAP HANA website.<br>• Document to be submitted along with the technical BOQ<br>• HANA Appliance should be fully factory configured |
| 3 | System | • SAP certified Single Node Scale-up HANA Box with latest Cascade lake CPU based server. |
| 4 | Processor | • 2 X Intel 8276 Platinum Processor, 28 Core, 2.2 Ghz |
| 5 | Memory | • 768 GB DDR4 RAM or more |
| 6 | Networking | • Minimum 4 X 10 Gbe Ethernet ports with SFP+ Modules for data and replication |

*e) Other General Specification*

| Sl. No. | Item | Description |
|---|---|---|
| 1 | Disk for Persistence Storage | • At least 4 times the RAM capacity in RAID5 with persistence storage with SSD's. |
| 2 | Operating System | • Latest version of "Suse Linux Enterprise Edition for SAP"<br>• OS version certified for the SAP HANA should be proposed for all the CPU's populated<br>• Supplied Operating System should be with Priority subscription for 5 years |
| 3 | High Availability Solution | • Clustering solution to be provided for application and HANA Boxes<br>• The HA solution between the two HANA boxes should be integrated with cluster software and HANA System Replication.<br>• The HA solution should provide the automated failover functionality within the nodes in case of:<br>  • Hardware failure in the box<br>  • OS failure<br>  • Network / Link failure<br>  • Database Server failure<br>  • Failover of Active Database instance from Primary node to Secondary Node and vice-versa<br>  • The Cluster software should support Disk based or Node Based Quorum implementation to prevent "split-brain" scenarios in Cluster Setup |
| 4 | Cluster Network | The heartbeat network, required to setup the HA solution, should be separate from the actual Data and User network. Minimum 2 nos. 24 port 1G Ethernet switches should be included in the solution to setup the cluster and management network between 2 HANA boxes. |
| 5 | System monitoring & Management | Proposed Infrastructure should have dedicated remote management functionality; management of Infrastructure should include following,<br>• Must have the capability to provide proactive notification of actual or impending component failure alerts.<br>• Automatic event handling should be supported to configure actions to notify appropriate users of failures through e-mail/SMS etc.<br>• Automatic event alert forwarding to OEM remote support |

| | | |
|---|---|---|
| | | center and proactively call-logging system. |
| 6 | Power Supply & Fan | Power supplies and Fans should be redundant and hot-swappable |
| 7 | Warranty & Support Services | 5 Years 24 x 7 Support with 6hr Call to resolution. Warranty shall be directly from OEM including Software upgrades/updates. The OEM should have the capability to offer lifecycle services like OS Upgrades, Patch Management and HANA DB Upgrade. |
| 8 | Bill of Materials | The vendor shall give make, model, part nos. of every component which will be cross verified by OEM. |
| 9 | Manufacturer Authorization Letter | Manufacturers Authorization Letter Specific to this tender must be submitted. Tender submitted without MAL will be rejected. |

ii) Application Servers for DC & DR

*a) Blade Enclosure*

| Sl. No. | Item | Description |
|---|---|---|
| **1** | **Make & Model** | |
| | Solution Requirement | • Proposed solution should support provisioning virtual, physical and container infrastructure from pools of compute, storage and networking resources<br>• Solution should have single console provisioning for compute, storage and server-side network configuration and direct attach storage (DAS). Direct connect midplane should deliver 14 Tbps of bandwidth. FC SAN should be available<br>• Solution should support software defined templates to quickly make changes to the infrastructure. Template should include server BIOS, firmware, boot order, RAID, storage configuration and network config of the infrastructure required for workload<br>• Solution should support scripting to reassign compute resources to different workloads to effectively utilize the infrastructure (re provision compute resources from one workload to another) |
| | Blade Chassis | • Solution to house the required number of blade servers in smallest number of enclosures.<br>• Should support two socket and four socket blades in the same enclosure, occupying a max of 7U/10U rack height |

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| | | • Should support minimum 8 number of 2 CPU Servers or 4 number of 4CPU servers Or Higher.<br>• Blade Chassis backplane engineered with 14Tbps or higher Chassis backplane bandwidth.<br>• Should support six interconnect bays to configure 3+3 redundancy<br>• Should support built-in management software appliance in redundancy with separate management network from production network<br>• Should support technology built-in to every chassis for Auto-Discovery of resources<br>• Chassis should provide display port and USB port to connect Laptop/Monitor locally<br>• Should support linking multiple enclosures (at least 20 enclosures) together to form single management ring to reduce complexity and provide single console of management for connected enclosures |
| | Interconnects support | • Should support housing of FCoE, Ethernet, FC and SAS interconnect fabrics offering redundancy as a feature. Also should support network switch with 25/50Gb downlinks and 100G uplink to DC switch |
| | Converged interconnect | • Redundant Interconnect modules shall be integrated within the chassis such that uplinks from the chassis can be directly connected to core LAN/SAN switches<br>• Interconnect should support 25Gbps downlinks to the Blades in redundancy supporting carving of each port into at least four ports.<br>• Should support at least six QSFP+/QSFP28 for external uplink to choose Ethernet and FC uplinks as needed<br>• Should support aggregation of multiple enclosures to consolidate data center network connections, reduce hardware and to scale network bandwidth across multiple enclosures.<br>• At-least 60 /36 servers should be supported per aggregation. Layer 2 network traffic should be switched within enclosure aggregation (without using top of the rack switch) and provide when multiple chassis aggregated, switching latency between enclosures should not exceed 1.0 micro-second for Ethernet |
| | Blade Chassis Interconnect | • Redundant Ethernet Switches should have at least 25Gb downlinks to each blade server should support 40G and 100G uplink to DC switch. and at least 8x 10GbE SFP+ |

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| | | uplink ports and Redundant Blade SAN Switches each with 4x 16 Gbps FC SFPs uplinks<br>Or<br>• Redundant interconnects and each interconnect should have at least 25Gb downlinks to each blade server and at least 8x 10GbE SFP+ uplink ports and at least 4x 16 Gbps FC SFP's uplinks ports and should support 40G and 100G uplink to DC switch. |
| | Power Supply | • The enclosure should be populated fully with power supplies of the highest capacity available with the vendor. Power supplies should support N+N as well as N+1 redundancy configuration, where N is greater than 1.<br>• Should offer a single-phase power subsystem enabled with technologies for lower power consumption and offering Platinum energy efficiency. Vendors should provide documents certifying the claims. |
| | Cooling | • Redundant hot pluggable fans or blowers enabled with technologies for improved power consumption and acoustics |
| | System Software | Management/controlling software's have to be from the OEM. |
| | Chassis management capabilities | Solution should support redundant physical management appliances within an enclosure or on multiple connected enclosures with failover and high availability<br>Should support auto-discovery of Compute, Memory, Storage and Fabrics within an enclosure or on multiple connected enclosures.<br>Should support activity, Health and Power LEDs for immediate status<br>Should support software-defined intelligence for configuring profiles to provision compute, storage, fabrics and images<br>Should support Firmware and OS Driver updates for the servers using profile templates to monitor, flag, and remediate<br>Should offer collaborative user interface which support logical resources to physical resources mapping, Smart/advanced Search, Activity Log, HTML5 mobile access, and Customizable Dashboard.<br>Should provide a dedicated 10GbE or higher management network for multi-enclosure communications, separate from data plane |

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| | | Should support frictionless Firmware and OS Driver updates using profile templates to monitor, flag, and remediate<br>Should support reporting capabilities for<br>1) asset and inventory information for the devices in the enclosures<br>2) thermal and power information, including real-time actual power usage per server and per enclosure<br>Reports should be exportable to csv or Microsoft Excel format |
| | Warranty | 5 Years 24x7 onsite support with commitment to resolve the problem within 6 Hours. Support has to be provided directly by OEM during the warranty period. |
| | Bill of Materials | The vendor has to give make, model, part nos. of every component which will be cross verified by OEM. |
| | Manufacturer Authorization Letter | Manufacturers Authorization Letter Specific to this tender must be submitted. Tender submitted without MAF will be rejected. |

*b) Server Blade*

| Sl. No. | Item | Description |
|---|---|---|
| **1** | **Make & Model** | |
| 2 | Server | • Offered Blade for SAP Application should be SAP certified. Make & Model offered should be available in the SAP website. |
| 3 | CPU | • 2 X Intel Xeon Gold 6252 (2.1GHz, 24-core) |
| 5 | Memory | • 768 GB DDR4 RAM or more |
| 6 | Disk for server Storage | • Minimum 2 X 600 GB 15K rpm SAS drives |
| 7 | Networking | • 1 no of Dual port 25G Adapter/ 1 Nos of Quad port of 10G Adapter and 1* Dual 16Gbps / Dual Port 25GbE or higher Converged Network Adaptor which supports partitioning into Ethernet and FC/iSCSI HBA ports per adaptor port |
| 8 | Operating System and Virtualization | • Latest version of "Suse Linux Enterprise Edition for SAP"<br>• Latest Windows Server Enterprise/Datacenter Edition<br>**Virtualization tools**<br>• VMWARE<br>• Supplied Operating System and Virtualization should be |

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| | | with subscription for 5 years<br>• (Refer Sizing sheet for number of Suse and Windows and VMWare Licenses) |
| 9 | High Availability Solution | • Clustering solution to be provided for applications at operating system level. |
| 11 | System monitoring & Management | Proposed Infrastructure should have dedicated remote management functionality; management of Infrastructure should include following,<br>• Must have the capability to provide proactive notification of actual or impending component failure alerts.<br>• Automatic event handling should be supported to configure actions to notify appropriate users of failures through e-mail/SMS etc.<br>• Automatic event alert forwarding to OEM remote support centre and proactively call-logging system. |
| 12 | Power Supply & Fan | • Power supplies and Fans should be redundant and hot-swappable |
| 13 | Warranty & Support Services | • 5 Years 24 x 7 Support with 6hr Call to resolution. Warranty shall be directly from OEM including Software upgrades/updates. The OEM should have the capability to offer lifecycle services like OS Upgrades, Patch Management. |
| 14 | Bill of Materials | • The vendor shall give part nos. of every component which will be cross verified by OEM. |
| 15 | Manufacturer Authorization Letter | • Manufacturers Authorization Letter Specific to this tender must be submitted. Tender submitted without MAL will be rejected. |

iii) Non-SAP Servers

*a) Enterprise Management Solution Blade Servers (DC & DR)*

| Sl. No. | Item | Description |
|---|---|---|
| 1 | **Make & Model** | **Specify** |
| 2 | CPU | 2 x Intel Xeon-Gold 6242 (2.8GHz, 16-core) Processor |
| 3 | Memory | 24DIMM slots.<br>256GB Dual Rank Memory DIMMS and support up to 3.0 TB using DDR4 Load Reduced DIMM (LRDIMM). |

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| 4 | Hard disk drive with carrier | 2 x 900 GB 10K RPM hot plug SFF drives |

*b) ADS, Mail & Misc Blade Servers (DC & DR)*

| Sl. No. | Item | Description |
|---|---|---|
| 1 | **Make & Model** | **Specify** |
| 2 | CPU | 2x Intel Xeon-Gold 6242 (2.8GHz/16-core/150W) Processor |
| 3 | Memory | 24DIMM slots.<br>384 GB (12 x 32GB DIMMS) Dual Rank Memory DIMMS and support up to 3.0 TB using DDR4 Load Reduced DIMM (LRDIMM). |
| 4 | Hard disk drive with carrier | 2 x 600GB 15K RPM hot plug SFF drives. |

*c) Blades for Legacy Servers in DC*

| Sl. No. | Item | Description |
|---|---|---|
| 1 | **Make & Model** | **Specify** |
| 2 | CPU | 2 x Intel Xeon-Gold 6238 (2.1GHz, 22-core) Processor |
| 3 | Memory | 24DIMM slots.<br>128GB (8*16GB) Dual Rank Memory DIMMS and support up to 3.0 TB using DDR4 Load Reduced DIMM (LRDIMM). |
| 4 | Hard disk drive with carrier | 2 x 600GB SSD RAID5 |

*d) Other General Specifications*

| Sl. No. | Item | Description |
|---|---|---|
| 1 | Memory Protection | ECC with multi-bit error protection, Online spare or mirrored memory |
| 2 | Storage Controller | It should support Integrated or add-on PCIe 3.0 based 12G SAS Raid Controller with RAID 0, 1 with 1GB of Flash backed write cache onboard |
| 3 | Networking features | 1 no of Dual port 25G Adapter/ 1 Nos of Quad port of 10G Adapter and 1* Dual 16Gbps / Dual Port 25GbE or higher |

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| | | Converged Network Adaptor which supports partitioning into Ethernet and FC/iSCSI HBA ports per adaptor port |
| 4 | Interfaces | Minimum of 1* internal USB 3.0 port ,1* internal SDHC card slot and 1* external USB 3.0 port |
| 5 | Bus Slots | Minimum of 2 Nos of x16 or higher PCIe 3.0 based slots supporting Converged Ethernet, Ethernet, FC adapters and SAS adaptors |
| 6 | Industry Standard Compliance | TPM 2.0 Support<br>Advanced Encryption Standard (AES) or Equivalent or better<br>Triple Data Encryption Standard (3DES) or Equivalent or better<br>SNMP v3<br>SSL 2.0<br>DMTF Systems Management Architecture for Server Hardware Command Line Protocol (SMASH CLP)<br>Active Directory v1.0<br>PCIe 3.0 Compliant<br>UEFI (Unified Extensible Firmware Interface Forum)<br>Redfish API |
| 7 | Embedded system management | Should support integration with management software to deliver ‘composable infrastructure' with a view of resources. This should be flexible and scalable solution providing IT managers with the architecture to implement their software-defined data center (SDDC) and to address the changing business needs and the challenges of today's enterprise data centers<br><br>Should support Gigabit out of band management port to monitor the servers for ongoing management, service alerting and reporting<br>Should support UEFI to configure and boot the servers securely<br>System should support RESTful API integration<br><br>System management should support provisioning servers by discovering and deploying 1 to few servers with embedded Provisioning tool<br><br>System should support embedded remote support to transmit hardware events directly to OEM or an authorized partner for automated phone home support |

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| 8 | System Security | Power-on password<br>Administrator's password<br>Keyboard password (Quick Lock)<br>Remote management On System Management Chipset with SSL encryption, Secure Shell version 2, Advanced Encryption Standard (AES) and Triple Data Encryption Standard (3DES) or equivalent or better on browser, CLP and XML scripting interface, AES and RC4 encryption of video<br>External USB port enable/disable<br>Network server mode<br>Serial interface control<br>TPM (Trusted Platform Module) 1.2 or 2.0 option<br>Advanced Encryption Standard (AES) or Equivalent or better<br>Intel® Advanced Encryption Standard-New Instructions (AES-NI) |
| 9 | OS Support | Microsoft Windows Server<br>Red Hat Enterprise Linux for SAP (RHEL)<br>SUSE Linux Enterprise Server for SAP (SLES)<br>VMware |
| 10 | System Performance Tuning | 1. System should support feature for improved workload throughput for applications sensitive to frequency fluctuations. This feature should allow processor operations in turbo mode without the frequency fluctuations associated with running in turbo mode<br>2. System should support workload Profiles for simple performance optimization |
| 11 | Secure encryption | System should support Encryption of the data (Data at rest) on both the internal storage and cache module of the array controllers using encryption keys. Should support local key management for single server and remote key management for central management for enterprise-wide data encryption deployment. |
| 12 | Firmware security | 1. For firmware security, system should support remote management chip creating a fingerprint in the silicon, preventing servers from booting up unless the firmware matches the fingerprint. This feature should be immutable<br><br>2. Should maintain repository for firmware and drivers' recipes to aid rollback or patching of compromised firmware. Should |

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| | | also store Factory Recovery recipe preloaded to rollback to factory tested secured firmware |
| 13 | Embedded Remote Management and firmware security | 1. System remote management should support browser based graphical remote console along with Virtual Power button, remote boot using USB/CD/DVD Drive. It should be capable of offering upgrade of software and patches from a remote client using Media/image/folder; It should support server power capping and historical reporting and should have support for multifactor/Two factor authentication<br>2. Server should have dedicated remote management port<br>3. Remote management port should have storage space earmarked to be used as a repository for firmware, drivers and software components. The components can be organized in to install sets and can be used to rollback/patch faulty firmware<br>4. Server should support agentless management using the out-of-band remote management port<br>5. The server should support monitoring and recording changes in the server hardware and system configuration. It assists in diagnosing problems and delivering rapid resolution when system failures occur<br>6. Applications to access the server remotely using popular handheld devices based on Android or Apple IOS should be available<br>7. Remote console sharing upto 6 users simultaneously during pre-OS and OS runtime operation, Console replay - Console Replay captures and stores for replay the console video during a server's last major fault or boot sequence. Microsoft Terminal Services Integration, 128-bit SSL encryption and Secure Shell Version 2 support. Should provide support for AES,3DES or equivalent/better on browser. Should provide remote firmware update functionality. Should provide support for Java free graphical remote console.<br>8. Should support RESTful API integration<br>9. System should support embedded remote support to transmit hardware events directly to OEM or an authorized partner for automated phone home support.<br>10. Pre-Failure Notification for all active and important components like processors, Memory, Hard drives, etc. and automatic calls logging |
| 14 | | Software should support dashboard view to quickly scan the managed resources to assess the overall health of the data |

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| | Server Management | center. It should provide an at-a-glance visual health summary of the resource's user is authorized to view. |
| | | The Dashboard minimum should display a health summary of the following:<br>• Server Profiles<br>• Server Hardware<br>• Appliance alerts |
| | | The Systems Management software should provide Role-based access control |
| | | Management software should support integration with popular virtualization platform management software like vCenter, and SCVMM |
| | | Should help provide proactive notification of actual or impending component failure alerts on critical components like CPU, Memory and HDD. |
| | | Should provide an online portal that can be accessible from anywhere. The portal should provide one stop, online access to the product, support information and provide information to track warranties, support contracts and status. The Portal should also provide a Personalized dashboard to monitor device heath, hardware events, contract and warranty status. Should provide a visual status of individual devices and device groups. The Portal should be available on premise (at our location - console based) or off premise (in the cloud). |
| | | Should help to proactively identify out-of-date BIOS, drivers, and Server Management agents and enable the remote update of system software/firmware components. |
| | | The Server Management Software should be of the same brand as of the server supplier. |
| 15 | Cloud Enabled Monitoring and Analytics or equivalent through Web Console | 1. Offered servers shall have cloud enabled monitoring and for proactive management. All required licenses for same shall be included in the offer.<br>2. Cloud Enabled Monitoring and shall have capability to provide following:<br>a. Providing Firmware upgrade and patch upgrade recommendations proactively.<br>b. Providing power and support entitlement status.<br>c. Recommendations to eliminate performance bottlenecks and critical events, having capability of proactive recommendation for arresting the issues / problems. |

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| 16 | Warranty | 5 Years 24x7 onsite support with commitment to resolve the problem within 6 Hours. Support has to be provided directly by OEM during the warranty period. |
| 17 | Bill of Materials | The vendor has to give make, model, part nos. of every component which will be cross verified by OEM. |
| 18 | Manufacturer Authorization Letter | Manufacturers Authorization Letter Specific to this tender must be submitted. Tender submitted without MAF will be rejected. |

iv) Storage for DC & DR

| Sl. No. | Item | Description |
|---|---|---|
| 1 | **Make & Model** | |
| 2 | Converge/ Unified Storage | • Offered Storage array shall be a true converge/ unified storage with a single Microcode/ operating system instead of running different Microcode/ Operating system/ Controllers for File, block and object services respectively.<br>• Offered Storage shall be a flagship Flash array from the OEM, should support only SSD's and shall be clearly published on their website.<br>• The Server & Storage supplied should be from same OEM. |
| 3 | Operating System & Clustering Support | • The storage array should support industry-leading Operating System platforms including: Windows 2012, Windows 2016, VMware, Solaris, HPE-UX, IBM-AIX and Linux. |
| 4 | Capacity & Scalability | • Refer Sizing sheet for Capacity required for DC & DR<br>• DC Storage capacity should be offered with 85 TB usable capacity using RAID5 with each drive capacity not exceeding 4 TB SSD.<br>• DR Storage capacity should be offered with 48 TB usable capacity using RAID5 with each drive capacity not exceeding 4 TB SSD.<br>• All drives shall be offered with 5 years comprehensive warranty.<br>• Offered Storage array shall support minimum of 480 SSD's<br>• Offered Storage array shall support at-least 500TB Usable capacity for file operations. |

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| 5 | Cache | • Offered Storage Array shall be given with Minimum of more than 128GB cache in a single unit and shall be scalable to more than 256GB.<br>• Cache shall be completely dynamic for read and write operations and vendor shall not offer any additional card / module for write cache operations.<br>• Cache shall be used only for Data and Control information. OS overhead shall not be done inside cache. |
| 6 | Data Reduction | • Offered Storage shall be Inline de-duplication and compression enabled. Given volume inside the storage array shall support both de-duplication and compression simultaneously. |
| 7 | Architecture & Processing Power | • Controllers shall be true active-active so that a single logical unit can be shared across all offered controllers in symmetrical fashion, while supporting all the major functionalities like Thin Provisioning, Snapshot, Cloning, replication etc. |
| 8 | No Single point of Failure | • Offered Storage Array shall be configured in a No Single Point of configuration including Array Controller card, Cache memory, FAN, Power supply etc. |
| 9 | Disk Drive Support | • Offered storage shall support various SSD capacities drives starting from 400GB onwards. |
| 10 | Raid Support, Virtualization & No. of Volumes | • Offered Storage Subsystem shall support Raid level 1, 5, 6 and 10.<br>• Offered storage array shall support at-least 4000 Volumes per controller. |
| 11 | Data Protection | • In-case of Power failure, Storage array shall have de-stage feature to avoid any data loss. |
| 12 | Protocols | • Offered Storage array shall support all well-known protocols like but not limited to FC, ISCSI, SMB 3.0, NFS V4, FTP/SFTP etc. |
| 13 | Host Ports and Back-end Ports | • Offered Storage shall have minimum of 12 X 16Gb FC Ports for host connectivity. All types of ports shall be 100% scalable.<br>• Offered storage shall have two additional ports for the storage-based replication.<br>• Offered storage shall have minimum of 16 SAS lanes running at 12Gbps speed and shall be scalable to 32 SAS lanes without any controller change. |
| 14 | Global Hot Spare | • Offered Storage Array shall support distributed Global hot Spare for offered Disk drives. |

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| | | • Global hot spare shall be configured as per industry practice. |
| 15 | Performance and Quality of Service | • Shall have capability to use more than 30 drives per array group or raid group for better performance.<br>• Offered storage array shall support quality of service for critical applications so that appropriate and required response time can be defined for application logical units at storage. It shall be possible to define different service / response time for different application logical units.<br>• Quality of service engine shall allow to define minimum and maximum cap for required IOPS / bandwidth for a given logical units of application running at storage array.<br>• It shall be possible to change the quality of service Response time ((In both milliseconds as well as Sub-milliseconds), IOPS, bandwidth specification on basis of real time. |
| 16 | Thin Provisioning and Space Reclaim | • Offered storage array shall support thin provisioning and Thin Re-claim to make the volume thin for an extended period of time for complete array supported raw capacity.<br>• Offered storage array shall be tightly integrated with VMware so that Eager zero disks layout can be used with thin provisioning and thin re-claim. |
| 17 | Maintenance | • Offered storage shall support online non-disruptive firmware upgrade for both Controller and disk drives. |
| 18 | Snapshot/ Point in time copy/ Clone | • The storage array should have support for both controller-based as well as file system-based snapshots functionality (At-least 4000 copies per array). |
| 19 | Storage Array Configuration & Management Software | • Vendor shall provide Storage Array configuration and Management software.<br>• Software shall be able to manage more than one array of same family. |
| 20 | Remote Replication | • The storage array should support hardware-based data replication at the array controller level across all models of the offered family and license should be included for the entire storage from day one.<br>• The Storage array shall also support three ways (3 Data Centers) replication to ensure zero RPO at any site Near DR and DR in native fashion without using any additional replication appliance. |

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| | | • Replication shall support incremental replication after resumption from Link Failure or failback situations. |
| 21 | Licenses | • Storage subsystem shall be supplied with Thin provisioning, Snapshot, Clone, Performance Monitoring, Online Raid Migration, Online Volume conversion (thin to thin compressed, thin to thin de-dup etc.), Quality of services, and File services on day 1 for the maximum supported capacity of array. |
| 22 | Warranty | • 5 Years 24x7 onsite support with commitment to resolve the problem within 6 Hours. Support has to be provided directly by OEM during the warranty period. |
| 23 | Bill of Materials | • The vendor has to give make, model, part nos. of every component which will be cross verified by OEM. |
| 24 | Manufacturer Authorization Letter | • Manufacturers Authorization Letter Specific to this tender must be submitted.<br>• Tender submitted without MAF will be rejected. |

v) Backup Solution for DC & DR

*a) Disk Backup for DC & DR*

| Sl. No. | Item | Description |
|---|---|---|
| 1 | **Make & Model** | **Shall be provided by OEM who is providing the Hardware** |
| 2 | Disk Backup | • Solution /Appliance Should offer Disk to Disk to Tape solution (D-D-T)<br>• Backup device shall be Modular design to allow configuration, add capacity increase performance.<br>• Offered appliance shall be certified to work with at-least 3 Backup application vendor ISV like HPE, Veritas, Dell-EMC, Veeam, Commvault etc.<br>• DC Device should be offered with 60 TB usable and scalable to 120 TB usable space by using not more than 4TB/8TB drives.<br>• DR Device should be offered 30 TB usable and scalable to 60 TB usable space by using not more than 4TB/8TB drives.<br>• Offered device shall also be scalable in native mode (Without de-duplication and compression)<br>• Vendor shall not use any additional staging device in- |

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| | | between while moving the data from Disk based backup device to public cloud or object storage<br>• Offered device shall have separate dedicated drives for Operating System of appliance and shall not participate in data backup<br>• Device shall be offered with dual Hardware Raid Controller card. Each card shall have dual 12Gbps SAS ports<br>• Offered device shall support emulation of both VTL and NAS target like CIFS.<br>• Offered device shall have capability to deliver selective restore from disk Library itself.<br>• Offered device shall have integrated de-duplication license, low bandwidth replication license so that only unique non duplicated block transfers to remote / DR location<br>• Offered device shall have intelligence to understand both source-based and target-based de-duplication and shall be integrated with all well-known backup ISVs like Veritas, Commvault and Veeam etc. At-least 3 ISVs shall be supported<br>• Offered device shall support receiving non-duplicated data from remote locations or branch office directly from the application servers / Client servers in low bandwidth mode without using any backup or replication-based device at remote location / Branch office<br>• Offered device shall have Minimum of 2 x 10/25 Gbps IP, 2 x 16Gbps FC and minimum of 4 x 1Gbps IP connection. License and Transceivers for all ports shall be offered and configured<br>• Offered Appliance Fiber channel ports shall support connectivity of servers either directly or via SAN switches while supporting the both source and Target based de-duplication<br>• Offered disk-based backup device shall also support encryption functionality<br>• When fully populated, offered device shall support rated write performance of more than 16TB per hour in native mode<br>• When fully populated, offered device shall supported rated write performance, when enabled with source level de-duplication, of more than 30TB/hr<br>• 5 Years 24x7 onsite support with commitment to resolve |

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| | | the problem within 6 Hours. Support shall be provided directly by OEM during the warranty period.<br>• The vendor shall give part nos. of every component which will be cross verified by OEM. |
| 3 | | Manufacturers Authorization Letter Specific to this tender must be submitted. Tender submitted without MAF will be rejected. |

*b) Tape Library*

| Sl. No. | Item | Description |
|---|---|---|
| 1 | **Tape Library** | **Only at DC**<br>**Make & Model:** Should be provided by HW OEM |
| 2 | Capacity | • Offered Tape Library shall support Native data capacity of 3.3PB (uncompressed) using LTO-8 Technology.<br>• Shall be offered with Minimum of Four LTO-8 FC tape drive. Drive shall support encryption, minimum 80 media slots from day 1.<br>• Shall be offered with 80 RW LTO-8 Cartridges and 4 Cleaning cartridges<br>• Shall be scalable 270 cartridge slots with additional enclosures |
| 3 | Tape Drive Architecture | • Offered LTO-8 drive in the Library shall conform to the Data rate matching technique for higher reliability<br>• Tape Drive Architecture in the Library shall conform to the INCITS/T10 SCSI-3 standard or newer standards. |
| 4 | Scalability | • Tape Library shall be scalable to minimum of 21 number of LTO-8 drives |
| 5 | Speed | • Offered LTO-8 drive shall support 300MB/sec in Native mode. |
| 6 | Connectivity | • Offered Tape Library shall provide native FC connectivity to SAN switches. |
| 7 | Partitioning | • Offered tape library shall have flexibility to configure each offered drive into a separate partition. Offered tape library shall have support for 21 partition when fully populated. |
| 8 | Encryption device | • Offered Library shall be provided with a hardware device like USB key, separate appliance etc. to keep all the encrypted keys in a redundant fashion. |

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| 9 | Management | • Tape Library shall provide web based remote management. |
| 10 | Barcode Reader and Mail slots | • Tape library shall support Barcode reader and mail slot<br>• Tape Library shall be offered with 5 mail slots and shall be scalable to 30 slots when fully populated.<br>• Offered LTO-8 drive shall also support LTO-7 – Type M media so that native cartridge capacity of LTO-7 cartridge can be increased to 9TB. |
| 11 | Other Features | • Tape Library shall have GUI Panel<br>• Shall be rack mountable<br>• Should have redundant power supply<br>• Tape Library shall be supplied with software which can predict and prevent failures through early warning and shall also suggest the required service action<br>• Offered drives in the tape library shall optionally support both data path and control path failover<br>• Offered Software shall also have the capability to determine when to retire the tape cartridges and what compression ratio is being achieved |
| 12 | Warranty | • 5 Years 24x7 onsite support with commitment to resolve the problem within 6 Hours. Support has to be provided directly by OEM during the warranty period |
| 13 | Bill of Materials | • The vendor shall give part nos. of every component which will be cross verified by OEM |
| 14 | Manufacturer Authorization Letter | • Manufacturers Authorization Letter Specific to this tender must be submitted. Tender submitted without MAF will be rejected. |

*c) Backup Software for DC & DR*

| Sl. No. | Item | Description |
|---|---|---|
| 1 | Backup Software | • The proposed backup solution should be available on various OS platforms such as Windows, Linux and UNIX platforms.<br>• The proposed backup solution shall support industry leading cluster solution such as MSCS, MC Service Guard, and Veritas Cluster.<br>• The proposed backup software should support both backups using snapshot/hardware-based and software |

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| | | based as well as backup to tapes for long term and offline data retention.<br>• The proposed backup software should automatically secure the communication between the server and the customer using Encrypted Control Communication.<br>• The proposed backup software should support single management window for all the different data protection locations.<br>• The proposed backup solution shall have same web-based GUI across heterogeneous platform to ensure easy administration.<br>• The proposed backup solution should support tape mirroring of the same job running concurrently with primary backup.<br>• The proposed backup software should use web-based scheduler for the backup jobs.<br>• The proposed backup software should support the use REST API for browse and restore operations.<br>• The proposed backup solution should allow creating tape clone facility after the backup process.<br>• The proposed backup solution should allow creating tape clone facility after the backup process.<br>• The proposed backup solution shall be configured in such a fashion that no extra license for customer and media servers is required while moving from LAN to SAN based backup.<br>• Backup software licenses to be provided for the offered capacity of SAN Storage. |

vi) SAN Switches for DC & DR

*a) SAN Switches (DC) – 48 Ports*

| Sl. No. | Description |
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| 1 | **Specify Make and Model** |
| 2 | Minimum Dual SAN switches shall be configured where each SAN switch shall be configured 44 * 16Gbps ports on each switch and 4 * 8Gbps Long Wave SFP+ Ports |

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| 3 | Should deliver 16 Gbit/Sec Non-blocking architecture with 1:1 performance for up to 48 ports in energy-efficient fashion |
| 4 | Should protect existing device investments with autosensing 4, 8, and 16 Gbit/sec capabilities. |
| 5 | The switch shall support different port types such as FL_Port, F_Port, E_Port, EX_Port. |
| 6 | The switch should be rack mountable |
| 7 | Should provide enterprise-class availability features such as redundant and hot pluggable components like power supply and FAN |
| 8 | The switch shall provide Aggregate bandwidth of 768 Gbit/sec end to end. |
| 9 | Switch shall have support for web-based management and should also support CLI. |
| 10 | The switch should have USB port for firmware download, support save, and configuration upload/download. |
| 11 | Offered SAN switches shall be highly efficient in power consumption. |
| 12 | Switch shall support POST and online/offline diagnostics, including trace logging, environmental monitoring, non-disruptive daemon/stateful process restart, FC ping and Pathinfo (FC traceroute), port mirroring (SPAN port). |
| 13 | Offered SAN switch shall support services such as Quality of Service (QoS) to help optimize application performance in consolidated, virtual environments. It should be possible to define high, medium and low priority QOS zones to expedite high-priority traffic |
| 14 | The switch shall be able to support ISL trunk up to 128 Gbit/sec between a pair of switches for optimal bandwidth utilization and load balancing. |
| 15 | SAN switch shall support to restrict data flow from less critical hosts at preset bandwidths. |
| 16 | It should be possible to isolate the high bandwidth data flows traffic to specific ISLs by using simple zoning |
| 17 | The Switch should be configured with the Zoning and shall support ISL Trunking features when cascading more than 2 numbers of SAN switches into a single fabric. |
| 18 | Offered SAN switches shall support to measure the top bandwidth-consuming traffic in real time for a specific port or a fabric which should detail the physical or virtual device. |
| 19 | 5 Years 24x7 onsite support with commitment to resolve the problem within 6 Hours. Support has to be provided directly by OEM during the warranty period. |
| 20 | The vendor has to give make, model, part nos. of every component which will be cross verified by OEM. |
| 21 | Manufacturers Authorization Letter Specific to this tender must be submitted. Tender submitted without MAF will be rejected. |

*b) SAN Switches (DR) – 24 Ports*

| Sl. No. | Description |
|---|---|
| 1 | **Specify Make & Model** |
| 2 | Minimum Dual SAN switches shall be configured where each SAN switch shall be configured with 24 * 16Gbps FC Ports on each switch |
| 3 | Required scalability shall not be achieved by cascading the number of switches and shall be offered within the common chassis only |
| 4 | Should deliver 16 Gbit/Sec Non-blocking architecture with 1:1 performance for up to 24 ports in a energy-efficient fashion |
| 5 | Should protect existing device investments with auto-sensing 4, 8, and 16 Gbit/sec capabilities. |
| 6 | The switch shall support different port types such as FL_Port, F_Port, E_Port, EX_Port. |
| 7 | The switch should be rack mountable |
| 8 | Should provide enterprise-class availability features such as redundant and hot pluggable components like power supply and FAN |
| 9 | The switch shall provide Aggregate bandwidth of 384 Gbit/sec end to end. |
| 10 | Switch shall have support for web-based management and should also support CLI. |
| 11 | The switch should have USB port for firmware download, support save, and configuration upload/download. |
| 12 | Offered SAN switches shall be highly efficient in power consumption. |
| 13 | Switch shall support POST and online/offline diagnostics, including trace logging, environmental monitoring, non-disruptive daemon/ stateful restart, FCping and Pathinfo (FC traceroute), port mirroring (SPAN port). |
| 14 | Offered SAN switch shall support services such as Quality of Service (QoS) to help optimize application performance in consolidated, virtual environments. It should be possible to define high, medium and low priority QOS zones to expedite high-priority traffic |
| 15 | The switch shall be able to support ISL trunk up to 128 Gbit/sec between a pair of switches for optimal bandwidth utilization and load balancing. |
| 16 | SAN switch shall support to restrict data flow from less critical hosts at preset bandwidths. |
| 17 | It should be possible to isolate the high bandwidth data flows traffic to specific ISLs by using simple zoning |
| 18 | The Switch should be configured with the Zoning and shall support ISL Trunking features when cascading more than 2 numbers of SAN switches into a single fabric. |

| | |
|---|---|
| 19 | Offered SAN switches shall support to measure the top bandwidth-consuming traffic in real time for a specific port or a fabric which should detail the physical or virtual device. |
| 20 | 5 Years 24x7 onsite support with commitment to resolve the problem within 6 Hours. Support has to be provided directly by OEM during the warranty period. |
| 21 | The vendor has to give make, model, part nos. of every component which will be cross verified by OEM. |
| 22 | Manufacturers Authorization Letter Specific to this tender must be submitted. Tender submitted without MAF will be rejected. |

vii) Core Switches (DC and DR)

| Sl. No. | Description | |
|---|---|---|
| 1 | **Specify Make & Model** | |
| 2 | Form Factor | Chassis switch with Minimum 4 usable Slots 19 Inch Rack mountable switch with management/supervisor Engine 1+1. OEM should provide all the hardware including fabric cards, CPU, Power Supplies, Fan Trays etc. and software, licenses to get full capacity of the provided chassis. |
| 3 | Architecture | Non-Blocking architecture. Must have EAL3 /NDCPP or above common criteria certification. |
| 4 | IPV6 Compliance | All Functionalities of Switch shall be IPV4 and IPv6 compliant and it should work on IPv6 Platform without any additional hardware/ software. |
| 5 | End of sale | OEM End-of-sale declaration shall not have been released for the quoted model at the time of the bid submission. |
| 6 | Feature Availability | All the specified features/ parameters/ certifications must be available on the Technical Bid opening date. Features/ parameters/ certifications proposed to be available in near future/ on roadmap shall not be considered. Switch should support ISSU (In Service Software upgrade), Virtualization, Fabric provisioning support BGP-EVPN, OSPF VxLAN, VRF, VRRP Should support VM-aware Network Automation, Should support 802.1Qbb, netconf, openstack/ openflow/ REST API support in same hardware. |
| 7 | Ports | 48 port 1/10G SFP+ populated with 24 Nos SFP+ multimode transceivers and Switch should have 40/100 Gbps ports module cards scalability in same hardware from day 1. |

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|---|---|---|
| 8 | SFP Transceivers | All the Transceivers/Modules used to connect the Switches should be from the same OEM/make of the switches only. Switch should support 1Gbps and 10Gbps models. |
| **Hardware Specification** | | |
| 1 | Centralized wire capacity | switch at least 9.6 Tbps switching bandwidth or more |
| 2 | Per Slot Switching Capacity | 2.4 Tbps |
| 3 | Total number of IPv4 routes | Total number of IPv4 routes 112000 or more, |
| 4 | VLANs (802.1q tagged VLAN) | 4000 or more Concurrent |
| 5 | Memory | 8GB DRAM or more |
| 6 | Storage | At least 1 GB SSD/Flash |
| **Support** | | |
| 1 | Switches must be supported for a minimum of 5 years by the hardware vendor with software updates and upgrades without additional cost. | |
| 2 | The OEM should provide support services 24x7 TAC with L1, L2 and L3 for 5 years free of cost. India toll free number should be reflected in official website of the OEM. Hardware replacement support should be 6 Hrs. | |

viii) TOR Switches for DC & DR

| **Sl. No.** | **Description** |
|---|---|
| **Specify Make & Model** | |
| **1** | **Architecture** |
| 1.1 | The switch should have at least 24 * SFP+ ports Loaded with 24*10G SR transceivers and 4 QSFP+ Ports |
| 1.2 | The switch should support dual power supply and fan tray |
| 1.3 | The switch should have Minimum of 1GB flash/SD RAM/DDRAM/SSD |
| 1.4 | At least 960 Gbps switching capacity |
| 1.5 | MAC Address table size of 128,000 entries |
| 1.6 | The Switch should have modular operating system |
| **2** | **Quality of Service** (QoS) |

| | |
|---|---|
| 2.1 | The switch should support IEEE 802.1p precedence |
| 2.2 | The Switch should support Strict Priority SP, WRR or equivalent feature. |
| **3** | **Data Center optimized** |
| 3.1 | The switch should support virtualization/stacking. Stacking cables to be provided |
| 3.2 | The switch should support for IEEE 802.1Qbb Priority Flow Control (PFC), Data Center Bridging Exchange (DCBX), or equivalent |
| **4** | **Manageability** |
| 4.1 | The switch should provide CLI capabilities |
| 4.2 | The switch should support Port monitoring capabilities |
| 4.3 | The switch should support Traceroute and ping functionality |
| 4.4 | The switch should support Multiple configuration files |
| 4.5 | The switch should support sFlow (RFC 3176) or equivalent |
| 4.6 | The switch should support SNMP v1, v2c and v3 or equivalent |
| 4.7 | The switch should support Out-of-band interface functionality |
| 4.8 | The switch should support Remote configuration and management capability |
| 4.9 | The switch should provide configuration via DHCP protocol |
| 4.10 | The switch should support Network Time Protocol (NTP)/Secure Network Time Protocol (SNTP)/Precision Time Protocol (PTP) RFC 1855 Compliant |
| 4.11 | The switch should support Device Link Detection Protocol (DLDP) or equivalent |
| 4.12 | The switch should support IEEE 802.1AB Link Layer Discovery Protocol (LLDP) or equivalent |
| **5** | **Layer 2 switching** |
| 5.1 | The switch should support 4,094 VLANs based on port. VLAN Mapping |
| 5.2 | The switch should provide full DHCP relay features with DHCP Snooping support |
| **6** | **Layer 3 routing** |
| 6.1 | The switch should support Equal-Cost Multipath (ECMP) feature |
| 6.2 | The switch should support routing of IP static routes, RIP, OSPF, and BGP from day 1 |
| 6.3 | The switch should be able to separate stacks for IPv4 and IPv6 |
| **7** | **Software Defined Networking (SDN) Capability** |
| 7.1 | OpenFlow or equivalent protocol to enable software-defined networking |
| 7.2 | Allows the separation of data (packet forwarding) and control (routing decision) paths, to be controlled by an internal/external SDN Controller |
| **8** | **Security** |

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| 8.1 | The switch should provide IP Layer 3 filtering capability based on source/destination IP address/subnet and source/destination TCP/UDP port number. |
| 8.2 | The switch should support IEEE 802.1X and RADIUS/TACACS network login |
| 8.3 | The switch should allow access only to specified MAC addresses, which can be learned or specified by the administrator |
| **9** | **Environmental Features** |
| 9.1 | Switch should be ROHS Compliance |
| 9.2 | Switch should support AC/DC Power inputs |
| 9.3 | Operating temperature of 0°C to 40°C |
| **10** | **Warranty & MAF** |
| 10.1 | 5 Years 24x7 onsite support with commitment to resolve the problem within 6 Hours of the point of problem detection. Support have to be provided directly by OEM during the warranty period. |
| 10.2 | The vendor has to give make, model, part nos. of every component which will be cross verified by OEM. |
| 10.3 | Manufacturers Authorization Letter Specific to this tender must be submitted. Tender submitted without MAF will be rejected. |

ix) 1G Switch (DC & DR)

*a) 1G Switch (DC & DR) – Type 1*

| **Sl. No.** | **Description** |
|---|---|
| **Specify Make and Model** | |
| **1** | **Architecture** |
| 1.1 | Shall be 1RU, 19" Rack Mountable |
| 1.2 | 48 RJ-45 autosensing 10/100/1000 ports |
| 1.3 | The switch shall support 2*10-Gigabit ports SFP+ and 2 RJ-45 1/10GBASE-T ports in addition to the above ports |
| 1.4 | Switch should have 1 RJ-45 serial console port |
| 1.5 | Switch should have switching capacity of 176 Gbps |
| 1.6 | Switch should provide 10/100/1G ports |
| 1.7 | Switch should support 16000 MAC address |
| **2** | **Management** |
| 2.1 | The Switch should support Intuitive Web browser-based management and Command Line Interface (CLI) capabilities |

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| 2.2 | The Switch should support Secure Web-management sessions with HTTPS / SSL |
| 2.3 | The Switch should support SNMPv1, v2c, and v3 protocols |
| 2.4 | The Switch should support Port mirroring feature |
| 2.5 | The Switch should support Network Time Protocol (NTP) capability |
| 2.6 | The Switch should support IEEE 802.1AB Link Layer Discovery Protocol (LLDP) or equivalent protocol |
| 2.7 | The Switch should support RMON capability |
| 2.8 | The Switch should support DHCP client modes |
| **3** | **Quality of Service (QoS)** |
| 3.1 | The Switch should support Broadcast control to allows limitation of broadcast traffic rate to cut down on unwanted network broadcast traffic |
| 3.2 | The Switch should support Rate limiting to sets per-port enforced maximums and per-port, per-queue minimums |
| 3.3 | The Switch should support Traffic prioritization and at least four hardware queues |
| **4** | **Connectivity** |
| 4.1 | The Switch should support IEEE 802.3X flow control |
| 4.2 | The Switch should support Packet storm protection to protects against broadcast, multicast, or unicast storms with user-defined thresholds |
| 4.3 | The Switch should support IPv6 host to enable switches to be managed and deployed at the IPv6 network's edge |
| 4.4 | The Switch should support IPv6 static routes |
| 4.5 | The Switch should support MLD snooping to forwards IPv6 multicast traffic to the appropriate interface, preventing traffic flooding |
| 4.6 | The Switch should support ACL and QoS for IPv6 network traffic |
| **5** | **Security** |
| 5.1 | The Switch should support IEEE 802.1X and RADIUS/TACACS network logins to controls port-based access for authentication and accountability |
| 5.2 | The Switch should support Automatic VLAN assignment to assign users automatically to the appropriate VLAN based on their identity, location and time of day |
| 5.3 | The Switch should support STP BPDU port protection to blocks Bridge Protocol Data Units (BPDUs) on ports that do not require BPDUs |
| 5.4 | The Switch should protect the root bridge from malicious attacks or configuration mistakes |
| 5.5 | The Switch should support Automatic denial-of-service protection to protects the network by blocking malicious DoS attacks aimed at the switch itself. |

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| 5.6 | The Switch should provide security so that only authorized access to the Web browser interface is allowed |
| **6** | **Performance** |
| 6.1 | The Switch should support IGMP / MLD Snooping to improve network performance by filtering multicast traffic when there is no multicast receiver on a connection. |
| **7** | **Layer 2 switching** |
| 7.1 | The Switch should support IEEE 802.1Q with 4,000 simultaneous VLAN IDs |
| 7.2 | The Switch should support standard IEEE 802.1D STP, IEEE 802.1w Rapid Spanning Tree Protocol (RSTP) for faster convergence, and IEEE 802.1s Multiple Spanning Tree Protocol (MSTP) or equivalent protocols |
| 7.3 | The Switch should support BPDU filtering to improve network efficiency by filtering unnecessary BPDU packets on a port. |
| **8** | **Layer 3 services** |
| 8.1 | The Switch should support DHCP relay |
| **9** | **Layer 3 routing** |
| 9.1 | The Switch should support Static IPv4/IPv6 routing |
| **10** | **Resiliency and high availability** |
| 10.1 | The Switch should support stacking and create a single logical managed unit with up to four switches |
| 10.2 | The Switch should support Link aggregation to groups together up to 8 ports per trunk automatically using Link Aggregation Control Protocol (LACP), or manually, to form an ultra-high-bandwidth connection to the network backbone. |
| **11** | **Convergence** |
| 11.1 | The Switch should support LLDP-MED (Media Endpoint Discovery) |
| 11.2 | The Switch should support Auto voice VLAN to recognize IP phones and automatically assigns voice traffic to dedicated VLAN for IP phones |
| **12** | **Environmental Features** |
| 12.1 | Shall provide support for RoHS regulations |
| 12.2 | Switch should support operating temperature of 0°C to 40°C |
| 12.3 | Switch should comply with Safety and Emission standards |
| **13** | **Warranty & MAF** |
| 13.1 | 5 Years 24x7 onsite support with commitment to resolve the problem within 6 Hours. Support has to be provided directly by OEM during the warranty period. |
| 13.2 | The vendor has to give make, model, part nos. of every component which will be cross verified by OEM. |

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|---|---|
| 13.3 | Manufacturers Authorization Letter Specific to this tender must be submitted. Tender submitted without MAF will be rejected. |

*b) 1G Switch (DC) – Type 2*

| Sl. No. | Description |
|---|---|
| **Specify Make and Model** | |
| **1** | **Architecture** |
| 1.1 | Shall be 1RU, 19" Rack Mountable |
| 1.2 | 24 RJ-45 autosensing 10/100/1000 ports |
| 1.3 | The switch should support 2*10-Gigabit ports SFP+ loaded with 2*SR transceivers and 2 RJ-45 1/10GBASE-T ports in addition to the above ports |
| 1.4 | Switch should have 1 RJ-45 serial console port |
| 1.5 | Switch should have switching capacity of 128 Gbps |
| 1.6 | Switch should support 16000 MAC address |
| **2** | **Management** |
| 2.1 | The Switch should support Intuitive Web browser-based management and Command Line Interface (CLI) capabilities |
| 2.2 | The Switch should support Secure Web-management sessions with HTTPS / SSL |
| 2.3 | The Switch should support SNMPv1, v2c, and v3 protocols |
| 2.4 | The Switch should support Port mirroring feature |
| 2.5 | The Switch should support Network Time Protocol (NTP) capability |
| 2.6 | The Switch should support IEEE 802.1AB Link Layer Discovery Protocol (LLDP) |
| 2.7 | The Switch should support RMON capability |
| 2.8 | The Switch should support DHCP client modes |
| **3** | **Quality of Service (QoS)** |
| 3.1 | The Switch should support Broadcast control to allows limitation of broadcast traffic rate to cut down on unwanted network broadcast traffic |
| 3.2 | The Switch should support Traffic prioritization and at least 8 hardware queues |
| **4** | **Connectivity** |
| 4.1 | The Switch should support IEEE 802.3X flow control |
| 4.2 | The Switch should support Packet storm protection to protects against broadcast, multicast, or unicast storms with user-defined thresholds |
| 4.3 | The Switch should support Jumbo frame up to 9-kilobyte frames |

| | |
|---|---|
| 4.4 | The Switch should support IPv6 host to enable switches to be managed and deployed at the IPv6 network's edge |
| 4.5 | The Switch should support IPv6 static routes |
| 4.6 | The Switch should support MLD snooping to forwards IPv6 multicast traffic to the appropriate interface, preventing traffic flooding |
| 4.7 | The Switch should support ACL and QoS for IPv6 network traffic |
| **5** | **Security** |
| 5.1 | The Switch should support IEEE 802.1X and RADIUS/TACACS network logins to controls port-based access for authentication and accountability |
| 5.2 | The Switch should support Automatic VLAN assignment to assign users automatically to the appropriate VLAN based on their identity, location and time of day |
| 5.3 | The Switch should support STP BPDU port protection to blocks Bridge Protocol Data Units (BPDUs) on ports that do not require BPDUs |
| 5.4 | The Switch should support Automatic denial-of-service protection to protects the network by blocking malicious DoS attacks aimed at the switch itself. |
| 5.5 | The Switch should provide security so that only authorized access to the Web browser interface is allowed |
| **6** | **Performance** |
| 6.1 | The Switch should support IGMP / MLD Snooping to improve network performance by filtering multicast traffic when there is no multicast receiver on a connection. |
| **7** | **Layer 2 switching** |
| 7.1 | The Switch should support IEEE 802.1Q with 4,000 simultaneous VLAN IDs |
| 7.2 | The Switch should support standard IEEE 802.1D STP, IEEE 802.1w Rapid Spanning Tree Protocol (RSTP) for faster convergence, and IEEE 802.1s Multiple Spanning Tree Protocol (MSTP) or equivalent protocols |
| 7.3 | The Switch should support BPDU filtering to improve network efficiency by filtering unnecessary BPDU packets on a port. |
| **8** | **Layer 3 services** |
| 8.1 | The Switch should support DHCP relay |
| **9** | **Layer 3 routing** |
| 9.1 | The Switch should support Static IPv4/IPv6 routing |
| 9.2 | The Switch should support 8 virtual VLAN interfaces as a minimum |
| **10** | **Resiliency and high availability** |

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|---|---|
| 13.3 | Manufacturers Authorization Letter Specific to this tender must be submitted. Tender submitted without MAF will be rejected. |

*b) 1G Switch (DC) – Type 2*

| Sl. No. | Description |
|---|---|
| **Specify Make and Model** | |
| **1** | **Architecture** |
| 1.1 | Shall be 1RU, 19" Rack Mountable |
| 1.2 | 24 RJ-45 autosensing 10/100/1000 ports |
| 1.3 | The switch should support 2*10-Gigabit ports SFP+ loaded with 2*SR transceivers and 2 RJ-45 1/10GBASE-T ports in addition to the above ports |
| 1.4 | Switch should have 1 RJ-45 serial console port |
| 1.5 | Switch should have switching capacity of 128 Gbps |
| 1.6 | Switch should support 16000 MAC address |
| **2** | **Management** |
| 2.1 | The Switch should support Intuitive Web browser-based management and Command Line Interface (CLI) capabilities |
| 2.2 | The Switch should support Secure Web-management sessions with HTTPS / SSL |
| 2.3 | The Switch should support SNMPv1, v2c, and v3 protocols |
| 2.4 | The Switch should support Port mirroring feature |
| 2.5 | The Switch should support Network Time Protocol (NTP) capability |
| 2.6 | The Switch should support IEEE 802.1AB Link Layer Discovery Protocol (LLDP) |
| 2.7 | The Switch should support RMON capability |
| 2.8 | The Switch should support DHCP client modes |
| **3** | **Quality of Service (QoS)** |
| 3.1 | The Switch should support Broadcast control to allows limitation of broadcast traffic rate to cut down on unwanted network broadcast traffic |
| 3.2 | The Switch should support Traffic prioritization and at least 8 hardware queues |
| **4** | **Connectivity** |
| 4.1 | The Switch should support IEEE 802.3X flow control |
| 4.2 | The Switch should support Packet storm protection to protects against broadcast, multicast, or unicast storms with user-defined thresholds |
| 4.3 | The Switch should support Jumbo frame up to 9-kilobyte frames |

b) ADS, Antivirus & Patch Mgmt Servers (Rack Server)

| Sl. No. | Item | Description |
|---|---|---|
| 1 | **Make & Model** | **Specify Make and Model** |
| 2 | Chassis | 2 U Rack Mountable |
| 3 | CPU | 2x Intel Xeon-Gold 6234 (3.3GHz/8-core) Processor |
| 4 | Memory | 24DIMM slots. 192 (6x32) GB Dual Rank RDIMMs |
| 5 | Hard disk drive | 3 x 1.2TB 10K RPM SAS drives |

c) Other General Specifications

| Sl. No. | Item | Description |
|---|---|---|
| 1 | Memory Protection | ECC with multi-bit error protection, Online spare or mirrored memory |
| 2 | HDD Bays | Up to 8 SFF HDD/SSD |
| 3 | Controller | It should support Integrated or add-on PCIe 3.0 based 12G SAS Raid Controller with RAID 0, 1, 5, 6, 10, 50, 60 with 2GB of Flash backed write cache onboard |
| 4 | Networking features | 1Gb 4-port network adaptors<br>2x10Gb 2-port adapter 10GBASET Copper (adapter level fault tolerance is required) |
| 5 | Interfaces | Serial – 1<br>Micro SD slot – 1<br>USB 3.0 support With Up to 5 Total: |
| 6 | Bus Slots | Server should support three PCI-Express 3.0 slots, at least one x16 PCIe slots |
| 7 | Power Supply | Should support hot plug redundant power supplies with minimum 94% efficiency |
| 8 | Fans | Redundant hot-plug system fans |

| | | |
|---|---|---|
| 9 | Industry Standard Compliance | ACPI 4.0 Compliant or above<br>PCIe 3.0 Compliant<br>PXE Support<br>Energy Star<br>ASHRAE A3/A4 or later<br>SMBIOS<br>Redfish API<br>SNMP v3<br>TLS 1.2<br>DMTF Systems Management Architecture |
| 10 | System Security | UEFI Secure Boot and Secure Start support<br>Security feature to ensure servers do not execute compromised firmware code<br>FIPS 140-2 validation<br>Common Criteria certification<br>Configurable for PCI DSS compliance<br>Advanced Encryption Standard (AES) and Triple Data Encryption Standard (3DES) on browser or equivalent<br>Tamper-free updates - components digitally signed and verified<br>Secure Recovery - recover critical firmware to known good state on detection of compromised firmware<br>Ability to rollback firmware<br>Secure erase of NAND/User data<br>TPM (Trusted Platform Module) 1.2<br>TPM (Trusted Platform Module) 2.0<br>Configurable for PCI DSS compliance<br>Secure erase of NAND<br>Chassis Intrusion detection |
| 11 | Operating Systems and Virtualization Software Support | Microsoft Windows Server<br>Red Hat Enterprise Linux for SAP (RHEL)<br>SUSE Linux Enterprise Server for SAP (SLES)<br>VMware |
| 12 | GPU support | System should support NVIDIA's latest computational accelerators and graphics accelerators |

| | | |
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| 13 | System Performance Tuning | 1. System should support feature for improved workload throughput for applications sensitive to frequency fluctuations. This feature should allow processor operations in turbo mode without the frequency fluctuations associated with running in turbo mode<br>2. System should support workload Profiles for simple performance optimization |
| 14 | Firmware security | 1. For firmware security, system should support remote management chip creating a fingerprint in the silicon, preventing servers from booting up unless the firmware matches the fingerprint. This feature should be immutable<br>2. Should maintain repository for firmware and drivers' recipes to aid rollback or patching of compromised firmware. Should also store Factory Recovery recipe preloaded to rollback to factory tested secured firmware |
| 15 | Server Management | System remote management should support browser based graphical remote console along with Virtual Power button, remote boot using USB/CD/DVD Drive. |
| | | System should support embedded remote support to transmit hardware events directly to OEM for automated phone home support |
| | | Should help provide proactive notification of actual or impending component failure alerts on critical components like CPU, Memory and HDD and automatic calls logging. System should support embedded remote support to transmit hardware events directly to OEM or an authorized partner for automated phone home support. |
| | | Should provide an online portal that can be accessible from anywhere. The portal should provide one stop, online access to the product, support information and provide information to track warranties, support contracts and status. The Portal should also provide a personalized dashboard to monitor device heath, hardware events, contract and warranty status. Should provide a visual status of individual devices and device groups. The Portal should be available on premise (at our location - console based) or off premise (in the cloud). |
| | | Should help to proactively identify out-of-date BIOS, drivers, and Server Management agents and enable the remote update of system software/firmware components. |
| | | The Server Management Software should be of the same brand as of the server supplier. |

| | | |
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| 16 | Cloud Enabled Monitoring and Analytics or equivalent web console. | 1. Offered servers shall have cloud enabled monitoring for proactive management. All required licenses for same shall be included in the offer.<br>2. Cloud Enabled Monitoring shall have capability to provide following:<br>a. Providing Firmware upgrade and patch upgrade recommendations proactively.<br>b. Providing power and support entitlement status.<br>c. Recommendations to eliminate performance bottlenecks and critical events, having capability of proactive recommendation for arresting the issues / problems. |
| 17 | Warranty | 5 Years 24x7 onsite support with commitment to resolve the problem within 6 Hours. Support has to be provided directly by OEM during the warranty period. |
| 18 | Bill of Materials | The vendor has to give make, model, part nos. of every component which will be cross verified by OEM. |
| 19 | Manufacturer Authorization Letter | Manufacturers Authorization Letter Specific to this tender must be submitted. Tender submitted without MAF will be rejected. |

## 2.2. DC & DR Software

i) Enterprise Management System (EMS) Solution (DC & DR)

| Sl. No. | Description |
|---|---|
| **Make & Model: Any Reputed Make** | |
| **General Requirement – For Entire NMDC Network** | |
| 1 | The proposed EMS solution should be an integrated, modular and scalable solution from single OEM (i.e. all Network Monitoring, server Monitoring including application and database monitoring and Service Management tools should be from single OEM) to provide comprehensive fault management, performance management, traffic analysis and business service management, IT service desk\ help desk \trouble ticketing system & SLA monitoring functionality. |
| 2 | It should have a secured single sign-on and unified console for all functions of components offered for seamless cross-functional navigation & launch for single pane of glass visibility across multiple areas of monitoring & management. |
| 3 | The proposed EMS solution should be built on modern container technologies and have an option to deploy on classic mode non-containerized as well as containerized mode. |

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| 4 | The solution should have self-monitoring ability to track status of its critical components & parameters such as Up/Down status of its services, applications & servers, CPU utilization, Memory capacity, File system space, Database Status, synchronization status between primary and secondary system and event processing etc. It should provide this information in real-time through graphical dashboards, events/alarms as well as in the form of historical reports. |
| 5 | To ensure the proposed software is secure, it should have ISO 27034 certification from a verification or certification agency which has global recognition. |
| 6 | EMS/NMS OEM must be an industry standard, enterprise grade solution and shall be in the present in Gartner's MQ reports for NPMD and ITSM for last two years (2017 & 2018). |
| 7 | It shall be ensured by MSP/OEM that the proposed EMS solution (hardware and software) provisioned from Day 1 is able to handle 3000 devices and shall be scalable to 5000 devices. |
| 8 | Proposed EMS Solutions MUST have been in operations in at least 3 or more deployments across government/public sector, monitoring and managing at least 10,000 network nodes in each of the cases individually. Self-certification of the OEM, along with the customer names and proof of software delivery must be submitted at the time of bid submission. |
| 9 | Solution should ensure compatibility of existing Infrastructure with the procured infrastructure and it must fill the end functionality of the project. Offered solution should support bi-directional integration between the NOC and SOC to have the single consolidated console of infrastructure and security events. |
| **Server Fault Monitoring & Application Performance Management** | |
| 10 | The proposed Enterprise Management tools must be able to monitor end to end performance of Server Operating Systems & Databases and Should be able to manage distributed, heterogeneous systems – Windows, UNIX & LINUX from a single management station. |
| 11 | Should provide a centralized point of control with out-of-the-box policy-based management intelligence for easy deployment for the servers, operating systems, applications and services for correlating and managing all the IT infrastructure components of a business service |
| 12 | There should be a single agent on the managed node that provides the system performance data, and for event management it should be able to prioritize events, do correlation & duplicate suppression ability to buffer alarms and provide automatic actions with capability to add necessary annotations |
| 13 | Each operator should be provided with user roles that should include operational service views enabling operators to quickly determine impact and root cause associated with events. |
| 14 | The system should integrate with Helpdesk / Service desk tool for automated incident logging and also notify alerts or events via e-mail or SMS. |

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| 15 | The system should have context-based analysis and forecasting based on performance data with automated policy deployment with detailed, intelligent monitoring of performance and availability data collection |
| 16 | Solution should provide alarm correlation and facilitate reduction of total number of alarms displayed by means of intelligent alarm correlation, suppression and root cause analysis techniques built into the system. The system must ensure reduction in MTTR by means of advanced event correlation, filtering and root cause analysis. |
| 17 | The proposed Alarm Correlation and Root Cause Analysis system shall integrate network, server and database performance information and alarms in a single console and provide a unified reporting interface for network components. The current performance state of the entire network & system infrastructure shall be visible in an integrated console. |
| 18 | It should have capability to perform cross domain correlation with alarm correlation from Network Monitoring tool, Systems monitoring tool and other domain monitoring tools. |
| 19 | Alarm Filtering should allow flexible filtering rules for DC staff to filter the alarms by category, severity, elements, duration, by user, by views, by geography or by department. |
| 20 | The proposed solution should provide out of the box root cause analysis with multiple root cause algorithms inbuilt for root cause analysis. |
| 21 | Should be able to send e-mail or Mobile –SMS to pre-defined users for pre-defined faults. |
| 22 | The proposed solution should able to monitor application middleware & database |
| **Network Fault Monitoring & Performance Management with Reporting** | |
| 23 | The Network Management function must monitor performance across heterogeneous networks from one end of the enterprise to the other. |
| 24 | The solution should allow for discovery to be run on a continuous basis which tracks dynamic changes near real-time; in order to keep the topology always up to date. This discovery should run at a low overhead, incrementally discovering devices and interfaces. |
| 25 | The tool should automatically discover different type of heterogeneous devices (all SNMP supported devices i.e. Router, Switches, LAN Extender, Servers, Terminal Servers, Thin-Customer and UPS etc.) and map the connectivity between them with granular visibility up to individual ports level. The tool shall be able to assign different icons/ symbols to different type of discovered elements. It should show live interface connections between discovered network devices. |
| 26 | It should support various discovery protocols to perform automatic discovery of all L2, L3 Network devices across NMDC locations and any further Network connectivity's planned in future. |
| 27 | The tool shall be able to discover IPv4 only, IPv6 only as well as devices in dual-stack. In case of dual stack devices, the system shall be able to discover and show both IPv4 and IPv6 IP addresses. |

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| 28 | The tool shall be able to work on SNMP V-1, V-2c & V-3 based on the SNMP version supported by the device. It shall provide an option to discover and manage the devices/elements based on SNMP as well as ICMP. |
| 29 | The proposed Network Fault Management solution must support extensive discovery mechanisms and must easily discover new devices using mechanisms such as SNMP Trap based discovery. It must also allow for inclusion and exclusion list of IP address or devices from such discovery mechanisms |
| 30 | The proposed solution must provide a detailed asset report, organized by vendor name, device type, listing all ports for all devices. The Solution must provide reports to identify unused/dormant Network ports in order to facilitate capacity planning |
| 31 | The propose solution should have diagnostic analytics capability that able to visually correlate performance and configuration changes of all network issues. |
| **Network Configuration Automation** | |
| 32 | The system should be able to clearly identify configuration changes / policy violations/ inventory changes across multi-vendor network tool. |
| 33 | The system should support secure device configuration capture and upload and thereby detect inconsistent “running” and “start-up” configurations and alert the administrators. |
| 34 | The proposed system should be able to administer configuration changes to network elements by providing toolkits to automate the following administrative tasks of effecting configuration changes to network elements: |
| 35 | a) Capture running configuration; b) Capture start-up configuration; c) Upload configuration; d) Write start-up configuration; e) Upload firmware |
| 36 | The proposed fault management solution must able to perform “load & merge” configuration changes to multiple network devices |
| 37 | The proposed fault management solution must able to perform real-time or scheduled capture of device configurations |
| 38 | NMS should support 3-Dimensional Compliance Model - Configuration, Software, Running State |
| **Reporting** | |
| 39 | Reporting solution should be able to report on Service Level status of configured business service. |
| 40 | It should be able to collect and collate information regarding relationship between IT elements and business service, clearly showing how infrastructure impacts business service levels. |
| 41 | The solution should be user configurable for building additional reports. |
| 42 | Solution should be able to collect Key performance measurements and statistics from all network domains and store it. This data is to be used for evaluation of performance of the end to end network infrastructure/services. |

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| 43 | The performance management system shall be able to collect and report data like: |
| 44 | a. Packet delay and packet loss |
| 45 | b. User bandwidth usage rate |
| 46 | d. Network availability rate |
| 47 | e. CPU usage rate |
| 48 | f. Input/output traffic through physical ports |
| 49 | g. Input/output traffic through logical ports |
| 50 | The Performance Management shall have user defined set of reports like: |
| 51 | a. Summary Reports for specific groups: Reports displaying per group of resources the group aggregations for a set of metrics (for example, per City, the maximum traffic or the total traffic). |
| 52 | b. Summary Reports for specific Resources: Reports displaying for a set of resources the period aggregations for the same set of metrics (for example, per interface, the maximum traffic over the day) |
| 53 | c. Detailed chart Reports: Reports displaying for one resource and the same set of metrics the values over the period (for example, the raw collected values for the day). |
| 54 | d. Resource Threshold Violation Reports: Reports displaying the resources for which a threshold was violated |
| 55 | c. Detailed chart Reports: Reports displaying for one resource and the same set of metrics the values over the period (for example, the raw collected values for the day). |
| 56 | d. Resource Threshold Violation Reports: Reports displaying the resources for which a threshold was violated. |
| **General Requirement of IT Service/ Helpdesk** | |
| 57 | Should able to support and handle large volume of incident, service requests, changes, etc. |
| 58 | Should have the feature to integrate with third party IVR or CTI |
| 59 | The porposed helpdesk should have splutions like : Incident management, Problem Management, Change Management, Knowledge Management, Service Level Management, Service Asset and Configuration management, Service Catalogue and Request Fulfilment, etc. The certification copies to be submitted. |
| 60 | The solution should provide to browse through CMDB which should offer powerful search capabilities for configuration items and services, enabling to quickly find CIs as well as their relationships to other CIs. |
| 61 | Tool Analytics should be completely configurable in terms of source data and results, enabling Process Managers and other IT Users to proactively identify trends that can be used to drive action. Multiple instances shall be allowed to be configured in different ways in different modules for different outcomes - for example one should be able to identify trends in one set of data and |

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| | subsequently develop linkages with other data, or Analytics can run on top of reporting results to provide further insights from unstructured data. |
| 62 | The tool should have the knowledge management OOB – knowledge databases to support investigations, diagnoses, root cause analysis techniques, and creating / updating workarounds, temporary fixes and resolutions |
| 63 | The tool should allow the creation of different access levels (i.e. Read only, write, create, delete) to knowledge management system |
| 64 | The proposed helpdesk solution must support code less configuration of processes that can be upgraded seamlessly without the need to reconfiguration of processes. |
| 65 | Solution should support comprehensive SLA management platform |
| 66 | Must allow creating and applying various operational level parameters to Incidents, Requests, Changes, and Release management modules. |
| 67 | The application should have a predefined/customizable field to indicate & track the progress/status of the lifecycle of ticket(s). |
| 68 | The tool should provide an audit trail, tracking & monitoring for record information and updates from opening through fulfilment to closure for example: IDs of individuals or groups opening, updating & closing records; dates / times of status & activities updates, etc. |
| 69 | SI's must proposed a full fledges Service Level Management Solution that allows for tracking of various service level performances of IT Infrastructure and vendor performance. |
| 70 | The solution should support SLA violations alerts during the tracking period. |
| 71 | The solution should support managing and maintaining a full history of an SLA. |
| 72 | The solution must provide a flexible framework for collecting and managing service level templates including Service Definition, Service Level Metrics, Penalties and other performance indicators measured across infrastructure and vendors |
| **Auto-Discovery and Inventory** | |
| 73 | Discovery should work without requiring agent installation (that is, agent-less discovery) while discovery Layers 2 through Layers 7 of OSI model |
| 74 | Should use Industry-standard protocols such as WMI, SNMP, JMX, SSH to perform discovery without requiring the installation of an agent |
| 75 | Discovery system should have ability to modify out-of-box discovery scripts, create customized discovery scripts |
| 76 | The EMS must provide a common configuration management database that must have a single solution for discovery of networks devices, servers & desktops, using a common probe, that supports both agent-less and agent-based technologies using. |
| **Warranty & MAF** | |
| 77 | 5 Years 24x7 online support |

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| 78 | The vendor has to give make, model, part nos. of every component which will be cross verified by OEM. |
| 79 | Manufacturers Authorization Letter Specific to this tender must be submitted. Tender submitted without MAF will be rejected. |

## 2.3. Firewall

i) Firewall (DC) – Type 1

| Sl. No | Description |
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| | |
| **General** | |
| 1 | The Firewall OEM should be leaders in latest Gartner's Enterprise Firewall Magic Quadrant report. |
| 2 | The Firewall OEM should be ICSA Labs certified for Firewall and should be Common Criteria EAL 4 certified |
| 3 | OEM should be having recommended rating from NSS Lab's Next Generation Firewall from past 2 years |
| 4 | OS should be "IPv6 Phase II Ready" certified |
| **Hardware** | |
| 5 | The Firewall must be appliance based |
| 6 | Should support 16 or more gigabit RJ45 interfaces |
| 7 | Should have 4 nos. of 10G SFP+ slots populated with the transceivers and should have upgrade option for 2 nos. of 40G QSFP+ in future |
| 8 | Should have 1 console port (RJ45) and 1 or more Number of USB ports |
| **Firewall Performance** | |
| 10 | Should have Firewall throughputs of minimum 60 Gbps or more |
| 11 | IPSec VPN throughput should be 20 Gbps or more |
| 12 | FW throughput should be 8 Gbps with enterprise mix traffic |
| 13 | Threat protection throughput should be 6 Gbps with enterprise mix traffic |
| 14 | Must support at least 8,000,000 or more concurrent connections |
| 15 | Must support at least 400,000 or more new sessions per second processing. |
| 16 | Should Support Virtualization (ie Virtual Systems / Virtual Domains). Should be having 10 or more virtual system license from day one |

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| **Firewall Features** | |
| 17 | Should support both “bridge mode” or "transparent mode” apart from the standard NAT mode |
| 18 | Should provide NAT functionality, including PAT. Should support NAT 66, NAT 64, DNS 64, Static NAT IPv4 to IPv6 and vice versa (VIP64 and VIP46) and IPv6-IPv4 tunnelling or dual stack. |
| 19 | Should support IPv4 & IPv6 policies |
| 20 | Provision to create secure zones / DMZ (i.e. Multi- Zone support) |
| 21 | Should support the standards based Multi-Link aggregation technology (IEEE 802.3ad) to achieve higher bandwidth. |
| 22 | Should support VLAN tagging (IEEE 802.1q) in NAT/Route mode |
| 23 | Should support Static routing and Dynamic Routing (RIP, OSPF & BGP) |
| 24 | Should support Active-Active as well as Active- Passive redundancy. |
| 25 | Should support ISP Load balancing and Failover |
| 26 | Should support multi-path intelligence based on link quality criteria |
| 27 | Should support link performance check based on packet loss, latency & jitter |
| 28 | Should support WAN path controller providing high application performance |
| 29 | Should support application specific rules based on SLA strategy |
| 30 | Should support high performance deep packet inspection for application identification and control |
| **Authentication** | |
| 31 | Should support User-Group based Authentication (Identity based Firewalling) & Scheduling |
| 32 | Should support authentication servers – RADIUS, LDAP & Active Directory |
| 33 | Support for RSA SecureID or other Token based Products |
| **VPN** | |
| 34 | The VPN should be integrated with firewall and should be ICSA Labs certified for IPSec VPN |
| 35 | Should support protocols such as DES & 3DES, MD5, SHA-1, SHA-256 authentication, Diffie- Hellman Group 1, Group 2, Group 5, Group 14, Internet Key Exchange (IKE) v1 as well as IKE v2 algorithm, The new encryption standard AES 128, 192 & 256 |
| 36 | Should support minimum 2000 IPSec Site-to-Site and 5000 no of IPSec Site-to-Client VPN tunnels. |
| 37 | Should have integrated SSL VPN with license for 500 concurrent SSL VPN users |
| 38 | Should support Single Sign-On Bookmarks for SSL Web VPN |
| 39 | Should support Windows, Linux and MAC OS for SSL-VPN |
| 40 | Should support NAT within IPSec/SSL VPN tunnels |

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| 41 | Should also support PPTP and L2TP over IPSec VPN protocols. |
| 42 | Should support Stateful failover for both Firewall and VPN sessions. |
| **IPS** | |
| 43 | Should have a built-in Signature and Anomaly based IPS engine on the same unit |
| 44 | Should have protection for 7000+ signatures |
| 45 | Able to prevent denial of service and distributed Denial of Service attacks. |
| 46 | Supports user-defined signatures (i.e., Custom Signatures) with Regular Expressions. |
| **Application Control** | |
| 47 | Should have Application control feature with 3000 or more application signatures |
| 48 | Should perform Traffic Shaping based on applications |
| 49 | Should control popular IM/P2P, proxy applications regardless of port/protocol |
| **Gateway Antivirus** | |
| 50 | The appliance should facilitate embedded anti-virus support |
| 51 | Gateway AV should be supported for real-time detection of viruses and malicious code for HTTP, HTTPS, FTP, SMTP, SMTPS, POP3 and IMAP protocols |
| 52 | should also include Botnet filtering and detecting and preventing Botnet command and control traffic |
| 53 | Should have configurable policy options. Possible to select traffic to scan for viruses |
| **Management, Log & Reporting** | |
| 54 | Firewall should support management either through GUI/CLI or through Central Management |
| 55 | Firewall should support logging to multiple syslog servers. |
| 56 | Log & Reporting should be a dedicated solution out of the Firewall |
| 57 | The log & reporting tool needs to be bundled or quoted along with the solution. The logging and analysis should either be an appliance or on a dedicated PC/ Server platform with 12 TB storage. The Executing Agency should take the responsibility of supplying the hardware and the OS with suitable warranty. |
| 58 | The solution should provide comprehensive security event logging, reporting |

ii) Firewall (DR & Perimeter) – Type 2

| **Sl. No** | **Description** |
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| **General** | |
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| 1 | The Firewall OEM should be leaders in latest Gartner's Enterprise Firewall Magic Quadrant report. |
| 2 | The Firewall OEM should be ICSA Labs certified for Firewall and should be Common Criteria EAL 4 certified. |
| 3 | OEM should be having recommended rating from NSS Lab's Next Generation Firewall from past 2 years. |
| 4 | OS should be “IPv6 Phase II Ready” certified |
| **Hardware** | |
| 5 | The Firewall must be appliance based |
| 6 | Should support 8 or more gigabit RJ45 interfaces |
| 7 | Should have 2 no of 10G SFP+ slots populated with the transceivers |
| 8 | Should have 1 console port (RJ45) and 1 or more Number of USB ports |
| 9 | Should have internal storage of 200 GB SSD |
| **Firewall Performance** | |
| 10 | Should have Firewall throughputs of minimum 30 Gbps or more |
| 11 | IPSec VPN throughput should be 10 Gbps or more |
| 12 | NGFW throughput should be 8 Gbps with enterprise mix traffic |
| 13 | Threat protection throughput should be 6 Gbps with enterprise mix traffic |
| 14 | Must support at least 7,000,000 or more concurrent connections |
| 15 | Must support at least 400,000 or more new sessions per second processing. |
| 16 | Should Support Virtualization (ie Virtual Systems / Virtual Domains). Should be having 10 or more virtual system license from day one |
| **Firewall Features** | |
| 17 | Should support both “bridge mode” or "transparent mode” apart from the standard NAT mode |
| 18 | Should provide NAT functionality, including PAT. Should support NAT 66, NAT 64, DNS 64, Static NAT IPv4 to IPv6 and vice versa (VIP64 and VIP46) and IPv6-IPv4 tunneling or dual stack. |
| 19 | Should support IPv4 & IPv6 policies |
| 20 | Provision to create secure zones / DMZ (ie Multi- Zone support) |
| 21 | Should support the standards based Multi-Link aggregation technology (IEEE 802.3ad) to achieve higher bandwidth. |
| 22 | Should support VLAN tagging (IEEE 802.1q) in NAT/Route mode |
| 23 | Should support Static routing and Dynamic Routing (RIP, OSPF & BGP) |
| 24 | Should support Active-Active as well as Active- Passive redundancy. |

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| 25 | Should support ISP Load balancing and Failover |
| 26 | Should support multi-path intelligence based on link quality criteria |
| 27 | Should support link performance check based on packet loss, latency & jitter |
| 28 | Should support WAN path controller providing high application performance |
| 29 | Should support application specific rules based on SLA strategy |
| 30 | Should support high performance deep packet inspection for application identification and control |
| **Authentication** | |
| 31 | Should support User-Group based Authentication (Identity based Firewalling) & Scheduling |
| 32 | Should support authentication servers – RADIUS, LDAP & Active Directory |
| 33 | Support for RSA Secure ID or other Token based Products |
| **VPN** | |
| 34 | The VPN should be integrated with firewall and should be ICSA Labs certified for IPSec VPN |
| 35 | Should support protocols such as DES & 3DES, MD5, SHA-1, SHA-256 authentication, Diffie- Hellman Group 1, Group 2, Group 5, Group 14, Internet Key Exchange (IKE) v1 as well as IKE v2 algorithm, The new encryption standard AES 128, 192 & 256 |
| 36 | Should support minimum 200 IPSec Site-to-Site and 1000 no of IPSec Site-to-Client VPN tunnels. |
| 37 | Should have integrated SSL VPN with license for 500 concurrent SSL VPN users |
| 38 | Should support Single Sign-On Bookmarks for SSL Web VPN |
| 39 | Should support Windows, Linux and MAC OS for SSL-VPN |
| 40 | Should support NAT within IPSec/SSL VPN tunnels |
| 41 | Should also support PPTP and L2TP over IPSec VPN protocols. |
| 42 | Should support Stateful failover for both Firewall and VPN sessions. |
| **IPS** | |
| 43 | Should have a built-in Signature and Anomaly based IPS engine on the same unit |
| 44 | Should have protection for 7000+ signatures |
| 45 | Able to prevent denial of service and distributed Denial of Service attacks. |
| 46 | Supports user-defined signatures (i.e., Custom Signatures) with Regular Expressions. |
| **Application Control** | |
| 47 | Should have Application control feature with 3000 or more application signatures |
| 48 | Should perform Traffic Shaping based on applications |

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| 49 | Should control popular IM/P2P, proxy applications regardless of port/protocol |
| **Gateway Antivirus** | |
| 50 | The appliance should facilitate embedded anti-virus support |
| 51 | Gateway AV should be supported for real-time detection of viruses and malicious code for HTTP, HTTPS, FTP, SMTP, SMTPS, POP3 and IMAP protocols |
| 52 | should also include Botnet filtering and detecting and preventing Botnet command and control traffic |
| 53 | Should have configurable policy options. Possible to select traffic to scan for viruses |
| **Management, Log & Reporting** | |
| 54 | Firewall should support management either through GUI/CLI or through Central Management |
| 55 | Firewall should support logging to multiple syslog servers. |
| 56 | Log & Reporting should be a dedicated solution out of the Firewall |
| 57 | The log & reporting tool needs to be bundled or quoted along with the solution. The logging and analysis should either be an appliance or on a dedicated PC/ Server platform. The Executing Agency should take the responsibility of supplying the hardware and the OS with suitable warranty. |
| 58 | The solution should provide comprehensive security event logging, reporting |

iii) Firewall – Web Application Filter

| Sl. No. | Description |
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| 1 | Web application firewall should be appliance based and provide specialized application threat protection. |
| 2 | Should be ICSA Certified |
| 3 | Should protect against application-level attacks targeted at web applications. |
| 4 | Should provide protection against sophisticated threats like SQL injection and cross-site scripting |
| 5 | Should provide controls to prevent identity theft, financial fraud and corporate espionage. |
| 6 | Appliance should have unlimited application licenses. |
| 7 | Automatic signature update and install |
| 8 | Device should have Sub Millisecond Latency |
| 9 | Should deliver at least 250 Mbps of WAF throughput |

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| 10 | Should have minimum 4 no's of 1G RJ45 |
| 11 | Should support at-least 4 nos of 1GB SFP slots |
| 12 | Should have minimum 200 GB of Storage space |
| 13 | Should have dual power supply |
| 14 | Dual-stack support for both IPv4 to IPv6 and IPv6 to IPv4 communication. |
| 15 | The appliance should be able to perform in multiple modes such as Active mode, passive mode, Transparent mode, Reverse proxy mode, |
| 16 | Appliance should continuously track the availability of the Servers being protected. |
| 17 | Should have a suitable Web Vulnerability Scanner to detect existing vulnerabilities in the protected web applications. |
| 18 | Should have Data Leak Prevention module to analyse all outbound traffic alerting/blocking any credit card leakage and information disclosure |
| 19 | Provide controls to meet PCI compliance requirements for web application servers. |
| 20 | Should have controls for Anti Web Defacement and provide ability to check the authorized version of the website content. |
| 21 | The solution should offer an on-board Anti-Virus solution for blocking the virus/malware file uploads into the servers from outside and the database should be updated automatically. |
| 22 | Should enforce strict RFC compliance check to prevent attacks such as encoding attacks, buffer overflows and other application specific attacks. |
| 23 | Should support automatic signature updates to protect against known and potential application security threats. |
| 24 | Should support XML firewall capability with schema validation, XML Firewall, IPS and routing capabilities. |
| 25 | Should Include policies for network and application layer denial of service threats |
| 26 | Should support XML Application protection |
| 27 | Should have built in policies |
| 28 | Should support custom signatures |
| 29 | Provide ability to allow/ deny URL access |
| 30 | Ability to define different policies for different applications |
| 31 | Ability to create custom attack signatures or events |
| 32 | Ability to combine detection and prevention |

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| 33 | Should protect certain hidden form fields. |
| 34 | Must provide ability to allow or deny a specific URL access. |
| 35 | WAF should support Normalization methods such as URL Decoding, Null Byte string, termination, converting back slash to forward slash character etc.. |
| 36 | A given user must be enforced to follow a sequence of pages while accessing. |
| 37 | Should provide a statistical view on collected application traffic |
| 38 | Should have controls against Brute force attacks |
| 39 | should Detect brute force attack (repeated requests for the same resource) against any part of the applications |
| 40 | Custom brute force attack detection for applications that do not return 401. |
| 41 | Protection against SYN-flood type of attacks |
| 42 | Should be able to protect Cookie Poisoning and Cookie Tampering. |
| 43 | Must support multiple HTTP versions |
| 44 | Should support restricting the methods used. |
| 45 | Should support restricting the method exceptions. |
| 46 | Should validate header length, content length, Body length, Parameter length, body line length etc.. |
| 47 | The device must be supported in reverse proxy mode |
| 48 | Appliance should be able to terminate SSL |
| 49 | Should Passively decrypt SSL |
| 50 | Client certificates should be supported in passive mode and active mode. |
| 51 | In termination mode, the backend traffic (i.e. the traffic from the WAF to the web server) can be encrypted via SSL |
| 52 | Should support High Availability in active /Passive, Configuration Sync modes. |
| 53 | WAF appliance should have application-aware load-balancing engine to distribute traffic and route content across multiple web servers. |
| 54 | The vulnerability scan should identify vulnerabilities such as XSS, SQL injection, Source code disclosure, HTTP Request Smuggling, Common web server vulnerabilities etc.. |
| 55 | Solution should be capable of detecting and distinguishing two sets of Bots from the Internet: Known search engines, Bad robots (scanners, crawlers, spiders) |
| 56 | Must be able to scan the authenticated applications. |

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| 57 | Should support exclusions in scanning by the administrator. |
| 58 | Should support Secure Administrative Access using HTTPS and SSH |
| 59 | Should support Role Based Access Control for Management |
| 60 | Should support multi-tenancy feature via administrative domains |
| 61 | Separate network interface for SSH/HTTPS access. |
| 62 | Ability to identify and notify system faults and loss of performance |
| 63 | Should support multiple log formats such as CSV, Syslog, TXT, etc. |
| 64 | Should be able to send logs to the existing log & report solution |
| 65 | Should support inbuilt Reporting and sending the report via E-Mail |
| 66 | Should support report formats in PDF, HTML, WORD etc.. |
| 67 | Should generate comprehensive event reports |

iv) Firewall (Perimeter) – Type 3

| Sl. No | Description |
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| | |
| **General** | |
| 1 | The Firewall OEM should be leaders in latest Gartner's Enterprise Firewall Magic Quadrant report. |
| 2 | The Firewall OEM should be ICSA Labs certified for Firewall and should be Common Criteria EAL 4 certified |
| 3 | OEM should be having recommended rating from NSS Lab's Next Generation Firewall from past 2 years |
| 4 | OS should be “IPv6 Phase II Ready” certified |
| **Hardware** | |
| 5 | The Firewall must be appliance based |
| 6 | Should support 12 or more gigabit RJ45 interfaces |
| 7 | Should support 1 or more Number of USB ports |
| 8 | Should have 1 console port (RJ45) |
| 9 | Should have internal storage of 200 GB SSD |
| **Firewall Performance** | |

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|---|---|
| 10 | Should have Firewall throughputs of minimum 6 Gbps or more |
| 11 | IPSec VPN throughput should be 3 Gbps or more |
| 12 | NGFW throughput should be 300 Mbps with enterprise mix traffic |
| 13 | Threat protection throughput should be 250 Mbps with enterprise mix traffic |
| 14 | Must support at least 1,500,000 or more concurrent connections |
| 15 | Must support at least 30,000 or more new sessions per second processing. |
| 16 | Should Support Virtualization (ie Virtual Systems / Virtual Domains). Should be having 5 or more virtual system license from day one |
| | **Firewall Features** |
| 17 | Should support both “bridge mode” or "transparent mode” apart from the standard NAT mode |
| 18 | Should provide NAT functionality, including PAT. Should support NAT 66, NAT 64, DNS 64, Static NAT IPv4 to IPv6 and vice versa (VIP64 and VIP46) and IPv6-IPv4 tunneling or dual stack. |
| 19 | Should support IPv4 & IPv6 policies |
| 20 | Provision to create secure zones / DMZ (ie Multi- Zone support) |
| 21 | Should support the standards based Multi-Link aggregation technology (IEEE 802.3ad) to achieve higher bandwidth. |
| 22 | Should support VLAN tagging (IEEE 802.1q) in NAT/Route mode |
| 23 | Should support Static routing and Dynamic Routing (RIP, OSPF & BGP) |
| 24 | Should support Active-Active as well as Active- Passive redundancy. |
| 25 | Should support ISP Load balancing and Failover |
| 26 | Should support multi-path intelligence based on link quality criteria |
| 27 | Should support link performance check based on packet loss, latency & jitter |
| 28 | Should support WAN path controller providing high application performance |
| 29 | Should support application specific rules based on SLA strategy |
| 30 | Should support high performance deep packet inspection for application identification and control |
| **Authentication** | |
| 31 | Should support User-Group based Authentication (Identity based Firewalling) & Scheduling |
| 32 | Should support authentication servers – RADIUS, LDAP & Active Directory |
| 33 | Support for RSA Secure ID or other Token based Products |
| **VPN** | |
| 34 | The VPN should be integrated with firewall and should be ICSA Labs certified for IPSec VPN |

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| 35 | Should support protocols such as DES & 3DES, MD5, SHA-1, SHA-256 authentication, Diffie- Hellman Group 1, Group 2, Group 5, Group 14, Internet Key Exchange (IKE) v1 as well as IKE v2 algorithm, The new encryption standard AES 128, 192 & 256 |
| 36 | Should support minimum 200 IPSec Site-to-Site and 1000 no of IPSec Site-to-Client VPN tunnels. |
| 37 | Should have integrated SSL VPN with license for 200 concurrent SSL VPN users |
| 38 | Should support Single Sign-On Bookmarks for SSL Web VPN |
| 39 | Should support Windows, Linux and MAC OS for SSL-VPN |
| 40 | Should support NAT within IPSec/SSL VPN tunnels |
| 41 | Should also support PPTP and L2TP over IPSec VPN protocols. |
| 42 | Should support Stateful failover for both Firewall and VPN sessions. |
| **IPS** | |
| 43 | Should have a built-in Signature and Anomaly based IPS engine on the same unit |
| 44 | Should have protection for 7000+ signatures |
| 45 | Able to prevent denial of service and distributed Denial of Service attacks. |
| 46 | Supports user-defined signatures (i.e., Custom Signatures) with Regular Expressions. |
| **Application Control** | |
| 47 | Should have Application control feature with 3000 or more application signatures |
| 48 | Should perform Traffic Shaping based on applications |
| 49 | Should control popular IM/P2P, proxy applications regardless of port/protocol |
| **Gateway Antivirus** | |
| 50 | The appliance should facilitate embedded anti-virus support |
| 51 | Gateway AV should be supported for real-time detection of viruses and malicious code for HTTP, HTTPS, FTP, SMTP, SMTPS, POP3 and IMAP protocols |
| 52 | should also include Botnet filtering and detecting and preventing Botnet command and control traffic |
| 53 | Should have configurable policy options. Possible to select traffic to scan for viruses |
| | **Web Filtering** |
| 54 | The appliance should facilitate embedded Web Content Filtering feature |
| 55 | Web content filtering solution should work independently without the need to integrate with External proxy server. |
| 56 | URL database should have 200 million or more URLs under more than 70 categories |
| 57 | Should be able to block different categories/sites based on User Authentication. |

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|---|---|
| **Management, Log & Reporting** | |
| 58 | Firewall should support management either through GUI/CLI or through Central Management |
| 59 | Firewall should support logging to multiple syslog servers. |
| 60 | Log & Reporting should be a dedicated solution out of the Firewall |
| 61 | The log & reporting tool needs to be bundled or quoted along with the solution. The logging and analysis should either be an appliance or on a dedicated PC/ Server platform. The Executing Agency should take the responsibility of supplying the hardware and the OS with suitable warranty. |
| 62 | The solution should provide comprehensive security event logging, reporting |

v) Firewall (Server Farm) – Type 4

| **Sl. No** | **Description** |
|---|---|
| **General** | |
| | |
| 1 | The Firewall OEM should be leaders in latest Gartner's Enterprise Firewall Magic Quadrant report. |
| 2 | The Firewall OEM should be ICSA Labs certified for Firewall and should be Common Criteria EAL 4 certified |
| 3 | OEM should be having recommended rating from NSS Lab's Next Generation Firewall from past 2 years |
| 4 | OS should be “IPv6 Phase II Ready” certified |
| **Hardware** | |
| 5 | The Firewall must be appliance based |
| 6 | Should support 12 or more gigabit RJ45 interfaces |
| 7 | Should have 2 no of 10G SFP+ slots populated with the transceivers |
| 8 | Should support 1 or more Number of USB ports |
| 9 | Should have 1 console port (RJ45) |
| **Firewall Performance** | |
| 10 | Should have Firewall throughputs of minimum 10 Gbps or more |
| 11 | IPSec VPN throughput should be 5 Gbps or more |
| 12 | NGFW throughput should be 1 Gbps with enterprise mix traffic |
| 13 | Threat protection throughput should be 800 Mbps with enterprise mix traffic |

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| 14 | Must support at least 1,500,000 or more concurrent connections |
| 15 | Must support at least 30,000 or more new sessions per second processing. |
| 16 | Should Support Virtualization (i.e. Virtual Systems / Virtual Domains). Should be having 5 or more virtual system license from day one |
| **Firewall Features** | |
| 17 | Should support both “bridge mode” or "transparent mode” apart from the standard NAT mode |
| 18 | Should provide NAT functionality, including PAT. Should support NAT 66, NAT 64, DNS 64, Static NAT IPv4 to IPv6 and vice versa (VIP64 and VIP46) and IPv6-IPv4 tunneling or dual stack. |
| 19 | Should support IPv4 & IPv6 policies |
| 20 | Provision to create secure zones / DMZ (ie Multi- Zone support) |
| 21 | Should support the standards based Multi-Link aggregation technology (IEEE 802.3ad) to achieve higher bandwidth. |
| 22 | Should support VLAN tagging (IEEE 802.1q) in NAT/Route mode |
| 23 | Should support Static routing and Dynamic Routing (RIP, OSPF & BGP) |
| 24 | Should support Active-Active as well as Active- Passive redundancy. |
| 25 | Should support ISP Load balancing and Failover |
| 26 | Should support multi-path intelligence based on link quality criteria |
| 27 | Should support link performance check based on packet loss, latency & jitter |
| 28 | Should support WAN path controller providing high application performance |
| 29 | Should support application specific rules based on SLA strategy |
| 30 | Should support high performance deep packet inspection for application identification and control |
| **Authentication** | |
| 31 | Should support User-Group based Authentication (Identity based Firewalling) & Scheduling |
| 32 | Should support authentication servers – RADIUS, LDAP & Active Directory |
| 33 | Support for RSA Secure ID or other Token based Products |
| **VPN** | |
| 34 | The VPN should be integrated with firewall and should be ICSA Labs certified for IPSec VPN |
| 35 | Should support protocols such as DES & 3DES, MD5, SHA-1, SHA-256 authentication, Diffie- Hellman Group 1, Group 2, Group 5, Group 14, Internet Key Exchange (IKE) v1 as well as IKE v2 algorithm, The new encryption standard AES 128, 192 & 256 |

| | |
|---|---|
| 36 | Should support minimum 200 IPSec Site-to-Site and 1000 no of IPSec Site-to-Client VPN tunnels. |
| 37 | Should have integrated SSL VPN with license for 200 concurrent SSL VPN users |
| 38 | Should support Single Sign-On Bookmarks for SSL Web VPN |
| 39 | Should support Windows, Linux and MAC OS for SSL-VPN |
| 40 | Should support NAT within IPSec/SSL VPN tunnels |
| 41 | Should also support PPTP and L2TP over IPSec VPN protocols. |
| 42 | Should support Stateful failover for both Firewall and VPN sessions. |
| **IPS** | |
| 43 | Should have a built-in Signature and Anomaly based IPS engine on the same unit |
| 44 | Should have protection for 7000+ signatures |
| 45 | Able to prevent denial of service and distributed Denial of Service attacks. |
| 46 | Supports user-defined signatures (i.e., Custom Signatures) with Regular Expressions. |
| **Application Control** | |
| 47 | Should have Application control feature with 3000 or more application signatures |
| 48 | Should perform Traffic Shaping based on applications |
| 49 | Should control popular IM/P2P, proxy applications regardless of port/protocol |
| **Gateway Antivirus** | |
| 50 | The appliance should facilitate embedded anti-virus support |
| 51 | Gateway AV should be supported for real-time detection of viruses and malicious code for HTTP, HTTPS, FTP, SMTP, SMTPS, POP3 and IMAP protocols |
| 52 | should also include Botnet filtering and detecting and preventing Botnet command and control traffic |
| 53 | Should have configurable policy options. Possible to select traffic to scan for viruses |
| **Web Filtering** | |
| 54 | The appliance should facilitate embedded Web Content Filtering feature |
| 55 | Web content filtering solution should work independently without the need to integrate with External proxy server. |
| 56 | URL database should have 200 million or more URLs under more than 70 categories |
| 57 | Should be able to block different categories/sites based on User Authentication. |
| **Management, Log & Reporting** | |
| 58 | Firewall should support management either through GUI/CLI or through Central Management |

| | |
|---|---|
| 59 | Firewall should support logging to multiple syslog servers. |
| 60 | Log & Reporting should be a dedicated solution out of the Firewall |
| 61 | The log & reporting tool needs to be bundled or quoted along with the solution. The logging and analysis should either be an appliance or on a dedicated PC/ Server platform. The Executing Agency should take the responsibility of supplying the hardware and the OS with suitable warranty. |
| 62 | The solution should provide comprehensive security event logging, reporting |

vi) Firewall (PLC Network) – Type 5

| **Sl. No** | **Specification** |
|---|---|
| | |
| **General** | |
| 1 | The Firewall OEM should be leaders in latest Gartner's Enterprise Firewall Magic Quadrant report. |
| 2 | The Firewall OEM should be ICSA Labs certified for Firewall and should be Common Criteria EAL 4 certified |
| 3 | OEM should be having recommended rating from NSS Lab's Next Generation Firewall from past 2 years |
| 4 | OS should be “IPv6 Phase II Ready” certified |
| **Hardware** | |
| 5 | The Firewall must be appliance based with rack mount option |
| 6 | Should support 8 or more gigabit RJ45 interfaces |
| 7 | Should support 1 or more Number of USB ports |
| 8 | Should have 1 console port (RJ45) |
| **Firewall Performance** | |
| 9 | Should have Firewall throughputs of minimum 2 Gbps or more |
| 10 | IPSec VPN throughput should be 1 Gbps or more |
| 11 | NGFW throughput should be 200 Mbps with enterprise mix traffic |
| 12 | Threat protection throughput should be 150 Mbps with enterprise mix traffic |
| 13 | Must support at least 1,000,000 or more concurrent connections |
| 14 | Must support at least 30,000 or more new sessions per second processing. |
| 15 | Should Support Virtualization (ie Virtual Systems / Virtual Domains). Should be having 5 or more virtual system license from day one |

| | |
|---|---|
| **Firewall Features** | |
| 16 | Should support both “bridge mode” or "transparent mode” apart from the standard NAT mode |
| 17 | Should provide NAT functionality, including PAT. Should support NAT 66, NAT 64, DNS 64, Static NAT IPv4 to IPv6 and vice versa (VIP64 and VIP46) and IPv6-IPv4 tunneling or dual stack. |
| 18 | Should support IPv4 & IPv6 policies |
| 19 | Provision to create secure zones / DMZ (ie Multi- Zone support) |
| 20 | Should support the standards based Multi-Link aggregation technology (IEEE 802.3ad) to achieve higher bandwidth. |
| 21 | Should support VLAN tagging (IEEE 802.1q) in NAT/Route mode |
| 22 | Should support Static routing and Dynamic Routing (RIP, OSPF & BGP) |
| 23 | Should support Active-Active as well as Active- Passive redundancy. |
| 24 | Should support ISP Load balancing and Failover |
| 25 | Should support multi-path intelligence based on link quality criteria |
| 26 | Should support link performance check based on packet loss, latency & jitter |
| 27 | Should support WAN path controller providing high application performance |
| 28 | Should support application specific rules based on SLA strategy |
| 29 | Should support high performance deep packet inspection for application identification and control |
| **Authentication** | |
| 30 | Should support User-Group based Authentication (Identity based Firewalling) & Scheduling |
| 31 | Should support authentication servers – RADIUS, LDAP & Active Directory |
| 32 | Support for RSA Secure ID or other Token based Products |
| **VPN** | |
| 33 | The VPN should be integrated with firewall and should be ICSA Labs certified for IPSec VPN |
| 34 | Should support protocols such as DES & 3DES, MD5, SHA-1, SHA-256 authentication, Diffie- Hellman Group 1, Group 2, Group 5, Group 14, Internet Key Exchange (IKE) v1 as well as IKE v2 algorithm, The new encryption standard AES 128, 192 & 256 |
| 35 | Should support minimum 100 IPSec Site-to-Site and 500 no of IPSec Site-to-Client VPN tunnels. |
| 36 | Should have integrated SSL VPN with license for 50 concurrent SSL VPN users |

| | |
|---|---|
| 37 | Should support Single Sign-On Bookmarks for SSL Web VPN |
| 38 | Should support Windows, Linux and MAC OS for SSL-VPN |
| 39 | Should support NAT within IPSec/SSL VPN tunnels |
| 40 | Should also support PPTP and L2TP over IPSec VPN protocols. |
| 41 | Should support Stateful failover for both Firewall and VPN sessions. |
| **IPS** | |
| 42 | Should have a built-in Signature and Anomaly based IPS engine on the same unit |
| 43 | Should have protection for 7000+ signatures |
| 44 | Able to prevent denial of service and distributed Denial of Service attacks. |
| 45 | Supports user-defined signatures (i.e., Custom Signatures) with Regular Expressions. |
| **Application Control** | |
| 46 | Should have Application control feature with 3000 or more application signatures |
| 47 | Should perform Traffic Shaping based on applications |
| 48 | Should control popular IM/P2P, proxy applications regardless of port/protocol |
| **Gateway Antivirus** | |
| 49 | The appliance should facilitate embedded anti-virus support |
| 50 | Gateway AV should be supported for real-time detection of viruses and malicious code for HTTP, HTTPS, FTP, SMTP, SMTPS, POP3 and IMAP protocols |
| 52 | should also include Botnet filtering and detecting and preventing Botnet command and control traffic |
| 53 | Should have configurable policy options. Possible to select traffic to scan for viruses |
| **Web Filtering** | |
| 54 | The appliance should facilitate embedded Web Content Filtering feature |
| 55 | Web content filtering solution should work independently without the need to integrate with External proxy server. |
| 56 | URL database should have 200 million or more URLs under more than 70 categories |
| 57 | Should be able to block different categories/sites based on User Authentication. |
| **Management, Log & Reporting** | |
| 58 | Firewall should support management either through GUI/CLI or through Central Management |
| 59 | Firewall should support logging to multiple syslog servers. |
| 60 | Log & Reporting should be a dedicated solution out of the Firewall |

| | |
|---|---|
| 61 | The log & reporting tool needs to be bundled or quoted along with the solution. The logging and analysis should either be an appliance or on a dedicated PC/ Server platform. The Executing Agency should take the responsibility of supplying the hardware and the OS with suitable warranty. |
| 62 | The solution should provide comprehensive security event logging, reporting |

## 2.4. Switch, EMS

i) Core Switches for Site Locations

*a) Core Switch – Type 1*

| Sl. No. | Description | |
|---|---|---|
| 1 | Form Factor | Chassis switch with Minimum 4 usable Slots 19 Inch Rack mountable switch with management/supervisor Engine 1+1 availability. OEM should provide all the hardware including fabric cards, CPU, Power Supplies, Fan Trays etc. and software, licenses to get full capacity of the provided chassis. |
| 2 | Architecture | Non-Blocking architecture. Must have EAL3 /NDCPP or above common criteria certification. |
| 3 | IPV6 Compliance | All Functionalities of Switch shall be IPV4 and IPv6 compliant and it should work on IPv6 Platform without any additional hardware/ software. |
| 4 | End of sale | OEM End-of-sale declaration shall not have been released for the quoted model at the time of the bid submission. |
| 5 | Feature Availability | All the specified features/parameters/certifications must be available on the Technical Bid opening date. Features /parameters /certifications proposed to be available in near future / on roadmap shall not be considered. Switch should support ISSU (In Service Software upgrade), Virtualization, Fabric provisioning support BGP-EVPN, OSPF VxLAN, VRF, VRRP Should support VM-aware Network Automation, Should support Migration of Port Profiles or equivalent, Should support 802.1Qbb, netconf, openstack/ openflow, REST API support in same hardware. |
| 6 | Ports | 24 Port 10G SFP Line Card, 24 Port 1G SFP Line card and 48 Port Copper 1G/10G Ports – each or 48 port |

| | | |
|---|---|---|
| | | 1/10G SFP+. Switch should support 40/100 Gbps ports module cards scalability in same hardware from day 1. |
| 7 | SFP Transceivers | All the Transceivers/Modules used to connect the Switches should be from the same OEM/ make of the switches only. Switch should support 1Gbps and 10Gbps models. |
| **Hardware Specification** | | |
| 1 | Centralized wire capacity | Switch at least 14 Tbps switching bandwidth or more |
| 2 | Per Slot Switching Capacity | 3.2 Tbps or more |
| 3 | Total number of IPv4 routes | Total number of IPv4 routes 112000 or more, |
| 4 | VLANs (802.1q tagged VLAN) | 4000 or more Concurrent |
| 5 | Memory | 8GB DRAM or more |
| 6 | Storage | 4GB SSD/Flash or more |
| **Support** | | |
| 1 | Switches must be supported for a minimum of 5 years by the hardware vendor with software updates and upgrades without additional cost. | |
| 2 | The OEM should provide support services 24x7 TAC with L1, L2 and L3 for 5 years free of cost. India toll free number should be reflected in official website of the OEM. | |

*b) Core Switch – Type 2*

| **Sl. No.** | **Description** | |
|---|---|---|
| 1 | Form Factor | Chassis switch with Minimum 4 usable Slots 19 Inch Rack mountable switch with management/supervisor Engine 1+1 availability. OEM should provide all the hardware including fabric cards, CPU, Power Supplies, Fan Trays etc. and software, licenses to get full capacity of the provided chassis. |
| 2 | Architecture | Non-Blocking architecture. Must have EAL3 /NDcPP or above common criteria certification. |

| | | |
|---|---|---|
| 3 | IPV6 Compliance | All Functionalities of Switch shall be IPV4 and IPv6 compliant and it should work on IPv6 Platform without any additional hardware/ software. |
| 4 | End of sale | OEM End-of-sale declaration shall not have been released for the quoted model at the time of the bid submission. |
| 5 | Feature Availability | All the specified features/ parameters/ certifications must be available on the Technical Bid opening date. Features/ parameters/ certifications proposed to be available in near future/ on roadmap shall not be considered. Switch should support ISSU (In Service Software upgrade), Virtualization, Fabric provisioning support BGP-EVPN, OSPF VxLAN, VRF, VRRP Should support VM-aware Network Automation, Should support Migration of Port Profiles or equivalent, Should support 802.1Qbb, netconf, openstack/ openflow, REST API support in same hardware |
| 6 | Ports | 24 Port 1G/10G SFP Line Card or 48 ports 1/10 Gbps SFP+ line card. Switch should support 40/100 Gbps ports module cards scalability in same hardware from day 1. |
| 7 | SFP Transceivers | All the Transceivers/Modules used to connect the Switches should be from the same OEM/make of the switches only. Switch should support 1Gbps and 10Gbps models. |
| **Hardware Specification** | | |
| 1 | Centralized wire capacity | Switch at least 14 Tbps switching bandwidth or more |
| 2 | Per Slot Switching Capacity | 3.2 Tbps or more |
| 3 | Total number of IPv4 routes | Total number of IPv4 routes 112000 or more, |
| 4 | VLANs (802.1q tagged VLAN) | 4000 or more Concurrent |
| 5 | Memory | 8GB D RAM or more |
| 6 | Storage | 4GB SSD/Flash or more |
| **Support** | | |
| 1 | Switches must be supported for a minimum of 5 years by the hardware vendor with software updates and upgrades without additional cost. | |

| | |
|---|---|
| 2 | The OEM should provide support services 24x7 TAC with L1, L2 and L3 for 5 years free of cost. India toll free number should be reflected in official website of the OEM. |

ii) Distribution Switches for Site Locations

*a) Distribution Switch – Type 1*

| **Sl. No.** | **Description** | |
|---|---|---|
| 1 | Form Factor | 19 Inch Rack mountable Ethernet |
| 2 | Architecture | Non-Blocking architecture. Must have EAL3/NDcPP or above common criteria certification. Should support ITU G.8032 standard. |
| 3 | IPV6 Compliance | All Functionalities of Switch shall be IPV4 and IPv6 compliant and it should work on IPv6 Platform without any additional hardware/ software. |
| 4 | End of sale | OEM End-of-sale declaration shall not have been released for the quoted model at the time of the bid submission. |
| 5 | Feature Availability | All the specified features/ parameters/ certifications must be available on the Technical Bid opening date. Features /parameters /certifications proposed to be available in near future / on roadmap shall not be considered. Switch should support VRF,OSPF,VRRP,BGP protocols. |
| 6 | Ports | Should support at least 48X1/10Gbps SFP and 4x10/40 ports should be Ready from day 1. |
| 7 | SFP Transceivers | All the Transceivers/Modules used to connect the Switches should be from the same OEM/make of the switches only. Switch should support up-to 1Gbps and 10Gbps models |
| **Hardware Specifications:** | | |
| 1 | Back Plane Bandwidth | 1.2 Tbps switching bandwidth or more |
| 2 | Packet throughput | 700 Mpps or more |
| 3 | MAC Addresses and MTBF | 225K or more and MTBF 585000 Hrs. or more |
| 4 | VLANs (802.1q tagged VLAN) | 4000 or more Concurrent |

| | | |
|---|---|---|
| 5 | Memory | 2GB DDR or more, |
| 6 | IPV6 host | 24K |
| 7 | Storage | 4GB Flash/SSD or more |
| **Support** | | |
| 1 | Switches must be supported for a minimum of 5 years by the hardware vendor with software updates and upgrades without additional cost. | |
| 2 | The OEM should provide support services 24x7 TAC with L1, L2 and L3 for 5 years free of cost. India toll free number should be reflected in official website of the OEM. | |

*b) Distribution Switch – Type 2*

| **Sl. No.** | **Description** | |
|---|---|---|
| 1 | Form Factor | 19 Inch Rack mountable Ethernet |
| 2 | Architecture | Non-Blocking architecture. Must have EAL3 /NDcPP or above common criteria certification. Should support ITU G.8032 standard. |
| 3 | IPV6 Compliance | All Functionalities of Switch shall be IPV4 and IPv6 compliant and it should work on IPv6 Platform without any additional hardware/ software. |
| 4 | End of sale | OEM End-of-sale declaration shall not have been released for the quoted model at the time of the bid submission. |
| 5 | Feature Availability | All the specified features/ parameters/ certifications must be available on the Technical Bid opening date. Features /parameters /certifications proposed to be available in near future / on roadmap shall not be considered. Switch should support VRF,OSPF,VRRP,BGP protocols. |
| 6 | Ports | Should Support at least 24x1/10Gbps SFP+ and 2x10/40/100 Gbps ports should be ready from day 1 |
| 7 | SFP Transceivers | All the Transceivers/Modules used to connect the Switches should be from the same OEM/make of the switches only. Switch should support up-to 1Gbps and 10Gbps models |
| **Hardware Specifications:** | | |

| | | |
|---|---|---|
| 1 | Back Plane Bandwidth | 800 Gbps switching bandwidth or more |
| 2 | Packet throughput | 600 Mpps or more |
| 3 | MAC Addresses and MTBF | 225K or more and MTBF 415000 Hrs. or more |
| 4 | VLANs (802.1q tagged VLAN) | 4000 or more Concurrent |
| 5 | Memory | 2GB DDR or more, |
| 6 | IPV6 host | 24K |
| 7 | Storage | 4GB Flash/SSD or more |
| **Support** | | |
| 1 | Switches must be supported for a minimum of 5 years by the hardware vendor with software updates and upgrades without additional cost. | |
| 2 | The OEM should provide support services 24x7 TAC with L1, L2 and L3 for 5 years free of cost. India toll free number should be reflected in official website of the OEM. | |

iii) Access Switches for Site Locations

*a) Access Switch – Type 1*

| **Sl. No.** | **Description** | |
|---|---|---|
| 1 | Form Factor | 19 Inch Rack mountable Ethernet switch with 1RU form |
| 2 | Architecture | Non-Blocking architecture. Must have EAL3 /NDcPP or above common criteria certification. Should support ITU G.8032 standard. |
| 3 | IPV6 Compliance | All Functionalities of Switch shall be IPV4 and IPv6 compliant and it should work on IPv6 Platform without any additional hardware/ software. |
| 4 | End of sale | OEM End-of-sale declaration shall not have been released for the quoted model at the time of the bid submission. |
| 5 | Feature Availability | All the specified features/ parameters/ certifications must be available on the Technical Bid opening date. Features /parameters /certifications proposed to be available in near future / on roadmap shall not be |

| | | |
|---|---|---|
| | | considered. Switch should support SNMP V2c and V3, 802.1AB, 802.1BA API and SDN-OpenFlow or equivalent feature, PBR or equivalent |
| 6 | Ports | 24-port Access Switch: Minimum of 24 ports 10/100/1000 Base T, POE/POE+ and 2 x10G SM SFP ports, 1 x Out of Band IP based management Port, 1 Console Port, 0°C to 45°C operating temperature, and, 10% to 90% relative humidity. Should have 16 K MAC Address, 2000 active VLANs. |
| 7 | Basic Layer-3 Support | Switches must be managed Basic Layer-3 type for better broadcast segmentation. |
| 8 | SFP Transceivers | All the Transceivers/Modules used to connect the Switches should be from the same OEM/make of the switches only. |
| **Hardware Specification** | | |
| 1 | Back Plane Bandwidth | At-least 128 Gbps switching bandwidth |
| 2 | Packet throughput | 95 Mpps or more for each member switch |
| 3 | MAC Addresses and MTBF | MAC - 16K or more and MTBF 300000 Hrs. or more |
| 4 | VLANs (802.1q tagged VLAN) | 4000 or more Concurrent |
| **Support** | | |
| 1 | Switches must be supported for a minimum of 5 years by the hardware vendor with software updates and upgrades without additional cost. | |
| 2 | The OEM should provide support services 24x7 TAC with L1, L2 and L3 for 5 years free of cost. India toll free number should be reflected in official website of the OEM. | |

*b) Access Switch (Industrial Grade) – Type 2*

| **Sl. No.** | **Description** | |
|---|---|---|
| 1 | Back Plane Bandwidth | At-least 24 Gbps switching bandwidth or more |
| 2 | Packet throughput | 16 Mpps or more |
| 3 | Type | Manageable Industrial Grade Switch. Should support ITU G.8032 standard. |

| | | |
|---|---|---|
| 4 | Ports | Minimum 8 x of 10/100/1000 RJ45 and 4 x 1G SFP interface. Simultaneous active port count should be 10 or more. |
| 5 | Performance and Reliability | It should be industrial grade switch. Should support operate at wider temperature range (-20 to 70 degree C) withstands greater shock, vibrations, temperature and EMI/EMC tests. MTBF value not less than 200000 Hrs. NEMA Compliant |
| 6 | Power | 46-58 V DC Redundant power input; POE Budget – 240 watts; Simultaneous 802.3at PoE+ for min 8 ports. Support for IEEE 802.3af as well. |
| 7 | VLAN support | a. Minimum 1000 active VLANS b. Dynamic VLAN with VTP / MVRP c. IP subnet Vlan |
| 8 | Security | a. 802.1x support<br>b. MAC-based Authentication<br>c. DHCP relay ipv4/ipv6, Snooping<br>d. ACL based on L2, L3, L4 rules<br>e. IP source Guard |
| 9 | Surveillance Traffic handling Features: | a. 8K MAC table<br>b. 8 QOS queues per port, DSCP remarking<br>c. NTP over IPv4/IPv6 |
| 10 | Certification | IEC, ROHS and safety certification |
| 11 | Operating conditions | temperature -20 ~ 70°C, humidity 5% to 90% (Non-condensing) |
| 12 | Accessories & OEM Criteria | 1) The OEM should provide support services 24x7 TAC with L1, L2 and L3 for 5 years free of cost. India toll free number should be reflected in official website of the OEM.<br>2) For campus solution (other than DC/DR) Core switches, Distribution switches, Access switches and Fiber modules should be from the same OEM. |
| **Support** | | |
| 1 | Switches must be supported for a minimum of 5 years by the hardware vendor with software updates and upgrades without additional cost. | |

iv) Access Point (Indoor)

| Sl. No. | Description |
|---|---|
| 1 | Access Points proposed must include tri radios (2.4 GHz, 5 GHz and dedicated sensor WIPS) or Access Points proposed must include dual radios with MU-MIMO and access point for dedicated dual band sensor (WIPS) |
| 2 | The access point should be light weight and should support installations above drop ceiling, under ceiling or on wall |
| 3 | LED should be available for activity indication |
| 4 | Must have 2x IEEE 802.3 Gigabit Ethernet autosensing |
| 5 | The access point must have integrated antenna |
| **802.11 ac Features** | |
| 6 | Must support 4x4 multiple-input multiple-output (MIMO) with Radio 1: 2.4GHz: 3x3 with 3SS or better and Radio 2: 5GHz: 4x4 with 4SS (4X4 -MU-MIMO) |
| 7 | Should have dual Radios and should support 256 QAM |
| 8 | Should support 1.733 Gbps data rates on dual concurrent radio operations |
| 9 | Should support 20, 40 and 80 MHz Channels |
| 10 | Should support Maximal Ratio Combining, should support 802.11ac transmit beamforming |
| **Radio Features** | |
| 11 | Maximum conducted transmit power shall be 23 dBm or more on both 2.4 and 5 GHz |
| **Networking Features** | |
| 12 | Access points or solution should provide automatic redundancy In-case a site controller fails |
| 13 | Must have a dynamic or smart RF management features which allows WLAN to automatically and intelligently adapt to changes in the RF environment |
| **Roaming Features** | |
| 14 | Along with a controller the Access Points should support fast roaming feature |
| **Security Features** | |
| 15 | The access point should provide wireless IPS sensor support on both radios |
| 16 | The WLAN Solution should support IP filtering. |
| 17 | WLAN Solution must support Application Visibility Control (Deep Packet Inspection) at both Controller. |
| 18 | WLAN Solution must support personal and enterprise WPA2 authentication for a staff WLAN concurrent with open access public WLAN |

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|---|---|
| 19 | Security solution must provide Rogue AP detection by comparing the MAC address forwarding tables in common enterprise class Ethernet LAN switches |
| 20 | Security solution must provide air termination of Rogue Aps |
| **Management Features** | |
| 21 | WLAN solution should provide features that provides no touch AP discovery, adoption, provisioning |
| 22 | WLAN solution should provide features that provides other management functions including firmware push and statistics |
| 23 | Must support telnet and/ or SSH login to Aps directly for troubleshooting flexibility |
| **Power** | |
| 24 | Access point should have Integrated PoE and power injector Support |
| **QoS Support** | |
| 25 | The Access Points should support WMM, WMM-UAPSD, 802.1p, Diffserv and TOS |
| 26 | Support for Voice-over-wireless LAN (VoWLAN) quality of service (QoS) ensures toll quality, even with many simultaneous calls on a single access point |
| **Certification** | |
| 27 | Access points must have WiFi Alliance certification for 802.11n and 802.11ac |
| **Support** | |
| 28 | Access point must be supported for a minimum of 5 years by the hardware vendor with software updates and upgrades without additional cost. |

v) Wireless Controller for Access Points

| Sl. No. | Description |
|---|---|
| 1 | WLC should support 1+1 failover for high availability. |
| 2 | The proposed WLC must be compliant with IEEE CAPWAP or equivalent for controller-based WLANs. |
| 3 | The proposed WLC should be 1U, rack-mountable appliance with 2 x 1G (or better) Ethernet interface. USB support and RS-232 serial console (RJ-45) interface. |
| 4 | The proposed WLC should support both centralized as well as distributed traffic forwarding architecture from day 1. It should be IPv6 ready from day one. |

| | |
|---|---|
| 5 | The proposed controller should support minimum 16K users/devices and WLANs-256. |
| 6 | The proposed WLAN controller should be supplied with minimum 100 AP license from Day-1 and can scale up to 500 APs without change / additional hardware. Additional AP license will be procured in future. |
| 7 | The wireless access points must securely download image from WLC and should be configured from WLC only. |
| 8 | The proposed WLC should support L2/L3 roaming for mobile clients |
| 9 | The proposed WLC should provide real-time radio power adjustments based on changing environmental conditions and signal coverage adjustments. It should also adjust radio channel automatically. |
| 10 | Should support dynamic bandwidth selection among 20Mhz, 40 MHz, 80Mhz and 160 MHz channels. |
| 11 | Controller should support Wi-Fi 6, 802.11ax technology |
| 12 | The proposed system must support coverage hole detection and correction that can be adjusted on a per WLAN basis. |
| 13 | Should support web-based authentication to provide a browser-based environment to authenticate clients that do not support the IEEE 802.1X supplicant. |
| 14 | Should support port-based and SSID-based IEEE 802.1X authentication. |
| 15 | Should support MAC authentication to provide simple authentication based on a user's MAC address. |
| 15 | Should support AP grouping to enable administrator to easily apply AP-based or radio-based configurations to all the APs in the same group |
| 16 | Plug-and-Play Fast and easy zero-touch installation plus rule-based access point adoption from all locations automates equipment discovery and deployment. |
| 17 | WLC should support Comprehensive Integrated Network Security Services Wired/wireless, built-in Wireless Intrusion Protection System (WIPS), and secure guest access with Captive web portal or equivalent solution. |
| 18 | WLC should provide BYOD Support. It should provide device fingerprinting and required to help manage and secure user-owned devices. |
| 19 | WLC should support 802.11w to secure management frames, NAC integration support |
| 20 | WLC should support guest access with Analytics/reporting. |
| 21 | WLC architecture should support tunnel forwarding and local forwarding |

| | |
|---|---|
| 22 | WLAN Solution should support captive portal with time-based access, Customize Guest page and must have option for self-guest registration options, so that guest can automatic register himself from day 1 or with equivalent solution. |
| 23 | System/Solution should provide safeguard from DOS attacks and Intrusion Detection and termination of Rogue Access Points. |
| 24 | System/Solution should support detection of Impersonation attack, Decryption failures, Invalid MAC transmission, Fake AP attack, Invalid 802.1x frames, Invalid source and destination address |
| 25 | WLAN Solution should have feature to create captive portal guest users for authenticating using their User ID (Email Address/ Mobile Number/ Member ID) and the received pass code on Email or SMS in order to complete the registration process. |

vi) Network Access Control Specification

| Sl. No. | Description |
|---|---|
| 1 | Dedicated redundant hardware Appliance or virtualized platform and one Centralized Console. Should be supplied with 1000 AAA (Endpoint Security) licenses. |
| 2 | Should be able to integrate with all makes of manageable network devices which can support open standard based protocols required for NAC operation |
| 3 | Must provide Network Access Control, End point Integrity Check and visibility in single pane of glass for the entire infrastructure from day 1 spread across multiple Network Locations / Zones |
| 4 | Each appliance should scale to at least 10000 devices |
| 5 | Solution must utilize standards-based authentication mechanisms enabling non-intelligent devices the ability to connect to the network and receive the proper network services. |
| 6 | Should be able to gather Detailed identity and access information with OS and device fingerprinting for Blackberry, Symbian, iOS, Android, OSX, Windows and more |
| 7 | Should be able to perform posture check for compute end points (Windows & MAC) for OS health for parameters like Registry Keys, allowed process, AV or Firewall Enabled etc. |
| 8 | Detect and protect any device with IP address without the need for a client application on each endpoint including detection of VoIP phones, printers, wireless devices, machinery, cameras, sensors etc. |

| | |
|---|---|
| 9 | Should be able to perform VAPT check using custom built-in scanner for network-based vulnerabilities |
| 10 | Able to build Interactive topology maps to locate the end systems per network connectivity |
| 11 | Device search functionality by attributes such as user name / OS type / IP- MAC address / System Name |
| 12 | Must Support location-based Registration portals to redirect Users entering through common location to different portals for different Network Zones |
| 13 | Must support automated context-based policy provisioning of network services for mobile devices |
| 14 | Must provide interoperability with Microsoft NAP and Trusted Computing Croup TNC. |
| 15 | Support Management Access Authentication and Authorization for Network Device Access |
| 16 | Support Manipulation of Radius Attributes for Authentication as well as Radius Accept |
| 17 | Must have SNMP MIB compile capability to integrate any 3rd party snmp compliant device |
| 18 | Must be able to create correlated topology based on LLDP, SNMP, L2 and L3 protocol connectivity hierarchy |
| 19 | Must provide the capabilities to modify, filter, and create your own flexible views of the network devices based on selectable SNMP OID |
| 20 | Must allow scheduled events or tasks that the user can perform behind the scenes or schedule an event for another time in the future. |
| 21 | Must provide a utility to view and select MIB objects from a tree-based representation |
| 22 | Must provide a Country wide VLAN monitoring capabilities. |
| 23 | Must provide comprehensive remote management support for all proposed network devices as well as any SNMP MIB-I or MIB-II manageable devices. |
| 24 | Must support RADIUS or LDAP Authentication for users of the application. |
| 25 | Must provide a tool to search and locate the physical location of connected devices and end users, quickly and easily. |
| 26 | Must allow IT administrators to easily define number of pre-configured network policies, and designate select personnel to activate/deactivate these policies as appropriate |
| 27 | Must support the ability to present detailed configuration information including date and time of configuration saves, firmware version, and file size. |

vii) OEM Element Management System (EMS) Specification

| Sl. No. | Description |
|---|---|
| 1 | NMS should be from the same OEM providing switching and wireless solution |
| 2 | It Should have Single Pane of Glass Overview of the network |
| 3 | NMS Solution should be virtual / hardware-based appliance |
| 4 | Must be able to support minimum 100 Switches and should be scalable to support minimum 1000 switches on the same virtual appliance |
| 5 | Must be able to create correlated topology based on LLDP, SNMP, STP connectivity hierarchy |
| 6 | Must provide centralized management that should be able to manage wired, wireless & security components of 3rd party OEMS's |
| 7 | Must allow system-level operations such as device discovery, event management, logging and application maintenance to be performed centrally. |
| 8 | Must provide the capabilities to modify, filter, and create your own flexible views of the network. |
| 9 | Must allow for graphing or viewing in table format and multiple OIDs that are user selectable. |
| 10 | Must allow scheduled events or tasks that the user can perform behind the scenes or schedule an event for another time in the future. |
| 11 | Must provide a utility to view and select MIB objects from a tree-based representation and include a compiler for new or third-party MIBs. |
| 12 | Must provide a system wide deployment of VLAN configuration and monitoring capabilities. |
| 13 | Must provide comprehensive remote management support for all proposed network devices as well as any SNMP MIB-I or MIB-II manageable devices. |
| 14 | Must support RADIUS and LDAP Authentication for users of the application. |
| 15 | Must have SNMP MIB compile capability to integrate any snmp compliant device |
| 16 | Must be able to define policies to rate-limit bandwidth, throttle the rate of new network connections, prioritize based on Layer 2 or Layer 3 QoS mechanisms, apply packet tags, isolate/quarantine a particular port or VLAN, and/or trigger pre-defined actions. |
| 17 | Must provide a tool to find the physical location of systems and end users, and where they are connected, quickly and easily. |
| 18 | Must provide automated functionality to ensure that appropriate services are available to each user, no matter where they log on. |

| | |
|---|---|
| 19 | Must support features to interact with 3rd party network security devices to provide automated response to security events and thus remediating real time threats |
| 20 | Must provide an audit trail (event log). |
| 21 | Must be able to integrate with NAC and Wireless devices |
| 22 | Must allow IT administrators to easily define a number of pre-configured network policies, and designate select personnel to activate/deactivate these policies as appropriate |
| 23 | When integrated with compatible WLAN it must be able to provide granular management functionalities like system location and tracking, wi-fi dashboards, client search, event logs etc via mobile devices as well such as tablet and smartphone |
| 24 | Must provide a detailed inventory of products organized by device type. |
| 25 | Must provide the ability to track device attributes such as serial number, asset tag, firmware version, CPU type and memory. |
| 26 | Must support he ability to present detailed configuration information including date and time of configuration saves, firmware version and file size. |
| 27 | Must record a history of device attributes and reports any changes made to the device. |
| 28 | Must be able to provide a history of firmware and configuration changes made to the device. |
| 29 | Must be able to generate valuable, in-depth reports for network inventory for planning purposes. |
| 30 | Must provide a centralized history of inventory management operations. |
| 31 | Must support the liability to download firmware to single or multiple devices simultaneously. |
| 32 | Must be able schedule route device configuration back-ups. |
| 33 | Must be able to download text-based (ASCII format) configuration templates to one or more devices. |
| 34 | Must instantly identify the physical location and user profile where an attack was sourced. |
| 35 | Must be able to take action based on a predefined security policy, including the ability to notify the intrusion detection system of the action taken via a SNMPv3 trap (inform). |
| 36 | When integrated with security devices such as NAC or IDS it must be able to isolate and quarantine the attacker without disruption to other users, applications and business critical systems. |

| | |
|---|---|
| 37 | When integrated with security devices such as NAC or IDS it must be able to dynamically deny, limit or change the characteristics of the user's access to the network. |
| 38 | Must provide a web interface that contains reporting, dashboards, troubleshooting and monitoring tools. |
| 39 | Must provide web-based flexible view, device views and event logs for the entire infrastructure. |
| 40 | Must enable diagnosis of network issues and performance through real-time NetFlow analysis. |
| 41 | Must provide port level analysis capability. |
| 42 | Must provide customizable reports. |
| 43 | Must be able to write Python scripts to integrate with IoT solutions. |
| 44 | Should have the capability to integrate with 3rd Party Vendors. |
| 45 | Should have the capability to reduce risk and ensure your network configurations comply to HIPAA and PCI with that analyses and assesses network configuration for compliance across your entire wired and wireless network. |
| 46 | Should have the ability to get actionable business insights and speeding up troubleshooting by separating network from application performance so you can quickly identify root-causes, monitors shadow IT, reports malicious or unwanted applications and assesses security compliance. |

## 2.5. WiFi

i) Access Point (Outdoor)

| Sl. No. | Description |
|---|---|
| | |
| 1 | Access Points proposed must include dual radios (2.4 GHz and 5 GHz) and should cover a distance of 2 kms in open area |
| 2 | The access point should be light weight and should support installations on walls or light poles without disturbing the aesthetics of the area. |
| 3 | LED should be available for activity indication |
| 4 | Must have 2x IEEE 802.3 Gigabit Ethernet autosensing |
| 5 | The access point must have integrated antenna |
| **802.11 ac Features** | |

| | |
|---|---|
| 6 | Must support 2x2 multiple-input multiple-output (MIMO) with Radio 1: 2.4GHz: 2x2 with 2SS or better and Radio 2: 5GHz: 2x2 with 2SS |
| 7 | Should have dual Radios and should support 255 clients |
| 8 | Should support 1.3 Gbps data rates on dual concurrent radio operations |
| 9 | Should support 20, 40 and 80 MHz Channels |
| 10 | Should support Maximal Ratio Combining, should support 802.11ac transmit beamforming |
| **Radio Features** | |
| 11 | Maximum conducted transmit power shall support 23 dBm or more on both 2.4 and 5 GHz |
| 12 | The antenna gain should be 4 dBi or more |
| **Networking Features** | |
| 13 | The access point or the controller should support DHCP relay |
| 14 | Must have a dynamic or smart RF management features which allows WLAN to automatically and intelligently adapt to changes in the RF environment |
| 15 | WLAN Solution should support Mesh capabilities |
| **Roaming Features** | |
| 16 | Along with a controller the Access Points should support fast roaming feature |
| 17 | **Security Features** |
| 18 | The access point should provide wireless IPS sensor support on both radios |
| 19 | The WLAN Solution should support IP filtering |
| 20 | WLAN Solution must support Application Visibility Control (Deep Packet Inspection) |
| 21 | WLAN Solution must support personal and enterprise WPA2 authentication for a staff WLAN concurrent with open access public WLAN |
| 22 | Security solution must provide Rogue AP detection by comparing the MAC address forwarding tables in common enterprise class Ethernet LAN switches |
| **Management Features** | |
| 23 | WLAN solution should provide features that provides no touch AP discovery, adoption, provisioning |
| 24 | WLAN solution should provide features that provides other management functions including firmware push and statistics |

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|---|---|
| 25 | Must support telnet and/ or SSH login to Aps directly for troubleshooting flexibility |
| **Power** | |
| 26 | Access point should have Integrated PoE and power injector Support |
| **QoS Support** | |
| 27 | The Access Points should support WMM, WMM-UAPSD, 802.1p, Diffserv and TOS |
| 28 | Support for Voice-over-wireless LAN (VoWLAN), quality of service (QoS). |
| **Certification** | |
| 29 | Access points must have WiFi Alliance certification for 802.11n and 802.11ac |
| 30 | Access points must have WiFi Alliance certification for WPA2 Enterprise |
| **Support** | |
| 31 | Access point must be supported for a minimum of 5 years by the hardware vendor with software updates and upgrades without additional cost. |

## 2.6. Campus Backbone Cabling

i) Fiber Termination Box

| Sl. No. | Description |
|---|---|
| 1 | Data Sheets in support of below to be provided |
| 2 | 19-inch rack mounted, |
| | Upto 2U height for 48-Fiber panels; 1U height for 24 fiber panels |
| 3 | Couplers: Panel fully loaded with Duplex LC SM Couplers and pigtails |
| | zirconia-ceramic sleeves, rated for minimum of 220 cycles mate & un-mate; integrated dust / protective caps preferred |
| 4 | Built-in Fusion Splice tray – 48 Fibers |
| 5 | Minimum 4 numbers of rubber cable glands in rear for entry of 15mm cables |
| 6 | Integrated fiber management |
| 7 | 1.2mm/ 16 gauge steel, powder coated, drawer style to facilitate on-site splicing |
| 8 | Adequate provision for label holders and labelling |

ii) Optical Fiber Cable (OFC)

| Sl. No. | Description |
|---|---|
| 1 | Data Sheets in support of below to be provided |
| 2 | Construction: |
| | Outdoor armoured cable – suitable for direct burial as well as ducted applications;<br>Loose Tube, corrugated Steel Armoured Cable;<br>UV resistant jacket;<br>Multi-loose tube, moisture blocking gel-filled, Dielectric central element reinforcing, surrounding by water blocking tape and aramid yarns;<br>cable weight less than 180Kg/KM;<br>cable diameter less than or equal to 15mm;<br>12-core and 6-core types |
| 3 | Fiber Type: ITU-T G.652.D, 250 micron buffered |
| 4 | Maximum core / clad offset: 0.5 microns |
| 5 | Tensile load 800N maximum, vertical rise 500m maximum |
| 6 | Operating temperature: -20 Degrees C to +70 Degrees C |
| 7 | RoHS compliant |
| 8 | Attenuation: 0.5dB/KM or better @ 1310nm and 1550nm or better |

iii) Optical Fiber Pigtails

| Sl. No. | Description |
|---|---|
| 1 | Data Sheets in support of below to be provided |
| 2 | LC Simplex pigtails, 1m length |
| 3 | SM, 2mm buffered jacketed Fiber, RoHS compliant |
| 4 | Insertion Loss: less than 0.3dB |
| 5 | Return Loss: greater than 45dB |
| 6 | End-face: OEM should certify compliance to IEC 61300-3 |

iv) Optical Fiber Cable (OFC) Patch Cord

| Sl. No. | Description |
|---|---|
| 1 | Data Sheets in support of below to be provided |
| 2 | LC-LC Duplex patch cords, |
| 3 | Assorted lengths: 3m, 5m, |

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|---|---|
| 4 | SM, 2mm zip-cord, RoHS compliant |
| 5 | Insertion Loss: less than 0.3dB |
| 6 | Return Loss: greater than 45dB |
| 7 | End-face: OEM should certify compliance to IEC 61300-3 |

v) CAT 6A Cable

| Sl. No. | Description |
|---|---|
| 1 | The Copper Cabling system shall be made up of 4-pair, Cat6A U/UTP LSZH cabling system. |
| 2 | The proposed U/UTP cabling system shall comply with 4-connector channel as well as permanent link performance specifications of the latest revisions of the TIA 568 (or equivalent ISO/ IEC 11801) standard. Documented data sheets shall be furnished by MSP / OEM. |
| 3 | All end points of the network will connect to the Passive Network Infrastructure using Cat6A U/UTP Cabling System. |
| 4 | All components of the U/UTP Cabling system proposed by a MSP should be from a single OEM. |
| 5 | It is preferable to have all components of the proposed U/UTP cabling system from an OEM be from a single, documented, publicly published, cabling solution set. |
| 6 | Cat6A U/UTP cabling system shall support 1000BASE-T Ethernet, 2.5GBASE-T and 5GBASE-T Ethernet, 10GBASE-T, as well as, Type 1, Type 2, Type 3, and Type 4 PoE delivery over a full 100m 4-connector channel. MSP to furnish documented proof for support of such applications. |
| 7 | The proposed Cat6A U/UTP cabling system shall comply performance of the following performance parameters for a 100m 4-connector Channel with the requirements of the latest revisions of TIA 568 standard |
| | DC Resistance and DC Resistance Unbalance;<br>Insertion, NEXT, PSNEXT and Return Losses;<br>ACRF and PSACRF;<br>TCL and ELTCTL;<br>Propagation Delay and Propagation Delay Skew;<br>PSANEXT and PSAACRF |
| 8 | MSP shall submit OEM documentation supporting performance compliance of proposed Ca6A U/UTP cabling systems to the channel specifications to the latest revision of TIA 568 standard. Such documentation should include the manufacturers part numbers that make up the 4-connector channel. |
| 9 | Performance headroom (worst case margins only), if any guaranteed by the OEM, for parameters specified above may be included in the OEM's |

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| | supporting documentation for channel specification. If is preferred that such documentation be a publicly published one. |
| 10 | Third party test reports of compliance of the performance parameters to the channel specifications of TIA 568 standards clearly indicating the part numbers that comprised the testing shall be included if available. |
| 11 | OEM certification for providing a 25-year performance warranty (upon installation and acceptance testing) shall be included for guaranteeing |
| | Performance compliance to channel performance specifications.<br>Performance (successful delivery) of applications as listed above.<br>Data sheets should be provided in support of above specification by MSP/ OEM |
| 12 | Manufacturers: CommScope Netconnect, Belden, Panduit etc. |
| 13 | Data sheet(s) in support of below to be provided. |
| 14 | Should meet channel specifications of latest TIA 568 standard for Cat6A when used as a component in the installed Cat6A U/UTP channel. |
| 15 | 23 AWG, U/UTP cable, 4-pair, CMR |
| 16 | Breaking strength: 400N (maximum) |
| 17 | Electrical Performance as per latest revision TIA 568 (or equivalent ISO/IEC standards) to Cat6A U/UTP performance requirements respectively |
| | DC Resistance and DC Resistance Unbalance<br>Insertion, Return, NEXT, PSNEXT losses<br>ACRF and PSACRF<br>TCL and ELTCTL<br>Propagation Delay and Propagation Delay Skew<br>PSANEXT and PSAACRF |
| 18 | UL approved |
| 19 | Fire rating: IEC 60332 |
| 20 | RoHS compliant |
| 21 | Any 3rd party test reports for electrical, mechanical and fire-rating performance to be included |

vi) CAT 6A Patch Cord (2 Meter)

| Sl. No. | Description |
|---|---|
| 1 | Data Sheets in support of below to be provided |
| 2 | Should meet channel specifications of latest TIA 568 standard for Cat6A when used as a component in the installed Cat6 U/UTP channel |

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|---|---|
| 3 | 100 ohms, Solid copper, 24AWG |
| 4 | CM jacket, with plug boot |
| 5 | Insertion life: 750 mate & un-mate cycles |
| 6 | Any 3rd party test reports for electrical, mechanical and fire-rating performance to be included |

vii) CAT6A UTP Information Outlet

| Sl. No. | Description |
|---|---|
| 1 | Data Sheets in support of below to be provided |
| 2 | Should meet channel specifications of latest TIA 568 standard for Cat6A when used as a component in the installed Cat6 U/UTP channel. |
| 3 | 8-position, 4-pair, UTP jack, with IDC contacts supporting 22 AWG to 24 AWG solid conductors. |
| 4 | Electrical Performance as per latest revision TIA 568 (or equivalent ISO/IEC standards) to Cat6A U/UTP performance requirements respectively |
| | DC Resistance and DC Resistance Unbalance; Insertion, Return, NEXT and PSNEXT losses; FEXT and PSFEXT losses; TCL and TCTL; Propagation Delay and Propagation Delay Skew; PSANEXT and PSAFEXT losses |
| 5 | **Durability:** |
| | Min 750 mate & un-mate cycles for plug interface; Min 20 re-terminations for the IDC punch down contacts |
| 6 | **PoE Support:** Support Type 1, Type 2, Type 3 and Type 4 PoE levels |
| 7 | **Operating temperature**: -10 Degree C to +60 Degrees C |
| 8 | UL approved. |
| 9 | RoHS Compliant |

viii) CAT6A Jack Panel

| Sl. No. | Description |
|---|---|
| 1 | Data Sheets in support of below to be provided |
| 2 | Should meet channel specifications of latest TIA 568 standard for Cat6A when used as a component in the installed Cat6 U/UTP channel. |
| 3 | 19”, 1U, straight, 24-port, un-loaded (support discrete modular jacks), metal frame, with integrated label holder |
| 4 | Rear Cable bar should be included in supplies |

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|---|---|
| 5 | Modular Jack of the panel should meet the specifications of Modular Jacks for electrical, durability, PoE support and operating temperature specified above |
| 6 | UL approved, RoHS compliant |

ix) CAT6A U/UTP MPTL Plugs

| Sl. No. | Description |
|---|---|
| 1 | Data Sheets in support of below to be provided |
| 2 | Should meet channel specifications of latest TIA 568 standard for Cat6A when used as a component in the installed Cat6 U/UTP channel. |
| 3 | Cable side termination: 8-position, 4-pair, UTP jack, with IDC contacts supporting 22 AWG to 24 AWG solid conductors, 20 re-terminations durability |
| 4 | Plug/Jack compatibility: RJ45 style, 750 mate & un-mate cycles durability |
| 5 | Electrical performance, PoE support, operating temperature specifications same as that for modular plug |
| 6 | UL approved and RoHS compliant |

x) CAT 6 Cable

| Sl. No. | Technical Specifications |
|---|---|
| 1 | This cable well exceeds the requirements of TIA/EIA-568-C.2 and ISO/IEC 11801 |
| 2 | Construction: 4 twisted pairs separated by internal X shaped, 4 channel, polymer spine / full separator. Half shall not be accepted. |
| 3 | The 4 pair Unshielded Twisted Pair cable shall be UL Listed. Cable should also be tested and verified by ERTL. |
| 4 | Conductor Solid Bare Copper and Jacket FR PVC and UL approved CM rated cable and Outer jacket sheath of the cable shall be LSZH. |
| 5 | Insulation: High Density Polyethylene |
| 6 | Dielectric Strength of cable should be 1.0KV dc |
| 7 | Attenuation (< 17 db), Pair – to – pair and PS NEXT, ELFEXT and PSELFEXT, Return Loss, ACR and PS ACR. |
| 8 | Bending Radius should be < 25.4mm at –20°C ± 1°C and Pulling Force: 11.5 Kg |
| 9 | Nominal Outer Diameter of Cable should be 6.1 mm and Conductor Diameter 0.56 mm (23 AWG) |
| 10 | Cable should support operating Temperature from -20° to +70°C |

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|---|---|
| 11 | Cable should come with printed sequential Length Counter on each meter |
| 12 | Cable support Conductor Resistance < 9.38 Ω /100m |
| 13 | Mutual Capacitance of cable should be < 5.6nF/100m |
| 14 | Max Resistance Unbalance of cable should be 5% Max |
| 15 | Capacitance Unbalance of cable should max 330pF/100m |
| 16 | Cable support Delay Skew: < 45nS, Operating Voltage: 72V and NVP: 69% |
| 17 | Category 6 UTP cables shall Supports Gigabit Ethernet (1000 base-T) standard and Operates at bandwidth of 600MHz. |

xi) CAT6 Patch Cord (2 Meter)

| Sl. No. | Description |
|---|---|
| 1 | Equipped with modular 8-position modular plugs on both ends, wired straight through with standards compliant wiring. |
| 2 | The Patch cords shall, at a minimum comply with proposed ANSI/TIA/EIA-568-C.2 Commercial Building Cabling Standards Transmission Performance Specifications for 4 pair 100□ Category 6 Cabling. |
| 3 | Should have 50 micro inches of gold plating over nickel contacts. |
| 4 | Should be covered by ETL verification program for compliance with TIA 568.C.2 |
| 5 | Conductor size: 24 AWG stranded bare copper |
| 6 | Cable flame property should follow VW-1 and FT-1 Standard |
| 7 | Jacket: PVC UL-94V-O |
| 8 | Temperature range: -10oC to +80oC |
| 9 | Operating life: Minimum 750 insertion cycles |
| 10 | Contact blade: Phosphor bronze |
| 11 | Contact plating: 50µ" Gold |
| 12 | Plug dimensions & tolerances compliant with FCC Part 68.500 and IEC 60603-7 |
| 13 | UL approved for copper conductor |
| 14 | Dielectric withstanding voltage: 150 V AC |
| 15 | Insulation resistance: 35 M Ohm (Max) |
| 16 | Cable length: 2 Meter |

xii) CAT6 UTP Information Outlet

| Sl. No. | Description |
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|---|---|
| 1 | INFORMATION OUTLET should support Category 6, ANSI/EIA/TIA568 C.2 and 568A/B configuration |
| 2 | All information outlets for 100 □, 22-26 AWG copper cable shall: Use insulation displacement connectors (IDC) |
| 3 | Allow for a minimum of 200 re-terminations without signal degradation below standards compliance limits. |
| 4 | Be constructed of high impact, flame-retardant thermoplastic with color and icon options for better visual identification. |
| 5 | IDC Contact Plating: Phosphor bronze with tin plated and Housing PC + glass fiber (UL 94 V-2) |
| 6 | Insertion force: 20N max (IEC 60603-7-4) |
| 7 | Contact Plating: 50 µ inches gold on plug contact area |
| 8 | Information outlet (RJ45 jack) should be covered under ETL Verification program for compliance with TIA 568.C.2 |
| 9 | Operation Temp: -10 C to 60 C |
| 10 | Plastic Housing: Polycarbonate, UL94V-0 rated or equivalent |
| 11 | Operating Life: Minimum 750 insertion cycles |
| 12 | Contact Material: Copper alloy |
| 13 | Surface mount box with single RJ45 socket to terminate UTP CAT 6 Cable |

xiii) CAT6 Jack Panel

| Sl. No. | Technical Specifications |
|---|---|
| 1 | The Cat-6 transmission performance is in compliance with ANSI/TIA-568-C.2, ISO/IEC 11801 Ed.2 and EN 50173-1 specification with LED indicator at each Port. |
| 2 | Allow for a minimum of 200 re-terminations without signal degradation below standards compliance limit and Fast-Location lighting cable identification technology for saving cost and time for cable identification |
| 3 | Have port identification numbers on the front of the panel with writable and erasable marking surfaces for each port on the front panel. |
| 4 | Should have self-adhesive, clear label holders and white labels with the panel should be of 1U height with 24 port un-loaded IO. |
| 5 | IDC: Suitable for 22-26 AWG stranded and solid wire compatible with both 110 & Krone punch down tools. |
| 6 | Each port / jack on the panel should be individually removable on field from the panel. |
| 7 | IDC cap: ABS, UL 94V -2 and Phosphor bronze with tin plated and Made of powder coated steel |

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|---|---|
| 8 | Plastic Housing: Polycarbonate, UL94V-0 rated or equivalent |
| 9 | Dielectric Strength: 1000V RMS for 1min |
| 10 | IDC Operating life: minimum 250 insertions and Jack Operating life: minimum 750 insertions |
| 11 | Insulation Resistance: 10M Ω min, Contact Resistance: 2mΩ per contact |
| 12 | Temperature Range: -10℃ to 60℃ max, Humidity :10%-65% |
| 13 | PCB: FR-4,1.6mm thickness, Panel : SECC,1.5mm thickness |
| 14 | Plug Retention Force: 15 lb and Jack Contact: phosphor bronze,50μ Inch thickness gold over nickel |
| 15 | IDC Contact: 0.8mm thickness phosphor bronze, tin plating over nickel |
| 16 | Should be rack mountable |

xiv) CAT6/6A Faceplates

| Sl. No. | Description |
|---|---|
| 1 | Data Sheets in support of below to be provided |
| 2 | Fire -retardant Plastic, ABS, |
| 3 | 1-port and 2-port styles, each port with spring Shutters |
| 4 | British Style, Square, white color |
| 5 | UL approved and RoHS compliant |
| 6 | Support Modular Jacks specified above |
| 7 | Integrated label holder |
| 8 | Back-box to be separately supplied for surface mount applications |

xv) Surface Mount Box

| Sl. No. | Description |
|---|---|
| 1 | Data Sheets in support of below to be provided |
| 2 | Fire -retardant Plastic, ABS, |
| 3 | 1-port, 2-port and 12-port styles, white color |
| 4 | UL approved and RoHS compliant |
| 5 | Support Modular Jacks specified above |
| | |

xvi) Network Rack

| Sl. No. | Description |
|---|---|
| **42U Rack** | |
| 1 | Racks should be 7' high with dimensions of 800mm x 1000mm suitable for mounting equipment and panels for network applications |
| 2 | Racks should provide sufficient cable entry and exit cut-outs in top and bottom of the rack |
| 3 | Integrated fan module – 4 fans with tray |
| 4 | Rack should support static load of at least 750 KGs on Casters and Levellers. |
| 5 | Racks should have a tough glass front door and steel sheet, split rear door. |
| 6 | Front and back doors shall have door handles and provided with locks. |
| 7 | For offering greater mounting flexibility of equipment, the rack should have 4No's adjustable, 19" verticals with punched 10mm square hole and Universal 12.7mm-15.875mm-15.875mm alternating hole pattern. |
| 8 | Rack should have numbered U positions to easily locate positions for mounting as well as identifying equipment. |
| 9 | All mounting hardware should come along with the rack |
| 10 | Side panels to be included. Side panels should sit flush with the rack and do not take up additional space |
| 11 | Rack should be supplied along with 4 Nos. of 1U covered horizontal Cable managers |
| 12 | Rack should be supplied along with 2 Nos. of covered vertical Cable managers |
| 13 | Rack should have provision for grounding and bonding. All accessories for grounding and bonding shall be supplied along with tacks. |
| 14 | 1 number of tray/ shelve |
| 15 | All sheet metal parts should be Pre-Treated and powder coated meeting ASTM Standard. |
| 16 | Racks shall be UL listed and RoHS compliant |
| 17 | Supply with 2 numbers of Vertical PDUs, Rack PDU SNMP enabled for Core Switches / Non-SNMP enabled for Distribution Switches, metered by Outlet with Switching, Zero U, 32A, 230V, (21) C13 & (3) C19 (or equivalent) along with all mounting accessories |
| 18 | Manufacturers: Rittal, APW, APC, Netrack, Valrack/ Legrand |
| **24U Rack (IP and Non-IP Rated)** | |

| | |
|---|---|
| 1 | Racks should be 24U high with dimensions of 600mm x 800mm suitable for mounting equipment and panels for network applications |
| 2 | IP55 rated or above |
| 3 | Racks should provide sufficient cable entry and exit cut-outs in top and bottom of the rack |
| 4 | Integrated fan module preferred |
| 5 | Rack should support static load of at least 750 KGs on Casters and Levellers |
| 6 | Racks should have a tough glass front door and steel sheet, split rear door. |
| 7 | Front and back doors shall have door handles and provided with locks. |
| 8 | For offering greater mounting flexibility of equipment, the rack should have 4No's adjustable, 19" verticals with punched 10mm square hole and Universal 12.7mm-15.875mm-15.875mm alternating hole pattern or equivalent. |
| 9 | Rack should have numbered U positions to easily locate positions for mounting as well as identifying equipment. |
| 10 | All mounting hardware should come along with the rack |
| 11 | Side panels to be included. Side panels should sit flush with the rack and do not take up additional space |
| 12 | Racks should be supplied with 2 Nos. of 1U horizontal cable managers. |
| 13 | Rack should have provision for grounding and bonding. All accessories for grounding and bonding shall be supplied along with tacks. |
| 14 | All sheet metal parts should be Pre-Treated, and powder coated meeting ASTM Standard. |
| 15 | 1 number of tray/ shelve |
| 16 | Racks shall be UL listed and RoHS compliant |
| 17 | Supply with 1 number of horizontal PDU, 16A along with all mounting accessories |
| 18 | Manufacturers: Rittal, APW, APC, Netrack, Valrack/ Legrand |

xvii) Pre-cast Conical Manhole Chamber

| Sl. No. | Description | |
|---|---|---|
| 1 | Size: | Height (With Cover) 800 mm. |
| | | Base Dia (Inner) 810 mm. |
| | | Top Opening (Inner) 550 mm. |
| | | Thickness of each ring 60 mm. |
| 2 | Material Used: | M 30 Grade Concrete |
| 3 | Reinforcement: | |

| | | |
|---|---|---|
| | | In the rings: In the top ring 3 nos. of TOR Steel horizontal rings of size 8mm supported by 8mm TOR Steel bars. |
| | | In top Cover: Multiple nos. of TOR Steel bars both ways. |
| | | Single Layer: 8mm TOR Steel bars. |
| | | The Top Cover guarded by GI M S Plate and provided two 12 mm hooks for lifting. |
| 4 | Load Bearing: | Suitable for an ultimate load 20 Tons (H.D. Cover Load as per IS: 12592 Specifications). |

xviii) Earthing Pit

| Sl. No. | Description |
|---|---|
| 1 | 17mm diameter X 3 meter Steel High Tensile EN-8D Grade Rod with Copper Bonding of minimum 250 microns, Pre-welded Clamp should have provision to connect external cables & strips. |
| 2 | Jam plus compound (03 Nos.) |
| 3 | Poly plastic earth pit cover |
| 4 | The rod should be CPRI tested |
| 5 | Conductive Gel (4 Kg). Polyplastic Earth Inspection Pit Cover. Earth pit cover of 10" diameter (EPC10) with load bearing capacity of more than 8 tones Tested from national Test House. |
| 6 | Back fill compound (BFC) Certified by National Test House (Govt. of India Lab) as per IEC 62561-7 and ASTM G57-06 for a resistivity of 0.244 ohms-mtr & tested for PH value of more than 9. |

xix) Spike Lightning Arrestor

| Sl. No. | Description | |
|---|---|---|
| 1 | Spike | 5 Prone |
| 2 | MOC | Copper |
| 3 | Down Pipe Dia | 25 mm |
| 4 | Down Pipe Length | 1500 mm |
| 5 | Base Plate Size | 90x90x3 mm |

xx) 1kVA Online UPS

| Sl. No. | Specifications | Requirement |
|---|---|---|
| **1** | **Capacity (in kVA / kW)** | **1kVA/0.8kW 1-Phase Input / 1-Phase Output** |

| | | |
|---|---|---|
| **2** | **Technology and Capability** | a) True **Online** configuration with **double conversion** UPS & Zero transfer time.<br>b) DSP based control with advanced technology.<br>c) Wide **Input voltage range** from (110 ~ 280VAC)<br>d) Auto **restart & capability** with the **Independent** battery bank operation of the UPS.<br>e) UPS should be designed at **Rated PF of 0.8 i.e. 1kVA/0.8kW** UPS rating.<br>f) **Generator compatibility** with **cold start** and **AC star**t features.<br>g) Automatic bypass to transfer the load on mains due to overload & internal fault.<br>h) ECO mode should be available in the UPS. |
| **3** | **Model Name & Number** | |
| 3.1 | 1kVA /0.9kW | **Make / Model / Part No** to be specified |
| **4** | **Input** | |
| 4.1 | Input facility -Phases / Wires | Single-Phase / 2-Wire & Gnd (1Phase & Neutral + Ground) |
| 4.2 | Input Voltage Range | 80-280VAC<br>Range (Full Load) 175~280VAC<br>Range (50 ~ 100% load is required) 80~175VAC |
| 4.3 | Nominal Input Frequency | 50/60Hz ± 10Hz |
| 4.4 | Input Frequency Range | 40 to 70 Hz |
| 4.5 | Input Power Factor | > 0.99(@ full resistive load) |
| 4.6 | Generator Compatibility | Compatibility to genset supply required |
| 4.7 | Input Protection | Should be provided at the input of the UPS suitable for the full rated capacity of the UPS. |
| **5** | **Output** | |
| 5.1 | Nominal Output voltage | 208/220/230/240 VAC |
| 5.2 | Output Voltage Regulation | ± 1% for linear load |
| 5.3 | Nominal Output Frequency | 50/60 Hz |
| 5.4 | Output Frequency Regulation | ± 0.1Hz |
| 5.5 | Output Frequency Slew Rate | < 1Hz/sec |
| 5.6 | Output Wave Form | Pure sine wave |
| 5.7 | Output Voltage Distortion (THDu) | < 3% for linear load & < 6% for non-linear load. |
| 5.8 | Crest Factor | 3:1 On Full Load (Minimum) |
| 5.9 | Output Short circuit Protection | Electronic Protection |
| **6** | **Transfer Time** | |
| 6.1 | Transfer Time (Mode of operation) | Zero ms from Mains mode to Battery Mode<br>Zero ms from Battery Mode to Mains mode |

| | | |
|---|---|---|
| 6.2 | Transfer Time (Inverter to Bypass / Bypass to Inverter) | < 4ms |
| 6.3 | Automatic Bypass switch | UPS should be capable of automatic change over to bypass. |
| **7** | **Efficiency (At Nominal Voltage & Resistive Load up to kW rating of UPS)** | |
| 7.1 | Overall Efficiency (AC to AC) - Online (Double Conversion) | Upto 86% (at 100% load) |
| **8** | **Overload** | |
| 8.1 | Inverter Overload capacity | <105% : continuous ; 105% ~ 125%: 1 minutes;<br>120% ~ 150%: 30 seconds; >150%: 0.5 seconds only |
| **9** | **Display Panel (In-build LC Display & LED)** | |
| 9.1 | **Measurements** (On LCD) | Input Voltage & Frequency, Bypass, Output Voltage & frequency, Kilowatt, kVA, ECO mode, Battery & Load Level Indicator, Ambient temperature & Event code. |
| 9.2 | **Fault Indication** (On LCD) | Charger warning, Fan fault, Temperature out of Range,+/-DC bus High/Low, Inverter Fault, DC-DC fault, abnormal output/Inverter voltage, output short circuit, charger fault, overload shutdown, battery low shutdown. |
| 9.3 | **Setable data** | Inverter Voltage, Inverter Frequency, Standby bypass, ECO, Bypass Range, Buzzer, Battery Capacity, Battery String, & Overload alarm |
| 9.4 | **Indications** (LED) | Green & Red |
| **10** | **Alarms** | |
| 10.1 | Audible Alarms | Charger warning, Fan fault, Temperature out of Range, +/-DC bus High/Low, Inverter Fault, DC-DC fault, abnormal output/Inverter voltage, output short circuit, charger fault, overload shutdown, battery low shutdown. |
| **11** | **Battery Backup / Battery Bank & Charger** | |
| 11.1 | Backup Required | Depends on the capacity of the battery. |
| 11.2 | Battery Bank Voltage | 24 V DC |
| 11.3 | Batteries Type | Sealed Maintenance Free (SMF) - 12V Cells, VRLA/ GEL, AGM |
| 11.4 | Battery Makes | Amara Raja / Exide / HBL / Amco / Rocket |
| 11.5 | Number of Battery Banks | Single Bank system. |
| 11.6 | Minimum Charger Rating (Including internal / external) | The charger should be able to deliver charging current equivalent to 10% of Battery Ah rating offered. (In-case of external chargers, suitable monitoring of the chargers should be provided in the UPS. Also, all external chargers taking AC input must have PFC - Power factor correction) |

| | | |
|---|---|---|
| 11.7 | Charger type / Charging Method & Charging Voltages | **Constant Voltage Constant Current** Solid state **SMPS** charger |
| 11.8 | Charger current | 4A extended upto 8A with internal charger (OPTIONAL) |
| 11.9 | Battery Housing (Vendor to provide the GA drawings of the offered Battery Rack) | Should be compact and space saving **MS steel open racks** complete with interconnectors |
| 11.10 | Battery End Cell Voltage | 1.75 V/cell |
| **12** | **Interfaces** | |
| 12.1 | USB Port should be available **(Mandatory)** | There should be provision for USB port also in the UPS. |
| 12.2 | RS232 Port should be available **(Mandatory)** | There should be provision for RS232 port also in the UPS. |
| 12.3 | Interface to NMS (Network Management System) | SNMP (IPV6) Card for connecting the UPS to LAN thru Ethernet port & monitoring thru NMS should be available (The cost of SNMP Card / NMS software to be quoted separately) |
| **13** | **Restart / Testing Capability** | |
| 13.1 | Cold Start | UPS should start up<br>On AC Supply (Mains) without DC Supply (Batteries)<br>On DC Supply (Batteries) without AC Supply (Mains) |
| 13.2 | Automatic Restart | UPS should start up automatically on mains resumption after battery low shutdown |
| 13.3 | Self Diagnosis | UPS should be capable to carry out self test of Rectifier / Charger /Battery & Inverter module during start-up |
| **14** | **Physical** | |
| 14.1 | Operating Temperature | 0 to 40 deg C |
| 14.2 | Storage Temperature | -15 to 50 deg C |
| 14.3 | Operating Humidity | 20% ~ 95%RH (No Condensing) |
| 14.4 | Operating Altitude | 0-1000m |
| 14.5 | Type of Cooling | Forced Air |
| 14.6 | Noise Level | < 40 dbA at 1 meter distance |
| 14.7 | Form Factor | Rack mountable |
| 14.8 | Packaging Material / Vibration Withstand & Drop Test | Recyclable (No CFC) &<br>1. Vibration testing as per ISTA -1G Non-operational with Packing |
| 14.9 | Standard Package of UPS to include the following minimum accessories | 1. UPS<br>2. Input cable<br>3. Battery cable<br>4. USB cable<br>5. User Manual |
| **15** | **Certifications** | |

| | | |
|---|---|---|
| 15.1 | Manufacturer | ISO 9001, 14001 |
| 15.2 | Product Safety Certifications **(Mandatory)** | **BIS Certification** |
| 15.3 | Product Safety Certifications **(Mandatory)** | **CE Certification** |
| 15.4 | Product Safety Certifications **(Mandatory)** | **RoHS Certification** |

xxi) 30kVA Online UPS

| Sl. No. | Specifications | Requirement |
|---|---|---|
| **1** | **Capacity (in kVA / kW)** | **30 kVA/ 30 kW 3-Phase Input / 3-Phase Output** |
| **2** | **Technology and Capability** | a) True **Online** configuration with **double conversion** UPS<br>b) **DSP** based technology with reduction in electronic components.<br>c) Fully rated power **(kVA=kW**) for maximum power availability.<br>d) Possibility of enhancing UPS capacity / redundancy by operating UPS in N**+X Parallel Redundant Configuration(PRS).**<br>e) Capability of **Independent or Common** battery bank operation of the UPS when operated in PRS.<br>f) UPS should be designed at **Rated PF of 1 i.e. 30kVA /30kW** UPS rating.<br>g) Dual Input design.<br>h) UPS should have IGBT topology for both PFC (power factor correction) and inverter.<br>i) Should have **Dual Aux power** design. |
| **3** | **Model Name & Number** | |
| 3.1 | 30 kVA / 30 kW | **Make / Model / Part No** to be specified by the vendor |
| **4** | **Input** | |
| 4.1 | Input facility -Phases / Wires | 3-Phase / 4-Wire & Gnd (3Phase & Neutral + Ground) |
| 4.2 | Input Voltage Range | 230/400V, 240/415V (3Φ4W)<br>Range (Full Load) 173~276 / 300~477VAC<br>Range (Derating to 70% Load) 132~173 / 228~300VAC |
| 4.3 | Nominal Input Frequency | 50/60Hz **(Auto-Selectable)** |
| 4.4 | Input Frequency Range | 45 to 65 Hz |
| 4.5 | Input Power Factor | > 0.99 (Full Load) |
| 4.6 | Current Harmonic Distortion (ITHD) | < 3% |

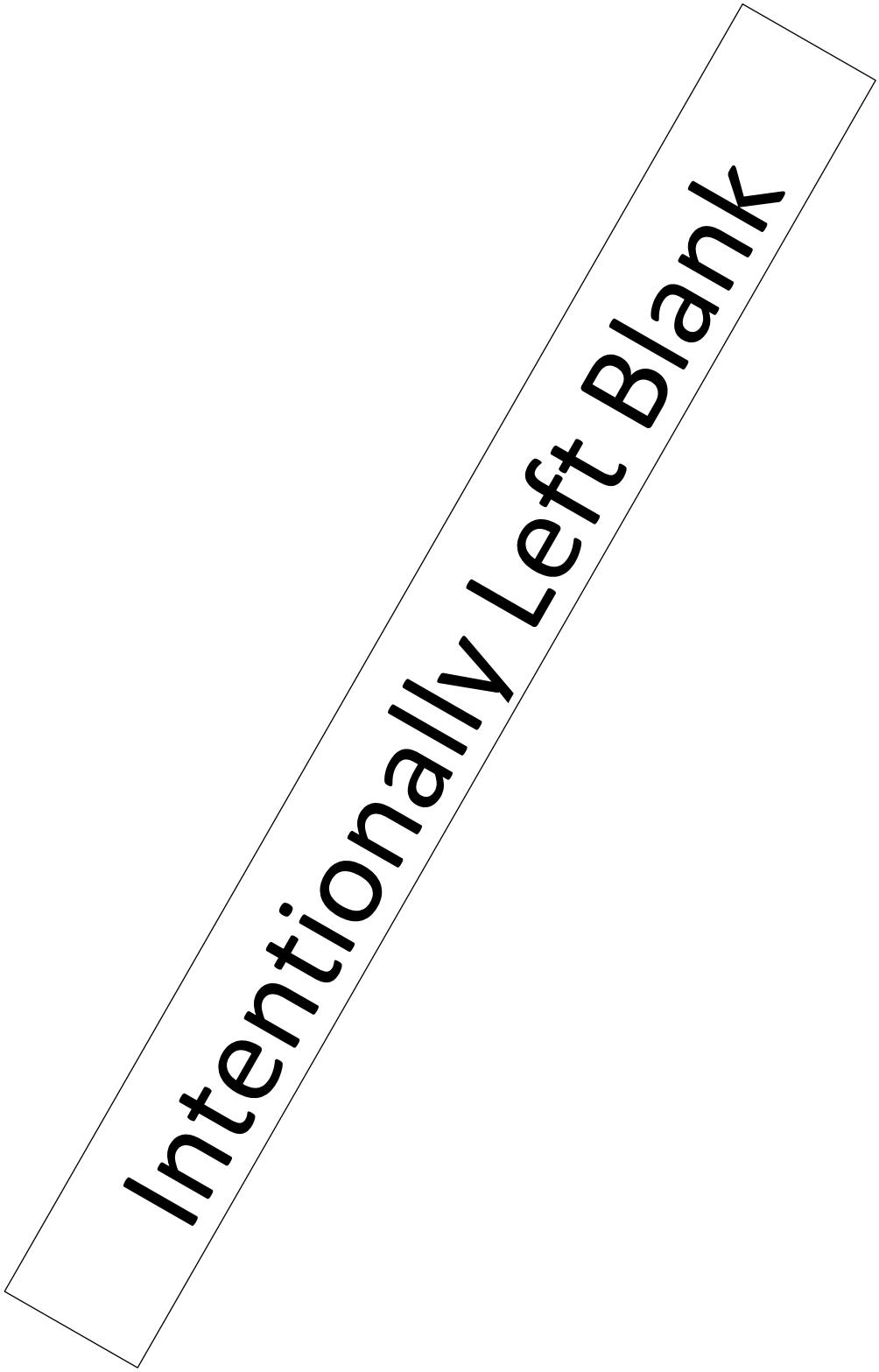
| | | |
|---|---|---|
| 4.7 | Generator Compatibility | Compatibility to genset supply required |
| 4.8 | Input Protection (Thru In-built 1P MCB) | Should be provided at the input of the UPS suitable for the full rated capacity of the UPS |
| **5** | **Output** | |
| 5.1 | Nominal Output voltage | 220/380V,230/400V,240/415V (3Φ4W) |
| 5.2 | Output Voltage Regulation | ± 1 % |
| 5.3 | Nominal Output Frequency | 50/60 Hz |
| 5.4 | Output Frequency Regulation | ± 0.05Hz |
| 5.5 | Output Frequency Slew Rate | ＜1Hz/sec |
| 5.6 | Output Wave Form | Pure sine wave |
| 5.7 | Output Voltage Distortion (THDu) | < 2 % (linear load) |
| 5.8 | Crest Factor | 3:1 |
| 5.9 | Output Short circuit Protection | Electronic Protection |
| **6** | **Transient Response / Recovery** | |
| 6.1 | Transient Response: Dynamic Regulation for 10% to 90% step linear load | ±7% or 60ms |
| 6.2 | Transient Recovery to steady state condition after 10% to 90% step linear load | < 1 cycle |
| **7** | **Transfer Time** | |
| 7.1 | Transfer Time (Mode of operation) | Zero ms from Mains mode to Battery Mode<br>Zero ms from Battery Mode to Mains mode |
| 7.2 | Transfer Time (Inverter to Bypass / Bypass to Inverter) | <1ms (Synchronized Mode) |
| 7.3 | **Automatic & Bi-directional static by-pass (In-built)** | Bypass To Inverter ±10 % (Rated Voltage)<br>Inverter To Bypass ±7 % (Rated Voltage) |
| 7.4 | **Maintenance Bypass** | 1.UPS should have option for manual maintenance bypass<br>2. Maintenance bypass cover removal sensing.<br>3.The maintenance bypass should provide for Hot-swap of the faulty UPS PWB for repairs / service. |
| **8** | **Efficiency (At Nominal Voltage & Resistive Load up to kW rating of UPS)** | |
| 8.1 | Overall Efficiency (AC to AC) - Online (Double Conversion) | Upto 96% |
| 8.2 | Overall Efficiency (AC to AC) - ECO Mode (Bypass feeding the load under normal conditions) | Upto 99% |
| **9** | **Overload** | |

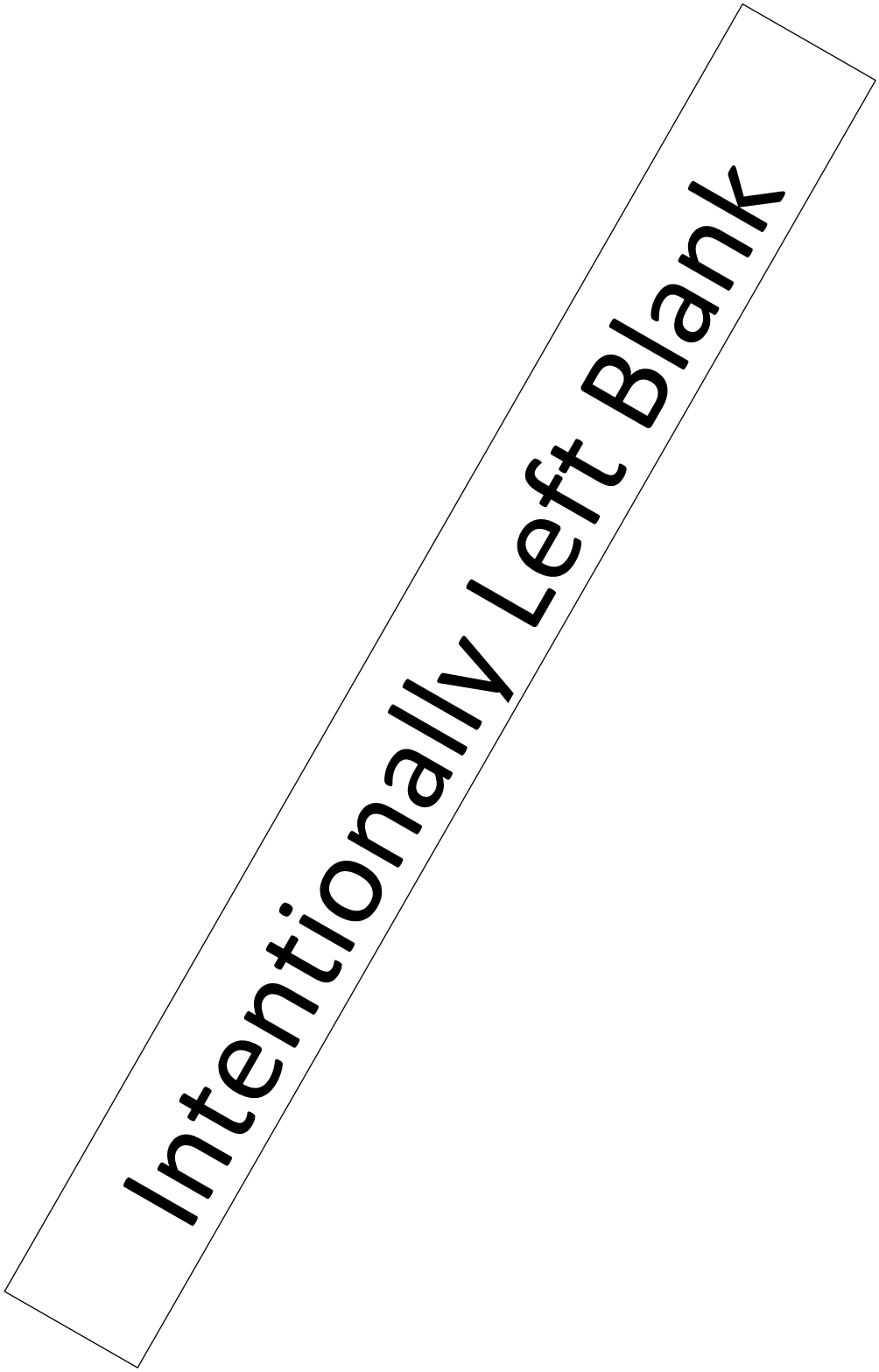
| | | |
|---|---|---|
| 9.1 | Inverter Overload capacity | ≤105 %: continuous,106% ~ ≤125%: 10 minutes; 126% ~ ≤150%: 1 minute; >150%: 1 second |
| **10** | **Display Panel (In-build LC Display & LED)** | |
| 10.1 | **Measurements** (On LCD) | Input: Voltage / Frequency, Bypass: Voltage / Frequency, Output: Voltage / frequency, Battery: Remaining time / Battery Level Indicator, Load**:** Percentage / Load Level Indicator, Battery Voltage Capacity/Status/Test Result, System Date/Time Setting, Current Time, PFC Fuse Open, Battery Temperature Too High, Battery Over Charge, Battery Out of Date, INV Short Circuit, Output Breaker Off, kVA, kW, output current, Battery current. |
| 10.2 | **Fault Indication** (On LCD) | Main Input Sequence Fault, Power Module General Fault, Battery Ground Fault, Bypass Static Switch Fault, Parallel Fault, System General Fault, Provide Bypass O/P Even If UPS Fault. |
| 10.3 | **Indications** (LED) | Normal-Green/Battery-Orange/Bypass-Green/Fault-Red |
| **11** | **Alarms** | |
| 11.1 | Audible Alarms | Battery Low beep / DC Fault beep/ UPS Overload beep/ o/p short ckt fault beep/ Shutdown beep |
| **12** | **Battery Backup / Battery Bank & Charger** | |
| 12.1 | Backup Required | 30 minutes |
| 12.2 | Battery Bank Voltage | 384 V DC or higher |
| 12.3 | Battery Bank VAh (Vendor to include battery sizing calculations with tender) | 26000 or higher |
| 12.4 | Batteries Type | Sealed Maintenance Free (SMF) - 12V Cells |
| 12.5 | Battery Makes | Amara Raja / Exide / HBL / Amco / Rocket |
| 12.6 | Number of Battery Banks | Maximum Two Banks in parallel |
| 12.7 | Minimum Charger Rating (Including internal / external) | The charger should be able to deliver charging current equivalent to 10% of Battery Ah rating offered. (In case of external chargers, suitable monitoring of the chargers should be provided in the UPS. Also, all external chargers taking AC input must have PFC - Power factor correction) |
| 12.8 | Charger type / Charging Method & Charging Voltages | **Constant Voltage Constant Current** Solid state **SMPS** charger<br>Float Charge 270V±(2V)<br>Boost Charge 280V±(2%V) |

| | | |
|---|---|---|
| 12.9 | Battery recharge time (After complete discharge) to 90% capacity | 10-12 hours |
| 12.10 | Battery Housing (Vendor to provide the GA drawings of the offered Battery Rack) | Should be compact and space saving **MS steel open racks** complete with interconnectors |
| 12.11 | Battery End Cell Voltage | 1.75 V/cell |
| **13** | **Interfaces** | |
| 13.1 | Serial Communication RS232 Port (Option of USB Port should be available) | RS232 Port should be provided as standard in the UPS. However, there should be provision for USB port also in the UPS. |
| 13.2 | REPO(Remote Emergency Power OFF) / ROO(Remote ON - OFF) Port | Provide both onsite & remote EPO to shutdown UPS when emergency situation happens. REPO Port with a user-supplied switch |
| 13.3 | Interface to NMS (Network Management System) | SNMP (IPV6) Card for connecting the UPS to LAN thru Ethernet port & monitoring thru NMS should be available (The cost of SNMP Card / NMS software to be quoted separately) |
| 13.4 | Interface to BMS (Building Management System) - To be quoted as option | ModBus Card for connecting to UPS to BMS thru RS485 & monitoring thru BMS |
| 13.5 | Interface to DCS (Distributed Control System) - To be quoted as option | Relay I/O Card or PFC (Potential free contacts) for connecting to UPS to DCS / PLC / SCADA system for communicating UPS operating status |
| 13.6 | UPS status information presented as 3 contact closures | UPS should have configurable input signal as shutdown UPS or battery test dry contact. |
| **14** | **Restart / Testing Capability** | |
| 14.1 | Cold Start | UPS should start up<br>On AC Supply (Mains) without DC Supply (Batteries)<br>On DC Supply (Batteries) without AC Supply (Mains) |
| 14.2 | Automatic Restart | UPS should start up automatically on mains resumption after battery low shutdown |
| 14.3 | Self Diagnosis | UPS should be capable to carry out self test of Rectifier / Charger /Battery & Inverter module during start-up |
| **15** | **Physical** | |
| 15.1 | Operating Temperature | 0℃ ~ 40℃ |
| 15.2 | Storage Temperature | −20℃ ~ 40℃ |
| 15.3 | Operating Humidity | ＜ 95% |
| 15.4 | Operating Altitude | 0 to 3000m(0 To 10000ft) |
| 15.5 | Type of Cooling | Forced Air |
| 15.6 | Noise Level | ＜ 60dBA at 1 Meter |

| | | |
|---|---|---|
| 15.7 | Air Filters | UPS should have internal anticorrosion air filters for dust filtration **(Optional)** |
| 15.8 | Dimension (w x d x h) in mm | To be furnished by the vendor |
| 15.9 | Weight - in kg | To be furnished by the vendor |
| 15.10 | Reliability | MTBF greater than 100000 hours |
| 15.11 | Packaging Material / Vibration Withstand & Drop Test | Recyclable (No CFC) &<br>1. Vibration testing as per ISTA -1G Non-operational with Packing |
| 15.12 | Standard Package of UPS to include the following minimum accessories | 1.SMART Slot<br>2.MINI Slot<br>3.Parallel Port<br>4.RS232 Port<br>5.REPO Port<br>6.Charger Detection Port<br>7.Input Dry Contact<br>8.Output Dry Contact<br>9.USB Port |
| 15.13 | Parallel Configuration | UPS should have capabilty for parallel 4 units. |
| 15.14 | DC bus Capacitor | UPS DC bus capacitor have minimum life of 5 years@40°ambient. |
| **16** | **Certifications** | |
| 16.1 | Manufacturer | ISO 9001: 2015, ISO 14001: 2015, ISO 18001: 2007 |
| 16.2 | Product Safety Certifications (Mandatory) | General Safety Requirements for UPS EMC EN/IEC/AS 62040-1<br>Requirements for UPS EN/IEC/AS 62040-2<br>UPS Classification according to IEC EN 62040-3 VFI-SS-111 |
| 16.3 | ROHS compliance | UPS should be ROHS compliance |

2.7

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## 2.8. Managed Services

| Sl. No. | Item | Description |
|---|---|---|
| **Network Management Service** | | |
| **Internet Routing Services** | | |
| 1 | | IPv4 subnet allocation |
| 2 | | Enable routing with peer AS over internet |
| 3 | | Transit AS services |
| 4 | | IPv6 subnet Pool allocation |
| 5 | | IPv6 BGP Peering |
| **Cross Connect and Telco Services** | | |
| 6 | | P2P link termination |
| 7 | | MPLS link termination |
| 8 | | MPLS connectivity |
| 9 | | Dynamic routing for achieving auto failovers |
| 10 | | VRF routing |
| 11 | | P2P Link with L2TP |
| **Monitoring and Support** | | |
| 12 | | Network devices ICMP monitoring |
| 13 | | CPU, Memory and sessions on Firewall |
| 14 | | P2P link monitoring |
| 15 | | MRTG |

| | | |
|---|---|---|
| 16 | | Complete monitoring of network devices, links etc |
| 17 | | Incident management |
| 18 | | Problem management |
| 19 | | Change management |
| 20 | | Network support |
| **Firewall Services** | | |
| 21 | | Standalone Firewall setup |
| 22 | | Firewalls with HA setups |
| 23 | | Cable pull test for HA |
| 24 | | Firewall port opening |
| 25 | | Firewall port blocking |
| 26 | | Country wise IP opening or blocking |
| 27 | | Read-only access to the firewall |
| 28 | | Trusted SSL certificate import |
| 29 | | Using the Load balancer feature in Firewalls |
| 30 | | Policy verification every year |
| 31 | | IPSEC VPN with Unlimited Users |
| 32 | | SSL VPN with unlimited users |
| 33 | | IPSEC remote access VPN with unlimited users |
| 34 | | Two factor-based authentication Integration |
| **OS Management Service** | | |
| 35 | Windows Server | **OS Installation and Upgrades** |
| 36 | | **OS Critical and Security Patch Management** |
| 37 | | **Monitoring of Windows Server.**<br>Monitoring of CPU, RAM, Disk Usage |
| 38 | | Monitoring of Disk IO, Windows Time Sync, |
| 39 | | **Monitoring of Windows Server Services** |
| 40 | | **Monitoring of Windows Server Performance** |
| 41 | | **Antivirus Patch Management** |
| 42 | | **Windows Server OS Log Analysis/Management** |
| 43 | | System, Application and Security Log Analysis |

| | | |
|---|---|---|
| 44 | | **Windows Server Security Management** |
| 45 | | Security Processes - User and Group Management |
| 46 | | Security Policies and Configurations |
| 47 | | Security Patches and Hot Fixes |
| 48 | | Windows Registry Configurations |
| 49 | | Windows Services |
| 50 | | File and Directory Security |
| 51 | | Audit Logging |
| 52 | | Windows Firewall Policy |
| 53 | | Time Zone Setting |
| 54 | | Event log setting |
| 55 | | Installation of server feature |
| | | Cluster setup and management |
| 56 | | Installation/ Modification/ Removal of IIS/ File server role. |
| 57 | | Configuring disks and volumes includes creating and formatting partitions, logical drives, & volumes |
| 58 | | Defragmenting volumes to improve file-system performance |
| 59 | | Managing file-system errors and bad sectors on a hard disk. |
| 60 | | **Windows Server folder and File access security/ share permission management.** |
| 61 | | **Windows Server backup Monitoring** |
| 62 | | Configuring system state and bare metal backup. |
| 63 | | Restoring system state and bare metal backup. |
| 64 | | **Windows Server Debug logs and Analysis** |
| 65 | | **Windows Scheduled Tasks Management**<br>**Windows Server Remote Access Management.** |
| 66 | | Enable/Disable Remote Desktop |
| 67 | | Installation/modification/removal of Device Drivers. |

| | | |
|---|---|---|
| 68 | | Create/delete/modify Users and groups |
| 69 | | Reset password, unlock users |
| 70 | | **Windows Server Problem/change/incident Management** |
| 71 | | **24x7 OS Support with Windows Support Service** |
| **Linux OS Management** | | |
| 72 | | Installation/ upgrade/ Monitoring of Linux OS |
| 73 | | Server hardening and uptime monitoring notifications |
| 74 | | Administration of Linux (SUSE) |
| 75 | | OS Virtualizations (KVM etc) |
| 76 | | Cluster setup and management. |
| 77 | | OS Patching/ Performance tuning/storage migration |
| 78 | | **Advance Authentication service (LDAP etc)** |
| 79 | | **Incident/Problem/Change management** |
| 80 | | **Antivirus management** |
| 81 | | **Support Service** |
| **Storage management** | | |
| 82 | | Break Fix Services (Incident Management) |
| 83 | | Implementation of Storage with LUN Allocation and management |
| 84 | | Provide Access to Storage box for customer |
| 85 | | Manage Access Rights to Storage Volumes |
| 86 | | Create/delete and Enable/disable Zones on FC Switches |
| 87 | | Software Patch updates |
| 88 | | Proactive Monitoring Storage Devices |
| 89 | | Log Analysis & Reporting |
| 90 | | Performance Analysis & Tuning |
| 91 | | Proactive Firmware Upgradation of Disk Drives & Controllers |
| 92 | | Non Disruptive Storage Migration |

| | | |
|---|---|---|
| 93 | | Capacity Planning & growth Rate Projections. RAID Design & configuration |
| 94 | | Storage Tiering and thick provisioning |
| 95 | | Multiple Hot Spares to sustain more than one Disk Failure simultaneously. |
| 96 | | Enterprise Replication & Snapshots. |
| 97 | | In-built Non-volatile flash based eternal Cache data protection to sustain power outages. |
| 98 | | Controller Architecture (Active-Active Symmetric Load balancing Virtualized controllers.) |
| 99 | | Recommendations on Security Policies |
| **Backup management** | | |
| 100 | | Monitoring of backup servers and backup Management |
| 101 | | Backup Configuration |
| 102 | | Backup Job Schedule Management |
| 103 | | Alert Mechanism for Failures |
| 105 | | Capacity Management |
| 106 | | Backup Restore Administration |
| 107 | | Backup Failure Analysis |
| 108 | | Data Encryption at Transit and at Rest |
| 109 | | Bare metal Backup |
| 110 | | Snapshot Backup, Backup on tape |
| 110 | | Linux Filesystem Backup |
| 111 | | Windows File System Backup |
| 112 | | HANA DB, Sybase DB. MAXDB and MS SQL Backup |
| 113 | | Exchange Backup |
| 114 | | Tape Lifecycle Management |
| 115 | | Tape Labeling |
| 116 | | Tape Rotation |
| 117 | | Tape Storage in Fire Safe Media Rack |
| 118 | | Tape Retrieval from Tape Drives |
| 119 | | Tape Collection within Municipal Boundary |

| | | |
|---|---|---|
| 120 | | Physical Verification and Audit of Media |
| **VMWare Services** | | |
| 120 | Monitoring/configuration of ESXI Services | CPU, RAM & DISK |
| 121 | | Memory Overcommitment |
| 122 | | Unlimited Virtual SMP |
| 123 | | Hot Pluggable Virtual HW |
| 124 | | MPIO / Third-Party Multi-Pathing |
| 125 | | Memory Ballooning/NIC teaming |
| 126 | | Installation/Modification/Deletion of ESXi device Drivers |
| 127 | | Esxi Server Log Analysis/Management**.** |
| 128 | | Security Processes - User and Group Management |
| 129 | | vSphere Host Profiles |
| 130 | | Authentication Services |
| 131 | | Security Profile |
| 132 | | Audit Logging Requirement |
| 133 | | ESXi Firewall Policy |
| 134 | | Time Zone Setting |
| 135 | | Sys Log Settings |
| 136 | | Managing vSphere Plugins |
| 137 | | vSphere Update Manager |
| 138 | | vSphere Dump Collector |
| 139 | | vSphere Management Assistant |
| 140 | | vCenter Management |
| 142 | | SMTP Email Alerts |
| 143 | | vSphere Web client |
| 144 | | vSphere HA, DRS, SDRS, FT, vMotion, Storage vMotion |
| 145 | | vSphere API, Storage API |
| 147 | | vSphere DPM |
| 148 | | Datastore & Datastores Clusters |

| | | |
|---|---|---|
| 149 | | vCenter Server Appliance |
| 150 | | Inventory Extensibility |
| 151 | | vCenter Single Sign-on |
| 152 | | Linked Mode, |
| 153 | | Custom Roles and Permissions |
| 154 | | Improved large-scale management |
| 155 | | VMWare vRealize Orchestrator, VMWare vRealize Operations Standard |
| 156 | | Proactive Optimization |
| 157 | | Dynamic Allocation of Resources – DRS |
| 158 | | Resource Management, Managing Scheduled Tasks.,<br>Analyzing ESXi Host debug logs. |
| 159 | | P2V and V2V Migration |
| 160 | | ESXi OS Critical and Security Patch Management |
| **Security Management** | | |
| 161 | | OS Logs, AV/AS logs, Vulnerability Assessment, Network Device Logs, Rule Based Correlation & Risk Based Correlation |
| 162 | | Incident Management, Log Retention for 6 Months |
| 163 | | Penetration Testing (Tool based) |
| 164 | | Historical Based Correlation |
| 165 | | PCI DSS, FIM, Advanced Persistent Threat protection, IPS/IDS, DDOS Protection, DDOS Reporting, Enabling DDOS services for NMDC networks |
| 166 | | Basic web filter service |
| 167 | | Application filter services |
| 168 | | Automatic updates of signatures |
| **DC-DR Services** | | |
| 169 | | RTO - Recovery Time Objective <-4 Hours<br>RPO – Recovery Point Objective <= 30 Minutes |
| 170 | | Network Convergence and Recovery |

| | | |
|---|---|---|
| 171 | | Failback and Primary DC Restoration |
| 172 | | DNS/GSLB |
| 173 | | Application Recovery |

## 2.9. NOC

i) Desktop for NOC

| Sr. No. | Description | |
|---|---|---|
| 1 | Make & Model Offered | To be clearly mentioned. All the relevant product brochures and manuals must be submitted |
| 2 | Processor: 5th Generation Intel Core i5 or above. | |
| 3 | Operating System: Windows 10 Prof. or above (64 bit). | |
| 4 | Display: 23 inch or above HD | |
| 5 | Port: HDMI, USB | |
| 6 | Memory (in GB): 8 or higher | |
| 7 | Hard Drive: 1 TB 5400 rpm | |
| 8 | Graphics Card: 2 GB Graphics Card make NVIDIA GeForce, ATI Radeon or equivalent | |
| 9 | DVD- R/W | |
| 10 | MS Office Standard License | |

ii) Screen/ Console (Large Format Display)

| Sl. No. | Description | |
|---|---|---|
| 1 | Make & Model Offered | To be clearly mentioned. All the relevant product brochures and manuals must be submitted |
| 2 | LFD shall be of 55-inch, full HD, 2 HDMI Ports, 1 VGA Port with AV features, 1 USB min, Contrast 4000:1 | |

Section A: Optical Fibre Laying

## 1.0 Optical Fibre Laying:

The Executing Agency shall prepare and submit for approval by the Purchaser, specific construction drawings for all types of soil strata/crossings taking into consideration the guidelines given in this specification. The construction/implementation shall be carried out as per the approved drawings.

The construction drawings shall inter-alia include the longitudinal sectional diagram of the trench for different soil strata and detail arrangement of crossings, number of pipes, size of pipe, locations and position of manholes, other details as per the technical specifications. Route maps shall be drawn to the scale of 1:20,000. For convenient handling in the field, the map shall be made on 300mm(W) and lengths not exceeding 1190mm sheets with 30 mm overlap shown on subsequent sheets.

### 1.1 Clearances

The Executing Agency shall be responsible for obtaining necessary clearances for excavation work from the authorities on behalf of the Owner and provide requisite copies of information, maps, survey report etc to the authorities. The Owner/Employer shall assist the Contractor in obtaining such clearances by providing the authority letter or any other relevant document. The Contractor shall make an all out effort with the concerned authority to get clearances expeditiously and to negotiate the least cost to the Owner/Employer. The Owner/Employer shall furnish all required bank guarantees and make payments to the concerned authorities directly based on the demand letter obtained by the Contractor from the concerned authorities. The Contractor shall ensure quick and speedy clearances in order to implement the project within stipulated schedule. In case the authorities have some objections on certain sections of routes proposed and are unwilling to provide clearances, the Contractor shall propose an alternate route, promptly carry out the survey and submit specific survey report for that and reapply for clearance after taking into account the comments/objections of the authority.

### 1.2 Excavation and Backfilling

The Contractor shall carry out excavation and backfilling of trenches in all kinds of soil strata such as normal soil, soft rock, hard rock for laying PLB HDPE pipe, RCC hume pipe and GI pipe.

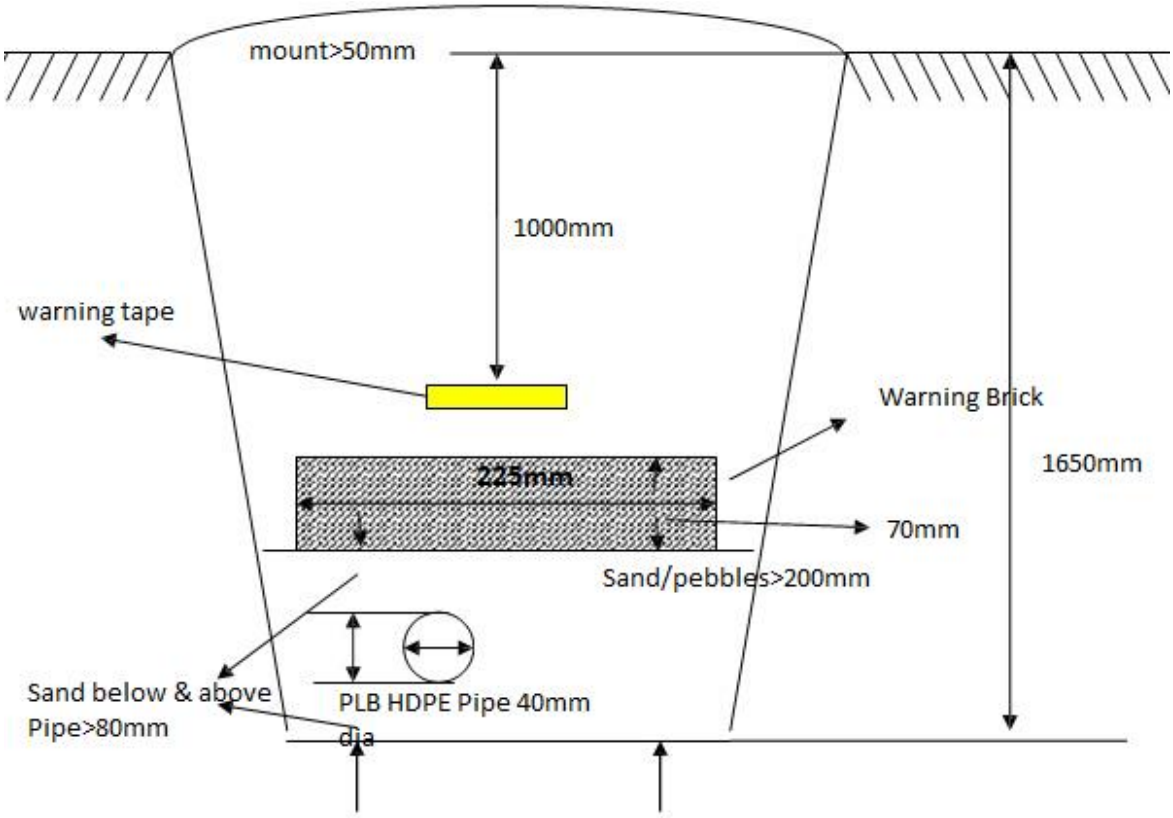



**Figure 1.0: Trench in Normal Soil for 1 PLB HDPE pipes (Not To Scale)**

### 1.2.1 Excavation

The cable trenches shall be dug as per route plan and detail trench drawings (indicating the various dimensions and other details of the trench) approved by the Owner/Employer for each type of soil strata. The Contractor shall take due care and precaution during excavation to avoid possible damage of other underground plants/facilities in the proposed underground fibre optic cable route and shall indemnify the Owner/Employer for all damages and shall be solely responsible for all the damages and losses. The Owner/Employer shall not be liable for any damages/losses.

For the purpose of this specification, soil strata types are defined below:

**Normal Soil** All type of soil {i.e. dry, wet (partially or fully submerged)} except soft rock or hard rock as defined below.

**Soft Rock** Lime stone, laterite, hard conglomerate or other fissured rock which can be quarried or split with crow bars, wedges or pickaxes. However, if required light blasting may be resorted to for loosening the material, but this will not in any way entitle the material to be classified as hard rock.

**Hard Rock** Any rock excavation other than specified under Soft Rock, for which blasting, drilling, chiseling are required.

Depth of trench shall be at least 1650 mm in normal soil. However, for rail & road crossings the trench depth shall be at least **1000** mm. Depth of trench shall be at least 1000 mm in soft rock from the depth softrock is encountered i.e. in case soft rock is encountered at say 500 mm then the actual depth of the trench shall be 500+1000 = 1500 mm limited to a maximum depth of 1650mm. Depth of trench shall be at least 800 mm in hard rock from the depth hard rock is encountered i.e. in case hard rock is encountered at say 300 mm then the actual depth of the trench shall be 300 + 800 = 1100 mm limited to a maximum depth of 1650mm. For excavation in hard rock, controlled blasting can be resorted to. The Contractor shall obtain necessary permissions from the statutory authorities for blasting and the use of explosives for this purpose. No blasting is permitted near permanent work or dwellings. Blasting shall be so made that pits are as near to the designed dimensions as practicable. Jackhammers can also be used for the excavation. The width of trench at the top and bottom shall be adequate for proper installation of PLB HDPE pipes, RCC hume pipes, GI pipes Warning tape, route marker and joint markers. The contractor shall submit the construction drawing for approval. The trench depth shall be measured from the bottom of the trench. Trench shall be located at the lowest point of lower area if possible. Trench shall not be constructed at field boundary or any up-heap. In case of uneven ground, the Contractor ensure that the bottom of the trench is not uneven, the Contractor shall maintain minimum depth of the trench as per specifications and may be required to increase the depth at some locations and provide a suitable gradient in the trench.

During the construction of trenches, the Contractor shall be responsible for shoring and strutting the walls of the trench on either side by using suitable means such as wooden planks to avoid subsidence of soil. The Contractor shall also be responsible for supporting the exposed plant/facilities of other utilities such as water, gas and oil pipes, electric, telephone or fibre optic cables etc. to avoid any possible damage. The Contractor shall also be responsible for any dewatering of the trench during digging and installation of pipes.

In case it is necessary to get around a large obstacle such as a boulder or an underground plant/facility, which has not been anticipated earlier the trench may be given a gentle bend within permissible radius or by construction of a manhole. Wherever possible, it is preferable to avoid additional manholes.

The **Purchaser Project Manager or his/her authorized representative** will be the authority to decide the classification of the soil i.e. normal soil, soft rock or hard rock. In few cases where the

required depth is not achievable, the Project manager may allow the lesser depth subject to providing the suitable protection such as providing the concrete casing of the installed ducts. For such cases, the contractor shall propose the suitable protection arrangement along with the reasons for non-achievability of the required depth and obtain the specific approval of the project manager before execution of the work. The decision of the Project Manager shall be final and binding on the Contractor.

### 1.2.2 Backfilling

After installation of PLB HDPE pipes, RCC hume pipes or GI pipes, the backfilling of the trench shall be done. The PLB HDPE pipes shall be sandwiched with sand as per the Figures 1.0. Backfilling shall normally be done with the excavated soil, unless it consists of large boulders/stone in which case the boulders/stone shall have to be broken to a maximum size of 80mm. The backfilling should be clean and free from organic matter or other foreign material. The earth shall be deposited in maximum 200 mm layers levelled and wetted and tamped properly before another layer is deposited. The earth filling is done with a suitable mount to allow for any shrinking of soil at the later date. In case of regular footpath, temporary reinstatement shall be done after backfilling. The left out earth if any has to be disposed by the Contractor to a suitable location as indicated by authorities at his own cost. It is advisable to start backfilling of the trench from one end or after padding of the pipe to avoid uplifting. In case of soft rock as well as hard rock, the PLB HDPE pipe shall be covered with 1:2:4 concrete. The cross section of the concrete shall be 100 mm (depth) x 200 mm (width). The Contractor shall properly cure the concrete for four days. The backfilling of the remaining portion shall be done as stipulated for normal soil.

Final inspection of the backfilling shall be done jointly by the Executing Agency and Purchaser immediately after first monsoon and the Executing Agency shall rectify the defects, if any, without any cost to the Purchaser.

## 1.3 Marking

The Contractor shall provide markers, warning bricks and warning tape as stipulated below for the routes where new PLB HDPE pipes are installed under this package.

### A) Markers

Route markers made of RCC (1:2:4) of length 1450 mm and a bottom cross section of 150mmx200mm tapering to 75mmx125mm at top shall be provided. Route markers shall be provided at 500 mm from the trench and away from the road centre, at an average of 200 m. Markers shall also be provided at major directional changes in route (from straight) and at both sides of all types of crossings. 900 mm of the marker shall be underground and 550 mm shall

be above the ground. The portion of route markers above ground shall be painted with brown synthetic enamel paint.

Joint Markers shall be provided at each joint location and shall be same as route markers except that they shall be blue in colour. In case joint markers and route markers fall at the same location, route marker shall not be installed and only joint marker shall be provided.

All Markers shall be Engraved vertically as “NAME OF UTILTIY” in 500 mm portion above the ground area and filled with fluorescent white colour. The marking shall face the road.

### B) Warning Bricks

Bricks class designation-5(50) of the actual size 225 mm (Length) x 111 mm (Width) x 70 mm (Thick) shall be laid breadth-wise as per the slandered practice (average 9 bricks per meter) in city area (municipality limits) immediately above the sand layer in which PLB HDPE pipe is installed. Stone slabs of suitable size may also be used in place of warning bricks with the approval of the Owner/Employer.

### C) Warning Tape

A warning tape, made of HDPE or LDPE (Low Density Poly Ethylene) other suitable inert material, containing a printed message "**WARNING :” Name of utility’s “ Fibre Optic Cable below**" shall also be laid over the pipe, throughout the cable route at a depth of 1000mm in normal soil (the depth in soft rock and hard rock shall be proposed by the Contractor and approved by the Owner/Employer), for warning the person who is excavating the trench. The width of the tape shall be at least 100 mm and thickness of the tape shall be at least 500 micrometers. The life of the warning tape shall be at least 25 years.

## 1.4 Installation of PLB HDPE Pipe

Two PLB HDPE pipes two PLB HDPE pipes **(one spare for future use)** shall be laid. Two PLB HDPE pipes shall be laid side by side (minimum spacing 30 mm) at bottom of the trench after making the surface smooth and providing 80 mm of sieved, stone free sand bedding. After laying the pipe additional sieved sand shall be added to increase the height of the sand layer to a total of 200 mm hence positioning the PLB HDPE pipe in the middle of the layer. In case of unavoidable rat infected areas along the finalised route, pebbles of dia 20 mm (nominal) shall be used in place of the sand. Other important steps are described as under:

a. PLB HDPE Pipe shall be laid in a flat bottom trench free from stones, sharp edged debris. Pipe shall not be laid in water filled trenches.

b. The Pipe shall be placed in trenches as straight as possible. Minimum bending radius of pipe and fibre optic cable shall always to be taken into account.

c. The ends of pipes shall always be closed with end plugs to avoid ingress of mud, water or dust i.e. all pipe opening shall be sealed to avoid entry of foreign material.

d. The pipes shall be joined tightly & properly through plastic couplers and the joint shall be smooth and free from steps. The joints shall be made properly so that it passes the duct integrity test. All joints shall be assembled with proper tools only.

e. Coupler shall not be placed along the bend portion of the pipe and hacksaw shall never be used to cut the pipe.

f. Cable sealing plugs shall be provided at all manhole locations and at locations cable is coming out of the pipe and empty pipe ends i.e. all pipe openings shall be sealed to avoid entry of foreign objects.

g. PLB HDPE pipes shall be installed in a manner that fibre optic cable can be pulled, blown, de- blown without damaging the fibre optic cable due to stresses.

The Executing Agency shall get inspected, by a representative of Purchaser, all joints before carrying out the backfilling. Joints shall be visually inspected and checked for tightness.

### 1.5 Reinstatement

The Executing Agency shall be required to carry out reinstatement of the excavated area in case the concerned authority requires so. Reinstatement shall include all works necessary (such as reconstruction of metalled/asphalt road, footpath etc) to restore the excavated area to original quality and shape.

### 1.6 Underground Fibre Optic Cable Installation

The cable shall be installed inside one of the 40mm diameter PLB HDPE pipes installed under this package along the route(s). The cable shall be installed by compressed air blowing technique. The cable blowing machine shall be suitable for blowing the proposed section lengths of fibre optic cables.

As various utilities have already installed their fibre optic cables in the existing PLB HDPE pipe routes, the Contractor shall take due care and precaution during installation of fibre optic cable and the rectifications work to avoid possible damage of ducts / OFC of other utilities. The Contractor shall indemnify the Owner/Employer for all the damages and the Contractor shall be solely responsible for the damages and losses. The Owner/Employer shall not be liable for any such damages.

Executing Agency shall provide armored fibre optic cable (TEC approved design) in some of the sections, which are not suitable for unarmored cable installation in ducts (example: highly rat infected sections). The armored fibre optic cable shall also be installed inside the PLB HDPE pipe / GI pipe / RCC pipe, as applicable. The routes and types of installation shall be finalised during project execution based on the site survey report and actual requirements.

The Contractor shall propose the exact methods and procedures for installation taking into consideration the following guidelines, for approval by the Owner/Employer.

a. The Optical Fibre Cable Drums shall be handled with utmost care. The drum shall not be subjected to shocks by dropping etc. They shall not be normally rolled along the ground for long distance and when rolled, shall in the direction indicated by the arrow. The battens shall be removed only at the time of actual laying.
b. A blowing machine in association with an appropriate compressor shall be used for blowing.
c. Temporary blowing chambers (if required) shall be constructed and then backfilled after blowing operation is completed.
d. Locations along the route, which provide easy access points for blowing machine and compressor, shall be determined.
e. Before starting the cable blowing, both PLB HDPE pipes installed under this package shall be checked for obstacles or damage. The already installed PLB HDPE pipe wherein cable are to be installed under this package shall also be checked for obstacles or damage. Checking shall be done by using a proper sized mandrel equipped with a transmitting device.
f. Always blow downhill wherever possible.
g. Multiple blowing machines may be used in tandem if so required.

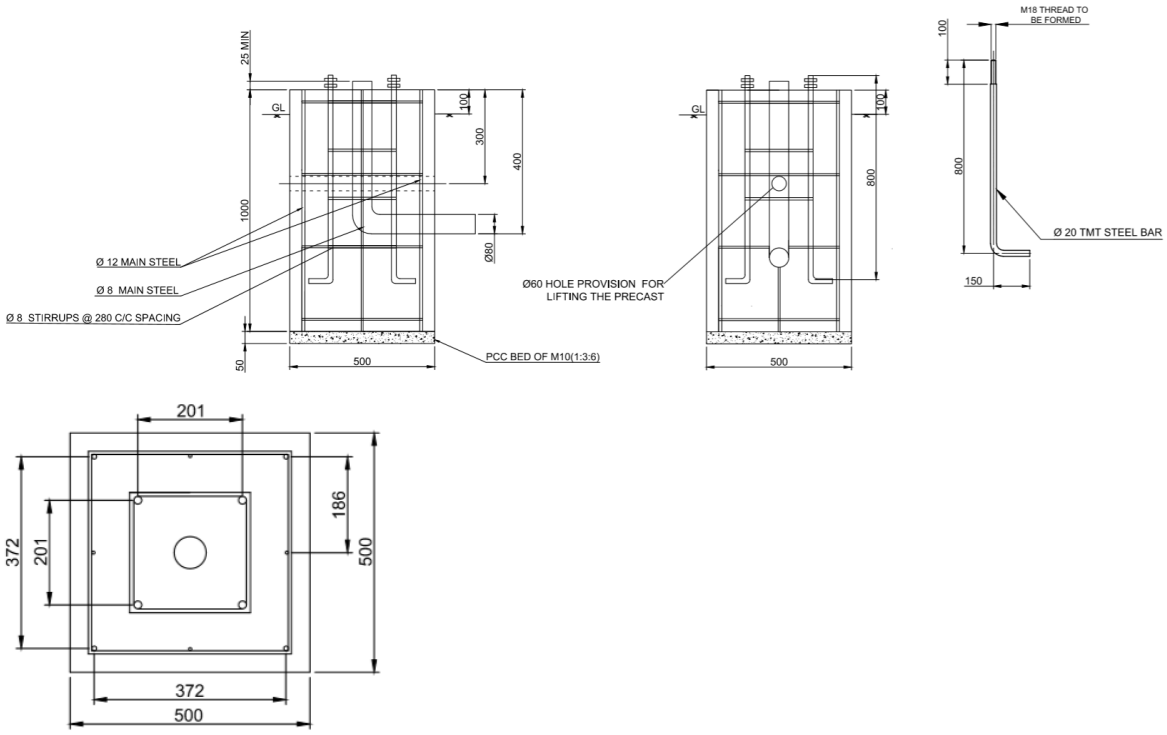
Installation by pulling may be permitted by the Owner/Employer in specific cases where installation by blowing is not feasible. In case pulling is used, the pulling speed shall be determined considering the site condition. Care must be taken not to violate the minimum bending radius applicable for the fibre optic

cable. Tension in the cable during laying shall not exceed tension limit of the offered FO cable and the cable should not be damaged during or after the pulling. While installing the cable, excess length of about 10 meters shall be stored at each joint location for each side. Excess length of 10 m shall be kept at one ends of a road crossing, culvert crossing and 20 meters at one end of bridges.

### 1.7 Trenchless Digging

Trenchless digging may be used in short section for crossing National highways, important road or rail crossings etc., where the concerned authorities do not permit open cut method, for which no additional cost shall be provided by the Employer.

## Section B: Foundation Details for Relocatable Standard Pole




1. P.C.C. Bed of M10 (1:3:6) Concrete 50 Thick to be laid below foundation
2. Foundation to be made of RCC with M20 Concrete
3. Anchor/J-Bolts to be made from Dia 25 TMT Steel Bars and bent as shown in figure and to be threaded M20X80 on end and galvanized
4. Dia 10 TMT Steel Bars stirrups at 200 C/C spacing to be provided for J bolts
5. 80 PVC pipe with elbow/HDPE pipe to be inserted withing the cage formed for cable entry as shown and to be accommodated within the space without disturbing the stirrups
6. PVC pipe with elbow should have min. 60 clearance after concreting at both ends
7. 8 nos. M20 Galvanized Steel nuts and 8 nos. M20 Galvanized Steel washers are to be used for Pole installation
8. The grouted J-bolts position should match with the Base Plate of the Relocatable vertical pole assembly
9. M20 concrete is used for RCC works
10. 50 mm cover is provided for main bars

**ANNEXURE-XII**

Details of MAF Required
(Revised as on 06.08.2020)

| Sl. No. | Type | Description | Country of Origin | MAF Required |
|---|---|---|---|---|
| **Data Center & Disaster Recovery Site** | | | | |
| a) | Hardware | | | |
| | | HANA Boxes | | Yes |
| | | Servers | | Yes |
| | | Blade Enclosures | | Yes |
| | | Storage | | Yes |
| | | Switches | | Yes |
| | | Tape Library | | Yes |
| b) | Software | | | |
| | | Microsoft Windows | | Yes |
| | | SLES | | Yes |
| | | SLES for SAP Applications | | Yes |
| | | Vmware | | Yes |
| | | EMS | | Yes |
| | | Backup | | Yes |
| **Networking** | | | | |
| a) | Active | | | |
| | | Firewalls | | Yes |
| | | Switches (Core, Distribution, Access) | | Yes |
| | | NAC | | Yes |
| | | Outdoor Wifi | | Yes |
| | | Indoor Wifi | | Yes |
| b) | Passive | | | |
| | | Optical Fiber Cable | | Yes |
| | | LIU's | | Yes |
| | | UTP Cables | | Yes |
| | | Jack Panels | | Yes |
| | | I/O's | | Yes |
| | | Patch Cords | | Yes |
| | | Racks | | Yes |
| **Others** | | | | |
| a) | Electrical | | | |
| | | UPS's | | Yes |

**Annexure-XIII**

# ITI LIMITED

(*A Government of India Undertaking* )

## COMPLIANCE STATEMENT
## (Revised on 06.08.2020)

NIT Reference No: CRP20E001 Dated: 20.05.2020

**Selection of an Experienced IT-Networking Partner**
**For**
**IT Infrastructure Implementation for ERP and other Future Digital Initiatives at NMDC Locations.**

| | | |
|---|---|---|
| **Supplier Name & Address:** | | |
| **Phone No. & Email Id** | | |
| **Clause No.** | **Description** | **Compliance (Yes/No)** |
| **1)** | **Scope of the Work** | |
| a | Establishment of a DC (Data Centre) and DR (Disaster Recovery Centre) (on Co-Location basis at MeitY Empaneled Service Provider) to host the Applications of NMDC such as SAP S/4 HANA ERP at DC, located in Hyderabad and DR located in another city and another seismic zone. | |
| b | Supply, Installation, Integration, Testing, Commissioning and Support (SiitcS) of LAN and WAN Networks. | |
| c | Provide/ Upgrade existing MPLS/ VPN at 15 locations of NMDC namely:<br>i. NMDC HO, Hyderabad<br>ii. Kirandul Iron Ore Mining Complex, Dantewada, Chhattisgarh<br>iii. Bacheli Iron Ore Mining Complex, Dantewada, Chhattisgarh<br>iv. Donimalai Iron Ore Mining Complex, Bellary, Karnataka<br>v. NISP, Jagdalpur, Chhattisgarh<br>vi. DMP, Panna, Madhya Pradesh<br>vii. R&D Centre, Hyderabad<br>viii. SIU, Paloncha<br>ix. GEC, Raipur<br>x. RO, Visakhapatnam<br>xi. RO, Bhubaneswar<br>xii. RO, New Delhi.<br>xiii. RO, Chennai<br>xiv. RO, Bengaluru<br>xv. RO, Kolkata | |
| d | To submit a detailed design and deployment methodology and plan of execution of the project for the approval before its implementation. | |
| e | Integrate / upgrade Internet Leased Lines (ILL) at HO, Projects and other locations of NMDC. | |
| f | Deployment of secured security solutions | |
| g | Provision of secured encrypted VPN over the internet for remote access to applications | |
| h | Inter Connecting the nodes with Optical fiber or Radio links, including supply, installation, integration, testing, commissioning and maintenance support (SiitcS) | |

| | | |
|---|---|---|
| | (**Detailed Scope of work to be referred for compliance, is enclosed at Annexure-I** ). | |
| | ***Note:*** *5 Years Comprehensive Warranty and maintenance support needs to be provided to all the elements of network.* | |
| | The required MPLS and ILL connectivity from the TSPs shall be arranged separately and bidder need not to account for its cost. | |
| | (Technical Specifications are enclosed at **Annexure-II**) | |
| | | |
| **2)** | **Eligibility Criteria** | |
| a. | The bidder must be, a company registered in India, under the companies Act – 1956 or 2013 and should be in business of IT / ITI ES/Networking for at least 5 years. | |
| b. | Average Annual financial turnover during the last 3 years, ending 31st March-2019 should be at least Rs. 100 Cr . Audited financial statements for the last 3 years (2016-17, 2017-18, 2018-19) to be enclosed. | |
| c. | The bidder should be financially strong having Positive Net worth in each of the last 3 financial years. | |
| d. | The intending bidder must be an IT/ITES/Networking company, having an Experience of successfully executing similar nature of works as mentioned in the Scope of Work viz. setting up of DC/DR (H/w & S/w), Firewalls, active Switches, Managed Services, Backbone cabling, Setting up of Wi-Fi Networks, laying of WAN/LAN Networks and laying of OFC etc. during the last 7 years (as on 31st March'2020) of at least following value/billing: | |
| | **One Project costing Rs 80 Cr OR Two projects costing Rs 50 Cr. each OR Three Projects costing Rs 40 Cr. each**. | |
| | The project/projects claimed towards experience, must contain one or more elements essentially from each of the following three categories. Elements of Category (i) below, must contribute at least 30% cost of the project. | |
| | i) The establishment of DC/DR, Fire-walls and Managed services. | |
| | ii) Active Switches, EMS and Backbone Cabling with associated IT components. | |
| | iii) Wi-Fi, P2P radio links and Laying of Underground OFC Networks. | |
| | (Project-Wise, Work order copies and completion certificates, depicting various project elements and costs thereof, with MAF details, to be enclosed). | |
| e. | IT Service & Security Accreditations: The intending bidder must possess the following certifications on the date of submission of the bids: | |
| | i) Valid ISO 20000 Certificate | |
| | ii) Valid ISO 27000 Certificate | |
| | iii) Valid CMMi Level 3 or above, certificate | |
| f. | The bidder should have MAF from respective OEM(s) for addressing this RFP, which it proposes to use in this project. | |
| g. | Authorization letters from OEM's concerned (MAF) to address this business opportunity needs to be enclosed in the given format. Bids without authorization will not be considered. List of MAF.s required is at **Annexure-XI**I | |
| h. | The bidder should not have been black listed by central / state governments / PSUs as on date of bid submission. Self-certificate shall be submitted in this regard. **(Annexure-X)** | |
| i. | Bidders must quote for one of the brands of the equipment as identified by the user and mentioned in the technical specs / Bill of Material. No other brand will be considered. | |
| j. | The bidder shall submit an undertaking that they do not have any ongoing disputes on statutory levies like Income Tax, GST, PF, ESI etc. | |
| k. | Authorization letter in company letter head authorizing the person signing the Bid for this RFP. | |
| l. | Clause by Clause compliance of RFP terms & conditions needs to be submitted. Non-compliance on technical specifications and offers with deviations are liable to be rejected. | |

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| m. | Make and Models quoted by prospective bidders should meet specific criteria of performance, reliability as well as ruggedness as per spec in the RFP and ERP solutions of comparable size running on SAP HANA software should be running on these models in other organisations as detailed by NMDC. Customers References, PO copies and satisfactory completion certificates from end user to be provided The data sheet along with compliance to NMDC specification to be provided along with the bid | |