

RailTel's Bid Specific Additional Terms & Conditions

Information to Bidder for the "Procurement Router, Switches, SFP, Rack etc. for Western Region for Project and Customer Delivery"

Ref: GeM Bid No. GEM/2022/B/2721331 dtd 10.11.2022

- The item/items in this bid should be quoted as per the technical specifications. *The details of the specifications along with consignee/site details are also available on website www.railtelindia.com*
- 1** In the specification wherever support for a feature has been asked for, it will mean that the feature should be available without RailTel requiring any other hardware/software/licenses. Thus, all hardware/software/licenses required for enabling the support/feature shall be included in the offer. The technical specifications are mentioned in **Annexure-I**.
- 2** OEM or Authorized distributor/Partner of OEM should have a registered office in India to provide sales and 24x7 support in India. The certificate to this effect should be submitted.
- 3** In case of the authorized distributor/partner certificate from the OEM to this effect should be submitted for **all major items**.
- 4** GSTIN ID of vendor should be provided from where goods will be supplied.
- 5 Delivery Period, Consignee Address and inspection**
 - 5.1 Delivery Period:** The supplier will have to supply the material within **120 days** from the date of issue of confirmed PO. If material is not supplied within the approved delivery period then penalty of 0.5% of undelivered/uninstalled quantity per week to the maximum to the 10% of the contract value will be levied.
 - 5.2 Name of locations for Consignee Address: As per the Annexure-V.**
 - 5.3 Inspection:**
Post Receipt Inspection at consignee Site before acceptance of stores: Nominated RailTel Executive by CA.

Supplier should also submit data sheet, guarantee and fitment certificate along with the supply of materials.
- 6 Estimated cost of tender & Earnest Money Deposit (EMD):**
 - 6.1 Estimated cost of tender:** Estimated cost of the Tender is **Rs. 3,08,83,186/-** (Incl. GST).

6.2 **Earnest Money Deposit (EMD): Rs. 6,17,664/-** with Payment online through RTGS/ internet banking in Beneficiary name RailTel Corporation of India Limited Account No. 11037321307, IFSC Code SBIN0001821, Bank Name: State Bank of India, Branch address: Churchgate Branch, Maharshi Karve Marg, Mumbai-400020.

6.2.1 The bidder seeking EMD exemption, must submit the valid supporting documents per the latest MSME guidelines.

6.2.2 **The Bid received without EMD/ documentary proof of exemption of EMD as per above clause 6.2.1 will be summarily rejected.**

6.2.3 Earnest Money of the unsuccessful bidder will be discharged/returned as promptly as possible. No interest shall be payable on the EMD.

7 This bid complies with “Public Procurement (preference to make in India) Policy Order, 2017 or latest issued by DIPP and Public Procurement Policy for Micro and Small Enterprises (MSEs) order, 2012” or latest issued by MoSME.”

The bidders claiming the preference have to submit relevant documents prescribed under relevant order.

7.1 For small scale units registered with NSIC under single point registration Scheme and participating in this tender enquiry, following exemptions are available: -

(i) They are exempted from depositing Earnest money.

These exemptions are applicable provided units are registered with NSIC and registration is current and valid. Firms claiming these exemptions are required to submit along with their offer, copy of their current and valid NSIC registration certificate, otherwise their offer would not be considered.

7.2 No exemption is, however, applicable to these units from payment of security deposit/ Performance Bank Guarantee.

8 **Security Deposit/Performance Bank Guarantee:**

The successful tenderer shall submit security deposit in the form of DD or irrevocable Bank Guarantee from any scheduled bank for due fulfillment of contract as per the details given below:

i. Security Deposit/Performance Bank Guarantee @ 3% of total value of Purchase Order is required to be submitted within 30 days of issue of Purchase Order with validity of 3 months beyond warranty. Period, failing which a penal interest of 15% per annum shall be charged for the delay period i.e. beyond 30 (thirty) days from the date of issue of LOA/PO. PBG format specified in **Annexure-IV**.

ii. The security deposit/PBG shall be submitted to RCIL/WR, Mumbai.

- iii. A separate advice of the BG will invariably be sent by the BG issuing bank to the RailTel's Bank through SFMS and only after this the BG will become acceptable to RailTel. It is therefore in own interest of bidder to obtain RailTel's bank IFSC code, its branch and address and advise these particulars to the BG issuing bank and request them to send advice of BG through SFMS to the RailTel's Bank.

The security deposit/Performance Bank Guarantee shall be released after successful completion of Contract obligations under the contract, duly adjusting any dues recoverable from the successful tenderer. Payment of Security Deposit in the form of Pay Order/Demand Draft should be made in favor of "RailTel Corporation of India Ltd" payable at Mumbai.

Note:

1. Any Performance security upto a value of Rs.5Lakhs is to be submitted through online transfer only
2. No interest shall be paid on the amount of Performance Security held by RailTel, at any stage.

9 Eligibility Criteria:

9.1 Technical Eligibility for Bidder:

The tenderer must have successfully completed any of the following during last 07 (seven) years, ending last day of month previous to the one in which tender is invited:

- Three similar works each costing not less than the amount equal to 30% of advertised value of the tender, or
- Two similar works each costing not less than the amount equal to 40% of advertised value of the tender, or
- One similar work each costing not less than the amount equal to 60% of advertised value of the tender.

Definition of similar work: Supply /Supply and installation of All type of IT/ Telecom equipment with satisfactory working in Government/PSUs/ Telecom Service providers/Public Listed Company in India or outside India.

Note: Work experience certificate from private individual shall not be considered. However, in addition to work experience certificates issued by any Govt. Organization, PSU or any reputed TELCO, work experience certificate issued by Public listed company having average annual turnover of Rs.500 crore and above in last 3 financial years excluding the current financial year, listed on National Stock Exchange or Bombay Stock Exchange, incorporated/registered at least 5 years prior to the date of opening of tender, shall also be considered provided the work experience certificate has been issued by a person authorized by the Public listed company to issue such certificates.

In case tenderer submits work experience certificate issued by public listed company, the tenderer shall also submit along with work experience certificate, the relevant copy of work order, bill of quantities, bill wise details of payment received duly certified by Chartered Accountant, TDS certificates for all payments received and copy of final/last bill paid by company in support of above work experience certificate.

9.2 Financial Criteria for Bidder:

The bidder should have minimum cumulative turnover of 150% of tendered value or above during the last 3 financial years (i.e. current year and/or three previous financial years). The bidder should provide Audited Balance Sheets / annual reports as documentary evidence and for current year, the Statutory Auditor's certificate for turnover of current year up to the date of bid opening for which Balance Sheet/P&L may not be available. In case of photocopy of Balance Sheet/P&L the same should be certified by Chartered Accountant as true copy.

9.3 Bidder should have authorization specific to this tender from respective OEM as per **Annexure-II**. If OEM is directly participating in the Bid, self-declaration in this connection required to be submitted.

9.4 Bidder should not have been banned/blacklisted by any Govt./Semi Govt./PSU/State Govt./Any Telecom entity in India for the supply of the material. An undertaking to this effect signed by the authorized signatory to be submitted by the Bidder.

10 Variation of Quantities at the Time of Award

The purchaser reserves the right to increase or decrease the quantity to be ordered up to 30 percent at the time of placement of contract. The purchasers also reserves the right to increase the ordered quantity by up to 30% of the contracted quantity during the currency of the contract at the contracted rates. Bidders are bound to accept the orders accordingly.

11 Warranty:

The materials are to be warranted for **3 years** from date of delivery to the consignee. The tenderer shall warrant that stores to be supplied shall be new and free from all defects and faults in material, workmanship and manufacturing and shall be of the highest grade and consistent with the established and generally accepted standards of materials of the type ordered and shall perform in full conformity with the specifications and drawings.

The supplier shall be responsible for any defects that may develop under the conditions provided by the contract and under proper use, arising from faulty materials, design or workmanship such as corrosion, inadequate quantity of material to meet item requirements, inadequate contact protection, deficiencies in design and/ or otherwise and shall remedy such defects at his own cost when

called upon to do so by the Purchaser who shall state in writing in what respect the stores are faulty.

12 Payment Conditions:-

- (i) 100% payment against full supply.
- (ii) 80% payment against part supply. In case bidder completes the supply order for one SOR, he can claim part payment of 80% against each SOR's completed supply of the said SORs. Balance payment shall be made after full supply.
- (iii) The following documents are to be submitted for payment:
 - Original Tax Invoice. (With separate Tax amount, containing POS, RailTel GSTN and Supplier GSTN).
 - Delivery Challan
 - Original Consignee receipt with GRN No.
 - Original Inspection Certificate
 - Transit Insurance Certificate
 - Warranty Certificate of OEM
 - Copy of BG/Proof of BG Submission
 - Certificate of receipt of Goods in good condition from RailTel
- (iv) Any changes in the statutory taxes & duties during the contract period shall be on RailTel account with in the original DOC. Beyond DOC, changes in statutory taxes & duties shall be on RailTel's account only when the delay is an account of RailTel.

- 13** The tenderers shall submit a notarized affidavit on a non-judicial stamp paper stating that they are not liable to be disqualified and all their statement/documents submitted along with bid are true and factual. Standard format of the affidavit to be submitted by the bidder is enclosed as **Annexure-III. Non submission of a notarised affidavit by the bidder shall result in summarily rejection of his/their bid.** And it shall be mandatorily incumbent upon the tenderer to identify state and submit the supporting **documents duly self-attested** by which they/he is qualifying the Qualifying Criteria mentioned in the Tender Document. It will not be obligatory on the part of Tender Committee to scrutinize beyond the submitted document of tenderer as far as his qualification for the tender is concerned.

The RailTel (RCIL) reserves the right to verify all statements, information and documents submitted by the bidder in his tender offer, and the bidder shall, when so required by the RailTel (RCIL), make available all such information, evidence and documents as may be necessary for such verification. Any such verification or lack of such verification by the RailTel (RCIL) shall not relieve the bidder of its obligations or liabilities hereunder nor will it affect any rights of the railway thereunder.

In case of any wrong information submitted by tenderer, the contract shall be terminated. Performance Guarantee (PG) of contract forfeited and agency barred for doing business on RailTel (RCIL).

14 Online Submissions:

The bidder is required to upload and submit the following documents on line before due date & time of bid. The due date & time for closing of the bid as per GeM Bid and the bid will be opened as per GeM Bid.

- (i) EMD.
- (ii) Clause wise compliance along with all mentioned documents/annexures for all clauses of GeM Bid and ATC (Information to bidder) documents.
- (iii) Data Sheet of offered item/equipment.
- (iv) Financial (Certified copies of audited balance sheets/annual reports of last three preceding financial years) and Technical Eligibility Criteria documents.
- (v) Technical Compliance of all Specification of items as per ATC documents.
- (vi) Proof of document required against Eligibility criteria of OEM and Bidder vide para -9.
- (vii) MAF/OEM Authorization as per **Annexure-II**.
- (viii) Notarized affidavit on a non-judicial stamp paper as per **Annexure-III**.
- (ix) Duly notarized Power of Attorney in name of authorized signatory as per Clause No. 18.
- (x) NIL deviation declarations as per **Annexure- VI**.
- (xi) MII declaration of bidder as **Annexure- VII**.

15 Offline submission:

Original copy of documents shall be submitted by tenderer offline at RailTel Corporation of India Western Railway Microwave Complex, Senapati Bapat Marg Mahalaxmi (West) Mumbai - 400013 at any point of time whenever asked for verification. Incase original are not produced before due date, bid may be rejected.

16 Make in India

The provisions of the Public Procurement (Preference to Make in India) Order 2017 dated June 15, 2017 (or subsequent revisions, if any) by Department of Industrial Policy and Promotion, Govt shall apply to this tender to the extent feasible. Minimum Local Content for SOR items shall be 50% for purchase preference as per the Notification No. 18-10/2017-IP dated 29th August 2018 issued by Department of Telecommunications, Ministry of Communications or as per the latest notification for FY 2020-21. Bidder shall be required to give a self-certification in his bid that the item offered meets the local content and shall give details of the location(s) at which the local value addition is made. Further the bidder shall provide a certificate from the statutory auditor or cost auditor of the company (in the case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of suppliers other than companies) giving the percentage of local content. In case of any false declaration, action shall be taken in line with the provisions of the PPP-MIII order.

17 Insurance

- 17.1 The Contractor shall take out and keep in force a policy or policies of insurance from the date, the delivery of material starts (including the transit portion) against all liabilities of the contractor or the Purchaser. The contractor shall take out and keep in force a Policy or policies of Insurance for all materials covered in schedule of requirement irrespective of whether used up in the portion of work already done or kept for the use in the balance portion of the work until such material are provisionally handed over to RailTel. The contractor should ensure the stores brought to site, against risks as required under the Emergency Risk (Goods) Insurance Act in force from time to time up to contract value.
- 17.2 It may be noted that the beneficiary of the insurance policy should be RailTel or the policies should be pledged in favor of RailTel. The contractor shall keep the policy/policies current till the item/equipment are handed over to the purchaser.

18 Power of Attorney

Power of attorney in favor of the signatory duly authorizing the signatory shall be submitted online before the due date and time of submission of the e-Tender and Original copy is needed to be submitted by the successful bidder as per the clause-15 above.

- 19 The guidelines and directives issued by Department of Telecommunication, Govt. of India regarding procurement of Telecommunication equipment from trusted sources shall be applicable to this tender. The offered equipment shall be trusted Products". The vendor/OEM shall submit declaration for compliance.

- Note:** 1) The bidder is required to give acceptance of all the clauses of **GeM bid, ATC** and RailTel's Bid Specific **ATC** document. Any deviation / non-acceptance may lead to rejection of the bid.
- 2) Information to Bidder viz. corrigendum /addendum/ amendments etc. for this bid shall be posted on www.railtelindia.com and GeM only.
- 3) This bid is governed by the Specific Additional Terms & Conditions and General Terms & Conditions laid down by the GeM against **GeM Bid No: GEM/2021/B/2721331**
- 4) After opening of the technical bid no correspondence/submission of document made at the initiative of the bidder will be entertained. However, the purchaser can, if required, ask for clarifications in writing which need to be submitted before a target date. The clarifications submitted as required by the purchaser before the target date will be considered.
- 5) In case, if any contradiction between GeM Bid, Additional Terms & Conditions, RailTel's Bid Specific Additional Terms & Conditions and General Terms & Conditions, RailTel's Bid Specific Additional Terms & Conditions will prevail.

Annexure-I**Technical Specification**

1. With 3 years warranty. The Electronics product should not be declared End of Service (EoS) by OEM for next 8 Years.
2. Equipped with necessary hardware/software to comply all above required / support features.
3. Back to Back warranty with respective OEMs for both Hardware and Software. The certificates/Undertaking for the same will have to be submitted along with bid from respective OEM.
4. UL, CE and FCC Certification is not required for PMA. However they have to produce certificate from standard lab approved/ authorized by Govt. of India that their product are equivalent to UL,CE and FCC and meets all standard and specification of UL,CE and FCC.

S. N.	Description of Item	Unit	Quantity
1	Router Type I as per Technical specification	Nos	8
2	Router Type II as per Technical specification	Nos	12
3	Router Type III as per Technical specification	Nos	9
4	Router Type IV as per Technical specification	Nos	10
5	Router Type V as per Technical specification	Nos	3
6	Router Type VI as per Technical specification	Nos	11
7	Router Type VII as per Technical specification	Nos	13
8	Switch Type I as per Technical specification	Nos	25
9	Switch Type II as per Technical specification	Nos	34
10	Switch Type III as per Technical specification	Nos	7
11	Switch Type IV as per Technical specification	Nos	72
12	Switch Type V as per Technical specification	Nos	77
13	Switch Type VI as per Technical specification	Nos	84
14	Switch Type VII as per Technical specification	Nos	51
15	Switch Type VIII as per Technical specification	Nos	1
16	Switch Type IX as per Technical specification	Nos	4
17	SFP+ 10G 10 KM Dual Fiber as per Technical specification	Nos	45
18	SFP+ 10G 10KM BIDI as per Technical specification	Nos	8
19	SFP+ 10G 40 KM BIDI as per Technical specification	Nos	236
20	SFP 1G 40 KM BIDI as per Technical specification	Nos	24
21	SFP 1G 10KM BIDI as per Technical specification	Nos	118

22	SFP 1G 10 KM Dual Fiber as per Technical specification	Nos	26
23	SFP+ 10G 60KM BIDI as per Technical specification	Nos	88
24	SFP 40G 40KM Dual Fibre as per Technical specification	Nos	2
25	XFP 10G 10KM Dual Fiber as per Technical specification	Nos	25
26	2*12F SC type FMS as per Technical specification	Nos	58
27	AC to DC Converter as per Technical specification	Nos	7
28	Rack 19" 9U as per Technical specification	Nos	14
29	Rack 19" 6U as per Technical specification	Nos	96
30	UPS 2.0 KVA as per Technical specification	Nos	4

Schedule of Requirement (SOR) wise technical Specification:

SOR item 1: Router Type I (4x100G QSFP28 and 24x10G SFP+) Technical Specifications

S N	Description	Compliance
1	a) The router should have minimum 4x100G QSFP28 and 8x10G SFP+ optical Interfaces Day one.	
	b) Router should have redundant power supply unit, Fan Trays unit and fixing arrangement in 19" width rack.	
	c) Router should use maximum 1U rack space in 19" width rack.	
2	The Router should support at least 230 Gbps (Full Duplex) throughput	
3	The router should support the following feature scale from the day one:-	
	a) MAC Table Size (64K)	
	b) IPv4 RIB/FIB (1M/128k)	
	c) IPv6 RIB/FIB (512k/32k)	
	d) MPLS Labels(32K)	
	e) Label Stack (5)	
	f) Packet Forwarding Rate (300 Mpps)	
	g) L3VPN (1000)	
	h) L2VPN (1K)	
4	Router can be of either modular/fixed type and shall have modular Operating system where it shall support individual restart of critical processes without affecting other processes or rebooting the entire operating system.	
5	All 10G interfaces shall be of SFP+ type and shall support LR/ER/ZR standards for all OEM vendors. Use of third party optics should not be locked for all interfaces.	
6	Router shall have option checking configuration before committing and option of rolling back to at least five configurations.	

7	Router should have redundant DC with the operating range of -40 to -72 VDC	
8	Digital Optical Monitoring (DOM) should be supported, optics information retrievable including RX/TX-power, threshold-monitoring/alarming, inventory.	
9	It shall support role based privileges for the system access and radius authentication for the System admin.	
10	The router should have a Console or Out-of-band Management.	
11	Alerts for environmental or other hardware based alarms should be visibly implemented on the chassis.	
12	The router should have mechanism for DDoS attack prevention	
13	The router should be IPv6 ready & support IPv4 to IPv6 transition technologies	
14	The router should support filtering based on different parameters like: srcip, dstip, src port, dst port, protocol etc	
15	The router should support IP SLA or RPM (or equivalent) for performance measurements, it should also support monitoring of IP SLA/RPM (or equivalent) probes using SNMP polling (OEM has to provide SNMP MIB information)	
16	Shall support QoS, option of traffic shaping per Interface based.	
17	Shall support at least 8 Queues per port and 3K queues per system	
18	Shall support following class of service features:	
	a) Classification, policing, marking, shaping, filtering	
	b) Manage congestion using a weighted random early detection (WRED) algorithm	
	c) Single Rate Three Color Policer RFC 2697	
	d) RFC 2698, A Two Rate Three Color Policer	
	e) Round Robin, WFQ, CBWFQ scheduling algorithms	
19	The router shall support traffic interface mirroring in both ingress & egress directions for both IPv4 & Ipv6	
20	The router shall support provision for event based scripts that shall be capable of performing actions based on certain triggers	
21	The router shall support aggregated Ethernet and bundle upto 16 links.	
22	Shall support following MPLS features	
	a) LDP and RSVP signalling	
	b) The router should be able to do load-balancing over multiple equal cost MPLS LSP	
	c) MPLS Ping, MPLS Trace Route	
	d) Fast Reroute Extensions to RSVP-TE for LSP Tunnels	
23	Shall support MPLS based VPN services	
	a) L3VPN, L2VPN & L2Circuits	
	b) Virtual Private LAN Service (VPLS)	
	c) Next Generation mVPN (P2MP) & mVPN (draft-rosen-vpn-mcast).	

	d) EVPN with VXLAN	
24	The router shall support the following routing features	
	a) BGPv4, BGP confederations and route reflector	
	b) OSPFv2 & OSPFv3	
	c) ISIS	
	d) IGMP v2/v3 & MLD	
	e) PIM-SM, PIM-SSM	
	f) VRRP	
25	Router shall support SNMP v2/v3 and NTP	
26	Shall support BFD for both single hop and multihop sessions	
27	Shall support the following OAM features and actions such as syslog/link down should be configurable on OAM event trigger:	
	802.3ah	
	802.1ag	
	Y.1731	
28	Shall support Multi-chassis LAG or equivalent functionality	
29	Ipv6 Features	
	a) Ipv6 Ping	
	b) Ipv6 trace route	
	c) VRRPv3	
	d) Ipv6 CoS (classification & rewrite, scheduling based on TC)	
	e) Ipv6 ACL	
	f) 6PE and 6VPE	
30	Router should support Dual Image/Partition	
31	Router should support security features of Broadcast/Multicast/Unicast Storm control.	
32	Router should comply to following Temperature performance parameters: i. Operating Temperature: 0 to 45 degree C or better	
33	Routers should support following Metro Ethernet Features:	
	i. ITU-T G.8032 Ethernet Ring Protection designed for loop protection.	
	ii. Should support multiple Ring up to 8 ring (main and sub ring) protection failover with in 50 ms or ITU-T G.8032 v2.	
34	The Router shall be designed for continuous operations with dual fan system.	
35	The vendor shall state if it is a fan less architecture.	
36	Router should support CFM and LFM alarms.	
	a. The router should support telemetry based on push model for monitoring network devices	
	b. The router should support various software models/sensors for capturing different health parameters from the devices	

	c. The router should support sending telemetry data to multiple consumers simultaneously	
37	The device should comply to the following safety standards or Equivalent Indian Standard	
	a. EN 55022 Class A Emissions (Europe) or Equivalent Indian Standard	
	b. FCC Class A (USA) Radiated Emissions or Equivalent Indian Standard	
	c. UL 60950-1 Information Technology Equipment – Safety or Equivalent Indian Standard	
	d. EN 60825-1 Safety of Laser Products or Equivalent Indian Standard	
	e. EN-61000-4-11 Voltage Dips and Sags or Equivalent Indian Standard	
	f. ETS-300386 Electromagnetic Compatibility Requirements or Equivalent Indian Standard	
	g. The device will conform to the following EN/IEC standard or any other equivalent Indian standard:	
	i. 61000-4-2 ESD	
	ii. 61000-4-3 Rdiated Immunity	
	iii. i61000-4-4 EFT	
	iv. 61000-4-5 Surge	
	v. 61000-4-6 Low Frequency Common Immunity	
38	The proposed router should be NEBS level 3 compliant or equivalent Indian standard if any.	
39	The operating system of the Routers category/series/family should be MEF-9/14 or CE(Carrier Ethernet) Certified/compliant or equivalent Indian Standard	
40	On Site OEM Warranty (Year) - 3 years	

SOR item 2: Router Type II (6 Nos. of Gigabit SFP ports with 2 Nos. of 10 Gigabit SFP+ ports) Technical Specifications

SN	Description	Compliance
1	The router shall be designed for continuous operations .The bidder shall furnish the MTBF (Mean Time between Failures) and MTRR (Mean Time to Restore) and predicted and observed values along with calculations by manufacturer.	
2	In case of full system failure, Switches shall maintain a trace area in the NVRAM, which would be used for analysis /diagnosis of the problem.	
3	Router shall have built in power on diagnostics system to detect hardware failures.	
4	Should have DC power supply (48V DC) arrangement.	

5	Router shall have suitable Visual Indicators for diagnostics and healthy /unhealthy status of ports & modules.	
6	Router shall have minimum 6 Nos. of Gigabit SFP ports and with 2 Nos. of 10 Gigabit SFP+ ports complying to IEEE 802.3, IEEE 802.3u and 802.3ab standard , supporting half duplex mode ,full duplex mode and auto negotiation on each port of 1G to optimize bandwidth.	
7	Router shall have minimum of 30 Gbps (full duplex) forwarding bandwidth at layer 2 switching fabric.	
8	Router shall have minimum 45 million packets (64 Byte packets) per second forwarding rate.	
9	Router shall have a minimum of 16000 MAC address space.	
10	Shall be temp hardened with a range of -0 to 65C and shall be 1RU compliant in size.	
11	It should be possible for the switches to be mounted on a 19-Inch rack. All accessories required for this mounting should be supplied.	
12	Should support jumbo frame.	
13	Router based solution is also acceptable.	
14	Shall have the following MPLS features.	
	i. Shall support Static IPv4 and Ipv6 routing. It shall also support OSPFv2 and OSPFv3.	
	ii. Shall also support BGP and ISIS based routing.	
	iii. Shall also support MPLS with RSVP and LDP signaling. It shall support MPLS FRR and L3VRF with upto 64 VRF.	
	iv. Shall support a scale of 250 VLAN and shall support Ethernet OAM features like BFD, 802.3ah, 802.1ag and Y.1731	
	v. Shall support at least 1K MPLS labels.	
	vi. Shall support 10K for IPv4 routes and 1K for IPv6 routes.	
	vii. It shall support LSP ping and trace.	
	viii. It shall support 8 hardware queues per port and shall support ingress policing and egress shaping.	
	ix. Shall support MPLS based L3 and L2 VPN services.	
	x. It shall also support SYNC Ethernet and SNMPv3.	
	xi. Shall support remote telnet and SSH capabilities and it shall be possible to integrate with NMS system	
	xii. Shall conform to UL 60950 or IEC 60950 or equivalent Standards for safety requirements of IT Equipment's.	
15	Shall have the following features. All software's/hardware's/ License required for this must be supplied along with the switch.	
	i. Link Aggregation Control (LCAP) as per IEEE 802.3ad.	
	ii. Support for IEEE 802.1Q VLAN on all ports.	

iii. Support for minimum 256 VLANs.	
iv. Support for IEEE 802.1 D spanning tree protocol.	
v. Support for IEEE 802.1 s MSTP.	
vi. Support Dynamic Host Configuration Protocol (DHCP).	
vii. Support Auto –MDIX (Media Dependent Interface Cross over)	
viii. Support Inter VLAN IP routing for full layer -3 routing.	
ix. Support for IPv6.	
x. Support Strict Priority Queuing.	
xi. Support Network Time Protocol (NTP) / Simple Network Time Protocol (SNTP) based.	
xii. RFC 1305 / 2030 for synchronization of date & time from the Central NTP Server.	
xiii. Support RADIUS protocol for console access restriction and authentication as per RFC 2138.	
xiv. Support 4 group of embedded RMON (history, static's and alarms) or equivalent functionality.	
xv. Support multiple privilege level to provide different level of access on console port and telnet sessions	
xvi. Support classification and scheduling as per IEEE 802.1P on all ports.	
xvii. Support Port Spanning functionally for measurements using a networks analyzer.	
xviii. Support all the standard MIBs (MIB-I&II).	
xix. Support for console port Interface for configuration and diagnostics purposes.	
xx. Support Port Spanning functionally for measurements using a networks analyzer.	
xxi. ITU-T G.8032 Ethernet Ring Protection designed for loop protection and fast convergence times (sub 50 ms) in ring topologies	
xxii. Should support multiple Ring up to 8 ring (Main and Sub Ring) protection failover within 50 ms (up to 10 Switches in ring) or ITU-T G.8032 v2 (Confirmed roadmap within a year time is also acceptable for ITU-T G.8032 v2 with no additional cost to RailTel).	
xxiii. Should support Optical Transceiver Digital Diagnostic Monitoring.	
xxiv. Priority queues: Eight hardware-based queues per port for flexible QoS management	
xxv. Traffic prioritization: Flow-based QoS with internal and external (a.k.a., remarking) prioritization	
xxvi. Bandwidth management: Flow-based bandwidth management, ingress rate limiting; egress rate shaping per port.	

	xxvii. Queue management: Configurable scheduling algorithms — Strict Priority Queuing (SPQ), Weighted Round Robin (WRR) and Deficit Round Robin (DRR) or better. Rack Mountable clamps for standard 19 inch Rack for each item.	
	xxviii. The following Metro Ethernet features should support:	
	1. IEEE 802.1ad Provider Bridge.	
	2. Transparent LAN Services with Service VLAN (SVLAN) and Customer VLAN (CVLAN) concept.	
	3. CVLAN to SVLAN translation and mapping	
	4. IEEE 802.1ag Ethernet OAM: Connectivity Fault Management (Support 32 MEPs).	
	5. Ethernet OAM compliant with IEEE 802.3ah.	
	6. ITU-T G.8032 Ethernet Ring Protection designed for loop protection and fast convergence times (sub 50 ms) in ring topologies.	
	7. Should support Optical Transceiver Digital Diagnostic Monitoring.	
	8. Switch should support real time performance monitoring like Latency, Packet drop, Jitter and etc. Same should be accessible using the command-line interface (CLI) or Simple Network Management Protocol (SNMP) and SYSLOG Management Information Bases (MIBs).	
16	Switch shall have support of following Standards:	
	i. IEEE 802.1D (STP)	
	ii. IEEE 802.1p (CoS)	
	iii. IEEE 802.1Q (VLANs)	
	iv. IEEE 802.1ag (Connectivity Fault Management)	
	v. IEEE 802.1s (MSTP)	
	vi. IEEE 802.3x (Flow Control)	
	vii. IEEE 802.3z (Gigabit Ethernet)	
	viii. IEEE 802.3ab (1000Base-T)	
	ix. IEEE 802.3ac (VLAN Tagging)	
	x. IEEE 802.3ad (Link Aggregation)	
	xi. IEEE 802.3ae (10 Gigabit Ethernet)	
	xii. IEEE 802.3ah	
	xiii. ITU-T G.8032/Y.1344 2010: Ethernet Ring	
17	Switch shall have the following Certifications or Equivalent Indian Standard Certificate:	
	i. The model of the Switches series/family shall have MEF-(9 & 14)/CE2.0 or any other equivalent or higher certification from authorized agencies.	
	ii. Switches should be NEBS or equivalent certified.	
	iii. CE / FCC or any other equivalent	

	iv. Shall conform to UL 60950 or IEC 60950 Standards or equivalent for safety requirements of IT Equipment's.	
	v. Shall Confirm to EN55022 Class A/B or CISPR22 Class A/B or CE Class A/B or CE Class A/B or equivalent for EMC for (Electro Magnetic Compatibility).	
18	On Site OEM Warranty (Year) - 3 years	
19	All interfaces shall be of SFP type and shall support LR/ER/ZR. Use of third party optics should not be locked for all interfaces	

SOR item 3: Router Type III (2 Nos. of Gigabit SFP ports and 2 Nos. of Gigabit RJ45 ports) Technical Specifications

SN	Description	Compliance
1	Architecture:	
1.1	Proposed Routers should support SDWAN ready	
1.2	The router should be a single box configuration for ease of management.	
1.3	It shall support hardware based VPN (3DES/AES) Encryption, MD5, SHA, SHA-256	
1.4	The router shall support complete Firewall features.	
1.5	Router shall support minimum 100K IPv4 and 50K IPv6 routes.	
1.6	The Router shall have enough "High-performance multicore processors capacity and 4 GB DRAM and 4GB Flash Memory from Day1. So as to efficiently meet all the functionalities laid down in the specifications.	
1.7	It shall have integrated USB port.	
1.8	It shall be supplied with necessary power cards, data cables, connectors, bracket accessories, wire managers and other appropriate accessories Routers shall be capable of working with 110 – 240 Volts AC nominal at frequency 50 +/- 2 Hz.	
2	Performance:	
2.1	It shall support high performance traffic forwarding with con-current features like firewall and encryption.	
2.2	Router shall support aggregate WAN throughput of 500 Mbps from Day-1.	
2.3	It shall support variety of Ethernet Interfaces – 2 RJ45 GigE and 2 SFP GigE port & 4 port LAN 10/100/1000 Mbps port.	
2.4	It shall support other IP Services like GRE tunneling, ACLs, Firewalling, NAT services.	
3	High Availability:	
3.1	It shall support non-stop forwarding for fast re-convergence of routing protocols.	
3.2	It shall support VRRP or equivalent	
4	Protocol Support:	

4.1	The router shall have routing protocols like IS-IS, RIP ver1 & RIP Ver.2, OSPF ver2, BGP4.	
4.2	It shall support multicast routing protocols IGMPv1/ v2/v3, PIM	
4.3	It shall support DHCP, IPv6 QoS and IPv6 Multicast, OSPFv3	
5	Quality of Service (QoS) Features:	
5.1	The router shall support the following:	
5.1.1	Classification and Marking: Policy based routing, IP Precedence, DSCP.	
5.1.2	Congestion Management: WRED, Priority queuing, Class based weighted fair queuing.	
5.1.3	Traffic Shaping and Policing for QoS	
6	Security Features:	
6.1	The router shall support GRE Tunneling & NAT Services.	
6.2	It shall support MD-5 route authentication	
6.3	It shall support AAA support using Radius.	
6.4	It shall support DoS prevention	
6.5	It shall support IP Access list to limit Telnet and SNMP access to router.	
6.6	It shall support multiple privilege level authentications for console and telnet access through Local database or through an external AAA Server.	
6.7	It shall support IEEE 802.1x support for MAC address authentication.	
7	Debug, Alarms & Diagnostics:	
7.1	The router shall have display of input and output error statistics on all interfaces.	
7.2	It shall have display of dynamic ARP table.	
7.3	Trace-route and Ping shall be available.	
8	It should support Network Time Protocol.	
9	Management:	
9.1	The router shall have support for CLI, Telnet and SNMPv3.	
9.2	It shall support Secure Shell for secure connectivity.	
9.3	It shall have to have dedicated console for Local management / login through USB port / RJ45 port / serial	
9.4	Event and System logging: Event and system history logging functions shall be available. The Router shall generate system alarms on events. Facility to put selective logging of events onto a separate hardware where the analysis of log shall be available.	
10	Certification Requirements:	
	"Router/ Router OS should be tested and certified for EAL 2 / NDPP (Network Device Protection Profile) or above under Common Criteria Program for security related functions or under Indian Common Criteria Certification Scheme (IC3S) by STQC, DEIT, Govt. of India."	
11	Use of third party optics should not be locked for all interfaces	
12	On Site OEM Warranty (Year) - 3 years	

SOR item 4: Router Type IV (1x RJ45 GigE and 1x SFP GigE port & 4 port LAN 10/100/1000 Mbps port) Technical Specifications

SN	Description	Compliance
1	Architecture:	
1.1	Proposed Routers should support SDWAN ready	
1.2	The router should be a single box configuration for ease of management.	
1.3	It shall support hardware based VPN (3DES/AES) Encryption, MD5, SHA, SHA-256	
1.4	The router shall support complete Firewall features.	
1.5	Router shall support minimum 100K IPv4 and 50K IPv6 routes.	
1.6	The Router shall have enough "High-performance multicore processors capacity and 4 GB DRAM and 4GB Flash Memory from Day1. So as to efficiently meet all the functionalities laid down in the specifications.	
1.7	It shall have integrated USB port.	
1.8	It shall be supplied with necessary power cards, data cables, connectors, bracket accessories, wire managers and other appropriate accessories. Routers shall be capable of working with 110 – 240 Volts AC nominal at frequency 50 +/- 2 Hz.	
2	Performance:	
2.1	It shall support high performance traffic forwarding with con-current features like firewall and encryption.	
2.2	Router shall support aggregate WAN throughput of 100 Mbps from Day-1.	
2.3	It shall support variety of Ethernet Interfaces – 1 RJ45 GigE and 1 SFP GigE port & 4 port LAN 10/100/1000 Mbps port.	
2.4	It shall support other IP Services like GRE tunneling, ACLs, Firewalling, NAT services.	
3	High Availability:	
3.1	It shall support non-stop forwarding for fast re-convergence of routing protocols.	
3.2	It shall support VRRP or equivalent	
4	Protocol Support:	
4.1	The router shall have routing protocols like IS-IS, RIP ver1 & RIP Ver.2, OSPF ver2, OSPF Ver3, BGP4.	
4.2	It shall support multicast routing protocols IGMPv1/ v2/v3, PIM	
4.3	It shall support DHCP, IPv6 QoS and IPv6 Multicast, OSPFv3	
5	Quality of Service (QoS) Features:	
5.1	The router shall support the following:	
5.1.1	Classification and Marking: Policy based routing, IP Precedence, DSCP.	
5.1.2	Congestion Management: WRED, Priority queuing, Class based weighted fair queuing.	

5.1.3	Traffic Shaping and Policing for QoS	
6	Security Features:	
6.1	The router shall support GRE Tunneling & NAT Services.	
6.2	It shall support MD-5 route authentication	
6.3	It shall support AAA support using Radius.	
6.4	It shall support DoS prevention	
6.5	It shall support IP Access list to limit Telnet and SNMP access to router.	
6.6	It shall support multiple privilege level authentications for console and telnet access through Local database or through an external AAA Server.	
6.7	It shall support IEEE 802.1x support for MAC address authentication.	
7	Debug, Alarms & Diagnostics:	
7.1	The router shall have display of input and output error statistics on all interfaces.	
7.2	It shall have display of dynamic ARP table.	
7.3	Trace-route and Ping shall be available.	
8	It should support Network Time Protocol.	
9	Management:	
9.1	The router shall have support for CLI, Telnet and SNMPv3.	
9.2	It shall support Secure Shell for secure connectivity.	
9.3	It shall have to have dedicated console for Local management / login through USB port / RJ45 port / serial	
9.4	Event and System logging: Event and system history logging functions shall be available. The Router shall generate system alarms on events. Facility to put selective logging of events onto a separate hardware where the analysis of log shall be available.	
10	Certification Requirements:	
	"Router/ Router OS should be tested and certified for EAL 2 / NDPP (Network Device Protection Profile) or above under Common Criteria Program for security related functions or under Indian Common Criteria Certification Scheme (IC3S) by STQC, DEIT, Govt. of India."	
11	On Site OEM Warranty (Year) - 3 years	
12	Use of third party optics should not be locked for all interfaces	

SOR item 5: Router Type - V Technical Specifications

S.N	Description	Compliance
1	The router shall have at least 8 x 10G ports on day 1 and should be fully populated with single mode optics.	
2	The router shall have the ability to support atleast 4 x10G and 2 x100G additional ports in future by just software/license upgrade and without change of hardware	

3	Total throughput - Minimum 300 Gbps	
4	MAC Table Size - 64K	
5	IPv4 RIB/FIB - 256K/128K	
6	IPv6 RIB/FIB - 182K/32K	
7	MPLS Labels - 16K	
8	Label Stack - 5	
9	L2/L3 VPN VRF: a) Minimum L2 1000, b) Minimum L3 256	
10	Packet Forwarding Rate at (IMIX packets) in Mpps - Minimum 300	
11	Support of number of queues per system - Minimum 3K	
12	Number of VLAN support - 4094	
13	Routers should be rack mountable to fit into a standard 19-inch rack	
14	Router can be of either modular/fixed type and shall have modular Operating system where it shall support individual restart of critical processes without affecting other processes or rebooting the entire operating system.	
15	All 10G interfaces shall be of SFP+ type and shall support LR/ER/ZR. Use of third party optics should not be locked for all interfaces	
16	Router shall have option checking configuration before committing and option of rolling back to at least five configurations.	
17	Router should have redundant DC (with the operating range of -48 to -60 VDC) power supplies	
18	Digital Optical Monitoring (DOM) should be supported, optics information retrievable including RX/TX-power, threshold-monitoring/alarms, inventory.	
19	It shall support role based privileges for the system access and radius authentication for the System admin.	
20	The router should have a Console or Out-of-band Management.	
21	Alerts for environmental or other hardware based alarms should be visibly implemented on the chassis.	
22	All interfaces shall support MPLS VPN services for IPv4/IPv6 : L2CKT L2VPN L3VPN EVPN VPLS NG-MVPN	
23	The router should have mechanism to protect itself from DDoS attack.	
24	The router should be IPv6 ready from day one.	
25	The router should support filtering based on different parameters like: srcip, dstip, src port, dst port, protocol etc	
26	Shall support QoS, option of traffic shaping per Interface based.	
27	Shall support following class of service features: a) Classification, policing, marking, shaping, filtering	

	b) Manage congestion using a weighted random early detection (WRED) algorithm	
	c) Single Rate Two Color Policer	
	d) Ingress policing	
	e) Egress shaping	
	f) Strict queuing , WFQ	
	g) Router should be able to classify based on 802.1 ad, 802.1 p, EXP and DSCP bits	
28	The router shall support provision for event based scripts that shall be capable of performing actions based on certain triggers	
29	The router shall support aggregated Ethernet and it shall be possible to bundle Upto 16 links.	
30	The router shall support the following routing features	
	a) BGPv4, BGP confederations and route reflector	
	b) RFC 2328, OSPF Version 2	
	c) RFC 3630, Traffic Engineering (TE) Extensions to OSPF Version 2	
	d) RFC 1195, Use of OSI IS-IS for Routing in TCP/IP and Dual Environments	
	e) RFC 5305, IS-IS Extensions for Traffic Engineering	
	f) BGP-Link State	
	g) BGP labeled Unicast	
	h) Policy based routing (PBR)	
	i) DHCP relay/server	
	j) IGMP v2 and v3 as described in RFC 2236 and RFC 3376 with IGMP Routing Policies to filter IGMP requests.	
	k) The router shall support Virtual Router Redundancy Protocol (VRRP) as per IETF RFC 3768	
	l) Router shall support SNMP v2/v3 and NTP	
	m) Shall support BFD for both single hop and multihop sessions and for IPv4 & IPv6	
31	Shall support following MPLS features	
	a) LDP/T-LDP and RSVP signaling	
	b) RSVP-TE including FRR	
	c) CSPF	
	d) LFA & Remote LFA	
	e) RFC 3031, Multiprotocol Label Switching Architecture	
	f) RFC 3032, MPLS Label Stack Encoding	
	g) The router should be able to do load-balancing over multiple equal cost MPLS LSP	
	h) The Router shall support MPLS Fast Reroute both link protection and Node protection.	
	i) MPLS Ping, MPLS Trace Route	
	j) Fast Reroute Extensions to RSVP-TE for LSP Tunnels	
32	All interfaces shall support MPLS VPN services for IPv4/IPv6 :	
	a) L2CKT	
	b) L2VPN	

	c) L3VPN	
	d) EVPN	
	e) VPLS	
	f) NG-MVPN	
33	Shall support the following OAM features	
	a) 802.3ah	
	b) 802.1ag	
	c) Y.1731	
	d) TWAMP	
34	IPv6 Features	
	a) IPv6 Ping	
	b) IPv6 trace route	
	c) OSPF v3	
	d) IS-IS	
	e) VRRPv3	
	f) IPv6 CoS (classification & rewrite, scheduling based on TC)	
	g) IPv6 ACL	
35	Multicast Feature: It shall support following:	
	a) It shall support IGMP snooping v2/v3	
	b) The router shall support PIM Sparse Mode, RFC 4601	
	c) RFC 3569, Source Specific Multicast (SSM)	
	d) Multicast Listener Discovery (MLDv2)	
36	The offered devices must support following functionalities to support 3rd party SDN (in future)	
	a) The router should support RFC 6020, YANG - A Data Modeling Language for the Network Configuration	
	b) The solution should support the network configuration protocol (NETCONF) that provides mechanisms to install, manipulate, and delete the configuration of network devices, RFC 6241	
	c) The router should be able to act as Path computation client in the PCE architecture defined in RFC 4655.	
	d) The router should support PCEP as defined in RFC5440.	
	e) The router should support BGP link-state (BGP-LS), RFC 4655	
37	Router should support Dual Image/Partition with USB flash drive booting option for OS recovery	
38	Router should support jumbo frame.	
39	Router should support port mirroring	
40	Router should support security features of Broadcast/Multicast/Unicast Storm control.	
41	Router should comply to following temperature & humidity parameters: a) Operating Temperature: -20° to 65° C or better b) Operating Humidity: 5-95% RH non-condensing	
42	Support for P and PE router functionality for MPLS on the same router simultaneously and on all the interfaces.	
43	Router shall support E-Line or E-LAN MEF standards.	
44	Segment Routing	

	a) The router should support SR-MPLS dataplane and protocols OSPF and IS-IS.	
	b) Traffic Steering of SR policies with Autoroute Include and Segment Routing TI-LFA	
	c) LSP ping, trace-route, Pseudo wire Ping over Segment Routing, trace route for binding-SID	
	d) MPLS-LDP interworking with SR-ISIS and SR-OSPF	
	e) Controller instantiated SR Policy (PCEP, BGP) and SR policy	
45	TELEMETRY Function: It shall support following:	
	a) The router should support telemetry based on push model for monitoring network devices	
	b) The router should support various software models/sensors for capturing different health parameters from the devices	
	c) The router should support sending telemetry data to multiple consumers simultaneously	
46	The operating system of the Routers Series/family should be atleast MEF-2.0 certified/complied	
47	The device should comply to the following safety standards	
	a) EN 55022 / EN 55032 Class A Emissions (Europe)	
	b) FCC Class A / FCC 47 CFR Part 15 (USA) Radiated Emissions	
	c) UL 60950-1 Information Technology Equipment - Safety	
	d) EN 60825-1 Safety of Laser Products	
	e) EN-61000 Immunity Test	
	f) EN 300 386 Electromagnetic Compatibility Requirements	
48	The proposed router should be NEBS level 3 compliant. Note: NEBS Certification is not required for PMA. However OEM has to produce certificate from standard lab approved or authorized by Govt. of India that the supplied Products are equivalent to NEBS and meet all standard and specification of NEBS.	
49	Use of third party optics should not be locked for all interfaces	
50	On Site OEM Warranty (Year) - 3 years	

SOR item 6: Router Type - VI Technical Specifications

SN	Parameters And Specifications		Complian
1	Type Router	WAN	
2	Stabderd Interface	Interface Console – 1, Gigabit Ethernet – 2 x1G port (1 combo and 1 RJ45) Gigabit Ethernate Switch Ports - 4	
3	Expandable	HIC – 2, Hardware Encryption – Built In	
4	No. Of Serial WAN Port	0	
5	Ethernet LAN PORT	Non PoE	

6	Packet forwarding rate (MPPS)	2.2	
7	Aggregated Throughput (Mbps)	1500	
8	Support for Redundant Power Supply	NA	
9	No. of 3G/4G Interface Card	0	
10	No. of Free Slots (Low density)	0	
11	No. of Free Slots (High density)	2	
12	Routing Protocols from day-1	RIP, OSPF, BGP, GRE, IPv4, IPv6, Multicast, OSPFV3, BGP, IPv4, IPv6, Static routes, ETC	
13	Network Management Protocols	Telnet, SNMP, Secure Shell (SSH) Protocol, Command-line interface (CLI), and HTTP management	
14	IPsec Throughput (Mbps)	300	
15	IPsec Encryption	IPsec with IKEv1, IKEv2, IPsec over IPV6, VRF-aware Ipsec, EasyVPN , DMVPN, VPN, SSL VPN	
16	Security Protocol	3DES, AES 128, AES 192, and AES 256, PKI, Hardware-accelerated DES	
17	QOS: support Class-Based Weighted Fair Queuing (CBWFQ WRED Hierarchical QoS for Traffic Management inspections Qos classification with TCP Application traffic.	Available	
18	Wattage (Watt)	24	
19	Dimension/Form Factor (RU)	1	
20	Operating Temperature Range (Degree C)	0 to 40 C	
21	Operating Humidity (RH) (%)e	0.9	
22	IPv6 Ready3. IPv6: OSPF v3 and static routers ipv6 Routing IPv6 Multicast IPv6 QoS IPv6 VPN over MPLS	Yes	
23	On Site OEM Warranty (Year)	3	
24	Use of third party optics should not be locked for all interfaces	Yes	

SOR item 7: Router Type - VII Technical Specifications

S N	Description	Compliance
1	The Router should support modular architecture, multi-core Processor. Router should have a security slot to secure the router to a desktop or other surface, use the Kensington or equivalent equipment.	
2	Router should support separate data and control plane capabilities.	
3	Router should have following interfaces :	
4	On-board 2x1G WAN Port & 4 x 2G LAN Port.	
5	Router should support 4 nos of POE ports or 2 nos PoE+, both option should be available	
6	Router should have minimum 4 GB of DRAM and 4 GB Flash from Day1	
7	The router should support following features IKEv1, IKEv2, VRF-aware IPsec, IPsec over IPV6, Hardware-accelerated DES, 3DES, AES 128, AES 192, and AES 256 from day1.	
8	Router should support minimum 100 tunnel	
9	Router can provide encrypted traffic performance of 350 Mbps.	
10	Router should have following protocol like static routes, RIPv1, RIPv2, OSPF, IS-IS, BGP, GRE, L2TP, L2TPv3, NAT, IPv4 and IPv6 Multicast, VRF lite, IGMPv3, 802.1x	
11	The Router should support Zone-Based Stateful Firewall, Application Aware Firewall and application inspection and control feature or an external appliance for the same functionality can be provided.	
12	Routers should support AAA using RADIUS and TACACS+	
13	Should have extensive support for IP SLA and best path selection for metrics like delay, latency, jitter, packet loss to assure business-critical IP applications from Day1.	
14	Router should support monitoring of network traffic with application level insight with deep packet visibility into web traffic, RTP-Based VoIP traffic.	
15	Router should capable to understand that system OS are authentic and unmodified, it should have cryptographically signed images to provide assurance that the firmware & BIOS are authentic.	
16	Router should have traffic load balancing capability on dual WAN Links based on based on advanced criteria, such as reachability, delay, loss, jitter and bandwidth utilization.	
17	Router shall have capability to add on demand IPSec VPN tunnels dynamically established multipoint-to-multipoint IPSEC based spoke-to-spoke VPN tunnels matching traffic conditions	
18	Router should have capability to enable SD-WAN features without hardware upgrade	

19	Router shall conform to UL 60950 or IEC 60950 or CSA 60950 or EN 60950 Standards for Safety requirements of Information Technology Equipment.	
20	Router shall conform to EN 55022 Class A/B or CISPR22 Class A/B or CE Class A/B or FCC Class A/B Standards for EMC (Electro Magnetic Compatibility) requirements.	
21	Router/Router's Operating System should be tested and certified for EAL 3/NDPP or above under Common Criteria Certification	
22	Router should be IPv6 logo ready Certified	
23	Router can support Encapsulations, Generic Routing Encapsulation (GRE), Ethernet, 802.1q VLAN, Point-to-Point Protocol (PPP), Multilink Pointto-Point Protocol (MLPPP), Frame Relay, Multilink Frame Relay (MLFR) (FR.15 and FR.16), High-Level DataLink Control (HDLC), Serial (RS-232, RS-449, X.21, V.35, and EIA-530), and PPP over Ethernet (PPPoE).	
24	Router can support Traffic management, Quality of Service (QoS), Class-Based Weighted Fair Queuing (CBWFQ), Weighted Random Early Detection (WRED), Hierarchical QoS, Policy-Based Routing (PBR), Performance Routing (PfR),	
25	Router can support Cryptographic algorithms, Encryption: DES, 3DES, AES-128 or AES-256 (in CBC and GCM modes). Authentication: RSA (748/1024/2048 bit), ECDSA (256/384 bit); Integrity: MD5, SHA, SHA-256, SHA-384, SHA512.	
26	Router can support protocols IPv4, IPv6, static routes, Routing Information Protocol Versions 1 and 2 (RIP and RIPv2), Open Shortest Path First (OSPF), Border Gateway Protocol (BGP), BGP Router Reflector, Intermediate System-to-Intermediate System (IS-IS), Multicast Internet Group Management Protocol Version 3 (IGMPv3), Protocol Independent Multicast Sparse Mode (PIM SM), PIMSource-Specific Multicast (SSM), Resource Reservation Protocol (RSVP), Encapsulated Remote Switched Port Analyzer (ERSPAN), IP Service-Level Agreements (IPSLA), Call Home, Embedded Event Manager (EEM), Internet Key Exchange (IKE), Access Control Lists (ACL), Ethernet Virtual Connections (EVC), Dynamic Host Configuration Protocol (DHCP), Frame Relay (FR), DNS, Locator ID Separation Protocol (LISP), Hot Standby Router Protocol (HSRP), RADIUS, Authentication, Authorization, and Accounting (AAA), Application Visibility and Control (AVC), IPv4-to-IPv6 Multicast, Multiprotocol Label Switching (MPLS), Layer 2 and Layer 3 VPN, IPsec, Layer 2 Tunneling Protocol Version 3 (L2TPv3), Bidirectional Forwarding Detection (BFD), IEEE 802.1ag, and IEEE 802.3ah.	
27	Proposed Router should be SDWAN ready.	

SOR item 8: Switch Type I Technical Specifications

SN	Specification:	Compliance
1	The LAN switch shall be standalone / rack mountable with the following ports:	
2	20 Nos. 10G SFP+ and 2 Nos. QSFP+ 40G ports.	
3	The switch should support RJ-45 console port and industry standard CLI	
4	The switch should support Reset button to make switch reset to default.	
5	The switch should support RJ-45 management port	
6	Switch should have 02 power supply in 1+1 in redundant mode. It should support type (-48v DC supply) of power source supply on a Single Power Port.	
7	General Specification:	
8	The LAN Switch should support below specs Min 256MB RAM, 16MB flash, 1.5MB buffer.	
9	The LAN switch shall be available with minimum Switching Fabric. 128 Gbps	
10	The LAN switch shall have minimum packet forwarding rate at 64-byte packet length 95 Mpps	
11	The LAN switch shall support minimum 16K MAC address.	
12	The LAN switch shall support 1024 static MAC address entries	
13	The LAN switch shall have 1K IGMP and 1K MLD snooping groups.	
14	Switch should support Dying Gasp for quick trouble shooting during power failures or system shut downs.	
15	Layer-2 Features:	
16	The LAN switch shall support IEEE 802.1Q VLAN up to 255 Active VLANs and 4094 VLAN ID.	
17	It shall support for Automatic Negotiation of link speed and duplex to help minimize the configuration & errors.	
18	It shall support centralized VLAN Management. VLANs created on the Core Switches shall be propagated to all the other switches automatically, thus reducing the overhead of creating / modifying / deleting VLANs in all the switches in turn eliminating the configuration errors & troubleshooting. It shall support GVRP / VTP for VLAN pruning and management.	
19	It shall support edge port in STP, RSTP, MSTP (16 instances), PVST+ mode, BPDU filtering.	
20	It shall support 802.1d, 802.1p, 802.1Q, 802.1s, 802.1w, 802.1x, 802.3x, 802.1ab.	
21	It shall support spanning-tree root guard and loop guard to prevent other edge switches becoming the root bridge.	
22	It shall support IGMP snooping v1, v2 and v3, IGMP Proxy, IGMP Querier and MLDv1, MLD Querier.	
23	It shall support Link Aggregation Protocol (LACP) as per IEEE 802.3ad and and 8 groups per device/8 ports per group.	

24	It shall Support for Detection of Unidirectional links and to disable them to avoid problems such as spanning tree loops and support Unidirectional Link Detection (UDLD) or any other industry equivalent protocol	
25	It shall have supports L2/L3/L4 QoS/CoS solutions help ensure that critical network services such as VoIP, ERP, Intranet, and video conferencing are served with proper priority.	
26	It shall support unknown unicast and multicast port blocking to allow tight control by filtering packets that the switch has not already learned how to forward.	
27	It shall support unicast MAC filtering to prevent the forwarding of any type of packet with a matching MAC address.	
28	Switch shall support for Admission Control features to improve the network's ability to automatically identify, prevent, and respond to security threats and also to enable the switches to collaborate with third-party solutions for security-policy compliance and enforcement before a host is permitted to access the network.	
29	It shall be able to discover the neighboring device of the same OEM giving the details about the platform, IP Address, Link connected through etc, thus helping in troubleshooting connectivity problems. It shall support LLDP or LLDP-MED for network discovery	
30	There shall be support for Asynchronous data flows upstream and downstream from the end station or on the uplink using ingress policing and egress shaping	
31	It shall support Optical Transceiver Digital Diagnostic Monitoring and support 802.3ah link layer remote loopback and discovery	
32	It shall support configuration rollback to replace current configuration with any saved configuration file	
33	It shall support Auto-MDIX.	
34	Quality of Service (QoS) Features:	
35	The LAN switch shall have per-port broadcast, multicast, and unicast storm control.	
36	There shall be 12 hardware-based queues per port for flexible QoS management.	
37	There shall be Shaping and Scheduling – SP, WRR, SPQ + WRR, WFQ, Weighted Deficit Round Robin (WDRR) or Equivalent Protocol	
38	The switch should support QOS based on Switch port, 802.1p priority queues, vLAN ID, MAC addresses, IPv4/IPv6 addresses, DSCP, ToS, Protocol type, TCP/UDP ports, IPv6 traffic class	
39	It should support Time-Based QOS	
40	It shall support BPDU filtering feature, to shut down Spanning Tree Protocol Port Fast-enabled interfaces when BPDUs are received to avoid accidental topology loops.	
41	Network Security Features:	

42	The LAN switch shall support IEEE 802.1x to allow dynamic, port-based security, providing user authentication, Dynamic VLAN assignment	
43	The LAN Switch shall support Compound Authentication and Change of authorization	
44	It shall support unicast MAC filtering to prevent the forwarding of any type of packet with a matching MAC address.	
45	It shall support unknown unicast and multicast port blocking to allow tight control by filtering packets that the switch has not already learned how to forward	
46	It shall support IGMP filtering to provide multicast authentication by filtering out no subscribers and limits the number of concurrent multicast streams available per port	
47	It shall support for SSHv2, SSL v2/v3, SNMPv3 to provide network security by encrypting administrator traffic during Telnet, SSH and SNMP sessions.	
48	It shall support IMPB, DHCP snooping, IPSG and dyanmic ARP inspection	
49	The switch shall be able to work on both IPv4 and IPv6 (dual stack) from day one	
50	It shall support Port Mirroring (minimum 4 mirror session) based on port basis and VLAN basis to support intrusion prevention system deployment in different VLANs. It shall support bidirectional data on mirror port which allows IDS to take action when an intruder is detected. It should support RSPAN.	
51	It shall support RADIUS authentication to enable centralized control of the switch and restrict unauthorized users from altering the configuration.	
52	It shall support MAC address notification to allow administrators to be notified of users added to or removed from the network	
53	It shall support port security up to 1K MAC address to secure the access to an access or trunk port based on MAC address. After a specific timeframe, the aging feature should remove the MAC address from the switch to allow another device to connect to the same port.	
54	It shall support multilevel security on console access to prevent unauthorized users from altering the switch configuration.	
55	It shall support BPDU filtering feature, to shut down Spanning Tree Protocol Port Fast enabled interfaces when BPDUs are received to avoid accidental topology loops.	
56	It shall support Spanning-Tree Root Guard (STRG) to prevent edge devices not in the network administrator's control from becoming Spanning Tree Protocol root nodes.	
57	Management:	
58	It shall have Remote Monitoring software agent to support for enhanced traffic management, monitoring, and analysis or FNF (flexible netflow) or any industry standard.	
59	It shall support Unidirectional Link Detection (UDLD)	

60	It shall have Layer 2 trace route to ease troubleshooting by identifying the physical path that a packet takes from source to destination	
61	It shall support Web based or Trivial File Transfer Protocol (TFTP) and File Transfer Protocol (FTP), SCP	
62	It shall support Simple Network Time Protocol/Network Timing Protocol (SNTP/NTP) to provide an accurate and consistent time stamp to all intranet switches	
63	It shall support RMON v1 and v2 standards and 4 RMON groups	
64	It shall support SNMPv1, SNMPv2c, and SNMPv3 and Telnet interface support to deliver comprehensive in-band management, and a CLI-based management console to provide detailed out-of-band management and Web Management for better manageability.	
65	It should support routing protocol static and RIP/OSPF.	
66	Switch should support Surge Protection on power input	
67	Switch should support Surge Protection to ± 4 kV (line-earth) and ± 2 kW (line-line) on power input	
68	Loopback Detection (LBD) and Switch should support 802.3ah link layer remote loopback and discovery	
69	It should support 63 IP interface, 8 loopback interfaces and Intervlan routing	
70	It shall support default routing and static routing Support for 128 static IPv4 routes and Support 64 static IPv6 routes	
71	It shall support VRRP v2	
72	Should support authentication to allow an IP phone and a PC to authenticate on the same switch port while being placed on the appropriate voice and data VLANs.	
73	Should support GVRP VLAN Trunking Protocol	
74	It should support Port-based VLAN, MAC-based VLAN, VLAN Trunking, Voice VLAN and Surveillance VLAN, Private VLAN, GVRP, GARP, IP-Subnet Based VLAN and ISM VLAN (MVR), Guest VLAN	
75	Should have the ability to disable per-VLAN MAC learning	
76	Should support MAC Authentication Bypass (MAB) and WebAuth with downloadable ACLs	
77	Switch must support Zero Touch Deployment feature so that it can automatically obtain IP address and configuration file from remote server	
78	It should support flex link.	
79	It should support TWAMP. Should support TWAMP responder and receiver for IPv6	
80	It should support Ethernet Ring Protection Switching ERPS v1 and v2 for main ring and sub rings : G.8032 ERPS Ring Protection Switching provides loop avoidance with redundancy in Layer-2 Ethernet networks using concept of RPL (Ring Protection Link). The switch completion time (transfer time) for a failure on a ring link shall be less than 50ms.	
81	It should support IEEE 802.1QinQ mechanism and VLAN translation	

82	It shall support built-in power-on diagnostics and system monitoring capabilities to detect hardware failures.	
83	Bandwidth management: Flow-based bandwidth management, ingress rate-limiting; egress rate shaping per port.	
84	It shall loopback detection and shut or disable a physical port and VLAN based on detection of loop on that interface	
85	To check support for Standard and Extended Access Lists	
86	It shall support access list based on IPv4/v6 address Protocol type IPv6 flow label VLAN-ID MAC-ID DSCP IPv6 traffic class TCP/UDP Port and User-defined packet content	
87	Switch shall support Time based ACL	
88	The Switch should support minimum 1K Ingress Access Control Entries	
89	To check IGMP static join feature.	
90	It shall support new tools such as Remote Defect Indication, Alarm Report, one-way or two-way Delay Measurement, Packet Loss measurement, and in-service diagnostics tools.	
91	To check Login and Access control List violations shall generate alarms to Network Management System and a log of the same shall be generated.	
92	It should support of ICMPv4, ICMPv6, Telnet v4, Telnet v6, SNMP v4 and SNMP v6	
93	Switch should support PVST+ to have different stp instance for each vlan.	
94	Switch should support CPU monitoring, Memory monitoring and password recovery.	
95	It should support MAC flapping feature to block a duplicate MAC to learn from uplink and downlink interface	
96	It should support duplicate address inspection	
97	Support multiple privilege level to provide different level of access on console port and telnet sessions	
98	Switch should support traffic segmentation	
99	It should support DOS attack prevention and URPF	
100	Switch should support sflow or netflow	
101	Switch should support IPv6 Neighbor Discovery (ND)	
102	It shall support MAC address notification to allow administrators to be notified of users added to or removed from the network.	
103	It should support DHCP server screening and client filtering, DHCP Client, DHCP Server and DHCP Relay with option 82,60,61,18, 37, 125 and 12.	
104	It should support IEEE 802.1ag Ethernet OAM: Connectivity Fault Management (Support 32 MEPs)	
105	It should support Ethernet OAM compliant with IEEE 802.3ah/Y.1731	
106	It should support Radius and TACACS + Switch, Local Database	
107	It should support L2 Protocol Tunneling for STP,GVRP and LACP	
108	Should support port and vlan mirroring and jumbo frame 9K.	

109	Switch should support system log, traceroute, PING Size up to 9000 bytes or more.	
110	Switch should have dual image. Switch shouldn't go in monitor in any case mode if power off during firmware upgrade.	
111	Should support Optical Transceiver Digital Diagnostic Monitoring for All SFP ports of 1/10G.	
112	Switch should support following SNMP traps or syslog	
113	i)Interface UP & Down	
114	ii)Optical power SFP threshold alarms	
115	iii)STP Topology Changes and New root bridge	
116	iv)LLDP table changes	
117	v)Threshold alarms for Temperature.	
118	vi)Ethernet OAM SNMP alarms.	
119	vii)Dying Gasp Traps or alarms	
120	Switch should comply to following Temperature performance parameters :	
121	i) Operating Temperature - min 0 to 50 °C	
122	ii) Storage Temperature - min -20 to 70 °C	
123	Safety Requirement :-	
124	Switch should have safety compliance of CE, LVD	
125	Electromagnetic Compatibility (EMC) Requirements:-	
126	Switch should have EMC compliance of CE	
127	Switch shall conform to EN 55022 Class A/B or CISPR22 Class A/B or CE Class A/B or FCC Class A/B Standards for EMC (Electro Magnetic Compatibility) requirements.	
128	Switch shall conform to UL 60950 or IEC 60950 or CSA 60950 or EN 60950 Standards for Safety requirements	
129	Should be allowed IPv6 ready from Day One.	
130	It shall have comprehensive debugging features required for software & hardware fault diagnosis. Switch should support Dying Gasp for quick trouble shooting during power failures or system shut downs.	
131	Switch should come with default accessories like Switch 3PIN Power cable, RJ-45 console cable, 2 mounting brackets for 19" rack mounting, Mounting kit, Quick Installation Guide	
132	Router to support GRE tunnels (RFC 2784).	
133	All 10G interfaces shall be of SFP+ type and shall support LR/ER/ZR. Use of third party optics should not be locked for all interfaces	
134	On Site OEM Warranty (Year) - 3 years	

SOR item 9: Switch Type II Technical Specifications

SN	Specification:	Compliance
1	The LAN switch shall be standalone / rack mountable with the following ports:	
2	20 Nos. 10/100/1000 SFP, 4 Port 1G Base-T/SFP combo port and 4 Nos. SFP+ port.	
3	The switch should support RJ-45 console port and industry standard CLI	
4	The switch should support Reset button to make switch reset to default.	
5	The switch should support RJ-45 management port	
6	Switch should have 02 power supply in 1+1 in redundant mode. It should support both type (-48v DC & 240v AC supply) of power source supply on a Single Power Port. Any power source (-48v DC / 240v AC supply) can be inserted on the power port without any external adapter.	
7	General Specification:	
8	The LAN Switch should support below specs Min 256MB RAM, 16MB flash, 1.5MB buffer.	
9	The LAN switch shall be available with minimum Switching Fabric. 128 Gbps	
10	The LAN switch shall have minimum packet forwarding rate at 64-byte packet length 95 Mpps	
11	The LAN switch shall support minimum 16K MAC address.	
12	The LAN switch shall support 1024 static MAC address entries	
13	The LAN switch shall have 1K IGMP and 1K MLD snooping groups.	
14	Switch should support Dying Gasp for quick trouble shooting during power failures or system shut downs.	
15	Layer-2 Features:	
16	The LAN switch shall support IEEE 802.1Q VLAN up to 255 Active VLANs and 4094 VLAN ID.	
17	It shall support for Automatic Negotiation of link speed and duplex to help minimize the configuration & errors.	
18	It shall support centralized VLAN Management. VLANs created on the Core Switches shall be propagated to all the other switches automatically, thus reducing the overhead of creating / modifying / deleting VLANs in all the switches in turn eliminating the configuration errors & troubleshooting. It shall support GVRP / VTP for VLAN pruning and management.	
19	It shall support edge port in STP, RSTP, MSTP (16 instances), PVST+ mode, BPDU filtering.	
20	It shall support 802.1d, 802.1p, 802.1Q, 802.1s, 802.1w, 802.1x, 802.3x, 802.1ab.	
21	It shall support spanning-tree root guard and loop guard to prevent other edge switches becoming the root bridge.	
22	It shall support IGMP snooping v1, v2 and v3, IGMP Proxy, IGMP Querier and MLDv1, MLD Querier.	

23	It shall support Link Aggregation Protocol (LACP) as per IEEE 802.3ad and 8 groups per device/8 ports per group.	
24	It shall Support for Detection of Unidirectional links and to disable them to avoid problems such as spanning tree loops and support Unidirectional Link Detection (UDLD) or any other industry equivalent protocol	
25	It shall have supports L2/L3/L4 QoS/CoS solutions help ensure that critical network services such as VoIP, ERP, Intranet, and video conferencing are served with proper priority.	
26	It shall support unknown unicast and multicast port blocking to allow tight control by filtering packets that the switch has not already learned how to forward.	
27	It shall support unicast MAC filtering to prevent the forwarding of any type of packet with a matching MAC address.	
28	Switch shall support for Admission Control features to improve the network's ability to automatically identify, prevent, and respond to security threats and also to enable the switches to collaborate with third-party solutions for security-policy compliance and enforcement before a host is permitted to access the network.	
29	It shall be able to discover the neighboring device of the same OEM giving the details about the platform, IP Address, Link connected through etc, thus helping in troubleshooting connectivity problems. It shall support LLDP or LLDP-MED for network discovery	
30	There shall be support for Asynchronous data flows upstream and downstream from the end station or on the uplink using ingress policing and egress shaping	
31	It shall support Optical Transceiver Digital Diagnostic Monitoring and support 802.3ah link layer remote loopback and discovery	
32	It shall support configuration rollback to replace current configuration with any saved configuration file	
33	It shall support Auto-MDIX	
34	Quality of Service (QoS) Features:	
35	The LAN switch shall have per-port broadcast, multicast, and unicast storm control.	
36	There shall be 12 hardware-based queues per port for flexible QoS management.	
37	There shall be Shaping and Scheduling – SP, WRR, SPQ + WRR, WFQ, Weighted Deficit Round Robin (WDRR) or Equivalent Protocol	
38	There shall be Shaping and Scheduling – SP, WRR, SPQ + WRR, WFQ, Weighted Deficit Round Robin (WDRR)	
39	The switch should support QOS based on Switch port, 802.1p priority queues, vLAN ID, MAC addresses, IPv4/IPv6 addresses, DSCP, ToS, Protocol type, TCP/UDP ports, IPv6 traffic class	
40	It should support Time-Based QOS	

41	It shall support BPDU filtering feature, to shut down Spanning Tree Protocol Port Fast enabled interfaces when BPDUs are received to avoid accidental topology loops.	
42	Network Security Features:	
43	The LAN switch shall support IEEE 802.1x to allow dynamic, port-based security, providing user authentication, Dynamic VLAN assignment	
44	The LAN Switch shall support Compound Authentication and Change of authorization	
45	It shall support unicast MAC filtering to prevent the forwarding of any type of packet with a matching MAC address.	
46	It shall support unknown unicast and multicast port blocking to allow tight control by filtering packets that the switch has not already learned how to forward	
47	It shall support IGMP filtering to provide multicast authentication by filtering out no subscribers and limits the number of concurrent multicast streams available per port	
48	It shall support for SSHv2, SSL v2/v3, SNMPv3 to provide network security by encrypting administrator traffic during Telnet, SSH and SNMP sessions.	
49	It shall support IMPB, DHCP snooping, IPSG and dynamic ARP inspection	
50	The switch shall be able to work on both IPv4 and IPv6 (dual stack) from day one	
51	It shall support Port Mirroring (minimum 4 mirror session) based on port basis and VLAN basis to support intrusion prevention system deployment in different VLANs. It shall support bidirectional data on mirror port which allows IDS to take action when an intruder is detected. It should support RSPAN.	
52	It shall support RADIUS authentication to enable centralized control of the switch and restrict unauthorized users from altering the configuration.	
53	It shall support MAC address notification to allow administrators to be notified of users added to or removed from the network	
54	It shall support port security up to 1K MAC address to secure the access to an access or trunk port based on MAC address. After a specific timeframe, the aging feature should remove the MAC address from the switch to allow another device to connect to the same port.	
55	It shall support multilevel security on console access to prevent unauthorized users from altering the switch configuration.	
56	It shall support BPDU filtering feature, to shut down Spanning Tree Protocol Port Fast enabled interfaces when BPDUs are received to avoid accidental topology loops.	
57	It shall support Spanning-Tree Root Guard (STRG) to prevent edge devices not in the network administrator's control from becoming Spanning Tree Protocol root nodes.	
58	Management:	

59	It shall have Remote Monitoring software agent to support for enhanced traffic management, monitoring, and analysis or FNF (flexible netflow) or any industry standard.	
60	It shall support Unidirectional Link Detection (UDLD)	
61	It shall have Layer 2 trace route to ease troubleshooting by identifying the physical path that a packet takes from source to destination	
62	It shall support Web based or Trivial File Transfer Protocol (TFTP) and File Transfer Protocol (FTP), SCP	
63	It shall support Simple Network Time Protocol/Network Timing Protocol (SNTP/NTP) to provide an accurate and consistent time stamp to all intranet switches	
64	It shall support RMON v1 and v2 standards and 4 RMON groups	
65	It shall support SNMPv1, SNMPv2c, and SNMPv3 and Telnet interface support to deliver comprehensive in-band management, and a CLI-based management console to provide detailed out-of-band management and Web Management for better manageability.	
66	All Gigabit Ethernet ports support IEC 61000-4-5 surge protection (6kV)	
67	Switch should support Surge Protection on power input and on Ethernet ports as per EN61000-4-5 standard	
68	Switch should support Surge Protection to ± 4 kV (line-earth) and ± 2 kW (line-line) on power input	
69	Loopback Detection (LBD) and Switch should support 802.3ah link layer remote loopback and discovery	
70	It should support 63 IP interface, 8 loopback interfaces and Intervlan routing	
71	It shall support default routing and static routing support for 128 static IPv4 routes support for 64 static IPv6 routes	
72	It shall support VRRP v2	
73	Should support authentication to allow an IP phone and a PC to authenticate on the same switch port while being placed on the appropriate voice and data VLANs.	
74	Should support GVRP VLAN Trunking Protocol	
75	It should support Port-based VLAN, MAC-based VLAN, VLAN Trunking, Voice VLAN and Surveillance VLAN, Private VLAN, GVRP, GARP, IP-Subnet Based VLAN and ISM VLAN (MVR), Guest VLAN	
76	Should have the ability to disable per-VLAN MAC learning	
77	Should support MAC Authentication Bypass (MAB) and WebAuth with downloadable ACLs	
78	Switch must support Zero Touch Deployment feature so that it can automatically obtain IP address and configuration file from remote server	
79	It should support flex link.	
80	It should support TWAMP. Should support TWAMP responder and receiver for IPv6	

81	It should support Ethernet Ring Protection Switching ERPS v1 and v2 for main ring and sub rings : G.8032 ERPS Ring Protection Switching provides loop avoidance with redundancy in Layer-2 Ethernet networks using concept of RPL (Ring Protection Link). The switch completion time (transfer time) for a failure on a ring link shall be less than 50ms.	
82	It should support In-Service Software Upgrade (ISSU)	
83	It shall support built-in power-on diagnostics and system monitoring capabilities to detect hardware failures.	
84	Bandwidth management: Flow-based bandwidth management, ingress rate-limiting; egress rate shaping per port.	
85	It shall loopback detection and shut or disable a physical port and VLAN based on detection of loop on that interface	
86	To check support for Standard and Extended Access Lists	
87	It shall support access list based on IPv4/v6 address Protocol type IPv6 flow label VLAN-ID MAC-ID DSCP IPv6 traffic class TCP/UDP Port and User-defined packet content	
88	Switch shall support Time based ACL	
89	The Switch should support minimum 1K Ingress Access Control Entries	
90	To check IGMP static join feature.	
91	It shall support new tools such as Remote Defect Indication, Alarm Report, one-way or two-way Delay Measurement, Packet Loss measurement, and in-service diagnostics tools.	
92	It should support of ICMPv4, ICMPv6, Telnet v4, Telnet v6, SNMP v4 and SNMP v6	
93	Switch should support PVST+ to have different stp instance for each vlan.	
94	Switch should support CPU monitoring, Memory monitoring and password recovery.	
95	Should have extensive support for IP SLA and best path selection for metrics like delay, latency, jitter, packet loss to assure business-critical IP applications or similar technology.	
96	It should support MAC flapping feature to block a duplicate MAC to learn from uplink and downlink interface	
97	It should support duplicate address inspection	
98	Support multiple privilege level to provide different level of access on console port and telnet sessions	
99	Switch should support traffic segmentation	
100	It should support DOS attack prevention and URPF	
101	Switch should support sflow or netflow	
102	Switch should support IPv6 Neighbor Discovery (ND)	
103	It shall support MAC address notification to allow administrators to be notified of users added to or removed from the network.	
104	It should support DHCP server screening and client filtering, DHCP client, DHCP Server and DHCP Relay with option 82,60,61,18,37,125 and 12	

105	It should support IEEE 802.1ag Ethernet OAM: Connectivity Fault Management (Support 32 MEPs)	
106	It should support Ethernet OAM compliant with IEEE 802.3ah/Y.1731	
107	It should support Radius and TACACS + Switch, Local Database	
108	It should support L2 Protocol Tunneling for STP,GVRP and LACP	
109	Should support port and vlan mirroring and jumbo frame 9K.	
110	Switch should support system log, traceroute, PING Size up to 9000 bytes or more.	
111	Switch should have dual image. Switch shouldn't go in monitor in any case mode if power off during firmware upgrade.	
112	Should support Optical Transceiver Digital Diagnostic Monitoring for All SFP ports of 1/10G.	
113	Switch should support following SNMP traps or syslog	
114	i)Interface UP & Down	
115	ii)Optical power SFP threshold alarms	
116	iii)STP Topology Changes and New root bridge	
117	iv)LLDP table changes	
118	v)Threshold alarms for Temperature.	
119	vi)Ethernet OAM SNMP alarms.	
120	vii)Dying Gasp Traps or alarms	
121	Switch should comply to following Temperature performance parameters :	
122	i) Operating Temperature - min 0 to 50 °C	
123	ii) Storage Temperature - min -20 to 70 °C	
124	Safety Requirement :-	
125	Switch should have safety compliance of CE, LVD	
126	Electromagnetic Compatibility (EMC) Requirements:-	
127	Switch should have EMC compliance of CE	
128	Switch shall conform to EN 55022 Class A/B or CISPR22 Class A/B or CE Class A/B or FCC Class A/B Standards for EMC (Electro Magnetic Compatibility) requirements.	
129	Switch shall conform to UL 60950 or IEC 60950 or CSA 60950 or EN 60950 Standards for Safety requirements	
130	Should be allowed IPv6 ready from Day One.	
131	It shall have comprehensive debugging features required for software & hardware fault diagnosis. Switch should support Dying Gasp for quick trouble shooting during power failures or system shut downs.	
132	Switch should come with default accessories like Switch 3PIN Power cable, RJ-45 console cable, 2 mounting brackets for 19" rack mounting, Mounting kit, Quick Installation Guide	
133	On Site OEM Warranty (Year) - 3 years	
134	Use of third party optics should not be locked for all interfaces	

SOR item 10: Switch Type III Technical Specifications

SN	Specification:	Compliance
1	The LAN switch shall be standalone / rack mountable with the following ports:	
2	24 Port 1G Base-T port and 4 Nos. SFP+ port.	
3	The switch should support RJ-45 console port and industry standard CLI	
4	The switch should support Reset button to make switch reset to default.	
5	The switch should support RJ-45 management port	
6	Switch should have 240v AC supply	
7	General Specification:	
8	The LAN Switch should support below specs Min 256MB RAM, 16MB flash, 1.5MB buffer	
9	The LAN switch shall be available with minimum Switching Fabric. 128 Gbps	
10	The LAN switch shall have minimum packet forwarding rate at 64-byte packet length 95 Mpps	
11	The LAN switch shall support minimum 16K MAC address.	
12	The LAN switch shall support 1024 static MAC address entries	
13	The LAN switch shall have 1K IGMP and 1K MLD snooping groups.	
14	Switch should support Dying Gasp for quick trouble shooting during power failures or system shut downs.	
15	Layer-2 Features:	
16	The LAN switch shall support IEEE 802.1Q VLAN up to 255 Active VLANs and 4094 VLAN ID.	
17	It shall support for Automatic Negotiation of link speed and duplex to help minimize the configuration & errors.	
18	It shall support centralized VLAN Management. VLANs created on the Core Switches shall be propagated to all the other switches automatically, thus reducing the overhead of creating / modifying / deleting VLANs in all the switches in turn eliminating the configuration errors & troubleshooting. It shall support GVRP / VTP for VLAN pruning and management.	
19	It shall support edge port in STP, RSTP, MSTP (16 instances), PVST+ mode, BPDU filtering.	
20	It shall support 802.1d, 802.1p, 802.1Q, 802.1s, 802.1w, 802.1x, 802.3x, 802.1ab.	
21	It shall support spanning-tree root guard and loop guard to prevent other edge switches becoming the root bridge.	
22	It shall support IGMP snooping v1, v2 and v3, IGMP Proxy, IGMP Querier and MLDv1, MLD Querier.	
23	It shall support Link Aggregation Protocol (LACP) as per IEEE 802.3ad and 8 groups per device/8 ports per group.	
24	It shall Support for Detection of Unidirectional links and to disable them to avoid problems such as spanning tree loops and support	

	Unidirectional Link Detection (UDLD) or any other industry equivalent protocol	
25	It shall have supports L2/L3/L4 QoS/CoS solutions help ensure that critical network services such as VoIP, ERP, Intranet, and video conferencing are served with proper priority.	
26	It shall support unknown unicast and multicast port blocking to allow tight control by filtering packets that the switch has not already learned how to forward.	
27	It shall support unicast MAC filtering to prevent the forwarding of any type of packet with a matching MAC address.	
28	Switch shall support for Admission Control features to improve the network's ability to automatically identify, prevent, and respond to security threats and also to enable the switches to collaborate with third-party solutions for security-policy compliance and enforcement before a host is permitted to access the network.	
29	It shall be able to discover the neighboring device of the same OEM giving the details about the platform, IP Address, Link connected through etc, thus helping in troubleshooting connectivity problems. It shall support LLDP or LLDP-MED for network discovery	
30	There shall be support for Asynchronous data flows upstream and downstream from the end station or on the uplink using ingress policing and egress shaping	
31	It shall support Optical Transceiver Digital Diagnostic Monitoring and support 802.3ah link layer remote loopback and discovery	
32	It shall support configuration rollback to replace current configuration with any saved configuration file	
33	It shall support Auto-MDIX	
34	Quality of Service (QoS) Features:	
35	The LAN switch shall have per-port broadcast, multicast, and unicast storm control.	
36	There shall be 12 hardware-based queues per port for flexible QoS management.	
37	There shall be Shaping and Scheduling – SP, WRR, SPQ + WRR, WFQ, Weighted Deficit Round Robin (WDRR) or Equivalent Protocol	
38	There shall be Shaping and Scheduling – SP, WRR, SPQ + WRR, WFQ, Weighted Deficit Round Robin (WDRR)	
39	The switch should support QOS based on Switch port, 802.1p priority queues, vLAN ID, MAC addresses, IPv4/IPv6 addresses, DSCP, ToS, Protocol type, TCP/UDP ports, IPv6 traffic class	
40	It should support Time-Based QOS	
41	It shall support BPDU filtering feature, to shut down Spanning Tree Protocol Port Fast-enabled interfaces when BPDUs are received to avoid accidental topology loops.	
42	Network Security Features:	
43	The LAN switch shall support IEEE 802.1x to allow dynamic, port-based security, providing user authentication, Dynamic VLAN assignment	

44	The LAN Switch shall support Compound Authentication and Change of authorization	
45	It shall support unicast MAC filtering to prevent the forwarding of any type of packet with a matching MAC address.	
46	It shall support unknown unicast and multicast port blocking to allow tight control by filtering packets that the switch has not already learned how to forward	
47	It shall support IGMP filtering to provide multicast authentication by filtering out no subscribers and limits the number of concurrent multicast streams available per port	
48	It shall support for SSHv2, SSL v2/v3, SNMPv3 to provide network security by encrypting administrator traffic during Telnet, SSH and SNMP sessions.	
49	It shall support IMPB, DHCP snooping, IPSG and dyanmic ARP inspection	
50	The switch shall be able to work on both IPv4 and IPv6 (dual stack) from day one	
51	It shall support Port Mirroring (minimum 4 mirror session) based on port basis and VLAN basis to support intrusion prevention system deployment in different VLANs. It shall support bidirectional data on mirror port which allows IDS to take action when an intruder is detected. It should support RSPAN.	
52	It shall support RADIUS authentication to enable centralized control of the switch and restrict unauthorized users from altering the configuration.	
53	It shall support MAC address notification to allow administrators to be notified of users added to or removed from the network	
54	It shall support port security up to 1K MAC address to secure the access to an access or trunk port based on MAC address. After a specific timeframe, the aging feature should remove the MAC address from the switch to allow another device to connect to the same port.	
55	It shall support multilevel security on console access to prevent unauthorized users from altering the switch configuration.	
56	It shall support BPDU filtering feature, to shut down Spanning Tree Protocol Port Fast enabled interfaces when BPDUs are received to avoid accidental topology loops.	
57	It shall support Spanning-Tree Root Guard (STRG) to prevent edge devices not in the network administrator's control from becoming Spanning Tree Protocol root nodes.	
58	Management:	
59	It shall have Remote Monitoring software agent to support for enhanced traffic management, monitoring, and analysis or FNF (flexible netflow) or any industry standard.	
60	It shall support Unidirectional Link Detection (UDLD)	
61	It shall have Layer 2 trace route to ease troubleshooting by identifying the physical path that a packet takes from source to destination	

62	It shall support Web based or Trivial File Transfer Protocol (TFTP) and File Transfer Protocol (FTP), SCP	
63	It shall support Simple Network Time Protocol/Network Timing Protocol (SNTP/NTP) to provide an accurate and consistent time stamp to all intranet switches	
64	It shall support RMON v1 and v2 standards and 4 RMON groups	
65	It shall support SNMPv1, SNMPv2c, and SNMPv3 and Telnet interface support to deliver comprehensive in-band management, and a CLI-based management console to provide detailed out-of-band management and Web Management for better manageability.	
66	All Gigabit Ethernet ports support IEC 61000-4-5 surge protection (6kV)	
67	Switch should support Surge Protection on power input and on Ethernet ports as per EN61000-4-5 standard	
68	Switch should support Surge Protection to ± 4 kV (line-earth) and ± 2 kW (line-line) on power input	
69	Loopback Detection (LBD) and Switch should support 802.3ah link layer remote loopback and discovery	
70	It should support 63 IP interface, 8 loopback interfaces and Intervlan routing	
71	It shall support default routing and static routing Support for 128 static IPv4 routes Support for 64 static IPv6 routes	
72	It shall support VRRP v2	
73	Should support authentication to allow an IP phone and a PC to authenticate on the same switch port while being placed on the appropriate voice and data VLANs.	
74	Should support GVRP VLAN Trunking Protocol	
75	It should support Port-based VLAN, MAC-based VLAN, VLAN Trunking, Voice VLAN and Surveillance VLAN, Private VLAN, GVRP, GARP, IP-Subnet Based VLAN and ISM VLAN (MVR), Guest VLAN	
76	Should have the ability to disable per-VLAN MAC learning	
77	Should support MAC Authentication Bypass (MAB) and WebAuth with downloadable ACLs	
78	Switch must support Zero Touch Deployment feature so that it can automatically obtain IP address and configuration file from remote server	
79	It should support flex link.	
80	It should support TWAMP. Should support TWAMP responder and receiver for IPv6	
81	It should support Ethernet Ring Protection Switching ERPS v1 and v2 for main ring and sub rings : G.8032 ERPS Ring Protection Switching provides loop avoidance with redundancy in Layer-2 Ethernet networks using concept of RPL (Ring Protection Link). The switch completion time (transfer time) for a failure on a ring link shall be less than 50ms.	
82	It should support IEEE 802.1QinQ mechanism and VLAN translation	
83	It shall support built-in power-on diagnostics and system monitoring capabilities to detect hardware failures.	

84	Bandwidth management: Flow-based bandwidth management, ingress rate-limiting; egress rate shaping per port.	
86	It shall loopback detection and shut or disable a physical port and VLAN based on detection of loop on that interface	
87	To check support for Standard and Extended Access Lists	
88	It shall support access list based on Ipv4/v6 address Protocol type Ipv6 flow label VLAN-ID MAC-ID DSCP Ipv6 traffic class TCP/UDP Port and User-defined packet content	
89	Switch shall support Time based ACL	
90	The Switch should support minimum 1K Ingress Access Control Entries	
91	To check IGMP static join feature.	
92	It shall support new tools such as Remote Defect Indication, Alarm Report, one-way or two-way Delay Measurement, Packet Loss measurement, and in-service diagnostics tools.	
93	To check Login and Access control List violations shall generate alarms to Network Management System and a log of the same shall be generated.	
94	It should support of ICMPv4, ICMPv6, Telnet v4, Telnet v6, SNMP v4 and SNMP v6	
95	Switch should support PVST+ to have different stp instance for each vlan.	
96	Switch should support CPU monitoring, Memory monitoring and password recovery.	
97	It should support MAC flapping feature to block a duplicate MAC to learn from uplink and downlink interface	
98	It should support duplicate address inspection	
99	Support multiple privilege level to provide different level of access on console port and telnet sessions	
100	Switch should support traffic segmentation	
101	It should support DOS attack prevention and URPF	
102	Switch should support sflow or netflow	
103	Switch should support Ipv6 Neighbor Discovery (ND)	
104	It shall support MAC address notification to allow administrators to be notified of users added to or removed from the network.	
105	It should support DHCP server screening and client filtering, DHCP Client, DHCP Server and DHCP Relay with option 82,60,61,18,37,125 and 12.	
106	It should support IEEE 802.1ag Ethernet OAM: Connectivity Fault Management (Support 32 MEPs)	
107	It should support Ethernet OAM compliant with IEEE 802.3ah/Y.1731	
108	It should support Radius and TACACS + Switch, Local Database	
109	It should support L2 Protocol Tunneling for STP, GVRP and LACP	
110	Should support port and vlan mirroring and jumbo frame 9K.	
111	Switch should support system log, traceroute, PING Size up to 9000 bytes or more.	

112	Switch should have dual image. Switch shouldn't go in monitor in any case mode if power off during firmware upgrade.	
113	Should support Optical Transceiver Digital Diagnostic Monitoring for All SFP ports of 1/10G.	
114	Switch should support following SNMP traps or syslog	
115	i)Interface UP & Down	
116	ii)Optical power SFP threshold alarms	
117	iii)STP Topology Changes and New root bridge	
118	iv)LLDP table changes	
119	v)Threshold alarms for Temperature.	
120	vi)Ethernet OAM SNMP alarms.	
121	vii)Dying Gasp Traps or alarms	
122	Switch should comply to following Temperature performance parameters :	
123	i) Operating Temperature - min 0 to 50 °C	
124	ii) Storage Temperature - min -20 to 70 °C	
125	Safety Requirement :-	
126	Switch should have safety compliance of CE, LVD	
127	Electromagnetic Compatibility (EMC) Requirements:-	
128	Switch should have EMC compliance of CE	
129	Switch shall conform to EN 55022 Class A/B or CISPR22 Class A/B or CE Class A/B or FCC Class A/B Standards for EMC (Electro Magnetic Compatibility) requirements.	
130	Switch shall conform to UL 60950 or IEC 60950 or CSA 60950 or EN 60950 Standards for Safety requirements	
131	Should be allowed IPv6 ready from Day One.	
133	It shall have comprehensive debugging features required for software & hardware fault diagnosis. Switch should support Dying Gasp for quick trouble shooting during power failures or system shut downs.	
132	Switch should come with default accessories like Switch 3PIN Power cable, RJ-45 console cable, 2 mounting brackets for 19" rack mounting, Mounting kit, Quick Installation Guide	
133	Use of third party optics should not be locked for all interfaces	
134	On Site OEM Warranty (Year) - 5 years	

SOR item 11 : Switch Type IV (Switches L2, POE based 8 ports) Technical Specification

S.N.	Description	Compliance
1	Should have 8 ports 10/100/1000 Mbps Base T	
2	Should have support for 2 ports SFP Based Gigabit ports.	
3	Should have at least 20 Gbps switching fabric.	
4	Should support at least 8K entries in the MAC table.	
5	Packet forwarding rates 14 million PPS	

6	Should Support 255 minimum VLANs.	
7	Switch should support IEEE 802.3af & IEEE 802.3at on Ethernet ports & Min 120W PoE Power Budget	
8	Should have AC Power Supply 100 to 240 V AC with 50 to 60 Hz and equipped with 3 pin plug.	
9	Should support Dual Images.	
10	Should support port mirroring and jumbo frame.	
11	Should support following for min. 64 Groups :	
	i. IGMP Snooping,	
	ii. IGMP v1/v2/v3 awareness Snooping,	
	iii. IGMP Snooping Queried.	
12	Should support RSTP, spanning-tree root guard, Port Fast and BPDU Guard/Filter or similar functionalities.	
13	Switch should support :	
	i. Surge protection of ± 2 kV (line-earth) and ± 1 kW (line-line) on power	
	ii. Surge protection of ± 4 kV on Ethernet ports and this will be applicable in case switch has copper ports.	
14	Should support following security features viz.:	
	i. Web Management (HTTPS),	
	ii. Broadcast/Multicast/Unicast Storm Control,	
	iii. DoS Attack Prevention	
15	Switch should support following SNMP traps or Syslog	
	i. Interface UP & Down	
	ii. Optical power SFP threshold alarms	
	iii. STP Topology Changes and New root bridge	
	iv. LLDP table changes	
	v. Threshold alarms for Temperature.	
16	Switch should comply to following Temperature performance parameters :	
	i. Operating Temperature - min 0 to 50 °C	
	ii. Storage Temperature - min -0 to 70 °C (-40 to 158 °F)	
17	It shall support MAC address notification to allow administrators to be notified of users added to or removed from the network.	
18	The switch shall be designed for continuous operations.	
19	IPv6/v4-L3 and IPv6-Multicast functionalities/features for Switches are desired but not mandatory.	
20	Safety Requirement :-	
	Switch should have safety compliance of UL.	
21	Electromagnetic Compatibility (EMC) Requirements:-	
	Switch should have EMC compliance of CE and FCC.	
22	The LAN switch shall support a console port or auxiliary/Ethernet port for the purpose of local and remote configuration and diagnostics.	

23	IPv6 feature should be ready from day 1.	
24	Qualitative Requirements:- i.The MTBF (Mean Time Between Failure) and MTTR (Mean Time To Repair) predicted and observed values shall be furnished along with calculations by the manufacturer.	
25	On Site OEM Warranty (Year) - 5 years	
26	Use of third party optics should not be locked for all interfaces	

SOR item 12 : Switch Type V (Fibre switches L2 Non POE) Technical Specifications

SN	Description	Compliance
1	Should have 24 ports SFP Based Gigabit ports.	
2	Should have support for 4 ports SFP+ Based 10G ports.	
3	Should have at least 120 Gbps switching fabric.	
4	Packet forwarding rates 90 million PPS	
5	Should support at least 16K entries in the MAC table.	
6	Should Support 255 minimum VLANs.	
7	Should have AC and DC power supply arrangement as given below in chassis without any external adaptors :	
	i. AC Power Supply 100 to 240 V AC with 50 to 60 Hz	
	ii. -48V DC supply	
	DC power supply should work as a redundant power supply to power-on the switch in case failure of AC power supply.	
8	Should support Dual Images.	
9	Should support Optical Transceiver Digital Diagnostic Monitoring for All SFP ports of 1G and 10G	
10	Should support port mirroring and jumbo frame.	
	Should support following for min. 64 Groups :	
11	i. IGMP Snooping,	
	ii. IGMP v1/v2/v3 awareness Snooping,	
	iii. IGMP Snooping Queried.	
12	Should support RSTP, MSTP, spanning-tree root guard, Port Fast and BPDU Guard/Filter or similar functionalities.	
13	Should support following security features viz.:	
	i. Web Management (HTTPS),	
	ii. Broadcast/Multicast/Unicast Storm Control,	
	iii. DoS Attack Prevention	
14	Switch should support following SNMP traps or syslog	
	i. Interface UP & Down	
	ii. Optical power SFP threshold alarms	
	iii. STP Topology Changes and New root bridge	
	iv. LLDP table changes	

	v. Threshold alarms for Temperature.	
	vi. Ethernet OAM SNMP alarms.	
15	Switch should comply to following Temperature performance parameters :	
	i. Operating Temperature - min 0 to 50 °C	
	ii. Storage Temperature - min -0 to 70 °C (-40 to 158 °F)	
16	It shall support MAC address notification to allow administrators to be notified of users added to or removed from the network.	
17	The switch shall be designed for continuous operations.	
18	IPv6/v4-L3 and IPv6-Multicast functionalities/features for Switches are desired but not mandatory.	
19	Safety Requirement :-	
	Switch should have safety compliance of UL.	
20	Electromagnetic Compatibility (EMC) Requirements:-	
	Switch should have EMC compliance of CE and FCC.	
21	The LAN switch shall support a console port or auxiliary/Ethernet port for the purpose of local and remote configuration and diagnostics.	
22	The LAN switch shall support built in power diagnostics system to detect hardware failures.	
23	IPv6 feature should be ready from day 1.	
24	Qualitative Requirements:-	
	i. The MTBF (Mean Time Between Failure) and MTTR (Mean Time To Repair) predicted and observed values shall be furnished along with calculations by the manufacturer.	
25	Switch should support following Metro Ethernet Features:	
	i. Q in Q , Double VLAN (Q-in-Q) ,Port-based Q-in-Q and VLAN Translation	
	ii. IEEE 802.1ag Ethernet OAM: Connectivity Fault Management	
	iii. Ethernet OAM compliant with IEEE 802.3ah/Y.1731	
	iv. ITU-T G.8032 Ethernet Ring Protection designed for loop protection and fast convergence times (sub 50 ms) in ring topologies.	
	v. L2 Protocol Tunneling.	
	vi. Loopback Detection	
26	The operating system of the Switches category/series/family should be MEF-9/14 or CE (Carrier Ethernet) Certified/compliant.	
27	Use of third party optics should not be locked for all interfaces	
28	On Site OEM Warranty (Year) - 3 years	

SOR item 13: Switch Type VI (24 port 10/100/1000 Mbps Base T & 4 port SFP) (AC Type) Technical Specification

S.No.	Description	Compliance
1	Switch shall be Managed, Non-PoE	
2	Should have 24 Number of 1G Copper Ports	
3	Should have 4 No. of 1 G SFP Port (Uplink)	
4	Switch should have Redundant Power supply (from day one) (AC & - 48V DC)	
5	Switching Capacity shall be Non Blocking 56 Gbps	
6	Switch Throughput shall be minimum 41.67 MPPS	
7	Switch should have the following Basic Layer-3 Protocol: Static route IPv4 & IPv6	
8	Switch should have the following Security Features: SSH v1/v2, SSL v1/v2/v3 , Port Security , Up to 64 MAC addresses per port	
9	Should support the following Management Protocol: CLI, GUI, Telnet, SNMP	
10	Switch should have (RJ-45 Type) Console port	
11	Switch Should support Quality of Service (QoS) features viz: CoS based on, Switch port , 802.1p priority , VLAN ID, MAC address, Ether Type	
12	Switch should comply to following performance parameters: i) Operating Temperature - min 0 to 50 °C ii) Minimum Operating Humidity (%RH) 10 - 95	
13	Switch should have EMI CERTIFICATE of FCC/IC /CE	
14	Switch should have SAFETY CERTIFICATE of UL	
15	The operating system of the Switches series/family shall have MEF-9 & 14 or higher certification from authorized agencies	
16	On Site OEM Warranty (Year) - 5 years	
17	Switch should support ERPS protocol	
18	Switch should support DHCP Server.	
19	Switch should support 6kv surge for Ethernet ports	
20	On Site OEM Warranty (Year) - 5 years	
21	Use of third party optics should not be locked for all interfaces	

SOR item 14: Switch Type VII (L2 Non POE (20 ports 1G SFP, 4 Port 1G combo (SFP & RJ-45) & 4 port 10 G SFP+ port having Internal Redundant / Dual AC & -48V DC (1+1)) Technical Specification

SN	Description	Compliance
1	Should have 20 ports SFP Based Gigabit ports & 4 Port 1G combo (SFP & RJ-45)	
2	Should have support for 4 ports SFP+ Based 10G ports.	
3	Should have at least 120 Gbps switching fabric.	
4	Packet forwarding rates 90 million PPS	
5	Should support at least 16K entries in the MAC table.	
6	Should Support 255 minimum VLANs.	
7	Should have AC and DC power supply arrangement as given below in chassis without any external adaptors :	
	i. AC Power Supply 100 to 240 V AC with 50 to 60 Hz	
	ii. -48V DC supply	
	DC power supply should work as a redundant power supply to power-on the switch in case failure of AC power supply.	
8	Should support Dual Images.	
9	Should support Optical Transceiver Digital Diagnostic Monitoring for All SFP ports of 1G and 10G	
10	Should support port mirroring and jumbo frame.	
	Should support following for min. 64 Groups :	
11	i. IGMP Snooping,	
	ii. IGMP v1/v2/v3 awareness Snooping,	
	iii. IGMP Snooping Queried.	
12	Should support RSTP, MSTP, spanning-tree root guard, Port Fast and BPDU Guard/Filter or similar functionalities.	
13	Should support following security features viz.:	
	i. Web Management (HTTPS),	
	ii. Broadcast/Multicast/Unicast Storm Control,	
	iii. DoS Attack Prevention	
14	Switch should support following SNMP traps or syslog	
	i. Interface UP & Down	
	ii. Optical power SFP threshold alarms	
	iii. STP Topology Changes and New root bridge	
	iv. LLDP table changes	
	v. Threshold alarms for Temperature.	
	vi. Ethernet OAM SNMP alarms.	
15	Switch should comply to following Temperature performance parameters :	
	i. Operating Temperature - min 0 to 50 °C	

	ii. Storage Temperature - min -0 to 70 °C (-40 to 158 °F)	
16	It shall support MAC address notification to allow administrators to be notified of users added to or removed from the network.	
17	The switch shall be designed for continuous operations.	
18	IPv6/v4-L3 and IPv6-Multicast functionalities/features for Switches are desired but not mandatory.	
19	Safety Requirement :-	
	Switch should have safety compliance of UL.	
20	Electromagnetic Compatibility (EMC) Requirements:-	
	Switch should have EMC compliance of CE and FCC.	
21	The LAN switch shall support a console port or auxiliary/Ethernet port for the purpose of local and remote configuration and diagnostics.	
22	The LAN switch shall support built in power diagnostics system to detect hardware failures.	
23	IPv6 feature should be ready from day 1.	
24	Qualitative Requirements:-	
	i. The MTBF (Mean Time Between Failure) and MTTR (Mean Time To Repair) predicted and observed values shall be furnished along with calculations by the manufacturer.	
25	Switch should support following Metro Ethernet Features:	
	i. Q in Q , Double VLAN (Q-in-Q) ,Port-based Q-in-Q and VLAN Translation	
	ii. IEEE 802.1ag Ethernet OAM: Connectivity Fault Management	
	iii. Ethernet OAM compliant with IEEE 802.3ah/Y.1731	
	iv. ITU-T G.8032 Ethernet Ring Protection designed for loop protection and fast convergence times (sub 50 ms) in ring topologies.	
	v. L2 Protocol Tunneling.	
	vi. Loopback Detection	
26	The operating system of the Switches category/series/family should be MEF-9/14 or CE (Carrier Ethernet) Certified/compliant.	
27	Use of third party optics should not be locked for all interfaces	
28	On Site OEM Warranty (Year) - 5 years	
29	Should support ERPS protocol.	

SOR item 15: Switch Type VIII (PoE Switch layer 3 Port 24) Technical Specification

S No	Description	Compliance
1	Should have 20 Number of Access /Downlink 10/100/1000 Base-T Ports having + 4 ports as combo ports 10/100 / 1000Base-T / SFP	

2	Should have 4 Number of Multi-Gigabit Ports (10 G SFP+ Port (Uplink)	
3	Switch shall support PoE IEEE 802.3af/at. Min 370 W from daye and option to upgrade 740W with redundant power supply.	
4	Should have at least 120 Gbps switching fabric.	
5	Should support port Trunking of at least 4 nos. GE/10GE ports.	
6	Should support GUI,CLI, Telnet, TFTP, SNMPv1, SNMPv2/ V2C, SNMPv3, NTP, Open flow 1.3, RMON, SSHv2, Single IP Management, DLDP/ UDLD	
7	Should support 802.1Q VLAN, LACP, STP, MSTP, RSTP, VLAN Layer 2 Protocols	
8	Should support the following Basic Layer-3 Protocol from day 1: Static Routing, RIPv1, RIPv2, BGP, OSPFv2, OSPFv3, RIPng, PBR	
9	Should support the following Layer-3 Protocol from day 1: OSPFv2, OSPFv3, PBR, BGP, BGP4, IS-IS, IS-ISv6, PIM-SM, PIM-SSM, PIM-DM	
10	Should support the following Layer-3 Protocol from day 1: MPLS, BGP, BGP4, IS-IS, IS-ISv6, PIM-SM, PIM-SSM, VRF Lite, VRF, PIM-DM, VRRP	
11	Should have the following security features: RA Guard, DHCP Snooping, Dynamic ARP Inspection, ACL,802.1x, RADIUS/ TACACS, Port Security, BPDU Guard, VRF Lite, IGMP snooping	
12	Should have Management Port/Console and RJ-45 out of band management port	
13	Should have minimum RAM 1024 MB.	
14	Should have minimum Flash Memory 1024 MB.	
15	Should support minimum (12K) MTU	
16	Should have Redundant Power supply (i) AC Power Supply 100 to 240 V AC with 50 to 60 Hz ii) -48V DC supply	
17	Should support at least 64000 entries in the MAC table.	
18	Should support minimum 4,000 Number of VLAN / VLAN IDs	
19	Should support minimum 10,000 IPv4 routing table	
20	Should support minimum 5,000 IP v6 routing table	
21	Should support minimum 95.24 MBPS Throughput / Forwarding Performance (MPPS)	
22	Switch Should support Quality of Service (QoS) features viz: 802.1p, SP, Queues per port, WRED/ WTD, Sflow, (NTP), Policing / Rate Limiting	
23	Switch IP v6 ready from day One.	
24	"OEM should have a : i) valid ISO 9000 & ISO 14000 certification on the date of opening of bid" or	
25	Switch should comply to following performance parameters: i) Operating Temperature - min 0 to 50 °C	

	ii) Minimum Operating Humidity (%RH) 10 - 95	
26	Switch should have EMI CERTIFICATE of FCC/IC /CE	
27	Switch should have SAFETY CERTIFICATE of UL	
28	The operating system of the Switches series/family shall have MEF-9 & 14 or higher certification from authorized agencies	
29	Should have minimum warranty of 5 years	
30	Switch should support ERPS protocol	
31	Switch should support Flex Link.	
32	Switch should support 6kv surge for Ethernet ports	
33	On Site OEM Warranty (Year) - 5 years	
34	Use of third party optics should not be locked for all interfaces	

SOR item 16: Switch Type IX (Access switch 4port 10G SFP+ port and 24 port 1G SFP ports Technical specification)

S.N.	Description	Compliance
1	Should have 24 ports SFP Based Gigabit ports.	
2	Should have support for 4 ports SFP+ Based Gigabit ports.	
3	Should have at least 120 Gbps switching fabric	
4	Packet forwarding rates 90 million PPS	
5	Should support at least 16Kentries in the MAC table.	
6	Should Support 255 minimum VLANs.	
7	Should support MTU size of 9216 bytes.	
8	Should have AC and DC power supply arrangement as given below in chassis without any external adaptors :	
	i. AC Power Supply 100 to 240 V AC with 50 to 60 Hz	
	ii. -48V DC supply	
	DC power supply should work as a redundant power supply to power-on the switch in case failure of AC power supply.	
9	Should support Dual Images.	
10	Should support Optical Transceiver Digital Diagnostic Monitoring for all SFP ports of 1G and 10G	
11	Should support port mirroring and jumbo frame.	
	Should support following for min. 64 Groups :	
12	i. IGMP Snooping,	
	ii. IGMP v1/v2/v3 awareness Snooping,	
	iii. IGMP Snooping Queried.	
13	Should support RSTP ,MSTP , spanning-tree root guard, Port Fast and BPDU Guard/Filter or similar functionalities.	
14	Should support following security features viz.:	
	i. Web Management (HTTPS),	
	ii. Broadcast/Multicast/Unicast Storm Control,	

	iii. DoS Attack Prevention	
15	Switch should support following SNMP traps or syslog	
	i. Interface UP & Down	
	ii. Optical power SFP threshold alarms	
	iii. STP Topology Changes and New root bridge	
	iv. LLDP table changes	
	v. Threshold alarms for Temperature.	
	vi. Ethernet OAM SNMP alarms.	
16	Switch should comply to following Temperature performance parameters :	
	i. Operating Temperature - min 0 to 50 °C	
	ii. Storage Temperature - min -0 to 70 °C (-40 to 158 °F)	
17	It shall support MAC address notification to allow administrators to be notified of users added to or removed from the network.	
18	The switch shall be designed for continuous operations.	
19	IPv6/v4-L3 and IPv6-Multicast functionalities/features for Switches are desired but not mandatory.	
20	Safety Requirement :-	
	Switch should have safety compliance of UL.	
21	Electromagnetic Compatibility (EMC) Requirements:-	
	Switch should have EMC compliance of CE and FCC.	
22	The LAN switch shall support a console port or auxiliary/Ethernet port for the purpose of local and remote configuration and diagnostics.	
23	The LAN switch shall support built in power diagnostics system to detect hardware failures.	
24	IPv6 feature should be ready from day 1.	
25	Qualitative Requirements:-	
	i. The MTBF (Mean Time Between Failure) and MTTR (Mean Time To Repair) predicted and observed values shall be furnished along with calculations by the manufacturer.	
26	Switch should support following Metro Ethernet Features:	
	i. Q in Q , Double VLAN (Q-in-Q) ,Port-based Q-in-Q and VLAN Translation	
	ii. IEEE 802.1ag Ethernet OAM: Connectivity Fault Management	
	iii. Ethernet OAM compliant with IEEE 802.3ah/Y.1731	
	iv. ITU-T G.8032 Ethernet Ring Protection designed for loop protection and fast convergence times (sub 50 ms) in ring topologies.	
	v. L2 Protocol Tunneling.	
	vi. Loopback Detection	
27	The operating system of the Switches category/series/family should be MEF-9/14 or CE (Carrier Ethernet) Certified/compliant.	
28	Should support ERPS protocol.	

29	On Site OEM Warranty (Year) - 3 years	
30	Use of third party optics should not be locked for all interfaces	

SOR item 17: SFP+ 10G 10 KM Dual Fiber Technical Specification

1. Should be compatible with OEM equipments like Cisco Juniper, Edgecore and D Link. IT should be MSA Complaint.
2. Should support minimum 10 km optical distance on Single mode Fiber (ITU-G 652D) should have LC type connector.
3. Should have 10 Gigabit Ethernet throughput on single mode fiber.
4. Important Parameters:
 - A. Link Budget (Max Tx Power- Receiver Sensitivity) 5 dB or better.
 - B. Transceiver supply voltage: 3.3 V (Nominal)
 - C. The case operating temperature -20 Degree Centigrade to +70 Degree Centigrade.
 - D. The storage Temp: -40 Degree Centigrade to +85 Degree Centigrade
 - E. Wavelength- 1310nm (Nominal)
5. Should support Digital Diagnostic Monitoring (MSA-SFF 8472 Compliant) feature with following operating parameters:
 - A. Transceiver temperature
 - B. Laser bias current
 - C. Launch Optical Power
 - D. Received optical power
 - E. Transceiver supply voltage:
 - F. It will provide alarm and warning flags to alert the user when particular operating parameters are outside of a factory set normal range.
6. Complies with SFF-8431/8432 SFP+ MSA (Multi-Source Agreements Standards)
7. Applications- 10 Gbps Ethernet
8. Performance Certificate: The bidder will submit a satisfactory performance certificate from Telecom Service Provider/ISP/Govt/PSU for the offered make of the SFP.
9. Regulatory Compliance:
 - A. EMI/EMC compatible with FCC/EN/IEC
 - B. Laser Safety compatible with FDA/EN/IEC
 - C. RoHS compliant

SOR item 18 : SFP+ 10G 10KM BIDI Technical Specification

Parameter	Value
Module Form Factor	SFP
Aggregate Data Rate	10 Gb/s or more
Link Length Support	10 Km or more
Protocols Supported	Ethernet
Fiber type	Single Fibre, Simplex LC Connector
temperature range	-40°C to +85°C
Power dissipation	< 1.5W
Receiver Sensitivity (OMA) @ 10.5Gb/s	Max -12.6 Dbm or better
Wavelength Range	1260-1340 nm
Average Launch Power Transmitter	Min. -8.2 dbm & Max +0.5 Dbm or better
Built in Digital Diagonistic Function	YES
Should have RoHS Compliant	YES
OEM must have ISO 9001 & 14001 Certificates	YES
Should have RoHS-6 Compliant	
Should have XLPPI Electrical Interface	
Built in Digital Diagonistic Function	
OEM must have ISO 9001 & 14001 Certificates	
Product must be IEC 60825(Laser Safety) and IEC 60950(Electrical Safety) certified by CSA or equivalent	
Manufacturer should be able to provide Factory test report for supplied transceiver parts.	
SFP should support all OEM Vendors devices and open all optic ports	

SOR item 19 : SFP+ 10G 40 KM BIDI Technical Specification

1. Should be compatible with OEM equipments like Cisco Juniper, Edgecore and D Link. IT should be MSA Complaint.
2. Should support minimum 40 km optical distance on Single Fiber (ITU-G 652D) (Bi Directional on Single Mode Fiber).
3. Should have LC type connector.
4. Should provide quantity in such a way that matching pair (BX U & D) can be achieved.
5. Should have 10 Gigabit Ethernet throughput on single mode fiber.
6. Important Parameters:

A. Link Budget (Max Tx Power- Receiver Sensitivity) 19 dB or better.

- B. Transceiver supply voltage: 3.3 V (Nominal)
 - C. The case operating temperature -20 Degree Centigrade to +70 Degree Centigrade.
 - D. The storage Temp: -40 Degree Centigrade to +85 Degree Centigrade
 - E. Wavelength- 1270/1330 or 1550/1310 (Nominal)
7. Should support Digital Diagnostic Monitoring (MSA-SFF 8472 Compliant) feature with following operating parameters:
- A. Transceiver temperature
 - B. Laser bias current
 - C. Launch Optical Power
 - D. Received optical power
 - E. Transceiver supply voltage:
 - F. It will provide alarm and warning flags to alert the user when particular operating parameters are outside of a factory set normal range.
8. Complies with SFF-8431/8432 SFP+ MSA (Multi-Source Agreements Standards)
9. Applications- 10 Gbps Ethernet
10. Performance Certificate: The bidder will submit a satisfactory performance certificate from Telecom Service Provider/ISP/Govt/PSU for the offered make of the SFP.
11. Regulatory Compliance:
- A. EMI/EMC compatible with FCC/EN/IEC
 - B. Laser Safety compatible with FDA/EN/IEC
 - C. RoHS compliant
12. SFP should support all OEM Vendors devices and open all optic ports

SOR item 20 : SFP 1G 40 KM BIDI Technical Specification

- 1. Should be compatible with OEM equipments like Cisco Juniper, Edgecore and D Link. IT should be MSA Complaint.
- 2. Should support minimum 40 km optical distance on Single Fiber (ITU-G 652D) (Bi Directional on Single Mode Fiber).
- 3. Should have LC type connector.
- 4. Should have 1 Gigabit Ethernet throughput on single mode fiber.
- 5. Important Parameters:
 - A. Link Budget (Max Tx Power- Receiver Sensitivity) 19 dB or better.
 - B. Transceiver supply voltage: 3.3 V (Nominal)
 - C. The case operating temperature -20 Degree Centigrade to +70 Degree Centigrade.
 - D. The storage Temp: -40 Degree Centigrade to +85 Degree Centigrade
 - E. Wavelength- 1270/1330 or 1550/1310 or 1490/1550

6. Should support Digital Diagnostic Monitoring (MSA-SFF 8472 Compliant) feature with following operating parameters:
 - A. Transceiver temperature
 - B. Laser bias current
 - C. Launch Optical Power
 - D. Received optical power
 - E. Transceiver supply voltage:
 - F. It will provide alarm and warning flags to alert the user when particular operating parameters are outside of a factory set normal range.
7. Complies with SFF-8431/8432 SFP+ MSA (Multi-Source Agreements Standards)
8. Applications- 1 Gbps Ethernet
9. Performance Certificate: The bidder will submit a satisfactory performance certificate from Telecom Service Provider/ISP/Govt/PSU for the offered make of the SFP.
10. Regulatory Compliance
 - A. EMI/EMC compatible with FCC/EN/IEC
 - B. Laser Safety compatible with FDA/EN/IEC
 - C. RoHS compliant
11. SFP should support all OEM Vendors devices and open all optic ports

SOR item 21: SFP 1G 10KM BIDI Technical Specification

1. Should be compatible with OEM equipments like Cisco Juniper, Edgecore and D Link. IT should be MSA Compliant.
2. Should support minimum 10 km optical distance on Single Fiber (ITU-G 652D) (Bi Directional on Single Mode Fiber).
3. Should have LC type connector.
4. Should provide quantity in such a way that matching pair (BX U & D) can be achieved.
5. Should have 1 Gigabit Ethernet throughput on single mode fiber.
6. Important Parameters:
 - A. Link Budget (Max Tx Power- Receiver Sensitivity) 5 dB or better.
 - B. Transceiver supply voltage: 3.3 V (Nominal)
 - C. The case operating temperature -20 Degree Centigrade to +70 Degree Centigrade.
 - D. The storage Temp: -40 Degree Centigrade to +85 Degree Centigrade
 - E. Wavelength- 1270/1330 or 1550/1310 or 1490/1550
7. Should support Digital Diagnostic Monitoring (MSA-SFF 8472 Compliant) feature with following operating parameters:
 - A. Transceiver temperature

- B. Laser bias current
 - C. Launch Optical Power
 - D. Received optical power
 - E. Transceiver supply voltage:
 - F. It will provide alarm and warning flags to alert the user when particular operating parameters are outside of a factory set normal range.
8. Complies with SFF-8431/8432 SFP+ MSA (Multi-Source Agreements Standards)
9. Applications- 1 Gbps Ethernet
10. Performance Certificate: The bidder will submit a satisfactory performance certificate from Telecom Service Provider/ISP/Govt/PSU for the offered make of the SFP.
11. Regulatory Compliance
- A. EMI/EMC compatible with FCC/EN/IEC
 - B. Laser Safety compatible with FDA/EN/IEC
 - C. RoHS compliant
12. SFP should support all OEM Vendors devices and open all optic ports

SOR item 22 : SFP 1G 10KM Dual Fiber Technical Specification

- 1. Should be compatible with OEM equipments like Cisco Juniper, Edgecore and D Link. IT should be MSA Compliant.
- 2. Should support minimum 10 km optical distance on Single mode Fiber (ITU-G 652D) Should have LC type connector.
- 3. Should have 1 Gigabit Ethernet throughput on single mode fiber.
- 4. Important Parameters:
 - A. Link Budget (Max Tx Power- Receiver Sensitivity) 5 dB or better.
 - B. Transceiver supply voltage: 3.3 V (Nominal)
 - C. The case operating temperature -20 Degree Centigrade to +70 Degree Centigrade.
 - D. The storage Temp: -40 Degree Centigrade to +85 Degree Centigrade
 - E. Wavelength- 1310nm
- 5. Should support Digital Diagnostic Monitoring (MSA-SFF 8472 Compliant) feature with following operating parameters:
 - A. Transceiver temperature
 - B. Laser bias current
 - C. Launch Optical Power
 - D. Received optical power
 - E. Transceiver supply voltage:
 - F. It will provide alarm and warning flags to alert the user when particular operating parameters are outside of a factory set normal range.

6. Complies with SFF-8431/8432 SFP+ MSA (Multi-Source Agreements Standards)
7. Applications- 1 Gbps Ethernet
8. Performance Certificate: The bidder will submit a satisfactory performance certificate from Telecom Service Provider/ISP/Govt/PSU for the offered make of the SFP.
9. Regulatory Compliance
 - A.EMI/EMC compatible with FCC/EN/IEC
 - B.Laser Safety compatible with FDA/EN/IEC
 - C. RoHS compliant
10. SFP should support all OEM Vendors devices and open all optic ports

SOR item 23 : SFP+ 10G 60KM BIDI Technical Specification

1. Should be compatible with OEM equipments like Cisco Juniper, Edgecore and D Link. IT should be MSA Compliant.
2. Should support minimum 60 km optical distance on Single Fiber (ITU-G 652D) (Bi Directional on Single Mode Fiber).
3. Should have LC type connector.
4. Should provide quantity in such a way that matching pair (BX U & D) can be achieved.
5. Should have 10 Gigabit Ethernet throughput on single mode fiber.
6. Important Parameters:
 - A. Link Budget (Max Tx Power- Receiver Sensitivity) 25 dB or better.
 - B. Transceiver supply voltage: 3.3 V (Nominal)
 - C. The case operating temperature -0 Degree Centigrade to +70 Degree Centigrade.
 - D. The storage Temp: -40 Degree Centigrade to +85 Degree Centigrade
 - E. Wavelength- 1270/1330 or 1310/1550 or 1490/1550 (Nominal)
7. Should support Digital Diagnostic Monitoring (MSA-SFF 8472 Compliant) feature with following operating parameters:
 - A. Transceiver temperature
 - B. Laser bias current
 - C. Launch Optical Power
 - D. Received optical power
 - E. Transceiver supply voltage:
 - F. It will provide alarm and warning flags to alert the user when particular operating parameters are outside of a factory set normal range.
8. Complies with SFF-8431/8432 SFP+ MSA (Multi-Source Agreements Standards)
9. Applications- 10 Gbps Ethernet

10. Performance Certificate: The bidder will submit a satisfactory performance certificate from Telecom Service Provider/ISP/Govt/PSU for the offered make of the SFP.
11. Regulatory Compliance
- A. EMI/EMC compatible with FCC/EN/IEC
 - B. Laser Safety compatible with FDA/EN/IEC
 - C. RoHS compliant
12. SFP should support all OEM Vendors devices and open all optic ports

SOR item 24 : SFP 40G 40KM Dual Fibre Technical Specification

Parameter	Value
Module Form Factor	QSFP+
Aggregate Data Rate	40 Gb/s
Link Length Supported	40 Km.
Protocols Supported	Typical applications include OTN OTU3, 40G Ethernet, Infiniband, Fibre Channel, SATA/SAS3
Fiber type	Dual Fibre, Duplex LC Connector
Operating temperature range	0°C to 70°C
Storage Temperature Range	- 40°C to 85°C
Power dissipation	< 3.5W
Average Launch Power	- -2.7 dBm to 4.5 dBm
Receiver Sensitivity	- 19 dBm or better
Should have RoHS-6 Compliant	
Should have XLPPI Electrical Interface	
Built in Digital Diagnostic Function	
OEM must have ISO 9001 & 14001 Certificates	
Product must be IEC 60825(Laser Safety) and IEC 60950(Electrical Safety) certified by CSA or equivalent	
Manufacturer should be able to provide Factory test report for supplied transceiver parts.	
SFP should support all OEM Vendors devices and open all optic ports	

SOR item 25: XFP 10G 10KM Dual Fiber Technical Specification

Parameter	Value
Module Form Factor	XFP
Aggregate Data Rate	10 Gb/s
Maximum Link Length	10 Km.
Protocols Supported	OTN/FEC protocols OTU1e & OTU2e
Fiber type	Dual Fibre, Duplex LC Connector

temperature range	-5°C to 70°C
Power dissipation	< 1.5W
Receiver Sensitivity (OMA) @ 10.5Gb/s	Max -12.6 Dbm
Transmitter & Dispersion Penalty (TDP)	Max 3.2 Dbm
Average Launch Power	Min. -6.0 dbm & Max 0.5 Dbm
Should have RoHS-6 Compliant	
Should have XLPPI Electrical Interface	
Built in Digital Diagnostic Function	
OEM must have ISO 9001 & 14001 Certificates	
Product must be IEC 60825(Laser Safety) and IEC 60950(Electrical Safety) certified by CSA or equivalent	
Manufacturer should be able to provide Factory test report for supplied transceiver parts.	
SFP should support all OEM Vendors devices and open all optic ports	

SOR item 26: 2*12F SC type FMS Technical Specifications

The FMS should be confirming to TEC NO.: GR/FDM-01/02/APR-2007 (Type-I) with latest amendment No. TEC/T/OFC-FDMS/149/2012. However, the FMS should have the following:

- i) It should be mountable in standard 19" rack and of slider type.
- ii) There should be arrangement of termination of 48/24/12/6 Nos. of fibers (as per SOR).
- iii) It should be supplied with 48/24/12/6 Nos. of pigtails of respective type of connector (as per SOR) of minimum 3 meter length.
- iv) Colour coded pigtails (900 μ n tight jacket) shall be provided for easy identification.
- v) The FMS should be supplied with arrangement of required Nos. of adapters (as per SOR).
- vi) The adaptors shall be fixed in such a way that these shall be easily accessible protecting the eye from direct exposure to laser.
- vii) There should be minimum two nos. of trays for the provision of termination of the fibers & sufficient space for routing of the fibers in the trays.
- viii) Trays shall be numbered bottom to top (tray no. 1 is lower most).
- ix) Pigtails shall follow tray numbering.
- x) Pigtails shall be labeled through colour coding/ferruling.
- xi) Adaptors shall be numbered Bottom to Top or Left to Right in ascending order.
- xii) All adaptors shall be provided with dust protection caps.
- xiii) Important Do's and Don'ts about the operation of the FMS shall be clearly indicated at convenient place on the FMS.
- xiv) Insertion Loss: ≤ 0.3 dB
- xv) Return Loss: ≥ 45 dB
- xvi) The FMS shall be manufactured as per latest state of art technology.
- xvii) The FMS shall be protected against the entry of dust and insects, rodents etc.

- xviii) Body should be of MS steel; powder coating painting (min. 70 micrometer thickness) shall be provided with rust resistance paint.
- xix) **Marking:** The marking on the system shall be indelible and following minimum information shall be provided by way of engraving or Laser printing method:
 - a) "RAILTEL" should be written on each FMS to be visible from front.
 - b) Manufacturer's name & date/ year of production.
 - c) Model No./Batch No./ Serial No.
 - d) Capacity i.e. No. of cables and the fibers.
 - e) Identification details/ cables/ Fiber/ labeling facility.
- xx) Preferred type of connector is SC/APC for all connectors.

SOR item 27: AC to DC Converter Technical Specifications

Features:-

- AC input range selectable by switch
- Protections- Short circuit/ Overload/ Over voltage/ Over temperature
- Forced air cooling by built-in DC fan
- Withstand 300vac surge input for 5 seconds
- Built-in cooling fan Off-On control
- Built-in constant current limiting circuit
- 100% full load burn in test.
- Led indicator for power on.
- Fixed switching frequency at 900KHz
- Low cost, high reliability
- 5 yrs warranty

Specification:-

- OUTPUT DC Voltage- 48V:
- Rated Current- 7.3A :
- Rated Power- 350.4W
- Setup Rise Time - 1000ms, 50ms/230VAC 1000ms,50ms/115VAC at full load
- INPUT Voltage Range- 90 ~ 132VAC / 180 ~ 264VAC by switch 254 ~ 370VDC
- Efficiency- 87.5% : Frequency Range- 47 ~ 63Hz
- AC Current - 7A/115VAC 4A/230VAC : Leakage Current- <3.5mA / 240VAC
- Overload- 105 ~ 135% rated output power
- Protection type - Constant current limiting, recovers automatically after fault condition is removed
- Over Voltage- 57.6 ~ 67.2V
- Over Temperature- 90°C•} 5°C (3.3~7.5V); 85°C•} 5°C (12~15V); 80°C•} 5°C(24V); 75°C•} 5°C (27~48V) (TSW1) Detect on case
- Function- Fan off/on control - RTH2≥50°C FAN ON, ≤45°C FAN OFF (3.3 ~ 7.5V)
- Working Temperature- -20 ~ +60°C(Refer to output load derating curve)
- Working Humidity - 20 ~ 90% RH non-condensing
- Safety Standards - UL60950-1 approved
- Withstand Voltage - I/P-O/P:3KVAC I/P-FG:2KVAC O/P-FG:0.5KVAC

- Isolation Resistance - I/P-O/P, I/P-FG, O/P-FG:100M Ohms/500VDC / 25°C/ 70% RH
- MTBF - 234.3K hrs min. MIL-HDBK-217F (25°C)

SOR item 28: Rack 19" 9U Technical specification

S N	SPECIFICATION	COMPLIANCE
1	19" Rack: 9U 600mmwidth/500mm depth, Steel frame structure design, metal top cover with 2 fan provision and cable entry provision covered with edge protected rubber grommet, bottom cover with cable entry provision covered with edge protected rubber grommet provide , Powder coated finish Texture Matt – 60 to 80Um	
2	Corrosion Resistance: Salt spray test according to ISO 9227 (NSS test) and IEC EN 60068-2-11 (Ka test) for 168 hours: degree of Rusting Ri1 according to ISO 4628-3, propagation ≤1 mm according to ISO 4628-8.	
3	Front glass single door with cam lock & key	
4	Front panel mounting hardware. – 1 No.	
5	Cantilever Tray 255mm D – 1 No.	
6	230V A/C 90 CFM fan mounted on top cover - 2 Nos.	
7	PDU 6 sockets 6A Sockets– 1 No.	
8	Horizontal Cable Manager 1U with PVC loops – 1 No.	

SOR item 29 : Rack 19" 6U Technical Specifications

- Supply of Outdoor 19"-6Ux 600D wall mount industrial heavy duty racks.
- Racks shall have front glass door, side openable & removable doors with proper ventilation with inbuilt lock-key arrangement at each door
- Inside of rack four AC operated 90 CFM fans and spike guard with fuse with pole brackets, clamps and other fixing accessories.

SOR item 30 : UPS 2.0 KVA Technical Specifications

- OUTPUT :- Output Power capacity 1000VA , Nominal output voltage 230V, (Note configurable for 220 : 230 or 240 nominal output voltage) Efficiency at full load 89.0%, Output voltage distortion Less than 3%, output frequency (sync to mains) 50/60 Hz +/- Hz user adjustable +/-0.1, Other output voltages 220, 240 Crest factor 3:1, Topology Double conversion Online, Waveform Type pure Sine Wave Output
- INPUT: Input output voltage range for main operations 160-280V, Input Voltage adjustable range for mains operation 100- 280 Volts
- Operating Environment 0 - 40Deg. C, Operating relative humidity 0-95%
- Management & amp; control: Interface port(s) DB-9 RS-232, Control panel- LED status display with load and/o battery bar- graphs and online : on battery : replace battery : overload and bypass indicators, Audible alarm

5. Internal batteries (Maintenance- free sealed Lead- acid battery with suspended electrolyte : leak proof),
6. Warranty: Onsite for 5 years

Note :- In the specification wherever support for a feature has been asked for, it will mean that the feature should be available without RailTel requiring any other hardware/software/licenses. Thus all hardware/software/licenses required for enabling the support/feature shall be included in the offer.

Annexure-II

RGM/WR
RailTel Corporation of India Ltd.

Dated:

.....
.....
.....

Subject: Manufacturer Authorisation form (MAF) to M/s for
.....

Ref: GeM Bid No. GEM/2021/B/2721331

Dear Sir,

We, M/s....., are established and reputed manufacturer and service provider of
.....(Product details), having our registered office at

.....

We hereby authorise M/s (bidder name), Office
..... to participate in bid and subsequently upon
award of the bid to execute the supply and Installation & Commissioning of our range of
products against your above said bid.

We further extend our warranty for years for our range of products offered by
M/sagainst the above-said bid.

Thanking you,
Best regards,

Authorised Signatory

Annexure-III**FORMAT FOR AFFIDAVIT TO BE UPLOADED BY TENDERER ALONGWITH THE TENDER DOCUMENTS**

(To be executed in presence of Public notary on non-judicial stamp paper of the value of Rs.100/-. The stamp paper has to be in the name of the tenderer) **

I..... (Name and designation)** appointed as the attorney/authorized signatory of the tenderer (including its constituents),
M/s._____ (hereinafter called the tenderer) for the purpose of the Tender documents for the work of

as per the tender No._____ of (-----Railway), do hereby solemnly affirm and state on the behalf of the tenderer including its constituents as under:

- (i) I/We the tenderer (s) am/are signing this document after carefully reading the contents.
- (ii) I/we the tenderer(s) also accept all the conditions of the tender and have signed all the pages in confirmation thereof.
- (iii) I/We hereby declare that I/We have downloaded the tender documents from RailTel's website www.railtelindia.com or GeM Portal gem.gov.in. I/We have verified the content of the document from the website and there is no addition, no deletion or no alteration to the content of the tender document. In case of any discrepancy noticed at any stage i.e. evaluation of tenderers, execution of work or final payment of the contract, the master copy available with the railway Administration shall be final and binding upon me/us.
- (iv) I/We declare and certify that I/we have not made any misleading or false representation in the forms, statements and attachments in proof of the qualification requirements.
- (v) **I/We also understand that my/our offer will be evaluated based on the documents/credentials submitted along with the offer and same shall be binding upon me/us.**
- (vi) **I/We declare that the information and documents submitted alongwith the tender by me/us are correct and I/we are fully responsible for the correctness of the information and documents submitted by us.**
- (vii) I/We undersigned that if the certificates regarding eligibility criteria submitted by us are found to be forged/false or incorrect at any time during process for evaluation of tenders, it shall lead to forfeiture of the tender EMD besides banning of business for five year on entire IR. Further, I/we (*insert name of*

the tenderer) ** _____ and all my/our constituents understand that my/our offer shall be summarily rejected.

- (viii) I/we also understand that if the certificates submitted by us are found to be false/forged or incorrect at any time after the award of the contract, it will lead to termination of the contract, along with forfeiture of EMD/SD and Performance Guarantee besides any other action provided in the contract including banning of business for five year on entire IR.

**DEPONENT
SEAL AND SIGNATURE
OF THE TENDERER**

VERIFICATION

I/We above named tenderer do hereby solemnly affirm and verify that the contents of my/our above affidavit are true and correct. Nothing has been concealed and no part of it is false.

**DEPONENT
SEAL AND SIGNATURE
OF THE TENDERER**

Place:

Dated:

** The contents in Italics are only for guidance purpose. Details as appropriate are to be filled in suitably by tenderer. Attestation before Magistrate/Notary Public.

Annexure -IV

Guarantee Bond for Performance Guarantee
(On Stamp Paper of requisite value)
(To be used by approved Scheduled Banks)

1. In consideration of the RailTel Corporation of India Limited, Registered office at Plate-A, 6th Floor, Office Block, Tower-2, East Kidwai Nagar, New Delhi-110023 and Regional office at RailTel Corporation of India Ltd, Mahalaxmi Railway Microwave Compound, Senapati Bapat Marg, Mahalaxmi- Mumbai- 400 013 (hereinafter called "the RailTel") having agreed to exempt **(Name and address of the Company/ Contractor both Registered and Regional office address)** (hereinafter called "the said Contractor(s)") from the demand, under the terms and conditions of an L.O.A No..... Dated..... [L.O.A Date] made between and RailTel Corporation of India Limited, for [Name of Work/Supply of Materials] (hereinafter called "the said Agreement") of **Performance Guarantee** for the due fulfillment by the said contractor's) of the terms and conditions contained in the said Agreement, or production of a Bank Guarantee for Rs..... (Rs. Only). We, (indicate the name of the Bank and address) hereinafter referred to as "the Bank") at the request of. M/s..... Contractor(s) do hereby undertake to pay the **RailTel** an amount not exceeding Rs. Against any loss or damage caused to or suffered or would be caused to or suffered by the RailTel by reason of any breach by the said Contractor(s) of any of the terms or conditions contained in the said Agreement.
 2. We, Bank (indicate the name of the Bank and address) do hereby undertake to pay the amount due and payable under this Guarantee without any demur, merely on demand from the **RailTel** stating that the amount is claimed is due by way of loss or damage caused to or would be caused to or suffered by the **RailTel** by reason of breach by the said Contractor(s) of any of terms or conditions contained in the said Agreement or by reason of the Contractor(s) failure to perform the said Agreement. Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs.
 3. We, Bank (indicate the name of the Bank and address) undertake to pay to the **RailTel** any money so demanded notwithstanding any dispute or disputes raised by the Contractor(s) / Supplier(s) in any suit or proceedings pending before any court or Tribunal relating thereto our liability under this present being, absolute and unequivocal.
- The Payment so made by us under this Bond shall be a valid discharge of our liability for payment thereunder and the Contractor(s) / Supplier(s) shall have no claim against us for making such payment.
4. We, Bank (indicate the name of the Bank and address) further agree that the Guarantee herein contained shall remain in full force

and effect during the period that would be taken for the performance of the said Agreement and that it shall continue to be enforceable till all the dues of the RailTel under or by virtue of the said Agreement have been fully paid and its claims satisfied or discharged or till **RailTel** certifies that the terms and conditions of the said Agreement have been fully and properly carried out by the said Contractor(s) and accordingly discharges this Guarantee. Unless a demand or claim under the Guarantee is made on us in writing on or before the We shall be discharged from all liability under this Guarantee thereafter.

5. We,(indicate the name of the Bank and address) further agree with the **RailTel** that the **RailTel** shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the Agreement or to extend time of to postpone for any time or from time to time any of the powers exercisable by the **RailTel** against the said contractor(s) and to forbear or enforce any of the terms and conditions relating to the said Agreement and we shall not be relieved from our liability by reason of any such variation, or extension to the said Contractor(s) or for any forbearance, act or omission on the part of **RailTel** or any indulgence by the **RailTel** to the said Contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have affect of so relieving us.
6. This Guarantee will not be discharged due to the change in the Constitution of the Bank or the Contractor(s) Supplier(s).
7. We, (indicate the name of Bank) lastly undertake not to revoke this Guarantee during its currency except with the previous consent of the **RailTel** in writing.
8. Notwithstanding anything contained herein,
 1. Our liability under the Bank guarantee shall not exceed Rs. (In Rupees)
 2. This Bank Guarantee shall be valid up toand
 3. We are liable to pay the guaranteed and or any part thereof under this Bank Guarantee only and only if you serve upon is a written claims or demand or before
..... (date of expiry of guarantee).

Dated the day of 2022 for

.....
(Indicate the name of the Bank)

Witness:

1. Signature
Name
2. Signature
Name

Annexure - V**Consignee Details:**

S.No.	Consignee	Consignee Address	RailTel Region	Items to be delivered
1	Sr. Manager/Tech RCIL/Ahmedabad	RailTel Office, Ahmedabad	Western Region	SOR Item No.29 (20 Qty) only.
2	Ast.GM/Tech RCIL/Nagpur	RailTel Office, Nagpur	Western Region	SOR Item No.29 (20 Qty) only.
3	Ast.GM /Tech RCIL/Bhopal	RailTel Office, Bhopal	Western Region	SOR Item No.29 (20 Qty) only.
4	Sr. Mgr/Stores RCIL/Mumbai	RailTel Office, Mumbai	Western Region	Balance All Items and Quantities.

Note: All the locations/stations name given above are tentative and may change. Successful Bidder may ask the final location with complete address after finalizing the tender. RailTel has the right to change location within RailTel Western Region area & firm has to supply & commission at location given by RailTel.

Annexure-VI

PROFORMA FOR Nil Deviation Component Compliance
Undertaking Letter
(TO BE SIGNED BY BIDDER)

To,
Regional General Manager/WR
RailTel Corporation of India Ltd.
Mahalaxmi, Mumbai-400013

Dear Sir,

Sub: NIL Deviation Compliance for **GeM Bid No.GEM/2022/B/2721331**

Over and above all our earlier conformations and submissions as per your requirements of the bid, we confirm that,

We will ensure our unconditional compliance of all the terms and conditions as mentioned in the Tender document. In case of any deviation, the same should be attached as an Annexure (as per Format given below) to this form. In case of any deviation, RailTel reserves the right to reject the bid without giving any justification. Format of Annexure (Deviation Statement)

S. No.	Clause No. & Chapter No.	Existing Clause of Tender	Proposed Clause	Remarks, if any

All the proposed items to be supplied as per SOR for the technical specifications as mentioned in Annexure-I of Bid.

We hereby certify that the items/materials mentioned in our offer are complete.

We confirm that there is no requirement of any other hardware and software to fulfill requirements as per scope against the bid. If any additional hardware and software is required to meet in scope requirements, then it would be provided by us at no extra cost to RailTel.

Place:

Date:

Seal and signature of the bidder

(This Form along with Annexure (if required) should be on the letterhead of the bidder duly signed by an authorized signatory)

Annexure-VII

Date:2022

MII DECLARATION

To

Regional General Manager/WR
RailTel Corporation of India Ltd.
Mahalaxmi, Mumbai-13

Subject: MII Declaration for SOR item

Tender Ref : GEM BID NO. GEM/2022/B/2721331

Dear Sir,

With reference to above subject and reference, we hereby declare that overall local content for quoted supply items are% Make in India as per the certificates submitted by the OEM.

Place:

Date:

Seal and signature of the bidder
