Part - 1
TENDER DOCUMENT FOR STRUCTURED NETWORK CABLING
AT
NS HOSPITAL, KOLLAM

TENDER NO: NS/TENDER/APRIL/NSMIMS101/IT/2019-20

OPENING DATE: 15/06/2019

On behalf of President of NS Hospital creation of Local Area Network facility at NS Hospital Expansion Block and Service Block inviting tender. The scope of work includes supply, installation, integration, testing and commissioning of Active and Passive network equipment's for Local Area Networking as per attached technical specification and bill of quantity (BoQ).

TENDER NO	NS/TENDER/APRIL/2019-06/15
NAME OF WORK	Structured Network Cabling
LOCATION OF SUPPLY / WORK	Structured Cabling Networking at NS Hospital Expansion Block and Service Block
SALE OF TENDER DOCUMENT	Tender documents can be obtained from IT Department, NS Hospital on all working days (Monday to Saturday) from 9 AM to 5 PM or can be downloaded from http://www.nshospital.org/tender
COST OF TENDER FORM	Rs 1500/- by paying at the office or DD in favor of Secretary, NS Hospital, payable at Kollam. In case of Tender document being downloaded from website, DD should be submitted along with EMD. The tender fees is nonrefundable.
EARNEST MONEY DEPOSIT	EMD of Rs 50,000/- (Rupees Fifty Thousand only) is to be submitted to NS Hospital directly in a separate sealed envelope so as to reach us on or before the due date of opening of tender. The EMD shall be in the form of Demand Draft, drawn in favor of Secretary, NS Hospital payable at Kollam. EMD will be refunded to the unsuccessful bidder after award of the work.
PRE-BID MEETING	A pre-bid meeting with all the prospective bidders is schedule to be held on 07/06/2019 at 14.00 hours at NS Hospital, Kollam. Interested applicants/ firms are invited to attend the same with a written statement of their query.

NOTIFICATION OF AMENDMENTS	As a result of the pre-bid meeting, if the technical specification requires any modification, suitable amendment to the tender document will be issued and the same will form part of the tender document.
SUBMISSION OF TENDER	Submission of tender document accepted only hard copies and its allied print- outs or documentations are to be forwarded to NS Hospital to reach prior opening of tender. All the covers shall be addressed to **The Secretary, NS Hospital, Kollam**. These packs should reach the office of NS Hospital through REGISTERED POST/SPEED POST/By Hand on or before the due date and time of the bid opening.
LAST DATE AND TIME OF TENDER SUBMISSION	11/06/2019 04:00 PM
DATE AND TIME OF OPENING	15/06/2019 11:00 AM
PERIOD OF COMPLETION OF WORK	2 Months

Note: In case of any clarification in with regard to submission of bids please contact Mr. Akhil (Tel: +91 474 2723199) or nsmimskollam@gmail.com.

QUOTATIONS INVITING FOR THE STRUCTURED NETWORK CABLING & SWITCHING AT OUR SERVICE BLOCK & EXPANSION BLOCK

Supply, Installation, Testing, Documentation, and Proving of complete ELV Passives

Client: NS Hospital, Kollam

#	DESCRIPTION OF ELV ITEMS	UNIT	QTY	UNIT RATE	UNIT AMOUNT	GST %	TOTAL
Approved Makes: Panduit, Systimax / Commscope, Molex only (For Copper & OFC Components)						
I.	**ITS Wiring for Data Networking, Security, Wi-Fi, AV, IPTV, NC, & IPABX**						
1	Supply of 4 Pair Solid , CAT6A U/UTP, LSZH 23 AWG, UTP Cable, with Cross (+/x) member pair separator complete as required. 305 Mtrs/Box	Box	125	₹ 0	₹ 0	0.00%	₹ 0
2	Supply of CAT-6A, keystone Information Outlets (White in Colour for Data & TV) complete as required with PVC back box	Nos	659	₹ 0	₹ 0	0.00%	₹ 0
3	Supply of CAT-6A, keystone information outlets for Work-end side, (Blue/Green in Colour for Voice) complete as required with PVC back box.	Nos	135	₹ 0	₹ 0	0.00%	₹ 0
4	Supply of CAT-6A, keystone information outlets for Work-end side, (Red/Orange in Colour for other PoE such as CCTV, WIFI, etc.) with PVC back box.	Nos	96	₹ 0	₹ 0	0.00%	₹ 0
5	Supply of Cat6A Ceiling Connector Assembly (Access Point & Bio Metrics)	Nos	20	₹ 0	₹ 0	0.00%	₹ 0
6	Supply of Face Plates Single Port, Colour: White/Silver	Nos	530	₹ 0	₹ 0	0.00%	₹ 0
	Supply of Face Plates Dual Port, Colour: White/Silver	Nos	180	₹ 0	₹ 0	0.00%	₹ 0
7	Supply of Cat 6A Mounting Patch Cords 1 meter (Yellow/White in Colour for Data)	Nos	470	₹ 0	₹ 0	0.00%	₹ 0
8	Supply of Cat 6A Mounting Cords 2 meter (Yellow /White in colour for Data)	Nos	470	₹ 0	₹ 0	0.00%	₹ 0
9	Supply of Cat 6A Mounting Patch Cords 1 meter (Red/Orange in Colour for other PoE)	Nos	96	₹ 0	₹ 0	0.00%	₹ 0
10	Supply of Cat 6A Mounting Patch Cords 2 meter (Red/Orange in Colour for other PoE)	Nos	96	₹ 0	₹ 0	0.00%	₹ 0
11	Supply of Cat 6A Mounting Cords 1 meter. (Blue/Green in Colour for Voice)	Nos	135	₹ 0	₹ 0	0.00%	₹ 0
12	Supply of Cat 6A Mounting Cords 2 meter. (Blue/Green in Colour for Voice)	Nos	96	₹ 0	₹ 0	0.00%	₹ 0
13	Supply of 1U 24 Ports Cat6A Loaded Patch Panel	Nos	6	₹ 0	₹ 0	0.00%	₹ 0

14	Supply of 1U 48 Ports Cat6A Loaded Patch Panel	Nos	14	₹ 0	₹ 0	0.00%	₹ 0
1	Supply of Indoor/Outdoor Fiber Optic Cable, 12-fiber, loose tube, LSZH, UV stabilized, Single Mode-OS2	Mtrs	600	₹ 0	₹ 0	0.00%	₹ 0
2	Supply of 24 Port LC/UPC Single Mode Fiber Optic Patch Panel, 1U fully loaded.	Nos	2	₹ 0	₹ 0	0.00%	₹ 0
3	Supply of LC-LC, Single mode , Duplex Patch Cord, 3 Meter	Nos	12	₹ 0	₹ 0	0.00%	₹ 0
4	Supply of LC-LC Single mode, Duplex Patch Cord, 2 Meter	Nos	12	₹ 0	₹ 0	0.00%	₹ 0
1	Supply of Indoor/Outdoor Fiber Optic Cable, 12-fiber, loose tube, LSZH, UV stabilized, Multimode-OM3/OM4	Mtrs	600	₹ 0	₹ 0	0.00%	₹ 0
2	Supply of 24 Port LC/UPC Multimode Mode OM4 Fiber Optic Patch Panel, 1U fully loaded.	Nos	4	₹ 0	₹ 0	0.00%	₹ 0
3	Supply of 48 Port LC/UPC Multimode Mode OM4 Fiber Optic Patch Panel, 1U fully loaded.	Nos	1	₹ 0	₹ 0	0.00%	₹ 0
4	Supply of LC-LC, Multimode mode OM4, Duplex Patch Cord, 3 Meter	Nos	24	₹ 0	₹ 0	0.00%	₹ 0
5	Supply of LC-LC Multimode mode OM4, Duplex Patch Cord, 2 Meter	Nos	24	₹ 0	₹ 0	0.00%	₹ 0
1	Supply of 9U 600x600 Wall Mount Cabinet Double Section With four Fan	Nos	1	₹ 0	₹ 0	0.00%	₹ 0
2	Supply of 15U 600x600 Wall Mount Cabinet Double Section With four Fan	Nos	5	₹ 0	₹ 0	0.00%	₹ 0
3	Supply of 19" Cable manger with metal rings and cover - 1U (Box type)	Nos	30	₹ 0	₹ 0	0.00%	₹ 0
4	Supply of 1Ph, 230V, 8A, 2U standard rack mount power distribution unit with 6 X Indian Round Pin 5A, Inlet Plug type 6A Indian Round Pin, 8A Fuse	Nos	2	₹ 0	₹ 0	0.00%	₹ 0
5	Supply of 800Wx1000D Floor Standing Network Cabinet FSC-Black. Front Glass Single Door, Rear Perforated Metal Double Door with Side Panels, Accessories: 4 Fan, 2 Vertical Cable Manger Closed Type, Shelf - 1 No. Mounting kit.	Nos	1	₹ 0	₹ 0	0.00%	₹ 0

6	Supply of Rack mount power distribution unit, 1Ph, 230V, 32A, 50/60Hz, Zero U standard with 10 X Indian Round Pin	Nos	1	₹ 0	₹ 0	0.00%	₹ 0
	Active Switches : Approved Makes: Cisco / HP / Ruckus						
V.	**Active Components**						
1	Supply and Installation, configuration, testing of 24 Port 10/100/1000 PoE Switch	Nos	5	₹ 0	₹ 0	0.00%	₹ 0
2	Supply and Installation, configuration, testing of 48 Port 10/100/1000 PoE Switch	Nos	4	₹ 0	₹ 0	0.00%	₹ 0
3	Supply and Installation, configuration, testing of 48 Port 10/100/1000 Switch	Nos	13	₹ 0	₹ 0	0.00%	₹ 0
4	Supply and Installation, configuration, testing of 24 Port 10/100/1000 Switch	Nos	1	₹ 0			
5	Supply and Installation, configuration, testing of 10G SFP+ to SFP+ 1m DAC Cable	Nos	23	₹ 0	₹ 0	0.00%	₹ 0
6	Supply and Installation, configuration, testing of 10G SFP+ Multimode Transceiver	Nos	12	₹ 0	₹ 0	0.00%	₹ 0
7	Supply and Installation, configuration, testing of 16 Port SFP+ fixed 1000/10000 SFP+ ports; Duplex: 100BASE-TX: half or full; 1000BASE-T Switch	Nos	2	₹ 0	₹ 0	0.00%	₹ 0
8	Supply and Installation, configuration, testing of 40G QSFP+ Single Mode Transceiver	Nos	4	₹ 0	₹ 0	0.00%	₹ 0
VI.	**LABOUR CHARGES FOR THE STRUCTURED NETWORK CABLING**						
1	Quote for the Labour charges separately item wise or lot wise after visiting site.			₹ 0	₹ 0	0.00%	₹ 0

PART – 2

BIDDER/ OEM ELIGIBILITY CRITERIA

1. Bidder should have experience in successfully implementing works of similar nature during the last 5 years. The work execution should be either of the following:
   a. One similar order costing not less than Rs 25 Lakhs
   b. Two similar orders each costing not less than Rs 15 Lakhs.
   [Similar order means "Supply, installation and commissioning of Network". (Bidder to submit copy of PO/Completion Certificate from the Client]

2. The Bidder should be OEM or Authorized Dealer/Distributor/System Integrator of the OEM of the offered product (Bidder to submit documentary proof).

3. The bidder should be in Networking business for a period of Minimum 5 years (supporting documents to be enclosed).

4. The average financial turnover during the last three consecutive financial years should be at least Rs. 50/-lacs per year for similar works.

5. The Bidder should have their service /spares center in Kollam / Kochi / Trivandrum, details of the same should be enclosed. If the Bidder doesn't have a service facility as stated, necessary proof for the understanding with vendor having service centers in Kollam / Kochi / Trivandrum to provide service support to NS Hospital for this project to be enclosed.

6. The OEM/ Bidder should give an undertaking that service & spare support will be provided for at least 3 years, after the specified warranty period on separate commercial terms.

7. The Bidder is required to quote for the complete BOQ. Partial quote are liable to be rejected.

8. Detailed Network Diagram / Solution document of the offered system should be attached along with the final invoice.

9. Bidder/OEM should submit ETL Third party certificate for the performance of Cat-6A channel cabling solution-Components certificate is NOT accepted.

10. Bidder/OEM should have at least One RCDD certified person based in India to monitor the site activities and integration (Relevant certificate with complete details shall be attached along with the BID to contact)

PART - 3

SPECIAL INSTRUCTIONS

1. The Bidder should visit the site with prior appointment and carry out necessary inspection and test/measurement as are necessary before attending the pre-bid meeting and before submitting its bids. All costs associated with such site visit and in preparation and submission of the Bid will have to be bear by the bidder. NS Hospital will in no case be responsible for such costs, regardless of the conduct or outcome of the bidding process.

2. The bidder shall submit only one option, which is best suitable to meet NS Hospital requirements. The bids submitted with more options shall be liable to be rejected.

3. Quotation should clearly specify delivery schedule.

4. Any taxes or statutory levies payable should be shown separately; otherwise quoted price will be treated as all inclusive.

5. Any deviation from NS Hospital's specification of items shall be clearly indicated in quotation itself.

6. The validity of quotation should be for a minimum of 90 days from the bid due date.

7. The Annual turnover of the bidder for the last 3 years may be submitted.

8. The bidder may quote the items, which meets the requirements and specification. In such case, the bidder shall provide the layout, make, model, material specifications, dimensions, brochures, photo catalogues of items quoted along with the bid, if available.

9. Items are to be supplied and installed at NS Hospital Expansion & Service Block.

10. Delivery of material at site and installation including loading and unloading shall be the responsibility of supplier.

11. Bidders are advised to visit and familiarize themselves with the site conditions and concerned areas before submission of tender documents.

12. The bidder should inform acceptance of Purchase Order within three days of receiving the order.

13. Split-up part numbers of each item of the BoQ is to be shown in the financial bid with line item cost.

14. The contract will be awarded to the bidder whose bid has been determined to be eligible and to be substantially responsive to the bid documents and who has offered the lowest evaluated bid.

PART - 4
PAYMENT TERMS

1. Payment Conditions. Up to 10% of the project cost, against Bank Guarantee (Security Deposit) shall be paid as project advance. Balance payments shall be made in three or less instalments. 70% of the total amount shall be cleared within respectable time on supply of complete project BoM/BoQ at each of our site. 20% shall be paid on completion of Final Acceptance Tests and QA. Each of these payments shall be made only against delivery challans and invoices duly signed with official seal and date by authorized the purchaser's officials or our Consultant. Bank Guarantee shall be periodically renewed by our Contractor, and shall be released after the expiry of warranty period or one year of project closure or handing over, whichever is later.

2. Delivery & Installations. The Supply/Installation of the ordered project components shall be completed at our site within 20 days from the issue of Purchase Order. The entire project commitments (including its training, documentations and QA etc.) must be completed, (as per the terms and conditions listed in this document) within 45 days of placement of Purchase Order or Intend.

3. Liquidated Damages (LD). In the event of the Contractor's failure to complete the works on time, or delay in supply the stores/goods and conduct trials, installation of equipment, training, documentation etc. as specified in this project/contract, NS Hospital may, at their discretion, withhold any payment until the completion of the contract. We the BUYER may also deduct from the SELLER / Contractor as agreed, liquidated damages up to the sum of 2.5% of the contract price of the delayed/undelivered stores/services mentioned above for every week of delay or part of a week, subject to the maximum value of the Liquidated Damages being not higher than 10% of the value of delayed stores/ services or test rejections. The product/material or the work is observed to be substandard would invite invoking of LD and a case of rejection even after installation.

PART - 5
ARBITRATION

In the event of any dispute or difference arising between the Contractor and tenderer out of or about the Contract or Tender or documentations or any of the terms and conditions contained therein or as to the interpretation or any other matter, both the parties shall resolve such dispute or difference first by mutual discussions. If any dispute or difference persists, it shall be referred to The President, NS Hospital for arbitration and reconciliation, who will have the freedom to appoint the Arbitrator. The arbitration will be held in Ernakulam and the proceedings shall be conducted in English. The parties to the dispute will instruct the Arbitrator(s) to render a decision within 30 days of the date of their appointment and such a decision shall be binding on both the parties. This Tender and the Contract shall, in all respects, be governed by and construed in all respects in accordance with the laws of the Republic of India.

PART – 6
SCOPE OF INSTALLATION, CONFIGURATION AND INTEGRATION

1. Physical installation and powering of all Active and Passive components as per Network requirement bidder should be informed us in prior for the UPS in lines connections.

2. Proper marking of cable, Safety Sign board/Route marker to be installed for cable laid underground and other miscellaneous work.

3. Any structure, permanent or temporary, dismantled or destroyed during the execution of the work shall be refilled/remake or restore to its original condition by the contractor at his own cost.

4. Any extra electrical points and data points required in the server room shall be provided by the contractor at his own cost.

5. Configuration and Integration of all of Active and Passive components as per the approved implementation plan.

6. Configuration of VLAN and Inter VLAN routing as per implementation plan.

7. Technical write up of the network design and functioning, System and Network architecture diagram, Active and Passive components configuration details, Security implementation.

8. As built network configuration details (port wise) with IP address, subnet, VLAN, port description, etc. for all active components.

9. Security implementation including VPNs, Firewall (Existing) rules, IDS/IPS, ACL details etc.

PART – 7
SCOPE OF TRAINING

1. Training on the Expansion & Service Block building Network design and functioning, Network architecture, Configuration of active components and Security implementation.

2. The training for the Active & Passive should be arranged to the NS Hospital Engineers at least one week.

3. Course material for the above (one copy each per participant) to be provided.

4. Any other Relevant Documentation if any.

5. The training should be conducted certified OEM staff / authorized by them.

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PAR T – 7
SCOPE OF CONDUIT LAYING

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1. Specification for 25mm PVC conduit/casing capping & 32/40 mm HDPE Pipe for outdoor OFC.

2. OFC Route Marker: The marker should be Cast Iron for cable route marking.

3. PVC pipe minimum 25mm dia, ISI mark, HMS grade (2mm thick), accessories for PVC pipes of the same make that of pipe; such as Spacers & Saddles, Couplers, Bends, inspection or non-inspection type (Elbows not allowed), Tees, Junction boxes of required ways and resin / adhesive to make all joints rigid. Black pipe shall not be used for surface type wiring. Permanently Solid Lubricated HDPE Pipes (33 mm inner dia, 40 mm outer dia).

4. Providing and fixing conduits in position of varying sizes (as per site requirements) of ISI rated White PVC conduits or casing cap.

5. Cutting concrete for laying PVC pipes with pull cables for Concealing of Cables and re-plastering surface.

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PART –8
STRUCTURED CABLING TECHNICAL SPECIFICATION

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1.1 System Description

Structured cabling system will be considered for Telephone/Data/Video Communication Network. Fiber Optic components for backbone cabling and Cat-6A based components for horizontal cabling shall be recommended. Following are the passive elements to be covered under Structured Cabling System:

1. Horizontal Cabling

     a. Cat-6A UTP Cable
     b. Cat-6A UTP Outlets.
     c. Face plate (Single and Dual Port)
     d. Cat-6A Patch Panel
     e. Cat-6A Patch Cords
     f. Ceiling Connector Assembly (Access Point & Bio Metric Only)

2. Fiber Backbone Cabling

     a. 12 Core Single mode, OS2 Fiber Optic (Indoor/Outdoor) Cable
     b. 12 Core Multimode, OM3 Fiber Optic (Indoor/Outdoor) Cable
     c. LC-OS2/OM4 Pigtails
     d. Fiber Patch Panel with all accessories

  e. OS2/OM4 Fiber Optic Patch Cords (LC-LC)

  3. Racks & Accessories

   a. Server Room Racks
   b. IDF/MDF Rooms Racks
   c. Wire Manager – Horizontal and Vertical
   d. Cable bundling material
   e. Labels

1.2 Technical specification Shuttered Face Plate

Standard Compliance	Compliance (Yes/No)	Remarks
Shall be available in 1 port and 2 port square versions.		
General Specifications a) Color: White b) Width: 86.36 mm (3.4 in) c) Height: 86.36 mm (3.4 in) d) Depth: 13.72 mm (0.54 in)		
Material shall be high impact, flame retardant, UL-rated 94 V-0, thermoplastic.		
Flammability Rating: UL 94 V-0 Safety Standard: UL Listed		
Shall be compatible with CAT 5e/CAT 6/CAT 6A information outlets.		
Shall have inbuilt shutters to prevent dust to accumulate on the information outlets which are not in use.		

  1. **Specification for CAT 6A LSZH U/UTP Cable**

Cat-6A U/UTP Horizontal Cable	Compliance (Yes/No)	Remarks
The Cable should meet ANSI/TIA 568C.2 Category 6A Specifications		
The cable should consist of Eight 23 AWG bare copper conductors. Copper Clad Aluminum or any other combinations are not allowed		
The weight of the cable box of 1000 Feet should not be less than 36. 90 lb/kft		
Maximum Operating Frequency will be 550 MHz		
Pair Separator shall be Isolator for between pair and within pair to reduce the cross talk and improve performance		
Should have ETL verified for Cat-6A full channel		

Standard Compliance	Compliance (Yes/No)	Remarks
The LSZH Cable should support the following standard to qualify		
ISO/IEC 60332-3-22 Vertical Flame spread test		
The cable and cordage shall be UTP components that do not include internal or external shields, screened components or drain wires.		

2. **Specification for Category 6A Information Outlets**

Standard Compliance	Compliance (Yes/No)	Remarks
All Category 6A outlets shall meet or exceed Category 6A transmission requirements for connecting hardware, as specified in TIA/EIA 568-B.C.2 Commercial Building Telecommunications Cabling Standard and ISO/IEC 11801:2002 Second Edition.		
The Category 6A outlets shall be backward compatible with Category 6, 5E, 5 and 3 cords and cables.		
The Category 6A outlets shall be of a universal design supporting T568 A & B wiring.		
The Category 6A outlets shall be capable of being installed at either a 45^i or a 90^i angle in any M-series modular faceplate, frame, or surface-mounted box avoiding the need for special faceplates.		
The Category 6A outlets shall have improved pair splitters and wider channel for enhanced conductor placement.		
C. Certifications: UL Listed		
The 8-pin modular (RJ-45) jacks shall comply with IEC 60603-7-4.		
The information outlet shall have a Current Rating of 1.5 A at 20°C to support the PoE and PoE+ applications		
The information outlet will have insertion life of 750 cycles minimum.		
The information outlet must be able to accept termination of solid conductors with nominal diameter of between 0.40 mm to 0.64 mm (26 to 22 AWG).		

3. **Specification for CAT 6A LSZH U/UTP RJ45 Patch Cords**

Standard Compliance	Compliance (Yes/No)	Remarks
Patch Cords shall be equipped with 8-pin modular plugs on each end.		
All cords shall be round, and consist of copper conductors, tightly twisted into individual pairs.		
Nominal cordage diameter shall not exceed 7.24 mm.		
Plugs shall be designed with an anti-snag latch to facilitate easy removal during move, add and change processes.		
The cordage sheath shall be made of Low-Smoke, Zero Halogen (LSZH)		
The LSZH version must comply with the following Fire Safety standards:		

Standard Compliance	Compliance (Yes/No)	Remarks
ISO/IEC 60332-3-22: Vertical Flame Spread		
The cordage shall be UTP components that do not include internal or external shields, screened components or drain wires.		
The patch cords will have insertion life of 750 cycles minimum.		

4. **Specification for CAT 6A Jack Panel**

Standard Compliance	Compliance (Yes/No)	Remarks
Cat-6A patch panels shall provide capabilities of registering patch connections made between corresponding panel ports and equipment port		
Copper patch panels shall be available in 24-port and 48-port standard and angled configurations, and a 24-port configuration that supports individual jack modules.		
Patch panels shall be compatible with standards-compliant 60603-7 (RJ45) plugs and shall detect the insertion and removal of compliant plugs into a patch panel port.		
patch panels shall be compatible with mounting on 19" based hardware per EIA-310		

5. **Ceiling Connector Assembly-CCA for connecting Camera**

Standard Compliance	Compliance (Yes/No)	Remarks
The Ceiling Connector Assembly (referred to as CCA) provides a means to connect UTP horizontal cable to a short, single-ended patch cord assembly in the field, the plug ended link may be used to connect to cameras, access points, and other ceiling-mounted devices		
The single Ceiling Connector Assembly shall support for Category 6A, Category 6 and Category 5E cabling solution		
The Ceiling Connector Assembly shall be of a universal design supporting T568 A & B wiring.		
Ceiling Connector Assembly shall available with cordage		
Plug Insertion life shall be 750 times as minimum		
Cordage length will be 18 inch as minimum		

6. **Multimode mode (OM3) indoor/outdoor gel free Fiber-12 Core**

Standard Compliance	Compliance (Yes/No)	Remarks

OM3, Indoor/outdoor, LSZH, UV Stabilized, Single Jacket/Single Armor, Gel-Free, Outdoor Stranded Loose Tube Cable, Corrugated steel tape armor is strong yet flexible, providing additional crush and rodent protection		
Fiber Type, OM3,		
Compression Test Method-IEC 60794-1 E3, Flex Test Method-IEC 60794-1 E6, Impact Test Method-IEC 60794-1 E4, Strain Test Method-IEC 60794-1 E1		
Water Penentration-24 h		
Regulatory Compliance: RoHS 2011/65/EU compliant		
No. of Fibers: 12		

Construction Materials
    a) Jacket Material: LSZH
    b) Armor Type: Corrugated Steel
    c) Number of fibers per tube: 12
    d) Jacket Color: Black
    e) Jacket UV Resistance: UV Stabilized
    f) Subunit Type: Gel-free
    g) No. of Rip cords: 2
    h) Water Swellable Tape: Yes		

Jacket UV Resistance-UV stabilized		

Physical Specifications
    a) Minimum Bend Radius, loaded: 17.3 cm
    b) Minimum Bend Radius, unloaded: 11.5 cm
    c) Tensile Load, long term, Max: 800 N
    d) Tensile Load, short term, Max: 2700 N
    e) Vertical Rise, Max: 740 m		

Mechanical Test Specifications
    a) Compression: 44 N/mm (as per IEC 60794-1 E3)
    b) Flex: 35 Cycles (as per IEC 60794-1 E6)
    c) Impact: 4.41 N-m (as per IEC 60794-1 E4)		

Optical Specifications
Attenuation, Maximum
    a) 1.00 dB/km @ 1300 nm
    b) 3.00 dB/km @ 850 nm
 	
Index of Refraction
    a) 1.479 @ 1300 nm
    b) 1.483 @ 850 nm
 	
1 Gbps Ethernet Distance
    a) 600 m @ 1300 nm
    b) 1020 m @ 850 nm
 	
10 Gbps Ethernet Distance		

a) 300 m @ 850 nm
 	
Bandwidth, Laser, Min.
    a) 500 MHz-km @ 1300 nm
    b) 2000 MHz-km @ 850 nm
 	
Bandwidth, OFL, min.
    a) 500 MHz-km @ 1300 nm
    b) 1500 MHz-km @ 850 nm		

7.   Single mode (OS2) indoor/outdoor gel free Fiber-12 Core

Standard Compliance	Compliance (Yes/No)	Remarks
Shall be Single mode (OS2) indoor/outdoor, Single Jacket, Single Armor, Gel-free, LSZH, UV Stabilized, Zero Water Peak Fiber.		
Qualification Standards: ANSI/ICEA S-87-640, EN 187105 and Telcordia GR-20 Standards Compliance: ITU-T G.652.D, ITU-T G.657.A1 (bend insensitive) and TIA-492CAAB (OS2)		
Regulatory Compliance: RoHS 2011/65/EU compliant		
No. of Fibers: 12 No. of Tubes: 1		

Construction Materials
    i) Jacket Material: LSZH
    j) Armor Type: Corrugated Steel
    k) Number of fibers per tube: 12
    l) Jacket Color: Black
    m) Jacket UV Resistance: UV Stabilized
    n) Subunit Type: Gel-free
    o) No. of Rip cords: 2
    p) Water Swellable Tape: Yes		

Physical Specifications
    a) Minimum Bend Radius, loaded: 17.3 cm
    b) Minimum Bend Radius, unloaded: 11.5 cm
    c) Tensile Load, long term, Max: 800 N
    d) Tensile Load, short term, Max: 2700 N		

Mechanical Test Specifications
    a) Compression: 44 N/mm (as per IEC 60794-1 E3)
    b) Flex: 35 Cycles (as per IEC 60794-1 E6)
    c) Impact: 2.94 N-m (as per IEC 60794-1 E4)
    d) Water Penetration Test Method: 24 h (as per IEC 60794-1 F5)		

Optical Specifications Attenuation, Maximum		

a) 0.22 dB/km @ 1550 nm
b) 0.27 dB/km @ 1490 nm
c) 0.31 dB/km @ 1385 nm
d) 0.34 dB/km @ 1310 nm

Index of Refraction
a) 1.467 @ 1310 nm
b) 1.468 @ 1385 nm
c) 1.468 @ 1550 nm

Cabled Cutoff Wavelength, maximum: 1260 nm

Fiber Optic sliding face plate panel unloaded, 1U

Standard Compliance	Compliance (Yes/No)	Remarks
Fiber panel shall be made of metal with powder coated which shall Accepts one front faceplate made of metal and two Splices tray with three trays each.		
The width shall be 19 inches and height of 1U (1.75 inches), with a maximum of 18 inch depth.		
The shelf/LIU shall be **sliding face plate panel unloaded, 1U**		
Panel shall be capable of Accepts 24 Duplex LC Adapters or Accepts		
Shall have splice trays to splice minimum 32 fibers.		
Mounting brackets can be placed in different positions		
Panel shall be intelligent panel to manage the fiber ports		

8.   **Front Face Plate Panel with Adaptor**

Standard Compliance	Compliance (Yes/No)	Remarks
1U Front Faceplate, unpopulated, accepts 24 duplex LC adapters		
LC Type interface for high density with duplex design		
Front Face Plate Panel with Adaptor shall be used in conjunction with G2 1U unpopulated shelves		
Insertion Loss will ≤ 0.50 dB at Random mated for 97% ≤ 0.25 dB at Random mated average		
ROHS/ELV Compliant		

9.   **Multimode (OM4) LC Pigtails, 5 feet**

Standard Compliance	Compliance (Yes/No)	Remarks

Standard Compliance	Compliance (Yes/No)	Remarks
LC to Connectorized, Fiber Pigtail, 0.9 mm Riser-OM4 (50/125m)		
Cable Length 5 feet		
Cable Sheath Low Smoke Zero Halogen (LSZH)		
Connector color Aqua		
Full Ceramic		
LC connector		
ROHS/ELV Compliant		

10.   Single mode (OS2) LC Pigtails, 5 feet

Standard Compliance	Compliance (Yes/No)	Remarks
LC to Connectorized, Fiber Pigtail, 0.9 mm Riser-OS2 (9/125m)		
Cable Length 5 feet		
Cable Sheath Low Smoke Zero Halogen (LSZH)		
Connector color Blue		
Full Ceramic		
LC connector		
ROHS/ELV Compliant		

11.   Tray Kit with 2 fusion splice trays

Standard Compliance	Compliance (Yes/No)	Remarks
Product type shall be Fusion splice kit		
For 1U shelves and surface mount enclosures		
Splice Trays shall be Included		
Number of Splice Trays will be 2		
Splices, quantity will be 32		
ROHS/ELV Compliant		

12.   Multimode (OM4) LC to LC Patch Cord,

Standard Compliance	Compliance (Yes/No)	Remarks

Standard Compliance	Compliance (Yes/No)	Remarks
LC to LC Duplex OM3, Fiber Optic Patch Cords 3m 50/ 125 micron		
Cable Sheath shall be made of LSZH		
Cable Diameter shall be 1.6 mm		
Ferrule shall made of Ceramic		
Operating Temperature -10 °C to +60 °C (+14 °F to +140 °F)		
Cable Retention Strength, maximum -4.40 lb @ 90 °		
ROHS/ELV Compliant		

Single mode (OS2) LC to LC Patch Cord,

Standard Compliance	Compliance (Yes/No)	Remarks
LC to LC Duplex, OS2 Fiber Optic Patch Cords 9/ 125 micron		
Cable Sheath shall be made of LSZH		
Cable Diameter shall be 1.6 mm		
Ferrule shall made of Ceramic		
Operating Temperature -10 °C to +60 °C (+14 °F to +140 °F)		
Cable Retention Strength, maximum -4.40 lb @ 90 °		
ROHS/ELV Compliant		

1.3 Warranty

Owner seeks warranty for the installed cable plant from the OEM equipment supplier. Bidder shall ensure that the OEM norms for supply, installation, testing and documentation as specified by the OEM supplier shall be adhered to, provided those are in line with TIA / EIA standards and Owner requirement specifications. The warranty shall be provided by the OEM vendor to Owner and shall be administered in India. The duration of the warranty shall be for a minimum of 25 years and shall cover the system performance, application assurance and the costs of the supply of components and installation.

PART - 9
Specifications Wall Mounted & Floor Mounted Racks 9U & 15U.

Sr	Item	Description
1	**Application**	To house active and passive networking equipment's like switches, routers, jack panels, modems etc.
2	**Basic Structure**	Basic structure of CRCA Steel in a welded frame with top, bottom and side frame. Wall mount XL series 9u/15u x 600x 600mm (500 + 100) with top & bottom cover with cable entry provisions. Ventilation slots to be provided on the Top Front and Bottom Front Faces for proper ventilation. Structure should be rigid and should allow front and rear mounting angles to be fixed at any desired depth.
3	**Front Door**	Front Glass Door with lock – should be easily removable type. Door should be able to be changed at site for left side / right side opening as per site conditions.
4	**Side panel**	<u>Hinged Louvered Side panels</u> (swing opening from front to back or back to front: changeable at site as per requirement) – with easily removable Hinges and lock for security
5	**Space**	Height - It Should Provide 9U/15U Usable Space. Width – It should be 600mmW and with 19" mounting format Depth – IT should be 600mm
6	**Load Bearing Capacity**	It should be able to take load of around 40 – 50 KG.
7	**Wall Mounting**	Provision for easy wall mounting should be there with appropriate anchor fasteners
8	**Cable Management**	Wall Mount should have integral vertical cable management provision for the cable management in front (right and left) In addition to the above, horizontal cable manager in 1U format with Nylon / PVC cable hoops to be provided.
9	**Heat Management**	Rack must be provided with one fan directly mounted on the roof top as an exhaust from the cabinet. Fan should be of AC 230V with flow volume of at least 90 CFM. Proper finger guards to be provided on the fans duly riveted to avoid any loosening.
10	**Powder Coating Details**	Thickness of powder coating should be 50 - 60 microns or more. *(Please Specify Colour – default is Black or RAL 7035)*
11	**Thickness of Material**	1. Wall Mount and its components should be made from CRCA Steel Material – at least 1.2mm thick 2. Mounting rails (2 Pairs) be made from CRCA Steel Material at least 1.5mm thick
12	**Shelving Options**	Wall mount rack should be provided with 1 fixed shelf (Ventilated)
13	**Power Management**	Rack should have horizontally mounted power strip with 6 sockets of Indian 5A type combination sockets (2+3 Pin). All cable used in manufacture of such power strip should be ISI grade. Overall rating of the power strip should be 16A and it should have Double Pole ON/OFF switch with indicator as an isolator. 3M long power input cable should be provided with appropriate rating and 15A Indian type plug.

Specifications 42U Floor Mounted Racks

Sr	Item	Description
1	General Requirements	Rack should be designed to provide Secure, Store, Streamline and Systemize IT Equipment's Rack should have 100% assured compatibility with all equipment's conforming to DIN 41494 (General Industrial Standard for equipment's) or Equivalent EIA /ISO / EN Standard
2	**Rack Dimention**	42Ux 800 x1000
3	Physical Specifications	The Rack unit should be supported on integral Plinth. Levelling Legs should support a static load of at least 1000 kg, total installed equipment weight.
		Rack should be of All Steel Construction and powder coated finish.
		All sheet metal parts should be Pre Treated and powder coated meeting ASTM Standard.
		The Vendor should have Front and Rear doors split Perforated Doors. Options with Industry Standard Centre / Swing Handle Multi-point locking. Door design should be compatible to use variety of access control options. These doors should be easily removable type without any tools.
		Rack design should enable shipping of the rack in (CKD) Completely Knock Down condition. Typically, the structure should comprise of extra deep front and rear frames in a welded multi-fold format fastened together with 3 pairs of depth channels to ensure prefect square construction.
		Rack design should allow maximum utilization of the inner space. In terms of width – out of 800mm – at least 590mm should be available for the cable dressing throughout the vertical height of the rack without any hindrance and/or for PDU Mounting in the front and rear of the rack.
		Vertical Mounting Rails should be fastened to the depth members such that the loading is directly and uniformly passed to the basic rack frame.
		Design should permit an easy assembly of the racks at site as per the requirement at site.
		4 Nos (2 Pairs) of Mounting rails (for Standard 19" mounting) should be made up of steel. (minimum 2.0mm thickness) Recessing of these Front & Rear 19" mounting rails should be completely flexible within depth of the rack. These Multi-Fold mounting rails (Not Simple L Type) should also have an extra internal web for increasing rigidity and to facilitate mounting of the shelves and other required accessories conveniently.
		Unique U Identification Notch and U Numbering should be provided on the 19" Mounting Rails such that these unique numbers are visible after mounting of the equipment also.
4	**Panels**	The Rack should have two side panels, top Cover and grounding and bonding accessories pre-installed by the manufacturer. Side Panels should be removable type but should be secured. These side panels should be flushed in the overall width.
5	**Earth Links**	All Rack components including Doors and Panels should be bonded together with appropriate earth links / bonding leads.
6	**Grounding**	Manufacture should provide Horizontal OR vertical Ground bus bar for equipment Grounding as per Customer / Tender Requirement
7	**Equipment Access & Installation**	The Rack should have usable Space even after installing locks and supportive accessories. The OEM should include Mounting hardware for equipment fixing with Universal Headed Washer Base Type of Screw head. OEM should include Baying/ Bolt-together kits for coupling racks

8	Certifications, Environmental and Safety Requirements	Racks should be manufactured by ISO9001:2008 , 18001 -2007 , Certified company. Manufacturer must certify that the products are RoHS Compliance. Manufacturer must carry product safety conformities from UL 2416, Manufacturer must certify that the products are Comply DIN41494 and Equivalent EIA/ISO/EN /CEA Standard. The rack should comply minimum of IP 20 rating. The enclosure should both protect the user from mechanical hazards and generally meet the requirements for a mechanical enclosure (stability, mechanical strength, aperture sizes, etc.) as defined in IEC 60950 as per the latest edition.
9	Ventilation and Thermal Management	The Rack should have ventilated front and rear doors to provide adequate airflow required by the major server manufacturers. The Rack should have a maximum ventilation area for the front door & rear doors. The Rack should provide the means to mount optional cooling accessories for high- density. The manufacturer should provide blanking panel kit to prevent the Recirculation of hot exhaust air. The manufacturer should provide air seal kit to seal all gaps to prevent recirculation of hot air. The Manufacture should provide Brushed cable entry and exit cutouts to avoid cold air leakage.
10	Cable Management	800 width Racks The manufacturer should supply 2 No cable management with detachable door in the front (On R & L Side) for management of Vertical Cables. These Cable Managers will have the Rigid Plastic Fingers in 1U Format to facilitate the cable management. Inner Space in these cable managers should be provided with combination of Fibre Management Spools and Metal Hoops. For HorizontalCable Management Closed Type Cable Organizer to be provided for management of Horizontal and power cables. For the Field Cables / In-Rack Cable Management, 2 No 100mm Cable baskets made from 5mm thick wire should be provided for management of Vertical Cables
11	Delivery & Installation	Racks should be shipped in CKD and assembled at site as per project requirement.
12	Power Management.	6/12 sockets of Indian standards ISI branded 15amps with 32amps capacity . All internal looping of sockets to the mains to be done with bus bars for 100% safety.

PART – 10

TECHNICAL SPECIFICATION OF SWITCHES

1.1. 24 Port Switch with 10Gig

Sr. No	Specifications	Compliance Yes / No	Remarks
1	Architecture		
	Shall be 19" Rack Mountable		
	24 RJ-45 autosensing 10/100/1000 ports and 4 SFP+ 1/10GbE ports		
	The switch should have 1 dual-personality (RJ-45 or USB micro-B) serial console port		
	1GB SDRAM and 12 MB Packet buffer size		
	Shall have switching capacity of 128 Gbps		
	Shall have up to 95 million pps switching throughput		
	The Switch should support 32000 MAC address		
	The switch should have Routing table size of 10000 entries (IPv4), 5000 entries (IPv6)		
2	Software Defined Networking (SDN) Capability		
	Open Flow protocol capability to enable software-defined networking		
	The switch should support Open Flow 1.0 and 1.3 specifications to enable SDN by allowing separation of the data (packet forwarding) and control (routing decision) paths		
3	Features		
	The switch should support HTTP redirect function		
	The switch should support User role to define a set of switch-based policies in areas such as security, authentication, and QoS. A user role can be assigned to a group of users or devices, using switch configuration		
	The switch should support Per-port tunneled node to provide a secured tunnel to transport network traffic on a per-port basis to a Controller. Authentication and network policies will be applied and enforced at the Controller		
	The Switch should support Static IP Visibility to do accounting for clients with static IP address		
4	Quality of Service (QoS)		
	The switch should support Traffic prioritization (IEEE 802.1p) to allows real-time traffic classification into eight priority levels mapped to eight queues		

	The switch should support Layer 4 prioritization to enable prioritization based on TCP/UDP port numbers		
	The switch should support Class of Service (CoS) to sets the IEEE 802.1p priority tag based on IP address, IP Type of Service (ToS), Layer 3 protocol, TCP/UDP port number, source port, and DiffServ		
	The switch should support Rate limiting to sets per-port ingress enforced maximums and per-port, per-queue minimums		
	The switch should Provide graceful congestion management		
5	Connectivity		
	The switch should support Auto-MDIX to provide automatic adjustments for straight-through or crossover cables on all 10/100 and 10/100/1000 ports		
6	IPv6 Feature		
	The switch should support IPV6 host to enable switches to be managed in an IPv6 network		
	The switch should support Dual stack (IPV4 and IPV6) to transition from IPv4 to IPv6, supporting connectivity for both protocols		
	The switch should support MLD snooping to forward IPv6 multicast traffic to the appropriate interface		
	The switch should support ACL and QoS for IPv6 network traffic		
	The switch should support static and RIPng protocols for IPV6		
7	Security		
	The switch should support RA guard, DHCPv6 protection, dynamic IPv6 lockdown, and ND snooping		
	The switch should have Energy-efficient design		
	The switch should support Energy-efficient Ethernet (EEE) to reduce power consumption in accordance with IEEE 802.3az		
	The switch should support very low latency, increased packet buffering, and adaptive power consumption		
	Selectable queue configurations		

	The switch should have facility to allow for increased performance by selecting the number of queues and associated memory buffering that best meet the requirements of the network applications		
8	Convergence		
	The switch should support IP multicast routing and PIM Sparse and Dense modes to route IP multicast traffic		
	The switch should support IP multicast snooping and data-driven IGMP		
	The switch should support LLDP-MED (Media Endpoint Discovery)		
	The switch should support IEEE 802.1AB Link Layer Discovery Protocol (LLDP)		
	The switch should support Local MAC Authentication		
9	Resiliency and high availability		
	The Switch should create one virtual resilient switch from four switches and attached the network devices using standard LACP for automatic load balancing and high availability to simplify network operation by reduce the need for complex protocols like Spanning Tree Protocol (STP), Equal-Cost Multipath (ECMP), and VRRP		
	The switch should support Virtual Router Redundancy Protocol (VRRP)		
	The switch should support IEEE 802.1s Multiple Spanning Tree		
	The switch should support IEEE 802.3ad link-aggregation-control protocol (LACP) and port trunking		
	The switch should provide easy-to-configure link redundancy of active and standby links		
10	Management		
	The switch should support SNMPv1, v2, and v3		
	The switch should support Zero-Touch Provisioning (ZTP)		
	The switch should support cloud based management platform offers simple, secure, and cost effective way to manage switches		
11	Manageability		
	The switch should support Dual flash images		
	The switch should allow assignment of descriptive names to ports		

	Find-Fix-Inform		
	The switch should have the capability to find and fixes common network problems automatically, then informs administrator		
	The switch should allow multiple configuration files to be stored to a flash image		
	The switch should support RMON, XRMON, and sFlow		
	The switch should provide advanced monitoring and reporting capabilities for statistics, history, alarms, and events		
	The switch should support ingress and egress port monitoring enable network problem solving		
	The switch should support Unidirectional link detection (UDLD)		
	The switch should support IP service level agreements (SLA) for voice		
12	Layer 2 switching		
	The switch should support IEEE 802.1Q (4094 VLAN IDs) and 2K VLANs simultaneously		
	The switch should support Jumbo packet support		
	The switch should support IEEE 802.1v protocol VLANs		
	The switch should support Rapid Per-VLAN Spanning Tree (RPVST+)		
	The switch should support GVRP and MVRP		
	The switch should support encapsulation (tunneling) protocol for overlay network that enables a more scalable virtual network deployment		
13	Layer 3 services		
	The switch should support DHCP server		
14	Layer 3 routing		
	The switch should support minimum 256 static IP routing		
	Routing Information Protocol (RIP)		
	The switch should support RIPv1, RIPv2, and RIPng routing and support 10,000 RIP routes		
	The switch should support OSPFv2 and OSPFv3 protocols for routing between access and the next layer on the LAN.		
	The switch should support Policy-based routing		
15	Security		
	The switch should support IEEE 802.1X		

	The switch should support Web-based authentication		
	The switch should support MAC-based authentication		
	The switch should support Multiple IEEE 802.1X users per port		
	The switch should support Concurrent IEEE 802.1X, Web, and MAC authentication schemes per port and accept up to 32 sessions of IEEE 802.1X, Web, and MAC authentications		
	The switch should support Access control lists (ACLs)		
	The switch should provide IP Layer 3 filtering based on source/destination IP address/subnet and source/destination TCP/UDP port number		
	The switch should support Source-port filtering		
	The switch should support RADIUS/TACACS+		
	The switch should support Secure shell		
	The switch should support Secure Sockets Layer (SSL)		
	The switch should support Port security		
	The switch should support MAC address lockout		
	The switch should support Secure FTP		
	The switch should support Switch management logon security		
	The switch should support STP BPDU port protection		
	The switch should support DHCP protection		
	The switch should support Dynamic ARP protection		
	The switch should support STP root guard		
	The switch should support Identity-driven ACL		
	The switch should support Per-port broadcast throttling		
	The switch should support Private VLAN		
16	Environmental Features		
	Shall support IEEE 802.3az Energy-efficient Ethernet (EEE) to reduce power consumption		
	Operating temperature of 0°C to 45°C		
	Safety and Emission standards including EN 60950; IEC 60950; VCCI Class A; FCC Class A		
17	Warranty and Support		
	The below Warranty shall be offered directly from the switch OEM.		

Sr. No	Specifications	Compliance Yes / No	Remarks
	Lifetime warranty with advance replacement and next-business-day delivery		
	Software upgrades/updates shall be included as part of the warranty		

1.2. 48 Port Switch with 10Gig

Sr. No	Specifications	Compliance Yes / No	Remarks
1	Architecture		
	Shall be 19" Rack Mountable		
	48 RJ-45 autosensing 10/100/1000 ports and 4 SFP+ 1/10GbE ports		
	The switch should have 1 dual-personality (RJ-45 or USB micro-B) serial console port		
	1GB SDRAM and 12 MB Packet buffer size		
	Shall have switching capacity of 176 Gbps		
	Shall have up to 112.0 million pps switching throughput		
	The Switch should support 32000 MAC address		
	The switch should have Routing table size of 10000 entries (IPv4), 5000 entries (IPv6)		
2	Software Defined Networking (SDN) Capability		
	Open Flow protocol capability to enable software-defined networking		
	The switch should support Open Flow 1.0 and 1.3 specifications to enable SDN by allowing separation of the data (packet forwarding) and control (routing decision) paths		
3	Features		
	The switch should support HTTP redirect function		
	The switch should support User role to define a set of switch-based policies in areas such as security, authentication, and QoS. A user role can be assigned to a group of users or devices, using switch configuration		
	The switch should support Per-port tunneled node to provide a secured tunnel to transport network traffic on a per-port basis to a Controller. Authentication and network policies will be applied and enforced at the Controller		
	The Switch should support Static IP Visibility to do accounting for clients with static IP address		
4	Quality of Service (QoS)		
	The switch should support Traffic prioritization (IEEE 802.1p) to allows real-time traffic classification into eight priority levels mapped to eight queues		
	The switch should support Layer 4 prioritization to enable prioritization based on TCP/UDP port numbers		
	The switch should support Class of Service (CoS) to sets the IEEE 802.1p priority tag based on IP address, IP Type of Service (ToS), Layer 3 protocol, TCP/UDP port number, source port, and DiffServ		
	The switch should support Rate limiting to sets per-port		

	ingress enforced maximums and per-port, per-queue minimums		
	The switch should Provide graceful congestion management		
5	Connectivity		
	The switch should support Auto-MDIX to provide automatic adjustments for straight-through or crossover cables on all 10/100 and 10/100/1000 ports		
6	IPv6 Feature		
	The switch should support IPV6 host to enable switches to be managed in an IPv6 network		
	The switch should support Dual stack (IPV4 and IPV6) to transition from IPv4 to IPv6, supporting connectivity for both protocols		
	The switch should support MLD snooping to forward IPv6 multicast traffic to the appropriate interface		
	The switch should support ACL and QoS for IPv6 network traffic		
	The switch should support static and RIPng protocols for IPV6		
7	Security		
	The switch should support RA guard, DHCPv6 protection, dynamic IPv6 lockdown, and ND snooping		
	The switch should have Energy-efficient design		
	The switch should support Energy-efficient Ethernet (EEE) to reduce power consumption in accordance with IEEE 802.3az		
	The switch should support very low latency, increased packet buffering, and adaptive power consumption		
	Selectable queue configurations		
	The switch should have facility to allow for increased performance by selecting the number of queues and associated memory buffering that best meet the requirements of the network applications		
8	Convergence		
	The switch should support IP multicast routing and PIM Sparse and Dense modes to route IP multicast traffic		
	The switch should support IP multicast snooping and data-driven IGMP		
	The switch should support LLDP-MED (Media Endpoint Discovery)		
	The switch should support IEEE 802.1AB Link Layer Discovery Protocol (LLDP)		
	The switch should support Local MAC Authentication		
9	Resiliency and high availability		
	The Switch should create one virtual resilient switch from four switches and attached the network devices using standard LACP for automatic load balancing and high availability to simplify network operation by reduce the need for complex protocols like Spanning Tree Protocol (STP), Equal-Cost Multipath (ECMP), and VRRP		
	The switch should support Virtual Router Redundancy Protocol (VRRP)		
	The switch should support IEEE 802.1s Multiple Spanning Tree		

	The switch should support IEEE 802.3ad link-aggregation-control protocol (LACP) and port trunking		
	The switch should provide easy-to-configure link redundancy of active and standby links		
10	Management		
	The switch should support SNMPv1, v2, and v3		
	The switch should support Zero-Touch Provisioning (ZTP)		
	The switch should support cloud based management platform offers simple, secure, and cost effective way to manage switches		
11	Manageability		
	The switch should support Dual flash images		
	The switch should allow assignment of descriptive names to ports		
	Find-Fix-Inform		
	The switch should have the capability to find and fixes common network problems automatically, then informs administrator		
	The switch should allow multiple configuration files to be stored to a flash image		
	The switch should support RMON, XRMON, and sFlow		
	The switch should provide advanced monitoring and reporting capabilities for statistics, history, alarms, and events		
	The switch should support ingress and egress port monitoring enable network problem solving		
	The switch should support Unidirectional link detection (UDLD)		
	The switch should support IP service level agreements (SLA) for voice		
12	Layer 2 switching		
	The switch should support IEEE 802.1Q (4094 VLAN IDs) and 2K VLANs simultaneously		
	The switch should support Jumbo packet support		
	The switch should support IEEE 802.1v protocol VLANs		
	The switch should support Rapid Per-VLAN Spanning Tree (RPVST+)		
	The switch should support GVRP and MVRP		
	The switch should support encapsulation (tunneling) protocol for overlay network that enables a more scalable virtual network deployment		
13	Layer 3 services		
	The switch should support DHCP server		
14	Layer 3 routing		
	The switch should support minimum 256 static IP routing		
	Routing Information Protocol (RIP)		
	The switch should support RIPv1, RIPv2, and RIPng routing and support 10,000 RIP routes		
	The switch should support OSPFv2 and OSPFv3 protocols for routing between access and the next layer on the LAN.		
	The switch should support Policy-based routing		

Sr. No	Specifications	Compliance Yes / No	Remarks
15	Security		
	The switch should support IEEE 802.1X		
	The switch should support Web-based authentication		
	The switch should support MAC-based authentication		
	The switch should support Multiple IEEE 802.1X users per port		
	The switch should support Concurrent IEEE 802.1X, Web, and MAC authentication schemes per port and accept up to 32 sessions of IEEE 802.1X, Web, and MAC authentications		
	The switch should support Access control lists (ACLs)		
	The switch should provide IP Layer 3 filtering based on source/destination IP address/subnet and source/destination TCP/UDP port number		
	The switch should support Source-port filtering		
	The switch should support RADIUS/TACACS+		
	The switch should support Secure shell		
	The switch should support Secure Sockets Layer (SSL)		
	The switch should support Port security		
	The switch should support MAC address lockout		
	The switch should support Secure FTP		
	The switch should support Switch management logon security		
	The switch should support STP BPDU port protection		
	The switch should support DHCP protection		
	The switch should support Dynamic ARP protection		
	The switch should support STP root guard		
	The switch should support Identity-driven ACL		
	The switch should support Per-port broadcast throttling		
	The switch should support Private VLAN		
16	Environmental Features		
	Shall support IEEE 802.3az Energy-efficient Ethernet (EEE) to reduce power consumption		
	Operating temperature of 0°C to 45°C		
	Safety and Emission standards including EN 60950; IEC 60950; VCCI Class A; FCC Class A		
17	Warranty and Support		
	The below Warranty shall be offered directly from the switch OEM.		
	Lifetime warranty with advance replacement and next-business-day delivery		
	Software upgrades/updates shall be included as part of the warranty		

1.3. 16 Port Switch with 40Gig

Sr. No	Specifications	Compliance Yes / No	Remarks
1	Architecture		
	Shall be 19" Rack Mountable		
	The switch should support Dual hot-swappable power supplies		

	16 SFP+ fixed 1000/10000 SFP+ ports; Duplex: 100BASE-TX: half or full; 1000BASE-T: full only; Ports 1 - 16 support MACSec, & 2 40GbE ports, with optional module		
	The switch shall have one expansion slots to support up to four 10G SFP+ Ports additionally or 0ne 40G QSFP+ port		
	1 RJ-45 serial console port		
	1 RJ-45 out-of-band management port		
	2GB SDRAM and 512 MB flash and 13.5 MB Packet buffer size		
	Shall have switching capacity of 480 Gbps		
	Shall have up to 285.7 million pps switching throughput		
	The Switch should support 64000 MAC address		
2	Software Defined Networking (SDN) Capability		
	Open Flow protocol capability to enable software-defined networking		
	Allows the separation of data (packet forwarding) and control (routing decision) paths, to be controlled by an external SDN Controller, utilizing Open flow protocol		
3	Features		
	The switch should support HTTP redirect function		
	The switch should support User role to define a set of switch-based policies in areas such as security, authentication, and QoS. A user role can be assigned to a group of users or devices, using switch configuration		
	The switch should support Per-port tunneled node		
4	Quality of Service (QoS)		
	The switch should support Advanced classifier-based QoS to classifies traffic using multiple match criteria based on Layer 2, 3, and 4 information and apply QoS policies such as setting priority level and rate limit to selected traffic on a per-port or per-VLAN basis		
	The switch should support Layer 4 prioritization to enable prioritization based on TCP/UDP port numbers		
	The switch should support Class of Service (CoS) to set the IEEE 802.1p priority tag based on IP address, IP Type of Service (ToS), Layer 3 protocol, TCP/UDP port number, source port, and DiffServ		
	The switch should support Port-based rate limiting to provide per-port ingress-/egress-enforced increased bandwidth		
	The switch should support Classifier-based rate limiting to use an access control list (ACL) to enforce increased bandwidth for ingress traffic on each port		
	The switch should support Reduced bandwidth to provides per-port, per-queue egress-based reduced bandwidth		
	The switch should support Remote intelligent mirroring to mirror selected ingress/egress traffic based on an ACL, port, MAC address, or VLAN to a local or remote switch anywhere on the network		
	The switch should support Remote monitoring (RMON), Extended RMON (XRMON), and sFlow v5 to provide advanced monitoring and reporting capabilities for statistics, history, alarms, and events		

		The switch should support Traffic prioritization allows real-time traffic classification into eight priority levels that will mapped to eight queues		
5	Management			
		The switch should allow assignment of descriptive names to ports		
		The switch should support IEEE 802.1AB Link Layer Discovery Protocol (LLDP)		
		The switch should leverage RADIUS to link a custom list of CLI commands to an individual network administrator's login for an audit trail documents activity		
		The switch should support Multiple configuration files to store easily to the flash image		
		The switch should support Dual flash images to provide independent primary and secondary operating system files for backup while upgrading		
		The switch should have Out-of-band Ethernet management port to enable management over a separate physical management network and keeps management traffic segmented from network data traffic		
		The switch should support Zero-Touch Provisioning (ZTP)		
		The switch should support Unidirectional Link Detection (UDLD)		
6	Connectivity			
		The switch should support Jumbo frames on Gigabit Ethernet and 10-Gigabit Ethernet ports		
		The switch should support Auto-MDIX		
		The switch should support following IPv6 feature		
		IPv6 host: enables switch management in an IPv6 network		
		Dual stack (IPv4 and IPv6): transition IPv4 to IPv6, supporting connectivity for both protocols		
		MLD snooping: forward IPv6 multicast traffic to the appropriate interface		
		IPv6 ACL/QoS: support ACL and QoS for IPv6 traffic		
		IPv6 routing: support static, RIPng, OSPFv3 routing protocols		
		6in4 tunneling: support encapsulation of IPv6 traffic in IPv4 packets		
		Security: provide RA guard, DHCPv6 protection, dynamic IPv6 lockdown, and ND snooping		
7	Performance			
		The switch should support Selectable queue configurations to allow for increased performance by selecting the number of queues and associated memory buffering that best meet the requirements of the network applications		
		The switch should support Energy-efficient Ethernet (EEE) support: reduces power consumption in accordance with IEEE 802.3az		
8	Resiliency and high availability			
		The Switch should support stacking up to 9 Switch and support up to 336 Gb/s of stacking throughput. The Switch support Ring, chain, and mesh stacking topologies		

	The Switch should support Virtualized switching to provide simplified management as the switches appear as a single chassis when stacked			
	The switch should support Virtual Router Redundancy Protocol (VRRP)			
	The switch should support Nonstop switching and routing			
	The switch should support IEEE 802.3ad Link Aggregation Protocol (LACP) and support up to 144 trunks, each with up to 8 links (ports) per trunk			
	The switch should support IEEE 802.1s Multiple Spanning Tree			
	The switch should enable loop-free and redundant network topology without using Spanning Tree Protocol; allows a server or switch to connect to two switches using one logical trunk for redundancy and load sharing			
	The switch should provide easy-to-configure link redundancy of active and standby links			
9	Layer 2 switching			
	The switch should support IEEE 802.1ad QinQ			
	The switch should support VLAN and tagging and support the IEEE 802.1Q standard and 4096 VLANs simultaneously			
	The switch should support IEEE 802.1v protocol VLANs			
	The switch should support MAC-based VLAN			
	The switch should support Rapid Per-VLAN Spanning Tree (RPVST+)			
	The Switch should dynamically load balances across multiple active redundant links to increase available aggregate bandwidth and allow concurrent Layer 3 routing			
	The switch should support GVRP and MVRP			
10	Layer 3 services			
	The switch should support Loopback interface address			
	The switch should support Route maps			
	The switch should support User datagram protocol (UDP) helper function			
	The switch should support DHCP server			
	The switch should support Bidirectional Forwarding Detection (BFD) to enable link connectivity monitoring and reduces network convergence time for static routing, OSPFv2, and VRRP			
11	Layer 3 routing			
	The switch should support Static IP routing for both IPv4 and IPv6 networks			
	The switch should support OSPFv2 for IPv4 routing and OSPFv3 for IPv6 routing			
	The switch should support Policy-based routing			
	The switch should support Border Gateway Protocol (BGP)			
	The switch should support RIPv1, RIPv2, and RIPng routing			
12	Security			
	The switch should support Source-port filtering			
	The switch should support RADIUS/TACACS+			

	The switch should support Secure shell		
	The switch should support Secure Sockets Layer (SSL)		
	The switch should support Port security		
	The switch should support MAC address lockout		
	The switch should support Detection of malicious attacks		
	The switch should support Secure FTP		
	The switch should support Switch management logon security		
	The switch should support Secure management access to deliver secure encryption of all access methods (CLI, GUI, or MIB) through SSHv2, SSL, and/or SNMPv3		
	The switch should support ICMP throttling		
	The switch should support Identity-driven ACL		
	The switch should support STP BPDU port protection		
	The switch should support Dynamic IP lockdown		
	The switch should support DHCP protection		
	The switch should support Dynamic ARP protection		
	The switch should support STP root guard		
	The Switch should secure management interfaces such as SNMP, Telnet, SSH, SSL, Web, and USB at the desired level		
	The Switch should display a customized security policy when users log in to the switch		
	The switch should support CPU protection		
	The switch should provide filtering based on the IP field, source/destination IP address/subnet and source/destination TCP/UDP port number on a per-VLAN or per-port basis		
	The switch should support IEEE 802.1X		
	The switch should support Web-based authentication		
	The switch should support MAC-based authentication		
	authenticates client with the RADIUS server based on client's MAC address		
	The switch should support Concurrent authentication modes to enables a switch port to accept up to 32 sessions of 802.1X, Web, and MAC authentication		
	The switch should support Private VLAN		
13	Convergence		
	The switch should support IP multicast snooping (data-driven IGMP)		
	The switch should support LLDP-MED (Media Endpoint Discovery)		
	The switch should support IP multicast routing including PIM sparse and dense modes to route IP multicast traffic		
	The switch should support Auto VLAN configuration for voice		
	The switch should support RADIUS VLAN		
	The switch should support Local MAC Authentication to assign attributes such as VLAN and QoS using locally configured profile that can be a list of MAC prefixes		
14	Environmental Features		
	Shall support IEEE 802.3az Energy-efficient Ethernet (EEE) to		

Sr. No	Specifications	Compliance Yes / No	Remarks
	reduce power consumption		
	Operating temperature of 0°C to 45°C		
	Safety and Emission standards including EN 60950; IEC 60950; VCCI Class A; FCC Class A		
15	Warranty and Support		
	The below Warranty shall be offered directly from the switch OEM.		
	Lifetime warranty with advance replacement and next-business-day delivery		
	Software upgrades/updates shall be included as part of the warranty		

1. 4. 24 Port PoE Switch with 10Gig

Sr. No	Specifications	Compliance Yes / No	Remarks
1	Architecture		
	Shall be 19" Rack Mountable		
	24 RJ-45 autosensing 10/100/1000 PoE+ports and 4 SFP+ 1/10GbE ports		
	The switch should have 1 dual-personality (RJ-45 or USB micro-B) serial console port		
	1GB SDRAM and 12 MB Packet buffer size		
	Shall have switching capacity of 128 Gbps		
	Shall have up to 95 million pps switching throughput		
	The Switch should support 32000 MAC address		
	The switch should have Routing table size of 10000 entries (IPv4), 5000 entries (IPv6)		
2	Software Defined Networking (SDN) Capability		
	Open Flow protocol capability to enable software-defined networking		
	The switch should support Open Flow 1.0 and 1.3 specifications to enable SDN by allowing separation of the data (packet forwarding) and control (routing decision) paths		
3	Features		
	The switch should support HTTP redirect function		
	The switch should support User role to define a set of switch-based policies in areas such as security, authentication, and QoS. A user role can be assigned to a group of users or devices, using switch configuration		
	The switch should support Per-port tunneled node to provide a secured tunnel to transport network traffic on a per-port basis to a Controller. Authentication and network policies will be applied and enforced at the Controller		
	The Switch should support Static IP Visibility to do accounting for clients with static IP address		
4	Quality of Service (QoS)		
	The switch should support Traffic prioritization (IEEE 802.1p) to allows real-time traffic classification into eight priority levels mapped to eight queues		

		The switch should support Layer 4 prioritization to enable prioritization based on TCP/UDP port numbers		
		The switch should support Class of Service (CoS) to sets the IEEE 802.1p priority tag based on IP address, IP Type of Service (ToS), Layer 3 protocol, TCP/UDP port number, source port, and DiffServ		
		The switch should support Rate limiting to sets per-port ingress enforced maximums and per-port, per-queue minimums		
		The switch should Provide graceful congestion management		
5	Connectivity			
		The switch should support Auto-MDIX to provide automatic adjustments for straight-through or crossover cables on all 10/100 and 10/100/1000 ports		
		The switch should support IEEE 802.3at Power over Ethernet (PoE+) to provides up to 30 W per port that allows support of the latest PoE+-capable devices such as IP phones, wireless access points, and security cameras, as well as any IEEE 802.3af-compliant end device		
		The switch should support Pre-standard PoE support to detects and provides power to pre-standard PoE devices		
6	IPv6 Feature			
		The switch should support IPV6 host to enable switches to be managed in an IPv6 network		
		The switch should support Dual stack (IPV4 and IPV6) to transition from IPv4 to IPv6, supporting connectivity for both protocols		
		The switch should support MLD snooping to forward IPv6 multicast traffic to the appropriate interface		
		The switch should support ACL and QoS for IPv6 network traffic		
		The switch should support static and RIPng protocols for IPV6		
7	Security			
		The switch should support RA guard, DHCPv6 protection, dynamic IPv6 lockdown, and ND snooping		
		The switch should have Energy-efficient design		
		The switch should support Energy-efficient Ethernet (EEE) to reduce power consumption in accordance with IEEE 802.3az		
		The switch should support very low latency, increased packet buffering, and adaptive power consumption		
		Selectable queue configurations		
		The switch should have facility to allow for increased performance by selecting the number of queues and associated memory buffering that best meet the requirements of the network applications		
8	Convergence			
		The switch should support IP multicast routing and PIM Sparse and Dense modes to route IP multicast traffic		
		The switch should support IP multicast snooping and data-driven IGMP		

	The switch should support LLDP-MED (Media Endpoint Discovery)			
	The switch should support IEEE 802.1AB Link Layer Discovery Protocol (LLDP)			
	The switch should support Local MAC Authentication			
9	Resiliency and high availability			
	The Switch should create one virtual resilient switch from four switches and attached the network devices using standard LACP for automatic load balancing and high availability to simplify network operation by reduce the need for complex protocols like Spanning Tree Protocol (STP), Equal-Cost Multipath (ECMP), and VRRP			
	The switch should support Virtual Router Redundancy Protocol (VRRP)			
	The switch should support IEEE 802.1s Multiple Spanning Tree			
	The switch should support IEEE 802.3ad link-aggregation-control protocol (LACP) and port trunking			
	The switch should provide easy-to-configure link redundancy of active and standby links			
10	Management			
	The switch should support SNMPv1, v2, and v3			
	The switch should support Zero-Touch Provisioning (ZTP)			
	The switch should support cloud based management platform offers simple, secure, and cost effective way to manage switches			
11	Manageability			
	The switch should support Dual flash images			
	The switch should allow assignment of descriptive names to ports			
	Find-Fix-Inform			
	The switch should have the capability to find and fixes common network problems automatically, then informs administrator			
	The switch should allow multiple configuration files to be stored to a flash image			
	The switch should support RMON, XRMON, and sFlow			
	The switch should provide advanced monitoring and reporting capabilities for statistics, history, alarms, and events			
	The switch should support ingress and egress port monitoring enable network problem solving			
	The switch should support Unidirectional link detection (UDLD)			
	The switch should support IP service level agreements (SLA) for voice			
12	Layer 2 switching			
	The switch should support IEEE 802.1Q (4094 VLAN IDs) and 2K VLANs simultaneously			
	The switch should support Jumbo packet support			
	The switch should support IEEE 802.1v protocol VLANs			

	The switch should support Rapid Per-VLAN Spanning Tree (RPVST+)		
	The switch should support GVRP and MVRP		
	The switch should support encapsulation (tunneling) protocol for overlay network that enables a more scalable virtual network deployment		
13	Layer 3 services		
	The switch should support DHCP server		
14	Layer 3 routing		
	The switch should support minimum 256 static IP routing		
	Routing Information Protocol (RIP)		
	The switch should support RIPv1, RIPv2, and RIPng routing and support 10,000 RIP routes		
	The switch should support OSPFv2 and OSPFv3 protocols for routing between access and the next layer on the LAN.		
	The switch should support Policy-based routing		
15	Security		
	The switch should support IEEE 802.1X		
	The switch should support Web-based authentication		
	The switch should support MAC-based authentication		
	The switch should support Multiple IEEE 802.1X users per port		
	The switch should support Concurrent IEEE 802.1X, Web, and MAC authentication schemes per port and accept up to 32 sessions of IEEE 802.1X, Web, and MAC authentications		
	The switch should support Access control lists (ACLs)		
	The switch should provide IP Layer 3 filtering based on source/destination IP address/subnet and source/destination TCP/UDP port number		
	The switch should support Source-port filtering		
	The switch should support RADIUS/TACACS+		
	The switch should support Secure shell		
	The switch should support Secure Sockets Layer (SSL)		
	The switch should support Port security		
	The switch should support MAC address lockout		
	The switch should support Secure FTP		
	The switch should support Switch management logon security		
	The switch should support STP BPDU port protection		
	The switch should support DHCP protection		
	The switch should support Dynamic ARP protection		
	The switch should support STP root guard		
	The switch should support Identity-driven ACL		
	The switch should support Per-port broadcast throttling		
	The switch should support Private VLAN		
16	Environmental Features		
	Shall support IEEE 802.3az Energy-efficient Ethernet (EEE) to reduce power consumption		

	Operating temperature of 0°C to 45°C		
	Safety and Emission standards including EN 60950; IEC 60950; VCCI Class A; FCC Class A		
17	Warranty and Support		
	The below Warranty shall be offered directly from the switch OEM.		
	Lifetime warranty with advance replacement and next-business-day delivery		
	Software upgrades/updates shall be included as part of the warranty		

1. 5. 48 Port PoE Switch with 10Gig

Sr. No	Specifications	Compliance Yes / No	Remarks
1	Architecture		
	Shall be 19" Rack Mountable		
	48 RJ-45 autosensing 10/100/1000 PoE+ ports and 4 SFP+ 1/10GbE ports		
	The switch should have 1 dual-personality (RJ-45 or USB micro-B) serial console port		
	1GB SDRAM and 12 MB Packet buffer size		
	Shall have switching capacity of 176 Gbps		
	Shall have up to 112.0 million pps switching throughput		
	The Switch should support 32000 MAC address		
	The switch should have Routing table size of 10000 entries (IPv4), 5000 entries (IPv6)		
2	Software Defined Networking (SDN) Capability		
	Open Flow protocol capability to enable software-defined networking		
	The switch should support Open Flow 1.0 and 1.3 specifications to enable SDN by allowing separation of the data (packet forwarding) and control (routing decision) paths		
3	Features		
	The switch should support HTTP redirect function		
	The switch should support User role to define a set of switch-based policies in areas such as security, authentication, and QoS. A user role can be assigned to a group of users or devices, using switch configuration		
	The switch should support Per-port tunneled node to provide a secured tunnel to transport network traffic on a per-port basis to a Controller. Authentication and network policies will be applied and enforced at the Controller		
	The Switch should support Static IP Visibility to do accounting for clients with static IP address		
4	Quality of Service (QoS)		
	The switch should support Traffic prioritization (IEEE 802.1p) to allows real-time traffic classification into eight priority levels mapped to eight queues		

	The switch should support Layer 4 prioritization to enable prioritization based on TCP/UDP port numbers		
	The switch should support Class of Service (CoS) to sets the IEEE 802.1p priority tag based on IP address, IP Type of Service (ToS), Layer 3 protocol, TCP/UDP port number, source port, and DiffServ		
	The switch should support Rate limiting to sets per-port ingress enforced maximums and per-port, per-queue minimums		
	The switch should Provide graceful congestion management		
5	Connectivity		
	The switch should support Auto-MDIX to provide automatic adjustments for straight-through or crossover cables on all 10/100 and 10/100/1000 ports		
	The switch should support IEEE 802.3at Power over Ethernet (PoE+) to provides up to 30 W per port that allows support of the latest PoE+-capable devices such as IP phones, wireless access points, and security cameras, as well as any IEEE 802.3af-compliant end device		
	The switch should support Pre-standard PoE support to detects and provides power to pre-standard PoE devices		
6	IPv6 Feature		
	The switch should support IPV6 host to enable switches to be managed in an IPv6 network		
	The switch should support Dual stack (IPV4 and IPV6) to transition from IPv4 to IPv6, supporting connectivity for both protocols		
	The switch should support MLD snooping to forward IPv6 multicast traffic to the appropriate interface		
	The switch should support ACL and QoS for IPv6 network traffic		
	The switch should support static and RIPng protocols for IPV6		
7	Security		
	The switch should support RA guard, DHCPv6 protection, dynamic IPv6 lockdown, and ND snooping		
	The switch should have Energy-efficient design		
	The switch should support Energy-efficient Ethernet (EEE) to reduce power consumption in accordance with IEEE 802.3az		
	The switch should support very low latency, increased packet buffering, and adaptive power consumption		
	Selectable queue configurations		
	The switch should have facility to allow for increased performance by selecting the number of queues and associated memory buffering that best meet the requirements of the network applications		
8	Convergence		
	The switch should support IP multicast routing and PIM Sparse and Dense modes to route IP multicast traffic		
	The switch should support IP multicast snooping and data-driven IGMP		

	The switch should support LLDP-MED (Media Endpoint Discovery)		
	The switch should support IEEE 802.1AB Link Layer Discovery Protocol (LLDP)		
	The switch should support Local MAC Authentication		
9	Resiliency and high availability		
	The Switch should creates one virtual resilient switch from four switches and attached the network devices using standard LACP for automatic load balancing and high availability to simplify network operation by reduce the need for complex protocols like Spanning Tree Protocol (STP), Equal-Cost Multipath (ECMP), and VRRP		
	The switch should support Virtual Router Redundancy Protocol (VRRP)		
	The switch should support IEEE 802.1s Multiple Spanning Tree		
	The switch should support IEEE 802.3ad link-aggregation-control protocol (LACP) and port trunking		
	The switch should provide easy-to-configure link redundancy of active and standby links		
10	Management		
	The switch should support SNMPv1, v2, and v3		
	The switch should support Zero-Touch Provisioning (ZTP)		
	The switch should support cloud based management platform offers simple, secure, and cost effective way to manage switches		
11	Manageability		
	The switch should support Dual flash images		
	The switch should allow assignment of descriptive names to ports		
	Find-Fix-Inform		
	The switch should have the capability to find and fixes common network problems automatically, then informs administrator		
	The switch should allow multiple configuration files to be stored to a flash image		
	The switch should support RMON, XRMON, and sFlow		
	The switch should provide advanced monitoring and reporting capabilities for statistics, history, alarms, and events		
	The switch should support ingress and egress port monitoring enable network problem solving		
	The switch should support Unidirectional link detection (UDLD)		
	The switch should support IP service level agreements (SLA) for voice		
12	Layer 2 switching		
	The switch should support IEEE 802.1Q (4094 VLAN IDs) and 2K VLANs simultaneously		
	The switch should support Jumbo packet support		
	The switch should support IEEE 802.1v protocol VLANs		

	The switch should support Rapid Per-VLAN Spanning Tree (RPVST+)		
	The switch should support GVRP and MVRP		
	The switch should support encapsulation (tunneling) protocol for overlay network that enables a more scalable virtual network deployment		
13	Layer 3 services		
	The switch should support DHCP server		
14	Layer 3 routing		
	The switch should support minimum 256 static IP routing		
	Routing Information Protocol (RIP)		
	The switch should support RIPv1, RIPv2, and RIPng routing and support 10,000 RIP routes		
	The switch should support OSPFv2 and OSPFv3 protocols for routing between access and the next layer on the LAN.		
	The switch should support Policy-based routing		
15	Security		
	The switch should support IEEE 802.1X		
	The switch should support Web-based authentication		
	The switch should support MAC-based authentication		
	The switch should support Multiple IEEE 802.1X users per port		
	The switch should support Concurrent IEEE 802.1X, Web, and MAC authentication schemes per port and accept up to 32 sessions of IEEE 802.1X, Web, and MAC authentications		
	The switch should support Access control lists (ACLs)		
	The switch should provide IP Layer 3 filtering based on source/destination IP address/subnet and source/destination TCP/UDP port number		
	The switch should support Source-port filtering		
	The switch should support RADIUS/TACACS+		
	The switch should support Secure shell		
	The switch should support Secure Sockets Layer (SSL)		
	The switch should support Port security		
	The switch should support MAC address lockout		
	The switch should support Secure FTP		
	The switch should support Switch management logon security		
	The switch should support STP BPDU port protection		
	The switch should support DHCP protection		
	The switch should support Dynamic ARP protection		
	The switch should support STP root guard		
	The switch should support Identity-driven ACL		
	The switch should support Per-port broadcast throttling		
	The switch should support Private VLAN		
16	Environmental Features		
	Shall support IEEE 802.3az Energy-efficient Ethernet (EEE) to reduce power consumption		

	Operating temperature of 0°C to 45°C		
	Safety and Emission standards including EN 60950; IEC 60950; VCCI Class A; FCC Class A		
17	Warranty and Support		
	The below Warranty shall be offered directly from the switch OEM.		
	Lifetime warranty with advance replacement and next-business-day delivery		
	Software upgrades/updates shall be included as part of the warranty		