Section-C

INSTITUTE FOR PLASMA RESEARCH

SST-1 Networking System

Technical Specifications

SST-1 Operation and Control Division

The document contains the detailed technical specifications for SST-1 networking System.

A. General Requirements applicable to complete Networking solution:

1. All optical, copper cables and cable installation shall be compatible for 1**0Gbps or higher** bandwidth.
2. The complete network shall maintain backward compatibility for 10/100/1000 Mbps equipment
3. All equipment recommended by the bidder shall be industry proven products complying ISO/IEC/EIA/TIA standards as mentioned in detailed technical specification.
4. The network diagram in Annexure – II shall be followed for basic minimum reference. The additional networking features which can increase the reliability or increase performance of the network can be incorporated by bidder. The bidder can optimize the solution with fulfilling the requirements mentioned in this document.
5. The network shall be based on star topology. The main star point shall be installed in SST-1 central server room, which is adjacent to SST-1 control room in IPR campus.
6. The complete network architecture diagram must be provided with model and make of components and their inter-connection.
7. Network environment is having magnetic field/ X-ray/ RF so optical fibre and copper cables shall be shielded end to end as mentioned in detailed specifications.
8. Sufficient Redundancy shall be included in the network solutions. Failure of any single optical link or a single central switch shall not bring down the availability of the network.
9. The bill of material quoted shall be complete including manufacturer, part/model and quantities as well as spares. Incomplete bill of material will not be accepted.
10. The bidder shall have the complete responsibility to integrate the complete network. During commissioning if any item not compatible or missing, shall be bidder's responsibility.
11. The bidder must have minimum 2 networking certified professionals, working fulltime on its payroll for deploying networking system.
12. Switching to new network after completion of commissioning shall be done at a suitable time agreed by IPR authorities.
13. The bidder must have its own office either in Ahmedabad or in Gandhinagar area with service support infrastructure to provide warranty and post warranty services.
14. The bidder shall submit the proof for the *point number 11 and 13*, failure to which the bid shall be rejected.

B. Networking Switches Requirements:

1. All Layer-2 access network switches shall have 1Gbps link for end user.
2. All network switches shall be manageable.
3. All network access switches shall have 2 number of minimum 10Gbps or higher uplink.
4. All network switches and other active components quoted shall be of same make or OEM.
5. All core and access switches shall have provision for redundant power supply.
6. All core network switches shall have all optical fibre ports of 10Gbps bandwidth or better as per the design solution.
7. The core switches shall have sufficient backplane capacity in order to handle full load on the network switches.

C. Cabling requirements

1. 12/24 core optical fibre cables shall be installed between different locations as per the tentative diagram in Annexure – II.

2. All fibre optic backbone cable connectors at both the end shall be of LC type.

3. All major fibre optic and copper cable, connectors and other components quoted shall be provided of same make or OEM.

D. Networking Rack requirements

The bidder shall quote the racks in order to house all networking equipments at different locations as specified in detailed specifications for network racks.

E. Installation and commissioning requirements

1. The bidder shall have to arrange skilled persons for installing the network system. All the civil or carpentry work required to deploy the networking system shall be responsibility of the bidder.

2. The bidder shall bring all tools required for installation / commissioning. No labour or tools will be provided.

3. The cable path for majority of new cables will be adjacent to the existing one wherever possible.

4. Bidder shall use all clamps, screws and other accessories of stainless steel or anti-corrosive material.

5. The openings for cable entry/exit from all network rack shall be sealed against rodents.

6. The bidder shall follow IPR safety rules during the installation /test/commissioning plans. The bidder shall arrange and bring all safety equipments along with him during network commissioning work.

7. All the optical cables need to be installed in HDPE class-B conduit. All copper cables shall be installed in ISI mark PVC pipe. The conduit/pipe etc. shall be included in BoM.

8. The entry/exit of all the cables (Fibre/UTP/Power) in the racks should be through Flame-retardant heat-shrinkable cable entry seals.

9. The bidder shall address required skills / competency and required workmanship in the installation/ test / commissioning plans.

10. The bidder shall address material handling issues, e.g. actions to avoid any damage to IPR property, in the installation / test / commissioning plans.

F. Testing requirements

1. Link End-to-End Attenuation Tests:

   a. Testing shall be performed on each cabling segment (connector to connector) for all cores in single cable.

   b. Horizontal and vertical backbone link measurements: Test at specified bandwidth in each direction according to the **TIA/EIA** standards.

   c. Attenuation test results shall be less than that calculated according to standards of **TIA/EIA.**

2. Data for each measurement shall be documented. Data recorded within the field-test instrument shall be transferred from the instrument to the computer running on **Linux/Windows** based utility that allows for the maintenance, inspection and archiving of the test records.

G. Execution Timeline

1. Vendor shall work in IPR premises during office hours from **9:00 in the morning to 5:30 in the evening** on all IPR working days.
2. Vendor shall supply the ordered material within 8 weeks from the date of Purchase Order.
3. Vendor shall submit the schedule of network installation/commissioning and testing work in advance.
4. Vendor shall take IPR's approval for the above schedule
5. Vendor must start network commissioning work within two week of supplying the networking components in IPR.
6. Vendor shall finish the network installation/commissioning work including testing within maximum three months after starting the work.

H. Warranty requirements

1. Warranty certificate of **20 years** shall be required for passive components and their installation at the final testing of the network. The bidder shall include the certification procedure and testing condition be fulfilled to get this certification.
2. Warranty certificate for all active components shall be for **3 years**.
3. The bidder shall provide the written letter from OEM of active components stating that support of quoted products will be provided for minimum 5 years from the date of acceptance.

I. Training requirements

After completion of network commissioning and testing a half/full day training session needs to be conducted in IPR premises at an agreed time. This shall include the demonstration of complete network configuration / monitoring management tools. This shall also demonstrate the network performance.

Detailed Technical Specifications

Table-1: Network Layer 3 Core Switch

Make, OEM Model/ OEM Part No.:

Sr. No.	IPR Specification	Compliance (Yes/No)	Remarks
1	**Architecture**		
1.1	The Switch should have 24-port 1/10 Gigabit Ethernet SFP+ for 80 bytes Packets with optional uplink modules.		
1.2	The Switch should have Dual redundant, modular power supplies and three modular fans providing redundancy.		
1.3	The switch should also have an option to support 440 Watts DC power supply.		
1.4	The Switch should be Stackable from Day 1 along with Stacking capabilities for Power also.		
1.5	The Switch Architecture should be able to stack at least 8 switches in a single stack.		
1.6	The Switch stack should be based on Distributed forwarding Architecture, where in each stack member forwards its own information on network.		
1.7	The Switch Stack Architecture should have centralized control and Management plane with Active Switch and all the information should be synchronized with Standby Switch.		
1.8	The Switch should support Stateful Switchover when switching over from Active to Standby switch in a Stack.		
1.9	The Switch Stack Architecture should be Plug & Play for attaching or removing any switch from the stack without any downtime.		
1.10	The Switch Stack Architecture should allow the end user to stack 24 Port Switch with 48 Port of the same model.		
1.11	Should be based on a Modular OS Architecture capable of hosting applications.		
1.12	Should have RJ-45 & Mini USB Console Ports for Management.		
1.13	Should have USB 2.0 for OS Management (uploading, downloading & booting of OS and Configuration).		
1.14	Should have Front to Back Airflow system.		
1.15	Should have Multi-core CPU Architecture.		
1.16	Should have at least 4 GB of Flash for storing OS and other Logs.		
1.17	Should have at least 4 GB of DRAM.		
1.18	Should have at least 1 10/100/1000 dedicated Ethernet Management Port.		
1.19	Should be able to carry power savings mechanism wherein it should reduce the power consumption on ports not being used.		

1.20	The switch should be rack mountable and should not take space more than 1 Rack Unit.		
2	**Switch Performance**		
2.1	The Switch should have at least 640 Gbps of non-blocking switching bandwidth.		
2.2	The switch should have at least 500 Mbps of forwarding rate.		
2.3	The Switch should have at least 240 Gbps Unidirectional or 480 Gbps Spatial Reuse Stack Bandwidth.		
2.4	The Switch should support at least 32000 MAC Addresses.		
2.5	The Switch should support at least 24000 IPv4 routes.		
2.6	The Switch should support at least 4000 VLAN ID's & 1000 Switched Virtual Interface's.		
2.7	The Switch should atleast 9198 bytes of Jumbo Frames.		
2.8	Should support 48,000 flows to have full visibility of traffic to identify users and user traffic flows in order to identify potential attackers		
3	**Layer 3 Features**		
3.1	The switch should support static Routing protocols such as RIP.		
3.2	The switch should support basic IP Unicast routing protocols (static, RIP v1 & RIP v2) should be supported.		
3.3	The switch should support IPv6 & IPv4 Policy Based Routing (PBR).		
3.4	The Switch should be able to discover (on both IPv4 & IPv6 Network) the neighbouring device giving the details about the platform, IP Address, Link connected through etc., thus helping in troubleshooting connectivity problems.		
3.5	The switch should support Detection of Unidirectional Links (in case of fibre cut) and to disable them to avoid problems such as spanning-tree loops.		
3.6	The switch should support centralized VLAN Management; VLANs created on the core switch should be propagated automatically.		
3.7	The switch should support 802.1 d, 802.1 s, 802.1 w Spanning-Tree & its Enhancement for fast convergence.		
3.8	The switch should support 802.1 Q VLAN encapsulation.		
3.9	The switch should support 802.3 ad (LACP) to combine multiple network links for increasing throughput and providing redundancy.		
4	**Layer 2 Features**		
4.1	The Switch should be able to discover the neighbouring device of the same OEM giving the details about the platform, IP Address, Link connected through etc. thus helping in troubleshooting connectivity problems.		
4.2	Should support Local Proxy or Address Resolution Protocol.		

4.3	The switch should have an intelligent feature to allow unidirectional links caused by incorrect fibre-optic wiring or port faults to be detected and disabled on fibre-optic interfaces.		
4.4	Should support Dynamic Trunking Protocol (DTP).		
4.5	Should support Port Aggregation Protocol (PAgP) automate the creation of Fast Ether-Channel groups or Gigabit Ether-Channel groups to link to another switch, router or server.		
4.6	Should support Link Aggregation Control Protocol (LACP) allows the creation of Ethernet channelling with devices that conform to IEEE 802.3ad.		
4.7	Should support UDLD and Aggressive UDLD protocol.		
4.8	Should support (IGMP) Snooping for IPv4 and IPv6 MLD v1 and v2 Snooping.		
4.9	Should support Per-Port Broadcast, Multicast, and Uni-cast Storm Control.		
4.10	Should support Voice VLAN.		
4.11	Should support VLAN Trunking Protocol (VTP).		
4.12	Should support RSPAN.		
4.13	Should support (BPDU) Guard & STRG.		
4.14	Should support Dynamic VLAN Assignment.		
4.15	Should support Flexlink to provide link redundancy & VLAN Flex Link load-balancing.		
4.16	Should support IEEE 802.1s/w Rapid Spanning Tree Protocol (RSTP) and Multiple Spanning Tree Protocol (MSTP).		
4.17	Should support Per-VLAN Rapid Spanning Tree (PVRST+).		
4.18	Should support Switch-Port Auto recovery.		
4.19	Should support Cross Stack QOS.		
5	**Network Security Features**		
5.1	The switch should have Port security to secure the access to an access or trunk port based on MAC address to limit the number of learned MAC addresses to deny MAC address flooding.		
5.2	The switch should support Dynamic ARP inspection (DAI) to ensure user integrity by preventing malicious users from exploiting the insecure nature of ARP.		
5.3	The switch should support IP source guard to prevent a malicious user from spoofing or taking over another user's IP address by creating a binding table between the client's IP and MAC address, port, and VLAN.		
5.4	The switch should support Unicast Reverse Path Forwarding (RPF) feature to mitigate problems caused by the introduction of malformed or forged (spoofed) IP source addresses into a network by discarding IP packets that lack a verifiable IP source address.		
5.5	The switch should support Bidirectional data support on the SPAN port to allow the intrusion detection system (IDS) to take action when an intruder is detected.		
5.6	The switch should support Private VLANs to restrict traffic.		

5.7	The switch should support MAC address notification to allow administrators to be notified of users added to or removed from the network.		
5.8	The switch should support VLAN ACLs on all VLANs prevent unauthorized data flows from being bridged within VLANs.		
5.9	The switch should support IPv6 ACLs that can be applied to filter IPv6 traffic.		
5.10	The switch should support Port-based ACLs for Layer 2 interfaces to allow security policies to be applied on individual switch ports.		
5.11	The switch should support Secure Shell (SSH) Protocol, Kerberos, and Simple Network Management Protocol Version 3 (SNMPv3) to provide network security by encrypting administrator traffic during Telnet and SNMP sessions.		
5.12	The switch should support TACACS and RADIUS authentication to facilitate centralized control of the switch and restricts unauthorized users from altering the configuration.		
5.13	The switch should support Multi level security on console access to prevent unauthorized users from altering the switch configuration.		
5.14	The switch should support Bridge protocol data unit (BPDU) Guard to shut down Spanning Tree PortFast-enabled interfaces when BPDUs are received to avoid accidental topology loops.		
5.15	The Switch should support Dynamic VLAN, Downloadable ACLs, Multi-Auth VLAN Assignment, MAC Based Filtering & Web Authentication security mechanism.		
5.16	Switch should support port security, DHCP snooping, IP source guard and Multi-domain Authentication.		
5.17	Switch should support flexible multiple authentication using 802.1x, MAC Authentication bypass, WEB authentication.		
5.18	The switch should Support 802.1x Supplicant with NEAT		
6	**Quality of Service**		
6.1	The Switch should be capable of deploying QoS policies at multiple levels based on AP, Radio, SSID & clients who are directly connected to the switch.		
6.2	The Switch should be capable of Downloading Downloadable Access List from network security engine based on user identity.		
6.3	The Switch should be capable of Queuing, Policing, Shaping and marking Wired Traffic based on Class of Service (CoS) or DSCP.		
6.4	The switch should support 802.1 p CoS and DSCP Field classification using marking and reclassification on a per-packet basis by source and destination IP address, MAC address, or Layer 4 Transmission Control Protocol/User Datagram Protocol (TCP / UDP) port number.		
6.5	The Switch should support Rate limiting based on source and destination IP address, source and destination MAC address, Layer 4 TCP/UDP information, or any combination of these fields, using QoS ACLs (IP ACLs or MAC ACLs), class maps, and		

	policy maps.		
6.6	The Switch should support Eight egress queues per port for wired traffic to enable differentiated management of different traffic types across the stack for wired traffic.		
7	**Manageability**		
7.1	The switch should allow administrators to remotely monitor ports in a Layer 2 switch network from any other switch in the same network.		
7.2	The management feature should have ease of troubleshooting by identifying the physical path that a packet takes from source to destination.		
7.3	Should provide for Embedded Remote Monitoring (RMON) software agent supporting four RMON groups (History, Statistics, Alarms and Events) for enhanced traffic management, monitoring, and analysis Web browser setup utility allows one-click initialization for IP addresses and passwords.		
7.4	Should provide support for TFTP (Trivial File transfer protocol) for the easy software upgrades on the network.		
7.5	Should have auto-configuration for ease of deployment of switches in the network by automatically configuring multiple switches across a network via a boot server.		
7.6	Should have auto-sensing on each non-GBIC port detects the speed of the attached device and automatically configures the port for 10-, 100-, or 1000-Mbps operation, easing the deployment of the switch in mixed 10, 100, and 1000 BaseT environments.		
7.7	Should have auto-negotiating on all ports automatically selects half- or full-duplex transmission mode to optimize bandwidth.		
7.8	Should have auto Smart ports providing automatic configuration as devices connect to the switch port, allowing auto detection and plug and play of the device onto the network.		
7.9	Should support Stacking Master Configuration Management.		
7.10	Should support four RMON groups (history, statistics, alarms, and events).		
7.11	Should support Network Assistant software for network management application for users up to 250.		
7.12	Should support SNMPv1, v2c, and v3.		
8	**Standards and Compliance**		

Sr. No.	IPR Specification	Compliance (Yes/No)	Remarks
8.1	Should be compliant with the standards: IEEE 802.1W, IEEE 802.1S, IEEE 802.1D (Spanning tree protocol), IEEE 802.1P (CoS Prioritization), IEEE 802.1Q (VLAN), IEEE 802.1S, IEEE 802.1W, IEEE 802.1X, IEEE 802.1ab, IEEE 802.1x-Rev, IEEE 802.3ad, IEEE 802.3af, IEEE 802.3ah ,IEEE 802.3X (full duplex on 10 BASE-T, 100 BASE-TX, and 1000 BASE-T ports), IEEE 802.3 (10 BASE-T specification), IEEE 802.3u (100 BASE-TX specification), IEEE 802.3ab (1000 BASE-T specification), IEEE 802.3z (1000 BASE-X specification), IEEE 802.3ad, IEEE 802.3af, IEEE 802.3at, IEEE 802.11, RMON I and II standards, SNMP v 1, SNMP v2c, and SNMP v3.		

Table-2: Network Layer 2 Access Switch 24 ports.

Make, OEM Model/ OEM Part No.:

Sr. No.	IPR Specification	Compliance (Yes/No)	Remarks
1	**Architecture**		
1.1	Should have 24 auto-negotiating 10 BASE-T/100BASE-TX/1000 Base-TX ports configured as Auto Sensing.		
1.2	Should have Small Form-Factor Pluggable 2 nos Gigabit SFP and 2 nos 10G SFP+ uplinks.		
1.3	Should support Stacking with additional Stack ports.		
1.4	Should support Stacking backplane of minimum of 20 Gbps & 8 units in a stack.		
1.5	Should support Cross Stack Ether-channel connections which can aggregate up to eight separate physical ports from any switches in the stack into one logical channel uplink.		
1.6	Should support Forwarding Bandwidth of minimum 100 Gbps & switching bandwidth of 200 Gbps.		
1.7	Should support Jumbo Frames of 9018 bytes.		
2	**Layer 2 Features**		
2.1	The Switch should be able to discover the neighbouring device of the same bidder giving the details about the platform, IP Address, Link connected through etc., thus helping in troubleshooting connectivity problems.		
2.2	Should support Local Proxy or Address Resolution Protocol.		
2.3	The switch should have an intelligent feature to allow unidirectional links caused by incorrect fibre-optic wiring or port faults to be detected and disabled on fibre-optic interfaces.		
2.4	Should support Dynamic Trunking Protocol (DTP).		
2.5	Support Port Aggregation Protocol (PAgP) automates the creation of Fast Ether Channel groups or Gigabit Ether Channel groups to link to another switch, router or server.		
2.6	Should support Link Aggregation Control Protocol (LACP) allows the creation of Ethernet channelling with devices that conform to IEEE 802.3ad.		

2.7	Should support UDLD and Aggressive UDLD protocol.		
2.8	Should support (IGMP) Snooping for IPv4 and IPv6 MLD v1 and v2 Snooping.		
2.9	Should support Per-Port Broadcast, Multicast, and Unicast Storm Control		
2.10	Should support Voice VLAN.		
2.11	Should support VLAN Trunking Protocol (VTP).		
2.12	Should support RSPAN.		
2.13	Should support (BPDU) Guard & STRG.		
2.14	Should support Dynamic VLAN Assignment.		
2.15	Should support Flex link to provide link redundancy & VLAN Flex Link load-balancing.		
2.16	Should support IEEE 802.1s/w Rapid Spanning Tree Protocol (RSTP) and Multiple Spanning Tree Protocol (MSTP).		
2.17	Should support Per-VLAN Rapid Spanning Tree (PVRST+).		
2.18	Should support Switch-Port Auto-recovery.		
2.19	Should support Cross Stack QOS.		
3	**Network Security Features**		
3.1	Switch should support port security.		
3.2	Switch should support DHCP snooping.		
3.3	Switch should support ARP inspection.		
3.4	Switch should support IP source guard.		
3.5	Switch should support flexible multiple authentication using 802.1x, MAC Authentication bypass, WEB authentication.		
3.6	The switch should support for comprehensive policy management capabilities using RADIUS Change of Authorization.		
3.7	The switch should Support 802.1x Supplicant with NEAT.		
3.8	The switch should also provide support for Private VLAN Edge.		
3.9	Should support Multi-domain Authentication.		
3.10	Should support Port-Based ACLs.		
3.11	Should support Secure Shell (SSH) Protocol.		
3.12	Should support TACACS+ and RADIUS Authentication.		
3.13	Should support MAC address Notification.		
3.14	Should support Multilevel Security on Console Access.		
4	**Quality of Service**		
4.1	The switch should have intelligence to continuously send multicast streams in a multicast VLAN while isolating the streams from subscriber VLANs for bandwidth and security reasons		
4.2	Auto QOS simplifies QoS configuration in voice over IP (VoIP) networks		
4.3	Should support 802.1p Class of Service (CoS) and differentiated services code point (DSCP) field classification.		

4.4	Should support Four Egress Queues Per Port.		
4.5	Should support Shaped Round Robin (SRR).		
4.6	Should support Weighted Tail Drop (WTD).		
4.7	Should support Rate Limiting.		
5	**Manageability**		
5.1	The switch should allow administrators to remotely monitor ports in a Layer 2 switch network from any other switch in the same network.		
5.2	The management feature should have ease of troubleshooting by identifying the physical path that a packet takes from source to destination.		
5.3	Should provide Embedded Remote Monitoring (RMON) software agent supporting four RMON groups (History, Statistics, Alarms and Events) for enhanced traffic management, monitoring, and analysis Web browser setup utility allows one-click initialization for IP addresses and passwords.		
5.4	Should provide support for TFTP (Trivial File transfer protocol) for the easy software upgrades on the network.		
5.5	Should provide Auto-configuration for ease of deployment of switches in the network by automatically configuring multiple switches across a network via a boot server.		
5.6	Should have Auto-sensing on each non-GBIC port detects the speed of the attached device and automatically configures the port for 10, 100 or 1000 Mbps operation, easing the deployment of the switch in mixed 10, 100, and 1000 BaseT environments.		
5.7	Should have Auto-negotiating on all ports automatically selects half- or full-duplex transmission mode to optimize bandwidth.		
5.8	Should have Auto Smart ports to provide automatic configuration as devices connect to the switch port, allowing auto detection and plug and play of the device onto the network.		
5.9	Should support Stacking Master Configuration Management.		
5.10	Should support four RMON groups (history, statistics, alarms, and events).		
5.11	Should support Network Assistant software for network management application for users up to 250.		
5.12	Should support SNMPv1, v2c, and v3.		
6	**Standards**		
6.1	Should support IEEE 802.1D, IEEE 802.1p, IEEE 802.1Q VLAN, IEEE 802.1s, IEEE 802.1w, IEEE 802.1X, IEEE 802.1ab, IEEE 802.3ad,IEEE 802.3af, IEEE 802.3ah,IEEE 802.3x,IEEE 802.3,IEEE 802.3u,IEEE 802.3ab,IEEE 802.3z.		

Table-3: Network Layer-2 Access Switch 48 ports - 2 Nos.			
Make, OEM Model/ OEM Part No.:			
Sr. No.	**IPR Specifications**	**Compliance (Yes/No)**	**Remarks**
1	**Architecture**		
1.1	Should have 48 auto-negotiating 10BASE-T/100BASE-TX/1000Base-TX ports configured as Auto Sensing.		
1.2	Should have Small Form-Factor Pluggable 2 nos Gigabit SFP and 2 nos 10G SFP+ uplinks.		
1.3	Should support Stacking with additional Stack ports.		
1.4	Should support Stacking backplane of minimum of 20 Gbps & 8 units in a stack.		
1.5	Should support Cross Stack Ether-channel connections which can aggregate up to eight separate physical ports from any switches in the stack into one logical channel uplink.		
1.6	Should support Forwarding Bandwidth of minimum 100 Gbps & switching bandwidth of 200 Gbps.		
1.7	Should support Jumbo Frames of 9018 bytes.		
2	**Layer 2 Features**		
2.1	The Switch should be able to discover the neighbouring device of the same bidder giving the details about the platform, IP Address, Link connected through etc., thus helping in troubleshooting connectivity problems.		
2.2	Should support Local Proxy or Address Resolution Protocol.		
2.3	The switch should have an intelligent feature to allow unidirectional links caused by incorrect fibre-optic wiring or port faults to be detected and disabled on fibre-optic interfaces.		
2.4	Should support Dynamic Trunking Protocol (DTP).		
2.5	Support Port Aggregation Protocol (PAgP) automates the creation of Fast Ether Channel groups or Gigabit Ether Channel groups to link to another switch, router or server.		
2.6	Should support Link Aggregation Control Protocol (LACP) allows the creation of Ethernet channelling with devices that conform to IEEE 802.3ad.		
2.7	Should support UDLD and Aggressive UDLD protocol.		

2.8	Should support (IGMP) Snooping for IPv4 and IPv6 MLD v1 and v2 Snooping.		
2.9	Should support Per-Port Broadcast, Multicast, and Unicast Storm Control		
2.10	Should support Voice VLAN.		
2.11	Should support VLAN Trunking Protocol (VTP).		
2.12	Should support RSPAN.		
2.13	Should support (BPDU) Guard & STRG.		
2.14	Should support Dynamic VLAN Assignment.		
2.15	Should support Flex link to provide link redundancy & VLAN Flex Link load-balancing.		
2.16	Should support IEEE 802.1s/w Rapid Spanning Tree Protocol (RSTP) and Multiple Spanning Tree Protocol (MSTP).		
2.17	Should support Per-VLAN Rapid Spanning Tree (PVRST+).		
2.18	Should support Switch-Port Auto-recovery.		
2.19	Should support Cross Stack QOS.		
3	**Network Security Features**		
3.1	Switch should support port security.		
3.2	Switch should support DHCP snooping.		
3.3	Switch should support ARP inspection.		
3.4	Switch should support IP source guard.		
3.5	Switch should support flexible multiple authentication using 802.1x, MAC Authentication bypass, WEB authentication.		
3.6	The switch should support for comprehensive policy management capabilities using RADIUS Change of Authorization.		
3.7	The switch should Support 802.1x Supplicant with NEAT.		
3.8	The switch should also provide support for Private VLAN Edge.		
3.9	Should support Multi-domain Authentication.		
3.10	Should support Port-Based ACLs.		
3.11	Should support Secure Shell (SSH) Protocol.		
3.12	Should support TACACS+ and RADIUS Authentication.		
3.13	Should support MAC address Notification.		
3.14	Should support Multilevel Security on Console Access.		
4	**Quality of Service**		
4.1	The switch should have intelligence to continuously send multicast streams in a multicast VLAN while isolating the streams from subscriber VLANs for bandwidth and security reasons		
4.2	Auto QOS simplifies QoS configuration in voice over IP (VoIP) networks		
4.3	Should support 802.1p Class of Service (CoS) and differentiated services code point (DSCP) field classification.		
4.4	Should support Four Egress Queues Per Port.		
4.5	Should support Shaped Round Robin (SRR).		

4.6	Should support Weighted Tail Drop (WTD).		
4.7	Should support Rate Limiting.		
5	**Manageability**		
5.1	The switch should allow administrators to remotely monitor ports in a Layer 2 switch network from any other switch in the same network.		
5.2	The management feature should have ease of troubleshooting by identifying the physical path that a packet takes from source to destination.		
5.3	Should provide Embedded Remote Monitoring (RMON) software agent supporting four RMON groups (History, Statistics, Alarms and Events) for enhanced traffic management, monitoring, and analysis Web browser setup utility allows one-click initialization for IP addresses and passwords.		
5.4	Should provide support for TFTP (Trivial File transfer protocol) for the easy software upgrades on the network.		
5.5	Should provide Auto-configuration for ease of deployment of switches in the network by automatically configuring multiple switches across a network via a boot server.		
5.6	Should have Auto-sensing on each non-GBIC port detects the speed of the attached device and automatically configures the port for 10, 100 or 1000 Mbps operation, easing the deployment of the switch in mixed 10, 100, and 1000 BaseT environments.		
5.7	Should have Auto-negotiating on all ports automatically selects half- or full-duplex transmission mode to optimize bandwidth.		
5.8	Should have Auto Smart ports to provide automatic configuration as devices connect to the switch port, allowing auto detection and plug and play of the device onto the network.		
5.9	Should support Stacking Master Configuration Management.		
5.10	Should support four RMON groups (history, statistics, alarms, and events).		
5.11	Should support Network Assistant software for network management application for users up to 250.		
5.12	Should support SNMPv1, v2c, and v3.		
6	**Standards**		
6.1	Should support IEEE 802.1D, IEEE 802.1p, IEEE 802.1Q VLAN, IEEE 802.1s, IEEE 802.1w, IEEE 802.1X, IEEE 802.1ab, IEEE 802.3ad,IEEE 802.3af, IEEE 802.3ah,IEEE 802.3x,IEEE 802.3,IEEE 802.3u,IEEE 802.3ab,IEEE 802.3z.		

Table-4: 10G BASE SFP+ LR Module

Make, OEM Model/ OEM Part No.:

Sr. No.	IPR Specification	Compliance (Yes/No)	Remarks
1.1	Should be 10G base SFP+ LR 1310nm SMF module.		
1.2	Should support 10GBASE Ethernet in accordance with IEEE 802.3.		
1.3	Should be compatible with the quoted core switch and access switch.		
1.4	Should have small form factor for greatest density per chassis.		
1.5	Should have digital optical monitoring capability for strong diagnostic capabilities.		
1.6	Should have Dual LC/PC connector.		
1.7	Should be hot-swappable that plugs into an Ethernet SFP+ port of the switch (no need to power down if installing or replacing).		
1.8	The module should support transmission on link length of atleast 10 Km on standard single-mode fibre.		

Table-5: Network Passive UTP Cabling Components
(Quantity decided by bidder as per the distance and other inputs provided)

Sr. No.	IPR Specifications	Compliance (Yes/No)	Remarks
1	All specifications for components & cabling should be tested up to 1200Mhz, UL/ETL listed; UL/ETL marking should be embossed/printed on the passive items & their packing.		
2	**Item: Shielded/FTP Cable (CAT-7A)** **Make, OEM Model/ OEM Part No.:**		
2.1	Should be 100 Ohm, 4X2 AWG23, solid bare copper, S/FTP installation cable with overall braided screen.		
2.2	Should support network line speeds up to 10 gigabits per second.		
2.3	Should have Outer jacket colour: gray		
2.4	Should Compliant with standards: ISO/IEC 11801 ed. 2.2, Low-smoke in acc. with IEC 61034, flame-retardant in acc. with IEC 60332-1 and halogen-free in acc. with IEC 60754-2, RAL 7035 standards for physical & electrical specifications, UL/ETL *R listed.		
2.5	Should be certified by independent test i.e. 3P/Delta lab for 10G (Gigabit) Ethernet Performance up to 100 mts, Certificate Must be submitted by bidder.		
3	**Item: 24 port Shielded Patch Panel** **Make, OEM Model/ OEM Part No.:**		
3.1	Should be 24 x RJ45 port, 19 inch, 1U, Metallic, high strength, unloaded, shielded, modular Patch Panel.		
3.2	Should have provision for blue colour coding on the patch panel side for identification.		
3.3	Should have Zigzag type IO placement for better alien cross talk.		
3.4	Should be Compliant with standards: Should confirm or exceed the EIA/TIA 568 C.2 Class EA standards, transmission channels of Class EA with up to 4 plugged connections according to ISO/IEC 11801 ed. 2.2, June 2011, EN 50173-1 May 2011 (DIN EN 50173-1) and Class F on 2 pairs, complies with Cat. 6A requirements of the standards ISO/IEC 11801 ed. 2.2, June 2011, EN 50173-1 May 2011, as well the U.S. standard Cat. 6A according to TIA 568-C.2.		
4	**Item: Shielded Information Outlets** **Make, OEM Model/ OEM Part No.:**		
4.1	Should have surface mount box with RJ-45 socket & gang box for Shielded Cat. 6A with dust cover and mounting plate in Single (1-port) or Dual (2-port) configuration.		

4.2	Should be Non PCB type, multiple time reusable and independent termination without any tool.		
4.3	Should have facility to have visual inspection of Contact area.		
4.4	Should have gold-plated bronze contacts for atleast 1000 mating cycles.		
4.5	Should have provision for 180° Cable Entry.		
4.6	Should have Dielectric strength >1000 Veff.		
4.7	Should be made of halogen-free and heavy-metal free material in acc. with EU directives RoHS 2.		
4.8	Should compliant with standards: ISO/IEC 11801 for Cat. 6A requirements. Suitable for 10GBASE-T applications in acc. with IEEE 802.3 Section Four up to 650 MHz and 100 m, for the setting up of transmission channels of Class EA with up to 4 plugged connections acc. to ISO/IEC 11801, Parallel pair termination without crossover in acc. with TIA 568-A/B, PoE and PoE+ compatible according to IEC 60512-99-001, re-embedded tested in acc. with IEC 60603-7-41 and 60512-27-100, halogen-free and heavy-metal free in acc. with EU directives RoHS 2, UL/ETL *R listed.		
4.9	Should be certified by independent test i.e. 3P/Delta lab for 10G Gigabit Ethernet Performance up to 100 meters.		
5	**Item: Shielded Patch Cord - 1/2 meters** **Make, OEM Model/ OEM Part No.:**		
5.1	Should be S/FTP, flexible, LSFRZH cable with 4 x 2 x AWG 26/7 inner conductor.		
5.2	Shall have RJ-45 plugs with matching color molded boot at both the ends		
5.3	All patch cords shall be factory crimped and packed.		
5.4	Shall support network line speeds up to 10 Gbps		
5.5	Shall support applications such as ISDN, POE, token ring & VOIP.		
5.6	**Preferred Colour:** Blue		
5.7	Should compliant with standards: IEC 61034 for Low-smoke, flame-retardant in acc. with IEC 60332-3C, Halogen-free and heavy-metal free in acc. with EU directives RoHS 2, compliant with Cat. 6A ISO component standard: IEC 60603-7-51 RJ45 category 6A ISO (650 MHz), shielded. Strain-relief function in acc. with TIA 568-C, for setting up of transmission channels of Class EA with up to 4 plugged connections acc. to ISO/IEC 11801 ed. 2.2, June 2011, EN 50173-1, May 2011 (DIN EN 50173-1), interoperable and backwards compatible with Category 6 and Category 5e, suitable for 10GBASE-T applications in acc. with IEEE 802.3™ Section Four up to 650 MHz.		
6	**Item: ABS British Style Face Plate** **Make, OEM Model/ OEM Part No.:**		
6.1	Should be Dual-port face plate with one single Blank.		
6.2	Should have provision to mount Coloured Hinged dust cover for port identification.		
6.3	Face plates should carry smart holes on the front side that will help to mount the passive security		

	solutions at the later part.		

Table-6: Network Passive OFC Cabling Components
(Quantity decided by bidder as per the distances and other input provided)

Sr. No.	Descriptions	Compliance (Yes/No)	Remarks
1	**Item: Single Mode Fibre Optic armoured cable** **Make, OEM Model/ OEM Part No.:**		
1.1	Should be 9.2/125 micron graded index, 12/24-core Single mode OS2 non-metallic, anti rodent, armored cable as per ISO/IEC-11801.		
1.2	Should be suitable for using in the building shaft and outdoor lying.		
1.3	Should be jelly filled with loose tubes construction, armouring with acrylic coated good quality steel tape with FRP strength member, water proof tape, and layer of HDPE jacket.		
1.4	Should be able to meet Gigabit & 10G Ethernet performance requirement up to 1000 m specified by IEEE 802.3z (1000 Base-X) & IEEE 802.3ae (10G Base-X)		
1.5	Should confirm or exceed the ISO/IEC 11801:2002; IEC 60794-1-2 E1; IEC 60794-1-2 E11; IEC 60794-1-2 E3; IEC 60794-1-2 F1; IEC60794-1and ITU Recommendation G.652.D standard standards for Fibre and cable performance specifications. Should be certified third party labs for IEC 60332-3 for flame retardant, IEC 61034-2 for low smoke & IEC 60754-2 for toxicity & acidity.		
2	**Item: Optical Fibre adapters - LC Type for terminating 9.2/125µ SM fibre** **Make, OEM Model/ OEM Part No.:**		
2.1	Should be duplex LC adapter in acc. with IEC 61754-20.		
2.2	Should have adapter body plus flange and integral quick-mounting clip and M2 thread in metallic colour made up of X10CrNi18-8 material or better and housing material of PBT / UL 94 V-0 or better.		
2.3	Should have Zirconia (ceramic) alignment sleeve.		
2.4	Should have integral self-closing metal laser protection flaps.		
2.5	Should have semi-transparent plastic dust covers, allowing optical testing with test lasers without removing the covers.		
2.6	Should have min. 500 mating cycle.		
2.7	Should have option for physical lock protection.		
2.8	The adapter should be qualified in acc. with IEC 61753-1 for category U (uncontrolled environment).		
3	**Item: Optical Fibre pigtails LC type - 1.5 meter for terminating**		

	9.2/125µ SM fibre **Make, OEM Model/ OEM Part No.:**		
3.1	Should be LSZH, semi-tight buffer PA/PBT.		
3.2	Should be Single mode 9.2/125 µm OS2 having length atleast 1.5 m.		
3.3	Should be fitted with one LC connector in acc. with IEC 61754-20.		
3.4	Should have Zirconia (ceramic) ferrule with PC polished end face geometry.		
3.5	Should be strain relief with white plastic dust cover.		
3.6	The connector should qualify in acc. with IEC 61753-1 for category U (uncontrolled environment).		
4	**Item: Optical Patch Cord 3 meter / 30 meter** **Make, OEM Model/ OEM Part No.:**		
4.1	Should be LSZH, semi-tight buffer PA/PBT.		
4.2	F8 2.7x5.5 mm, yellow, single mode 9.2/125 µm OS2		
4.3	Patch cord should be Mounted on both sides with LC-Duplex connectors in accordance with IEC 61754-4.		
4.4	Should have Zirconia (ceramic) ferrule with a PC polished end face geometry.		
4.5	Connectors should tune in accordance with IEC 61755-3-1 and qualified in acc. with IEC 61753-1 for category U (uncontrolled environment).		
4.6	The material should be PBT / UL 94 V-0,		
4.7	Should have duplex clip, 1 x blue and 1 x red strain relief with material TPE / UL 94 V-0 and plastic dust cover.		
5	**Item: LIU 24 fibre, 1U, 19" Rack mount enclosure** **Make, OEM Model/ OEM Part No.:**		
5.1	Should be loaded with LC couplers & adaptor plates for 6/12/24 and 48 fibres 9.2/125 micron SM.		
5.2	Should be 19", 1U height rack mountable metallic distribution enclosure with removable back cover.		
5.3	The metallic box and front panel material should be powder-coated stainless steel.		
5.4	Should have integrated adapter plate and splice tray with all clamps, harnessing rings, ties etc.		
5.5	Should be provided with front & rear compatible cable management rings/ bars.		

Table-7: Floor Standing Network Rack – 32U			
Make, OEM Model/ OEM Part No.:			
Sr. No.	**IPR Specification**	**Compliance (Yes/No)**	**Remarks**
1	**Size**		
1.1	Should have a usable height of 32U and overall height with castors should not exceed		
1.2	Should have approximate width of 800mm.		
1.3	Should have maximum overall depth of 1000mm.		
1.4	Should be capable to carry minimum 500 Kg load.		
2	**Material**		
2.1	Should have rigid frame structure.		
2.2	Should have glass front door.		
2.3	Should have single or dual rear perforated doors.		
2.4	Should have removable side panels with slam latches & indents for easy access.		
2.5	Should have ventilated top and bottom covers with cable entry provision. The top cover should have provision for fan tray mounting.		
2.6	The front/rear door and side panels should be made up of CRCA steel with powder coating.		
3	**Power Management**		
3.1	Should have atleast 1 power distribution unit with 10 numbers of 5/15 Amp sockets, 32 Amp MCB and indicator with 3 meter cable having 3 pin plug termination.		
4	**Accessories**		
4.1	Should have fully accessible 19" mounting angles at front and rear with "U" marking for easy location of equipment in the designated slots.		
4.2	Should have atleast 4 nos. of 1U, 19" horizontal cable manager.		
4.3	Should have four fan position Fan Housing Unit with 4 nos. of 230 VAC, 90 CFM fans.		
5	**Others**		
5.1	Should have floor placement using 2 nos. of castors with foot brakes and 2 nos. of castors without brake and levelling legs.		
5.2	Should have earth continuity kit.		

Sr. No.	IPR Specification	Compliance (Yes/No)	Remarks
5.3	Should have atleast 5 nos. of equipment mounting hardware packet with atleast 20 items each.		
6	**Standards**		
6.1	Should be compliant with the standards DIN41494/EIA 310D, environment friendly according to RoHS and ISO 9001-2000, ISO 14001 -2004.		

Table-8: Standing/Wall mount Network Rack – 9U			
Make, OEM Model/ OEM Part No.:			
Sr. No.	**IPR Specification**	**Compliance (Yes/No)**	**Remarks**
1	**Size**		
1.1	Should have a usable height of 9U.		
1.2	Should have approximate width of 600mm.		
1.3	Should have maximum overall depth of 800mm.		
1.4	Should be capable to carry minimum 50 Kg load.		
2	**Material**		
2.1	Should have rigid frame construction.		
2.2	Should have glass front door.		
2.3	Should have single or dual rear perforated doors.		
2.4	Should have removable side panels with slam latches & indents for easy access.		
2.5	Should have ventilated top and bottom covers with cable entry provision. The top cover should have provision for atleast two fans tray mounting.		
2.6	All the frames, front/rear door and side panels should be made up of CRCA steel with zirconium powder coating.		
3	**Power Management**		
3.1	Should have atleast 1 power distribution unit with atleast 6 numbers of 5 Amp sockets, 32 Amp MCB, spike suppressor and indicator with 1.5 meter cable having 3 pin plug termination.		
4	**Accessories**		
4.1	Should have fully recessible 19" mounting angles at front and rear with "U" marking for easy location of equipment in the designated slots.		
4.2	Should have atleast 1 no. of 1U, 19" horizontal cable manager.		
4.3	Should have two fan position Fan Housing Unit with 2 nos. of 230 VAC, 90 CFM fans.		
5	**Others**		
5.1	Should have provision to stand on the floor as well as for mounting on the wall mounting.		
5.2	Should have earth continuity kit.		

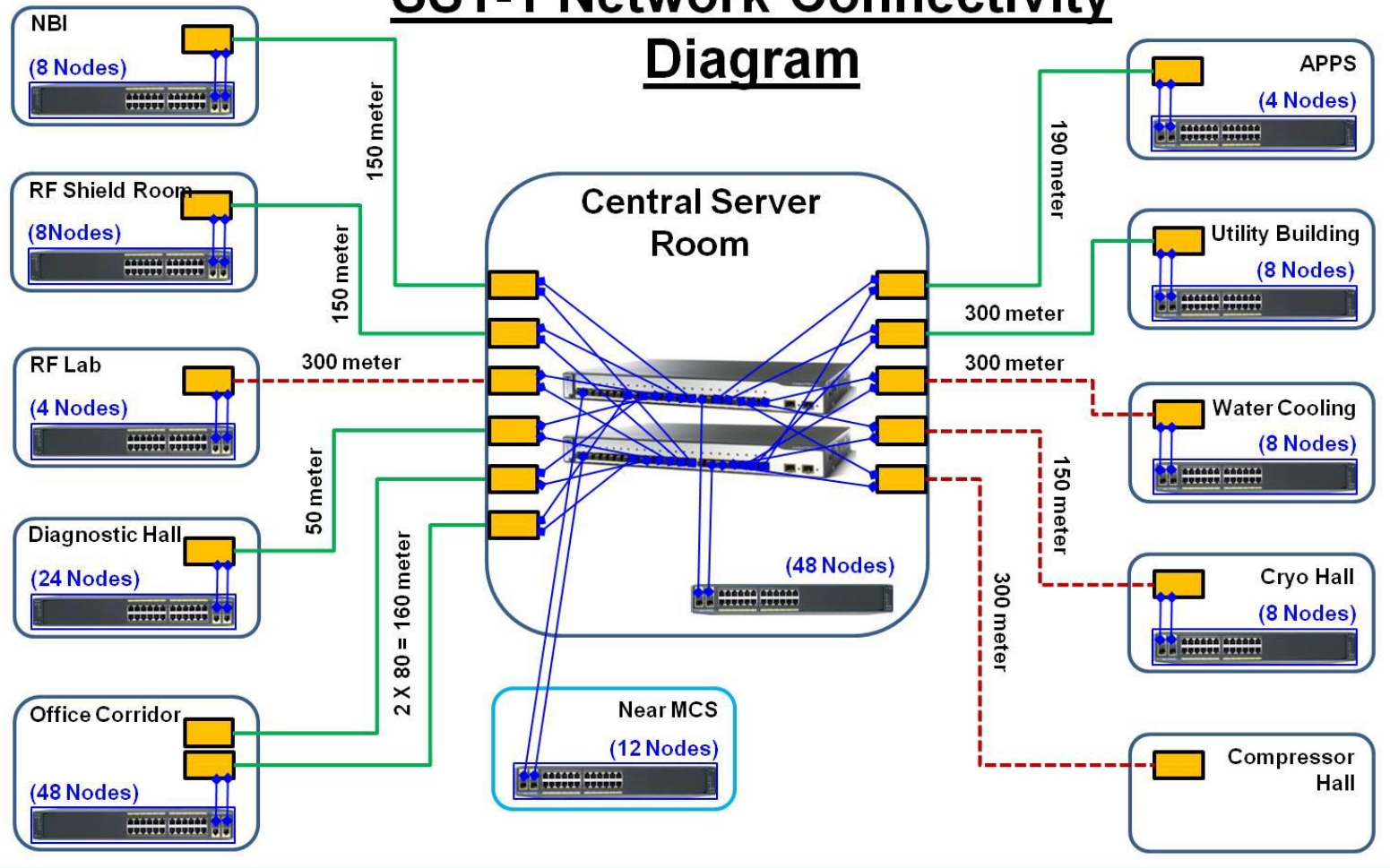| 5.3	Should have atleast 1 no. of equipment mounting hardware packet having atleast 10 items.		
6	**Standards**		
6.1	Should be compliant with the standards DIN41494/EIA 310D, environment friendly according to RoHS and ISO 9001-2000, ISO 14001 -2004.		

Annexure-I

Tentative Number of Network Ports and distances at different Locations

Sr. No.	Location	No. of Ports	Average distance (m) for single node	Total CAT-7A cable required in meter
1	Central Control Room	48	10	480
2	Control Room (Near MCS)	12	10	120
3	Diagnostic Hall	24	15	360
4	Office Corridor	48	20	960
5	RF	8	5	40
6	NBI Bay	8	10	80
7	RF Lab	4	10	40
8	APPS	4	10	40
9	Utility Building – First Floor	8	15	120
10	Water Cooling Building	8	15	120
11	Cryo Hall	8	5	40
	TOTAL	**180**		**2420**

Tentative Distances for optical fibre backbone

Location From	Location To	Distance in Meter	No of Fibre cores
Central Server room	Diagnostic Hall	50	24
do	Office Corridor	2X80m =160	2X24 = 48
do	RF Bay	150	24
do	NBI Bay	150	24
do	APPS	190	24
do	Utility Building – First Floor	300	24
do	Water Cooling Building	300	12
do	Cryo Hall	150	12
do	Compressor Hall	300	12
do	RF Lab	300	12

Annexure-II

SST-1 Network Connectivity Diagram

NBI (8 Nodes)

RF Shield Room (8Nodes)

RF Lab (4 Nodes)

Diagnostic Hall (24 Nodes)

Office Corridor (48 Nodes)

Central Server Room

(48 Nodes)

Near MCS (12 Nodes)

APPS (4 Nodes)

Utility Building (8 Nodes)

Water Cooling (8 Nodes)

Cryo Hall (8 Nodes)

Compressor Hall

150 meter
150 meter
300 meter
50 meter
2 X 80 = 160 meter
190 meter
300 meter
300 meter
150 meter
300 meter

Legend:
- ------- 12 Core Single Mode Fiber
- ——— 24 Core Single Mode Fiber
- ◆——◆ Patchcord
- ▣ LIU
- Core Switch
- 1G Access Switch