Structured Cable

Annexure 12 A

S/N	Required Minimum Specifications	Bidder's compliance (Yes / No)	Bidder's remarks
1	All passive component, accessories and cables supplied under this contract shall be in accordance with the latest applicable recommendations, regulations and standards of: - CCITT / ITU - ANSI - IEC 60364 - IEEE Standard 1100 - IETF - TIA 942 - IS 3043 - EIA / TIA 568 Standards - NFPA 72 and NFPA 318 International Electro-technical Commission (IEC)		
2	Quality Control: The horizontal cable shall have a unique print string on the cable jacket. This unique identifier shall also be used for on-line reference to a full set of factory tests that were performed on a sample from the same mater reel. The on-line reference must be available on the SCS vendor public website, such that it can be accessed at any time.		

CAT 6A Cable			Annexure 12 B
S/N	Required Minimum Specifications	Bidder's compliance (Yes / No)	Bidder's remarks
1	The Cable should meet ANSI/TIA 568C.2 Category 6A Specifications		
2	The Conductors should be twisted in pairs with four pairs contained in a flame retardant LSZH jacket separated by a divider and conductor size should be 23 AWG.		
3	The cable should support the installation temperature: 0 to 60 0 C		
4	The Cable should support Operating temperature of -20 to 60 0 C		
5	The Category 6A/ Class EA STP Structured Cabling System(SCS) shall comply with the standards ISO/IEC 11801:2010,EN 50173 Part 1 through Part 5:2010 and 2011, ANSI/TIA-568-C IEC 60603-7-4,IEEE 802.3 applications as outlined in section 2 & Local/National Codes and Regulations.		
6	The Category 6A/ Class EA UTP system should support IEEE Ethernet applications: 802.3e - 1BASE5, 802.3i – 10GBASE-T , 802.3u - 100BASE-TX, 100BASE-T4, 802.3y - 100BASE-T2, 802.3z - 1000BASE-X, 8023ab - 1000BASE-T,802.af - Power Over Ethernet (15.4W),802.3at - Power Over Ethernet Enhancements (25.5W),802.3az - Energy Efficient Ethernet.		
7	The SCS must be tested by a 3rd Party test facility to EIA/TIA 568C, ISO/IEC 11801 Amendment 1 and for the channel testing ,the certificate for the same must be provided as part of the bid response.		

Fibre Cables (OM3/OM4)			Annexure 12 C
S/N	**Required Minimum Specifications**	**Bidder's compliance (Yes / No)**	**Bidder's remarks**
1	The 50/125 mm fiber channel shall support single-channel serial transmission, 10 gigabits per second (Gb/s) for a distance of 300 meters, 40Gbps up to a distance of 100-150 meters		
2	The channel shall support 10 Gb/s short wavelength (850 nm) emerging technology applications using vertical cavity surface emitting lasers (VCSELs) and low bit rate LED applications for legacy systems.		
3	The 50 micron fiber shall be optimized to control differential mode delay (DMD) or equivalent standard, so that "pulse splitting" at 10 Gb/s is eliminated.		
4	The high performance fiber shall use the same termination and test procedures that are currently used for the existing industry's lower performance 50 mm fiber. Fibers shall be manufactured with dual acryl ate coating for maximum color retention and protection.		
5	The 50 mm fiber cable, 50 mm fiber connectors, 50 mm patch cords and apparatus, which comprise the channel shall be manufactured from a single manufacturer		
6	The 50 micron fiber shall meet or exceed the following standards, as applicable, for OSP or Plenum cables: ICEA S-83-596, ISO/IEC-794, GR-409, TIA/EIA455, TIA/EIA492, TIA/EIA568-B, ANSI-FDDI, IEEE 802, UL 910 or equivalent, OFNP classification as described in the National Electric Code (NEC2), OFN-LS Low Smoke Cables, CSA Certified (OFN FT4/FT6) or equivalent and approved component industry standards.		
7	Multimode fiber cable should be Bend - Insensitive multi-mode fiber (BIMMF) to significantly reduce macro bend losses even in the most challenging bend scenarios.		
8	The cable should be able to withstand bending radius of 3 times the outer diameter. Maximum insertion loss in MTP connector should be <=0.35 dB		
9	Maximum reflectance loss in MTP connector should be <-35 dB		
10	Trunks cable shall be manufactured with ultra-bendable fiber and meet the fiber performance: (@ 850 nm wavelength) - (a) Max. Attenuation, Loose Tube Cable - 3.0 dB/km (b) Max. Attenuation, Tight Buffer Cable - 3.0 dB/km (@ 1300 nm wavelength) - (a) Max. Attenuation, Loose Tube Cable - 1.0 dB/km (b) Max. Attenuation, Tight Buffer Cable - 1.0 dB/km		
11	Flame Test Specifications : Flame Test Listing NEC OFNRLS (ETL) and c(ETL) or equivalent		
12	The OM3/OM4 fibre should be bidirectional mode		

CAT 6A/ Fiber Optic Patch Chord/Panel			Annexure 12 D
S/N	**Required Minimum Specifications**	**Bidder's compliance (Yes / No)**	**Bidder's remarks**
1	Patch Cords should comply TIA/EIA-568C.2 and ISO 11801 standards		
2	Each patch cord should be 100% factory made and performance tested.		
3	Fiber optic patch cords should be as per EIA/TIA standards.		
4	The ganged adapter style patch panel will utilise increments of six RJ-45 style jacks in a common molded component.		
5	The ganged adapters shall have RJ45 jack in the front and Insulation Displacement Connector (IDC) at the rear of the module.		
6	The panel shall have horizontal cord organizers available as to improve patch cord management		
7	The patch panel type shall be a 1U panel capable of supporting 24 Port (copper) and 48 port (Fibre) configuration compliant with IEC 60603-7-4 while meeting the Channel Performance as specified in Amendment 1 to ISO/IEC 11801:2002		
8	The panel shall be equipped with a removable rear mounted cable management bar and front and rear labels		

Information Outlet			Annexure 12 E
S/N	**Required Minimum Specifications**	**Bidder's compliance (Yes / No)**	**Bidder's remarks**
1	The 8-pin modular Jacks shall be 4-pair, RJ-45 and shall comply with IEC 60603-7-4 and ISO 11801 standards		
2	Modular jacks shall be shall easily fit in a UTP / STP CAT 6A Face Plate and shall terminate using both T568A and T568B wiring.		
3	Outlet shall be capable of terminating 23 AWG CAT 6A STP/UTP cable conductors.		
4	The Category 6A outlets shall be backward compatible with Category 6 and 5E cords and cables.		
5	The information outlet must support 90 degree cable termination.		
6	The insulation displacement contacts shall be paired, with additional space between pairs, to improve crosstalk performance.		
7	The modular jacks or faceplate must be auto shuttered and should have integral dust cover protection		

Leaf Switch Fibre -Data & DMZ

Annexure 12 F1

Make and Model :

S/N	Required Minimum Specifications	Bidder's compliance (Yes / No)	Bidder's remarks
A	**Hardware & Interface / Performance**		
1	Switch should have 48 ports or more, capable of 10/25 GbE SFP+. Oversubscription ratio of the connectivity between each leaf to SPINE switches should not be less than 8:1		
2	Switch should support minimum 2.56 Tbps switching capacity/throughput or more		
3	Switch should support at least 2000 Million packets per second		
4	Shall support Non-blocking architecture and wire-speed Layer-2 and Layer-3 forwarding		
5	For SFP/SFP+, shall support 10/25 GBE		
6	The switch should support 12,000 IPv4 and IPv6 routes entries in the routing table including multicast routes		
7	Switch should have console port		
8	Switch should have management interface for Out of Band Management		
9	Switch should be rack mountable and support side rails if required		
10	Switch should have adequate power supply for the complete system usage with all slots populated and used and provide N+1 redundant		
11	Switch should have hardware health monitoring capabilities and should provide different parameters through SNMP		
12	Switch should support VLAN tagging (IEEE 802.1q)		
13	Switch should support IEEE Link Aggregation or Ethernet Bonding functionality to group multiple ports for redundancy		
14	Switch should support Configuration roll-back and check point		
15	Switch should support for different logical interface types like loopback, VLAN, SVI/RBI, Port Channel/LAG, multi chassis port channel etc		
B	**Operating System**		
1	Shall support modern modular operating system designed for data center scalability and reliability		
2	Shall support auto process recovery from failures		
3	Shall support Health monitoring and self healing		
4	Shall support Live patching through ISSU or hitless upgrade (In-Service Software Upgrades) without distruption of other processes/system modules while upgrading operating system		
5	Shall support Single Operating System binary image for all switch models		
6	Shall support Industry standard CLI		
C	**Control Plane**		
1	Quad Core x86 CPU		
2	4GB DRAM		
3	4GB Flash		
4	24 MB Buffer		
D	**Layer 2 features**		
1	Shall support 96K MAC entries		
2	Spanning Tree Protocol (IEEE 802.1.D, 802.1W, 802.1S)		
3	Switch should support VLAN Trunking (802.1q) and should support 4096 VLAN		
4	Switch should support basic Multicast IGMP v1, v2, v3		
5	Shall support Rapid Per VLAN Spanning Tree (RPVST+)		
6	Shall support 802.3ad Link Aggregation LACP with up to 16 ports/channel		
7	Shall support up to 64 ports per Link Aggregation Group (LAG)		
8	Shall support 100 Link Aggregation Groups (LAG)		
9	Shall support 64 ports active/active layer2/Layer3 multipathing redundancy		
10	Shall support 802.1AB Link Layer Discovery Protocol (LLDP)		
11	Shall support Port Mirroring		
12	Shall support 802.3x Flow Control		
13	Shall support Jumbo Frames 9216 Bytes		
14	Shall support active/active layer-2 topology without STP where host are dual homed to switch using vPC or MLAG		
E	**Layer 3 features**		
1	Shall support 100K IPv4 Unicast entries		
2	Shall support 8K or more IPv6 Unicast entries		
3	Shall support 10K IPv4 Multicast entries		
4	Shall support 4K ACL		
5	Shall support basic layer-3 routing – static routes, RIP		
6	Shall support VRRP or equivalent		
7	Shall support 64-way ECMP routing for load balancing and redundancy		
8	Shall support OSPF & BGP routing		
9	Shall support PIM-SM multicast routing		
10	Shall support Route Maps		
11	Shall support Anycast RP		
F	**Data center Advanced Features and Network Virtulization**		
1	Shall be VxLAN ready.		
2	Switch should support Network Virtualization using Virtual Over Lay Network using VXLAN		
3	Switch should support VXLAN and EVPN or equivalent for supporting Spine - Leaf architecture to optimize the east - west traffic flow inside the data center		
4	Switch should support Open Flow/Open Day light/Open Stack controller		
5	Switch should support Data Center Bridging		
6	Switch should support multi OEM hypervisor environment and should be able to sense movement of VM and configure network automatically, may be using orchestation layer		

G	**Quality of Service (QoS) Features**		
1	Up to 8 queues per port		
2	802.1p based classification		
3	DSCP based classification		
4	DSCP based classification and remarking		
5	Rate limiting		
6	Switch should support for different type of QoS features for ream time traffic differential treatment using a. Weighted Random Early Detection b. Strict Priority Queuing		
7	Switch should support to trust the QoS marking/priority settings of the end points as per the defined policy		
H	**Security and Network Management features**		
1	Shall Support ACLs using Layer 2, Layer 3, Layer 4 fields		
2	Shall Support MAC Security		
3	Shall Support TACACS+/RADIUS		
4	Shall Support SNMP v2, v3		
5	Shall have 100/1000 management port		
6	Shall Support USB port		
7	Shall Support Management over IPv4, IPv6		
8	Switch should support DHCP Snooping		
9	Switch should provide remote login for administration using: a. Telnet b. SSHV2		
10	Shall Support Syslog		
11	Shall Support AAA		
12	Industry Standard CLI		
13	Shall Support Port Mirroring		
14	Shall Support sFlow / netFlow		
15	Switch should support for management and monitoring status using different type of Industry standard NMS using: a. SNMP V1 and V.2 b. SNMP V.3 with encryption c. Filtration of SNMP using Access list d. SNMP MIB support for QoS		
16	Switch should support for basic administrative tools like: a. Ping b. Traceroute		
17	Shall support built in TCP Dump or Wireshark trouble shooting tool or equivalent		
18	Switch should support for embedded RMON/RMON-II for central NMS management and monitoring		
19	Switch should support for sending logs to multiple centralised syslog server for monitoring and audit trail		
20	Switch should support central time server synchronization using Network Time Protocol NTP V.4/PTP		
21	Switch should support for providing granular MIB support for different statistics of the physical and logical interfaces		
22	Switch should provide different privilege for login in to the system for monitoring and management		
I	**Standards Compliance**		
1	Shall Support IEEE 802.1D Bridging and Spanning Tree		
2	Shall Support IEEE 802.1p QOS/COS		
3	Shall Support IEEE 802.1Q VLAN Tagging		
4	Shall Support IEEE 802.1w Rapid Spanning Tree		
5	Shall Support IEEE 802.1s Multiple Spanning Tree Protocol		
6	Shall Support IEEE 802.1AB Link Layer Discovery Protocol		
7	Shall Support IEEE 802.3ad Link Aggregation with LACP		
8	Shall Support IEEE 802.3x Flow Control		
9	Shall Support IEEE 802.3ab 1000BASE-T		
10	Shall Support IEEE 802.3z Gigabit Ethernet		
11	Shall Support IEEE 802.3ae 10 Gigabit Ethernet		
12	Shall Support IEEE 802.3by 25 Gigabit Ethernet		
J	**Monitoring, Provisioning**		
1	Shall support Advance Event Management for pro-active network monitoring or equivalent		
2	Shall support Restoration of Operating System & Configuration from USB		
3	Shall support CLI schedular, Shell script, for timed automation, and event managert for triggered automation		
4	Shall support sFlow or Netflow or equivalent		
5	Shall support centralized script/system to configure a switch without user intervention		
K	**Virtualization features**		
1	Virtualization switch should communicate with vSphere 4.0 and above, and vCenter to support adaptive network virtualization		
2	VLAN auto provision - Auto create/configure VM VLAN when new VM is created in vCenter		
3	VM Auto Discovery – Find exactly which ESX Hosts and VMs are on a given port in the network. Displays the full Physical Port to Virtual Switch to VM Binding.		
4	Should Dynamically create VLAN policy based on VM movement.		
5	Should be able to extract vNIC information from the VM Host.		
6	VmWare Multi-Tenancy – Connecting up to 4 separate vCenter administrative domain.		

L	**High Hardware Availability and Air Flow**		
1	Switch should have 1:1/N+1 level of redundancy for power supply and fans		
2	Should support both Front-to-back and back-to-front reversible airflow for optimized cooling		
3	Switch should support in-line hot insertion and removal of different parts like modules/ power supplies/ fan tray etc and should not require switch reboot & should not disrupt the functionality of the system		
4	Switch should provide gateway level of redundancy in Ip V.4 and IP V.6 using HSRP/VRRP		
M	**Misc**		
1	Switch should support the complete STACK of IP V4 and IP V6 services		
2	The Switch and different modules used should function in line rate and should not have any port with oversubscription ratio applied		
3	Switch should support Configuration roll-back and check point		
4	The transcievers should be from same OEM of the proposed switch		

Leaf Switch Copper -Data & DMZ

Annexure 12 F2

Make and Model :

S/N	Required Minimum Specifications	Bidder's compliance (Yes / No)	Bidder's remarks
A	**Hardware & Interface / Performance**		
1	Switch should have 48 ports or more, capable 1/10 GbE BASE-T. Oversubscription ratio of the connectivity between each leaf to SPINE switches should not be less than 8:1		
2	Switch should support minimum 1.28 Tbps or more switching capacity/throughput		
3	Switch should support 1446 or more Million packets per second		
4	Shall support Non-blocking architecture and wire-speed Layer-2 and Layer-3 forwarding		
5	The switch should support 12,000 IPv4 and IPv6 routes entries in the routing table including multicast routes		
6	Switch should have console port		
7	Switch should have management interface for Out of Band Management		
8	Switch should be rack mountable and support side rails if required		
9	Switch should have adequate power supply for the complete system usage with all slots populated and used and provide N+1 redundant		
10	Switch should have hardware health monitoring capabilities and should provide different parameters through SNMP		
11	Switch should support VLAN tagging (IEEE 802.1q)		
12	Switch should support IEEE Link Aggregation or Ethernet Bonding functionality to group multiple ports for redundancy		
13	Switch should support Configuration roll-back and check point		
14	Switch should support for different logical interface types like loopback, VLAN, SVI/RBI, Port Channel/LAG, multi chassis port channel etc		
B	**Operating System**		
1	Shall support modern modular operating system designed for data center scalability and reliability		
2	Shall support auto process recovery from failures		
3	Shall support Health monitoring and self healing		
4	Shall support Live patching through ISSU or hitless upgrade (In-Service Software Upgrades) without distruption of other processes/system modules while upgrading operating system		
5	Shall support Single Operating System binary image for all switch models		
6	Shall support Industry standard CLI		
C	**Control Plane**		
1	Quad Core x86 CPU		
2	4GB DRAM		
3	4GB Flash		
4	24 MB Buffer		
D	**Layer 2 features**		
1	Shall support 96K MAC entries		
2	Spanning Tree Protocol (IEEE 802.1.D, 802.1W, 802.1S)		
3	Switch should support VLAN Trunking (802.1q) and should support 4096 VLAN		
4	Switch should support basic Multicast IGMP v1, v2, v3		
5	Shall support Rapid Per VLAN Spanning Tree (RPVST+)		
6	Shall support 802.3ad Link Aggregation LACP with up to 16 ports/channel		
7	Shall support up to 64 ports per Link Aggregation Group (LAG)		
8	Shall support 100 Link Aggregation Groups (LAG)		
9	Shall support 64 ports active/active layer2/Layer3 multipathing redundancy		
10	Shall support 802.1AB Link Layer Discovery Protocol (LLDP)		
11	Shall support Port Mirroring		
12	Shall support 802.3x Flow Control		
13	Shall support Jumbo Frames 9216 Bytes		
14	Shall support active/active layer-2 topology without STP where host are dual homed to switch using vPC or MLAG		
E	**Layer 3 features**		
1	Shall support 100K IPv4 Unicast entries		
2	Shall support 8K or more IPv6 Unicast entries		
3	Shall support 10K IPv4 Multicast entries		
4	Shall support 4K ACL		
5	Shall support basic layer-3 routing – static routes, RIP		
6	Shall support VRRP or equivalent		
7	Shall support 64-way ECMP routing for load balancing and redundancy		
8	Shall support OSPF & BGP routing		
9	Shall support PIM-SM multicast routing		
10	Shall support Route Maps		
11	Shall support Anycast RP		
F	**Data center Advanced Features and Network Virtulization**		
1	Shall be VxLAN ready.		
2	Switch should support Network Virtualization using Virtual Over Lay Network using VXLAN		
3	Switch should support VXLAN and EVPN or equivalent for supporting Spine - Leaf architecture to optimize the east - west traffic flow inside the data center		
4	Switch should support Open Flow/Open Day light/Open Stack controller		
5	Switch should support Data Center Bridging		
6	Switch should support multi OEM hypervisor environment and should be able to sense movement of VM and configure network automatically, may be using orchestation layer		

G	**Quality of Service (QoS) Features**		
1	Up to 8 queues per port		
2	802.1p based classification		
3	DSCP based classification		
4	DSCP based classification and remarking		
5	Rate limiting		
6	Switch should support for different type of QoS features for ream time traffic differential treatment using a. Weighted Random Early Detection b. Strict Priority Queuing		
7	Switch should support to trust the QoS marking/priority settings of the end points as per the defined policy		
H	**Security and Network Management features**		
1	Shall Support ACLs using Layer 2, Layer 3, Layer 4 fields		
2	Shall Support MAC Security		
3	Shall Support TACACS+/RADIUS		
4	Shall Support SNMP v2, v3		
5	Shall have 100/1000 management port		
6	Shall Support USB port		
7	Shall Support Management over IPv4, IPv6		
8	Switch should support DHCP Snooping		
9	Switch should provide remote login for administration using: a. Telnet b. SSHV2		
10	Shall Support Syslog		
11	Shall Support AAA		
12	Industry Standard CLI		
13	Shall Support Port Mirroring		
14	Shall Support sFlow / netFlow		
15	Switch should support for management and monitoring status using different type of Industry standard NMS using: a. SNMP V1 and V.2 b. SNMP V.3 with encryption c. Filtration of SNMP using Access list d. SNMP MIB support for QoS		
16	Switch should support for basic administrative tools like: a. Ping b. Traceroute		
17	Shall support built in TCP Dump or Wireshark trouble shooting tool or equivalent		
18	Switch should support for embedded RMON/RMON-II for central NMS management and monitoring		
19	Switch should support for sending logs to multiple centralised syslog server for monitoring and audit trail		
20	Switch should support central time server synchronization using Network Time Protocol NTP V.4/PTP		
21	Switch should support for providing granular MIB support for different statistics of the physical and logical interfaces		
22	Switch should provide different privilege for login in to the system for monitoring and management		
I	**Standards Compliance**		
1	Shall Support IEEE 802.1D Bridging and Spanning Tree		
2	Shall Support IEEE 802.1p QOS/COS		
3	Shall Support IEEE 802.1Q VLAN Tagging		
4	Shall Support IEEE 802.1w Rapid Spanning Tree		
5	Shall Support IEEE 802.1s Multiple Spanning Tree Protocol		
6	Shall Support IEEE 802.1AB Link Layer Discovery Protocol		
7	Shall Support IEEE 802.3ad Link Aggregation with LACP		
8	Shall Support IEEE 802.3x Flow Control		
9	Shall Support IEEE 802.3ab 1000BASE-T		
10	Shall Support IEEE 802.3z Gigabit Ethernet		
11	Shall Support IEEE 802.3ae 10 Gigabit Ethernet		
J	**Monitoring, Provisioning**		
1	Shall support Advance Event Management for pro-active network monitoring or equivalent		
2	Shall support Restoration of Operating System & Configuration from USB		
3	Shall support CLI schedular, Shell script, for timed automation, and event managert for triggered automation		
4	Shall support sFlow or Netflow or equivalent		
5	Shall support centralized script/system to configure a switch without user intervention		
K	**Virtualization features**		
1	Virtualization switch should communicate with vSphere 4.0 and above, and vCenter to support adaptive network virtualization		
2	VLAN auto provision - Auto create/configure VM VLAN when new VM is created in vCenter		
3	VM Auto Discovery – Find exactly which ESX Hosts and VMs are on a given port in the network. Displays the full Physical Port to Virtual Switch to VM Binding.		
4	Should Dynamically create VLAN policy based on VM movement.		
5	Should be able to extract vNIC information from the VM Host.		
6	VmWare Multi-Tenancy – Connecting up to 4 separate vCenter administrative domain.		
L	**High Hardware Availability and Air Flow**		

1	Switch should have 1:1/N+1 level of redundancy for power supply and fans		
2	Should support both Front-to-back and back-to-front reversible airflow for optimized cooling		
3	Switch should support in-line hot insertion and removal of different parts like modules/ power supplies/ fan tray etc and should not require switch reboot & should not disrupt the functionality of the system		
4	Switch should provide gateway level of redundancy in Ip V.4 and IP V.6 using HSRP/VRRP		
M	**Misc**		
1	Switch should support the complete STACK of IP V4 and IP V6 services		
2	The Switch and different modules used should function in line rate and should not have any port with oversubscription ratio applied		
3	Switch should support Configuration roll-back and check point		
4	The transcievers should be from same OEM of the proposed switch		

Spine Switch -Data			Annexure 12 G
Make and Model :			
S/N	**Required Minimum Specifications**	**Bidder's compliance (Yes / No)**	**Bidder's remarks**
A	**Interface/Performance**		
1	Should be modular chassis. Oversubscription ratio of the connectivity between each leaf to SPINE switches should not be less than 6:1.		
2	Shall support at least 20 Terabits or higher per second fabric capacity		
3	Shall support at least 2 Terabits or more per second per line card		
4	Shall support up to 256 - 40/100 Gbe ports		
5	Shall support minimum 800 Mpps per line card		
6	Shall support less than 5 Micro second latency		
7	Shall support Non-blocking architecture		
8	Shall support up to 256 - 40/100 Gbe ports		
9	Should support 40G long range and short range QSFPs.		
10	Switch should have console port for local management		
11	Switch should have management interface for Out of Band Management		
12	Switch should support for different logical interface types like loopback, VLAN, SVI/RBI, Port Channel/LAG, multi chassis port channel etc		
13	Switch should be rack mountable and support side rails, if required		
14	Switch should support VLAN tagging (IEEE 802.1q)		
15	Switch should support IEEE Link Aggregation or Ethernet Bonding		
16	The switch should support hardware based loadbalancing at wire speed using LACP and multi chassis etherchannel/LAG		
17	The switch should support 1,20,000 IPv4 and IPv6 routes entries in the routing table with multicast routes		
18	Switch should have wire rate switching capacity including the services:		
	a. Switching		
	b. IP Routing (Static/Dynamic)		
	c. IP Forwarding		
	d. Policy Based Routing		
	e. QoS		
	f. ACL and Global Control Plane Policing.		
	g. IP V.6 host and IP V.6 routing		
19	Switch should support minimum 32 VRF instances		
B	**Operating System**		
1	Shall support modern modular operating system designed for data center scalability and reliability		
2	Shall support auto process recovery from failures		
3	Shall support Health monitoring and self healing		
4	Shall support Single Operating System binary image for all switch models		
5	Shall support Industry standard CLI		
C	**Resilient Control Plane**		
1	Quad Core x86 CPU		
2	16GB DRAM		
3	4GB Flash		
4	24 Mb buffer per line card		
5	The switch should support dual supervisor and seamless switchover in case of failure		
D	**Layer 2 features**		
1	Shall support 120K MAC entries		
2	Spanning Tree Protocol (IEEE 802.1D, 802.1W, 802.1S)		
3	Switch should support VLAN Trunking (802.1q) and should support 4096 VLAN		
4	Switch should support basic Multicast IGMP v1, v2, v3		
5	Shall support Rapid Per VLAN Spanning Tree (RPVST+)		
6	Shall support 802.3ad Link Aggregation LACP with up to 16 ports/channel		
7	Shall support up to 64 ports per Link Aggregation Group (LAG)		
8	Shall support 256 Link Aggregation Groups (LAG)		
9	Shall support 64 ports active/active layer2/Layer3 multipathing redundancy		
10	Shall support 802.1AB Link Layer Discovery Protocol (LLDP)		
11	Shall support Port Mirroring		
12	Shall support 802.3x Flow Control		
13	Shall support Jumbo Frames 9216 Bytes		
14	Shall support IGMP v2/v3 snooping		
15	Shall support active/active layer-2 topology without STP where host are dual homed to switch		
E	**Layer 3 features**		
1	Shall support 100K IPv4 Unicast entries		
2	Shall support 8K or More IPv6 Unicast entries		
3	Shall support 10K IPv4 Multicast entries		
4	Shall support 4K ACL		
5	Shall support basic layer-3 routing – static routes, RIP		
6	Shall support VRRP or equivalent		
7	Shall support 64-way ECMP routing for load balancing and redundancy		
8	Shall support OSPF v2 with MD5 auth, BGP v4 with MD5 auth, ISIS using MD5 Authentication and MP BGP		
9	Shall support PIM-SM, PIM-SSM and Multicast Source Discovery Protocol (MSDP) multicast routing, IGMP V.1, V.2 and V.3		
10	Shall support Route Maps		

11	Shall support Anycast RP		
F	**Data center Advanced Features and Network Virtualization**		
1	Shall be VxLAN ready.		
2	Switch should support Network Virtualization using Virtual Over Lay Network using VXLAN		
3	Switch should support VXLAN and EVPN or equivalent for supporting Spine - Leaf architecture to optimize the east - west traffic flow inside the data center		
4	Switch should support Open Flow/Open Day light/Open Stack controller		
5	Switch should support Data Center Bridging		
6	Switch should support multi OEM hypervisor environment and should be able to sense movement of VM and configure network automatically, may be using orchestation layer		
G	**Quality of Service (QoS) Features**		
1	Up to 8 queues per port		
2	802.1p based classification		
3	DSCP based classification		
4	DSCP based classification and remarking		
5	Rate limiting		
6	Switch should support for different type of QoS features for ream time traffic differential treatment using a. Weighted Random Early Detection b. Strict Priority Queuing		
7	Switch should support to trust the QoS marking/priority settings of the end points as per the defined policy		
H	**Security and Network Management features**		
1	Shall Support ACLs using Layer 2, Layer 3, Layer 4 fields		
2	Shall Support MAC Security		
3	Shall Support TACACS+ / RADIUS		
4	Shall Support SNMP v2, v3		
5	Shall have 100/1000 management port		
6	Shall Support RS-232 serial console port		
7	Shall Support USB port		
8	Shall Support Management over IPv4, IPv6		
9	Switch should support DHCP Snooping		
10	Switch should provide remote login for administration using: a. Telnet b. SSHV2		
11	Shall Support Syslog		
12	Shall Support AAA		
13	Industry Standard CLI		
14	Shall Support Port Mirroring		
15	Shall Support sFlow / netFlow		
16	Switch should support for management and monitoring status using different type of Industry standard NMS using: a. SNMP V1 and V.2 b. SNMP V.3 with encryption c. Filtration of SNMP using Access list d. SNMP MIB support for QoS		
17	Switch should support for basic administrative tools like: a. Ping b. Traceroute		
18	Shall support built in TCP Dump or Wireshark trouble shooting tool or equivalent		
19	Switch should support for embedded RMON/RMON-II for central NMS management and monitoring		
20	Switch should support for sending logs to multiple centralised syslog server for monitoring and audit trail		
21	Switch should support central time server synchronization using Network Time Protocol NTP V.4		
22	Switch should support for providing granular MIB support for different statistics of the physical and logical interfaces		
23	Switch should provide different privilege for login in to the system for monitoring and management		
24	Protection from unnecessary or DoS traffic by control plane protection policy		
25	Switch should support to prevent edge devices in the network not administrator's controlled from becoming Spanning Tree Protocol root nodes		
I	**Standards Compliance**		
1	Shall Support IEEE 802.1D Bridging and Spanning Tree		
2	Shall Support IEEE 802.1p QOS/COS		
3	Shall Support IEEE 802.1Q VLAN Tagging		
4	Shall Support IEEE 802.1w Rapid Spanning Tree		
5	Shall Support IEEE 802.1s Multiple Spanning Tree Protocol		
6	Shall Support IEEE 802.1AB Link Layer Discovery Protocol		
7	Shall Support IEEE 802.3ad Link Aggregation with LACP		
8	Shall Support IEEE 802.3x Flow Control		
9	Shall Support IEEE 802.3ba 40/100 Gigabit Ethernet		
J	**Monitoring, Provisioning**		
1	Shall support Advance Event Management for pro-active network monitoring or equivalent		
2	Shall support Restoration of Operating System & Configuration from USB		
3	Shall support CLI schedular, Shell script, for timed automation, and event managert for triggered automation		
4	Shall support sFlow or Netflow or equivalent		

5	Shall support centralized script/system to configure a switch without user intervention		
K	**Virtualization and Next Gen DC features**		
1	Virtualization switch should communicate with vSphere 4.0 and above, and vCenter to support adaptive network virtualization		
2	VLAN auto provision - Auto create/configure VM VLAN when new VM is created in vCenter		
3	VM Auto Discovery – Find exactly which ESX Hosts and VMs are on a given port in the network. Displays the full Physical Port to Virtual Switch to VM Binding.		
4	Should Dynamically create VLAN policy based on VM movement.		
5	Should be able to extract vNIC information from the VM Host.		
6	VmWare Multi-Tenancy – Connecting up to 4 separate vCenter administrative domain.		
L	**Hardware High Availability**		
1	Switch should have redundant power supply and fans		
2	Switch should support in-line hot insertion and removal of different parts like modules/ power supplies/ fan tray etc and should not require switch reboot & should notn disrupt the functionality of the system		
3	Switch should provide gateway level of redundancy in Ip V.4 and IP V.6 using HSRP/VRRP		
4	Switch should support for BFD For Fast Failure Detection as per RFC (5880)		
5	Switch should support Graceful Restart for OSPF, BGP etc.		
6	Switch should support in line hot insertion and removal of different parts like modules/power supplies/fan tray etc. This should not require rebooting of the switch or create disruption in the working/functionality of the switch		
M	**Data Center Class Design**		
1	shall support both front to back and back to front reversible air flow		
2	Each line module support as below		
3	QSFP+ ports should be able to split into 4X10GbE using Direct attached cable or Fiber Cable		
N	**Misc**		
1	Switch should support the complete STACK of IP V4 and IP V6 services		
2	The Switch and different modules used should function in line rate and should not have any port with oversubscription ratio applied		
3	Switch should support Configuration roll-back and check point		
4	Switch should support for BFD For Fast Failure Detection as per RFC (5880)		
5	The transcievers should be from same OEM of the proposed switch		
1	Switch should support the complete STACK of IP V4 and IP V6 services		
2	The Switch and different modules used should function in line rate and should not have any port with oversubscription ratio applied		
3	Switch should support Configuration roll-back and check point		
4	Switch should support for BFD For Fast Failure Detection as per RFC (5880)		
5	The transcievers should be from same OEM of the proposed switch		

Spine Switch -DMZ			Annexure 12 H
Make and Model :			
S/N	**Required Minimum Specifications**	**Bidder's compliance (Yes / No)**	**Bidder's remarks**
A	**Interface/Performance**		
1	Should be fixed switch. Oversubscription ratio of the connectivity between each leaf to SPINE switches should not be less than 6:1.		
2	should support minimum 2.56 Tbps switching capacity/throughput or more		
3	Shall support upto 48 or more wirespeed 40/100 GbE ports		
4	Shall support at least 1 BPPS or more wirespeed L2 & L3		
5	Shall support under 5 Micro second latency		
6	Shall support Non-blocking architecture		
7	Shall support QSFP 40/100 GBE		
8	Should support 40G long range and short range QSFPs.		
9	Switch should have console port for local management		
10	Switch should have management interface for Out of Band Management		
11	Switch should support for different logical interface types like loopback, VLAN, SVI/RBI, Port Channel/LAG, multi chassis port channel etc		
12	Switch should be rack mountable and support side rails, if required		
13	Switch should support VLAN tagging (IEEE 802.1q)		
14	Switch should support IEEE Link Aggregation or Ethernet Bonding		
15	The switch should support hardware based loadbalancing at wire speed using LACP and multi chassis etherchannel/LAG		
16	The switch should support 1,20,000 IPv4 and IPv6 routes entries in the routing table with multicast routes		
17	Switch should have wire rate switching capacity including the services:		
	a. Switching		
	b. IP Routing (Static/Dynamic)		
	c. IP Forwarding		
	d. Policy Based Routing		
	e. QoS		
	f. ACL and Global Control Plane Policing.		
	g. IP V.6 host and IP V.6 routing		
18	Switch should support minimum 32 VRF instances		
B	**Operating System**		
1	Shall support modern modular operating system designed for data center scalability and reliability		
2	Shall support auto process recovery from failures		
3	Shall support Health monitoring and self healing		
4	Shall support Single Operating System binary image for all switch models		
5	Shall support Industry standard CLI		
C	**Resilient Control Plane**		
1	Quad Core x86 CPU		
2	8GB DRAM		
3	4GB Flash		
4	16 MB Buffer		
D	**Layer 2 features**		
1	Shall support 120K MAC entries		
2	Spanning Tree Protocol (IEEE 802.1D, 802.1W, 802.1S)		
3	Switch should support VLAN Trunking (802.1q) and should support 4096 VLAN		
4	Switch should support basic Multicast IGMP v1, v2, v3		
5	Shall support Rapid Per VLAN Spanning Tree (RPVST+)		
6	Shall support 802.3ad Link Aggregation LACP with up to 16 ports/channel		
7	Shall support up to 64 ports per Link Aggregation Group (LAG)		
8	Shall support 48 Link Aggregation Groups (LAG)		
9	Shall support 64 ports active/active layer2/Layer3 multipathing redundancy		
10	Shall support 802.1AB Link Layer Discovery Protocol (LLDP)		
11	Shall support Port Mirroring		
12	Shall support 802.3x Flow Control		
13	Shall support Jumbo Frames 9216 Bytes		
14	Shall support IGMP v2/v3 snooping		
15	Shall support active/active layer-2 topology without STP where host are dual homed to switch		
E	**Layer 3 features**		
1	Shall support 100K IPv4 Unicast entries		
2	Shall support 8K or more IPv6 Unicast entries		
3	Shall support 10K IPv4 Multicast entries		
4	Shall support 4K ACL		
5	Shall support basic layer-3 routing – static routes, RIP		
6	Shall support VRRP or equivalent		
7	Shall support 64-way ECMP routing for load balancing and redundancy		
8	Shall support OSPF v2 with MD5 auth, BGP v4 with MD5 auth, ISIS using MD5 Authentication and MP BGP		
9	Shall support PIM-SM, PIM-SSM and Multicast Source Discovery Protocol (MSDP) multicast routing, IGMP V.1, V.2 and V.3		
10	Shall support Route Maps		
11	Shall support Anycast RP		
F	**Data center Advanced Features and Network Virtulization**		
1	Shall be VxLAN ready.		
2	Switch should support Network Virtualization using Virtual Over Lay Network using VXLAN		
3	Switch should support VXLAN and EVPN or equivalent for supporting Spine - Leaf architecture to optimize the east - west traffic flow inside the data center		
4	Switch should support Open Flow/Open Day light/Open Stack controller		
5	Switch should support Data Center Bridging		

6	Switch should support multi OEM hypervisor environment and should be able to sense movement of VM and configure network automatically, may be using orchestation layer		
G	**Quality of Service (QoS) Features**		
1	Up to 8 queues per port		
2	802.1p based classification		
3	DSCP based classification		
4	DSCP based classification and remarking		
5	Rate limiting		
6	Switch should support for different type of QoS features for ream time traffic differential treatment using a. Weighted Random Early Detection b. Strict Priority Queuing		
7	Switch should support to trust the QoS marking/priority settings of the end points as per the defined policy		
H	**Security and Network Management features**		
1	Shall Support ACLs using Layer 2, Layer 3, Layer 4 fields		
2	Shall Support MAC Security		
3	Shall Support TACACS+ / RADIUS		
4	Shall Support SNMP v2, v3		
5	Shall have 100/1000 management port		
6	Shall Support RS-232 serial console port		
7	Shall Support USB port		
8	Shall Support Management over IPv4, IPv6		
9	Switch should support DHCP Snooping		
10	Switch should provide remote login for administration using: a. Telnet b. SSHV2		
11	Shall Support Syslog		
12	Shall Support AAA		
13	Industry Standard CLI		
14	Shall Support Port Mirroring		
15	Shall Support sFlow		
16	Switch should support for management and monitoring status using different type of Industry standard NMS using: a. SNMP V1 and V.2 b. SNMP V.3 with encryption c. Filtration of SNMP using Access list d. SNMP MIB support for QoS		
17	Switch should support for basic administrative tools like: a. Ping b. Traceroute		
18	Shall support built in TCP Dump or Wireshark trouble shooting tool or equivalent		
19	Switch should support for embedded RMON/RMON-II for central NMS management and monitoring		
20	Switch should support for sending logs to multiple centralised syslog server for monitoring and audit trail		
21	Switch should support central time server synchronization using Network Time Protocol NTP V.4		
22	Switch should support for providing granular MIB support for different statistics of the physical and logical interfaces		
23	Switch should provide different privilege for login in to the system for monitoring and management		
24	Protection from unnecessary or DoS traffic by control plane protection policy		
25	Switch should support to prevent edge devices in the network not administrator's controlled from becoming Spanning Tree Protocol root nodes		
I	**Standards Compliance**		
1	Shall Support IEEE 802.1D Bridging and Spanning Tree		
2	Shall Support IEEE 802.1p QOS/COS		
3	Shall Support IEEE 802.1Q VLAN Tagging		
4	Shall Support IEEE 802.1w Rapid Spanning Tree		
5	Shall Support IEEE 802.1s Multiple Spanning Tree Protocol		
6	Shall Support IEEE 802.1AB Link Layer Discovery Protocol		
7	Shall Support IEEE 802.3ad Link Aggregation with LACP		
8	Shall Support IEEE 802.3x Flow Control		
9	Shall Support IEEE 802.3ba 40/100 Gigabit Ethernet		
J	**Monitoring, Provisioning**		
1	Shall support Advance Event Management for pro-active network monitoring or equivalent		
2	Shall support Restoration of Operating System & Configuration from USB		
3	Shall support CLI schedular, Shell script, for timed automation, and event managert for triggered automation		
4	Shall support sFlow or Netflow or equivalent		
5	Shall support centralized script/system to configure a switch without user intervention		
K	**Virtualization and Next Gen DC features**		
1	Virtualization switch should communicate with vSphere 4.0 and above, and vCenter to support adaptive network virtualization		
2	VLAN auto provision - Auto create/configure VM VLAN when new VM is created in vCenter		
3	VM Auto Discovery – Find exactly which ESX Hosts and VMs are on a given port in the network. Displays the full Physical Port to Virtual Switch to VM Binding.		
4	Should Dynamically create VLAN policy based on VM movement.		
5	Should be able to extract vNIC information from the VM Host.		
6	VmWare Multi-Tenancy – Connecting up to 4 separate vCenter administrative domain.		
L	**Hardware High Availability and Air Flow**		
1	Switch should have redundant power supply and fans		
2	shall support both front to back and back to front reversible air flow		
3	Switch should support in-line hot insertion and removal of different parts like modules/ power supplies/ fan tray etc and should not require switch reboot & should notn disrupt the functionality of the system		
4	Switch should provide gateway level of redundancy in Ip V.4 and IP V.6 using HSRP/VRRP		
5	Switch should support for BFD For Fast Failure Detection as per RFC (5880)		
6	Switch should support Graceful Restart for OSPF, BGP etc.		
M	**Data Center Class Design**		
1	Each line module support as below		

2	QSFP+ ports should be able to split into 4X10GbE using Direct attached cable or Fiber Cable		
N	**Misc**		
1	Switch should support the complete STACK of IP V4 and IP V6 services		
2	The Switch and different modules used should function in line rate and should not have any port with oversubscription ratio applied		
3	Switch should support Configuration roll-back and check point		
4	Switch should support for BFD For Fast Failure Detection as per RFC (5880)		
5	The transcievers should be from same OEM of the proposed switch		
4	QSFP+ ports should be able to split into 4X10GbE using Direct attached cable or Fiber Cable		
N	**Misc**		
1	Switch should support the complete STACK of IP V4 and IP V6 services		
2	The Switch and different modules used should function in line rate and should not have any port with oversubscription ratio applied		
3	Switch should support Configuration roll-back and check point		
4	Switch should support for BFD For Fast Failure Detection as per RFC (5880)		
5	The transcievers should be from same OEM of the proposed switch		

Load Balancer			Annexure 12 I
Make and Model :			
S/N	**Required Minimum Specifications**	**Bidder's compliance (Yes / No)**	**Bidder's remarks**
A	**Platform**		
1	Must be an appliance with hardened OS		
2	Platform should be a full proxy architecture and must perform reverse proxy		
3	Should support at least 5 virtual instances scalable to at least 16 virtual instances which have full fault isolation and resource reservation between each virtual instance.		
4	Should have a dedicated out-of-band Ethernet management port		
5	Should have full support IPv6. It should support all IPv6 scenarios:		
6	a. IPv4 on the inside and IPv6 on the outside (Phase – II certified)		
7	b. IPv6 on the inside and IPv4 on the outside		
8	c. IPv6 on the inside and outside		
9	Should support VLAN, LACP & Trunking		
10	Should be a high performance purpose built hardware based solution with a minimal of intel quad core processor or better		
11	Should have a minimum memory of 32 GB		
12	Must support FOR SFP+ & QSFP 16 * 10G Ports & 4 *40G Ports and should be supplied with 8 x 10GB SFP+		
13	Should have Dual Power Supply		
B	**Performance**		
1	Platform should have "L7" throughput of minimum 20 Gbps scalable to 64 Gbps or above on the same hardware"		
2	The Proposed Appliance should support minimum 250k of L7 RPS		
3	The Proposed Appliance should support minimum 775k of L4 connection per second		
4	The Proposed Appliance should have and support 6000 CPS with 2048 bit key SSL		
5	Should have SSL Throughput of minimum 20 Gbps and scalable to 40 Gbps		
6	Should have Compression throughput of minimum 8 Gbps		
7	Should support configurable TCP Optimization features for client- side and server-side connection		
C	**Security features**		
1	Proposed solution should contain an internal geo location database from day one		
2	Proposed Solution should support client NAT & server NAT		
3	Proposed solution should support HTTP Header manipulation on client requests and server responses to hide server identities		
4	Proposed Solution should have Advance Denial of Service protection		
D	**Server Load Balancing**		
1	Should have application delivery features such as layer 7 load balancing, layer 7 content switch, caching, hardware/software/firmware based SSL offload and hardware based server side compression		
2	Dual TCP Stack for client side as well as server side for optimizing TCP traffic towards both sides		
3	Should have capability to monitor the applications using intelligent application level monitors which can be system defined, internal or external executable scripts		
4	Should have 2048 and 4096 bit key for SSL certificate support		
5	Should have capability to support ECC, RSA and ECC+RSA (Hybrid) Certificates for SSL offload		
6	Should provide static and dynamic load balancing algorithms such as round robin, weighted round robin, fastest, predictive and observed		
7	Should have HTTP 2.0 gateway in environment where the client to load balancer traffic is HTTP 2.0 and from load balancer to server is normal HTTP 1.1		
8	The Device should support Advanced Web Performance		
E	**Optimization**		
1	The Device should support Application Performance Monitoring for advanced end to end reporting for every application transaction.		
F	**Device Administration**		
1	Should provide HTTPS interface management for administering the device		
2	For device management and administration appliance should have internal user database as well as must support external user database of RADIUS, TACACS+, Microsoft AD, LDAP and ClientCertificate LDAP		
3	Should provide SSH interface management for administering the device		
4	Should provide troubelshooting and traffic analysis tool like tcpdump		
5	Should support role based admin access with roles like no access, Guest,Operator,Application editior,Resource Administrator and Administrator		
6	Should have a live dashboard with graphical reporting		
	a. CPU Usage		
	b. Memory Usage		
	c. Connections Statistics		
	d. Throughput Statistics		
	e. Virtual Server Status		
	f. Pool Status		
	g. Node Status		
7	Should provide historical graphical reporting for the last 30 days on appliance itself or using external reporting solution seamlessly.		
8	Should have a built-in tool to take a snapshot of the unit for trobleshooting and analysis purpose		
9	Vendor should provide a service to upload this snapshot and get feedback on the heatlh of the unit & missing Hotfixes and best practices		

10	Appliance should support multiple configuration backup on appliance itself, also as when configuration restore happens it should backup last running config automatically and administrator should be able to go back to at least 4 restoration points		
11	The proposed appliance should support full isolation and resource reservation for Management Overhead		
G	**High Availability**		
1	Should have active-active and active-backup high availability with TCP/IP connection mirroring as well as SSL Connection mirroring. Hence old connection should not fail or forced for SSL renegotiation.		
2	Should have transparent failover between 2 devices, the failover should be transparent to other networking devices		
3	Should support network based failover for session mirroring, connection mirroring and heartbeat check		
4	Should support config autosync, manual sync to and from active and backup unit		
5	Should support the feature to force the active device to standby and back to active state; or force a device to offline mode		
6	Should support MAC masquerading		
7	Should support N+1 High Availability Clustering for future scalability with the ability to add heterogenous devices from the same OEM into the cluster		
H	**Reporting Features**		
1	Should have a Reporting Engine built-in		
2	Should support High Speed Logging to a syslog server		
3	Support for customized logging through scripts to log any parameter from L3 to L7, like Geolocation, IP addresses, client browser, client OS, etc..		

Router : Type 1			Annexure 12 J1
Make and Model :			
S/N	**Required Minimum Specifications**	**Bidder's compliance (Yes / No)**	**Bidder's remarks**
A	**Architecture**		
1	This should be a 3 slot or higher router		
2	Should support 32 10/100/1000 WAN ports day one with scalability of another 32 10/100/1000 WAN ports		
3	Router shall be based on RISC-based processors		
4	The router shall have four WAN Interface card slots supporting LAN/WAN/Voice interface cards - Ethernet, V.35, ISDN, E1, FXS/FXO, 3G/4G WAN module, session border controller functionality		
5	The router shall have 2GB DRAM and 256 MB Flash Memory		
6	The router shall be 19" Rack Mountable (any hardware required shall be offered)		
7	The Router should support SDN OpenFlow 1.3.1 or Netconf / Rest / Yang		
8	Router shall have advanced Multi-Service Architecture delivering WAN router, Ethernet switch, firewall, VPN, and SIP/voice gateway all in one box		
9	The Router should provid flexible analog voice interface options for easy integration within a wide range of deployments		
10	The Router should have USB interface		
11	The Router should have redudent power supply from day1		
12	The Router Shold have modular operating system		
13			
14	The Rouoter shouold have the ability to do eases utilization of the main processor by transmitting Layer 2 packets directly via the Multi Gigabit Fabric		
15	The router should support routing table size of 750000 entries for IPv4 and 750000 entries for IPv6		
B	**Performance**		
1	The Router should have forwarding performance of minimum 500 Mbps scalable to 1 Gbps		
2	The Router should have embedded hardware encryption accelerator to improve encryption performance		
C	**Quality of Service (QoS)**		
1	The Router should support Committed Access Rate (CAR) and line rate		
2	The Router should support FIFO, PQ, CQ, WFQ, CBQ, and RTPQ Congestion management		
3	The Router should suppor Weighted random early detection (WRED)/random early detection (RED) congestion avoidance capabilities through the use of queue management algorithms		
4	The Router should support traffic shaping, FR QoS, MPLS QoS, and MP QoS/LFI		
D	**Management**		
1	The Router should support Industry-standard CLI with a hierarchical structure		
2	The Router should restrict access to critical configuration commands to offers multiple privilege levels with password protection,ACLs provide telnet and SNMP access, local and remote syslog capabilities allow logging of all access		
3	The Router should support SNMPv1, v2, and v3		
4	The Router should support Remote monitoring (RMON)		
5	The Router should support FTP, TFTP, and SFTP support		
6	The Router should support ping and traceroute for both IPv4 and IPv6		
7	The Router should support Network Time Protocol (NTP)		
8	The Router should provide a central repository for system and network information; aggregates all logs, traps, and debugging information generated by the system and maintains them in order of severity; outputs the network information to multiple channels based on user-defined rules		
9	The Router should provide management access through modem port and terminal interface; provides access through terminal interface, telnet, or SSH		
10	The Router should analyze network performance and service quality by sending test packets, and provides network performance and service quality parameters such as jitter, TCP, or FTP connection delays; allows network manager to determine overall network performance and diagnose and locate network congestion points or failures		
E	**Connectivity**		
1	The Router should support Virtual Private LAN Service (VPLS)		
2	The Router should support Network mobility to enable a node to retain the same IP address and maintain application connectivity when the node travels across networks. It allows location-independent routing of IP datagrams on the Internet		
3	The Router should protect against broadcast, multicast, or unicast storms with user-defined thresholds		
4	The Router should support internal loopback testing for maintenance purposes and an increase in availability.		
5	The Router should support High-density port connectivity		
F	**Resiliency and high availability**		
1	The Router should act as a part of the management and backup function to provide backup for device interfaces; delivers reliability by switching traffic over to a backup interface when the primary one fails		
2	The Router should support Virtual Router Redundancy Protocol (VRRP)		
3	The Router should Embedded Automation Architecture (EAA)		
4	The Router should Bidirectional Forwarding Detection (BFD)		
G	**Layer 2 switching**		
1	The Router should support IEEE 802.1D STP, IEEE 802.1w Rapid Spanning Tree Protocol (RSTP) for faster convergence, and IEEE 802.1s Multiple Spanning Tree Protocol (MSTP)		

2	The Router should suppor Internet Group Management Protocol (IGMP) and Multicast Listener Discovery (MLD) protocol snooping		
3	The Router should control and manages the flooding of multicast packets in a Layer 2 network		
4	The Router should support Port mirroring		
5	The Router should suppor IEEE 802.1Q-based VLANs		
6	The Router should suppor sFlow or Realtime traffic flow		
7	The Router should support traffic sampling		
H	**Layer 3 services**		
1	The Router should support WAN Optimization feature		
2	The Router should support WAN Optimization feature using TFO and a combination of DRE, Lempel-Ziv (LZ) compression to provide the bandwidth optimization for file service and web applications.		
3	The Router should support Network Address Translation – Protocol Translation (NAT-PT)		
4	The Router should support Address Resolution Protocol (ARP)		
5	The Router should support User Datagram Protocol (UDP) helper		
6	The Router should support Dynamic Host Configuration Protocol (DHCP)		
I	**Layer 3 routing**		
1	The Router should support Static IPv4 routing, Pv1 and RIPv2 routing includes loop protection,Border Gateway Protocol 4 (BGP-4), Intermediate system to intermediate system (IS-IS),Open shortest path first (OSPF) with ECMP		
2	The Router should support Static IPv6 routing		
3	The Router should maintain separate stacks for IPv4 and IPv6 to ease the transition from an IPv4-only network to an IPv6-only network design		
4	The Router should support Routing Information Protocol next generation (RIPng)		
5	The Router should extend RIPv2 to support IPv6 addressing		
6	The Router should support OSPF for IPv6		
7	The Router should extend BGP-4 to support Multiprotocol BGP (MBGP), including support for IPv6 addressing		
8	The Router should extend IS-IS to support IPv6 addressing		
9	The Router should support IPv6 tunneling		
10	The Router should support Multiprotocol Label Switching (MPLS)		
11	The Router should support Multiprotocol Label Switching (MPLS) Layer 3 VPN		
12	The Router should support Multiprotocol Label Switching (MPLS) Layer 2 VPN		
13	The Router should support Policy routing		
J	**Security**		
1	The Router should support Application layer protocol inspection, Transport layer protocol inspection, ICMP error message check, andTCP SYN check. Support more L4 and L7 protocols like TCP, UDP, UDP-Lite, ICMPv4/ICMPv6, SCTP, DCCP, RAWIP, HTTP, FTP, SMTP, DNS, SIP, H.323, SCCP.		
2	The Router should support Zone based firewall		
3	The Router Should support Dyanamic VPN		
4	The Router Should support VPN between enterprise branches that use dynamic addresses to access the public network		
5	The Router should support Access control list (ACL)		
6	The Router should support Terminal Access Controller Access-Control System (TACACS+)		
7	The Router should support IEEE 802.1x allows authentication of multiple users per port		
8	The Router should support RADIUS		
9	The Router should support Network address translation (NAT)		
10	The Router should support Secure Shell (SSHv2)		
11	The Router should support Unicast Reverse Path Forwarding (URPF)		
12	The Router should support IPSec VPN		
13	The Router should support DES, 3DES, and AES 128/192/256 encryption, and MD5 and SHA-1 authentication		
14	The Router should support Attack Detection and Protection		
15	The router should support DPI from day one		
I	**Convergence**		
1	The Router should support Internet Group Management Protocol (IGMP)		
2	The Router should support Any-Source Multicast (ASM) or Source-Specific Multicast (SSM) to manage IPv4 multicast networks and should support IGMPv1, v2, and v3		
3	Protocol Independent Multicast (PIM)		
4	The Router should support IPv4 and IPv6 multicasting to allow one-to-many and many-to-many transmission of information and support PIM Dense Mode (DM), Sparse Mode (SM), and Source-Specific Mode (SSM)		
5	The Router should support Multicast Source Discovery Protocol (MSDP)		
6	The Router should support Multicast Border Gateway Protocol (MBGP)		
7	The Router should support traffic distribution using powerful scheduling algorithms, including Layer 4 to 7 services and monitor the health status of servers and firewalls		
8	The Router should have Embedded VPN firewall		
9	The Router should support for RoHS and WEEE regulations		
J	**Environmental Features**		
1	The Router should have UL 60950-1; IEC 60950-1; EN 60950-1; CAN/CSA-C22.2 No. 60950-1; FDA 21 CFR Subchapter J; AS/NZS 60950-1; GB 4943.1		
2	The Router should have VCCI V-4/2012.04; EN 55022 :2010 ; CISPR 22 ; EN 55024; ICES-003 issue 5;		
3	The Router should have FCC part 68; CS-03 Telecom certification		

Router : Type 2			Annexure 12 J2
Make and Model :			
S/N	**Required Minimum Specifications**	**Bidder's compliance (Yes / No)**	**Bidder's remarks**
A	**Architecture**		
1	This should be a 3 slot or higher router		
2	This should support 8 10/100/100 WAN ports day one		
3	Router shall be based on RISC-based processors		
4	The router shall have four WAN Interface card slots supporting LAN/WAN/Voice interface cards - Ethernet, V.35, E1, 3G/4G WAN module, session border controller functionality		
5	The router shall have 2GB DRAM and 256 MB Flash Memory		
6	The router shall be 19" Rack Mountable (any hardware required shall be offered)		
7	The Router should support SDN OpenFlow 1.3.1 or Netconf / Rest / Yang		
8	Router shall have advanced Multi-Service Architecture delivering WAN router, Ethernet switch, firewall, VPN, and SIP/voice gateway all in one box		
9	The Router should provid flexible analog voice interface options for easy integration within a wide range of deployments		
10	The Router should have USB interface		
11	The Router should have redudent power supply from day1		
12	The Router Shold have modular operating system		
13			
14	The Rouoter shouold have the ability to do eases utilization of the main processor by transmitting Layer 2 packets directly via the Multi Gigabit Fabric		
15	The router should support routing table size of 750000 entries for IPv4 and 750000 entries for IPv6		
B	**Performance**		
1	The Router should have forwarding performance of minimum 500 Mbps scalable to 1 Gbps		
2	The Router should have embedded hardware encryption accelerator to improve encryption performance		
C	**Quality of Service (QoS)**		
1	The Router should support Committed Access Rate (CAR) and line rate		
2	The Router should support FIFO, PQ, CQ, WFQ, CBQ, and RTPQ Congestion management		
3	The Router should suppor Weighted random early detection (WRED)/random early detection (RED) congestion avoidance capabilities through the use of queue management algorithms		
4	The Router should support traffic shaping, FR QoS, MPLS QoS, and MP QoS/LFI		
D	**Management**		
1	The Router should support Industry-standard CLI with a hierarchical structure		
2	The Router should restrict access to critical configuration commands to offers multiple privilege levels with password protection,ACLs provide telnet and SNMP access, local and remote syslog capabilities allow logging of all access		
3	The Router should support SNMPv1, v2, and v3		
4	The Router should support Remote monitoring (RMON)		
5	The Router should support FTP, TFTP, and SFTP support		
6	The Router should support ping and traceroute for both IPv4 and IPv6		
7	The Router should support Network Time Protocol (NTP)		
8	The Router should provide a central repository for system and network information; aggregates all logs, traps, and debugging information generated by the system and maintains them in order of severity; outputs the network information to multiple channels based on user-defined rules		
9	The Router should provide management access through modem port and terminal interface; provides access through terminal interface, telnet, or SSH		
10	The Router should analyze network performance and service quality by sending test packets, and provides network performance and service quality parameters such as jitter, TCP, or FTP connection delays; allows network manager to determine overall network performance and diagnose and locate network congestion points or failures		
E	**Connectivity**		
1	The Router should support Virtual Private LAN Service (VPLS)		
2	The Router should support Network mobility to enable a node to retain the same IP address and maintain application connectivity when the node travels across networks. It allows location-independent routing of IP datagrams on the Internet		
3	The Router should protect against broadcast, multicast, or unicast storms with user-defined thresholds		
4	The Router should support internal loopback testing for maintenance purposes and an increase in availability.		
5	The Router should support High-density port connectivity		
F	**Resiliency and high availability**		
1	The Router should act as a part of the management and backup function to provide backup for device interfaces; delivers reliability by switching traffic over to a backup interface when the primary one fails		
2	The Router should support Virtual Router Redundancy Protocol (VRRP)		
3	The Router should Embedded Automation Architecture (EAA)		
4	The Router should Bidirectional Forwarding Detection (BFD)		
G	**Layer 2 switching**		
1	The Router should support IEEE 802.1D STP, IEEE 802.1w Rapid Spanning Tree Protocol (RSTP) for faster convergence, and IEEE 802.1s Multiple Spanning Tree Protocol (MSTP)		

2	The Router should suppor Internet Group Management Protocol (IGMP) and Multicast Listener Discovery (MLD) protocol snooping		
3	The Router should control and manages the flooding of multicast packets in a Layer 2 network		
4	The Router should support Port mirroring		
5	The Router should suppor IEEE 802.1Q-based VLANs		
6	The Router should suppor sFlow or Realtime traffic flow		
7	The Router should support traffic sampling		
H	**Layer 3 services**		
1	The Router should support WAN Optimization feature		
2	The Router should support WAN Optimization feature using TFO and a combination of DRE, Lempel-Ziv (LZ) compression to provide the bandwidth optimization for file service and web applications.		
3	The Router should support Network Address Translation – Protocol Translation (NAT-PT)		
4	The Router should support Address Resolution Protocol (ARP)		
5	The Router should support User Datagram Protocol (UDP) helper		
6	The Router should support Dynamic Host Configuration Protocol (DHCP)		
I	**Layer 3 routing**		
1	The Router should support Static IPv4 routing,Pv1 and RIPv2 routing includes loop protection,Border Gateway Protocol 4 (BGP-4), Intermediate system to intermediate system (IS-IS),Open shortest path first (OSPF) with ECMP		
2	The Router should support Static IPv6 routing		
3	The Router should maintain separate stacks for IPv4 and IPv6 to ease the transition from an IPv4-only network to an IPv6-only network design		
4	The Router should support Routing Information Protocol next generation (RIPng)		
5	The Router should extend RIPv2 to support IPv6 addressing		
6	The Router should support OSPF for IPv6		
7	The Router should extend BGP-4 to support Multiprotocol BGP (MBGP), including support for IPv6 addressing		
8	The Router should extend IS-IS to support IPv6 addressing		
9	The Router should support IPv6 tunneling		
10	The Router should support Multiprotocol Label Switching (MPLS)		
11	The Router should support Multiprotocol Label Switching (MPLS) Layer 3 VPN		
12	The Router should support Multiprotocol Label Switching (MPLS) Layer 2 VPN		
13	The Router should support Policy routing		
J	**Security**		
1	The Router should support Application layer protocol inspection, Transport layer protocol inspection, ICMP error message check, andTCP SYN check. Support more L4 and L7 protocols like TCP, UDP, UDP-Lite, ICMPv4/ICMPv6, SCTP, DCCP, RAWIP, HTTP, FTP, SMTP, DNS, SIP, H.323, SCCP.		
2	The Router should support Zone based firewall		
3	The Router Should support Dyanamic VPN		
4	The Router Should support VPN between enterprise branches that use dynamic addresses to access the public network		
5	The Router should support Access control list (ACL)		
6	The Router should support Terminal Access Controller Access-Control System (TACACS+)		
7	The Router should support IEEE 802.1x allows authentication of multiple users per port		
8	The Router should support RADIUS		
9	The Router should support Network address translation (NAT)		
10	The Router should support Secure Shell (SSHv2)		
11	The Router should support Unicast Reverse Path Forwarding (URPF)		
12	The Router should support IPSec VPN		
13	The Router should support DES, 3DES, and AES 128/192/256 encryption, and MD5 and SHA-1 authentication		
14	The Router should support Attack Detection and Protection		
15	The router should support DPI from day one		
I	**Convergence**		
1	The Router should support Internet Group Management Protocol (IGMP)		
2	The Router should support Any-Source Multicast (ASM) or Source-Specific Multicast (SSM) to manage IPv4 multicast networks and should support IGMPv1, v2, and v3		
3	Protocol Independent Multicast (PIM)		
4	The Router should support IPv4 and IPv6 multicasting to allow one-to-many and many-to-many transmission of information and support PIM Dense Mode (DM), Sparse Mode (SM), and Source-Specific Mode (SSM)		
5	The Router should support Multicast Source Discovery Protocol (MSDP)		
6	The Router should support Multicast Border Gateway Protocol (MBGP)		
7	The Router should support traffic distribution using powerful scheduling algorithms, including Layer 4 to 7 services and monitor the health status of servers and firewalls		
8	The Router should have Embedded VPN firewall		
9	The Router should support for RoHS and WEEE regulations		
J	**Environmental Features**		
1	The Router should have UL 60950-1; IEC 60950-1; EN 60950-1; CAN/CSA-C22.2 No. 60950-1; FDA 21 CFR Subchapter J; AS/NZS 60950-1; GB 4943.1		
2	The Router should have VCCI V-4/2012.04; EN 55022 :2010 ; CISPR 22 ; EN 55024; ICES-003 issue 5;		
3	The Router should have FCC part 68; CS-03 Telecom certification		

Router : Type 3			Annexure 12 J3
Make and Model :			
S/N	**Required Minimum Specifications**	**Bidder's compliance (Yes / No)**	**Bidder's remarks**
A	**Architecture**		
1	This should be a 2 slot router		
2	Should support 8 PRI ports day one		
3	Router shall be based on RISC-based processors		
4	The router shall have four WAN Interface card slots supporting LAN/WAN/Voice interface cards - Ethernet, V.35, ISDN, E1, FXS/FXO, 3G/4G WAN module, session border controller functionality		
5	The router shall have 3 GB DRAM and 2 GB Flash Memory		
6	The router shall be 19" Rack Mountable (any hardware required shall be offered)		
7	The Router should support SDN OpenFlow 1.3.1 or Netconf / Rest / Yang		
8	Router shall have advanced Multi-Service Architecture delivering WAN router, Ethernet switch, firewall, VPN, and SIP/voice gateway all in one box		
9	The Router should provid flexible analog voice interface options for easy integration within a wide range of deployments		
10	The Router should have USB interface		
11	The Router Shold have modular operating system		
12	The Rouoter shouold have the ability to do eases utilization of the main processor by transmitting Layer 2 packets directly via the Multi Gigabit Fabric		
13	The router should support routing table size of 500000 entries for IPv4 and 500000 entries for IPv6		
B	**Performance**		
1	The Router should have forwarding performance of minimum 2.4 Mpps		
2	The Router should have embedded hardware encryption accelerator to improve encryption performance		
C	**Quality of Service (QoS)**		
1	The Router should support Committed Access Rate (CAR) and line rate		
2	The Router should support FIFO, PQ, CQ, WFQ, CBQ, and RTPQ Congestion management		
3	The Router should suppor Weighted random early detection (WRED)/random early detection (RED) congestion avoidance capabilities through the use of queue management algorithms		
4	The Router should support traffic shaping, FR QoS, MPLS QoS, and MP QoS/LFI		
D	**Management**		
1	The Router should support Industry-standard CLI with a hierarchical structure		
2	The Router should restrict access to critical configuration commands to offers multiple privilege levels with password protection,ACLs provide telnet and SNMP access, local and remote syslog capabilities allow logging of all access		
3	The Router should support SNMPv1, v2, and v3		
4	The Router should support Remote monitoring (RMON)		
5	The Router should support FTP, TFTP, and SFTP support		
6	The Router should support ping and traceroute for both IPv4 and IPv6		
7	The Router should support Network Time Protocol (NTP)		
8	The Router should provide a central repository for system and network information; aggregates all logs, traps, and debugging information generated by the system and maintains them in order of severity; outputs the network information to multiple channels based on user-defined rules		
9	The Router should provide management access through modem port and terminal interface; provides access through terminal interface, telnet, or SSH		
10	The Router should analyze network performance and service quality by sending test packets, and provides network performance and service quality parameters such as jitter, TCP, or FTP connection delays; allows network manager to determine overall network performance and diagnose and locate network congestion points or failures		
E	**Connectivity**		
1	The Router should support Virtual Private LAN Service (VPLS)		
2	The Router should support Network mobility to enable a node to retain the same IP address and maintain application connectivity when the node travels across networks. It allows location-independent routing of IP datagrams on the Internet		
3	The Router should protect against broadcast, multicast, or unicast storms with user-defined thresholds		
4	The Router should support internal loopback testing for maintenance purposes and an increase in availability.		
5	The Router should support High-density port connectivity		
F	**Resiliency and high availability**		
1	The Router should act as a part of the management and backup function to provide backup for device interfaces; delivers reliability by switching traffic over to a backup interface when the primary one fails		
2	The Router should support Virtual Router Redundancy Protocol (VRRP)		
3	The Router should Embedded Automation Architecture (EAA)		
4	The Router should Bidirectional Forwarding Detection (BFD)		
G	**Layer 2 switching**		
1	The Router should support IEEE 802.1D STP, IEEE 802.1w Rapid Spanning Tree Protocol (RSTP) for faster convergence, and IEEE 802.1s Multiple Spanning Tree Protocol (MSTP)		
2	The Router should suppor Internet Group Management Protocol (IGMP) and Multicast Listener Discovery (MLD) protocol snooping		
3	The Router should control and manages the flooding of multicast packets in a Layer 2 network		
4	The Router should support Port mirroring		

5	The Router should suppor IEEE 802.1Q-based VLANs		
6	The Router should suppor sFlow or Realtime traffic flow		
7	The Router should support traffic sampling		
8	The Router should have the capability to Define port as switched or routed		
H	**Layer 3 services**		
1	The Router should support WAN Optimization feature		
2	The Router should support WAN Optimization feature using TFO and a combination of DRE, Lempel-Ziv (LZ) compression to provide the bandwidth optimization for file service and web applications.		
3	The Router should support Network Address Translation – Protocol Translation (NAT-PT)		
4	The Router should support Address Resolution Protocol (ARP)		
5	The Router should support User Datagram Protocol (UDP) helper		
6	The Router should support Dynamic Host Configuration Protocol (DHCP)		
I	**Layer 3 routing**		
1	The Router should support Static IPv4 routing,Pv1 and RIPv2 routing includes loop protection,Border Gateway Protocol 4 (BGP-4), Intermediate system to intermediate system (IS-IS),Open shortest path first (OSPF) with ECMP		
2	The Router should support Static IPv6 routing		
3	The Router should maintain separate stacks for IPv4 and IPv6 to ease the transition from an IPv4-only network to an IPv6-only network design		
4	The Router should support Routing Information Protocol next generation (RIPng)		
5	The Router should extend RIPv2 to support IPv6 addressing		
6	The Router should support OSPF for IPv6		
7	The Router should extend BGP-4 to support Multiprotocol BGP (MBGP), including support for IPv6 addressing		
8	The Router should extend IS-IS to support IPv6 addressing		
9	The Router should support IPv6 tunneling		
10	The Router should support Multiprotocol Label Switching (MPLS)		
11	The Router should support Multiprotocol Label Switching (MPLS) Layer 3 VPN		
12	The Router should support Multiprotocol Label Switching (MPLS) Layer 2 VPN		
13	The Router should support Policy routing		
J	**Security**		
1	The Router should support Application layer protocol inspection, Transport layer protocol inspection, ICMP error message check, andTCP SYN check. Support more L4 and L7 protocols like TCP, UDP, UDP-Lite, ICMPv4/ICMPv6, SCTP, DCCP, RAWIP, HTTP, FTP, SMTP, DNS, SIP, H.323, SCCP.		
2	The Router should support Zone based firewall		
3	The Router Should support Dyanamic VPN		
4	The Router Should support VPN between enterprise branches that use dynamic addresses to access the public network		
5	The Router should support Access control list (ACL)		
6	The Router should support Terminal Access Controller Access-Control System (TACACS+)		
7	The Router should support IEEE 802.1x allows authentication of multiple users per port		
8	The Router should support RADIUS		
9	The Router should support Network address translation (NAT)		
10	The Router should support Secure Shell (SSHv2)		
11	The Router should support Unicast Reverse Path Forwarding (URPF)		
12	The Router should support IPSec VPN		
13	The Router should support DES, 3DES, and AES 128/192/256 encryption, and MD5 and SHA-1 authentication		
14	The Router should support Attack Detection and Protection		
15	The router should support DPI from day one		
I	**Convergence**		
1	The Router should support Internet Group Management Protocol (IGMP)		
2	The Router should support Any-Source Multicast (ASM) or Source-Specific Multicast (SSM) to manage IPv4 multicast networks and should support IGMPv1, v2, and v3		
3	Protocol Independent Multicast (PIM)		
4	The Router should support IPv4 and IPv6 multicasting to allow one-to-many and many-to-many transmission of information and support PIM Dense Mode (DM), Sparse Mode (SM), and Source-Specific Mode (SSM)		
5	The Router should support Multicast Source Discovery Protocol (MSDP)		
6	The Router should support Multicast Border Gateway Protocol (MBGP)		
7	The Router should support traffic distribution using powerful scheduling algorithms, including Layer 4 to 7 services and monitor the health status of servers and firewalls		
8	The Router should have Embedded VPN firewall		
9	The Router should support for RoHS and WEEE regulations		
J	**Environmental Features**		
1	The Router should have UL 60950-1; IEC 60950-1; EN 60950-1; CAN/CSA-C22.2 No. 60950-1; FDA 21 CFR Subchapter J; AS/NZS 60950-1; GB 4943.1		
2	The Router should have VCCI V-4/2012.04; EN 55022 :2010 ; CISPR 22 ; EN 55024; ICES-003 issue 5;		
3	The Router should have FCC part 68; CS-03 Telecom certification		

Router: Type 4			Annexure 12 J4
Make and Model :			
S/N	**Required Minimum Specifications**	**Bidder's compliance (Yes / No)**	**Bidder's remarks**
A	**Architecture**		
1	This should be a 2 slot router		
2	It should support 8 WAN 10/100/1000 ports day one		
3	Router shall be based on RISC-based processors		
5	The router shall have four WAN Interface card slots supporting LAN/WAN/Voice interface cards - Ethernet, V.35, 3G/4G WAN module, session border controller functionality		
6	The router shall have 2GB DRAM and 256 MB Flash Memory		
7	The router shall be 19" Rack Mountable (any hardware required shall be offered)		
8	The Router should support SDN OpenFlow 1.3.1 or Netconf / Rest / Yang		
9	Router shall have advanced Multi-Service Architecture delivering WAN router, Ethernet switch, firewall, VPN, all in one box		
10	The Router should provid flexible analog voice interface options for easy integration within a wide range of deployments	delete	
11	The Router should have USB interface		
12	The Router Shold have modular operating system		
14	The Rouoter shouold have the ability to do eases utilization of the main processor by transmitting Layer 2 packets directly via the Multi Gigabit Fabric		
15	The router should support routing table size of 500000 entries for IPv4 and 500000 entries for IPv6		
B	**Performance**		
1	The Router should have forwarding performance of minimum 2.4 Mpps		
2	The Router should have embedded hardware encryption accelerator to improve encryption performance		
C	**Quality of Service (QoS)**		
1	The Router should support Committed Access Rate (CAR) and line rate		
2	The Router should support FIFO, PQ, CQ, WFQ, CBQ, and RTPQ Congestion management		
3	The Router should suppor Weighted random early detection (WRED)/random early detection (RED) congestion avoidance capabilities through the use of queue management algorithms		
4	The Router should support traffic shaping, FR QoS, MPLS QoS, and MP QoS/LFI		
D	**Management**		
1	The Router should support Industry-standard CLI with a hierarchical structure		
2	The Router should restrict access to critical configuration commands to offers multiple privilege levels with password protection,ACLs provide telnet and SNMP access, local and remote syslog capabilities allow logging of all access		
3	The Router should support SNMPv1, v2, and v3		
4	The Router should support Remote monitoring (RMON)		
5	The Router should support FTP, TFTP, and SFTP support		
6	The Router should support ping and traceroute for both IPv4 and IPv6		
7	The Router should support Network Time Protocol (NTP)		
8	The Router should provide a central repository for system and network information; aggregates all logs, traps, and debugging information generated by the system and maintains them in order of severity; outputs the network information to multiple channels based on user-defined rules		
9	The Router should provide management access through modem port and terminal interface; provides access through terminal interface, telnet, or SSH		
10	The Router should analyze network performance and service quality by sending test packets, and provides network performance and service quality parameters such as jitter, TCP, or FTP connection delays; allows network manager to determine overall network performance and diagnose and locate network congestion points or failures		
E	**Connectivity**		
1	The Router should support Virtual Private LAN Service (VPLS)		
2	The Router should support Network mobility to enable a node to retain the same IP address and maintain application connectivity when the node travels across networks. It allows location-independent routing of IP datagrams on the Internet		
3	The Router should protect against broadcast, multicast, or unicast storms with user-defined thresholds		
4	The Router should support internal loopback testing for maintenance purposes and an increase in availability.		
5	The Router should support High-density port connectivity		
F	**Resiliency and high availability**		
1	The Router should act as a part of the management and backup function to provide backup for device interfaces; delivers reliability by switching traffic over to a backup interface when the primary one fails		
2	The Router should support Virtual Router Redundancy Protocol (VRRP)		
3	The Router should Embedded Automation Architecture (EAA)		
4	The Router should Bidirectional Forwarding Detection (BFD)		
G	**Layer 2 switching**		
1	The Router should support IEEE 802.1D STP, IEEE 802.1w Rapid Spanning Tree Protocol (RSTP) for faster convergence, and IEEE 802.1s Multiple Spanning Tree Protocol (MSTP)		
2	The Router should suppor Internet Group Management Protocol (IGMP) and Multicast Listener Discovery (MLD) protocol snooping		
3	The Router should control and manages the flooding of multicast packets in a Layer 2 network		

4	The Router should support Port mirroring		
5	The Router should suppor IEEE 802.1Q-based VLANs		
6	The Router should suppor sFlow or Realtime traffic flow		
7	The Router should support traffic sampling		
H	**Layer 3 services**		
1	The Router should support WAN Optimization feature		
2	The Router should support WAN Optimization feature using TFO and a combination of DRE, Lempel-Ziv (LZ) compression to provide the bandwidth optimization for file service and web applications.		
3	The Router should support Network Address Translation – Protocol Translation (NAT-PT)		
4	The Router should support Address Resolution Protocol (ARP)		
5	The Router should support User Datagram Protocol (UDP) helper		
6	The Router should support Dynamic Host Configuration Protocol (DHCP)		
I	**Layer 3 routing**		
1	The Router should support Static IPv4 routing,Pv1 and RIPv2 routing includes loop protection,Border Gateway Protocol 4 (BGP-4), Intermediate system to intermediate system (IS-IS),Open shortest path first (OSPF) with ECMP		
2	The Router should support Static IPv6 routing		
3	The Router should maintain separate stacks for IPv4 and IPv6 to ease the transition from an IPv4-only network to an IPv6-only network design		
4	The Router should support Routing Information Protocol next generation (RIPng)		
5	The Router should extend RIPv2 to support IPv6 addressing		
6	The Router should support OSPF for IPv6		
7	The Router should extend BGP-4 to support Multiprotocol BGP (MBGP), including support for IPv6 addressing		
8	The Router should extend IS-IS to support IPv6 addressing		
9	The Router should support IPv6 tunneling		
10	The Router should support Multiprotocol Label Switching (MPLS)		
11	The Router should support Multiprotocol Label Switching (MPLS) Layer 3 VPN		
12	The Router should support Multiprotocol Label Switching (MPLS) Layer 2 VPN		
13	The Router should support Policy routing		
J	**Security**		
1	The Router should support Application layer protocol inspection, Transport layer protocol inspection, ICMP error message check, andTCP SYN check. Support more L4 and L7 protocols like TCP, UDP, UDP-Lite, ICMPv4/ICMPv6, SCTP, DCCP, RAWIP, HTTP, FTP, SMTP, DNS, SIP, H.323, SCCP.		
2	The Router should support Zone based firewall		
3	The Router Should support Dyanamic VPN		
4	The Router Should support VPN between enterprise branches that use dynamic addresses to access the public network		
5	The Router should support Access control list (ACL)		
6	The Router should support Terminal Access Controller Access-Control System (TACACS+)		
7	The Router should support IEEE 802.1x allows authentication of multiple users per port		
8	The Router should support RADIUS		
9	The Router should support Network address translation (NAT)		
10	The Router should support Secure Shell (SSHv2)		
11	The Router should support Unicast Reverse Path Forwarding (URPF)		
12	The Router should support IPSec VPN		
13	The Router should support DES, 3DES, and AES 128/192/256 encryption, and MD5 and SHA-1 authentication		
14	The Router should support Attack Detection and Protection		
15	The router should support DPI from day one		
I	**Convergence**		
1	The Router should support Internet Group Management Protocol (IGMP)		
2	The Router should support Any-Source Multicast (ASM) or Source-Specific Multicast (SSM) to manage IPv4 multicast networks and should support IGMPv1, v2, and v3		
3	Protocol Independent Multicast (PIM)		
4	The Router should support IPv4 and IPv6 multicasting to allow one-to-many and many-to-many transmission of information and support PIM Dense Mode (DM), Sparse Mode (SM), and Source-Specific Mode (SSM)		
5	The Router should support Multicast Source Discovery Protocol (MSDP)		
6	The Router should support Multicast Border Gateway Protocol (MBGP)		
7	The Router should support traffic distribution using powerful scheduling algorithms, including Layer 4 to 7 services and monitor the health status of servers and firewalls		
8	The Router should have Embedded VPN firewall		
9	The Router should support for RoHS and WEEE regulations		
J	**Environmental Features**		
1	The Router should have UL 60950-1; IEC 60950-1; EN 60950-1; CAN/CSA-C22.2 No. 60950-1; FDA 21 CFR Subchapter J; AS/NZS 60950-1; GB 4943.1		
2	The Router should have VCCI V-4/2012.04; EN 55022 :2010 ; CISPR 22 ; EN 55024; ICES-003 issue 5;		
3	The Router should have FCC part 68; CS-03 Telecom certification		

Campus Access Switch

Annexure 12 K

Make and Model :

S/N	Required Minimum Specifications	Bidder's compliance (Yes / No)	Bidder's remarks
Solution Requirement			
1	Should have Minimum expandability of 10 slot / modular Chassis based switch with in-built RPS		
2	Layer 3 switch with Backplane / Switch of at least 460 Gbps and forwarding rate of 210 Mpps		
3	Layer 3 granular quality of service (QoS) features		
4	Should support 10 Gigabit port on fiber		
5	Should be capable of providing Port level redundancy		
6	Uplink should also be running on 10 Gigabit with fiber with 4 ports to connect to Core Switch		
7	Shared memory architecture		
8	19" rack mountable		
9	Full duplex operation		
10	Support for secured Web-Based Management		
11	Support for Enhanced STP functions		
12	Support for Gigabit interfaces – SX, LX, ZX, 1000BaseT		
13	High MTBF Support		
14	Operating LED Signal		
15	External PCMCIA Flash or USB Portfor storing OS & configuration files for High availability Design		
16	Temperature Alarm and Power Monitoring		
17	The Switches must be able to generate Syslog Messages with timestamp and Severity codes, which can be exported to a Syslog Server.		
18	The Switches must be able to Build up its own inventory (like Device Name, Chassis Type, Memory, Flash, Software ver. Etc)		
19	Switch should support 48 Ports (10/100/1000 Mbps) Line card and on day1 256 ports to be supplied		
Layer 2 Features			
1	L2 Switching Support		
2	L2 Multi-Homing Support		
3	L2 Multicast Support – IGMP Snooping		
4	Multi-Link Trunking (GigaEtherchannel , Fast Etherchannel)		
5	Multiple Spanning tree Domain (802.1s), IEEE 802.1w rapid spanning tree and IEEE 802.3ad		
6	Multi Instance Spanning Tree support for Load sharing on redundant links and fast convergence time		
7	Spanning-Tree Protocol (IEEE 802.1D) per bridge group		
8	STP Fast Calculation		
9	Multicast must be supported in hardware so that performance is not affected by multiple multicast instances.		
10	Spanning-Tree Protocol (IEEE 802.1D) per bridge group		
11	Support to achieve trunking between switches automatically		
12	To support atleast 500 VLANs/switch		
13	To support atleast 32K MAC addresses / switch		
14	To support bundling of multiple physical ports into a single logical channel, to offer aggregate bandwidth		
15	Wire speed performance Layer 2 Switching with 48 Gbps of Switching Fabric		
Layer 3 Features			
1	Support for high-performance routing with support for RIPv1, RIPv2, OSPF		
2	Support for IP		
3	Support for VRRP or equivalent		
4	Layer 3 Multihoming		
5	Secondary Addressing		
6	Classless Interdomain routing		
7	Support for DHCP Interface Tracker		
8	Rip,OSPF,BGP Authentication support		
9	Route Redistribution from OSPF-RIP		

10	IPv4 Total Routes should be 256,000		
11	To support a minimum of 4000 ACL entries		
12	Wire speed performance Layer 3 Switching with 48 Gbps of Switching Fabric		
Other Features			
1	Support for ACLs based on source and destination Media Access Control (MAC) addresses, IP addresses, or Transmission Control Protocol (TCP)/User Datagram Protocol (UDP) ports		
2	Support for ease of configuration of VLANs across switches (Virtual Trunking Protocol or equivalent)		
3	Support for auto-configuring trunks between switches (Dynamic Trunking Protocol or GUI, etc.)		
4	IEEE 802.1Q VLAN Support – Port based VLANs		
5	Support for Routed VLAN, Port based and QoS based ACLs		
6	Support for Multicast routing protocols (PIM) and Internet Group Management Protocol (IGMP) snooping in hardware, IP Multicast Support: IGMP snooping, supporting IGMP v1, v2 and v3		
7	Support for industry standard Differentiated Services Code Point field (DSCP) and/or the 802.1p Class of Service (CoS) field.		
8	Classification and reclassification based on source/destination IP address, source/destination Media Access Control (MAC) address or the Layer 4 TCP/UDP ports.		
9	Ability to classify, reclassify, police, and mark the incoming packets before the packet is placed in the shared buffer.		
10	Scheduling using Weighted Round Robin (WRR)		
11	Congestion control via Weighted Random Early Detection (WRED).		
12	Support for rate-limiting via Committed Access Rate (CAR) with a granularity of increments of 64 Kbps		
13	Policy-based Routing Filters		
14	Should Support Multicast routing protocol like Pim sparse/dense/sparse-dense/bidirectional PIM		
15	In Service Software Upgrade Capability (ISSU)		
16	Web Cache Redirect Protocol/WCCP v1 & v2 or equivalent protocol.		
Policy Based Quality of Services (PB-QoS)			
1	Policy Based QoS Support		
2	Per Port Priority Based QoS		
3	802.1p Support		
4	Priority Queues		
5	Bandwidth Engineering & Management – Per Port Minimum, Rate Limiting, excess bursting, shaping		
6	Support for L3/L4 filtering capabilities for inter VLAN traffic		
7	High Priority Transmit Queuing/strict queues.		
8	QoS-based forwarding based on IP precedence		
9	Strict Priority Queuing Support		
10	Port and Priority Rate Limiting		
11	Policing		
12	Weighted Random Early Detect Support		
13	Support for a minimum of 200 policies on ingress and 200 policies on egress		
Redundancy			
1	Redundant Power Supply Unit		
2	Link Aggregation		
3	Non Stop Forwarding (NSF)		
4	Stateful Switch Over (SSO)		
5	Spanning Tree (802.1d) with support for spanning tree per VLAN		
6	Redundant Switch Fabric		
7	Redundant Control Plane		
8	Should support redundancy protocols like HSRP, GLBPor equivalent		
Security Features			
1	Layer 3 /4 Access Control Lists (ACLs) standard and extended		
2	Security (User Access): Internal DB/External RADIUS /TACACS+		
3	Configuration Change Tracking		

4	System Event Logging		
5	Syslog		
6	Support for 802.1X Authentication		
7	MAC lockdown for port security		
8	Apply L3-L4 ACL to Intra-VLAN Traffic		
9	Port Based ACLs		
10	Apply L2 VACL to Intra-VLAN Traffic		
11	Port Security		
12	Hardware based broadcast control		
IEEE Standard Compliance:			
1	802.1Q VLAN tagging		
2	802.1p Priority		
3	802.1D Spanning Tree		
4	802.3u Fast Ethernet		
5	802.3x Flow Control		
6	802.3z Gigabit Ethernet.		
7	802.3ab 1000Base-T (Gigabit Ethernet over Copper)		
8	Should also support Fiber Modules		

Campus Core Switch

Annexure 12 L

Make and Model :

S/N	Required Minimum Specifications	Bidder's compliance (Yes / No)	Bidder's remarks
Solution Requirement			
1	The Switch should support non-blocking Layer 2 switching and Layer 3 routing		
2	The switch should not have any single point of failure like power supplies and fans etc should have 1:1/N+1 level of redundancy		
3	Switch support in-line hot insertion and removal of different parts like modules/power supplies/fan tray etc should not require switch reboot and disrupt the functionality of the system		
4	Switch should support the complete STACK of IP V4 and IP V6 services.		
5	The Switch and different modules used should function in line rate and should not have any port with oversubscription ratio applied		
Hardware and Interface Requirement			
1	Switch should have the following interfaces:		
	a. 48 x 1G/10G Multi Mode Fiber Interface		
	b. 6 x 40/100GbE QSFP ports		
2	Switch should have console port		
3	Switch should have management interface for Out of Band Management		
4	Switch should be rack mountable and support side rails if required		
5	Switch should have adequate power supply for the complete system usage with all slots populated and used and provide N+1 redundant		
6	Switch should have hardware health monitoring capabilities and should provide different parameters through SNMP		
7	Switch should support VLAN tagging (IEEE 802.1q)		
8	Switch should support IEEE Link Aggregation and Ethernet Bonding functionality to group multiple ports for redundancy		
9	Switch should support Configuration roll-back and check point		
10	Switch should support for different logical interface types like loopback, VLAN, SVI, Port Channel, multi chassis port channel/LAG etc		
Performance Requirement			
1	The switch should support 12,000 IPv4 and IPv6 routes entries in the routing table including multicast routes		
2	Switch should support Graceful Restart for OSPF, BGP etc.		
3	Switch should support minimum 1000 VRF instances		
4	The switch should support hardware based loadbalancing at wire speed using LACP and multi chassis etherchannel/LAG		
5	Switch should support minimum 1.4 Tbps of switching capacity (or as per specifications of the switch if quantity of switches are more, but should be non blocking capacity) including the services:		
	a. Switching		
	b. IP Routing (Static/Dynamic)		
	c. IP Forwarding		
	d. Policy Based Routing		
	e. QoS		
	f. ACL and Other IP Services		
	g. IP V.6 host and IP V.6 routing		
Advance Features			
1	Switch should support Network Virtualisation using Virtual Over Lay Network using VXLAN (RFC 7348)/NVGRE as per RFC 2890		
2	Switch should support VXLAN (RFC7348) and EVPN or equivalent for supporting Spine - Leaf architecture		
3	Switch should support OpenFlow/Open Day light/Open Stack controller		
4	Switch should support Data Center Bridging		
Layer 2 Features			

1	Spanning Tree Protocol (IEEE 8201.D, 802.1W, 802.1S		
2	Switch should support VLAN Trunking (802.1q) and should support 4096 VLAN		
3	Switch should support basic Multicast IGMP v1, v2, v3		
4	Switch should support minimum 96,000 no. of MAC addresses		
5	Switch should support 8 Nos. of link or more per Port channel (using LACP) and support 48 port channels or more per switch		
6	Switch should support Industry Standard Port/Link Aggregation for All Ports across any module or any port.		
7	Switch should support multi chassis Link Aggregation for All Ports across any module or any port of the switch and Link aggregation should support 802.3ad LACP protocol for communication with downlink/uplink any third party switch or server		
8	Switch should support Jumbo Frames up to 9K Bytes on 1G/10G Ports		
9	Support for broadcast, multicast and unknown unicast storm control to prevent degradation of switch performance from storm due to network attacks and vulnerabilities		
10	Switch should support Link Layer Discovery Protocol as per IEEE 802.1AB for finding media level failures		
Layer 3 Features			
1	Switch should support all physical ports to use either in Layer2 or Layer 3 mode and also should support layer 3 VLAN Interface and Loopback port Interface		
2	Switch should support basic routing feature i.e. IP Classless, default routing and Inter VLAN routing		
3	Switch should support static and dynamic routing using:		
	a. Static routing		
	b. OSPF V.2 using MD5 Authentication		
	c. ISIS using MD5 Authentication		
	d. BGP V.4 using MD5 Authentication		
	e. Should support route redistribution between these protocols		
	f. Should be compliant to RFC 4760 Multiprotocol Extensions for BGP-4 (Desirable)		
4	Switch should support multi instance MPLS routing using VRF, VRF Edge routing and should support VRF Route leaking functionality		
5	Switch should be capable to work as DHCP server and relay		
6	Switch should provide mutlicast traffic rechable using:		
	a. PIM-SM		
	b. PIM-SSM		
	c. Bi-Directional PIM		
	d. Support RFC 3618 Multicast Source Discovery Protocol (MSDP)		
	e. IGMP V.1, V.2 and V.3		
Availability			
1	Switch should have provisioning for connecting to 1:1/N+1 power supply for usage and redundancy		
2	Switch should provide gateway level of redundancy in Ip V.4 and IP V.6 using VRRP		
3	Switch should support for BFD For Fast Failure Detection as per RFC 5880		
Quality of Service			
1	Switch system should support 802.1P classification and marking of packet using:		
	a. CoS (Class of Service)		
	b. DSCP (Differentiated Services Code Point)		
	c. Source physical interfaces		
	d. Source/destination IP subnet		
	e. Protocol types (IP/TCP/UDP)		
	f. Source/destination TCP/UDP ports		
2	Switch should support methods for identifying different types of traffic for better management and resilience		
3	Switch should support for different type of QoS features for ream time traffic differential treatment using:		
	a. Weighted Random Early Detection		
	b. Strict Priority Queuing		

4	Switch should support to trust the QoS marking/priority settings of the end points as per the defined policy		
5	Switch should support Flow control of Ethernet ports to control traffic rates during congestion by allowing congested nodes to pause link operation at the other end for receiving traffic as per IEEE 802.3x		
Security			
1	Switch should support for deploying different security for each logical and physical interface using Port Based access control lists of Layer-2 to Layer-4 in IP V.4 and IP V.6 and logging for fault finding and audit trail		
2	Switch should support control plane i.e. processor and memory Protection from unnecessary or DoS traffic by control plane protection policy		
3	Switch should support for stringent security policies based on time of day of Layer-2 to Layer-4		
4	Switch should support for external database for AAA using:		
	a. TACACS+		
	b. RADIUS		
5	Switch should support to restrict end hosts in the network. Secures the access to an access or trunk port based on MAC address. It limits the number of learned MAC addresses to deny MAC address flooding		
6	Switch should support DHCP Snooping		
7	Switch should support Dynamic ARP Inspection to ensure host integrity by preventing malicious users from exploiting the insecure nature of the ARP protocol		
8	Switch should support IP Source Guard to prevents a malicious hosts from spoofing or taking over another host's IP address by creating a binding table between the client's IP and MAC address, port, and VLAN		
9	Switch should support to prevent edge devices in the network not administrator's controled from becoming Spanning Tree Protocol root nodes		
10	Switch should support unicast and/or multicast blocking on a switch port to suppress the flooding of frames destined for an unknown unicast or multicast MAC address out of that port		
11	Switch should support Spanning tree BPDU protection		
12	Switch should support for MOTD banner or equivalent displayed on all connected terminals at login and security discrimination messages can be flashed as per banks ISD rules		
Manageability			
1	Switch should support for embedded RMON/RMON-II for central NMS management and monitoring		
2	Switch should support for sending logs to multiple centralised syslog server for monitoring and audit trail		
3	Switch should provide remote login for administration using:		
	a. Telnet		
	b. SSH V.2		
4	Switch should support for capturing packets for identifying application performance using local and remote port mirroring for packet captures		
5	Switch should support for management and monitoring status using different type of Industry standard NMS using:		
	a. SNMP V1 and V.2		
	b. SNMP V.3 with encryption		
	c. Filtration of SNMP using Access list		
	d. SNMP MIB support for QoS		
6	Switch should support for basic administrative tools like:		
	a. Ping		
	b. Traceroute		
7	Switch should support central time server synchronization using Network Time Protocol NTP V.4		
8	Switch should support for providing granular MIB support for different statistics of the physical and logical interfaces		
9	Switch should support for predefined and custmised execution of script for device mange for automatic and scheduled system status update for monitoring and management		

10	Switch should provide different privilege for login in to the system for monitoring and management		
11	Switch should support Real time Packet Capture using Wireshark in real time for traffic analysis and fault finding		
IPv6 features			
1	Switch should support for IP V.6 connectivity and routing required for network reachability using different routing protocols such:		
	a. OSPF V.3		
	b. BGP with IP V.6		
	c. IP V.6 Policy based routing		
	d. IP V.6 Dual Stack etc		
	e. IP V.6 Static Route		
	f. IP V.6 Default route		
	g. Should support route redistribution between these protocols		
2	Switch should support multicast routing in IP V.6 network using PIMv2 Sparse Mode		
3	Switch should support for QoS in IP V.6 network connectivity		
4	Switch should support for monitoring and management using different versions of SNMP in IP V.6 environment such as:		
	a. SNMPv1, SNMPv2c, SNMPv3		
	b. SNMP over IP V.6 with encryption support for SNMP Version 3		
5	Switch should support syslog for sending system log messages to centralized log server in IP V.6 environment		
6	Switch should support NTP to provide an accurate and consistent		
	timestamp over IPv6 to synchronize log collection and events		
7	Switch should support for IP V.6 different types of tools for administration and management such as:		
	a. Ping		
	b. Traceroute		
	c. VTY		
	d. SSH		
	e. TFTP		
	f. DNS lookup		

PDU				Annexure 12 M
Make and Model :				
S/N	**Required Minimum Specifications**		**Bidder's compliance (Yes / No)**	**Bidder's remarks**
	GENERAL			
1	**Description**	HP 7.3 kVA, 230V, 30 outlet, INTL Basic		
2	**Function**	Basic		
3	**Form Factor**	Mid Height		
	INPUT			
4	**Max VA**	7300		
5	**PDU Inlet**	IEC 60309 332P6		
6	**Cable Length (m)**	8ft / 2.44m		
7	**Voltage**	220-240V		
8	**Current**	32		
9	**Phase**	1-phase		
10	**Phase Configuration**	L-N		
	OUTPUT			
11	**Outlets**			
		(24) C13 (6) C19		
12	**Circuit Breakers**	3 x 16A		
13	**Output Voltage**	220-240V		

RACK			Annexure 12 N
S/N	**Required Minimum Specifications**	**Bidder's compliance (Yes / No)**	**Bidder's remarks**
GENERAL			
1	All the racks should be of 42U size.		
2	Dimension of Network rack is – 800mm x 1000mm x 2000mm or 42U whichever is less		
3	Dimension of Server rack is – 600mm x 1000mm x 2000mm or 42U whichever is less		
Technical Specifications			
1	Rack should be designed and engineered specifically for easy assembly and rapid equipment integration at site.		
2	Design should be based on the use of aluminium profiles for the four vertical pillars, which should be connected solidly to two welded steel end-frames. This results not only in low weight and an elegant appearance, but also permits quick assembly.		
3	Rigidity provided by the steel end-frames such that the rack should be able to handle equipment loads of upto 850kg.		
4	Conforms to DIN 41494 - and current industry practices		
5	Steel Doors - plain, vented at bottom, fully perforated and dual perforated		
6	Glass Doors - with optional vented side trims for front-to-back air flow		
7	Choice of powder coat shades		
8	Vertical pillars of the frame are aluminium extrusions. All other parts are of formed sheet steel		
9	Finishing should be with all block or combination of Light Grey (RAL 7035) and Dark Grey(RAL 7037)		
10	The rack should stand on the Raised Access floor		
11	The rack should support the cooling, cable management and power distribution Unit		
12	The Rack should contain all the necessary component and accessories to mount the servers / switches, storage etc.,		
13	Network Rack (aggregation) should have Patch panel for Cross/Inter Connectivity to Server Rack		
14	Network rack shall be with proper cable management, Ladder, Vertical & Horizontal Wire Manager etc		

Cable Tray			Annexure 12 O
S/N	**Required Minimum Specifications**	**Bidder's compliance (Yes / No)**	**Bidder's remarks**
General			
1	Cable tray shall be manufactured from steel wires, welded together and bent into final shape prior to surface treatment.		
2	Surface Treatments:		
	i). Electro zinc plated to EN 12329 for interior use		
	ii). Hot Dipped Galvanised to EN ISO 1461 (formally BS 729 since 1999).		
	iii). Stainless Steel to EN 10088-2 - AISI 316L		
3	Steel Wire Cable Tray Widths & Depths		
	i).Cable Tray dimensions should be as per design and may have the following		
	ii).Depths of 30mm, 54mm, 80mm, 105mm & 150mm.		
	iii)Widths of 50mm, 100mm, 150mm, 200mm, 300mm, 400mm 450mm, 500mm & 600mm for depths of 30mm & 54mm.		
	iv). Widths of 100mm, 150mm, 200mm, 300mm 400mm & 500mm for Depths of 105mm & 150mm		
	v) All trays should be of 2500mm - 3000mm long		
Additional Specification			
1	Steel Wire Cable Tray will be produced from lateral and longitudinal sidewall steel wires, with minimum diameters of :		
	i) 4 mm for trays of widths up to 100mm		
	ii) 4.5 mm for trays of widths of 300mm		
	iii) 6.0 mm for trays of widths of 400mm, 450mm, 500mm and 600mm		
2	Trays should be manufactured with a longitudinal 'T-welded' safety edge along the top wire of the sidewall (excluding 30x50)		
3	Trays should be constructed with a 50mm x 100mm mesh configuration.		
4	All tray fittings (e.g. changes in direction, level and size) shall be constructed on site, to the manufacturers instructions, using side action bolt croppers and fastened using 25mm and 30mm counter clamps with M6 bolts and nuts, all surface treated as the tray.		
5	Trays will be coupled together using either a fast spring coupler or a 25mm/30mm counter clamp combination with supporting lateral splice plate on trays over 300mm width. The coupling will have the same surface finish as the tray.		
6	Trays shall be supported at a maximum span of 2.5m by trapeze, wall, floor or channel mounting methods and will not exceed maximum loads as specified by the manufacturer.		
7	All welds will be manufactured to an average minimum tensile strength of 500Kg per weld.		
Tests, Certification and Conformity			
1	Loading and deflection characteristics of the tray should be tested and the results published in accordance with the European Standard CEI 61537.		
2	Suitability for the support of Cat6A/OM3/OM4 data cabling should be demonstrated by way of independent test verification.		
3	Fire test certification should be published in accordance with the E30/E90 standard.		
4	Electrical continuity across a coupling should be demonstrated by means of a published test method and result.		
5	A degree of EMI protection is demonstrated by means of published test methods and results.		