



INDIAN INSTITUTE OF TECHNOLOGY BOMBAY
MATERIALS MANAGEMENT DIVISION
Powai, Mumbai 400076.

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Technical Specification of IIT Bombay Hostel Network

IIT Bombay invites proposals from prospective bidders to revamp the existing computer networks in the student's hostels.

Bidders are requested to send their technical bids as per the schedule provided in this document. After evaluating the received proposals, IIT Bombay will shortlist the vendors that meet the technical eligibility criteria. As a part of the technical evaluation process, IIT Bombay reserves the right to perform actual tests on the equipment to verify the specified qualitative and quantitative features of the same and accept or reject the bids based on the test results, as a proof of concept (POC) of features specified in the technical specification. The shortlisted vendors will be invited to participate in an electronic reverse auction. The details of this procedure are provided separately.

This document describes the technical specifications of the equipment, cables, and other accessories. For the evaluation of the commercial phase of the bid, it is mandatory that the bidder shall include

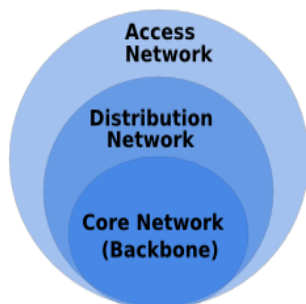
- i) A comprehensive warranty for 5 years.
- ii) 2 years of AMC in the total price of the bid.

1.0 Overview

The existing IIT Bombay network is a 3-tier network that includes the Academic area, Hostel area, and Residential area. The Academic area spans over 30+ departments, centres, schools, and Interdisciplinary Programs, and 30+ labs.

The existing hostel network at IIT Bombay spans across all 18 hostels. Each hostel has a somewhat similar infrastructure. ([Hostel 12,13,14], [Hostel 15,16]). Hostel 18 is the new hostel and has no need for any switches and network cabling. The hostel-wise room occupancy chart is given in **Annex-I**.

The proposed hostel network up-gradation will directly affect the hostels listed below.



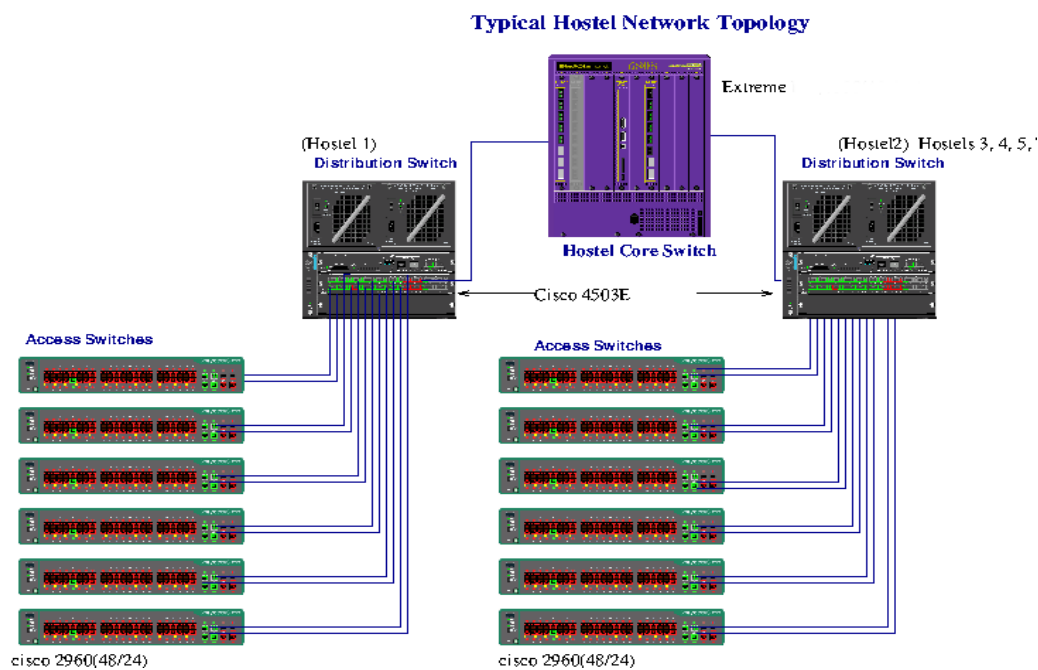
Hostels	Wings	Floors
1-6, 9	6 to 8	3
10(old) + 10 (New)	1 to 2	7
11	3	4
12	4	7
13-14	3	7

15-16	3	10
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Note: Hostel 7 and Hostel 8 are unoccupied from this year due to infrastructure issues hence not considered in this project.

2.0 Existing Network Infrastructure

Each hostel has one distribution switch with a 10Gbps up-link to the IIT Bombay backbone campus network. In each of the hostels 1 to 14, access switches are connected to the distribution switches through the two numbers of 6-core multimode fibers. At present, most of the access switches in hostel 1 to 14 are managed with Cisco (the 2960s, 2960g, 2960x) and Extreme x440. Most of the hostel rooms have two LAN ports, one LAN port was installed in 2001-2002, and another one installed in 2009-2010. The new building of hostel 10 and hostels 12,13 and 14 have single LAN ports. Each Hostel network topology is similar to figure below, and detailed hostel network topology given in **Annex-X**



3.0 Goal of Proposed Network Revamp

The successful completion of the network up-gradation should ensure the following features are achieved :

- 1 Complete manageability of the network.
- 2 Due to the increase in the strength of the students, all rooms will have two LAN ports.
- 3 Upgrade existing wing Switches uplinks from 1+1 Gbps to 10Gbps ready
- 4 Upgrade hostel distribution from 10Gbps to the IITB core 40Gbps ready
- 5 L3-L7 security features are mentioned in the specifications below.
- 6 Advanced L2 security features are mentioned in the specifications below.
- 7 IPv6 readiness to all the hostel networks.
- 8 SDN based Fabric readiness to all the hostel networks.
- 9 Provision of the WiFi connectivity to each wing corridor of all the hostels.
- 10 Make the entire network manageable via standardized protocols and commercial network management software.

Note that L2 security features like MAC to IP address binding and Time-based ACL in the access switches, Storm Control, DOS, IPV6, SDN based Fabric, and network management with the network traffic in-depth analysis, etc features are critical for this network.

The total bill of quantities for these active network components is given in **Annex-II**

4.0 Qualification Criteria for Bidder and OEM

The bidder/OEM's qualification will be determined based on their ability to execute this project and provide continuous support.

The Bidder/OEM should submit the tender documents with the indexing as mentioned in the criteria shown below with the proof of supporting documents. The sequence with page numbers and bookmarking should be clearly specified. In addition to the supporting documents, an undertaking for the fulfillment of each eligibility criteria should be submitted.

The OEM should satisfy the following criteria.

Sr. No.	Eligibility Criteria	Yes/No	Submit the Proof Documents
1	OEM must be in the core business of networking equipment(L2 and L3 Switches) and must have a presence for a minimum of 10 years in India.		
2	The bidder should be an authorized representative of the OEM. The bidder shall furnish the manufacturer's authorization(MAF) letter from the respective OEMs, specific to this tender mentioning the tender number for which bid the authorization is being provided.		
3	OEM should have 24x7x365 fully functional service and support centres in India. that can guarantee during warranty and AMC period that any replacement if required can be done within 24 hours/Next business day. Provide the relevant documents.		
4	Bidder should be an OEM-certified network switches solution supplier and integrator.		
5	The bidder should have an annual turnover of at least INR 5 crores from system integration involving Supply, Installation, Testing, Commissioning, and Maintenance of IT infrastructure i.e. Network Business in each of the last three financial years		
6	<p>The bidder must have experience in Supply, Installation, Maintenance of Installation of LAN Networking solutions at any Government / Semi-Govt. / Government Undertaking / PSU / Institution / Educational Institutes of Higher Learning and Enterprise Customers during previous 7 years ending last day of month previous to the month of publication of this tender, as under:</p> <ul style="list-style-type: none"> I. At least one project with a value of Rs. 5 crores OR II. At least two projects with a value of Rs. 2.5 crores each OR III. At least three projects with a value of Rs. 1.5 crores each. 		

7	The Bidder should have at least 5 network-certified engineers on their payroll for a minimum period of one year as on the date of submission of the bid. The bidder should provide the technical staff certificates, roll list, and resume of their employees in the excel sheet format with relevant documents as proof. Further, these resources should have prior experience in the implementation/maintenance of projects like Campus-wide LAN, management, designing, and commissioning of such projects.		
8	Bidders should have implemented at least one project at a single customer location in India, consisting of a minimum of 100 access (L2) Switches and 25 distribution (L3) switches during the last 7 years. The proof for this should be duly supported by the relevant purchase order copies/customer agreements if any. The bidder shall furnish attested true copies of all these documents and customers' contact details.		
9	The bidder should be a solution supplier and integrator of an authorized OEM.		
10	An undertaking (self certified) is to be submitted by the bidder that neither the OEM nor the bidder should have been blacklisted for security or for any other reason by any state or central government in India or by any public sector unit in India to date.		
11	The proposed OEM product shall not be declared the end of support and end of life for the next 7 years from the date of submission of the bid.		
12	All network switching components (distribution switches(L3), access switches(L2), transceivers(SX, LX, LR Modules), Stacking cables and Network Management Software (NMS), etc.) from the same OEM.		
13	The offered products distribution switches(L3), access switches(L2) solution against the supply order shall be of the latest version, the latest product, and should be under support for the next 7 years. However, if any product, which is declared an end of life by the OEM during the supply period of material (During the Contract period), the bidder should supply a replaced model or next higher model/version with the same specification of higher specification of the product.		
14	The support facilities should be fully owned by the bidder / OEM and managed by their permanent employees (company payroll) and not through franchisee(s).		
15	The bidder should have local support in Mumbai.		
16	Bidder/OEM Should have India toll free customer support.		
17	Technical Assistance Centre(TAC) and research and development (R&D) should be based in India.		
18	The bidder should have valid documentary proof of GST registration number.		
19	The bidder should have a positive net worth during the last three financial years.		
20	It is mandatory to enclose all the supporting documents.		

5.0 Scope of Work and Terms & Conditions

The bidders who have the capability to provide a TOTAL TURNKEY solution which includes

- 1 The bidders shall supply, including transportation to the site, install, configure and demonstrate all the specified features in the switches as a total turnkey solution.

- 2 The bidders shall provide all the documentation including Architecture, Design, Deployment diagrams, test plans, operating and service manuals and test reports of the deployed LAN switches, both in hard and electronic copy versions.
- 3 The bidders should provide all documents/manuals useful for daily administration.
- 4 The bidder shall bear all costs during the preparation and submission of the proposal, site visit (if required) etc.
- 5 The bidder must provide verifiable documents to support their claims.
- 6 The bidders may be asked to come to IIT Bombay and present the solutions proposed in their technical bids.
- 7 No new information will be accepted from the bidder after the submission of the bids. However, IIT Bombay may ask for clarifications if required, on submitted information to evaluate the bid. The bidder should respond to such clarification requests within the specified time defined by IIT Bombay during that phase.
- 8 IIT Bombay reserves all the rights to accept or reject any applications/suggestions without assigning any reasons whatsoever.
- 9 Due to an extremely strict deadline for incurring the expenditure, IIT Bombay has the right to cancel the PO if the delivery, installation and acceptance testing is not completed within the stipulated timeline. Specifically,
 - 9.1 Delivery should be **within 24-28 weeks** of issuing of PO.
 - 9.2 Installation, commissioning, and acceptance testing should complete within 18 weeks of delivery.
- 10 The bidder shall provide a comprehensive warranty for the first 5 years and AMC for the subsequent 2 years. The payment for AMC will be paid half yearly.
- 11 The warranty period is to be counted from the **date when the installation is completed and the acceptance certificate has been issued by IIT Bombay.**
- 12 The installation will be executed by certified and trained engineers from Bidder/OEM for the complete solution followed by well documented, comprehensive user training.
- 13 Any item not specifically mentioned in the technical specification solution and bill materials but is required for successful implementation of the total overall solution (in the solution proposed by Bidder/OEM) must be brought to our notice and Bidder/OEM should include all the necessary components in the bid without any cost of product and licensing to the IIT Bombay.
- 14 **At the time of installation, if it is found that some additional hardware or software items are required to meet the operational requirement of the configuration, but not included in the OEM's original list of deliverables, the Bidder/OEM shall supply such items to ensure the completeness of the configuration at no extra cost and within the stipulated time.**
- 15 The entire installation should be done at the proposed site only. Requests for remote access for installation/fine-tuning will not be entertained during the installation period.
- 16 The covering letter and all the proformas should be submitted on the company letterhead of the bidder, along with the technical proposal.
- 17 Bidders should quote for the products and models specified in the Technical Specification Table with service level agreement as mentioned in the document elsewhere.
- 18 If the specific model is not available, the bidder can quote for a product with higher specification and capability and compatibility. Bidders cannot quote for products with inferior specifications.

- 19 Bidders have to be awarded by OEM as one of their certified partners and bidders also have to produce such certificates.
- 20 The bidder should attach a compliance sheet with each of the specifications, and configuration manuals and reference documents with proof of compliance.
- 21 We reserve the right to reject the quotation of any bidder who violates these conditions and reserve the right to cancel the tender at any time.
- 22 An undertaking of acceptance of the above terms & conditions should be given by the Bidder on their letterhead.
- 23 OEM must have support centers in India.
- 24 Any complaint / Breakdown call reported should be attended on the same day within 2 hours by the local resident engineers or city allocated engineer of the Bidder. The resolution of critical calls will be resolved within 8 hours while non-critical issues will be resolved within the next day.
- 25 Warranty: Each product deployed in the network shall be with a comprehensive on-site OEM warranty (including labors and spares) for the 5 Years starting from the date of Acceptance of the project implementation. IITB as well as the selected bidder should be able to log a call with the OEM as per the support contract offered. The service agreement contract copy from the OEM should be submitted to IITB within the 3 month period after the award of the contract.

26 Delivery and Installation Schedule.

- a) The time duration for the complete roll-out of the proposed solution is up to 24-28 weeks from the date of the formal purchase order. After issuing the purchase order, failing which the penalty clauses mentioned in the PO will be levied and PBG will be forfeited.
- b) For the Site Not Ready (SNR) case, the bidder is required to submit a certificate signed by Network Project Coordinator to IITB. However, regarding the readiness of the site, the decision of the Project Coordinator will be final. No penalty will be imposed for Site Not Ready (SNR) cases.

27 The commercial bidding will be a two-phase process that includes an electronic reverse auction. The technically qualified bidders are eligible for the reverse auction and their commercial bid will be opened and the lowest bid will be considered as the base for reverse auction.

Annex V: Detailed Specifications for Access switches (Layer 2 Managed) and also used for PoC

Sr. No.	Item	Specification
1	Type	<ul style="list-style-type: none"> ● Layer 2 managed
2	48 Port Version	<ul style="list-style-type: none"> ● 48 nos. of 10/100/1000 BaseT ports ● The 48 ports above, four are additional uplink ports with 4 nos. of 1G/10GBase-SX SFP based Gigabit Ethernet Ports Auto Speed, Auto-negotiation capabilities. ● Packet Forwarding Rate:130 Mpps ● Switching capacity 176Gbps ● With Stacking 40Gbps from Day 1 ● Minimum Packet Buffer 4MB ● Minimum RAM 1GB ● Minimum Flash 1GB
	24 Port Version	<ul style="list-style-type: none"> ● 24 nos. of 10/100/1000 BaseT ports ● The 24 ports above, four are additional uplink ports with 4 nos. of 1G/10G SX SFP based Gigabit Ethernet Ports, Auto Speed, Auto-negotiation capabilities ● Packet Forwarding Rate: 95 Mpps ● Switching capacity 128Gbps ● With Stacking 40Gbps from Day 1: ● Minimum Packet Buffer 2 MB ● Minimum RAM 1GB ● Minimum Flash 1GB
	24 Port PoE+ Version	<ul style="list-style-type: none"> ● 24 nos. of 10/100/1000Base PoE+ ports ● The 24 ports above, four are additional uplink ports with 4 nos. of 1G/10G SX SFP based Gigabit Ethernet Ports, Auto Speed, Auto-negotiation capabilities. ● Packet Forwarding Rate:95 Mpps ● Switching capacity 128Gbps ● The PoE+ budget should be a minimum of 720 Watt. ● With Stacking 40Gbps from Day 1 ● Minimum Packet Buffer 2 MB ● Minimum RAM 1GB ● Minimum Flash 1GB
	8 Port PoE+ Version	<ul style="list-style-type: none"> ● 8 nos. of 10/100/1000 Base PoE+ ports ● The 8 ports above, two are additional uplink ports with 2 nos. of 1G/10G SX SFP based Gigabit Ethernet Ports, Auto Speed, Auto-negotiation capabilities. ● Packet Forwarding Rate: 39 Mpps ● Switching capacity 54 Gbps ● The PoE+ should be a minimum of 180 Watt. ● With Stacking 40 Gbps from Day 1 ● Minimum Packet Buffer 2 MB ● Minimum RAM 1GB ● Minimum Flash 1GB

3	Layer 2 Security	<ul style="list-style-type: none"> ● Rate limiting/Shaping based on Port, IP address, and MAC address ● Port based ACL ● Time based ACL (It should be possible to enforce an access list based on the time of day. It should allow the network administrator to define, permit and deny access). ● MAC to IP address binding, Port to MAC address binding ● MAC limiting, MAC address tracking/movement, and notification. ● DHCP Snooping. DHCP option 82 with Port/VLAN ID. ● DHCP Server (IPv4, IPV6) or DHCP Solution (IPv4, IPV6) per distribution ● DoS protection, SYN attack protection, Protection against man in the middle attack or equivalent. ● Port based security- 802.1x, Port based network access control ● Per port Unicast, broadcast, multicast storm control. ● Role based policy ● Layer 2 traceroute or equivalent ● IP security (Dynamic ARP protection, DHCP enforcement) ● 1 to many port mirroring ● MAC authentication, web authentication ● SNMP, SSH, TELNET ACL to access the switch for admin and user restrictions. ● MACsec encryption
4.	L2 Protocols	<ul style="list-style-type: none"> ● Support for IEEE 802.1D (STP &RSTP), IEEE 802.1Q, 802.1w, 802.1s ● BPDU Guard or equivalent ● Support for IEEE 802.3ad Link aggregation and load sharing. ● Support for IEEE 802.1AB LLDP, LLDP-MED for autoconfiguration ● Port//MAC based VLAN ● MVRP 802.1ak or equivalent ● Stacking up to Max 8 switches ● Radius and TACACS+ for users ● IEEE 802.3az (Energy Efficient Ethernet) ● The switch should support VLAN with a minimum 512 active VLAN and 4K VLAN ID, 16K MAC
5.	Switch Management	<ul style="list-style-type: none"> ● Command Line Interface (CLI) ● SNMPv1, SNMPv2, SNMPv3, ● Secure Shell (SSH1/ SSH2), SFTP, SCP and Telnet ● Support for TFTP, NTP ● Support for RMON I and II ● RADIUS authentication enabled centralized control of the switch ● The switch should support Python/TCL Language scripting for automation. ● Should support open API for third-party application integration. ● Web based management. ● Should support telemetry or equivalent ● The switch should support multiple firmware and configurations to restore easily from Flash.
6.	Multicast & QoS Features	<ul style="list-style-type: none"> ● IGMP v1, v2, v3, and IGMP snooping ● The switch should support priority queuing ● The switch should support 8 hardware QoS queues per port ● The switch should support DSCP

7.	Hardware	<ul style="list-style-type: none"> ● ASIC based hardware for high performance ● Wire speed storm control ● Wire speed ACL enforcement ● IPV6 support ● Console port, USB or External Flash, and Out of band IP base management port ● sflow/NetFlow or equivalent support. ● Should support a 9K jumbo frame. ● Should support minimum 1K ACL ● Firmware should latest in nature.
8.	SDN / Automation	<ul style="list-style-type: none"> ● Software Defined Networking (SDN) based fabric network or equivalent Capability from day1. ● OpenFlow/RESTCONF/Netconf or equivalent protocol capability to enable software-defined networking. ● Virtualizing and segregating. Segmenting/Dynamic segmentation users and services with isolation zones. ● The solution should be able to build/configure virtualized L2 and L3 encapsulated tunnels or fabric across multiple switches ● The solution should provide automated configuration of services (VLAN, Multicast), etc. end to end with minimal human intervention. (The vendor should showcase the automation technology) ● Should with IPv4 and IPv6 ● The solution should support any topology regardless of the number of switches connected. ● The SDN based Fabric solution should support network automation from Day 1. ● The OEM/Bidder should provide all the requisite hardware and licenses for the SDN based Fabric solution from Day 1. ● Required orchestration tools to automate SDN based fabric networks should be provided from day 1.
9.	Basic L3 Functionality	<ul style="list-style-type: none"> ● The Switch should support static routes and dynamic routing protocols like RIP from day 1, Upgradable to OSPF in the future. ● Should support policy based routing.
10.	Power, Fan & Temperature	<ul style="list-style-type: none"> ● 220V AC 50Hz. with Indian standard Power cable. ● The switch should support variable fan speed to adjust to varying weather conditions on the campus. ● 0-45 C operating temperature and 10-90 % Relative humidity <p>** Note that the power cords in all components should comply with Indian standards. Adapters should not be used.</p>

Annex V: Detailed Specifications of Distribution switch (Layer 3) and also used for PoC:

Sr. No.	Item	Specification
1.	Type	<ul style="list-style-type: none"> ● Layer 3
2.	48 Port version all fiber ports	<ul style="list-style-type: none"> ● 48 ports 1G/10G each with 1G/10G-SX (SFP) Fiber ports. ● The 4 uplink ports of 10G/40G Ethernet over fiber (LR) should support both SM/MMF. ● Packet Forwarding Rate:1000 Mpps ● Switching capacity 3.2Tbps ● Switch should support fully non-blocking operation with wire speed switching architecture. ● 16K ipv4 Routes ● 6K ipv6 routes ● 50k ARP records ● 250 VRF ● 16GB RAM ● 16 GB Flash ● Packet Buffer 32MB
3.	Layer 3 Support	<ul style="list-style-type: none"> ● RIP v1 & v2, OSPF, OSPFv3 VRRP, BGP, BGP4, VRF, IPV6, openFlow/ Sflow/ Netflow ● Policy based routing from day 1 ● BFD (Bidirectional Forwarding Detection), route distribution, unicast reverse path forwarding. ● IPv4/IPv6 neighbor discovery, source guard ● 6 in 4 tunnel (ipv6 to ipv4 tunnel)
4.	Multicast	<ul style="list-style-type: none"> ● IGMP v1/v2/v3, IGMP filtering/ IGMP snooping ● Multicast VLAN Registration or equivalent ● PIM , PIM-SM, PIM-SSM (Protocol Independent Multicast) ● MLD snooping ● Switch should support for priority queuing and support 8 hardware QoS queues per port ● Switch should support DSCP
5.	Layer 2 Security	<ul style="list-style-type: none"> ● Rate limiting/Shaping based on Port, IP address and MAC address ● Port based ACL ● MAC to IP address binding ● Port to MAC address binding ● MAC limiting, MAC address tracking/movement and notification. ● DHCP Snooping, DHCP relay, DHCP option 82 with Port/VLAN ID. ● DHCP Server or DHCP Server Solution for IPv4 and IPv6 ● RA Guard, DHCP Guard, ● Port based security- 802.1x, Port based network access control ● BPDU Guard or equivalent ● Per port Unicast, broadcast, multicast storm control. ● Layer 2 traceroute ● 1 to many port mirroring ● MAC authentication, Web authentication ● Role based policy ● IP security (ARP protection) ● SNMP, SSH, TELNET ACL to access the switch for admin and user restrictions.
6.	L2 Protocols	<ul style="list-style-type: none"> ● Support for IEEE 802.1D (STP & RSTP and MSTP), IEEE 802.1Q, 802.1w, 802.1s ● Support for IEEE 802.3ad Link aggregation and load sharing. ● Support for IEEE 802.1AB LLDP. ● Port/MAC based VLAN. ● MVRP 802.1ak or equivalent.

7.	Switch Management	<ul style="list-style-type: none"> ● Command Line Interface (CLI), SNMPv1, SNMPv2, SNMPv3. ● Secure Shell (SSH1& SSH2), SCP, SFTP and Telnet. ● Support for TFTP, NTP. ● Support for RMON I & II. ● RADIUS authentication enabled centralized control of switch over (ipv4 and ipv6) for AAA. ● Web Based Management. ● Switch should support Python/TCL/Restconf Language scripting for automation. ● Should support open API for third party application integration. ● API support to remote configuration and scripting. ● ping, traceroute ● Switch should support multiple firmware and configuration to restore easily from Flash.
8.	QoS	<ul style="list-style-type: none"> ● ACL based on L2/L3/L4 headers ● Rate limiting/ Shaping/ Policing/Marking ● IEEE 802.1p, DiffServ
9.	Hardware	<ul style="list-style-type: none"> ● Wire speed ACL enforcement ● Wire speed Storm control ● ASIC based hardware for high performance ● IPV6 support ● Out of band ip base management port ● sflow/netflow or equivalent support. ● Firmware should latest in nature
10.	Redundancy	<ul style="list-style-type: none"> ● Redundant power supply (220V 50 Hz) ● Hot swappable power supply and fan tray
11.	SDN/ Automation	<ul style="list-style-type: none"> ● Software Defined Networking (SDN) based fabric network, equivalent Capability support from day 1 ● OpenFlow/RESTCONF/Netconf or equivalent protocol capability to enable software-defined networking. ● Virtualizing and segregating, segmentation/dynamic segmentation users and services with isolation zones. This solution enables ● The solution should provide automated configuration of services (VLAN, Multicast), etc. end to end with minimal human intervention. (The vendor should showcase the automation technology) ● The solution should be able to build virtualized L2 and L3 encapsulated tunnels or fabric across multiple switches. ● Should with IPv4 and IPv6 ● The Solution should support any topology regardless of the number of switches connected. ● The SDN based Fabric solution should support network automation from Day 1. ● The OEM/Bidder should provide all the requisite hardware and licenses for the SDN based Fabric from Day 1 ● The switch should support VXLAN for similar overlay technology. ● Required orchestration tools to automate SDN based fabric networks should be provided from day 1..

Annex VI: Network Management Software

To manage all access and distribution switches, NMS with the capability of managing these (according to BoQ Qty) is required and also showcased for PoC.

- Web based user interface.
- Should support full configuration, fault, and performance management.
- Ability to present graphical views of the network.
- Capability to view the network topology.
- Should support alarm/event correlation and reporting(SMS/MAIL)
- Should support the management of SNMP v1/v2/v3 devices
- Should support various privilege levels.
- Should give analytics of network and applications traffic patterns,
- Should give network performance Reporting, Historical reporting.
- Should support network SDN based Fabric automation
- The Automation tool should assist in troubleshooting in the SDN based Fabric network.
- Should support device/network health monitoring.
- Should support network inventory and connected device IP addresses.
- Event management and logging.
- Network device archiving and backup configuration.
- Should support scripting (Python/TCL/REST API, etc,)
- Automated download/upload firmware to network devices.
- Schedule events and tasks.
- Should support Radius and LDAP authentication for user/admin of the applications.
- Should support different MIBs.
- Should be able to integrate with NAC or Analytics in future if required.
- Switches and NMS from the same OEM.
- The solution should have capabilities to monitor the health of network devices including CPU & memory utilization, link errors & discards, and link availability (Real-time and trending), device serial numbers, and firmware also should support upgrades and downgrades of the firmware.
- The solution should have the capability to provide Wired Client visibility – Device type, Hostname, MAC address of the device, IPV4, IPV6, VLAN ID, Connected network device, location, port number and last seen. time and location.
- The solution should have the capability to provide Wired client Application-level visibility - Per application, Packet loss, latency along with usage, throughput.
- The solution should have the capability to keep 30 days of historical data made of clients, devices, and applications and should go back for 30 days and see the cause of a network issue. This will help to provide instant right root cause analysis.
- The solution should provide reasons for reachability issues.
- The solution should design the network in a hierarchical manner - IITB Campus, Area, Building, and Floor.
- The solution should have self-learning capabilities like discovering the devices, getting on boarded using Zero-touch provisioning/ Plug and play, and creating a topology automatically
- The solution should provide configuration compliance with drift/changes between the old version and the new version

Annex-I: Current Room Occupancy of all Hostels

Hostels	Total Rooms	Single Room	Double Room	Total Occupancy
H1	284		284	300
H2	273	144	124	392
H3	281	143	138	419
H4	252	204	48	300
H5	252	186	66	320
H6	292	194	95	384
H9	282	208	72	352
H10 Old	225	76	149	174
H10 New	738	738		738
H11	265	187	66	355
H12	832	852		832
H13	636	636		636
H14	634	634		634
H15	513		513	532
H16	513		513	519
H17	1109	1109		0
H18	1109	1109		1109
Tansa	128		128	256
Total Rooms	7393			7008

Annex-II

The numbers of switches required for each hostel are as follows.

Sr. No.	Hostels	Layer 3 Switch	Layer 2 Switches 48-Port	Layer 2 Switches 24-Port	Layer 2 Switches 24-Port PoE+	Layer 2 Switches 8-Port PoE+	GBIC SX 1G	Stacking Cable	GBIC LR 10G
1	Hostel 1	1	8	9	8		18	18	2
2	Hostel 2	1	8	9	8		18	18	2
3	Hostel 3	1	8	8	7		16	16	2
4	Hostel 4	1	10	7	10		20	20	2
5	Hostel 5	1	9	4	6		18	12	2
6	Hostel 6	1	10	5	7		16	20	2
7	Hostel 7	0	0	0	0		0	0	0
8	Hostel 8	0	0	0	0		0	0	0
9	Hostel 9	1	12	1	6		14	24	2
10	Hostel 10(old)	1	7	1	7		16	14	2
	Hostel 10(new)	1	18	0	0		36	20	2
11	Hostel 11	1	9	2	6		18	18	2
12	Hostel 12	1	8	64	36	0	72	36	2
13	Hostel 13	1	0	50	28	0	56	36	2
14	Hostel 14	1	24	0	24	0	58	24	2
15	Hostel 15	0	0	0	9	0	0	0	0
16	Hostel 16	0	0	0	9	0	0	0	0
17	Hostel 17	0	0	0	0	0	0	0	0
18	Hostel 18	0	0	0	10	0	20	0	0
19	Tansa	0	0		0	0	0	0	0
20	For Dept WiFiP(Qty 924)					50			
	Total Quantity	13	131	160	181	50	396	276	26

Annex-III

Bill of Quantities (Active Components: Must including 5 year Warranty)

Sr. No.	Item	Quantity
1.	Distribution Switch L3 (as per specification 48 X 1/10G Fiber port) with uplink with 40Gbps, 10Gbps data speed support (As per technical specification) with console cables.	14
2.	Access Switch (as per specification 48 port) (As per technical specification) with console cables.	135
3.	Access Switch (as per specification 24 port) (As per technical specification) with console cables.	165
4.	Access Switch (as per specification 24 port) PoE+ (As per technical specification) with console cables.	185
5.	Access Switch (as per specification 8 10/100/1000 port) PoE+ (As per technical specification) with console cables.	50
6.	Network Management Software(NMS) (As per technical specification)	1
7.	10G fiber Modules SFP (LR)	30
8.	1G Fiber module SFP (SX)	400
9.	1G Fiber module SFP (LX)	50
10.	Stacking Cable	280
11.	Comprehensive AMC for items 1-6 for a period of 2 years (Four hours response time with 99% uptime commitment. This should be available on a 24x7 basis.) AMC percentage should not exceed 10% of goods value.	2 Years

6.0. Service Level Agreement and Warranty:

All the following conditions must be agreed upon.

1. Proposed Products (software, firmware, and hardware) should have a comprehensive OEM onsite warranty pack for 7 years (5 years warranty and 2 AMC) for the entire shipment starting from the date of installation.
2. IIT Bombay as well as the selected bidder should be able to log a call with the OEM as per the support contract offered.
3. The service agreement contract copy should be submitted to IIT Bombay within the 3 months after the award of the contract.
4. The defects, if any, during the guarantee/warranty period are to be rectified free of charge by arranging free replacement wherever necessary.
5. The OEM/bidder has to ensure that the proposed switching solution delivers an uptime guarantee of 100% of the switching solution system. Every percentage point of downtime between 2% to 10% will incur a penalty of 0.1% of the total cost of this tender. Every percentage point of downtime above 10% will incur a penalty of 0.5% of the total cost of this tender.
6. In the event of failure of any of the components of the proposed switching solution, the OEM/bidder has to ensure that the defects are rectified within two full working days. Any delay in switching warranty servicing beyond 3 days will incur a penalty of 0.2% of the total cost per day of delay. Any service/support delay in the switching solution or any of its components/application not working beyond 24 hours will incur a penalty of 0.2% of the total cost of this tender for every completed 24 hours.
7. During the warranty period, OEM/bidder will have to undertake comprehensive maintenance of the entire hardware components, equipment, software support supplied by the vendor at the place of installation of the equipment(each six-month time span).
8. A letter of commitment for five years from the date of installation, concerning Hardware Software, and Firmware support from OEM should be enclosed in the bid cover. Offers will be rejected if they are not accompanied by a letter from the OEM.
9. The maximum penalty for non-performance will be 5% of the total cost of the tender. On reaching this limit in any year, the OEM/bidder will be considered in breach of the contract. The penalty will not apply if the delay is caused by IIT Bombay.
10. Technical support from Bidder/OEM should be provided for system administration/maintenance of the switching solution during the entire warranty period.
11. OEM/Bidder should protect any data during any upgrades of hardware/firmware/OS.
12. The OEM/Bidder must submit the name of the service engineers employed by them who are competent to serve the switching installation, along with their contact details in India, working knowledge of basic networking switching, routing and SDN setup (viz. installation, Configuration, Licensing, ACL Policy and Management, etc.) to IIT Bombay CC Network Team.
13. An inventory of common parts that require replacement shall be made available to IIT Bombay a prior on site.
14. This comprehensive onsite warranty includes but is not limited to software releases, up-gradation and bug fixes.

15. The OEM to be quoted by the bidder must have local Technical Assistance Centre (TAC) support in India through a toll-free number and Returned Materials Authorization (RMA) depot in India. Where customers can directly log a complaint against any failure.
16. Delivery and Installation Schedule.
 - a) The time duration for the complete roll-out of the proposed solution **is up to 36** weeks from the date of the formal purchase order
 - b) For the Site Not Ready (SNR) case, the bidder is required to submit a certificate signed by the Network Project Coordinator to IITB. However, regarding the readiness of the site, the decision of the Project Coordinator will be final. No a penalty will be imposed for Site Not Ready (SNR) cases.
17. It is reiterated that the AMC will be paid at the start of the 6th and 7th year, payment will be half-yearly, as per GFR Rule.
18. The technically qualified bidder will be allowed to participate in commercial bidding. Commercial bidding is an electronic reverse auction. The winning bid will be determined based on commercial and the bidder will be allowed further quote below the winning bid or keep the same.
19. Documentation to be provided (After installation)
 - a. Network survey for proposed locations of IIT Bombay campus.
 - b. Step by step installation guide and configuration of switching solution from start.
 - c. Network L2 and L3 Switches configuration and integration with IIT Bombay existing setup.
 - d. Basic troubleshooting and Hands on the L2 security features like MAC to IP address binding and Time-based ACL in the access switches, Storm Control, DOS, IPV6, SDN based Fabric, and network management with the network traffic in-depth analysis, etc features are critical for this network.
 - e. Any other document/manual useful for daily administration.
 - f. The technically qualified bidder should provide hands-on training of detailed configuration and debugging methodology to the CC network Team. It may be on premises or in OEM/Bidder location, without charge.

Annexure-VII :

Selection of the winning bidder

- The Bidder should submit two bids. Technical and commercial. The technically qualified bidders are allowed to participate in the commercial bid
- The technical evaluation will be completed before the commercial bidding process and the technically qualified bidders commercial bid will be opened and the lowest bid will be considered as base price for the reverse electronic auction. And bidders are requested to participate reverse auctions conducted by the RA module, IIT Bombay approved platform.
- The usual reverse auction with a specified stopping rule and a minimum decrement. These will be intimidated by the IITB RA-approved system or the third-party RA system by all the vendors. This will end when the reverse auction stops.
- The winning bid will be the one with the lowest bid.
- The lowest bidder can also submit a final closed bid that is lower than its stopping bid or no change in his bidding price.

Indenter: Head Computer Center

Annexure VIII: Performance Statement proforma (for a period of last three years)

Na of the firm: _____

Order Placed by (full name and address of the purchaser)	Order number and date	Description and quality of the ordered equipment	Value of order	Date of completion of delivery as per contract	Date of actual completion of delivery	Reason of late delivery if any	Has the equipment been installed properly ? (submit a certificate from the purchaser)	Contact person along with contact details

Annexure IX: Certificate Of Completed Work From Past Customers

(Furnish this information for each work from the CUSTOMERS referred in the few previous Form for whom the work was executed)

1. Name of work / Project and Location
2. Agreement/Purchase Order Number
3. Estimated Cost
4. Tendered Cost
5. Date of Start
6. Date of Completion
 - a. Stipulated date of completion
 - b. The actual date of completion
7. Amount of compensation levied for delayed completion if any.
8. Performance on HPL Benchmark using CPU cores of HPC system (in TFlop/s)
9. Performance report:
 - a. Quality of Work: Excellent/ Very good/ Good/ Fair
 - b. Resourcefulness: Excellent/ Very good/ Good/ Fair
 - c. Responsiveness: Excellent/ Very good/ Good/ Fair
 - d. Accessibility to management when needed: Excellent/ Very good/ Good/ Fair
10. Name of Institute/ Chief Project Manager or Equivalent
11. Contact Details
12. Would you award work again to this supplier Yes/ No

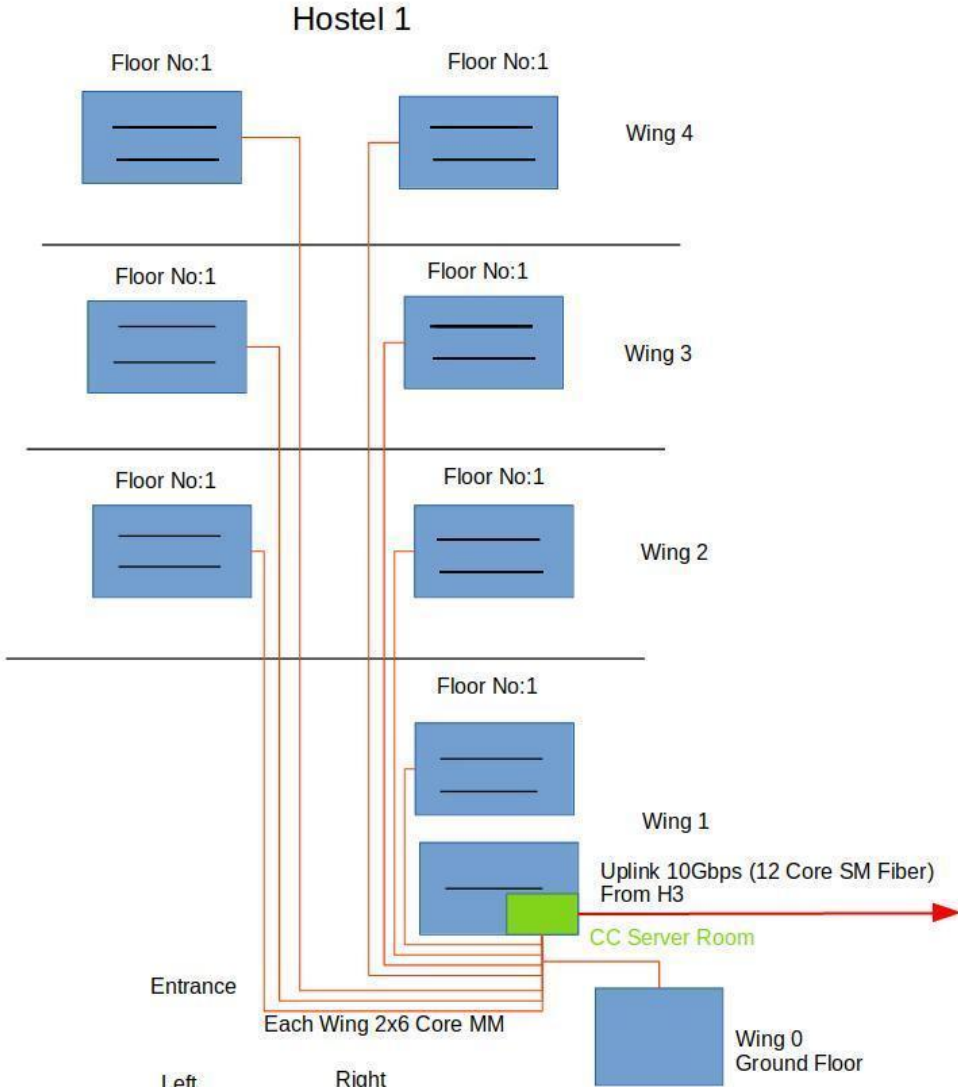
Date:

Place:

Signature(with Seal)

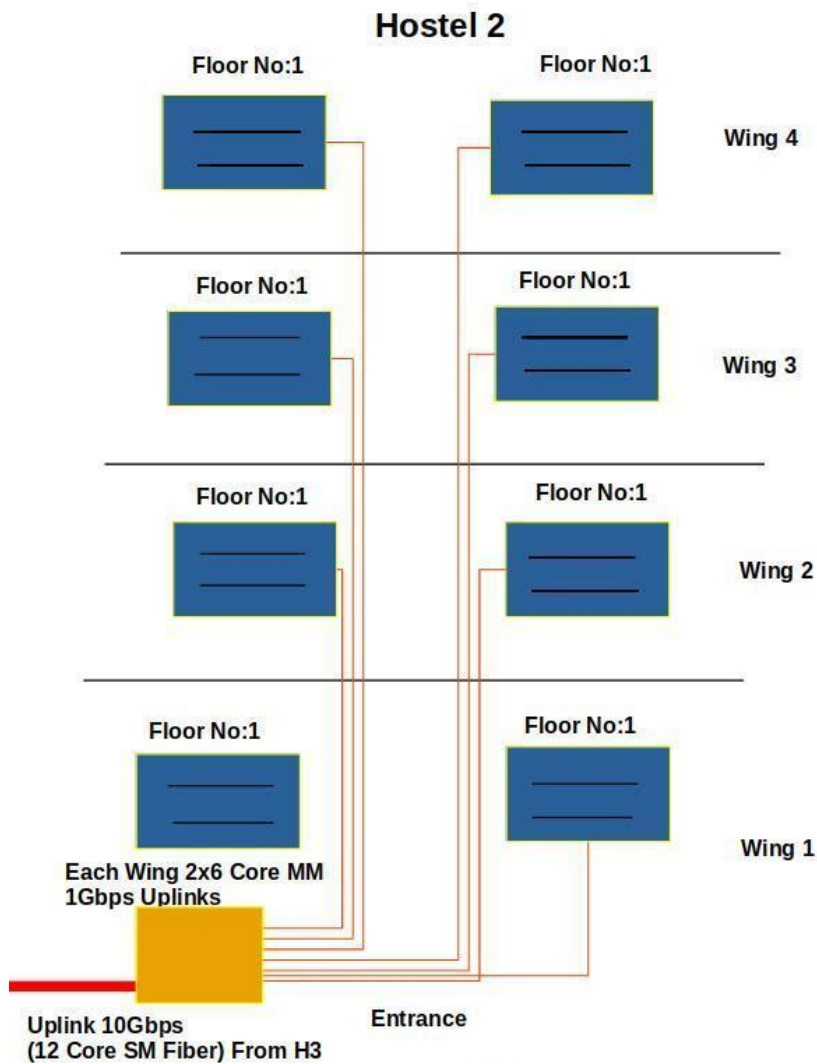
Annex-X: Detailed Hostels Network Topology

Hostel 1 Network Topology



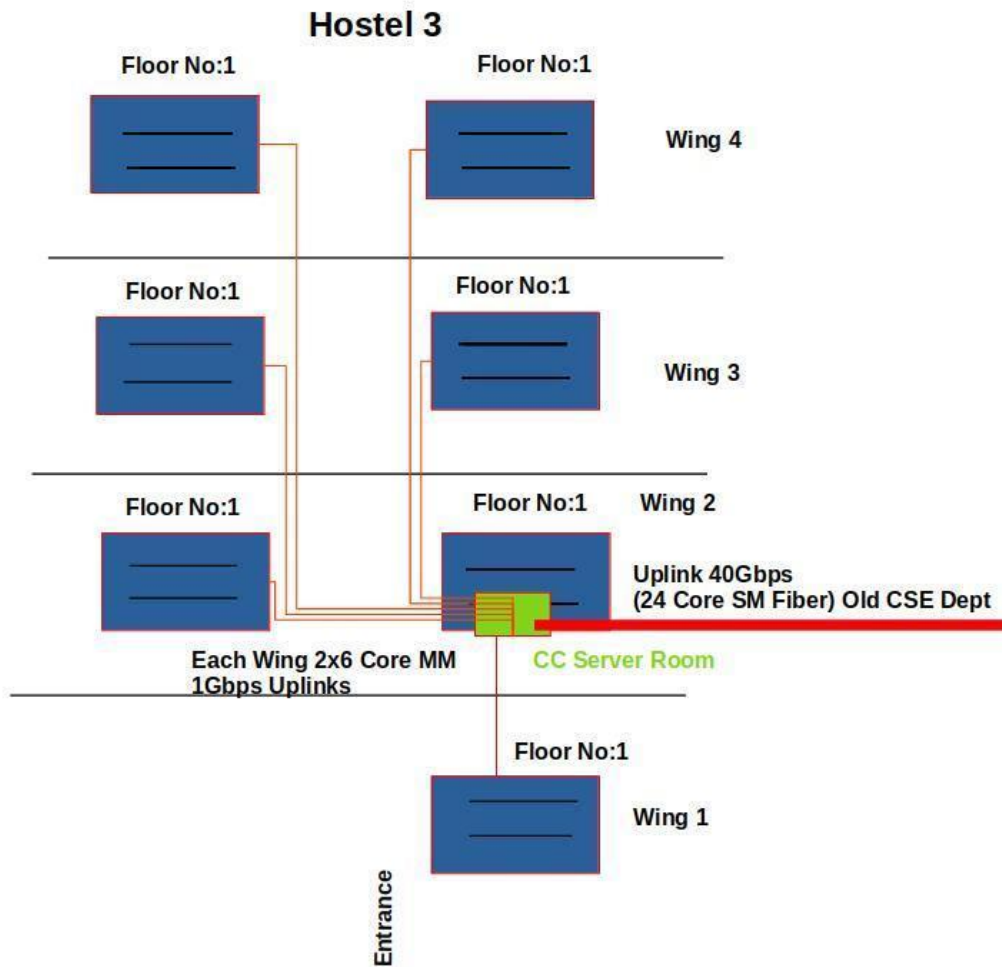
	Left	Right		
Wing 0	Comp Room X440-24t	X440-G2-48t	Total Rooms	284
Wing 1	X440-G2-48t	X440-G2-48t	NW IO ports (96 WiFi)	664
Wing 2	2x X440-G2-48t	2x X440-G2-48t	Total Switches (15x48t+ 1x24t)	16
Wing 3	2x X440-G2-48t	2x X440-G2-48t		
Wing 4	2x X440-G2-48t	2x X440-G2-48t		

Hostel 2 Network Topology



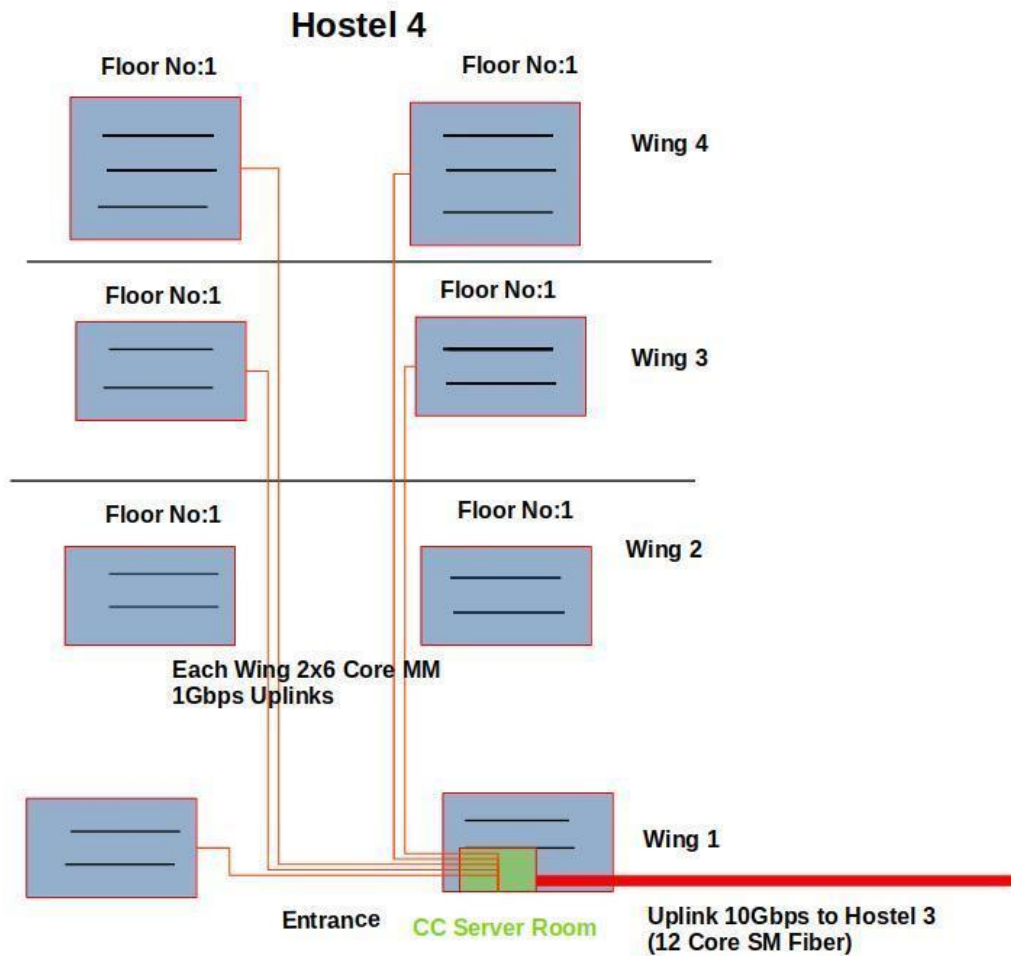
	Left	Right		
Computer Room	Comp Room Cisco 2960S-24t		Total Rooms	273
Wing 1	2x X440-G2-48t	2x X440-G2-48t	N/W IO ports (96 WiFi)	642
Wing 2	2x X440-G2-48t	2x X440-G2-48t	Total Switches (14x48t+ 2x24t,1x8t)	17
Wing 3	X440-G2-48t, x440-8t	2x X440-G2-48t		
Wing 4	X440-G2-48t.x440-24t	2x X440-G2-48t		

Hostel 3 Network Topology



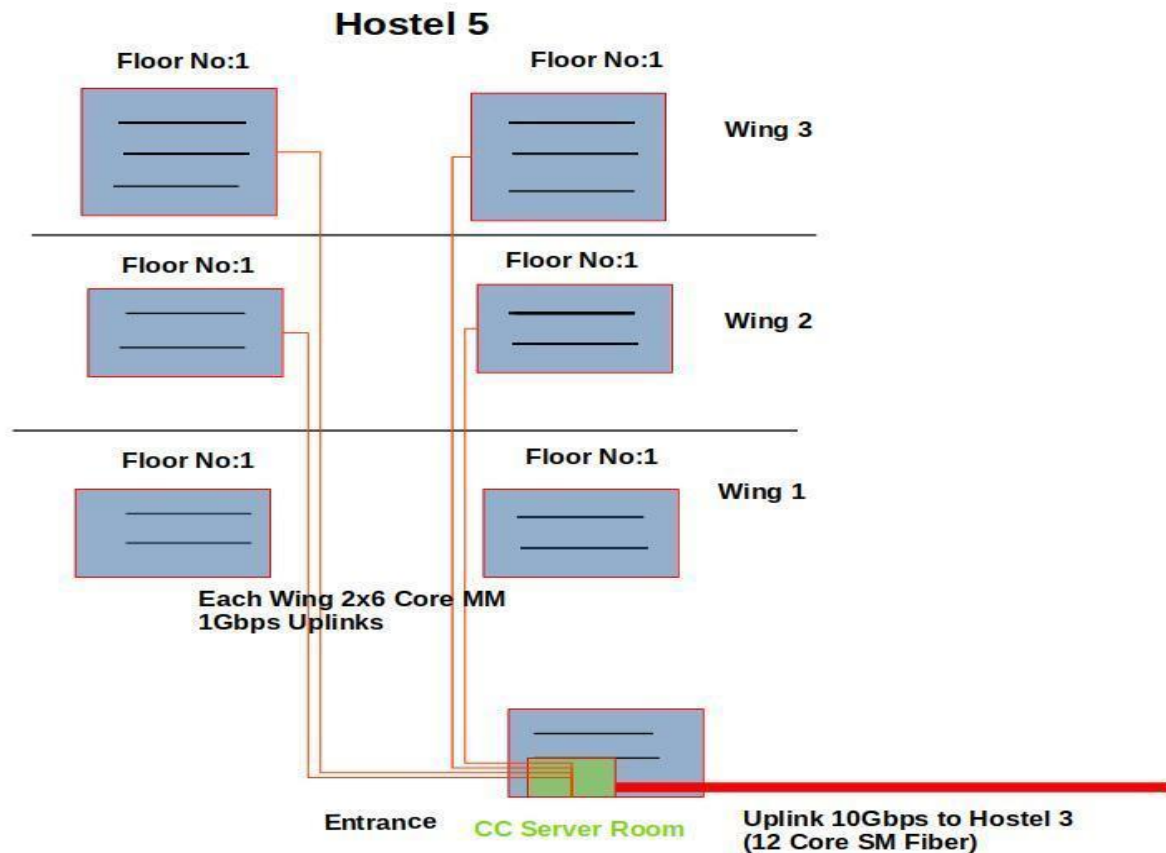
		Left	Right		
Computer Room	Comp Room 2960S-24t			Total Rooms	281
Wing 1	1x X440-G2-48t 2x 2960S-48t			N/W IO ports (96 WiFi)	658
Wing2	2x 2960S-48t	X440-G2-48t, 2960S-24t		Total Switches (15x48t+ 1x24t,)	16
Wing 3	2x 2960S-48t	2x 2960S-48t			
Wing 4	X440-G2-48t 2960S-48t	2x 2960S-48t			

Hostel 4 Network Topology



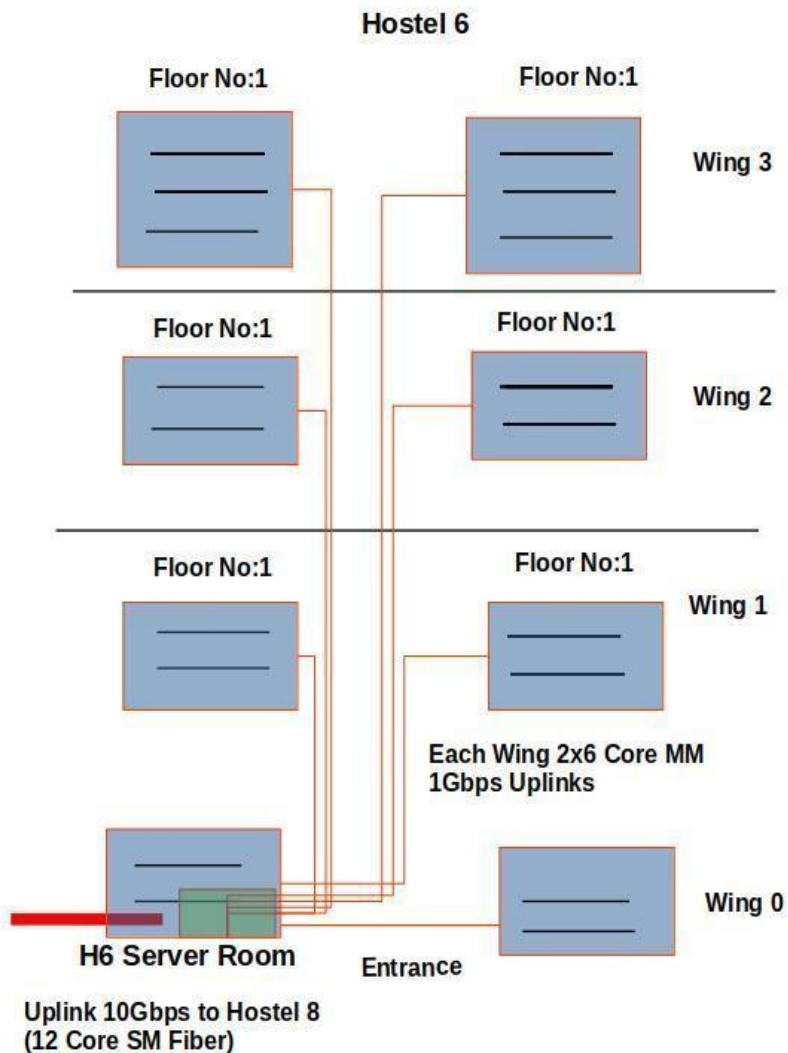
	Left	Right		
Computer Room	Comp Room 2960S-24t		Total Rooms Old Configuration	281
Wing 1	2x 2960S-48t	2x 2960S-48t	N/W IO ports (72 WiFi)	640
Wing 2	2960S-48t, x440-48t	2x 2960S-48t, 2960S-24t	Total Switches (16x48t+ 4x24t,)	20
Wing 3	2x 2960S-48t	2x 2960S-48t, 2960S-24t	Total Rooms New Configuration	100
Wing 4	2x 2960S-48t, 2960S-24t	2960S-48t, 2960S- 24t, x440-48t	N/W IO Ports (40 WiFi)	240

Hostel 5 Network Topology

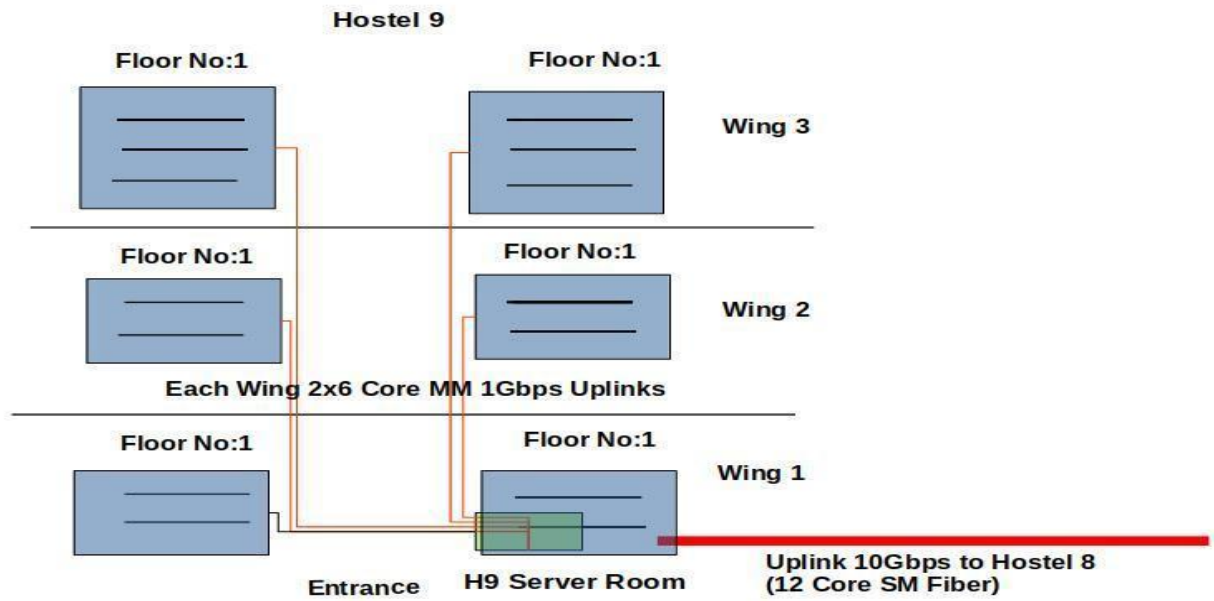


	Left	Right		
Computer Room	Comp Room 2960S-24t		Total Rooms	281
Wing 1	2x 2960S-48t	2x 2960S-48t	N/W IO ports (77 WiFi)	658
Wing2	2960S-48t, x440-48t	2x 2960S-48t, 2960S-24t	Total Switches (16x48t+ 4x24t,)	20
Wing 3	2x 2960S-48t	2x 2960S-48t, 2960S-24t		

Hostel 6 Network Topology

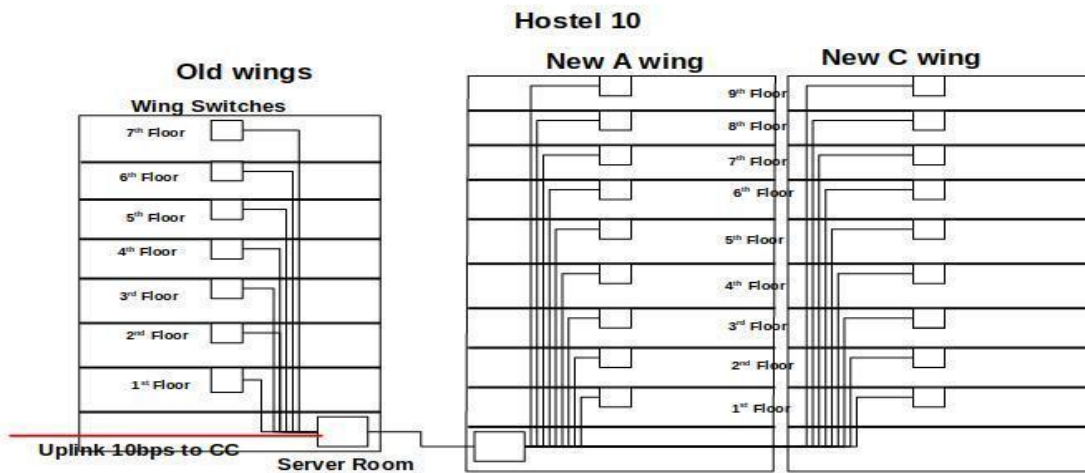


	Left	Right		
Computer Room	Comp Room 2960S-24t		Total Rooms	292
Wing 0	2960S-48t, 2960S-24t		NW IO ports (89 WiFi)	680
Wing 1	2x 2960S-48t	2x 2960S-48t, 2960S-24t	Total Switches (12x48t+ 6x24t,)	18
Wing2	2960S-48t, 2960S-24t	2x 2960S-48t, 2960S-24t		
Wing 3	2x 2960S-48t	2x 2960S-48t, 2960S-24t		



	Left	Right		
Computer Room	Comp Room Cisco-Linksys-24t		Total Rooms	282
Wing 1	2x 2960S-48t, 2960S-24t	2960S-48t X440-48t	N/W IO ports (77 WiFi)	660
Wing2	2x2960S-48t,	3x 2960S-48t,	Total Switches (13x48t+ 2x24t,)	15
Wing 3	2x 2960S-48t	2x 2960S-48t,		

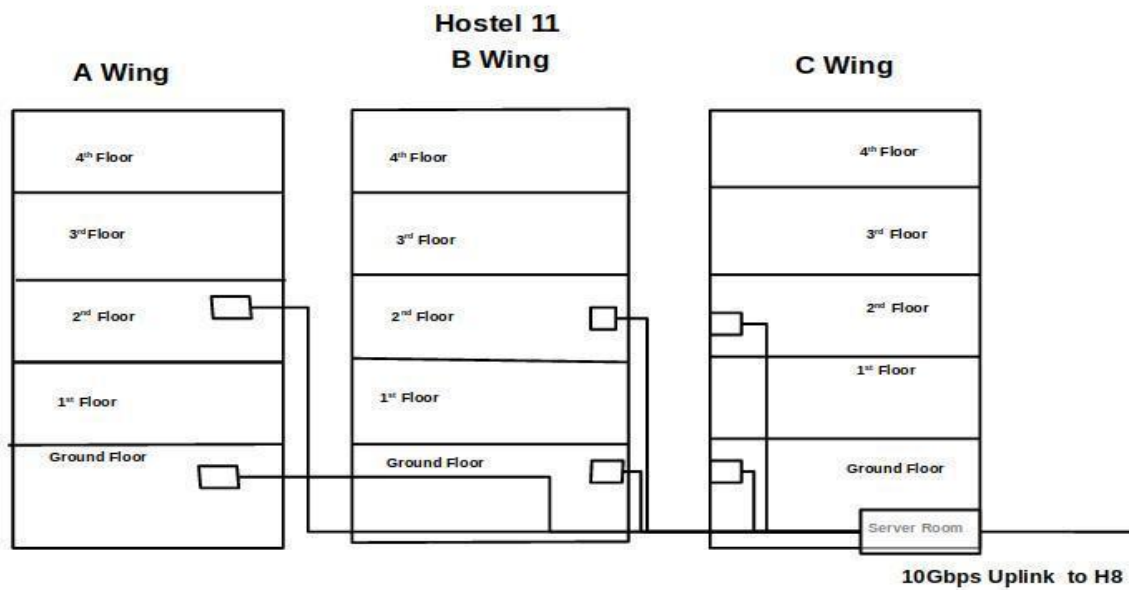
Hostel 10 Network Topology



Floors	Old Hostel 10	New Hostel 10 A Wing	New Hostel 10 C Wing
1 st Floor	Cisco 2960S-48t	Extreme X440-24P	Extreme X440-24P
2 nd Floor	2960S-48t	X440-24P	X440-24P
3 rd Floor	2960S-48t	X440-24P	X440-24P
4 th floor	2960S-48t	X440-24P	X440-24P
5 th Floor	Dlink-48t	X440-24P	X440-24P
6 th Floor	2960S-48t	X440-24P	X440-24P
7 th Floor	2960S-48t	X440-24P	X440-24P
8 th Floor		X440-24P	X440-24P
9 th Floor		X440-24P	X440-24P

	Old H10	New H10
Total Rooms	225	738
N/W IO ports (WiFi)	47	250
Total Switches (13x48t+ 2x24t)	7x48t	18x24P

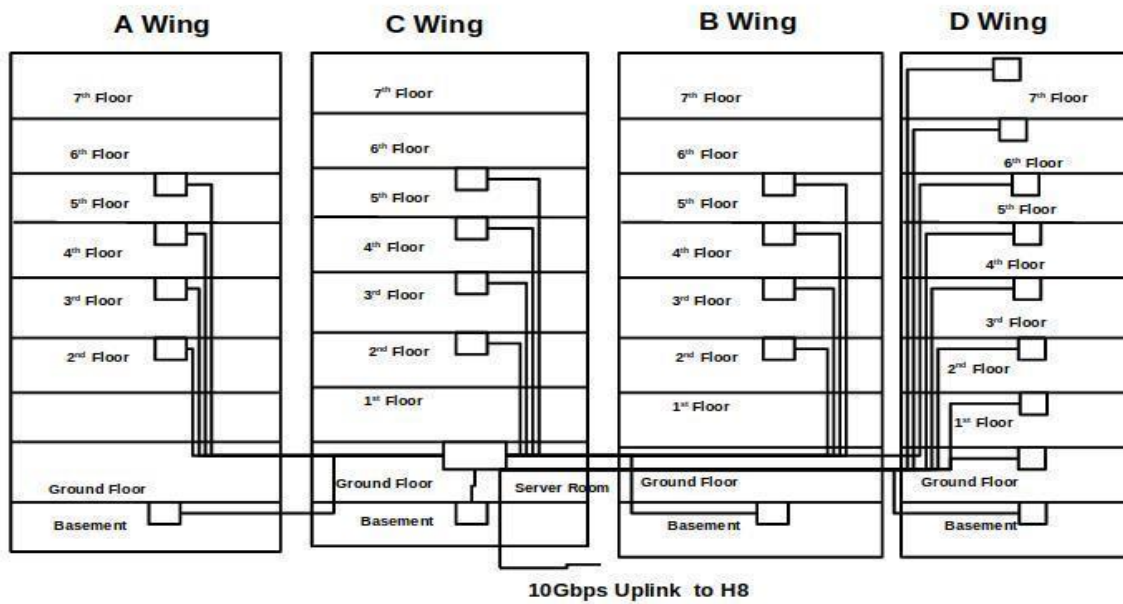
Hostel 11 Network Topology



Floors	Wing A	B Wing	C Wing		A Wing	B Wing	C wing
Computer Room	2960S-24t			Total Rooms 265	105	63	66
Ground Floor	X440-48t X440-48t 2960S-48t	2960S-48t, 2960S-48t, 2960S-48t X440-48t	2960S-48t 2960S-48t	N/W IO ports (WiFi 69) proposed	23	23	23
2 nd Floor	X440-48t Dlink-48t 2960S-48t	2960S-48t 2960S-48t	2960S-48t 2960S-48t	Total Switches (16x48t)	6x48t	6x48t	4x48t
				1x24t PoE proposed	1X48t PoE	1X48t PoE	1X48t PoE

Hostel 12 Network Topology

Hostel 12

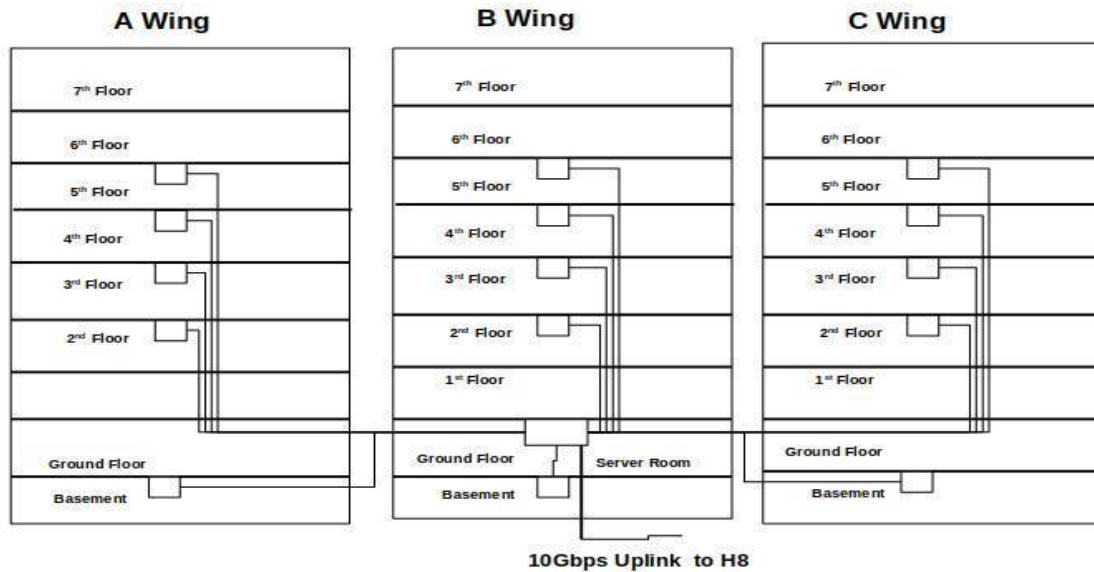


Floors	Wing A	B Wing	C Wing	D Wing
Basement	X440-48t	2960S-48t	2960S-48t	2960S-48t
2 nd Floor	2960S-48t	2960S-48t	2960S-48t	2960S-48t
3 rd Floor	2960S-48t	2960S-48t	2960S-48t	Dlink-48t
4 th floor	2960S-48t	2960S-48t	2960S-48t	2960S-48t
5 th floor	2960S-48t	2960S-48t	2960S-48t	2960S-48t
Ground Floor	2960S-48t	2960S-48t	2960S-48t	2960S-48
1 st Floor				2960S-48
6 th Floor				2960S-48
7 th floor				2960S-48

	A Wing	B Wing	C wing	D wing
Total Rooms	195	192	192	192
N/W IO ports (WiFi 233) proposed	62	57	57	57
Total Switches (15x48t)	6x48t	6x48t	6x48t	9x48t

Hostel 13 Network Topology

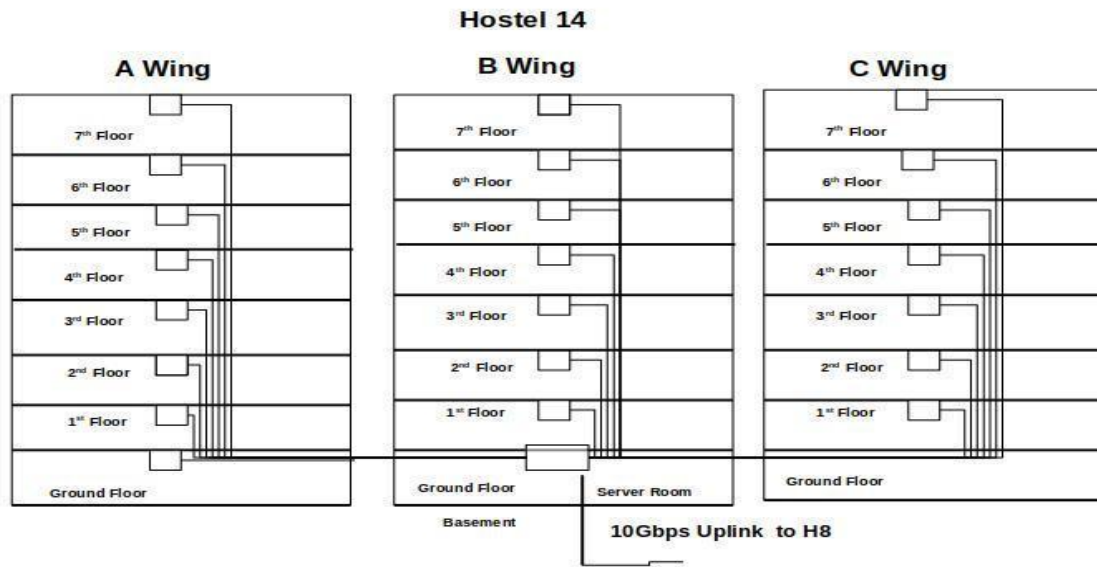
Hostel 13



Floors	Wing A	B Wing	C Wing
Basement	X440-48t	2960S-48t	2960S-48t
2 nd Floor	2960S-48t	2960S-48t	2960S-48t
3 rd Floorx	2960S-48t	2960S-48t	2960S-48t
4 th floor	2960S-48t	2960S-48t	2960S-48t
5 th Floor	2960S-48t	2960S-48t	2960S-48t

	A Wing	B Wing	C wing
Total Rooms	223	220	220
N/W IO ports (WiFi 176)	62	62	62
Total Switches (15x48t)	5x48t	5x48t	5x48t

Hostel 14 Network Topology



Floors	Wing A	B Wing	C Wing		A Wing	B Wing	C wing
Grd floor	2960S-48t	2960S-48t	Dlink-48t	Total Rooms	223	220	220
1 st Floor	2960S-48t	2960S-48t	2960S-48t	N/W IO ports (WiFi 176)	62	57	57
2 nd Floor	2960S-48t	2960S-48t	2960S-48t	Total Switches (24x48t)	8x48t	8x48t	8x48t
3 rd Floor	2960S-48t	2960S-48t	X440-48t				
4 th Floor	X440-48t	X440-G2-48t	X440-48t				
5 th Floor	2960S-48t	X440-48t	2960S-48t				
6 th Floor	2960S-48t	2960S-48t	2960S-48t				
7 th Floor	Dlink-48t	2960S-48t	2960S-48t				