Department of Mechanical Engineering

Indian Institute of Science

Bangalore 560012

NOTICE INVITING OPEN TENDER

for

Upgradation of Networking Infrastructure at Mechanical Engineering
Department, Indian Institute of Science, Bangalore

Tender No: IISc/ME/2022/INF-NTW/290922-Rev-2.0

Revision Date- 20/10/2022

(Changes are highlighted)

Chair

Department of Mechanical Engineering

Indian Institute of Science

Bangalore 560012

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INDIAN INSTITUTE OF SCIENCE, BANGALORE

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Upgradation of Networking Infrastructure at Mechanical Engineering Department, Indian Institute of Science, Bangalore

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Annexures

1. Schedule of Events

Table 1 Schedule of Events

Release of Tender	September 29th, 2022
Site survey for Prospective Bidders[1,2]	October 3rd -4th, 2022
Deadline for submission of queries (for Prebid clarification)	October 8th, 2022, 05.00 pm IST
Prebid clarification Meeting[2]	October 10th, 2022, 03.00 pm IST
Deadline for submission of bid	October 31st, 2022, 05.00 pm IST
Opening of Technical bid	November 2nd, 2022
Listing of technically qualified bidders	November 3rd, 2022 (Tentative)
Opening of price bids	November 4th, 2022 (Tentative)

1 Interested bidders are requested to coordinate with Dr. Alok Behera (alokbehera@iisc.ac.in) to arrange the site survey. Please cc chair.me@iisc.ac.in in all correspondences with regard to the tender

2 Query for pre-bid clarification may be sent to chair.me@iisc.ac.in

3 This meeting will be online on MS Teams. Vendors who wish to participate in this meeting may request the email address, upon which they will be sent a meeting link. No queries will be entertained after the pre-bid meeting

4 The Opening of the Technical and Price bids in-person and physical meeting will be arranged at the Conference Room of the Mechanical Engineering Department at IISc, Bangalore

5 Bidders are requested to submit the closed envelope tender document at Mechanical Engineering Office on/before the deadline and collect the acknowledgment slip

6 The concerned must sign and seal each page of the submitted bid document.

7 The signed copy of compliance and cross reference should be submitted on OEM's letterhead

8 All the proposed hardware and software licenses should be perpetual. It should continue to work even after support/warranty expiry

Note: 1) No request for the extension of any timelines mentioned in the table above will be entertained

2) Bidder on whom the order would be placed will have to execute the order and invoice the order before 1st March 2023

3) IISc reserves the right to disqualify any bidder or agency due to lack of technical/nontechnical compliance at its discretion. This decision will be final, and no queries in this regard will be entertained

2. Introduction

The Mechanical Engineering Department at IISc campus at Yeshwanthpur is spread across six buildings and accommodates nearly 1000 users comprising faculty, staff, and students. The department is planning a comprehensive upgradation of its aging network infrastructure to the state-of-the art CAT-6/6A enabled network hardware with Wi-Fi-6 enable access points to provide hi-speed LAN/Wi-fi connectivity across all labs, office spaces, conference room, auditoriums, common lobbies within the department. The upgradation is expected to ensure Hi-speed and uninterrupted network connectivity from all the department users to the main campus network.

The scope of the work includes Supply, installation, and commissioning of Access Points & switches along with installing 10 gig Fiber from campus hub (SERC) to Mechanical Engineering (ME Department), Installation of indoor wires & LAN ports (electrical & network), Installation of UPS in necessary places, and design of proposed server room, installation of Network Management Systems (NMS), comprehensive warranty, and two years of post-warranty AMC, etc.

Interested bidders are invited to submit proposals for the supply, installation, and commissioning of Network Switches, NMS, and passive components/work for the LAN infrastructure to upgrade the department's network connectivity.

2.1 Scope of Work

The Institute invites proposals in a two-cover format from bidders who have the capability to provide a **TOTAL TURNKEY** solution which includes

- (a) Supply,
- (b) Transportation to the site
- (c) Transit insurance
- (d) Installation, including necessary cabling, testing, commissioning, and documentation
- (e) Integration with the existing environment
- (f) Three years of comprehensive warranty, and two years of post-warranty AMC.

The detailed technical scope of work and the technical specifications are mentioned in the subsequent sections. The bidders must ensure that the resources (personnel) allocated for each of the above tasks are competent and capable of meeting all the technical requirements to ensure that the broad objective of delivery of services as per expectations is fully met.

A broad overview of the network topology proposed for the network upgrade is shown in Fig. 1. The network topology at the Mechanical Engineering building shown in the above figure employs the following architecture.

- The topology involves redundant fibre-optic connections between the distribution (Layer-3) switches (DS1 & DS2) and the access (Layer-2) switches in the racks.
- There are 7 different racks in different locations.
- All switches (except the distribution switches) within a single rack are required to be inter-stackable/interconnectable via stacking/inter connection cables.
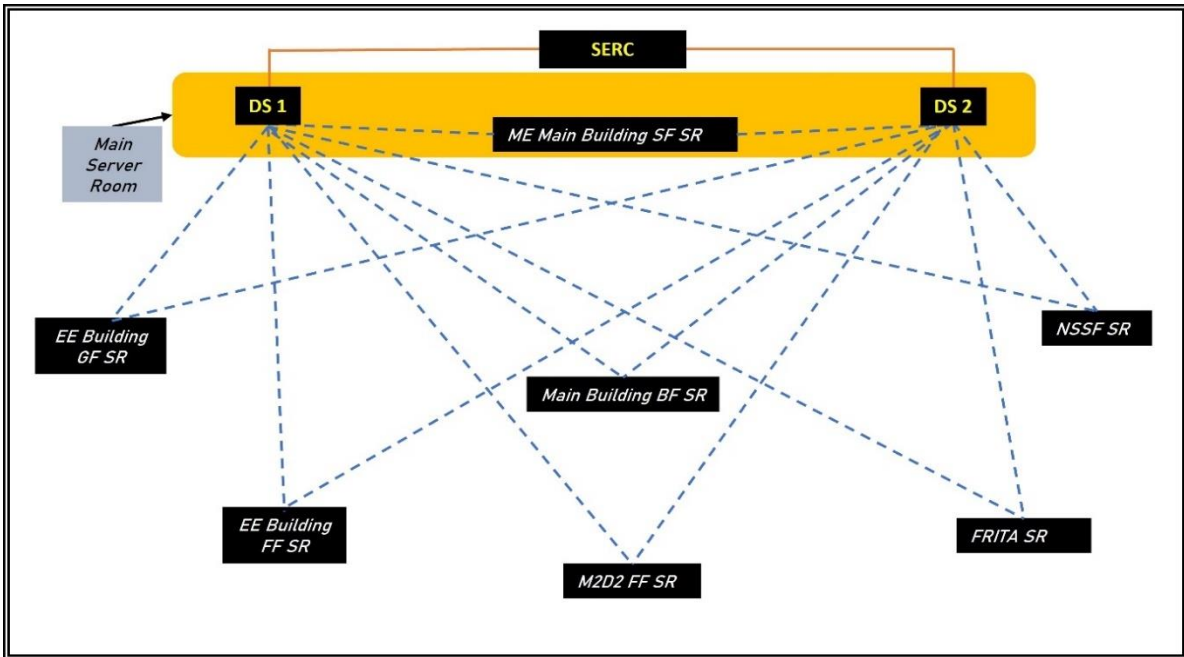
Fig. 1 ME Logical Topology

- All requisite licenses for achieving all the features mentioned in this document must be perpetual and must be included from the day of commissioning.
- The distribution switches must be configurable to create groups for each VLAN to act as a virtual logical gateway (default gateway) for all the hosts within the VLAN for redundancy. The switches must support at least 150 active groups. All licenses and hardware required for achieving the abovementioned feature must be included from day one.
- Switches must be rack mountable in a standard 19-inch network rack. All accessories required for mounting must be included in the quote.
- All quoted switches must contain at least two hot-swappable redundant power supplies and include IEC type D/M (3 round pin) power cords for all power supplies.
- All the quoted switches must support the following
  o IEEE 802.1Q VLAN tagging
  o 802.1Q VLAN on all ports with support for minimum 4000 VLANs.
  o Spanning Tree Protocol as per IEEE 802.1d
  o Multiple Spanning-Tree Protocol as per IEEE 802.1s
  o Rapid Spanning-Tree Protocol as per IEEE 802.1w
  o Self-learning of unicast & multicast MAC addresses and associated VLANs
  o Link Aggregation Control Protocol (LACP) as per IEEE 802.3ad.
  o "Port Mirroring" functionality for measurements using a network analyzer
  o Minimum 64 multiple Spanning-tree instances.
  o RoHS Compliance
  o IEEE 802.1x support
  o IPV6 and IPV6 & IPV4 dual stack

The Schedule of Requirements for active components, passive components, civil works, and Installation & Servicing are given in Section 3. Additional technical specifications of the distribution L3 switches, L2 switches, Passive component, Civil works, and Installation & Services are given in Sections 4 and 5

3. Schedule of requirements

The Bidder is expected to quote for the following items. Each item must be from the same OEM.

3.1 Active Components

Table 2 List of Active Components

S/No	Item Description	Total
1	Wi-Fi Access Point support IEEE 802.11a/n/ac/ax on 5Ghz band and IEEE 802.11b/g/n/ax on 2.4Ghz band with at least 8x8:8 5Ghz radio and at least 4x4 2.4Ghz radio. Must have at least one 5Gbps Ethernet interfaces. Must be Controller based locally hosted with H.A. Must be Wi-Fi CERTIFIED 6™. Must support POE+ on 802.3at/bt	5
2	Wi-Fi Access Point support IEEE 802.11a/n/ac/ax on 5Ghz band and IEEE 802.11b/g/n/ax on 2.4Ghz band with at least 2X2 MU-MIMO spatial streams on 5GHz radio and 4X4 MU-MIMO spatial streams on 2.4GHz radio. Must have at least one 2.5Gbps Ethernet interface. Must be Controller based locally hosted with H.A. Must be Wi-Fi CERTIFIED 6™. Must support POE+ on 802.3at/bt	75
3	16 SFP+ ports layer-3 manageable 1G/10G switch with dual power supply (DS 1 & 2)	2
4	Single Mode 1310nm SFP+ transceiver (10GBASE-LR)	35
5	Wireless Controller	2
6	NMS with hardware	1
7	Stacking cable or SFP+ Twinax cable 2 meters	30
8	Stacking cable or SFP+ Twinax cable 5 meters	10
And*		
9	48 UTP port non-POE switch with 4 SFP+ port layer 2, 10/100/1000 Mbps manageable switch with stacking capability and dual power supply	16
10	48 UTP 10/100/1000 Mbps and at least 8 ports of Mgig (1/2.5/5 Gbps) ports, all 8 ports must concurrently support (1/2.5/5 Gbps), and the switch should have at least 4 SFP+ port layer-2, manageable switch having at least 740 W power budget for POE (Support POE+ on all ports concurrently) with redundant power supply	14
Or*		
11	48 UTP port non-POE switch with 4 SFP+ port layer 2, 10/100/1000 Mbps manageable switch with stacking capability and dual power supply	20

12	48 UTP 10/100/1000 Mbps and at least ports of Mgig (1/2.5/5 Gbps) ports, all 12 ports must concurrently support (1/2.5/5 Gbps), and the switch should have at least 4 SFP+ port layer-2, manageable switch having at least 740 W power budget for POE (Support POE+ on all ports concurrently) with redundant power supply	10
	Optional**	
13	Backplane stacking module	30

*The bidder should provide either line items 9 and 10 or 11 and 12.
**Line item 13 is optional and will not be considered for L1 bidder selection.

The technical specifications of these items are detailed in **Section 4**. The Technical Bid should list the make and model of each item, including the various types of L2 switches that satisfy the requirements as separate line items and their quantities. Technical documentation about each distinct item must be included along with the technical bid.

3.2 Passive Components

Table 3 List of Passive Components

S/No	Item Description	Total	Units
1	48-Core Single Mode (9/125µm) armoured outdoor Optical Fibre Cable in meters	2000	Meters
2	6-Core Single Mode (9/125µm) armoured outdoor Optical Fibre Cable in meters	1000	Meters
3	CAT 6A UTP cable in meters	5000	Meters
4	CAT 6 UTP cable in meters	43000	Meters
5	Unloaded 24 port 1U CAT 6A UTP Jack Panel	7	Nos
6	Unloaded CAT 6 UTP Jack Panel	51	Nos
7	CAT 6A Information Outlet compatible with jack panel mentioned above	90	Nos
8	CAT 6 Information Outlet compatible with jack panel mentioned above	1100	Nos
9	CAT 6A RJ45 connector	90	Nos
10	CAT 6 Information Outlet, Face plate and Back box	1100	Nos
11	48 Fibre core LIU with LC connector, mountable in 19" network rack	2	Nos
12	24 Fibre core LIU with LC connector, mountable in 19" network rack	6	Nos
13	12 Fibre core LIU with LC connector, mountable in 19" network rack	2	Nos

14	6 Fibre core LIU with LC connector, mountable in 19" network rack	3	Nos
15	Cable manager mountable in 19" Network Rack	85	Nos
16	CAT 6A UTP Patch Cord 2 meter	90	Nos
17	CAT 6 UTP Patch Cord 2 meter	1100	Nos
18	CAT 6 UTP Patch Cord 5 meter	1100	Nos
19	CAT 6 UTP Patch Cord 1 meter	1100	Nos
20	Single Mode pigtail with LC connector	250	Nos
21	LC-LC single mode duplex patch cord 2 meter	36	Nos
22	42 U Network rack with integrated cooling and Power Backup with 6 kVA UPS compatible with the network switch supplied.	2	Nos
23	19-inch, 1000 mm depth, 32U Floor Standing Network rack with 8 socket power-strip	3	Nos
24	19-inch, 650 mm depth, 12U Floor Standing Network rack with 8 socket power-strip	3	Nos
25	The UV-treated PVC casing and capping 40 x 40 mm in meters with necessary accessories	17000	Meters
26	Metal raceways (6" Perforated and hot deep galvanized)	4200	Meters
27	UV-treated PVC conduit of diameter of 32mm in meters with necessary accessories	500	Meters
28	1.5-inch HDPE pipe with of PE-63 or higher in meters	1000	Meters
29	Rack Mountable UPS 10 KVA, 3φ online UPS with SMF Batteries providing at least 1 hour backup for a load of 8KW with battery stand and other necessary accessories including input and output circuits	2	Nos
30	Rack Mountable UPS 6 KVA, 1φ online UPS with SMF Batteries providing at least 1 hour backup for a load of 4KW with battery stand and other necessary accessories, including input and output circuits	3	Nos
31	5/15 AMPS round pin power socket with switch and back box	16	Nos
32	3-core, 1.5 sq. mm wire, shielded copper electrical cable in meters	300	Meters
33	Configuration and Installation/mounting on ceiling/wall or angle bracket of Access points with radium reflective labelling	75	Nos
34	Configuration and Installation of Network Switches in network rack with radium reflective labelling	30	Nos

3.3 Civil Work

Table 4 List of Civil Work

1	Excavation of soil (depth 3 feet, width 1 feet) and resurfacing for burial of HDPE Pipe per running meter	500	Meters
2	Excavation of soil and construction of 3x3x3 ft brick chamber with RCC lid for pulling outdoor OFC	5	Nos
3	Horizontal Directional Drilling (HDD) for crossing roads in meters	30	Meters
4	Moiling for crossing roads in meters	30	Meters
5	Installation of UTP cables through PVC casing and capping in meters	48000	Meters
6	Installation of OFC through PVC conduit indoors meters	500	Meters
7	Installation of indoor electrical cables through PVC conduit in meters	300	Meters
8	Installation of PVC conduit in meters	21700	Meters
9	RCC core cutting of 3-inch diameter for inter-floor wiring	10	Nos
10	Installation of HDPE pipe underground (3 feet from solid surface) in meters	1000	Meters
11	Installation of outdoor OFC through HDPE pipe in meters	1000	Meters

3.4 Installation and Services

Table 5 List of Installation and Services

1	Installation, termination, and labelling of UTP cables on Jack Panel	51	Nos
2	Termination and labelling of UTP cables on Information Outlet with Face plate and back box	1190	Nos
3	Installation and labelling of LIU	13	Nos
4	Fusion splicing of pigtails with OFC inside LIU	490	Nos
5	Installation of power socket	16	Nos
6	Installation of all network racks with cable dressing and labelling on patch cord	7	Nos
7	Installation of 10KVA UPS and batteries with proper earthing and MCB	2	Nos
8	Installation of 6 KVA UPS and batteries with proper earthing and MCB	3	Nos
9	Documentation of the entire project, as mentioned in the RFP	1	Nos
10	Testing and generating reports as mentioned in RFP	1	Nos
11	AMC charges for additional 2 years post 3 years warranty	1	Nos

The technical specifications of these passive items are detailed in **Section 5**.

The Technical Bid should list the make and model of each item that satisfy the requirements (see **Section 4 and 5**) as separate line items and their quantities. Technical documentation about each item must be included during tendering.

4. Technical Specification for Active Components

4.1 Access Point- Type 1

i. Must have at least one 5 Gbps Ethernet interface.

ii. Must be Controller based and must be locally hosted.

    a. The data plane and Controller plane must be separate. That is, even if the controller is down or out of network, the Access Points must continue to function normally.

    b. High Availability of Controller must be ensured with easy Disaster Recovery possible.

    c. Data transfer between Access Point and Controller must be encrypted.

iii. The solution must be scalable to support up to at least 150 Access points

iv. The Access points must be Wi-Fi CERTIFIED 6™.

v. Must support IEEE 802.11a/n/ac/ax on 5Ghz band and IEEE 802.11b/g/n/ax on 2.4Ghz band.

vi. Access Points must work with all features supported on PoE+.

vii. Access Point shall support tri radio operation with 4x4 MIMO on all three radio interfaces and MU-MIMO technology with option to combine the 2 radio to operate on 8x8 operation.

viii. Access Point shall be able to support Multigigabit Ethernet, support up to 5 Gbps PHY speed using single Cat5e or above (Cat6, Cat6a, Cat7) cable

ix. Access Point should have Bluetooth5 radio to support use cases of location, asset tracking and analytics.

x. Access Point shall be able to power up using 802.3at power with full radio operation of 12 Spatial streams and transmit power upto 22dBm.

xi. Access Point shall support Dual 5GHz radios

xii. Access Point shall have a dedicated radio/chipset 1x1/2x2 for spectrum monitoring capabilities, WIPS, and off-channel RRM without compromising and using the client-serving radios.

xiii. Access Point shall support hardware driven beamforming

xiv. Access Point should have 1x 5gig Multigigabit Ethernet (RJ-45) – IEEE 802.3bz

xv. Access Point should have USB port for future requirement.

xvi. Must have at least 3 dBi Antenna gain on each radio

xvii. Must Support data rate up to 5 gbps.

xviii. Must support minimum of 23 dbm of transmit power in both 2.4Ghz and 5 Ghz radios. And should follow the local regulatory Norms.

xix. Must support AP enforced load-balance between 2.4 Ghz and 5 Ghz band.

xx. Must incorporate radio resource management for power, channel, and performance optimization

xxi. Must have -97 dB or better Receiver Sensitivity.

xxii. Must support Proactive Key Caching and/or other methods for Fast Secure Roaming.

xxiii. Must support Management Frame Protection.

xxiv. Should support locally significant certificates on the APs using a Public Key Infrastructure (PKI).

xxv. Access Points must support Hardware-based encrypted user data and management traffic between controller and Access point for better security.

xxvi. Must support the ability to serve clients and monitor the RF environment concurrently.

xxvii. Same model AP that serves clients must be able to be dedicated to monitoring the RF environment.

xxviii. Must be plenum-rated (UL2043).

xxix. Must support 12 WLANs per AP for SSID deployment flexibility.

xxx. Access Point Must continue serving clients when link to controller is down. It should also have option to authenticate user through Radius server directly from Access Point during link unavailability to controller.

xxxi. Must support telnet and/or SSH login to APs directly for troubleshooting flexibility.

xxxii. Must support QoS and Video Call Admission Control capabilities.

xxxiii. Access point should be Wi-Fi 6 certified

4.2 Access Points – Type 2

i. Must have at least one 2.5Gbps Ethernet interface.

ii. Must be Controller based and must be locally hosted.

a. The data plane and Controller plane must be separate. That is, even if the controller is down or out of network, the Access Points must continue to function normally.

b. High Availability of Controller must be ensured with easy Disaster Recovery possible.

c. Data transfer between Access Point and Controller must be encrypted.

iii. The solution must be scalable to support up to at least 150 Access points

iv. The Access points must be Wi-Fi CERTIFIED 6™.

v. Must support IEEE 802.11a/n/ac/ax on 5Ghz band and IEEE 802.11b/g/n/ax on 2.4Ghz band.

vi. Apart from DC power, the Wi-Fi Access Points must work with all features supported on PoE+.

vii. The Access Point must have at least 2X2 MU-MIMO spatial streams 2.4GHz radio and 4X4 MU-MIMO spatial streams on 5 GHz radio

viii. The Access Point must support POE+ on 802.3at/bt.

ix. Must support WPA2 and WPA3 Enterprise.

x. Must support two-way band steering (example from 2.4GHz band to 5GHz and from 5 GHz to 2.4 GHz).

xi. Must support auto channel allocation to avoid interference between APs.

xii. Must support auto transmission power selection based on neighbor count and loudness for both bands.

xiii. Must support manual transmission power selection per Access Point on a granularity scale of 1 dBm.

xiv. The Wi-Fi radio transmission parameters must comply with the Indian transmission regulations.

xv. The Wi-Fi radio must have a transmit power of 23 dBm (without considering antenna gain) or higher for both 2.4Ghz and 5Ghz.

xvi. Must support both Bridge and NAT modes.

xvii. Must support configurable management VLAN (support other than VLAN-1 as management VLAN).

xviii. Must be ceiling mountable with all necessary accessories for ceiling mounting included.

xix. The Controller and Access Point device should support dual stack for IPV4 and IPV6.

xx. The Access Points must simultaneously broadcast at least 6 SSIDs as visible network to client.

xxi. The solution should detect and identify all types of Wi-Fi enabled client devices.

xxii. Both the controller and Wi-Fi device should support SNMP v2c, v3.

xxiii. The solution should support RADIUS, Active Directory and LDAP based authentication.

xxiv. The proposed Controller and Access Points must be of reliable and reputed brand only.

xxv. The solution should be able to work in a heterogenous environment by not hindering the operation of existing APs of different makes already deployed at IISc.

xxvi. The solution should maintain logs which includes all activities performed by the users like login, any configuration changes made on the system, device deletion, device authorization, log out etc., for at least 365 days.

xxvii. The solution should support uploading of all logs to external Syslog Server in LAN/WAN on real-time and scheduled basis.

xxviii. The solution should block traffic based on IP address, port, URL, hostname etc. and QoS (for example: bandwidth restriction for the SSID, QoS tagging of special traffic like Voice) at the edge (AP).

xxix. The solution must allow VLAN segmentation at the edge.

xxx. The solution must support Advanced Encryption Standards (AES), Temporal Key Integrity Protocol (TKIP).

xxxi. The solution must have the capability of auto classifying Wi-Fi clients as authorized (managed clients connecting to IISc, Bangalore network), guest, rogue (un-managed client attempting connection to IISc, Bangalore network) or external (unmanaged not connecting to IISc, Bangalore network e.g., neighbor), in addition to manual classification.

xxxii. Access Point shall have dedicated radio/chipset for spectrum monitoring capabilities, WIPS and off channel RRM without compromising and using the client serving radios.

xxxiii. Access Point should have 1x 100, 1000, 2500 Multigigabit Ethernet (RJ-45) – IEEE 802.3bz

4.2.1 Necessary licenses, warranty, and support for all access points

i. The quote should include all required Hardware and Software licenses to support all the Access Points and Controllers. The solution should include these licenses from the first day of the installation. There should not be any additional licenses required for DR.

ii. All the AP features should be active post-expiration of the subscription/license validity. All the features and signatures available at the time of expiration of the license should continue to work. Renewal of licenses should be required only for new features, Visibility, configuration changes, and updates/releases announced by the OEM after the contract expires. The vendor must propose a perpetual license.

iii. The total solution should have 5 years' on-site warranty for Access Points and controller.

iv. The total solution should include technical support for software/firmware and software upgrades for controller and Access Points for 5 years.

v. TAC support must be from OEM not Bidder during the whole 5 years.

vi. The total solution should be upgradable to the latest stable firmware version, as and when available, at no extra cost.

vii. Warranty support should include NBD hrs. response time and provision of replacement along with appropriate configuration and installation in next business day for Hardware.

4.2.2 Possible access points models:

A. Indoor for Labs and general locations:

- Must have at least one 2.5 Gbps Ethernet interface.
- Must have at least 4x4:4 on 5Ghz and 2.4Ghz radio
- Must support DL-MU-MIMO and UL-MU-MIMO
- Must support DL-MU-OFDMA and UL-MU-OFDMA

B. Indoor auditorium and big classrooms:

- Must have at least one 5Gbps Ethernet interfaces.

- Must have at least 8x8:8 5Ghz radio and at least 4x4 2.4Ghz radio

- Must support DL-MU-MIMO and UL-MU-MIMO

- Must support DL-MU-OFDMA and UL-MU-OFDMA

4.3   48 Port Non-PoE

4.3.1 Specification

i.   Switch should be 1U and rack mountable in standard 19" rack.

ii. Switch should support internal field replaceable unit redundant power supply from day of commissioning.

iii. Switch should have minimum 2 GB RAM and 2 GB Flash.

iv. Stacking/interconnection with ring-based topology to have minimum 48Gbps throughput or 20Gbps for Direct interconnects. All necessary interconnectors and cables must be supplied along with the switches up to a pod of 4 Switches.

4.3.2 Performance

i.   Switch shall have minimum 150 Gbps of switching fabric and 100 Mpps of forwarding rate with non-blocking architecture

ii. Switch shall have minimum 10K MAC Addresses and 250 active VLAN.

iii. Should support minimum 10K IPv4 routes or more

iv. Switch shall have 1K or more multicast routes.

v.   Switch should support atleast 15K flow entries.

vi. Switch should support 128 or more STP Instances.

vii. Switch should have 4 MB or more packet buffer.

4.3.3 Functionality

i.   Switch should support IEEE Standards of Ethernet: IEEE 802.1D, 802.1s, 802.1w, 802.1x, 802.3ad, 802.3x, 802.1p, 802.1Q, 802.3, 802.3u, 802.3ab, 802.3z.

ii. Switch must have functionality like static routing, RIP, REP PIM, OSPF, VRRP, PBR and QoS features from Day1.

iii. Switch should support network segmentation that overcomes the limitation of VLANs using VXLAN and VRFs.

iv. Switch shall have 802.1p class of service, marking, classification, policing and shaping and eight egress queues.

v.   Switch should support management features like SSHv2, SNMPv2c, SNMPv3, NTP, RADIUS and TACACS+.

vi. Switch should support RFC 2460 Internet Protocol, Version 6 (IPv6) Specification RFC 2461 Neighbour Discovery for IP Version 6 (IPv6), RFC 2462 IPv6 Stateless Address Auto-configuration and RFC 2463 Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification

vii. Switch should support 802.1x authentication and accounting, IPv4 and IPv6 ACLs and Dynamic VLAN assignment.

viii. Switch must have the capabilities to enable automatic configuration of switch ports as devices connect to the switch for the device type.

ix. During system boots, the system's software signatures should be checked for integrity. System should be capable to understand that system OS are authentic and unmodified, it should have cryptographically signed images to provide assurance that the firmware & BIOS are authentic.

4.3.4 Interface

i. Switch shall have 48 nos. 10/100/1000 Base-T ports and 4 nos of SFP+ port.

4.3.5 Certification

i. Switch shall conform to UL 60950 or IEC 60950 or CSA 60950 or EN 60950 Standards for Safety requirements of Information Technology Equipment.

ii. Switch shall conform to EN 55022 Class A/B or CISPR22 Class A/B or CE Class A/B or FCC Class A/B Standards for EMC (Electro Magnetic Compatibility) requirements.

iii. Switch / Switch's Operating System should be tested for EAL 2/NDPP or above under Common Criteria Certification.

4.4   48 Port Mgig switch

4.4.1 Specification

i. Switch should be 1U and rack mountable in standard 19" rack.

ii. Switch should support internal field replaceable unit redundant power supply from day of commissioning.

iii. Switch should have minimum 2 GB RAM and 2 GB Flash.

iv. Stacking/interconnection with ring-based topology to have minimum 48Gbps throughput or 20Gbps for Direct interconnects. All necessary interconnectors and cables must be supplied along with the switches up to a pod of 4 Switches.

4.4.2 Performance

i. Switch shall have minimum 250 Gbps of switching fabric with non-blocking architecture

ii. Switch shall have minimum 15 K MAC Addresses and 250 active VLAN.

iii. Should support minimum 10K IPv4 routes or more

iv. Switch shall have 1 K or more multicast routes.

v. Switch should support atleast 15K flow entries

vi. Switch should support 128 or more STP Instances.

vii. Switch should have 6MB or more packet buffer.

4.4.3 Functionality

i. Switch should support IEEE Standards of Ethernet: IEEE 802.1D, 802.1s, 802.1w, 802.1x, 802.3ad, 802.3x, 802.1p, 802.1Q, 802.3, 802.3u, 802.3ab, 802.3z.

ii. Switch must have functionality like static routing, RIP, REP PIM, OSPF, VRRP, PBR and QoS features from Day1.

iii. Switch should support network segmentation that overcomes the limitation of VLANs using VXLAN and VRFs.

iv. Switch shall have 802.1p class of service, marking, classification, policing and shaping and eight egress queues.

v. Switch should support management features like SSHv2, SNMPv2c, SNMPv3, NTP, RADIUS and TACACS+.

vi. Switch should support RFC 2460 Internet Protocol, Version 6 (IPv6) Specification RFC 2461 Neighbour Discovery for IP Version 6 (IPv6), RFC 2462 IPv6 Stateless Address Auto-configuration and RFC 2463 Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification

vii. Switch should support 802.1x authentication and accounting, IPv4 and IPv6 ACLs and Dynamic VLAN assignment.

viii. Switch must have the capabilities to enable automatic configuration of switch ports as devices connect to the switch for the device type.

ix. During system boots, the system's software signatures should be checked for integrity. System should be capable to understand that system OS are authentic and unmodified, it should have cryptographically signed images to provide assurance that the firmware & BIOS are authentic.

4.4.4 Interface

i. 48 UTP 10/100/1000 Mbps and at least 8 ports of Mgig (1/2.5/5 Gbps) ports, and the switch should have at least 4 SFP+ port layer-2, manageable switch having at least 740 W power budget for POE (Support POE+ on all ports concurrently) with redundant power supply.

4.4.5 Certification

i. Switch shall conform to UL 60950 or IEC 60950 or CSA 60950 or EN 60950 Standards for Safety requirements of Information Technology Equipment.

ii. Switch shall conform to EN 55022 Class A/B or CISPR22 Class A/B or CE Class A/B or FCC Class A/B Standards for EMC (Electro Magnetic Compatibility) requirements.

iii. Switch / Switch's Operating System should be tested for EAL 2/NDPP or above under Common Criteria Certification.

4.5   Core switch

4.5.1 General Features:

i. Switch should be 1U and rack mountable in standard 19" rack.

ii. Switch should support internal hot-swappable Redundant Power supply from day day of commissioning.

iii. Switch should have redundant hot swappable fans.

iv. Switch should have minimum 4 GB RAM and 4 GB Flash.

v. ==Stacking/interconnection with ring-based topology to have minimum 48Gbps throughput or 20Gbps for Direct interconnects. All necessary interconnectors and cables must be supplied along with the switches up to a pod of 4 Switches.==

4.5.2 Performance:

i. Switch shall have minimum 500 Gbps of switching fabric with non-blocking architecture.

ii. Switch shall have minimum 32K MAC Addresses and 1000 active VLAN.

iii. Should support minimum 32K IPv4 routes or more and 16K IPv6 routes or more

iv. Switch shall have 8K or more multicast routes.

v. Switch should support atleast 64K flow entries

vi. Switch should support 128 or more STP Instances.

vii. Switch should have 16MB or more packet buffer.

4.5.3 Functionality:

i. Switch should support IEEE Standards of Ethernet: IEEE 802.1D, 802.1s, 802.1w, 802.1x, 802.3ad, 802.3x, 802.1p, 802.1Q, 802.3, 802.3u, 802.3ab, 802.3z & 1588v2.

ii. Switch must have functionality like static routing, RIP, PIM, OSPF, VRRP, PBR and QoS features from Day1

iii. Should support advance Layer 3 protocol like BGPv4, BGPv6, MPLS, VRF, VXLAN, IS-ISv4, OSPFv3, MP-BGP

iv. Switch shall have 802.1p class of service, marking, classification, policing and shaping and eight egress queues.

v. Switch should support management features like SSHv2, SNMPv2c, SNMPv3, NTP, RADIUS and TACACS+.

vi. ==Switch should support RFC 2460 Internet Protocol, Version 6 (IPv6) Specification RFC 2461 Neighbour Discovery for IP Version 6 (IPv6), RFC 2462 IPv6 Stateless Address Auto-configuration and RFC 2463 Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification==

vii. ==Switch should support 802.1x authentication and accounting, IPv4 and IPv6 ACLs and Dynamic VLAN assignment==

viii. Switch must have the capabilities to enable automatic configuration of switch ports as devices connect to the switch for the device type.

ix. During system boots, the system's software signatures should be checked for integrity. System should be capable to understand that system OS are

authentic and unmodified, it should have cryptographically signed images to provide assurance that the firmware & BIOS are authentic.

x. Switch shall have modular OS to support application 3rd party application hosting

4.5.4 Interface

i. 16 SFP+ ports layer-3 manageable 1G/10G switch with dual power supply

4.5.5 Certification:

i. Switch shall conform to UL 60950 or IEC 60950 or CSA 60950 or EN 60950 Standards for Safety requirements of Information Technology Equipment.

ii. Switch shall conform to EN 55022 Class A/B or CISPR22 Class A/B or CE Class A/B or FCC Class A/B Standards for EMC (Electro Magnetic Compatibility) requirements.

iii. Switch / Switch's Operating System should be tested for EAL 2/NDPP or above under Common Criteria Certification.

4.6   Wireless Controller

4.6.1 Hardware

i. The controller shall support deployment flexibility without compromising any features

ii. The controller shall support min 5 Gbps tunneling capacity and shall be upgradable to 10 gbps.

iii. The controller shall support 2x 10G/Multigigabit copper uplink.

iv. Wireless Controller shall support link aggregation and load sharing between Access Point to WLC links

v. The controller shall support hardware encrypted data plane between Access Point and Controller

vi. The controller shall be proposed with complete feature set including licensed feature

4.6.2 High Availability

i. High Availability mode shall support controller inline data plane mode as well as local switching mode and Mesh mode

ii. High Availability mode shall allow geographically dispersed installation between Controllers

iii. The controller failover shall not trigger client de-authentication and re-association

iv. The controller shall support hot WLC software patching for fixing bugs

v. The controller shall support hot AP software patching for fixing bugs

vi. The controller shall support new AP hardware without need for upgrading entire controller software.

vii. The controller shall support rolling AP upgrade

viii. The controller shall support rolling AP upgrade without need for clustering

ix. The redundant Controller shall sync Access Point and Client Status, including DHCP IP lease status

4.6.3 Software

i. Access Point shall be able to proactively distributes Client connection before and after association

ii. and tracking client condition in real time using data packet RSSI

iii. The controller shall support standard-based, secure AP-Controller data & control protocol like CAPWAP. protocol that has known vulnerability like PAPI cannot be used.

iv. <mark>The controller shall support Inter-Controller Wireless Roaming, or the controller should support at least 1000 Aps</mark>

v. The controller shall maintain per-user Application usage and shall be able to export it for network analytic.

vi. The controller shall support Multi Languages options from embedded GUI Management

vii. The controller shall provide per-Client Connection Scoring and provide reasoning of Client Connection Score

viii. The controller shall support Cellular offload using IPv6 tunneling to Mobile Core network

4.6.4 RF management

i. The controller shall be able to support multiple RF Management profile per group of APs, including Transmit Power Control and Dynamic Channel Assignment on both 2.4GHz and 5Ghz

ii. The controller shall be able to identify and avoid interferers with network performance impact analysis report

iii. <mark>The controller shall support optimized manual/automatic channel width (20~160Mhz) selection over 5GHz, 802.11ac</mark>

4.6.5 Mesh

i. Mesh AP nodes shall provide quick convergence and fast failover to new root mesh node

ii. Mesh Backhaul interface shall support full duplex operation using wired daisy chaining

iii. Mesh AP shall support fast roaming for Wired-client through wired-to-wireless bridge client

4.6.6 Application Recognition and Control

i. The controller shall support per-user and per-WLAN based application recognition and control that throttle usage by rate-limiting

ii. The controller application recognition technology shall support exporting to 3rd party compatible format, such as NetFlow v9

iii. The controller shall provide policy-based mDNS gateway including Chromecast gateway

iv. The controller shall support new application signatures without upgrading controller software

4.6.7 BYOD & Security

i. The controller shall provide Device Profiling using multiple profiling methods to reduce false detection

ii. The system shall provide secure onboarding service for both employee and guest based on standard-based security protocol

iii. Proposed system shall not use public cloud as user data repository

iv. The controller shall be able to be embedded custom web portal page (HTML) to fully customize user experience without additional cost or extra box

v. The controller shall provide rule-based rogue classification and automatically run rogue mitigation action

vi. The controller shall be able to detect employee device connection to Rogue Access Point and contain it automatically. It should also support protection from Honeypot or Evil twin.

vii. The system shall support control plane encryption on both IPv4 and IPv6

viii. The Controller's image upgrade shall be done through secure, encrypted transport

ix. The controller shall be able to provide unique pre-shared keys to the devices that do not support the 802.1x security protocol

x. The controller shall support Identity PSK for on boarding

xi. The controller shall support identification & mitigation of threats inside encrypted traffic

4.6.8 Network

i. The controller shall support mapping of specific VLANs to single SSID, depending on Access Point location and user

4.6.9 Configuration

i. The controller shall support automatic VLAN assignment per SSID to load-balance user connection.

ii. Assigned VLAN pool shall be same as number of available VLAN in the system

iii. The controller shall support embedded best practice configuration profile and setup

iv. The controller shall support packet fragmentation between Access Point and controller communication

4.7 Network Management System

4.7.1 General

i. Single NMS should be able to manage Wired and Wireless devices. It should be from same OEM of active network devices bidder is quoting.

4.7.2 Administration & Security

i. NMS should have the ability to establish function-level, role-based permissions (e.g., who can use what functions of the product)

ii. The Management System shall support LDAP/AD integration for the user authentication. (Administration shall be handled within AD or local, not both)

iii. Within the password policy: Should be able to set min, Length, expiration

iv. The Management System shall allow role-based authorization with different rights and views assigned to these roles. Based on network element groups assigned to users' groups

v. NMS should support user-based roles with different management privileges.

vi. NMS should support RADIUS /TACACS+ authentication.

4.7.3 Alarms/Event Management

i. NMS should have a centralized, robust switch Syslog management with filtering capability by severity, facility, and device IP address.

ii. NMS should support Display events and generate alarms.

iii. NMS should support Detailed reporting including events and alarms, inventory, and outages.

iv. Must support customizable performance and interface thresholds alert management

v. Must support historical alarm management.

vi. Must support and provide alarm notification alert through console, e-mail alert.

vii. NMS should provide fault suppression.

viii. It should be possible to acknowledge multiple alarms. The timestamp and the user who acknowledged the alarm should be stored in the Management System.

ix. The Management System shall be able to categorize alarms, into different severity levels

x. Event history: Event shall be stored with timestamps

xi. Alarm burst protection / mitigation: The Management System should be able to handle a vast amount of alarms/events

xii. The requisite server needs to be supplied by the Bidder.

4.7.4 API Support

i. NMS should support Inbound/Outbound Application Programming Interfaces (API's). This could be your own API or 3rd Party integration API's.

ii. Northbound and Southbound Interfaces, The Management System shall be able to forward alarms to other systems.

iii. Standard based API's: The Management System should offer Standard based API's

4.7.5 Architecture

i. NMS should be available as a hardware or virtual appliance. Bidder should quote necessary server/ appliance as per OEM best practice.

ii. NMS software should have scaling capacity of minimum upto 7000 devices per instance if need to upgrade in future. License as per requirement.

iii. The system supports hierarchical deployment where each software system at its own level can run independently, execute permissions separately, and have local portal and collection servers.

iv. The system supports integrated management of network devices, hosts. Besides, it can analyze and manage interactions between IT resources, and support a unified monitoring policy, unified alarm policy and view management.

v. The system can provide a one-page summary view of business operation.

vi. Product should support IPFIX (NetFlow v10)

vii. The Management System shall support local database.

4.7.6 Change and Compliance Management

i. NMS should have networking best practices to proactively identify suboptimal configuration settings such as port duplex mismatch, VLAN, IPSLA, QoS, PBR, misconfigurations, and others.

ii. NMS should have built-in workflow processes to include Network Configuration Validation, Change Approval Process, and Configuration Deployment Process.

iii. NMS should provide out-of-the-box policy content with your product (e.g., SOX, PCI, Best Practice, NSA security best practice guidelines)

iv. NMS product come with pre-defined, out-of-the-box compliance reports.

v. NMS product should detect network device configuration changes (for example, changes to OS version, IP address, hostname, textual configuration files, and hardware, software and modeled (e.g., ACL, VLAN) configuration attributes) for devices in inventory.

vi. NMS should have the ability to log configuration changes and who made them.

vii. NMS should have the ability to detect configuration changes via real-time external events - Syslog messages.

4.7.7 Configuration Management

i. Must support device configuration backup and restore feature

ii. Must support device configuration backup in manual or scheduled basis.

iii. Must support device configuration management in per device or batch mode operation

iv. Must support device configuration comparison feature between two specified configures, and the configuration changes will be highlighted in different color.

v. Must support software management.

vi. NMS should have the ability to compare configuration versions using a side-by-side, split-screen display to highlight differences between current captured configuration

vii. NMS tool should have the ability to highlight differences in textual configuration files.

viii. NMS should have the ability to update individual configuration attributes (rather than uploading entire configuration files to update one attribute)

ix. NMS should have the ability to remediate a device back into compliance and roll back to a previously saved configuration by automatically prompting the user.

x. NMS should have the ability to perform changes with a list of command lines (e.g., cut-and-paste CLI commands).

xi. NMS should have the ability to perform changes with scripts to handle more-complex configuration changes to network devices.

xii. NMS should have the ability to perform a textual configuration search using regular expression pattern matching.

4.7.8 Discovery

i. Must support discovery of devices through route table, arp table and network number.

ii. Provide an estimate of how quickly your Network Configuration & Change Management (NCCM) platform can be up and operational? (i.e., installed configured, fully discovered all devices and able to retrieve and push changes)

iii. NMS should support discovery on IPv4.

iv. NMS should support discovery on IPv6

v. The Management System should be able to automatically discover the network elements as well as their current status and status change with no manual intervention using Different MIBs

vi. The Management System should be able to automatically discover the network elements as well as their status and status change with no manual intervention.

4.7.9 Group Management

i. NMS should support Device management capability using device groups

ii. Device Grouping Flexibility

4.7.10 Inventory Management

i. NMS product should support push/pull update software on network devices.

ii. NMS should provide Interface inventory, display switch ports and connected device's IP addresses.

iii. NMS should support Device inventory displaying detailed hardware components of all managed devices

iv. Must support VLAN management

v. NMS product should do automatic proactive vulnerability discovery for the platforms it manages (i.e., PSIRT, bugs, hardware lifecycle management)

4.7.11 Monitoring

i. The system has a default monitoring policy. The system provides a recommended monitoring policy, which can be modified as required.

ii. The system supports replication of policies and applies replicated policies to other monitored objects to improve the deployment efficiency.

iii. The system supports formulation of resource policies in batches, that is, the system can add objects with the same monitoring policy in batches.

iv. Be able to collect data about bandwidth utilization, store it and present it via GUI.

v. QoS Profiles - Different Classes - Exceed, violate, and conform statistics, Policing statistics, Classification statistics, Queuing statistics

vi. NMS should have a summary page that shows the number of devices, links, interfaces, license used/available status, and device collection status.

4.7.12 Network Topology

i. The system sets filtering conditions for creating sub topologies of layer 2 and layer 3 topologies and supports importing layer 2 and layer 3 topologies.

ii. The system supports topology customization using devices and pictures provided by the system.

iii. The system supports nodes to be deployed using icons or symbols of devices. These icons and symbols are also available for resources and sub networks.

iv. Able to add and change backgrounds to have better visual effect

v. Auto topology discovery - Layer 2 and Layer 3(BGP, OSPF, IS-IS and LDP)

4.7.13 Performance

i. The system supports component extensions such as traffic analysis, log monitoring, and script monitoring to facilitate integrated monitoring of the operation and maintenance of IT resources.

ii. The system supports the NetFlow and IPFIX protocols by using Flow technologies.

iii. The system supports viewing traffic based on multiple dimensions, such as applications, sources, purposes, and sessions.

iv. The system provides complete traffic analysis functions, including real-time monitoring of network traffic, alarming for traffic overload, analyzing traffic

v. The system provides traffic flow direction analysis, monitors TCP sessions, and provides the matrix view for TCP sessions to present the statistics for traffic of all network nodes and sessions.

vi. Must support historical port utilization and performance report for up to last 180 days

vii. Operation status of the processes

viii. User-defined index such as the real-time connection and traffic of the network adapter, and the packet loss rate, utilization, and transmission rate of the network port.

ix. Should map call flows through the network to pinpoint problem areas.

x. Jitter: The Management System shall be able to monitor jitter via IP sla or probe

xi. Delay: The Management System shall be able to monitor delay via IP sla or probe

xii. Latency: The Management System shall be able to monitor latency via IP sla or probe

4.8 Transceivers

i. Single Mode 1310 nm SFP+ transceiver (10GBASE-LR) of the same OEM as the quoted switch. The transceivers must be compatible with the quoted switches.

ii. Each of the Seven (7) Stacks should have 4 Transceivers (7 x 4 = 28) and another 4 transceivers for the Core uplink connectivity.

5. Technical Specifications of Passive Components, Civil Work, and Installation & Services

- There are around 1100 UTP CAT6/6A information outlets spread across five buildings.

- The passive work at the switch end in all the floors of the building must be carried out neatly.

- It is vital to mention that majority of the building are of stone construction and requires ought most care during network wiring.

- The technician working should have a prior experiencing of working in stone construction and the new line should not hamper the esthetic of the building.

5.1 Passive Components

5.1.1 Network Racks with PDUs

i. The Bidder may provide racks with PDUs from any reliable and reputed brand.

ii. All electrical components must be of any reliable and reputed brand.

iii. Seven Racks of the following sizes are required:

- 42 U – Network rack with integrated cooling- 2 Nos
- 32 U – Standard 19-inch Rack with minimum depth of 1000 mm- 4 Nos
- 12 U – Standard 19-inch Rack with minimum depth of 650 mm- 2 Nos

5.1.2 Specifications for the 42 U Network rack with integrated cooling

- Built-in Features Enclosure: Emergency Fan Cooling, Lighting, Dual Input Power Panel, Cable Management, Intelligent Controls with Touchscreen Display

- Power Protection: 6kVA Easy UPS with Battery pack
- Power Distribution: Metered
- Power Input: 230V / 50Hz
- Cooling: 3.5kW Split DX with intelligent eco modes
- Ventilation: Fan Assisted with automated economizer / emergency modes
- Security: Standard Lock, Intrusion Detection
- Fire Suppression: Optional
- Monitoring: + configurable with DCIM software
- Cabinet Dimension (H×W×D): 2180×800×1200 (mm) Includes top of emergency fan cooling unit
- Usable RU space: 36 RU (6kVA SRV)
- Cooling capacity: 3500 W, variable speed
- UPS Capacity: 6 kVA

5.1.3 Patch Panels & Accessories

The Bidder may provide these components of a reliable and reputed brand only.

5.2 License, Warranty and Support

i. The total solution should include licenses for all necessary features from the first day of the installation. All the licenses quoted should be perpetual. All the features and signatures including WIPS available at the time of expiration of license should continue to work. Renewal of licenses should be required only for new features and updates/releases announced by the OEM after the contract expires.

ii. The total solution should have 3 years' on-site warranty for Access Points, Switches, UPS & batteries, cabling & accessories, and controller.

iii. The total solution should include technical support for software/firmware and software upgrades for controller, Access Points and Switches for 3 years.

iv. The total solution should be upgradable to the latest stable version, as and when available, at no extra cost.

v. The quote should also include additional 2 years' AMC specified as a separate line item.

vi. Warranty support should include 4 hrs. response time and provision of replacement along with appropriate configuration and installation in next business day for Hardware.

vii. Should provide single point of contact and should provide call logging and escalation matrix.

5.2.1 Acceptance Parameters for the Proposed Solution (Only Applicable during and post implementation)

5.2.1.1 Overage and Capacity Planning

i. On-site site survey by the bidder is optional to plan Wi-Fi deployment in each floor of each building.

ii. The bidder should provide the location of Access Points on the floor plan for all buildings (Note: tentative location plan will be provided by Mechanical Engineering Department).

iii. The bidder should provide OEM-certified coverage heat map for 2.4 GHz and 5 GHz separately with -65 dBm RSSI threshold for 2.4 GHz and 5 GHz. All coverage holes in the premises should be indicated clearly.

iv. The bidder should provide OEM-certified AP coverage redundancy map.

5.2.1.2 Physical Installation

i. Inspect installation of Network racks, OFC, UPS, Power Cables, UTP cables and Network Switches.

ii. Configuration check on controller including the policies.

iii. Test the physical mounting of each Access Point.

iv. Test each Access Point connectivity to the central controller.

5.2.1.3 Wired Network Test:

i. Perform OTDR/RFC 2544 tests for all OFC links and submit reports.

ii. Perform end-to-end connectivity test of all UTP links and submit reports.

iii. Check reachability and latency test on all Network Switches and submit reports.

5.2.1.4 Wi-Fi Controller Configuration Test:

i. Check authorized Wi-Fi set up for each Subnet / VLAN / Location as the case may be.

ii. Check both Authorized user and Guest user policies.

iii. Test each Access Point if they have the right authorized and guest policy.

iv. Check Wi-Fi prevention policy for each subnet, VLAN and location.

v. Check the configured alerts and alert delivery methods.

vi. Check the administrative users and their access rights.

vii. Check the configured reports (content, delivery frequency, recipient list).

viii. Check the automatic backup and archival parameters.

ix. Check archival of logs.

5.2.1.5 Commissioning Test

i. Test for all Access Points connectivity to the controller.

ii. Test and verify authorized Access Points inventory and authorized client inventory.

iii. Verify external Access Points list and verify uncategorized / unauthorized client list.

iv. Verify if all authorized wireless devices are tagged to right location.

v. Test for authorized client connection to authorized Access Point and respective SSID as per the set authentication policy.

vi. Test for Guest client connection to authorized Access Points and respective SSID as per the set authentication policy.

vii. Test if the Access Points are operational after shutting down the controller.

viii. Test if automatic Rogue Access Points prevention is working on all types of rogue APs.

ix. Test if unauthorized client association to authorized Access Point is automatically prevented.

x. Test if automatic client Mis-association prevention is working.

xi. Test if Ad-Hoc Networks are detected and automatically prevented.

xii. Test if Mac-Spoofing is detected.

xiii. Test if automatic prevention of Honeypot (with Multipot) is functional.

xiv. Test is Denial of Service (DoS) Attack is detected.

xv. Testing of deployment of policies, firmware updating remotely through the controller.

xvi. Testing WIPS functionality across the subnet.

xvii. The entire testing exercise should complete in two weeks' time from the Date of installation.

5.2.1.6 Documentation and Reports

i. Documentation of the entire project along with testing reports must be submitted to IISc.

ii. Documentation must include RF Coverage Heat Maps clearing showing that the -65 dBm RSSI requirement within all hostel rooms is met.

iii. Documentation must include complete network diagram which clearly depicts Switch Management IP Address, Switch Location, AP Location and Switch Port to each AP.

iv. Documentation must include complete configuration in a step-by-step manner.

5.2.1.7 Solution Fine Tuning and Handover to operations team of Mechanical Engineering Department

i. Fine tune Wi-Fi Access policies and security policies.

ii. Rebuild authorized device inventory and remediate mis-configured APs.

(Further detailed passive specification are attached to the technical compliance sheet Annexture-3)

6. Terms and Conditions

6.1   Bidder's Eligibility Criteria (BEC)

Compliance with the following conditions is mandatory.

1. The bidder (Tier-1//Tire-2/Highest level System Integrator (SI) partner of the OEM) must have successfully completed/ongoing three Wireless LAN Access Infrastructure (Wi-Fi / WIPS Solution) implementations in India in the last three years of which one must be Wi-Fi & WIPS Solution. The value of any one turnkey solution implemented must be at least **Rs. 7 crores**. Complete list, along with the contact details of the customers (as mentioned above), must be provided.
   Supporting Documents to be enclosed:

a)	Copies of the P. O.-s, stating clearly the duration of contract, value, and scope.	YES/NO
b)	Letter from the organization, supporting the claim of completion of the project and satisfactory delivery of services.	YES/NO
c)	Letter from the OEM to support the claim of Tier-1/Tire-2 relationship of SI with the OEM.	YES/NO

2. The bidder must have a registered office in India and been in operation for at least 10 years as on 30.09.2022. Joint venture or consortium are not permitted.
   Supporting Documents to be enclosed:

a)	Documents supporting the above claim	YES/NO

3. The OEM must provide all technical support to the bidder for the contract period. A letter to this effect must be submitted along with the bid.
   Supporting Documents to be enclosed:

a)	Authorization letter from the OEM to support SI during the contract period	YES/NO

4. The bidder is expected to be a profit-making company with an annual turnover of at least **Rs.40 Crores** in each of the last 3 financial years.
   Supporting Documents to be enclosed:

a)	Annual audited balance sheets for 3 years	YES/NO

5. The bidder should be in a position to demonstrate its capability to deliver all the services expected during the contract period.
   Supporting Documents to be enclosed:

a)	Documents supporting the above claim	YES/NO

6. The bidder must have an office in Bangalore with Service/Support Engineers posted in Bangalore.
   Supporting Documents to be enclosed:

a)	Documents supporting the above claim	YES/NO

7. The bidder must not be blacklisted by Central Govt. /State Govt./PSUs/Other Govt. Agency/ Govt Educational Institute/University.
   Supporting Documents to be enclosed:

a)	A declaration on company's letterhead.	YES/NO

8. The bidder must submit Solvency Certificate of at least Rs. 20 Crores or above from Scheduled Commercial Bank. The Certificate should not older than 12 months.
   Supporting Documents to be enclosed:

a)	Solvency Certificate from Scheduled Commercial Bank	YES/NO

6.2   Earnest Money Deposit (EMD)

1. All bidders must submit **Rs. 10,00,000/- (Rs. Ten Lakh only)** as bid security in the form of RTGS/NEFT transfer, the bidder must submit e-receipt as a proof of EMD submission along with the technical bid. Failure to comply with this requirement will result in rejection of the bid. The account details of IISc are provided below.

2. After the placement of the purchase order on the successful bidder, the EMD amount will be returned to the unsuccessful bidders without interest.

3. The EMD amount will be returned to the successful bidder after the Institute places a firm purchase order for the procurement and the successful bidder then submits a performance security/bank guarantee (Annexure 5) followed by its verification.

4. Bidders registered with NSIC / MSME will be exempted for EMD and Tender Fee. The bidder must submit copy of valid certificate.

5. The bid must be valid for at least 180 days from the actual date of opening of the technical bid. Withdrawal of the bid within the period of validity will result in forfeiture of the EMD amount.

Table 6. Details of the Bank Account of IISc Bangalore for submitting EMD

Account's Name	Registrar, IISc	Note:
Bank	State Bank of India	• It is mandatory to write the Name & Address of the Bidder and Tender Reference No. & Date on the back side of the e-receipt of NEFT/RTGS.
Branch	IIS Bangalore	
Branch Code	02215	
Account No.	31728098170	
IFSC	SBIN0002215	
MICR	560002020	
GSTIN	29AAATI1501J2ZV	• Acceptance of the e-receipt of NEFT/RTGS is subject to its verification from the Finance & Accounts section, IISc.
PAN	AAATI1501J	
IEC Code	0788012428	

6.3 Guidelines for Bid Submission

1. If a bidder submits a response to the tender, then it is assumed that the bidder accepts all the conditions specified in this document. Tender submitted through any other mode will not be entertained.
2. The submission consists of two parts: Technical Bid and Commercial Bid.
   2.1. Technical bid should contain:
      2.1.1. Supporting documents mentioned in the BEC and Overall Compliance Statement.
      2.1.2. Terms and conditions of the offer.
      2.1.3. Supporting technical material, including brochures.
      2.1.4. A duly filled BOQ compliance sheet as mentioned in Annexure 1 of the RFP. No prices should be mentioned.
      2.1.5. A duly filled technical compliance sheet as mentioned in Annexure 2 and 3 of the RFP.
      2.1.6. A duly filled Techno-commercial compliance sheet as mentioned in Annexure 4 of the RFP.
   2.2. Commercial bid (Financial bid or Price Bid) should contain:
      2.2.1. The commercial bid must contain prices for every line item in the BOQ (Section 3.1-3.4).
      2.2.2. Any additional item over and above the items mentioned in Section 3.1 to 3.4 must be mentioned clearly as a separate line item, stating the quantity, unit of measurement and must be with 3 years of warranty.
      2.2.3. The final commercial evaluation will be based on Total Price of all the line items.

Points to Note:

1   Prices should not be mentioned in the Technical Bid.
2   All pages of technical bid must be page numbered.
3   Bidder on whom the order would be placed will have to execute the order and invoice the order before 1st March 2023
4   IISc is eligible for reduced customs duty for supply of equipment quoted in foreign currency; all such equipment must be shown as separate line items. Bidders planning to quote any imported solution must give the offer in the respective currency.
5   The offer must clearly state the components of pricing separately. For example, the supply part, F & I, I & C, Warranty services and any other charges must be quoted as separate line items.
6   A tender not complying with any of the above conditions is liable to be rejected. Incomplete proposals are liable to be rejected.
7   A Technical Committee at IISc, Bangalore reserves the right to modify the technical specifications or the required quantity at any time. In such case, the bidders will be notified.

8   A Technical Committee at IISc reserves the right to accept or reject any proposal, in full or in part, without assigning any reason.

9   The bidders are requested to go through the Terms and Conditions detailed in this document, before filling out the tender.

10   A pre-bid clarification meeting is scheduled as per the timeline given. Queries relating to the tender documents must be submitted in writing (Email address: chair.me@iisc.ac.in) on or before the specified timeline. Queries received after this deadline will not be entertained.

6.4 Evaluation of bids

The evaluation process to identify the successful bidder has two stages.

1. **Evaluation of technical bids.**

    i. A Technical Committee constituted by the Institute will evaluate the submitted bids and identify the Bidders whose solution meets meet the mandatory technical requirements mentioned in Sections 4 and 5 in this document.

    ii. The Committee will also verify from the documentation provided if the Bidder satisfies the Bidder's Eligibility Criteria.

    iii. All Bidders whose bids are found responsive will be invited for a technical presentation and demonstration at Mechanical Engineering Department. The dates for this are given in the Schedule of Events (Section 1). The detailed timings for the presentation and demonstration and switch set-up slots will intimated via email correspondence.

    iv. The Bidder (if called for technical presentation) must submit all the original documents submitted for the technical bid (hard copy, properly spiral bound, in one volume only), to IISc for verification at the time of the technical presentation.

    v. The technical presentation will be limited to 30 minutes including Q&A. The first 5 minutes may be spent introducing the Bidder's company (1 slide), the solution and its salient aspects (4-5 slides). The next 25 minutes must be spent on a demonstration. The bidder is expected to physically show with the two quoted distribution switches and two quoted access switches (schedule for prior hardware set-up will be informed via email correspondence) that the redundancy required of the solution is satisfied. The HSRP/VRRP/GLBP features on the distribution switches must also be clearly demonstrated.

    vi. The Technical Committee will decide on the technically qualified bidders based on the bids and the demonstration. *The decision of the Technical Committee is final and binding on all the Bidders.*

2. **Evaluation of commercial bids**

    2.1. Only technically qualified bidders' commercial bids will be taken up for evaluation in the e-tendering process. Commercial bids shall be opened only for the technically qualified bidders after the technical evaluation. The Institute will communicate the date and time of opening of the commercial bids.

    2.2. Commercial bids which are not in compliance with the terms and conditions set out [Refer to "Commercial Terms and Conditions"] in the tender will be rejected.

    2.3. For bids/components of bids submitted in foreign currency, the INR equivalent will be calculated using the exchange rate on the day of opening of the commercial bid.

Acceptance Criteria

1. The successful bidder must implement the solution at the site and complete the necessary integration of the solution with the core network infrastructure deployed at the Mechanical Engineering Department, IISc and demonstrate the performance of the deployed infrastructure to the technical committee.
2. The bidder is expected to adhere to the Acceptance Test Plan (ATP) given in technical specifications in section 4 and 5.
3. The warranty services will start only after installation and commissioning of the WLAN and WIPS solution.

6.5 Service Level Agreement and Warranty

1. In the event of failure of any of the sub-systems or components of the proposed solution, the bidder must ensure that defects are rectified, or the equipment is replaced with necessary configuration free of cost within 24 hours from the time it was reported.
2. Failure to meet the above requirement will result in extension of warranty services by 3 days for each day of delay during the warranty period.
3. The bidder must maintain a suitable stock of necessary spare equipment during the contract period.
4. The bidder must provide 3 years' warranty and thereafter 2 years' comprehensive AMC for all the hardware and software components of the solution, from the date on which the solution is accepted, as per the Acceptance Test Plan. During the warranty period and AMC period, the bidder must undertake comprehensive maintenance of all the equipment, hardware components, support, and accessories. The bidder must also perform periodic software upgrades, updates, and patches, as well as preventive maintenance.
5. Collection of faulty hardware from the site and provisioning the replacement hardware during the contract period (warranty & comprehensive AMC) on the site shall be the responsibility of the bidder.
6. IISc reserves the right to invoke the Performance Bank Guarantee (Annexure 5) submitted by bidder in case
   a. Supplied equipment, hardware & software components fail to achieve the performance as stipulated in this document.
   b. The bidder fails to provide satisfactory service in the scheduled time frame, during the contract period, as stipulated in this document.
7. The bidder should also clearly indicate post-warranty comprehensive AMC cost, covering all hardware and software upgrades, as a percentage of the equipment cost for a period of 2 years, on an annual basis, in the commercial bid.
8. Care shall be taken by the bidder while handling and installing the various equipment and component of the work to avoid damage to the building. He shall be responsible for repairing all damages and restoring the same to their original finish at his cost failing which the same shall be got rectified/made good at the risk and cost of the contractor by the department and will be recovered in the bill. He shall also remove all unwanted and waste materials arising of the installation work every day at his cost.
9. The Passive Components of structured cabling distribution network will be free from manufacturing defects in material and workmanship under normal and proper use.
10. All Passive Components in the structured cabling distribution network shall meet or exceed the relevant component specification of the EIA/TIA 568-B and EIA/TIA 568-C.2 series and ISO/IEC 11801: 2002 standards; or later version as applicable at the time of installation.
11. Watch and ward of the stores and their safe custody shall be the responsibility of the contractor till the final taking over of the installation by the department.
12. IISc holds the rights to withheld 5 % of the total project value if the quality of execution and workmanship is not found satisfactory by the Technical Committee at IISc.

6.6 Commercial Terms & Conditions

1. The commercial bid should contain among other things, payment terms, warranty, installation, commissioning, AMC charges etc. as per BOQ. All such conditions must be in line with the tender. In case of any deviation or conditional offer, the bid may be treated as non-responsive and hence will not be considered for evaluation. These charges will be paid only after successful supply, installation, and acceptance. IISc will enter into a contract with the successful bidder which will detail all contractual obligations during the warranty period. Bidders must quote for AMC charges for two (2) years after the three (3) years warranty period.

2. IISc is registered with DSIR in order to get concession in Customs Duty. IISc will provide necessary documents required for availing concession in Customs Duty. Bidders should consider these facts while offering their price bids for this tender. Please note that IISc will not be involved in custom duty / airport charges payment, custom clearance, forwarding and transportation / shipment of import items; IISc will only provide relevant documents for availing concession / exemption in Custom duty to submission of documents (viz. Invoice, Bill of Entry, Bill of Lading, airway Bill, etc.) by the vendor. Bill of Entry must be in the name of IISc. Customs duty must be paid by the vendor only. Before release of final payment, all original documents with regards to import must be handed over to IISc, failing which final payment may not be released.

3. In case of rupee offer, the component of tax, and any other statutory levies should be shown separately and not included in the total amount, to enable us to avail exemption.

4. In case of imports, the commercial bid should contain among other things, the name and address of the Indian agent, if any, and the agency commission payable to the agent. Please quote the prices for import items on 'DDP - Delivered Duty Paid' terms.

5. Proposals should contain the name and contact details, viz., phone, fax and email of the designated person to whom all future communication will be addressed.

6. Prices should be quoted in detail, for all the subsystems given in the Technical Specifications part of the tender. Further, price validity should be for six months.

7. IISc will place the purchase order only on the successful bidder.

6.7 Payment Terms

1. The total project cost will consist of two parts
    1.1. Equipment supplies part (Supply).
    1.2. Installation, testing, commissioning, documentation, warranty, and AMC charges / maintenance services part (referred to as "Services" in short).
2. Payment Terms: - Payment will be released as follows:
    2.1. For orders placed in foreign / INR currency, payment towards 70% of the total order value of the Supply part will be released only after delivery of all such items on site at IISc, Bangalore, followed by inspection and auditing by the IISc Committee and submission of report regarding delivery of correct items by the Committee. Rest of the amount (30% of the order value of Supply and 100% of Services) will be paid only after completion of installation, commissioning, Acceptance Test Plan (ATP) and acceptance by the IISc Committee, followed by submission of a report regarding completion of the work by the Committee. Payments will be released through RTGS only (*no payment through Letter of Credit (LC)*).
    2.2. Services part of the project is payable only in Indian Rupees and will be paid only after completion of installation, commissioning, Acceptance Test Plan (ATP) and acceptance by the IISc.
    2.3. At the time of installation, any additional requirement of Supply or Services, over and above the quantity mentioned in the attached BOQ must be supported at the same rate as originally quoted.
    2.4. At the time of installation, if additional or less quantity of various items of Supply or Services are needed, then payment will be released only for actual Supply and Services. Final payment will be adjusted accordingly. Any payment will be released only after submission of PBG followed by receiving of verification report of genuineness of the Bank Guarantee.
    2.5. Payment will subject to deduction of TDS as per rules/laws.
    2.6. After completion of the warranty period, AMC charges will be paid once in every six months after completion of six-month AMC period, subject to a report of satisfactory performance by the user department of IISc.
3. Performance Security / Performance Bank Guarantee (PBG) – After placement of order, the successful bidder must submit Performance Security / Performance Bank Guarantee (PBG) (Annexure 5) within two weeks of the issue date of the order, failing which order may be cancelled. The PBG will be 10% of the total order value. The performance security must be valid for five years and two months from date of successful installation accepted by IISc. Performance security may be furnished in the form of RTGS / NEFT payment issued by a scheduled commercial bank in India (preferably nationalized bank) in favour of "The Registrar, Indian Institute of Science, Bangalore." Bank details of IISc are attached in Section 6.2. No interest will be payable by IISc on the Performance Security deposited. The Earnest Money Deposit (EMD) of the successful bidder shall be returned on receipt of Performance Security (Performance Bank Guarantee / PBG). If the successful bidder fails to

furnish the performance security or fails to deliver/provide the item/installation/service as per the order's terms and conditions within the stipulated period, the EMD shall be liable to be forfeited. The Performance Security will be forfeited and credited to IISc's account in the event of a breach of contract by the successful bidder. An undertaking to this effect must be submitted by the bidder.

4. Indian Agency commission (IAC), if any, must be mentioned in the commercial bid and it will be paid only after satisfactory installation & commissioning.

6.8 Supply, Installation, and Acceptance

1. Bidder on whom the order would be placed will have to execute the order and invoice the order before 1st March 2023.

2. The successful Bidder must install and configure the switches on site, ensure and demonstrate that they are all operating as required by this tender, and integrate the distribution switches with the IISc core network.

3. All relevant technical documentation related to the further configuration and customization must be provided by the Bidder at the end of the installation.

4. The Bidder should demonstrate the smooth operation of the installed infrastructure to Technical Committee. Only upon a successful demonstration will the provided solution be deemed accepted.

5. The warranty services will start only after the acceptance by IISc of the provided solution.

ANNEXURE-1

BOQ Compliance Sheet

S/No	Particulars	Quantity	Units	Included in the commercial bid (YES/No)	Remark or Model Name
	Active Components				
1	Wi-Fi Access Point support IEEE 802.11a/n/ac/ax on 5Ghz band and IEEE 802.11b/g/n/ax on 2.4Ghz band with at least 8x8:8 5Ghz radio and at least 2x2 2.4Ghz radio. Must have at least one 5Gbps Ethernet interfaces. Must be Controller based locally hosted with H.A. Must be Wi-Fi CERTIFIED 6™. Must support POE+ on 802.3at/bt	5	Nos		
2	Wi-Fi Access Point support IEEE 802.11a/n/ac/ax on 5Ghz band and IEEE 802.11b/g/n/ax on 2.4Ghz band with at least 4X4 MU-MIMO spatial streams on 5GHz radio and 4X4 MU-MIMO spatial streams on 2.4GHz radio. Must have at least one 2.5Gbps Ethernet interface. Must be Controller based locally hosted with H.A. Must be Wi-Fi CERTIFIED 6™. Must support POE+ on 802.3at/bt	75	Nos		
3	16 SFP+ ports layer-3 manageable 1G/10G switch with dual power supply (DS 1 & 2)	2	Nos		
4	Single Mode 1310nm SFP+ transceiver (10GBASE-LR)	35	Nos		
5	Wireless Controller	2	Nos		
6	NMS with hardware	1	Nos		
7	Stacking cable or SFP+ Twinax cable 2 meters	30	Nos		
8	Stacking cable or SFP+ Twinax cable 5 meters	10	Nos		
	And*				
9	48 UTP port non-POE switch with 4 SFP+ port layer 2, 10/100/1000 Mbps manageable switch with stacking capability and dual power supply	16	Nos		
10	48 UTP 10/100/1000 Mbps and at least 8 ports of Mgig (1/2.5/5 Gbps) ports, all 8 ports must concurrently support (1/2.5/5 Gbps), and the switch should have at least 4 SFP+ port layer-2, manageable switch having at least 740 W power budget for POE (Support POE+ on all ports concurrently) with redundant power supply	14	Nos		
	Or*				
11	48 UTP port non-POE switch with 4 SFP+ port layer 2, 10/100/1000 Mbps manageable switch with stacking capability and dual power supply	20	Nos		
12	48 UTP 10/100/1000 Mbps and at least 12 ports of Mgig (1/2.5/5 Gbps) ports, all 12 ports must concurrently support (1/2.5/5 Gbps), and the switch should have at least 4 SFP+ port layer-2, manageable switch having at least 740 W power	10	Nos		

	budget for POE (Support POE+ on all ports concurrently) with redundant power supply				
	Optional**				
13	Backplane stacking module	30	Nos		

*The bidder should provide either line items 9 and 10 or 11 and 12.
** Line item 13 is optional and will not be considered for L1 bidder selection.

	Passive Components				
1	48-Core Single Mode (9/125μm) armored outdoor Optical Fibre Cable in meters	2000	Meters		
2	6-Core Single Mode (9/125μm) armored outdoor Optical Fibre Cable in meters	1000	Meters		
3	CAT 6A UTP cable in meters	5000	Meters		
4	CAT 6 UTP cable in meters	43000	Meters		
5	Unloaded 24 port 1U CAT 6A UTP Jack Panel	7	Nos		
6	Unloaded CAT 6 UTP Jack Panel	51	Nos		
7	CAT 6A Information Outlet compatible with jack panel mentioned above	90	Nos		
8	CAT 6 Information Outlet compatible with jack panel mentioned above	1100	Nos		
9	CAT 6A RJ45 connector	90	Nos		
10	CAT 6 Information Outlet, Face plate and Back box	1100	Nos		
11	48 Fibre core LIU with LC connector, mountable in 19" network rack	2	Nos		
12	24 Fibre core LIU with LC connector, mountable in 19" network rack	6	Nos		
13	12 Fibre core LIU with LC connector, mountable in 19" network rack	2	Nos		
14	6 Fibre core LIU with LC connector, mountable in 19" network rack	3	Nos		
15	Cable manager mountable in 19" Network Rack	85	Nos		
16	CAT 6A UTP Patch Cord 2 meter	90	Nos		
17	CAT 6 UTP Patch Cord 2 meter	1100	Nos		
18	CAT 6 UTP Patch Cord 5 meter	1100	Nos		
19	CAT 6 UTP Patch Cord 1 meter	1100	Nos		
20	Single Mode pigtail with LC connector	250	Nos		
21	LC-LC single mode duplex patch cord 2 meter	36	Nos		
22	42 U Network rack with integrated cooling and Power Backup with 6 kVA UPS compatible with the network switch supplied.	2	Nos		
23	19-inch, 1000 mm depth, 32U Floor Standing Network rack with 8 socket power-strip	3	Nos		
24	19-inch, 650 mm depth, 12U Floor Standing Network rack with 8 socket power-strip	3	Meters		
25	UV treated PVC casing and capping 40 x 40 mm in meters with necessary accessories	17000	Meters		

26	Metal raceways (6" Perforated and hot deep galvanised)	4200	Meters		
27	UV treated PVC conduit of diameter of 32mm in meters with necessary accessories	500	Meters		
28	1.5-inch HDPE pipe with of PE-63 or higher in meters	1000	Nos		
29	Rack Mountable UPS 10 KVA, 3φ online UPS with SMF Batteries providing at least 1hour backup for a load of 8KW with battery stand and other necessary accessories including input and output circuits	2	Nos		
30	Rack Mountable UPS 6 KVA, 1φ online UPS with SMF Batteries providing at least 1hour backup for a load of 4KW with battery stand and other necessary accessories including input and output circuits	3	Nos		
31	5/15 AMPS round pin power socket with switch and back box	16	Meters		
32	3-core, 1.5 sq mm wire, shielded copper electrical cable in meters	300	Nos		
33	Configuration and Installation/mounting on ceiling/wall or angle bracket of Access points with radium reflective labelling	75	Nos		
34	Configuration and Installation of Network Switches in network rack with radium reflective labelling	30	Nos		

	Civil Work				
1	Excavation of soil (depth 3 feet, width 1 feet) and resurfacing for burial of HDPE Pipe per running meter	500	Meters		
2	Excavation of soil and construction of 3x3x3 ft brick chamber with RCC lid for pulling outdoor OFC	5	Nos		
3	Horizontal Directional Drilling (HDD) for crossing roads in meters	30	Meters		
4	Moiling for crossing roads in meters	30	Meters		
5	Installation of UTP cables through PVC casing and capping in meters	48000	Meters		
6	Installation of OFC through PVC conduit indoors meters	500	Meters		
7	Installation of indoor electrical cables through PVC conduit in meters	300	Meters		
8	Installation of PVC conduit in meters	21700	Meters		
9	RCC core cutting of 3-inch diameter for inter-floor wiring	10	Nos		
10	Installation of HDPE pipe underground (3 feet from solid surface) in meters	1000	Meters		
11	Installation of outdoor OFC through HDPE pipe in meters	1000	Meters		

	Installation and Services				
1	Installation, termination and labelling of UTP cables on Jack Panel	51	Nos		

2	Termination and labelling of UTP cables on Information Outlet with Face plate and back box	1190	Nos		
3	Installation and labelling of LIU	13	Nos		
4	Fusion splicing of pigtails with OFC inside LIU	490	Nos		
5	Installation of power socket	16	Nos		
6	Installation of all network rack with cable dressing and labelling on patch cord	7	Nos		
7	Installation of 10KVA UPS and batteries with proper earthing and MCB	2	Nos		
8	Installation of 6 KVA UPS and batteries with proper earthing and MCB	3	Nos		
9	Documentation of the entire project, as mentioned in the RFP	1	Nos		
10	Testing and generating reports as mentioned in RFP	1	Nos		
11	AMC charges for additional 2 years post 3 years warranty	1	Nos		

ANNEXURE 2

Technical Compliance Sheet for Active Components

Specifications		Yes/No	Remark
1.	**Access Point- Type 1**		
i.	Must have at least one 5 Gbps Ethernet interface.		
ii.	Must be Controller based and must be locally hosted.		
a.	The data plane and Controller plane must be separate. That is, even if the controller is down or out of network, the Access Points must continue to function normally.		
b.	High Availability of Controller must be ensured with easy Disaster Recovery possible.		
c.	Data transfer between Access Point and Controller must be encrypted.		
iii.	The solution must be scalable to support up to at least 150 Access points		
iv.	The Access points must be Wi-Fi CERTIFIED 6™.		
v.	Must support IEEE 802.11a/n/ac/ax on 5Ghz band and IEEE 802.11b/g/n/ax on 2.4Ghz band.		
vi.	Access Points must work with all features supported on PoE+.		
vii.	Access Point shall support tri radio operation with 4x4 MIMO on all three radio interfaces and MU-MIMO technology with option to combine the 2 radio to operate on 8x8 operation.		
viii.	Access Point shall be able to support Multigigabit Ethernet, support up to 5 Gbps PHY speed using single Cat5e or above (Cat6, Cat6a, Cat7) cable		
ix.	Access Point should have Bluetooth5 radio to support use cases of location, asset tracking and analytics.		
x.	Access Point shall be able to power up using 802.3at power with full radio operation of 12 Spatial streams and transmit power upto 22dBm		
xi.	Access Point shall support Dual 5GHz radios		
xii.	Access Point shall have a dedicated radio/chipset 1x1/2x2 for spectrum monitoring capabilities, WIPS, and off-channel RRM without compromising and using the client-serving radios.		
xiii.	Access Point shall support hardware driven beamforming		
xiv.	Access Point should have 1x 5gig Multigigabit Ethernet (RJ-45) – IEEE 802.3bz		
xv.	Access Point should have USB port for future requirement.		
xvi.	Must have at least 3 dBi Antenna gain on each radio		
xvii.	Must Support data rate up to 5 gbps.		
xviii.	Must support minimum of 23 dbm of transmit power in both 2.4Ghz and 5 Ghz radios. And should follow the local regulatory Norms.		
xix.	Must support AP enforced load-balance between 2.4 Ghz and 5 Ghz band.		
xx.	Must incorporate radio resource management for power, channel and performance optimization		

xxi.	Must have -97 dB or better Receiver Sensitivity.		
xxii.	Must support Proactive Key Caching and/or other methods for Fast Secure Roaming.		
xxiii.	Must support Management Frame Protection.		
xxiv.	Should support locally significant certificates on the APs using a Public Key Infrastructure (PKI).		
xxv.	Access Points must support Hardware-based encrypted user data and management traffic between controller and Access point for better security.		
xxvi.	Must support the ability to serve clients and monitor the RF environment concurrently.		
xxvii.	Same model AP that serves clients must be able to be dedicated to monitoring the RF environment.		
xxviii.	Must be plenum-rated (UL2043).		
xxix.	Must support 12 WLANs per AP for SSID deployment flexibility.		
xxx.	Access Point Must continue serving clients when link to controller is down. It should also have option to authenticate user through Radius server directly from Access Point during link unavailability to controller.		
xxxi.	Must support telnet and/or SSH login to APs directly for troubleshooting flexibility.		
xxxii.	Must support QoS and Video Call Admission Control capabilities.		
xxxiii.	Access point should be Wi-Fi 6 certified		
2.	**Access Points – Type 2**		
i.	Must have at least one 2.5Gbps Ethernet interface.		
ii.	Must be Controller based and must be locally hosted.		
a.	The data plane and Controller plane must be separate. That is, even if the controller is down or out of network, the Access Points must continue to function normally.		
b.	High Availability of Controller must be ensured with easy Disaster Recovery possible.		
c.	Data transfer between Access Point and Controller must be encrypted.		
iii.	The solution must be scalable to support up to at least 150 Access points		
iv.	The Access points must be Wi-Fi CERTIFIED 6™.		
v.	Must support IEEE 802.11a/n/ac/ax on 5Ghz band and IEEE 802.11b/g/n/ax on 2.4Ghz band.		
vi.	Apart from DC power, the Wi-Fi Access Points must work with all features supported on PoE+.		
vii.	The Access Point must have at least 2X2 MU-MIMO spatial streams 2.4GHz radio and 4X4 MU-MIMO spatial streams on 5GHz radio.		
viii.	The Access Point must support POE+ on 802.3at/bt.		
ix.	Must support WPA2 and WPA3 Enterprise.		
x.	Must support two-way band steering (example from 2.4GHz band to 5GHz and from 5 GHz to 2.4 GHz).		
xi.	Must support auto channel allocation to avoid interference between APs.		
xii.	Must support auto transmission power selection based on neighbor count and loudness for both bands.		

xiii.	Must support manual transmission power selection per Access Point on a granularity scale of 1 dBm.		
xiv.	The Wi-Fi radio transmission parameters must comply with the Indian transmission regulations.		
xv.	The Wi-Fi radio must have a transmit power of 23 dBm (without considering antenna gain) or higher for both 2.4Ghz and 5Ghz.		
xvi.	Must support both Bridge and NAT modes.		
xvii.	Must support configurable management VLAN (support other than VLAN-1 as management VLAN).		
xviii.	Must be ceiling mountable with all necessary accessories for ceiling mounting included.		
xix.	The Controller and Access Point device should support dual stack for IPV4 and IPV6.		
xx.	The Access Points must simultaneously broadcast at least 6 SSIDs as visible network to client.		
xxi.	The solution should detect and identify all types of Wi-Fi enabled client devices.		
xxii.	Both the controller and Wi-Fi device should support SNMP v2c, v3.		
xxiii.	The solution should support RADIUS, Active Directory and LDAP based authentication.		
xxiv.	The proposed Controller and Access Points must be of reliable and reputed brand only.		
xxv.	The solution should be able to work in a heterogenous environment by not hindering the operation of existing APs of different makes already deployed at IISc.		
xxvi.	The solution should maintain logs which includes all activities performed by the users like login, any configuration changes made on the system, device deletion, device authorization, log out etc., for at least 365 days.		
xxvii.	The solution should support uploading of all logs to external Syslog Server in LAN/WAN on real-time and scheduled basis.		
xxviii.	The solution should block traffic based on IP address, port, URL, hostname etc. and QoS (for example: bandwidth restriction for the SSID, QoS tagging of special traffic like Voice) at the edge (AP).		
xxix.	The solution must allow VLAN segmentation at the edge.		
xxx.	The solution must support Advanced Encryption Standards (AES), Temporal Key Integrity Protocol (TKIP).		
xxxi.	The solution must have the capability of auto classifying Wi-Fi clients as authorized (managed clients connecting to IISc, Bangalore network), guest, rogue (un-managed client attempting connection to IISc, Bangalore network) or external (unmanaged not connecting to IISc, Bangalore network e.g., neighbor), in addition to manual classification.		
xxxii.	Access Point shall have dedicated radio/chipset for spectrum monitoring capabilities, WIPS and off channel RRM without compromising and using the client serving radios.		
xxxiii.	Access Point should have 1x 100, 1000, 2500 Multigigabit Ethernet (RJ-45) – IEEE 802.3bz		
Necessary Licenses, warranty, and support for all access points			
i.	The quote should include all required Hardware and Software licenses to support all the Access Points and Controllers. The solution should include these licenses from the first day of the installation. There should not be any additional licenses required for DR.		

ii.	All the AP features should be active post-expiration of the subscription/license validity. All the features and signatures available at the time of expiration of the license should continue to work. Renewal of licenses should be required only for new features, Visibility, configuration changes, and updates/releases announced by the OEM after the contract expires. The vendor must propose a perpetual license.		
iii.	The total solution should have 5 years' on-site warranty for Access Points and controller.		
iv.	The total solution should include technical support for software/firmware and software upgrades for controller and Access Points for 5 years.		
v.	TAC support must be from OEM not Bidder during the whole 5 years.		
vi.	The total solution should be upgradable to the latest stable firmware version, as and when available, at no extra cost.		
vii.	Warranty support should include NBD hrs. response time and provision of replacement along with appropriate configuration and installation in next business day for Hardware.		
Possible access points models:			
A. Indoor for Labs and general locations:			
i.	Must have at least one 2.5 Gbps Ethernet interface.		
ii.	Must have at least 4x4:4 on 5Ghz and 2x2 2.4 Ghz radio		
iii.	Must support DL-MU-MIMO and UL-MU-MIMO		
iv.	Must support DL-MU-OFDMA and UL-MU-OFDMA		
B. Indoor auditorium and big classrooms:			
i.	Must have at least one 5Gbps Ethernet interfaces.		
ii.	Must have at least 8x8:8 5Ghz radio and at least 4x4 2.4Ghz radio		
iii.	Must support DL-MU-MIMO and UL-MU-MIMO		
iv.	Must support DL-MU-OFDMA and UL-MU-OFDMA		
3.	**48 Port Non-PoE**		
Specification			
i.	Switch should be 1U and rack mountable in standard 19" rack.		
ii.	Switch should support internal field replaceable unit redundant power supply from day of commissioning.		
iii.	Switch should have minimum 2 GB RAM and 2 GB Flash.		
iv.	Stacking/interconnection with ring-based topology to have minimum 48Gbps throughput or 20Gbps for Direct interconnects. All necessary interconnectors and cables must be supplied along with the switches up to a pod of 4 Switches.		
Performance			
i.	Switch shall have minimum 176 Gbps of switching fabric and 130 Mpps of forwarding rate with non-blocking architecture		
ii.	Switch shall have minimum 16K MAC Addresses and 250 active VLAN.		
iii.	Should support minimum 11K IPv4 routes or more		
iv.	Switch shall have 1K or more multicast routes.		
v.	Switch should support atleast 16K flow entries		
vi.	Switch should support 128 or more STP Instances.		

vii.	Switch should have 4MB or more packet buffer.		

Functionality

i.	Switch should support IEEE Standards of Ethernet: IEEE 802.1D, 802.1s, 802.1w, 802.1x, 802.3ad, 802.3x, 802.1p, 802.1Q, 802.3, 802.3u, 802.3ab, 802.3z.		
ii.	Switch must have functionality like static routing, RIP, REP PIM, OSPF, VRRP, PBR and QoS features from Day1.		
iii.	Switch should support network segmentation that overcomes the limitation of VLANs using VXLAN and VRFs.		
iv.	Switch shall have 802.1p class of service, marking, classification, policing and shaping and eight egress queues.		
v.	Switch should support management features like SSHv2, SNMPv2c, SNMPv3, NTP, RADIUS and TACACS+.		
vi.	Switch should support RFC 2460 Internet Protocol, Version 6 (IPv6) Specification RFC 2461 Neighbour Discovery for IP Version 6 (IPv6), RFC 2462 IPv6 Stateless Address Auto-configuration and RFC 2463 Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification		
vii.	Switch should support 802.1x authentication and accounting, IPv4 and IPv6 ACLs and Dynamic VLAN assignment.		
viii.	Switch must have the capabilities to enable automatic configuration of switch ports as devices connect to the switch for the device type.		
ix.	During system boots, the system's software signatures should be checked for integrity. System should be capable to understand that system OS are authentic and unmodified, it should have cryptographically signed images to provide assurance that the firmware & BIOS are authentic.		

Interface

i.	Switch shall have 48 nos. 10/100/1000 Base-T ports and 4 nos of SFP+ port.		

Certification

i.	Switch shall conform to UL 60950 or IEC 60950 or CSA 60950 or EN 60950 Standards for Safety requirements of Information Technology Equipment.		
ii.	Switch shall conform to EN 55022 Class A/B or CISPR22 Class A/B or CE Class A/B or FCC Class A/B Standards for EMC (Electro Magnetic Compatibility) requirements.		
iii.	Switch / Switch's Operating System should be tested for EAL 2/NDPP or above under Common Criteria Certification.		

4.	**48 Port Mgig switch**		

Specification

i.	Switch should be 1U and rack mountable in standard 19" rack.		
ii.	Switch should support internal field replaceable unit redundant power supply from day of commissioning.		
iii.	Switch should have minimum 2 GB RAM and 2 GB Flash.		
iv.	Stacking/interconnection with ring-based topology to have minimum 48Gbps throughput or 20Gbps for Direct interconnects. All necessary interconnectors and cables must be supplied along with the switches up to a pod of 4 Switches.		

Performance

i.	Switch shall have minimum 272 Gbps of switching fabric with non-blocking architecture		
ii.	Switch shall have minimum 16K MAC Addresses and 250 active VLAN.		

iii.	Should support minimum 11K IPv4 routes or more		
iv.	Switch shall have 1K or more multicast routes.		
v.	Switch should support atleast 16K flow entries		
vi.	Switch should support 128 or more STP Instances.		
vii.	Switch should have 4 MB or more packet buffer.		
Functionality			
i.	Switch should support IEEE Standards of Ethernet: IEEE 802.1D, 802.1s, 802.1w, 802.1x, 802.3ad, 802.3x, 802.1p, 802.1Q, 802.3, 802.3u, 802.3ab, 802.3z.		
ii.	Switch must have functionality like static routing, RIP, REP PIM, OSPF, VRRP, PBR and QoS features from Day1.		
iii.	Switch should support network segmentation that overcomes the limitation of VLANs using VXLAN and VRFs.		
iv.	Switch shall have 802.1p class of service, marking, classification, policing and shaping and eight egress queues.		
v.	Switch should support management features like SSHv2, SNMPv2c, SNMPv3, NTP, RADIUS and TACACS+.		
vi.	Switch should support RFC 2460 Internet Protocol, Version 6 (IPv6) Specification RFC 2461 Neighbor Discovery for IP Version 6 (IPv6), RFC 2462 IPv6 Stateless Address Auto-configuration and RFC 2463 Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification		
vii.	Switch should support 802.1x authentication and accounting, IPv4 and IPv6 ACLs and Dynamic VLAN assignment		
viii.	Switch must have the capabilities to enable automatic configuration of switch ports as devices connect to the switch for the device type.		
ix.	During system boots, the system's software signatures should be checked for integrity. System should be capable to understand that system OS are authentic and unmodified, it should have cryptographically signed images to provide assurance that the firmware & BIOS are authentic.		
Interface			
i.	48 UTP 10/100/1000 Mbps and at least 8/12 ports of Mgig (1/2.5/5 Gbps) ports, all 8/12 ports must concurrently support (1/2.5/5 Gbps), and the switch should have at least 4 SFP+ port layer-2, manageable switch having at least 740 W power budget for POE (Support POE+ on all ports concurrently) with redundant power supply		
Certification			
i.	Switch shall conform to UL 60950 or IEC 60950 or CSA 60950 or EN 60950 Standards for Safety requirements of Information Technology Equipment.		
ii.	Switch shall conform to EN 55022 Class A/B or CISPR22 Class A/B or CE Class A/B or FCC Class A/B Standards for EMC (Electro Magnetic Compatibility) requirements.		
iii.	Switch / Switch's Operating System should be tested for EAL 2/NDPP or above under Common Criteria Certification.		
5.	**Core switch**		
General Features:			
i.	Switch should be 1U and rack mountable in standard 19" rack.		
ii.	Switch should support internal hot-swappable Redundant Power supply from day of commissioning.		
iii.	Switch should have redundant hot swappable fans.		

iv.	Switch should have minimum 4 GB RAM and 4 GB Flash.		
v.	<mark>Stacking/interconnection with ring-based topology to have minimum 48Gbps throughput or 20Gbps for Direct interconnects. All necessary interconnectors and cables must be supplied along with the switches up to a pod of 4 Switches.</mark>		
Performance:			
i.	Switch shall have minimum 800 Gbps of switching fabric with non-blocking architecture.		
ii.	Switch shall have minimum 32K MAC Addresses and 1000 active VLAN.		
iii.	Should support minimum 32K IPv4 routes or more and 16K IPv6 routes or more		
iv.	Switch shall have 8K or more multicast routes.		
v.	Switch should support atleast 64K flow entries		
vi.	Switch should support 128 or more STP Instances.		
vii.	Switch should have 16MB or more packet buffer.		
Functionality			
i.	Switch should support IEEE Standards of Ethernet: IEEE 802.1D, 802.1s, 802.1w, 802.1x, 802.3ad, 802.3x, 802.1p, 802.1Q, 802.3, 802.3u, 802.3ab, 802.3z & 1588v2.		
ii.	Switch must have functionality like static routing, RIP, PIM, OSPF, VRRP, PBR and QoS features from Day1		
iii.	Should support advance Layer 3 protocol like BGPv4, BGPv6 , MPLS, VRF, VXLAN, IS-ISv4, OSPFv3, MP-BGP		
iv.	Switch shall have 802.1p class of service, marking, classification, policing and shaping and eight egress queues.		
v.	Switch should support management features like SSHv2, SNMPv2c, SNMPv3, NTP, RADIUS and TACACS+ .		
vi.	<mark>Switch should support RFC 2460 Internet Protocol, Version 6 (IPv6) Specification RFC 2461 Neighbour Discovery for IP Version 6 (IPv6), RFC 2462 IPv6 Stateless Address Auto-configuration and RFC 2463 Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification</mark>		
vii.	<mark>Switch should support 802.1x authentication and accounting, IPv4 and IPv6 ACLs and Dynamic VLAN assignment</mark>		
viii.	Switch must have the capabilities to enable automatic configuration of switch ports as devices connect to the switch for the device type.		
ix.	During system boots, the system's software signatures should be checked for integrity. System should be capable to understand that system OS are authentic and unmodified, it should have cryptographically signed images to provide assurance that the firmware & BIOS are authentic.		
x.	Switch shall have modular OS to support application 3rd party application hosting		
Interface			
i.	<mark>16 SFP+ ports layer-3 manageable 1G/10G switch with dual power supply</mark>		
Certification:			
i.	Switch shall conform to UL 60950 or IEC 60950 or CSA 60950 or EN 60950 Standards for Safety requirements of Information Technology Equipment.		
ii.	Switch shall conform to EN 55022 Class A/B or CISPR22 Class A/B or CE Class A/B or FCC Class A/B Standards for EMC (Electro Magnetic Compatibility) requirements.		

iii.	Switch / Switch's Operating System should be tested for EAL 2/NDPP or above under Common Criteria Certification.		
6.	**Wireless Controller**		
Hardware			
i.	The controller shall support deployment flexibility without compromising any features		
ii.	The controller shall support min 5 Gbps tunneling capacity and shall be upgradable to 10 gbps.		
iii.	The controller shall support 2x 10G/Multigigabit copper uplink.		
iv.	Wireless Controller shall support link aggregation and load sharing between Access Point to WLC links		
v.	The controller shall support hardware encrypted data plane between Access Point and Controller		
vi.	The controller shall be proposed with complete feature set including licensed feature		
High Availability			
i.	High Availability mode shall support controller inline data plane mode as well as local switching mode and Mesh mode		
ii.	High Availability mode shall allow geographically dispersed installation between Controllers		
iii.	The controller failover shall not trigger client de-authentication and re-association		
iv.	The controller shall support hot WLC software patching for fixing bugs		
v.	The controller shall support hot AP software patching for fixing bugs		
vi.	The controller shall support new AP hardware without need for upgrading entire controller software.		
vii.	The controller shall support rolling AP upgrade		
viii.	The controller shall support rolling AP upgrade without need for clustering		
ix.	The redundant Controller shall sync Access Point and Client Status, including DHCP IP lease status		
Software			
i.	Access Point shall be able to proactively distributes Client connection before and after association and tracking client condition in real time using data packet RSSI		
ii.	The controller shall support standard-based, secure AP-Controller data & control protocol like CAPWAP. protocol that has known vulnerability like PAPI cannot be used.		
iii.	The controller shall support Inter-Controller Wireless Roaming, or the controller should support at least 1000 Aps		
iv.	The controller shall maintain per-user Application usage and shall be able to export it for network analytic.		
v.	The controller shall support Multi Languages options from embedded GUI Management		
vi.	The controller shall provide per-Client Connection Scoring and provide reasoning of Client Connection Score		
vii.	The controller shall support Cellular offload using IPv6 tunneling to Mobile Core network		
RF management			
i.	The controller shall be able to support multiple RF Management profile per group of APs, including Transmit Power Control and Dynamic Channel Assignment on both 2.4GHz and 5Ghz		

ii.	The controller shall be able to identify and avoid interferers with network performance impact analysis report		
iii.	<mark>The controller shall support optimized manual/automatic channel width (20~160Mhz) selection over 5GHz, 802.11ac</mark>		

Mesh

i.	Mesh AP nodes shall provide quick convergence and fast failover to new root mesh node		
ii.	Mesh Backhaul interface shall support full duplex operation using wired daisy chaining		
iii.	Mesh AP shall support fast roaming for Wired-client through wired-to-wireless bridge client		

Application Recognition and Control

i.	The controller shall support per-user and per-WLAN based application recognition and control that throttle usage by rate-limiting		
ii.	The controller application recognition technology shall support exporting to 3rd party compatible format, such as NetFlow v9		
iii.	The controller shall provide policy-based mDNS gateway including Chromecast gateway		
iv.	The controller shall support new application signatures without upgrading controller software		

BYOD & Security

i.	The controller shall provide Device Profiling using multiple profiling methods to reduce false detection		
ii.	The system shall provide secure onboarding service for both employee and guest based on standard-based security protocol		
iii.	Proposed system shall not use public cloud as user data repository		
iv.	The controller shall be able to be embedded custom web portal page (HTML) to fully customize user experience without additional cost or extra box		
v.	The controller shall provide rule-based rogue classification and automatically run rogue mitigation action		
vi.	The controller shall be able to detect employee device connection to Rogue Access Point and contain it automatically. It should also support protection from Honeypot or Evil twin.		
vii.	The system shall support control plane encryption on both IPv4 and IPv6		
viii.	The Controller's image upgrade shall be done through secure, encrypted transport		
ix.	The controller shall be able to provide unique pre-shared keys to the devices that do not support the 802.1x security protocol		
x.	The controller shall support Identity PSK for on boarding		
xi.	The controller shall support identification & mitigation of threats inside encrypted traffic		

Network

i.	The controller shall support mapping of specific VLANs to single SSID, depending on Access Point location and user		

Configuration

i.	The controller shall support automatic VLAN assignment per SSID to load-balance user connection.		
ii.	Assigned VLAN pool shall be same as number of available VLAN in the system		
iii.	The controller shall support embedded best practice configuration profile and setup		

iv.	The controller shall support packet fragmentation between Access Point and controller communication		
7.	**Network Management System**		
General			
i.	Single NMS should be able to manage Wired and Wireless devices. It should be from same OEM of active network devices bidder is quoting.		
Administration & Security			
i.	NMS should have the ability to establish function-level, role-based permissions (e.g., who can use what functions of the product)		
ii.	The Management System shall support LDAP/AD integration for the user authentication. (Administration shall be handled within AD or local, not both)		
iii.	Within the password policy: Should be able to set min, Length, expiration		
iv.	The Management System shall allow role-based authorization with different rights and views assigned to these roles. Based on network element groups assigned to users' groups		
v.	NMS should support user-based roles with different management privileges.		
vi.	NMS should support RADIUS /TACACS+ authentication.		
Alarms/Event Management			
i.	NMS should have a centralized, robust switch Syslog management with filtering capability by severity, facility, and device IP address.		
ii.	NMS should support Display events and generate alarms.		
iii.	NMS should support Detailed reporting including events and alarms, inventory, and outages.		
iv.	Must support customizable performance and interface thresholds alert management		
v.	Must support historical alarm management.		
vi.	Must support and provide alarm notification alert through console, e-mail alert.		
vii.	NMS should provide fault suppression.		
viii.	It should be possible to acknowledge multiple alarms. The timestamp and the user who acknowledged the alarm should be stored in the Management System.		
ix.	The Management System shall be able to categorize alarms, into different severity levels		
x.	Event history: Event shall be stored with timestamps		
xi.	Alarm burst protection / mitigation: The Management System should be able to handle a vast amount of alarms/events		
xii.	The requisite server needs to be supplied by the Bidder.		
API Support			
i.	NMS should support Inbound/Outbound Application Programming Interfaces (API's). This could be your own API or 3rd Party integration API's.		
ii.	Northbound and Southbound Interfaces, The Management System shall be able to forward alarms to other systems.		
iii.	Standard based API's: The Management System should offer Standard based API's		
Architecture			

i.	NMS should be available as a hardware or virtual appliance. Bidder should quote necessary server/ appliance as per OEM best practice.		
ii.	NMS software should have scaling capacity of minimum upto 7000 devices per instance if need to upgrade in future. License as per requirement.		
iii.	The system supports hierarchical deployment where each software system at its own level can run independently, execute permissions separately, and have local portal and collection servers.		
iv.	The system supports integrated management of network devices, hosts. Besides, it can analyze and manage interactions between IT resources, and support a unified monitoring policy, unified alarm policy and view management.		
v.	The system can provide a one-page summary view of business operation.		
vi.	Product should support IPFIX (NetFlow v10)		
vii.	The Management System shall support local database.		
Change and Compliance Management			
i.	NMS should have networking best practices to proactively identify suboptimal configuration settings such as port duplex mismatch, VLAN, IPSLA, QoS, PBR, misconfigurations, and others.		
ii.	NMS should have built-in workflow processes to include Network Configuration Validation, Change Approval Process, and Configuration Deployment Process.		
iii.	NMS should provide out-of-the-box policy content with your product (e.g., SOX, PCI, Best Practice, NSA security best practice guidelines)		
iv.	NMS product come with pre-defined, out-of-the-box compliance reports.		
v.	NMS product should detect network device configuration changes (for example, changes to OS version, IP address, hostname, textual configuration files, and hardware, software and modeled (e.g., ACL, VLAN) configuration attributes) for devices in inventory.		
vi.	NMS should have the ability to log configuration changes and who made them.		
vii.	NMS should have the ability to detect configuration changes via real-time external events - Syslog messages.		
Configuration Management			
i.	Must support device configuration backup and restore feature		
ii.	Must support device configuration backup in manual or scheduled basis.		
iii.	Must support device configuration management in per device or batch mode operation		
iv.	Must support device configuration comparison feature between two specified configures, and the configuration changes will be highlighted in different color.		
v.	Must support software management.		
vi.	NMS should have the ability to compare configuration versions using a side-by-side, split-screen display to highlight differences between current captured configuration		
vii.	NMS tool should have the ability to highlight differences in textual configuration files.		

viii.	NMS should have the ability to update individual configuration attributes (rather than uploading entire configuration files to update one attribute)		
ix.	NMS should have the ability to remediate a device back into compliance and roll back to a previously saved configuration by automatically prompting the user.		
x.	NMS should have the ability to perform changes with a list of command lines (e.g., cut-and-paste CLI commands).		
xi.	NMS should have the ability to perform changes with scripts to handle more-complex configuration changes to network devices.		
xii.	NMS should have the ability to perform a textual configuration search using regular expression pattern matching.		
Discovery			
i.	Must support discovery of devices through route table, arp table and network number.		
ii.	Provide an estimate of how quickly your Network Configuration & Change Management (NCCM) platform can be up and operational? (i.e., installed configured, fully discovered all devices and able to retrieve and push changes)		
iii.	NMS should support discovery on IPv4.		
iv.	NMS should support discovery on IPv6		
v.	The Management System should be able to automatically discover the network elements as well as their status and status change with no manual intervention using Different MIBs		
vi.	The Management System should be able to automatically discover the network elements as well as their status and status change with no manual intervention.		
Group Management			
i.	NMS should support Device management capability using device groups		
ii.	Device Grouping Flexibility		
Inventory Management			
i.	NMS product should support push/pull update software on network devices.		
ii.	NMS should provide Interface inventory, display switch ports and connected device's IP addresses.		
iii.	NMS should support Device inventory displaying detailed hardware components of all managed devices		
iv.	Must support VLAN management		
v.	NMS product should do automatic proactive vulnerability discovery for the platforms it manages (i.e., PSIRT, bugs, hardware lifecycle management)		
Monitoring			
i.	The system has a default monitoring policy. The system provides a recommended monitoring policy, which can be modified as required.		
ii.	The system supports replication of policies and applies replicated policies to other monitored objects to improve the deployment efficiency.		
iii.	The system supports formulation of resource policies in batches, that is, the system can add objects with the same monitoring policy in batches.		

iv.	Be able to collect data about bandwidth utilization, store it and present it via GUI.		
v.	QoS Profiles - Different Classes - Exceed, violate and conform statistics, Policing statistics, Classification statistics, Queuing statistics		
vi.	NMS should have a summary page that shows the number of devices, links, interfaces, license used/available status, and device collection status.		
Network Topology			
i.	The system sets filtering conditions for creating sub topologies of layer 2 and layer 3 topologies and supports importing layer 2 and layer 3 topologies.		
ii.	The system supports topology customization using devices and pictures provided by the system.		
iii.	The system supports nodes to be deployed using icons or symbols of devices. These icons and symbols are also available for resources and sub networks.		
iv.	Able to add and change backgrounds to have better visual effect		
v.	Auto topology discovery - Layer 2 and Layer 3(BGP, OSPF, IS-IS and LDP)		
Performance			
i.	The system supports component extensions such as traffic analysis, log monitoring, and script monitoring to facilitate integrated monitoring of the operation and maintenance of IT resources.		
ii.	The system supports the NetFlow and IPFIX protocols by using Flow technologies.		
iii.	The system supports viewing traffic based on multiple dimensions, such as applications, sources, purposes, and sessions.		
iv.	The system provides complete traffic analysis functions, including real-time monitoring of network traffic, alarming for traffic overload, analyzing traffic		
v.	The system provides traffic flow direction analysis, monitors TCP sessions, and provides the matrix view for TCP sessions to present the statistics for traffic of all network nodes and sessions.		
vi.	Must support historical port utilization and performance report for up to last 180 days		
vii.	Operation status of the processes		
viii.	User-defined index such as the real-time connection and traffic of the network adapter, and the packet loss rate, utilization, and transmission rate of the network port.		
ix.	Should map call flows through the network to pinpoint problem areas.		
x.	Jitter: The Management System shall be able to monitor jitter via IP sla or probe		
xi.	Delay: The Management System shall be able to monitor delay via IP sla or probe		
xii.	Latency: The Management System shall be able to monitor latency via IP sla or probe		
8.	**Transceivers**		
i.	Single Mode 1310 nm SFP+ transceiver (10GBASE-LR) of the same OEM as the quoted switch. The transceivers must be compatible with the quoted switches.		
ii.	Each of the Seven (7) Stacks should have 4 Transceivers (7 x 4 = 28) and another 4 transceivers for the Core uplink connectivity.		

ANNEXURE 3

Technical Compliance Sheet for Passive Components, Civil Work, Installation and Services

Specifications	YES/No	Remark
A. Passive Components		
A.1. Manufacturers (OEM) criteria		
i. The Bidder has provided network racks with PDU from any reliable and reputed brand only.		
ii. All electrical components must be of any reliable and reputed brand make only.		
iii. OEM should have a manufacturing presence with 10Years in India. Proof of Incorporation should be attached		
iv. OEM shall provide min 25 years of warranty on component as well as performance for all the offered products		
v. All Passive Components should be ROHS Complied- Supporting ROHS Certificated to be attached		
vi. Only Premium Brand and No Class B Products should be quoted		
A.2. Network Racks with PDUs: Racks of the following sizes are required:		
i. 42 U – Network rack with integrated cooling		
ii. 32 U – Standard 19-inch Rack with minimum depth of 1000 mm		
iii. 12 U – Standard 19-inch Rack with minimum depth of 650 mm		
Specifications for the 42 U Network rack with integrated cooling		
i. Built-in Features Enclosure: Emergency Fan Cooling, Lighting, Dual Input Power Panel, Cable Management, Intelligent Controls with Touchscreen Display		
ii. Power Protection: 6kVA Easy UPS with Battery pack		
iii. Power Distribution: Metered		
iv. Power Input: 230V / 50Hz		
v. Cooling: 3.5kW Split DX with intelligent eco modes		
vi. Ventilation: Fan Assisted with automated economizer/ emergency modes		
vii. Security: Standard Lock, Intrusion Detection		
viii. Fire Suppression: Optional		
ix. Monitoring: + configurable with DCIM software		
x. Cabinet Dimension (H×W×D): 2180×800×1200 (mm) Includes top of emergency fan cooling unit		
xi. Usable RU space: 36 RU (6kVA SRV)		
xii. Cooling capacity: 3500 W, variable speed		
xiii. UPS Capacity: 6 kVA		
A.3. CAT6A Technical Specification's		
CAT6 A 10G Shielded LSZH U/FTP Cable		
i. The cable is constructed of 4 screened pairs and a drain wire. Cable should minimise alien crosstalk, provides excellent signal isolation and provides superior electromagnetic interference (EMI) protection.		
ii. System is compliant with the latest ISO/IEC 11801 A1.1 draft and ratified TIA/EIA 568-B.2-10 for the support of 10GBASE-T.		
iii. ETL verified to TIA/EIA-568-B.2-10 Category 6A standard		
iv. Commercial Standards | ISO/IEC 11801 amendment 2:2010 Class EA, TIA/EIA-568-C.2 Category 6A, IEC 61156-5, ETL independent testing, EN50288-6-1 Standard		
v. Fire Propagation Test | IEC 60332-1		

vi.	Application	IEEE 802.3 10GBASE-T 10Gb/s, IEEE 802.3 1000GBASE-T 1Gb/s, TIA/EIA-854 1000BASE-TX 1Gb/s, ATM 155Mb/s 155Mb/s		
vii.	Operating Temperature	Operation: -20˚C to +60˚C		
		Installation: 0˚C to +50˚C		
viii.	Conductor Size	23AWG / Primary Insulation: Polyolefin		
ix.	Screen material	Laminated Aluminium		
x.	Sheath Type: LSOH	LSOH - Low Smoke Zero Halogen		
xi.	Screen	Each pair enclosed in laminated aluminium foil		
xii.	Drain Wire	Tinned Copper		
xiii.	Electrical Characteristics			
xiv.	DC Resistance	Max 8.2 Ohms / 100m at 20 Degree C		
xv.	Resistance	max 2% at 20 Degree C		
xvi.	Insulation Resistance (500V)	min 150 Mohms/Km at 20 Degree C		
xvii.	Mutual Capacitance	Nom. 4.6nf / 100m at 1kHz		
xviii.	Capacitance unbalance (pair to ground)	max 330 pf/100m at 1kHz		
xix.	Test voltage (DC, 1min)	750 V / 1min		

CAT6 A 10G Shielded Jack

i.	Jack Construction	Should be 360Degree Shielded Metal housing		
ii.	Standards	TIA-568-C.2 Augmented CAT6, ISO 11801 Amd 1 Class EA, IEC 60603-7, FCC Subpart F 68.5		
iii.	Mechanical Characteristics	Operating Life: Min 750 insertion cycles		
iv.	Electrical / Optical Characteristics	Interface Resistance: 20m Ohms Initial Contact Resistance: 2.5m Ohms Insulation Resistance: > 100M Ohm		
v.	Dust Cover	Should cover the RJ45 interface to avoid dust & Contaminants		
vi.	Approval	ETL independent testing		
vii.	Should have ROHS Compliant			

Category 6A Field Termination Plug (Tool less)

i.	Category 6A field terminable plug is designed to support 10 Gigabit networks and can be easily terminated using parallel jaw pliers			
ii.	Standards:	IEC 60603-7-5		
		UL Listed		
iii.	Plug protection category	IP 20		
iv.	Supporting cable diameter	6~9mm		
v.	Termination capability	Solid wire 22~26 AWG		
		Stranded wire 22 ~27 AWG		

CAT6A Shielded Patch Cord

i.	Cable - Conductor Size- 24-26AWG Stranded bare copper with Pre-Terminated with RJ 45 Plug			

ii.	Screen material: Aluminium/polyester shield with tinned copper drain wire			
iii.	Screen Max Outer Diameter 6.5mm			
iv.	Screen Temperature Range: -20°C to +60°C			
v.	Plug Operating Life: Minimum 750 insertion cycles Min 750 Insertion cycles			
vi.	Plug Contact Material: Copper Alloy Copper Alloy			
vii.	Plug Contact Plating: 1.25 micrometres Au/Ni			
viii.	RJ45 Plug dimensions compliant with ISO/IEC 60603-7 and FCC 47 Part 68			
ix.	Standards: ISO / IEC 11801 2nd Ed Amd 1 Class EA, TIA-569-C.2 CAT6A, UL 1883; CSA C22.2			
x.	Fire Propagation Tests IEC 60332-1, IEC 61034-2			
xi.	Electrical Characteristics: Max Voltage: 150 VAC (max), Max Current: 1.5A @ 25°C			
xii.	Supports: High Speed 10G BASE-T Networks and backward compatible with 10/100/1000BASE-T Networks			
xiii.	ROHS Compliant			
CAT6 A 10G Unloaded Patch Panel with Rear Cable Manager				
i.	RJ45 I/O Compatibility	Should be compatible with CAT6A 10G Shielded Jack, CAT6 and CAT5e RJ45 Jack		
ii.	Material	CRS - Cold Rolled Steel (Thickness - 1.5mm) with ROHS Compliant		
iii.	Dimension	19" Width, 1U Height / 1.75Inch for 24Port Straight and Angled and 2U Height / 3.5Inch for 48Port Straight and Angled Panel		
iv.	Cable Manager	Flat type Perforated Metal Rear Cable Manager (Iron or Steel Rod will not be accepted)		
		If Rear Cable Manager is not part of the Unloaded Panel, please share Rear Cable Manager with Price and Data Sheet		
v.	Labels	Should include labels and clear label covers at the front and back		
A.4.	**CAT6 Technical Specification's**			
Power Cat 6 4 Pair Cable				
i.	Type	Unshielded twisted pair cabling system, TIA / EIA 568-C.2 Category 6 Cabling system		
ii.	Network support	Supports ultrahigh speed data networks such as Gigabit Ethernet (1000 Base-T and 1000 Base-TX) and beyond.		
iii.	TIA / EIA 568-B.1	ETL Verified, UL Listed andUL channel verified- All three Certificates are mandatory		
iv.	IEEE 802.3ab	Zero-bit Error, ETL verified		

v. Warranty	25-year systems warranty; Warranty to cover Bandwidth of the specified and installed cabling system, and the installation costs. Site certificate must be issued by OEM		
vi. Performance characteristics to be provided along with bid	Attenuation, Pair-to-pair and PS NEXT, ELFEXT and PSELFEXT, Return Loss, ACR and PS ACR for 4-connector channel		
vii. Manufacturer	All passive cabling must be from same OEM (UTP and Fiber)		
viii. Conductors	23 AWG solid bare copper		
ix. Insulation	Polyethylene		
x. Approvals	UL Listed and UL Channel verified		
	ETL verified to TIA / EIA Cat 6		
xi. Frequency tested up to	700 MHz minimum		
xii. Packing	Box of 305 meters		
xiii. Impedance	100 Ohms + / - 15 ohms		
xiv. Performance characteristics to be provided along with bid	Attenuation, Pair-to-pair and PS NEXT, ELFEXT and PSELFEXT, Return Loss, ACR and PS ACR		
xv. Delay Skew:	45ns Max		
xvi. Impedance:	100 ± 15 Ohms		
xvii. Current Rating:	1.5 A Max		
xviii. Conductor DC Resistance:	66.5Ω/km		
xix. Voltage:	150VAC		
xx. Propagation delay:	535ns/100m @250MHz		
xxi. Mutual Capacitance:	5.6nF/100m Nominal		
xxii. Insulation Resistance:	500 MΩ Minimum		
xxiii. Dielectric Strength:	1000 V RMS		
xxiv. Contact Resistance:	10 mΩ Max		
Power Cat 6 Data Gate Jack: Features and Benefits			
i. prevents incomplete mating			
ii. protects from dust and contaminants when terminated			
iii. Features pointed IDC towers to speed termination and enhance cable retention			
iv. Dual color-coding allows for 568 A/B wiring configuration			
v. Can be terminated using industry standard punch-down tools			
vi. RJ-11 compatible			
vii. Molded category identification on jack face as well as optional port identification icons			
viii. USOC Wiring Sequences Available			
ix. Dust Proof: Should cover the RJ45 interface to avoid dust & Contaminants			
x. RJ45 I/O Compatibility	a. Individual Compatible RJ45 Jack		
	b. Pointed IDC Tower on RJ45 Jack for easy termination		

		c. Half Plugged Patch Cord should be spitted out if not properly plugged in		
Mechanical Characteristics				
i.	Plastic Housing:	Thermoplastic UL94V-0 rated or equivalent		
ii.	Operating Life:	Minimum 750 insertion cycles		
iii.	Contact Material:	Copper Alloy		
iv.	Contact Plating:	50µ" Gold/100µ" Nickel		
v.	Contact Force:	100g minimum		
vi.	Plug Retention Force:	11 lbf minimum		
IDC Connector				
i.	Plastic Housing:	Thermoplastic UL94V-0 rated or equivalent		
ii.	Operating Life:	Minimum 20 reterminations		
iii.	Contact Material:	Copper Alloy		
iv.	IDC Contact Plating:	Tin/Lead Plate		
v.	Wire Accommodation:	22-24 AWG solid		
Electrical Characteristics				
i.	Interface Resistance:	20 milliohms		
ii.	Initial Contact Resistance:	2.5 milliohms		
iii.	Insulation Resistance:	>100 Megaohms		
Wall plates				
i.	Features and Benefits	The stylish unloaded Synergy Wall plates were designed specifically to accept the UTP Data gate Connector. The unloaded Synergy Wall plates are available in 1, 2 and 4 port variants, in five colours, to co-ordinate with any decor and any installation size.		
ii.	Accommodates	Accommodates UTP, STP Data gate jacks, Molex single bezel Fibre modules, Molex media configurable modules		
iii.	Material	VE10 ABS		
A.5.	**24 Port loaded Patch Panel 1U Height**			
Features and benefits				
i.	Available in 1U 24 Port and 2U 48 Port density			
ii.	Prevents incomplete mating			
iii.	Protects from dust and contaminants			
iv.	Features pointed IDC towers to speed termination and enhance cable retention			
v.	Dual colour-coding allows for 568 A/B wiring configuration			
vi.	Front and rear port labelling (port sequence 1–480) as well as panel identification label			
vii.	4 x 6 ganged jack configuration			
viii.	Individually removable patch panel ports			
ix.	Removable cable management shelf(s) ensure bend radius compliance			
x.	Available with either ANSI and metric hardware kit			
xi.	Can be terminated using industry standard punch-down tools			

xii.	RJ45 port which is RJ-11 compatible			
xiii.	Molded category identification on each port face as well as optional port identification icons			
xiv.	Rear Cable Manager: Flat type metal with Perforated Rear Cable Manager to hold CAT6 UTP Cable with velcro cable ties			
xv.	Dust Proof: RJ45 Jack should be supplied with Cap or Shutter to avoid Dust			
xvi.	RJ45 I/O Compatibility	a. Individual Compatible RJ45 Jack		
		b. Pointed IDC Tower on RJ45 Jack for easy termination		
		c. Half Plugged Patch Cord should be spitted out if not properly plugged in		
Mechanical Characteristics				
i.	Material: CRS (cold rolled steel)			
ii.	Thickness: .060" (1.52mm)			
iii.	Coating: Grey / Option for Black			
Jack Connector				
i.	Plastic Housing: Thermoplastic UL94V-0 rated or equivalent			
ii.	Operating Life: Minimum 750 insertion cycles			
iii.	Contact Material: Phosphor Bronze			
iv.	Contact Plating: 50μ" Gold/100μ" Nickel			
v.	Contact Force: 100g minimum			
vi.	Plug Retention Force: 11 lbf minimum			
IDC Connector				
i.	Plastic Housing: Thermoplastic UL94V-0 rated or equivalent			
ii.	Operating Life: Minimum 20 re-terminations			
iii.	Contact Material: Phosphor Bronze			
iv.	IDC Contact Plating: Solder Plate (60% tin/40% lead)			
v.	Wire Accommodation: 22-24 AWG solid			
Electrical Characteristics				
i.	Interface Resistance: 20 milliohms			
ii.	Initial Contact Resistance:2.5 milliohms			
iii.	Insulation Resistance: >100 Megaohms			
iv.	Standards: ETL Verified to ANSI/TIA-568-C.2, ISO/IEC 11801 Category 6			
A.6.	**Power Cat 6 Patch cord**			
i.	Type: Powercat 6 U/UTP End-to-End Solution and are designed to support data networks for 10/100BASE-T and 1000BASE-T applications.			
ii.	Conductor size: 24 AWG stranded copper wire			
iii.	Nom. O.D.: 5.9mm			
iv.	Sheath:LS0H			
v.	Bend radius: 4X O.D.			
vi.	Boots: Transparent Plug with anti-snag slip on boots			
vii.	RJ45 Plug Standard: ISO/IEC 60606-7-4 and FCC 47 Part 68			
viii.	Sheath Standards: Fire Propagation compliant with CSA FTI, IEC 60332-1, IEC 61034			
ix.	Operating temperature range: -20°C to 60°C			
x.	MIN operating life: 750 insertion cycles			
xi.	RJ45 plug and boot material: Clear polycarbonate			
xii.	Contact material: 0.35mm thick copper alloy			

xiii.	Contact plating: Selective gold		
xiv.	RJ45 plug dimensions compliant with: ISO/IEC 60603-7-4 and FCC 47 Part 68		
xv.	Commercial Standards: ISO/IEC 11801:2002/Amd 2:2010 Cat 6-, TIA-568-C.2 Cat 6		
xvi.	ETL Verified		
xvii.	Fire Propagation Tests: LS0H Sheath: CSA FT1, IEC 60332-1, IEC 61034		
xviii.	Standard length available 0.5mt to 10 mts		
A.7.	**Optical Fiber Cable Technical Specification**		
Armored Single-Mode OS2			
i.	Cable Type: optical fibres in water blocked loose tube, taped, corrugated steel tape armored (STA) polyethylene (HDPE) outer sheathed embedded with two steel wires on the periphery. The cables are with UV Stabilized PE Jacket and protected from Rodent attacks. complying to ISO/IEC 11801, EN50173, ANSI/TIA 568-C.3, Telcordia GR-20; suitable for use in indoor / outdoor ducts, direct burial and backbone cabling		
ii.	Fiber Type: Single Mode, 9/125-micron primary coated buffers, OS2 (IEC 60793-2-50, B1.3 and ITU T G652.d). Shall be manufactured using Vapor Axial Deposition technology.		
iii.	Tube construction type: Polybutylene, Terephthalate (PBT)		
iv.	Tube color: White		
v.	Tube diameter: 3.0/2.0 mm nominal OD/ID		
vi.	No of fibres: 4/6/8/12		
vii.	Fibre color sequence: Blue, Orange, Green, Brown, Slate (Grey), White, Red, Black, Yellow, Violet, Pink, Aqua		
viii.	Water Blocking: Thixotropic Gel (Tube) Petroleum Jelly (Interstices)		
ix.	Core Wrapping: Polyethylene Terephthalate		
x.	Armouring: Corrugated Steel Tape Armour (ECCS Tape), Thickness > 0.125mm		
xi.	Peripheral Strength Member: Two Steel wires (0.9 mm dia)		
xii.	Ripcord: Polyester based yarns below armoured tape for easy ripping		
xiii.	Outer Sheath: UV Stabilised Polyethylene (HDPE)		
xiv.	Sheath thickness: 2.0 mm nominal		
xv.	Sheath colour: lack		
xvi.	Standards: complying to ISO/IEC 11801 2nd Edition, type OS1/OS2; AS/ACIF S008; AS/NZS 3080; TIA/EIA 568.C.3; IEC-60793-1, 60793-2 EN50173, ANSI/TIA 568-C.3, Telcordia GR-20; suitable for use in indoor / outdoor ducts, direct burial and backbone cabling		
Mechanical Characteristics			
i.	Dimensions and Mass Overall Cable (Nominal): 9.0 MM		
ii.	Mass (Nominal): 80 kg/km		
iii.	Cable length: 2 km ± 10%		
iv.	Max. Bending Radius (during installation): 20 X Overall diameters		
v.	Max. Bending Radius (during full load): 10 X Overall diameters		
vi.	Max. Tensile Strength-Short Term: 1500N		
vii.	Max. Crush Resistance-Short Term: 2000N/10 cm		
viii.	Operating Temperature range: -40°C ±70°C		

Optical characteristics		
i. Core Diameter @ 1310nm 9 + 0.6 μm		
ii. Cladding Diameter: 125 + 1.0 μm		
iii. Cladding Non circularity: < 1.0 %		
iv. Core Non circularity: < 6.0 %		
v. Core-Cladding Concentricity error: < 0.6 μm		
vi. Primary Coating Diameter-uncoloured: 245 + 10 μm		
vii. Primary Coating Diameter-coloured: 250 + 15 μm		
viii. Primary Coating Non-Circularity: < 6.0 %		
ix. Primary Coating Cladding Concentricity error: < 12.5 μm		
x. Proof Stress Level: > 0.7 (~ 1%) GPa		
xi. Strip Force (Peak): 1.0 < F peak.strip< 8.9		
xii. Zero dispersion wavelength: 1310-8/+12 nm		
xiii. Zero dispersion slope: > 0.091 ps/(nm2.km)		
xiv. Fibre curl: > 4 m-radius of curvatuer		
xv. Cut-off wavelength: < 1260 nm		
xvi. Mode field diameter at 1310: 9.3 ± 0.5 μm		
xvii. Mode field diameter at 1550 :10.4 ± 0.8 μm		
xviii. Macro bending loss @ 1550 nm, 100 turns on a 60mm mandrel: <0.5 db		
xix. Max (chromatic)dispersion: @1270-1340nm, <5.3ps/nm-km, @1285-1330nm, <3.5ps/nm-km		
xx. Polarisation mode dispersion (PMD) coefficient, cabled < 0.5 ps/sq km), PMD Link Design Value < 0.2 ps/sq km) RoHS Complaint		
Electrical/Optical Characteristics		
i. Attenuation Characteristics - Optical Performance Max. Attenuation (Cable with fibres) At 1310 nm: 0.35 dB/km, At 1550 nm: 0.22 dB/km Max. Average Attenuation; At 1310 nm: 0.33 dB/km, At 1550 nm: 0.21 dB/km		
A.8. **Single Mode Pigtail**		
i. Type of connectors: SC / LC LSOH Jacket - Reduces toxic / corrosive		
ii. Length: 1.5 Mtrs		
iii. Polishing: 100% Factory polished, tested and Guaranteed Performance		
iv. Standards: ROHS Compliant		
A.9. **24 Port Rack Mount Fiber Panel**		
i. Rack Mount: 19" rack mounted with 1U height, Sliding Drawer Type with 4 Cable entry/exit points (covered with rubber grommets)		
ii. Material: Cold Rolled Steel or Any form of Rugged Steel. Mild and Powder coated material is not acceptable		
iii. Accommodation and Supports: Accommodation of single mode cable multimode fibers Capable of supporting SC and LC interface - For 24 Port with SC Coupler Configurable. Fits up to four 6 pack plates/Angled 6 pack plates Management rings within system to accommodate excess fibre bend radius.		
iv. Compatibility: Labelling for port identification, Fiber Management rings to accommodate excess fiber cordage behind the trough adapters and maintain fiber bend radius		

A.10.	**Optical Fibre Adapter Plates**		
i.	From 6 Fibre to 24 Fibre Density – Allows you to reuse your existing enclosure and increase your fibre count to meet demand		
ii.	Greater Asset Utilisation – Easily Expandible, allows multiple generational uses of the enclosure for the same rack area, the blank plates and a small profile plate ensures to only pay for the adapters needed		
iii.	Snap Rivets – allows for easy installation and removal		
iv.	100% Factory Tested – Guaranteed performance		
v.	Commercial Standards: ISO/IC 11801, ANSI/TIA/EIA 568.B.3-2000, ANSI/TIA/EIA-492, TELECORDIA GR-409, ICEA-596		
vi.	Mechanical Characteristics: Dimensions: 86 x 33mm		
vii.	Plate Material: Black Electroplate or Thermoplastic		
A.11.	**SC-LC Single Mode OFC Patch Cords 9/125 Micron**		
i.	Type of connectors: SC or LC LSOH Jacket - Reduces toxic / corrosive		
ii.	Length: Minimum 1 meters		
iii.	Polishing: 100% Factory polished and tested		
iv.	Insertion Loss: Less than 0.35dB per connector		
v.	Attenuation: 0.4dB/km over 1310nm to 1625nm		
vi.	Standards: ROHS Compliant		
vii.	Jacket colour: Industry Standard Colour - OS1-Yellow, OM3-Aqua, OM2-Grey, OM1-Orange		
viii.	Make and Type: SC to LC Duplex Fiber Optic Patch Cord 9/125 Micron		
ix.	Cable Sheath: LSZH		
x.	Cable Diameter:1.6 mm		
xi.	Ferrule: Ceramic		
xii.	Buffer: Tight buffered		
xiii.	Temperature Range: -40 Degree C to +85 Degree C		
xiv.	Buffer Diameter: 900µm		
xv.	Primary Coating: 245µm		
xvi.	Strength Member: Aramid Yarn		
xvii.	Jacket Material: LS0H IEC 61034-1 & 2, IEC-60332-1, IEC-60754- 1 & 2		
	B. Civil Work		
i.	Majority of the building are of stone construction and most care ought be taken during network wiring.		
ii.	The technician should have a prior experiencing of working in stone construction and any action should not hamper the esthetic of the building.		
iii.	The excavation, construction, cabling, casing & caping, road crossing and core cutting works should be neat and clean.		
iv.	Care shall be taken by the bidder while handling and installing the various equipment and component of the work to avoid damage to the building. He shall be responsible for repairing all damages and restoring the same to their original finish at his cost failing which the same shall be got rectified/made good at the risk and cost of the contractor by the department and will be recovered in the bill. He shall also remove all unwanted and waste materials arising of the installation work every day at his cost.		

v.	The Passive Components of structured cabling distribution network will be free from manufacturing defects in material and workmanship under normal and proper use.		
vi.	All Passive Components in the structured cabling distribution network shall meet or exceed the relevant component specification of the EIA/TIA 568-B and EIA/TIA 568-C.2 series and ISO/IEC 11801: 2002 standards; or later version as applicable at the time of installation.		
vii.	Watch and ward of the stores and their safe custody shall be the responsibility of the contractor till the final taking over of the installation by the department.		
C. Installation and Services			
License, Warranty and Support			
i.	The total solution should include licenses for all necessary features from the first day of the installation. All the licenses quoted should be perpetual. All the features and signatures including WIPS available at the time of expiration of license should continue to work. Renewal of licenses should be required only for new features and updates/releases announced by the OEM after the contract expires.		
ii.	The total solution should have 3 years' on-site warranty for Access Points, Switches, UPS & batteries, cabling & accessories, and controller.		
iii.	The total solution should include technical support for software/firmware and software upgrades for controller, Access Points and Switches for 3 years.		
iv.	The total solution should be upgradable to the latest stable version, as and when available, at no extra cost.		
v.	The quote should also include additional 2 years' AMC specified as a separate line item.		
vi.	Warranty support should include 4 hrs. response time and provision of replacement along with appropriate configuration and installation in next business day for Hardware.		
vii.	Should provide single point of contact and should provide call logging and escalation matrix.		
Acceptance Parameters for the Proposed Solution (Only Applicable during and post implementation)			
Overage and Capacity Planning			
i.	On-site site survey by the bidder is required to plan Wi-Fi deployment in each floor of each building.		
ii.	The solution must ensure at least -65 dBm RSSI inside all hostel rooms.		
iii.	The bidder should provide the location of Access Points on the floor plan for all buildings (Note: tentative location plan will be provided by IISc).		
iv.	The bidder should provide OEM-certified coverage heat map for 2.4 GHz and 5 GHz separately with -65 dBm RSSI threshold for 2.4 GHz and 5 GHz. All coverage holes in the premises should be indicated clearly.		
v.	The bidder should provide OEM-certified AP coverage redundancy map.		
Physical Installation			
i.	Inspect installation of Network racks, OFC, UPS, Power Cables, UTP cables and Network Switches.		
ii.	Configuration check on controller including the policies.		
iii.	Test the physical mounting of each Access Point.		
iv.	Test each Access Point connectivity to the central cloud-based controller.		

Wired Network Test:			
i.	Perform OTDR/RFC 2544 tests for all OFC links and submit reports.		
ii.	Perform end-to-end connectivity test of all UTP links and submit reports.		
iii.	Check reachability and latency test on all Network Switches and submit reports.		
Wi-Fi Controller Configuration Test:			
i.	Check authorized Wi-Fi set up for each Subnet / VLAN / Location as the case may be.		
ii.	Check both Authorized user and Guest user policies.		
iii.	Test each Access Point if they have the right authorized and guest policy.		
iv.	Check Wi-Fi prevention policy for each subnet, VLAN and location.		
v.	Check the configured alerts and alert delivery methods.		
vi.	Check the administrative users and their access rights.		
vii.	Check the configured reports (content, delivery frequency, recipient list).		
viii.	Check the automatic backup and archival parameters.		
ix.	Check archival of logs.		
Commissioning Test			
i.	Test for all Access Points connectivity to the cloud-based controller.		
ii.	Test and verify authorized Access Points inventory and authorized client inventory.		
iii.	Verify external Access Points list and verify uncategorized / unauthorized client list.		
iv.	Verify if all authorized wireless devices are tagged to right location.		
v.	Test for authorized client connection to authorized Access Point and respective SSID as per the set authentication policy.		
vi.	Test for Guest client connection to authorized Access Points and respective SSID as per the set authentication policy.		
vii.	Test if the Access Points are operational after shutting down the cloud-based controller.		
viii.	Test if automatic Rogue Access Points prevention is working on all types of rogue APs.		
ix.	Test if unauthorized client association to authorized Access Point is automatically prevented.		
x.	Test if automatic client Mis-association prevention is working.		
xi.	Test if Ad-Hoc Networks are detected and automatically prevented.		
xii.	Test if Mac-Spoofing is detected.		
xiii.	Test if automatic prevention of Honeypot (with Multipot) is functional.		
xiv.	Test is Denial of Service (DoS) Attack is detected.		
xv.	Testing of deployment of policies, firmware updating remotely through the controller.		
xvi.	Testing WIPS functionality across the subnet.		
xvii.	The entire testing exercise should complete in two weeks' time from the Date of installation.		
Documentation and Reports			
i.	Documentation of the entire project along with testing reports must be submitted to IISc.		
ii.	Documentation must include RF Coverage Heat Maps clearing showing that the -65 dBm RSSI requirement within all hostel rooms is met.		

iii.	Documentation must include complete network diagram which clearly depicts Switch Management IP Address, Switch Location, AP Location and Switch Port to each AP.		
iv.	Documentation must include complete configuration in a step-by-step manner.		
Solution Fine Tuning and Handover to operations team of IISc Bangalore			
i.	Fine tune Wi-Fi Access policies and security policies.		
ii.	Rebuild authorized device inventory and remediate mis-configured APs.		
iii.	Fine tune events, alerts, reports, and other parameters.		

ANNEXURE-4

Techno-commercial Compliance Sheet

S/No.	Item	YES/ NO	Page No.
1.	E-receipt as a proof of EMD submission		
2.	Copies of the P. O.-s, clearly stating the duration of contract, value, and scope		
3.	Letter from the organization, supporting the claim of completion of the project and satisfactory delivery of services.		
4.	Letter from the OEM to support the claim of Tier-1/Tire-2 relationship of SI with the OEM.		
5.	Documents supporting the claim that the bidder has a registered office in India and been in operation for at least 10 years as on 30.09.2022		
6.	Authorization letter from the OEM to support SI during the contract period		
7.	Annual audited balance sheets for 3 years		
8.	Documents supporting the claim that the bidder in a position to demonstrate its capability to deliver all the services expected during the contract period.		
9.	Documents supporting the claim that the bidder has an office in Bangalore with Service/Support Engineers posted in Bangalore		
10.	A declaration on company's letterhead stating that the bidder is/was not blacklisted by Central Govt. /State Govt./PSUs/Other Govt. Agency/ Govt Educational Institute/University.		
11.	Solvency Certificate from Scheduled Commercial Bank		
12.	Detailed site survey report		
13.	Signed hard copy of technical compliance along with cross reference submitted in OEM's letter head		
14.	All the proposed hardware and software licenses proposed are perpetual in nature		

ANNEXURE 5
Format for Bank Guarantee for Performance Security (Performance Bank Guarantee)

To
The Registrar
Indian Institute of Science (IISc)
Bangalore – 560 012 (Karnataka, India)

Subject: Performance Bank Guarantee (PBG)

Reference: IISc Purchase Order No. _____ dated _____

Dear Sir,

1. We hereby issue a Bank Guarantee as follows: -
   Bank Guarantee No. _____Date: _____
   Amount of Guarantee Rs. _____,
   Guarantee covers from _____ To _____
   Last Date for Lodgement of Claim: _____

2. This deed of Guarantee executed by the (Name of the Bank: _____)
   constituted under _____ Act,_____ having its
   Central Office at _____
   and amongst other places a branch at _____
   (hereinafter referred to as "The Bank") in favour of The Registrar, Indian
   Institute of Science, Bangalore – 560 012 (hereinafter referred to as I.I.Sc.) for
   an amount of not exceeding Rs._____(in words:
   Rupees._____ only) at the request of M/s
   _____(hereinafter referred to as the
   "Contractor" / "Supplier").

3. In consideration of The Registrar, Indian Institute of Science, Bangalore – 560
   012 (hereinafter called IISc.) having entered into an agreement vide IISc's
   Purchase Order No. _____dated_____
   with M/s _____ (hereinafter called the Supplier) to
   carry out the supply and installation of the
   _____ ___<Name of the
   equipment/work/Job> at Indian Institute of Science, Bangalore as per their
   above order, the Supplier agreed to execute a Bank Guarantee for 10% of the
   total order value viz. Rs. _____ (Rupees
   _____) towards
   Performance Security / Performance Guarantee obligation for a period of ____
   year(s) / mo nth(s) from _____ to _____.

4. We, the _____ Bank,
   _____Branch (hereinafter referred to as a Guarantor) at
   the request of the supplier, irrevocably undertake to indemnify and to keep
   indemnify I.I.Sc. without any demur to the extent of Rs._____
   (Rupees _____) in the event
   of the aforesaid Supplier failing to comply the Warranty / contractual
   Obligations as per the agreed terms to the full satisfaction of the Company as
   mentioned in the I.I.Sc.'s purchase order.

5. NOW THIS BANK HEREBY GUARANTEES that in the event of the said
   Supplier failing to abide by any of the conditions referred in tender document /
   purchase order / performance of the equipment / Machinery / service, etc. this
   Bank shall pay to Indian Institute of Science, Bangalore on demand and without
   protest or demur Rs .... (Rupees.....................................).

6. We _____Bank, further agree that the Guarantee herein contained shall remain in full force and affect during the period that would be taken for the performance of the equipment and / or services as stated in the Purchase Order issued by I.I.Sc. and that it shall continue to be enforceable till the completion of the period and certified that warranty and contractual obligations have been fully carried out by the supplier and accordingly discharges the Guarantee subject. However, I.I.Sc. shall have no right under after the expiry of the Guarantee, i.e., _____(date).

7. We, _____Bank undertake not to revoke this Guarantee, during its currency except with the previous consent of I.I.Sc. in writing.

8. Notwithstanding anything contained herein,
   (a) Our liability under the Bank Guarantee shall not exceed Rs. _____(Rupees _____).
   (b) This Bank Guarantee shall be valid up to _____.
   (c) We are liable to pay the guaranteed amount or any part thereof under this Bank Guarantee only and only if I.I.Sc. serve upon us a written claim or demand on or before expiry of date (i.e., _____).

9. NOTWITHSTANDING anything contained herein above, our liability under this Guarantee is restricted to Rs. _____ (Rupees _____only) our guarantee shall remain in force until. Unless a Demand or claim under the guarantee is made on our Bank in writing on or before _____ all your rights under the said guarantee be forfeited and we shall be relieved and discharged from all liabilities thereunder.

10. This Bank further agrees that the decision of Indian Institute of Science, Bangalore as to whether the said Supplier has committed a breach of any of the conditions referred in tender document / purchase order shall be final and binding.

11. This Bank further agrees that the claims if any, against this Bank Guarantee shall be enforceable at our branch office at .... situated at .... (Address of local branch) as following details:

Name of the Bank	
Branch Name	
Branch Code	
IFSC Code	
E-mail Id	
Phone / Mobile No.	

Seal & Signature of the Bank