

TECHNICAL SPECIFICATIONS/COMPLIANCE

S.No	Requirements	Compliance FC/NC
Wireless LAN Controller for Islamabad Site		
1	The proposed product shall support robust GUI configurations of both IPv4 and IPv6 ACL policies.	
2	The proposed products should have onboard SSD internal storage for storage of logs, event etc.	
3	The proposed product must be based on hardware architecture for Security features inspection (NG Firewalling, Application Control, Advanced Malware, URL, Anti-Spam, SSL/TLS inspection etc) in the hardware. If security features are not available, then separate equipment need to be quoted	
4	Supports centralized management of access points, enabling seamless control over wireless networks.	
5	Facilitates smooth client transitions between access points without disrupting network connectivity.	
6	Provides captive portals for guest authentication and access	
7	Identifies and mitigates unauthorized access points to maintain network security	
8	Utilizes deep Layer-7 inspection to prioritize critical applications and manage bandwidth effectively	
9	Allows for remote diagnostics, including spectrum analysis and packet captures, to resolve network issues efficiently.	
10	The proposed system shall minimally provide management access through CLI console using console port, SSHv2, telnet or from GUI console	
11	The proposed product should be able to facilitate administration audits by logging detailed activities to event log - management access and also configuration changes.	
12	Administrators shall be able to configure both IPv4 and IPv6 DHCP service on an interface of the proposed product.	
13	Administrators shall be able to group interfaces, both physical and virtual, into zones that simplifies the creation of security policies.	
14	The proposed product shall support static routing and policy-based routing	
15	The proposed product shall support Open Shortest Path First (OSPF) and Border Gateway Protocol (BGP) for both IPv4 and IPv6.	
16	The proposed product must support active-passive (failover HA), active-active (load balancing HA) and Clustering.	
17	The proposed product shall support various QoS (quality of service) techniques, including: Traffic policing, Traffic shaping and Queuing	
18	The proposed product shall detect over 4,000+ applications for Application visibility and Control.	
19	The proposed product shall support custom application detection and control.	
20	The proposed system shall support aggregation of 200+ interfaces to create a virtual WAN link.	
21	The proposed system shall support performance SLA settings which are used to monitor WAN interfaces link quality and to detect link failures.	
22	The proposed system shall allow SLA targets to be created. These are a set of constraints that are used to control the paths that	

	traffic take. These constraints should include Latency, Jitter and Packer Loss threshold	
23	The proposed system shall provide settings to the characteristic of probes, including check interval, link failure and restoration considerations.	
24	The proposed system shall support per-packet load-balancing among IPSec tunnels.	
25	The proposed system shall support forward error correction (FEC) on VPN overlay networks.	
26	The proposed system shall support Border Gateway Protocol (BGP) learned routes as dynamic destinations.	
27	Should be offered with 3 years licenses and support	
Require Hardware based WLC with following performance specs		
1	WLC throughput @ 64 byte UDP: 26 Gbps or more	
2	SSL inspection throughput: 7 Gbps or more	
3	Application Control throughput: 27.8 Gbps or more	
4	Concurrent TCP sessions: 11 Million or more	
5	New TCP sessions/sec: 400K cps or more	
6	Form Factor: under 1.5RU	
7	Power: Dual AC	
8	Local Storage:470GB or more	
9	Support: Should be offered with support for 3 years	
10	Virtual Domains: 25 or more	
11	Interfaces: 8 x 10GE SFP+, 4 x 1GE SFP, 10 x GE RJ45	
Wireless LAN Controller for Karachi & Lahore		
1	The proposed product shall support robust GUI configurations of both IPv4 and IPv6 firewall policies.	
2	The proposed products should have onboard SSD internal storage for storage of logs, event etc.	
3	The proposed product must be based on hardware architecture for Security features inspection (NG Firewalling, , Application Control, Advanced Malware, URL, Anti-Spam, SSL/TLS inspection, IPS, Antimalware etc) in the hardware. If security features are not available then separate equipment need to be quoted.	
4	The proposed system shall minimally provide management access through: GUI using HTTP or HTTPs access CLI console using console port, SSHv2, telnet or from GUI console	
5	The administrator authentication shall be facilitated by a local database, PKI & remote services such as Radius, LDAP and TACACS+.	
6	The proposed product should be able to facilitate administration audits by logging detailed activities to event log - management access and also configuration changes.	
7	Administrators shall be able to configure both IPv4 and IPv6 DHCP service on an interface of the proposed product.	
8	Administrators shall be able to configure multiple loopback interfaces on the proposed product.	
9	Administrators shall be able to group interfaces, both physical and virtual, into zones that simplifies the creation of security policies.	
10	The proposed product shall support static routing and policy-based routing	

11	The proposed product shall support Open Shortest Path First (OSPF) and Border Gateway Protocol (BGP) for both IPv4 and IPv6.	
12	The proposed product must support active-passive (failover HA), active-active (load balancing HA) and Clustering.	
13	The proposed product shall support various QoS (quality of service) techniques, including: Traffic policing, Traffic shaping and Queuing	
14	The proposed product shall provide Secure sockets layer (SSL) content scanning and inspection abilities that allow organizations to apply antivirus scanning, application control, web/URL filtering, and IPS inspection to encrypted traffic	
15	The proposed product's IPS engine shall offer: Signature based detection using real time updated database Anomaly based detection that is based on thresholds	
16	The proposed product shall provide the ability to apply DNS category filtering to control user access to web resources.	
17	The proposed product shall allow administrator to prevent sensitive data from leaving the network. Administrator shall be able to define sensitive data patterns, and data matching these patterns that will be blocked and/or logged when passing through the unit.	
18	The proposed product shall allow configuration of virtual systems resource limiting and management.	
19	The proposed system shall support Border Gateway Protocol (BGP) learned routes as dynamic destinations.	
20	The proposed product shall support Virtual routing and forwarding (VRF).	
21	The proposed product shall support various logging facilities: Local Memory. Local Storage. Multiple Concurrent Syslog Servers.	
22	Health check probes using IPv4/IPv6 Ping and HTTP	
23	Selection of multiple destinations (or servers) to probe	
24	Proposed Solution should be offered with IPS, Advanced Malware Protection, Application Control, URL , Antispam Service and support for 3 years	
25	The proposed system shall support aggregation of 200+ interfaces to create a virtual WAN link.	
26	The proposed system shall support performance SLA settings which are used to monitor WAN interfaces link quality and to detect link failures.	
27	The proposed product shall support virtual firewalls that divide the Firewall into two or more virtual units that function independently.	
28	The proposed product shall provide the ability to exempt web sites from SSL scanning by site reputation, address, category, or using a whitelist.	
29	The proposed product shall detect over 4,000+ applications for Application visibility and Control.	
30	The proposed product shall support custom application detection and control.	
31	The proposed product shall support clientless and client-based SSL Remote Access VPNs.	
32	The proposed product shall support IPsec based Remote Access VPNs.	
33	The proposed product shall support both Route based and policy-based site to site IPsec VPNs.	

34	The proposed product shall support the upgrade of the firmware without interrupting communication through the cluster	
35	Interfaces relating to the performance SLA profile	
36	The proposed product shall have the ability to interconnect discrete security solutions into an integrated whole to detect, monitor, block, and remediate attacks across the entire attack surface.	
37	The proposed system shall allow SLA targets to be created. These are a set of constraints that are used to control the paths that traffic take. These constraints should include Latency, Jitter and Packer Loss threshold	
38	The proposed system shall provide settings to the characteristic of probes, including check interval, link failure and restoration considerations.	
39	The proposed system shall provide option to disable the implicated static route when an interface is inactive.	
40	The proposed system shall support per-packet load-balancing among IPSec tunnels.	
41	The proposed system shall support forward error correction (FEC) on VPN overlay networks.	
42	Should be offered with 3 years licenses and support.	
Require Hardware based WLC with following performance specs		
1	WLC throughput @ 64 byte UDP: 28Gbps or more	
2	SSL inspection throughput: 3Gbps or more	
3	Application Control throughput: 6.6Gbps or more	
4	Concurrent TCP sessions: 3 Million or more	
5	New TCP sessions/sec: 140K cps or more	
6	Form Factor: under 1.5RU	
7	Power: Dual AC	
8	Local Storage:470GB or more	
9	Support:Should be offered with support for 3 years	
10	Virtual Domains: 10 or more	
11	Interfaces: 4 x 10GE SFP+, 8 x 1GE SFP, 18 x GE RJ45	
Centralized Management Platform		
1	Centralized management should allow administrator to manage and monitor devices from one location	
2	Centralized management should Provision and monitor devices from one console across your network, branch offices or campuses	
3	Must support alerting via email and SNMP	
4	Solution must Orchestrate security devices and systems on-premise to streamline network provisioning, security policy updates & change management.	
5	Solution must Automate workflows and configurations for firewalls, switches and wireless infrastructure	
6	Solution should be offered for devices offered in the solution for 3year	
7	The management tool/software (VM based) should provide additional GUI for administrator to manage, configure and reporting from the switching network	
8	Proposed Solution be able to process 10 GB of logs per day per site.	
9	Proposed Solution should have 3 Year Support/Subscription license	
10	Must provide Powerful Network Security Visibility with customizable interactive Dashboard and summary views	

11	The Centralized logging and Reporting appliance must be able to parse logs and generate reports for all the appliance supplied along with this solution	
12	Proposed Solution support a real time dashboard.	
13	Proposed Solution support a log viewer (real time and historical)	
14	An additional functionality GUI offering configuration management of the following tasks on the switches: VLAN Configuration Link Aggregation Configurations Configuration for SNMP, RADIUS, Syslog, NTP STP, MSTP, BDPU Guard, Root Guard, Edge Port Firmware Management Users, admin passwords Automatic switch discovery and topology	
15	Solution must reduce complexity and costs by leveraging automated REST API, scripts, connectors, and automation stitches	
16	Solution must automate backups up to nodes with streamlined software and security updates for all managed devices	
17	Proposed Solution have Drill-down capabilities to follow the trail of an attacker, trace transactions, and gain new insights	
18	Proposed Solution provide superior Visualization with graphical bubble charts, and a geographical Threat Map	
19	Proposed Solution have Automated Correlation Engine to identify suspicious traffic pattern and present a prioritized list of hosts which are compromised.	
20	Proposed Solution have built-in report templates, which are highly customizable	
21	Proposed Solution have the facility to create custom reports with intuitive chart builder	
22	Proposed Solution have Automated alert notification for issues, problems and attacks	
23	Proposed Solution support alerting via email and SNMP	
24	Proposed Solution support integration with 3 rd party system via JSON and XML Web Services API	
25	Proposed Solution be deployed as VM	
26	Should be offered with 3 years licenses and support	
Core Switches		
<u>Interface Minimum:</u>		
1	The switch must be equipped with 48x 10G/1G SFP+/SFP ports and 6x 100G/40G QSFP28/QSFP+ ports	
2	Should be offered with all available licenses	
<u>Performance: (documentary proof required)</u>		
1	Switch must support redundant power supplies	
2	MTBF should be 10years +	
3	Switching capacity should be full duplex with 1760 Gbps or more	
4	Packet Per Second processing should be duplex with 1518Mpps or more	
5	MAC address storage 64K or higher	
6	Network Latency should be less or equal to 1micro second	
7	Memory 8GB or more with Flash of 128MB with additional 128 GB SSD drive or higher .	
8	VLAN support 4K	
9	Route Entries (IPv4/IPv6) 14k/6k, L3 Host Entries (IPv4/IPv6) 16k/ 8k	
10	Mandatory support of all L2 Protocols	
11	<u>Mandatory Layer 2 Protocol Requirement</u>	

	• 802.1D – Spanning Tree Protocol (STP)	
	• 802.1w – Rapid Spanning Tree Protocol (RSTP)	
	• 802.1s – Multiple Spanning Tree Protocol (MSTP)	
	• 802.1AB Link Layer Discovery Protocol (LLDP)	
	• 802.3ad – Link Aggregation Control Protocol (LACP)	
	• Multi-chassis Link Aggregation (MC-LAG)	
	Unicast/Multicast traffic balance over trunking port	
12	<u>Mandatory Layer 3 Protocol Requirement</u>	
	• Static Routing, RIP v1/v2, OSPF v1/v2	
	• Policy Based Routing, Virtual Router Redundancy Protocol (VRRP)	
	• Bidirectional Forwarding Detection (BFD)	
	• Virtual Routing and Forwarding	
	• Unicast Reverse Path Forwarding (uRPF)	
	• BGP, DHCP relay	
	• Internet Group Management Protocol (IGMP)	
	• Multicast Listener Discovery (MLD)	
	• IGMP Snooping	
	• Quality of Service (QoS)	
13	IEEE family protocols: 802.3: 802.3, 802.3ae, 802.3ab, 802.3z. support 802.1ad (Q-in-Q) and Selective Q-in-Q protocols	
14	Support LAG and MLAG	
15	Routing: The switch must be able to support following IPv4 routing protocols:	
16	BGP, IS-IS, OSPF, RIP, PIM-SSM	
17	•The switch must support Policy-based Routing	
18	•The switch must be able support BFD for static routing and dynamic routing protocols OSPF, BGP, L2. L3 multicast with IGMP Snooping of all versions	
19	The switch must support Flow Control 802.3x	
20	SNMP versions 2c and 3, Syslog	
21	The switch should support min of 8MB aggregate buffer size.	
22	Switch must support L2 multipathing and must not have any STP limitation	
23	The switch must support integration with standard sys log server. Event logging for audit purposes.	
24	Switches must be offered with 3 year NBD and OEM remote support.	
25	Switch MUST support jumbo frames	
26	Switch MUST support load balancing algorithms with Link Aggregation such as: dst-ip, dst-mac, src-dst-ip, src-dst-mac, src-ip, src-mac	
27	Switch MUST support GUI Support for MLAG Configuration	
28	Switch support backup of the full system configuration via the GUI.	
29	Switch allow configuration of multiple administrator accounts and corresponding access profiles to restrict permissions per configuration sub-system.	
30	Switch support multiple configuration files with 2 bootable partitions for better availability and easy upgrade / fallback.	
31	Switch support templates pushed to multiple units to expedite deployment using Centralized Management	
32	Switch support Creating LLDP and QOS Profiles using Centralized Management	
33	Should be offered with 3 years licenses and support	

8 Port Access Switches (Non-POE)		
<u>Interface Minimum:</u>		
1	The switch must be equipped with 7 x GE RJ45, 1x GE/POE-PD and 2 x 1GE SFP	
<u>Performance: (documentary proof required)</u>		
1	MTBF should be 10years +	
2	Switching capacity should be full duplex with 20 Gbps full duplex or more	
3	Packet Per Second processing should be duplex with 30 Mpps or more	
4	MAC address storage 8K or higher	
5	Network Latency should be under 4micro second	
6	Memory 256MB with Flash of 32MB or more	
7	VLAN support 4K or more	
8	Packet buffer of 512KB or more	
9	<u>Mandatory Layer 2 Protocol Requirement</u>	
	• 802.1D – Spanning Tree Protocol (STP)	
	• 802.1w – Rapid Spanning Tree Protocol (RSTP)	
	• 802.1s – Multiple Spanning Tree Protocol (MSTP)	
	• 802.1AB Link Layer Discovery Protocol (LLDP)	
	• 802.3ad – Link Aggregation Control Protocol (LACP)	
	• Multi-chassis Link Aggregation (MC-LAG)	
10	Unicast/Multicast traffic balance over trunking port	
11	IEEE family protocols: 802.3: 802.3, 802.3ae, 802.3ab, 802.3z.	
12	support 802.1ad (Q-in-Q) and Selective Q-in-Q protocols	
13	The switch must support Flow Control 802.3x	
14	SNMP versions 2c and 3, Syslog	
15	The switch should support min of 512KB aggregate buffer size.	
16	The switch must support integration with standard sys log server. Event logging for audit purposes.	
17	Switches must be offered with 3 years NBD and OEM remote support.	
18	Switch MUST be simple initial CLI configuration. Following installation, all configurations must be performed via a simple web-based GUI.	
19	Switch MUST support jumbo frames	
20	Switch MUST support load balancing algorithms with Link Aggregation	
21	Switch MUST support assignment of port security policy via GUI	
22	Switch MUST support rate limit and QoS for Quarantine	
23	Switch MUST support Netflow/IPFIX Flow Export	
24	Switch support backup of the full system configuration via the GUI.	
25	Switch allow configuration of multiple administrator accounts and corresponding access profiles to restrict permissions per configuration sub-system.	
26	Proposed Switch support multiple configuration files with 2 bootable partitions for better availability and easy upgrade / fallback.	
27	Switch MUST support Creating LLDP and QOS Profiles using Centralized Management	
28	Should be offered with 3 years licenses and support	
8 Port Access Switches (POE)		
<u>Interface Minimum:</u>		
1	The switch must be equipped with 8 x GE RJ45 and 2 x 1GE SFP	
<u>Performance: (documentary proof required)</u>		

1	Support PoE Power Budget of 130Watts or more	
2	MTBF should be 10years +	
3	Switching capacity should be full duplex with 20 Gbps or more	
4	Packet Per Second processing should be duplex with 30 Mpps or more	
5	MAC address storage 8K or higher	
6	Network Latency should be under 4micro second	
7	Memory 256MB with Flash of 32MB or more	
8	VLAN support 4K or more	
9	Packet buffer of 512KB	
10	<u>Mandatory Layer 2 Protocol Requirement</u>	
	• 802.1D – Spanning Tree Protocol (STP)	
	• 802.1w – Rapid Spanning Tree Protocol (RSTP)	
	• 802.1s – Multiple Spanning Tree Protocol (MSTP)	
	• 802.1AB Link Layer Discovery Protocol (LLDP)	
	• 802.3ad – Link Aggregation Control Protocol (LACP)	
	• Multi-chassis Link Aggregation (MC-LAG)	
11	Unicast/Multicast traffic balance over trunking port	
12	IEEE family protocols: 802.3: 802.3, 802.3ae, 802.3ab, 802.3z.	
13	support 802.1ad (Q-in-Q) and Selective Q-in-Q protocols	
14	The switch must support Flow Control 802.3x	
15	SNMP versions 2c and 3, Syslog	
16	The switch should support min of 512KB aggregate buffer size.	
17	The switch must support integration with standard sys log server. Event logging for audit purposes.	
18	Switches must be offered with 3 years NBD and OEM remote support.	
19	Switch MUST be simple initial CLI configuration. Following installation, all configurations must be performed via a simple web-based GUI.	
20	Switch MUST support jumbo frames	
21	Switch MUST support load balancing algorithms with Link Aggregation	
22	Switch MUST support assignment of port security policy via GUI	
23	Switch MUST support rate limit and QoS for Quarantine	
24	Switch MUST support Netflow/IPFIX Flow Export	
25	Switch support backup of the full system configuration via the GUI.	
26	Switch allow configuration of multiple administrator accounts and corresponding access profiles to restrict permissions per configuration sub-system.	
27	Proposed Switch support multiple configuration files with 2 bootable partitions for better availability and easy upgrade / fallback.	
28	Switch MUST support Creating LLDP and QOS Profiles using Centralized Management	
29	Should be offered with 3 years licenses and support	
24 Port Access Switch (Non-POE)		
<u>Interface Minimum:</u>		
1	The switch must be equipped with 24x GE RJ45 and 4x 10GE SFP+	
<u>Performance: (documentary proof required)</u>		
1	MTBF should be 10years +	
2	Switching capacity should be full duplex with 128 Gbps or more	

3	Packet Per Second processing should be duplex with 190Mpps or more	
4	MAC address storage 32K or higher	
5	Network Latency should be under 1micro second	
6	Memory 512MB with Flash of 64MB or more	
7	VLAN support 4K or more	
8	Packet buffer of 2MB	
9	<u>Mandatory Layer 2 Protocol Requirement</u>	
	• 802.1D – Spanning Tree Protocol (STP)	
	• 802.1w – Rapid Spanning Tree Protocol (RSTP)	
	• 802.1s – Multiple Spanning Tree Protocol (MSTP)	
	• 802.1AB Link Layer Discovery Protocol (LLDP)	
	• 802.3ad – Link Aggregation Control Protocol (LACP)	
	• Multi-chassis Link Aggregation (MC-LAG)	
10	Unicast/Multicast traffic balance over trunking port	
11	IEEE family protocols: 802.3: 802.3, 802.3ae, 802.3ab, 802.3z.	
12	support 802.1ad (Q-in-Q) and Selective Q-in-Q protocols	
13	The switch must support Flow Control 802.3x	
14	SNMP versions 2c and 3, Syslog	
15	The switch should support min of 2MB aggregate buffer size.	
16	The switch must support integration with standard sys log server. Event logging for audit purposes.	
17	Switches must be offered with 3 years NBD and OEM remote support.	
18	Switch MUST be simple initial CLI configuration. Following installation, all configurations must be performed via a simple web-based GUI.	
19	Switch MUST support jumbo frames	
20	Switch MUST support load balancing algorithms with Link Aggregation	
21	Switch MUST support assignment of port security policy via GUI	
22	Switch MUST support rate limit and QoS for Quarantine	
23	Switch MUST support Netflow/IPFIX Flow Export	
24	Switch support backup of the full system configuration via the GUI.	
25	Switch allow configuration of multiple administrator accounts and corresponding access profiles to restrict permissions per configuration sub-system.	
26	Proposed Switch support multiple configuration files with 2 bootable partitions for better availability and easy upgrade / fallback.	
27	Switch MUST support Creating LLDP and QOS Profiles using Centralized Management	
28	Should be offered with 3 years licenses and support	
24 Port Access Switch (POE)		
<u>Interface Minimum:</u>		
1	The switch must be equipped with 24x GE RJ45 and 4x 10GE SFP+	
<u>Performance: (documentary proof required)</u>		
1	Switch should power budget of 370Watts or more	
2	MTBF should be 10years +	
3	Switching capacity should be full duplex with 128 Gbps or more	
4	Packet Per Second processing should be duplex with 190Mpps or more	
5	MAC address storage 32K or higher	
6	Network Latency should be under 1micro second	
7	Memory 512MB with Flash of 64MB or more	

8	VLAN support 4K or more	
9	Packet buffer of 2MB	
10	Must be 24 (802.3af/at) compliant	
11	<u>Mandatory Layer 2 Protocol Requirement</u>	
	• 802.1D – Spanning Tree Protocol (STP)	
	• 802.1w – Rapid Spanning Tree Protocol (RSTP)	
	• 802.1s – Multiple Spanning Tree Protocol (MSTP)	
	• 802.1AB Link Layer Discovery Protocol (LLDP)	
	• 802.3ad – Link Aggregation Control Protocol (LACP)	
	• Multi-chassis Link Aggregation (MC-LAG)	
	• Unicast/Multicast traffic balance over trunking port	
12	IEEE family protocols: 802.3: 802.3, 802.3ae, 802.3ab, 802.3z.	
13	support 802.1ad (Q-in-Q) and Selective Q-in-Q protocols	
14	The switch must support Flow Control 802.3x	
15	SNMP versions 2c and 3, Syslog	
16	The switch should support min of 2MB aggregate buffer size.	
17	The switch must support integration with standard sys log server. Event logging for audit purposes.	
18	Switches must be offered with 3 years NBD and OEM remote support.	
19	Switch MUST be simple initial CLI configuration. Following installation, all configurations must be performed via a simple web-based GUI.	
20	Switch MUST support jumbo frames	
21	Switch MUST support load balancing algorithms with Link Aggregation	
22	Switch MUST support rate limit and QoS for Quarantine	
23	Switch MUST support Netflow/IPFIX Flow Export	
24	Switch support backup of the full system configuration via the GUI.	
25	Switch allow configuration of multiple administrator accounts and corresponding access profiles to restrict permissions per configuration sub-system.	
26	Proposed Switch support multiple configuration files with 2 bootable partitions for better availability and easy upgrade / fallback.	
27	Switch MUST support Creating LLDP and QOS Profiles using Centralized Management	
28	Should be offered with 3 years licenses and support	
48 Port Access Switch		
<u>Interface Minimum:</u>		
1	The switch must be equipped with 48x GE RJ45 and 4x 10GE SFP+	
<u>Performance: (documentary proof required)</u>		
1	MTBF should be 10years +	
2	Switching capacity should be full duplex with 175 Gbps or more	
3	Packet Per Second processing should be duplex with 260Mpps or more	
4	MAC address storage 32K or higher	
5	Network Latency should be under 1micro second	
6	Memory 512MB with Flash of 64MB or more	
7	VLAN support 4K or more	
8	Packet buffer of 2MB	
9	Must be 24 (802.3af/at) compliant	
10	<u>Mandatory Layer 2 Protocol Requirement</u>	
	• 802.1D – Spanning Tree Protocol (STP)	
	• 802.1w – Rapid Spanning Tree Protocol (RSTP)	

	• 802.1s – Multiple Spanning Tree Protocol (MSTP)	
	• 802.1AB Link Layer Discovery Protocol (LLDP)	
	• 802.3ad – Link Aggregation Control Protocol (LACP)	
	• Multi-chassis Link Aggregation (MC-LAG)	
11	Unicast/Multicast traffic balance over trunking port	
12	IEEE family protocols: 802.3: 802.3, 802.3ae, 802.3ab, 802.3z.	
13	support 802.1ad (Q-in-Q) and Selective Q-in-Q protocols	
14	The switch must support Flow Control 802.3x	
15	SNMP versions 2c and 3, Syslog	
16	The switch should support min of 2MB aggregate buffer size.	
17	The switch must support integration with standard sys log server. Event logging for audit purposes.	
18	Switches must be offered with 3 years NBD and OEM remote support.	
19	Switch MUST be simple initial CLI configuration. Following installation, all configurations must be performed via a simple web-based GUI.	
20	Switch MUST support jumbo frames	
21	Switch MUST support load balancing algorithms with Link Aggregation	
22	Switch MUST support assignment of port security policy via GUI	
23	Switch MUST support rate limit and QoS for Quarantine	
24	Switch MUST support Netflow/IPFIX Flow Export	
25	Switch support backup of the full system configuration via the GUI.	
26	Switch allow configuration of multiple administrator accounts and corresponding access profiles to restrict permissions per configuration sub-system.	
27	Proposed Switch support multiple configuration files with 2 bootable partitions for better availability and easy upgrade / fallback.	
28	Switch MUST support Creating LLDP and QOS Profiles using Centralized Management	
29	Should be offered with 3 years licenses and support	
Access Points (Indoor)		
<u>Interface Minimum:</u>		
1	1 100/1000/2500Base-T RJ45, 1 RS-232 RJ45 Serial Port	
2	Bluetooth scanning and iBeacon advertisement @ 10 dBm max TX power	
3	Indoor AP with 2 + 1 BLE radios	
4	Internal x2 Dual band Wi-Fi + x1 BLE/ZigBee antenna	
5	Wi-Fi-7 IEEE 802.11be Dual-band 2.4/5 and 2 streams 2 radios (2x2)	
<u>Performance:</u>		
1	802.3af = 15.4W max, 802.3at = 25.5W max	
2	2x2 MU-MIMO Up to 688 Mbps + 2.88 Gbps	
3	MTBF should be 10years +	
4	Frequency band: 2.4GHz Channel width: 20/40MHz Modulation: BPSK, QPSK, 64/256/1024/4096 QAM MIMO Chains: 2x2 Service	
5	Frequency band: 5.0GHz Channel width: 20/40/80/160MHz Modulation: BPSK, QPSK, 16/64/256/1024/4096 QAM MIMO Chains: 2x2 Service	
7	EAP-TLS, EAP-TTLS/MSCHAPv2, PEAPv0/EAP-MSCHAPv2, PEAPv1/EAP-GTC, EAP-SIM, EAP-AKA, EAP-FAST, EAP-TTLS/PAP	
8	SSID supported: Local-Bridge, Mesh, Tunnel	

9	Managed from a Wireless LAN Controller on-prem or on-cloud	
10	Should be Wi-Fi 7 Certified	
11	802.11a, 802.11b, 802.11be, 802.11e, 802.11g, 802.11h, 802.11i, 802.11j, 802.11k, 802.11n, 802.11r, 802.11v, 802.11ac, 802.11ax, 802.1X, 802.3af, 802.3at, 802.3bt, 802.3az, 802.1Q, 802.11u, 802.11w, 802.11bz	
12	OFDMA(both UL/DL), 2.4 GHz OFDMA, BSS Coloring, Enhanced Target Wake Time (TWT)	
13	Should have Mount kit for Ceiling, T-Rail and Wall	
14	Should be offered with 1 years licenses and support	

Access Point (Outdoor)		
Sr. #	System Performance and scaling requirements	Compliance
Interface Minimum:		
1.	Port Port 1: 1× RJ-45 Multi-Gigabit Ethernet (100 M / 1 G / 2.5 G / 5 G), 802.3bt PoE-IN Port 2: 1× Fiber optic SFP+ Cage, 1 G / 10 G link speed Console: 1× RJ-45 Serial Console (RS-232	
2.	Bluetooth scanning and iBeacon advertisement @ 10 dBm max TX power	
3.	Ruggedized indoor/outdoor AP 4 + 1 BLE	
4.	Four-Radio 2.4GHz + 5GHz + 6GHz + Scan 6 Wi-Fi Internal Antennas + 1 BLE/Zigbee internal antenna	
5.	7 Internal antennas	
Performance:		
1.	Power consumption 26 Watts with IP67 Rating	
2.	2x2 MU-MIMO Up to 688 Mbps + 4.3 Gbps + 5.76 Gbps data rate	
3.	MTBF should be 10years +	
4.	Frequency band: 2.4GHz Channel width: 20/40MHz Modulation: BPSK, QPSK, 64-1024 QAM MIMO Chains: 2x2 Service	
5.	Frequency band: 5.0GHz UNII-1 to UNII-4 Channel width: 20/40/80/160/240MHz Modulation: BPSK, QPSK, 64-1024 QAM MIMO Chains: 2x2 Service	
6.	Frequency band: 6.0GHz UNII-5 to UNII-8 Channel width: 20/40/80/160/320MHz Modulation: BPSK, QPSK, 64-1024 QAM MIMO Chains: 2x2 Service	
7.	Frequency bands: 2.4 GHz and 5.0 GHz MIMO Chains: 1x1 Frequency Scanning	
8.	EAP-TLS, EAP-TTLS/MSCHAPv2, PEAPv0/EAPMSCHAPv2, PEAPv1/EAP-GTC, EAP-SIM, EAP-AKA, EAP-FAST, EAP-TTLS/PAP	
9.	802.11a, 802.11b, 802.11be, 802.11e, 802.11g, 802.11h, 802.11i, 802.11j, 802.11k, 802.11mc, 802.11n, 802.11r, 802.11v, 802.11ac, 802.11ax, 802.11u, 802.11w, 802.1Q, 802.1X, 802.3ad, 802.3at, 802.3az, 802.3bt, 802.3bz	
10.	SSID supported: Local-Bridge, Mesh, Tunnel	
11.	OFDMA, BSS Coloring, UL-MU-MIMO, DL-MU-MIMO, Enhanced Target Wake Time (TWT)	
12.	Must support spectrum analyzer for Wireless monitoring	
13.	Power injector must be included with the Access point	
14.	Should have Mount kit for Ceiling, T-Rail and Wall	
15.	Managed from a Wireless LAN Controller on-prem or on-cloud	
16.	Operating Temp -40°F to 158°F (-40°C to 70°C) -58°F to 178°F (-50°C to 80°C)	
17.	Humidity 5% to 90% non-condensing	
18.	Should be Wi-Fi7 Certified	
19.	Should be offered with 1 years licenses and support	

PASSIVE ITEMS:

Sn#	Item	Unit	Specification
1	UTP Cable	Meters	• 6A-pair, 23/24 AWG solid copper conductor • Category 6 UTP compliant with ANSI/TIA-568.2-D and ISO/IEC 11801 • Supports 1 Gbps and 10 Gbps • Flame retardant, RoHS compliant • Must be Fluke tested after installation
2	Duct 16x38	RFT	• High-quality rigid PVC cable management duct • Smooth internal surface for cable protection • UV resistant, non-corrosive, fire-retardant • Includes cover with secure locking mechanism • Suitable for indoor structured cabling installations
3	Duct 5.906 Inch (150mm)	RFT	• High-quality rigid PVC cable management duct • Smooth internal surface for cable protection • UV resistant, non-corrosive, fire-retardant • Includes cover with secure locking mechanism • Suitable for indoor structured cabling installations
4	Duct 3x3 Inch (76.2mm)	RFT	• High-quality rigid PVC cable management duct • Smooth internal surface for cable protection • UV resistant, non-corrosive, fire-retardant • Includes cover with secure locking mechanism • Suitable for indoor structured cabling installations
5	Duct 60x60	RFT	• High-quality rigid PVC cable management duct • Smooth internal surface for cable protection • UV resistant, non-corrosive, fire-retardant • Includes cover with secure locking mechanism • Suitable for indoor structured cabling installations
6	12 Ports ODF	Nos	• Wall-mountable steel enclosure • Supports single-mode fiber with minimum 12 ports • Includes splice tray(s), cable glands, and adapters • Compatible with SC/LC connectors • Powder-coated, corrosion-resistant body • Designed as per IEC / ITU-T fiber standards
7	18 U Cabinet with PDU	Nos	• Standard wall-mount cabinet • Cold-rolled steel construction • Lockable front glass/mesh door and solid rear door • Removable side panels • Proper ventilation and cable entry points • Supplied with rack-mount PDU, rated minimum 16A • Load bearing capacity suitable for enterprise network equipment
8	27U Cabinet with PDU	Nos	• Standard floor-standing cabinet • Cold-rolled steel construction • Lockable front glass/mesh door and solid rear door • Removable side panels • Proper ventilation and cable entry points • Supplied with rack-mount PDU, rated minimum 16A • Load bearing capacity suitable for enterprise network equipment
9	42U Rack with PDU	Nos	• Standard floor-standing cabinet • Cold-rolled steel construction • Lockable front glass/mesh door and solid rear door • Removable side panels • Proper ventilation and cable entry points • Supplied with rack-mount PDU, rated minimum 16A

			• Load bearing capacity suitable for enterprise network equipment
10	Loaded Patch Panel	Nos	• Category 6, 24-port • Fully loaded with RJ-45 keystone jacks • Compliant with ANSI/TIA-568.2-D • Rack-mountable (19-inch) • Supports PoE/PoE+ applications
11	I/O's	Nos	• Cat 6A RJ-45 keystone jacks • 110-type termination • Compatible with standard faceplates • Compliant with TIA/EIA standards • Suitable for PoE applications
12	Face Plate	Nos	• High-impact ABS plastic • Flush or surface mount compatible • Matches standard keystone modules
13	Back Box	Nos	• PVC or metal back box • Flush or surface mounted • Compatible with face plates and conduits
14	12 core OFC Cable (SM)	Meters	• Single-mode fiber • ITU-T G.652.D compliant • Suitable for indoor/outdoor use • Low attenuation, moisture resistant
15	RJ45 Connector	Nos	• Type: RJ45 Pass-Through Modular Plug • Category Compliance: Minimum Cat6A, backward compatible with Cat6/Cat5e • Connector Standard: 8P8C (8 Position, 8 Contact) • Shielding: UTP or FTP/STP (as per cable type offered) • Contact Material: Phosphor Bronze with Gold Plating (minimum 50μ inches) • Housing Material: Polycarbonate, UL 94V-0 Rated • Conductor Compatibility: Solid and Stranded Copper Conductors • Wire Gauge Support: 22-26 AWG • Pass-Through Design: Conductors pass completely through the connector for easy verification and termination
15	Cable Manager	Nos	• Horizontal rack-mount cable manager • 19-inch standard • Includes rings or finger duct design • Supports proper cable dressing
16	Fiber Patch Cord 3 Meter	Nos	• Single-mode • connectors (as specified) • Factory terminated and tested
17	Rawal Bolt	Nos	• Galvanized steel anchor bolts • Suitable for concrete and masonry • Adequate load-bearing strength
18	1m Ethernet Patch Cord	Nos	• Category 6 stranded copper cable • Factory molded RJ-45 connectors • Snagless boot • Supports Gigabit Ethernet and PoE • ANSI/TIA-568 compliant
19	3m Ethernet Patch Cord	Nos	• Category 6 stranded copper cable • Factory molded RJ-45 connectors • Snagless boot • Supports Gigabit Ethernet and PoE • ANSI/TIA-568 compliant
20	5m Ethernet Patch Cord	Nos	• Category 6 stranded copper cable • Factory molded RJ-45 connectors • Snagless boot • Supports Gigabit Ethernet and PoE • ANSI/TIA-568 compliant

21	10m Ethernet Patch Cord	Nos	• Category 6 stranded copper cable • Factory molded RJ-45 connectors • Snagless boot • Supports Gigabit Ethernet and PoE • ANSI/TIA-568 compliant
22	Flexible pipe	Meters	• Type: Flexible PVC Conduit / Flexible Corrugated Pipe • Size: 1 Inch • Material: High-grade PVC, self-extinguishing, flame-retardant • Color: Grey/Black • Compression Strength: Suitable for indoor ICT and electrical installations • Temperature Range: -15°C to +60°C (minimum) • Protection Rating: IP54 or better • Standards: IEC 61386 compliant
24	Industrial Socket	Nos	• Industrial-grade power socket • Heat-resistant housing • Rated for continuous load operation • Suitable for UPS / network equipment
25	Elbow 90-degree bend	Nos	• PVC/GI compatible elbows • Smooth curve to prevent cable damage • Matching size with conduit system
26	1.5-inch upvc pipe	Nos	• High-strength UPVC conduit • Flame retardant • Smooth internal wall • Suitable for structured cabling
27	1-inch upvc pipe	Nos	• High-strength UPVC conduit • Flame retardant • Smooth internal wall • Suitable for structured cabling
28	Shuttle Clip	Nos	• Standard electrical and civil installation accessories • Good quality, suitable for long-term installation • Used for proper finishing and cable support
29	1.5-inch Socket	Nos	• Standard electrical and civil installation accessories • Good quality, suitable for long-term installation • Used for proper finishing and cable support
30	1.5-inch Band	Nos	• Standard electrical and civil installation accessories • Good quality, suitable for long-term installation • Used for proper finishing and cable support
31	1 way (1 inch) Band	Nos	• Standard electrical and civil installation accessories • Good quality, suitable for long-term installation • Used for proper finishing and cable support
32	Cable Tie	Nos	• Standard electrical and civil installation accessories • Good quality, suitable for long-term installation • Used for proper finishing and cable support
33	Silicon	Nos	• Standard electrical and civil installation accessories • Good quality, suitable for long-term installation • Used for proper finishing and cable support
34	Tape	Nos	• Standard electrical and civil installation accessories • Good quality, suitable for long-term installation • Used for proper finishing and cable support
35	Plaster of Paris	KG	• Standard electrical and civil installation accessories • Good quality, suitable for long-term installation • Used for proper finishing and cable support
36	Screws with Rawal Plug Gatti	Nos	• Standard electrical and civil installation accessories • Good quality, suitable for long-term installation • Used for proper finishing and cable support
37	2 MM Power Cable (90 meter Roll)	Roll	• Copper conductor • 2-core insulated cable • Rated for standard electrical loads • PVC insulated, flame retardant
38	16 MM Earthing Cable	Meters	• Bare or insulated copper conductor • Suitable for proper grounding of racks and

			equipment • Compliant with electrical safety standards
39	1 KVA UPS with 10-15 mints standard backup	Nos	• True online double-conversion UPS • Output: 1kVA / ~700W • Pure sine wave output • Internal batteries with 10–15 minutes backup • LCD display and full protection (overload, surge, thermal)
40	6 KVA UPS with 10-15 mints standard backup	Nos	• True online double-conversion UPS • Output: 6kVA / ~5.4kW • Wide input voltage range • Internal VRLA batteries • LCD display and protection mechanisms • Suitable for network and IT loads