

## 2. Switch Network

### Scope of Work

a. To design, Supply, Installation and Configuration of Managed Switches.

- Design an appropriate network topology and switch configuration according to industry best practices.
- Provide a detailed proposal including the recommended managed switch models, quantities, and associated hardware and software requirements. The proposal must include Central network management Solution to enable efficient monitoring, configuration, and maintenance of the network infrastructure.
- Supply the agreed-upon managed switches and any additional hardware or software components as specified in the proposal.
- Configuration of the managed switches in alignment with the agreed-upon design and our specific requirements.
- Equipment installation for Server Room, FSM Building Floors and Male' area Sites, including physical placement of the switches, ensuring proper cable management, and conducting thorough connectivity testing.

b. Key Feature Requirements for Network Switches.

#### ➤ Server Room (Core Switch)

- 24 SFP ports (support 1G/10G speed)
- 4 SFP+ ports (support multiple speeds, including 1G/10G/25G/50G)
- Should be 19" Rack Mountable.
- Should have at least one USB-C console port and USB Type-A port.
- Provide transceiver modules along with the switches.
- Minimum 8GB RAM, 32GB flash and 8MB packet buffer memory.
- Must include a redundancy switch to ensure high availability and minimize downtime.
- Resiliency features.
  - Must support hot-swappable power supplies.
  - Should have Stacking Support feature.
  - Must support Bidirectional Forward Detection (BFD)
  - Unidirectional Link Detection (UDLD)
  - Should support Virtual Router Redundancy Protocol (VRRP)

- Should have switching capacity of 880 Gbps or more and throughput of 650 Mpps or more.
- Must have the capability to support both Layer 2 (L2) and Layer 3 (L3) functionality.
  - Should have a minimum MAC address table size that can accommodate 32,000 entries.
  - vlan tagging, according to the IEEE 802.1Q standard.
  - port mirroring.
  - capability to support an IPv4 ARP (Address Resolution Protocol) table with a minimum capacity of 49,000 entries or more.
  - capability to support a minimum of 1024 SVIs (Switched Virtual Interfaces) for IPv4.
  - DHCP server for IPV4 address allocation for network.
  - IGMP v1, v2, v3 and IGMP snooping.
- Must support Quality of Service (QoS) and a range of security features.
  - Access Control Lists (ACLs) with the ability to create rules based on both Layer 2 and Layer 3 headers.
  - Port security.
  - Dynamic ARP protection.
  - Control Plane Policing (CoPP).
- Must Support configuration through secure command-line interface (CLI) over SSH, Secure Web interface.
- Must support network management capabilities.

➤ Department / Site (Access Switch)

- 48 or 24 port Gigabit Ethernet ports.
- Minimum 2 SFP+ ports (support multiple speeds, including 1G/10G)
- Should be 19" Rack Mountable.
- Should have at least one console port.
- Provide transceiver modules along with the switches.
- Minimum 4GB RAM, 16GB flash and 1MB packet buffer memory.
- Should have switching capacity of 170 Gbps or more and throughput of 80 Mpps or more.
- Must have the capability to support both Layer 2 (L2) and Layer 3 (L3) functionality.
  - Should have a minimum MAC address table size that can accommodate 8,000 entries.
  - vlan tagging, according to the IEEE 802.1Q standard.
  - port mirroring.

- capability to support an IPv4 ARP (Address Resolution Protocol) table with a minimum capacity of 1,020 entries or more.
  - capability to support a minimum of 16 SVIs (Switched Virtual Interfaces) for IPv4.
  - Should support static routing.
  - IGMP v1, v2, v3 and IGMP snooping.
  - Must support Quality of Service (QoS) and a range of security features.
    - Access Control Lists (ACLs) with the ability to create rules based on both Layer 2 and Layer 3 headers.
    - Strict priority (SP) queuing.
    - Port security.
    - Dynamic ARP protection.
    - Control Plane Policing (CoPP).
  - Must Support configuration through secure command-line interface (CLI) over SSH, Secure Web interface.
  - Must support network management capabilities.
- c. Provide on-prem or cloud-based network management solution along with the switches. The network management solution should include the following features:
- Network topology view with connected switches along with details.
  - Should support following functions related to the proposed switches:
    - Template based Configuration.
    - Monitoring up to switch port level.
    - Troubleshooting.
    - Reporting.
  - GUI-based Configuration Comparison and Analysis
  - AI-based analytics capabilities to provide advanced insights and analysis related to the proposed switch.
    - Performance Monitoring.
    - Traffic Analysis.
    - High CPU utilization.
    - High Memory utilization.
    - Excessive port flaps.
    - Excessive port errors.
  - SFTP and TFTP support.
  - Should support RMON and sFlow.
  - User Access Control and Management.

d. Quantity and Minimum requirements.

- Network Switch

#	Location	Quantity Required	Minimum Gigabit Eth Ports	Minimum SFP Ports	POE
<b>Server Room</b>					
1	Core Switch	2		16 SFP+	No
<b>FSM Building</b>					
2	Floor 7A	1	48	2 SFP+	Yes
3	Floor 7B	1	48	2 SFP+	Yes
4	Floor 6AB	1	48	2 SFP+	Yes
5	Floor 5A	1	48	2 SFP+	Yes
6	Floor 5B	1	24	2 SFP+	Yes
7	Floor 4A	1	24	2 SFP+	Yes
8	Floor 4B	1	24	2 SFP+	Yes
9	Floor 2A	1	16	2 SFP+	Yes
<b>Male Locations</b>					
10	Easyfill	1	16	2 SFP+	Yes
11	Easyfill 1	1	16	2 SFP+	Yes
12	Easyfill 2	1	16	2 SFP+	Yes
13	Easyfill 4	1	16	2 SFP+	Yes
14	Easyfill 3	1	24	2 SFP+	Yes
15	Easyfill 5	1	16	2 SFP+	Yes
16	Easyfill 6 - Thilafushi	1	16	2 SFP+	Yes
17	Thilafushi Site	1	48	2 SFP+	Yes
<b>Regional Sites</b>					
18	Addu	1	16	2 SFP+	Yes
19	Fuvahmulah	1	16		Yes
20	Thinadhoo	1	16		Yes
21	Felivaru	1	16		Yes
22	Kooddoo	1	16		Yes
23	Hulhumeedhoo	1	16		Yes
<b>Spare</b>					
24	ICT	1	48	2 SFP+	Yes
25	ICT	1	24	2 SFP+	Yes

- 10G SFP+ LC LR 10km SMF Transceiver

#	Location / Switch	Quantity Required
1	Server Room (Core Switch)	32
2	Department / Site (Access Switch)	32
3	ICT Spare	2
<b>Total:</b>		<b>66</b>

e. Configuration of Switches Central Monitoring.

- Configuration of switches remotely and on-site.
- Creation of VLANs as per below requirement.
- Creation of switched virtual interfaces (SVIs) and the assignment of IP addresses based on the provided information.
- Configure necessary routing.
- Assigning switch ports to specific VLANs and the tagging of VLANs.
- Adding switches to a central platform for monitoring and management purposes.
- Perform IP connectivity tests via ping.

VLAN ID	Location	IP Address
VLAN711	Floor 7A	xxx.xxx.71.0/255
VLAN712	Floor 7B	xxx.xxx.72.0/255
VLAN611	Floor 6A	xxx.xxx.61.0/255
VLAN612	Floor 6B	xxx.xxx.62.0/255
VLAN511	Floor 5A	xxx.xxx.51.0/255
VLAN512	Floor 5B	xxx.xxx.52.0/255
VLAN411	Floor 4A	xxx.xxx.41.0/255
VLAN412	Floor 4B	xxx.xxx.42.0/255
VLAN211	Floor 2A	xxx.xxx.21.0/255
VLAN900	Easyfill	xxx.xxx.90.0/255
	Easyfill 1	
	Easyfill 2	
	Easyfill 3	
	Easyfill 4	
	Easyfill 5	
	Easyfill 6 - Thilafushi	
VLAN901	Thilafushi Site	xxx.xxx. 91.0/255
VLAN902	Addu	xxx.xxx. 92.0/255
	Fuvahmulah	
	Thinadhoo	
VLAN903	Felivaru	xxx.xxx. 93.0/255
	Kooddoo	
	Hulhumeedhoo	
100	Servers & Switches	xxx.xxx.100.0/255
111	Staff Wifi	xxx.xxx.111.0/255
112	Corporate Wifi	xxx.xxx.112.0/255
113	CCTV	xxx.xxx.113.0/255
114	IP Phone	xxx.xxx.114.0/255
115	Access Control	xxx.xxx.115.0/255

f. Warranty and Support.

- Minimum 3 years Parts and Service Warranty.
- Manufacturer Authorization Letter and Engineer Certificates should be attached along Proposed Brand.

g. Documentation and Labeling.

- Create accurate documentation, including cable and equipment labeling, to facilitate future maintenance and troubleshooting.
- Maintain detailed documentation of switch configurations.
- Maintain an inventory of installed equipment for future reference.

h. Training and Handover.

- Provide training to technical staff members.
- Conduct a thorough handover of the installed equipment.
- Ensure all necessary documentation, including the management and administration of the new switches, is provided.

**Deliverables:**

The expected deliverables of the Switch Network are as follows:

a. Network Design. – with bid documents.

- Clear and accurate network diagrams depicting the physical layout of the switch network. These diagrams should illustrate the connections between switches, network segments, and other network devices.
- Include detailed specifications for the Switch, such as brand, model, Country of Origin, Country of Manufacture, configurations, and capabilities.
- Provide a comprehensive list of all network equipment required for the project, including quantities and specific configurations or features.

b. Project Timeline. – with bid documents.

- Provide a project timeline outlining the different stages and milestones of the network implementation project.
- Include start and end dates for each task or activity, dependencies between tasks, and key milestones.

c. Switch Configuration and Equipment Installation. – Upon project award

- The completion of switch configuration, including the configuration settings for each switch, VLAN configuration, Quality of Service (QoS) configurations, port configurations, security measures, and Network management configurations.
- The Completion of Physical installation of network switches.

d. Documentation and As-Built Drawings. - After Completing Project

- Comprehensive documentation capturing the details of the implemented network infrastructure. This includes updated network diagrams, switch configurations, equipment inventory, and any other relevant information, including records of any changes or modifications made during the project implementation.

e. Training and Handover - After Completing Project

- Provide proper training for ICT staff members to enhance their skills in managing and maintaining the network infrastructure efficiently.
- Training documentation that outlines the materials, sessions, and resources provided for network management. This includes user manuals, operational procedures, troubleshooting guides, and any specific training sessions conducted.