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اِنْ شَاءَ اللّٰهُ
عَزَّ وَجَلَّ

1. $\frac{1}{x^2} = x^{-2}$ $\frac{d}{dx} x^{-2} = -2x^{-3} = -\frac{2}{x^3}$

- 2.1.2 $\frac{1}{2} \frac{d}{dt} \left(\frac{1}{2} m v^2 \right) = \frac{1}{2} m v \frac{dv}{dt} = \frac{1}{2} m v \frac{d}{dt} \left(\frac{1}{m} \frac{d}{dt} \right) = \frac{1}{2} \frac{d}{dt} \left(\frac{1}{2} m v^2 \right)$

- 2.1.4 رَدِّ رُوخُ قُتُقُتُرُسُ وَاوُتُقُيُيُ قُتُقُتُرُسُ قُتُقُتُرُسُ قُتُقُتُرُسُ قُتُقُتُرُسُ رَدِّ رُوخُ وَاوُتُقُيُيُ قُتُقُتُرُسُ

- [illegible]

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- 4.2 $\frac{d}{dt} \left(\frac{1}{2} m v^2 \right) = \frac{d}{dt} \left(\frac{1}{2} m \dot{x}^2 \right) = m \dot{x} \ddot{x} = m \dot{x} a = \dot{x} F = \frac{d}{dt} (x F) - x \frac{dF}{dt}$

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		6.1	7.	6
6.1.1 6.1.2 6.1.3 6.1.4 6.1.5 6.1.6 6.1.7	6.1.1 6.1.2 6.1.3 6.1.4 6.1.5 6.1.6 6.1.7	6.1.1 6.1.2 6.1.3 6.1.4 6.1.5 6.1.6 6.1.7	6.1.1 6.1.2 6.1.3 6.1.4 6.1.5 6.1.6 6.1.7	6.1.1 6.1.2 6.1.3 6.1.4 6.1.5 6.1.6 6.1.7

Supply of Datacenter Switches RFP

1. Introduction

The Elections Commission of Maldives (herein referred as ECM) is seeking proposals from qualified and experienced vendors submit proposals for the supply, delivery, and support of enterprise-grade data center switching equipment to enhance the performance, scalability, and resilience of our core infrastructure. The selected solution must support high-availability architecture, advanced Layer 2/Layer 3 features, modern data center fabrics, and robust security and automation capabilities. Vendors should detail hardware specifications, software features, licensing models, warranties, implementation services, training, and ongoing maintenance/support. Proposals must address compliance with the technical requirements and timelines outlined in this RFP.

2. Scope of Work

Supply and delivery of network switches in accordance with the technical specifications specified in point 3.

3. Technical Specifications

3.1. Datacenter Switch X2 nos.

3.1.1. General Requirements

- 3.1.1.1. The proposed core aggregation switch shall be a high-density, modular Layer 3 switch designed for deployment in data center and high-performance network environments.
- 3.1.1.2. It shall be capable of aggregating mixed copper and optical interfaces and supporting multi-speed uplinks at 10G, 25G, 40G, and 100G rates.
- 3.1.1.3. The switch must include at least one expansion card slot for future upgrades, allowing for additional port configurations or interface modules to be added later.
- 3.1.1.4. The switch must offer a modular hardware design with hot-swappable components, including fans and power supplies, and must support hardware-level expansion for future scalability.
- 3.1.1.5. The switch shall have a 1U form factor and be mountable in a standard 19-inch equipment rack.

3.1.2.Interface Configurations

- 3.1.2.1. Minimum 24 RJ45 ports, each capable of operating at 10 Mbps, 100 Mbps, and 1 Gbps speeds using auto-negotiation and auto-MDI/MDIX functionality. These ports shall support copper Ethernet cables using standard 10/100/1000BASE-T protocols.
- 3.1.2.2. Minimum 16 optical ports supporting 10 Gigabit Ethernet, using SFP+ slots that are backward compatible with 1G SFP modules. These ports must support both single-mode and multimode transceivers.
- 3.1.2.3. Minimum of 2 uplink ports must be provided using QSFP28 interfaces, each supporting both 100 Gigabit Ethernet and 40 Gigabit Ethernet transceivers. These uplinks shall support breakout into 4×10G or 4×25G interfaces when required.
- 3.1.2.4. The device must include 1 RJ45 console port for serial-based configuration and troubleshooting.
- 3.1.2.5. The switch must support dynamic port reconfiguration, allowing SFP+ and SFP28 ports to auto-negotiate between 1G, 2.5G, 10G, and 25G speeds based on inserted transceiver type and link partner capabilities.
- 3.1.2.6. A USB Type-A port must be available for firmware upgrades, configuration backup, or log export.

3.1.3. Performance Requirements

- 3.1.3.1. The switch must have a switching capacity of no less than 1.2 Terabits per second (Tbps), ensuring it can handle all ports operating at full line rate without bottlenecks.
- 3.1.3.2. The device shall support a packet forwarding rate of at least 800 million packets per second (Mpps) under standard packet sizes, to ensure optimal throughput under heavy load.
- 3.1.3.3. The switch must be equipped with a minimum of 24 Megabytes (MB) of buffer memory, shared across all ports, to ensure smooth handling of bursts and congestion scenarios.
- 3.1.3.4. The device must be capable of learning and storing a minimum of 64,000 MAC addresses, allowing it to support large networks and multi-tenant environments.
- 3.1.3.5. The switch must support jumbo frame transmission with a frame size of at least 9,000 bytes, allowing for more efficient data transfer in storage or virtualized environments.
- 3.1.3.6. The switch must support a minimum of 16,000 IPv4 routing table entries, and 8,000 IPv6 entries, for use in Layer 3 routing environments.
- 3.1.3.7. It must also support low-latency forwarding, with typical latency values less than 1 microsecond for Layer 2 packet switching.
- 3.1.3.8. The switch must support intelligent hardware-level packet processing using dedicated ASICs optimized for low-latency forwarding and deep

packet inspection. It must include hardware-based support for telemetry, flow tracking, and congestion monitoring.

3.1.4. Power and Cooling Requirements

- 3.1.4.1. The switch must be delivered with redundant AC power module rated at a minimum of 600 Watts, sufficient to power all interfaces fully populated with optical modules.
- 3.1.4.2. The power supply must be hot-swappable and must support front-to-rear airflow to align with standard data center cooling layouts.
- 3.1.4.3. The power module should support input voltages in the standard AC range and comply with international safety and efficiency standards.
- 3.1.4.4. The switch must include a minimum two hot-swappable modular fan units to maintain optimal thermal performance under continuous operation.
- 3.1.4.5. Fans must be capable of front-to-rear airflow, with air intake from the port side and exhaust from the power supply side, to match airflow design in typical rack-mounted environments.
- 3.1.4.6. The system must support fan redundancy, with the ability to operate at reduced capacity in the event of a single fan failure and generate alarms for fan status.

3.1.5. Software and Features

- 3.1.5.1. The switch must include a comprehensive feature set supporting Layer 2 and Layer 3 functions.
- 3.1.5.2. VLAN configuration (802.1Q, QinQ), STP/RSTP/MSTP loop prevention protocols
- 3.1.5.3. Link aggregation using IEEE 802.3ad (LACP)
- 3.1.5.4. Static and dynamic routing using OSPF, RIP, and BGP
- 3.1.5.5. Multicast protocols including IGMP v1/v2/v3 and MLD snooping
- 3.1.5.6. DHCP snooping with Option 82, ARP inspection, and IP source guard
- 3.1.5.7. ACL-based filtering on Layer 2 to Layer 4 fields, including MAC, IP, and port-based filtering
- 3.1.5.8. QoS mechanisms include traffic classification, marking, queue scheduling (WRR, SP), policing, and shaping
- 3.1.5.9. Port-based and VLAN-based mirroring, traffic monitoring (sFlow or NetStream), and loopback detection
- 3.1.5.10. Support for firmware upgrades via USB, TFTP, or remote management tools
- 3.1.5.11. Dual-image firmware supports high availability during updates

3.1.6. Management Requirements

- 3.1.6.1. The switch must support a full-featured CLI accessible via console or SSH.
- 3.1.6.2. A web-based management interface should be available for simplified operation.
- 3.1.6.3. SNMP support must include versions v1, v2c, and v3.
- 3.1.6.4. Management protocols shall include NTP, Syslog, and RESTful API support.
- 3.1.6.5. Configuration files must be exportable and importable from external USB devices.
- 3.1.6.6. The switch must support remote firmware upgrades and rollback.
- 3.1.6.7. Support for Open Programmability System (OPS) must be included, allowing administrators to deploy Python-based scripts directly on the switch for automation, monitoring, and custom control logic.
- 3.1.6.8. Support for cloud-based and on-premises management platforms must be included, with secure API access, role-based access control, and multi-tenant configuration isolation.
- 3.1.6.9. A USB port must allow plug-and-play configuration backup or system restoration.

3.1.7. Security Requirements

- 3.1.7.1. The switch must support 802.1X port-based authentication, MAC-based authentication, and fallback methods.
- 3.1.7.2. RADIUS and TACACS+ must be supported for centralized authentication.
- 3.1.7.3. HTTPS and SSHv2 must be supported for encrypted management sessions.
- 3.1.7.4. The switch must provide mechanisms for broadcast/multicast storm control and CPU protection.
- 3.1.7.5. Password policies must enforce complexity, requiring at least three types of characters and a minimum of eight characters.

3.1.8. Accessories

- 3.1.8.1. QSFP28,40G High Speed Direct-attach Cables, 1m (QSFP28) x2
- 3.1.8.2. RJ45-to-DB9 Console Cable 3m x1

3.2. TOR Switch x2 nos.

3.2.1. General Requirements

- 3.2.1.1. ToR switch must be a compact, high-performance Layer 3 switch designed for enterprise and data center edge deployments.
- 3.2.1.2. It shall be capable of aggregating mixed copper and optical interfaces and supporting multi-speed uplinks at 10G and 25G rates.

- 3.2.1.3. It must support modular architecture with hot-swappable components including fans and power supplies and offer future-proof scalability via expansion slots.
- 3.2.1.4. The switch shall have a 1U form factor and be mountable in a standard 19-inch equipment rack.

3.2.2. Interface Configurations

- 3.2.2.1. The switch must include a minimum of 16 SFP+ ports supporting 1G, 2.5G, and 10G Ethernet speeds. These ports must be backward compatible with 1G SFP modules and support both single-mode and multimode fiber transceivers.
- 3.2.2.2. The switch must include a minimum of 8 SFP28 ports supporting 10G and 25G Ethernet speeds. These ports must auto-negotiate based on inserted transceiver type and support fallback to 10G operation when using compatible SFP+ modules.
- 3.2.2.3. All SFP+ and SFP28 ports must support Digital Optical Monitoring (DOM) for real-time transceiver diagnostics including temperature, voltage, bias current, and optical power levels.
- 3.2.2.4. The switch must support auto-negotiation and auto-sensing across all SFP+ and SFP28 ports for seamless interoperability with 1G, 2.5G, 10G, and 25G transceivers.
- 3.2.2.5. The switch must include 1 dedicated out-of-band management Ethernet port (RJ45), supporting 10/100/1000 Mbps operation.
- 3.2.2.6. A USB Type-A port must be available for firmware upgrades, configuration backup, or log export.

3.2.3. Performance Requirements

- 3.2.3.1. The switch must support a switching capacity of at least 1.12 Terabits per second (Tbps), ensuring full line-rate forwarding across all interfaces under maximum load conditions.
- 3.2.3.2. The device must support a packet forwarding rate of no less than 450 million packets per second (Mpps), measured under standard packet sizes and full traffic load.
- 3.2.3.3. MAC address table capacity must be no less than 64,000 entries, allowing the switch to support large-scale deployments with extensive endpoint diversity.
- 3.2.3.4. The switch must support jumbo frames with a minimum MTU size of 9,000 bytes, facilitating efficient data transfer for storage, virtualization, and high-performance computing workloads.
- 3.2.3.5. Routing table must support a minimum of 16,000 IPv4 entries and 8,000 IPv6 entries, enabling robust Layer 3 routing capabilities across dual-stack environments.

- 3.2.3.6. Layer 2 switching latency must be less than 1 microsecond under typical conditions, ensuring real-time responsiveness for latency-sensitive applications.
- 3.2.3.7. The switch must support cloud-based and on-premises management platforms with secure API access, role-based access control, and multi-tenant configuration isolation.
- 3.2.3.8. The switch must support dynamic traffic engineering features such as Equal-Cost Multi-Path (ECMP) routing and policy-based forwarding to optimize network paths and resource utilization.
- 3.2.3.9. Support for intelligent stacking technologies must be included, allowing multiple switches to operate as a single logical unit with unified management and redundancy.
- 3.2.3.10. The switch must support intelligent telemetry features such as NetStream or sFlow for real-time traffic visibility and performance monitoring.

3.2.4. Power and Cooling Requirements

- 3.2.4.1. The switch must be equipped with redundant AC power modules rated at a minimum of 180 Watts, supporting hot-swappable operation and front-to-rear airflow.
- 3.2.4.2. The switch must include two hot-swappable modular fan units with intelligent speed control and airflow direction compatible with standard rack deployments.
- 3.2.4.3. The power supply must be hot-swappable and must support front-to-rear airflow to align with standard data center cooling layouts.
- 3.2.4.4. The power module should support input voltages in the standard AC range and comply with international safety and efficiency standards.
- 3.2.4.5. Fans must be capable of front-to-rear airflow, with air intake from the port side and exhaust from the power supply side, to match airflow design in typical rack-mounted environments.
- 3.2.4.6. The system must support fan redundancy, with the ability to operate at reduced capacity in the event of a single fan failure and generate alarms for fan status.

3.2.5. Software and Features

- 3.2.5.1. The switch must support Layer 2/3 switching and routing, including VLANs (802.1Q, QinQ), STP/RSTP/MSTP, LACP, OSPF, RIP, BGP, IGMP, ACLs, QoS, sFlow/NetStream, and dual-image firmware support.
- 3.2.5.2. The switch must support Native-IP telemetry and integration with IP-based monitoring systems using standard protocols such as gRPC and NetConf.
- 3.2.5.3. DHCP snooping with Option 82, ARP inspection, and IP source guard
- 3.2.5.4. ACL-based filtering on Layer 2 to Layer 4 fields, including MAC, IP, and port-based filtering

- 3.2.5.5. QoS mechanisms including traffic classification, marking, queue scheduling (WRR, SP), policing, and shaping
- 3.2.5.6. Multicast protocols including IGMP v1/v2/v3 and MLD snooping
- 3.2.5.7. Port-based and VLAN-based mirroring, traffic monitoring (sFlow or NetStream), and loopback detection
- 3.2.5.8. Support for firmware upgrades via USB, TFTP, or remote management tools
- 3.2.5.9. Dual-image firmware supports high availability during updates.

3.2.6. Management Requirements

- 3.2.6.1. The switch must support CLI via console and SSH, web-based GUI, SNMP v1/v2c/v3, NTP, Syslog, RESTful API, USB-based config backup, and remote firmware upgrades.
- 3.2.6.2. The switch must support real-time hardware diagnostics including voltage, temperature, fan speed, and power module status monitoring, with SNMP trap generation on threshold violations.
- 3.2.6.3. The switch must support loopback testing on individual interfaces and provide per-port error counters for CRC, alignment, and collision statistics.
- 3.2.6.4. The switch must support Open Programmability System (OPS) allowing Python-based scripts to be deployed for automation, monitoring, and custom control logic.

3.2.7. Security Requirements

- 3.2.7.1. The switch must support 802.1X, MAC-based authentication, RADIUS, TACACS+, SSHv2, HTTPS, storm control, CPU protection, and enforce password complexity policies.
- 3.2.7.2. The switch must provide mechanisms for broadcast/multicast storm control and CPU protection.
- 3.2.7.3. Password policies must enforce complexity, requiring at least three types of characters and a minimum of eight characters.

3.2.8. Accessories

- 3.2.8.1. SFP+ Direct-Attach Cables (DACs), passive, 10 Gbps, high-speed, 3-meter length, designed for short-distance connections between 10G-capable devices using SFP+ ports. X8 nos.
- 3.2.8.2. SFP28 Direct-Attach Cables (DACs), passive, 25 Gbps, high-speed, 5-meter length, suitable for short-range interconnects between 25G-capable devices using SFP28 interfaces. X8 nos.
- 3.2.8.3. Optical Transceiver, SFP+, 10G, Multi-mode Module (850nm, Short Range, LC) X16 nos.

4. Warranty & Compliance

- 4.1. The bidder should provide a minimum of One year manufacturer hardware warranty for the respective requirements included in the proposed solution.
- 4.2. All proposed hardware must be CE, FCC, and RoHS compliant.
- 4.3. Transceivers and cables must be genuine OEM-certified

5. Delivery Schedule

- 5.1. The deadline for submitting the required materials to the Commission and completion of Installation is Maximum 60 days.
 - 5.1.1. This 60-day period will commence from the date of signing the agreement, and it includes public holidays.
 - 5.1.2. The successful bidder must sign the agreement within 3 days from the date of award of the project.
- 5.2. After completion of delivery, the vendor should obtain sign-off on the Installation-cum-Acceptance certificate from the ECM official. ECM will carry out acceptance of hardware as per acceptance test plan.
- 5.3. Installation will be treated as incomplete in one/all the following situations:
 - 5.3.1. Non-delivery of any hardware, software or other components, accessories, documentation, drivers, media mentioned in the order.
 - 5.3.2. Non-delivery of supporting documentation.

6. Expectations from Bidders

- 6.1. As required by this RFP, the bid must be accurate, comprehensive, and in the format specified. As stated in points 2 and 3, all suggested items must be accompanied by the relevant technical documents.
- 6.2. The bidder must submit a valid and current Manufacturer Authorization Letter (MAL) issued by the original equipment manufacturer (OEM). This letter must explicitly authorize the bidder to supply and support the proposed equipment as per the specifications outlined in this RFP. Failure to provide this document will result in disqualification of the bid.
- 6.3. The vendor must provide at least 4 references where such systems have been supplied on-premises. (Letter from the client confirming the completion of the project).