UTM

UNIVERSITI TEKNOLOGI MALAYSIA

FACULTY OF COMPUTING

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BACHELOR OF COMPUTER SCIENCE (BIOINFORMATICS)

SECR1213 NETWORK COMMUNICATIONS - SECTION 01

PROJECT TASK 3

CHOOSING THE APPROPRIATE LAN DEVICES

GROUP NAME: DATA VOYAGERS

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LAN Devices

Device	Specifications	Price per unit (RM)	Quantity	Subtotal (RM)
Router  Reference: Cisco 4000 Family ISR Data Sheet	Brand: Cisco Model: Cisco 4000 Router ISR4331 - aggregate throughput is 100Mbps and upgradeable to 300Mbps with a performance license - has 2 slots of Network Interface Module(NIM) for modular WAN and LAN options like Ethernet, T1/E1, xDSL, 4G LTE, etc - with 3 onboard GE - has 1 onboard ISC slot - has 1 Enhanced service-module (SM-X) slot - 4 GB Flash Memory default - 4 GB DRAM default	4491.11	1	4491.11

Wireless Access Point  Reference: UniFi AC AP Datasheet	Brand: Ubiquiti Networks Model: UniFi UAP-AC-PRO Features: - Wireless Communications Standards: 802.11a/b/g/n/ac - Dual-Band Operation: ● 2.4 GHz: Up to 450 Mbps ● 5 GHz: Up to 1300 Mbps - MIMO Technology: 3x3 MIMO on both bands - Antennas: Dual-band antennas with 3x3 MIMO configuration - Maximum Throughput: 1750 Mbps (combined) - Compatible devices: Gaming Console, Personal Computer, Printer, Security Camera, Smart Television, Smart Thermostat, Smartphone, Tablet Special Features: - Weather-resistant and versatile design - Restrict airtime access to increase the capacity and efficiency of Wi-Fi devices. - Automatically optimizes the connection speed by band steering technology - Easy to manage with a UniFi Network web app or mobile app.	625.11	4	2500.44
Firewall 	Brand: Fortinet Model: Fortinet FortiGate 60E	2,999.00	1	2,999.00

Reference: FortiGate/FortiWi Fi 60E Series Data Sheet	Specifications -Firewall Throughput: 3 Gbps (IPv4) & 250 Mbps (NGFW - Next Generation Firewall) throughput. - 180 Mbps throughput Threat Protection - 400 Mbps IPS Throughput: - Interfaces: 1 x USB Port. 1 x Console Port. 8 x GE RJ45 Ports 2 x GE RJ45 WAN Ports. - Up to 1.8 million concurrent sessions. Security Features: - Deep inspection for encrypted traffic. - AI-powered threat intelligence with FortiGuard services. - Integrated FortiOS console for simplified network visibility and control.			
Switch (48 ports)  Reference: Cisco Catalyst 2960-X and 2960-XR Series Switches Data Sheet - Cisco	Brand: Cisco Model: Cisco Catalyst 2960-X Series (48 Ports) Features: - 48 Gigabit Ethernet ports. - Uplink options include 2x 10G SFP+ or 4x 1G SFP ports. - Up to 216 Gbps forwarding bandwidth - Up to 108 Gbps Switching capacity - Maximum 64-byte packet throughput: 77.37 Mbps - Supports Cisco FlexStack-Plus for up to 8	5000.00	2	10000.00

	switches in a stack. - 80 Gbps Stacking bandwidth. Power over Ethernet (PoE): - PoE budget of 370W, supporting devices like IP phones, wireless access points, and cameras. - PoE+ support (802.3at) for up to 30W per port. Security Features: - Layer 2 and Layer 3 access control lists (ACLs). - Secure remote management with SSH, HTTPS, and SNMPv3. - Advanced threat detection and mitigation. - Cisco EnergyWise technology for energy management and monitoring. - Reduced power consumption during idle periods.			
Switch (24 ports)  Reference: Cisco Catalyst 2960-L Series Switches Data Sheet - Cisco	Brand: Cisco Model: Cisco Cisco Catalyst 2960-L (24 Ports) Features: - 24 Gigabit Ethernet ports for device connectivity. - 2 x 1G SFP uplink ports for fiber or long-distance connections. - 56 Gbps Switching Capacity. - 41.66 Mpps Forwarding Rate. - Supports up to 255	1500.00	1	1500.00

	VLANs. - Supports PoE (802.3af) on all ports. - PoE budget of up to 370W, ideal for powering IP phones, cameras, and wireless access points. Security Features: - MACsec (Media Access Control Security) for secure Ethernet communications. - Port security, VLAN segmentation, and access control lists (ACLs) for network protection. Energy Efficiency: - Energy-efficient design using Cisco EnergyWise to monitor and manage power usage. - "Green" certification for low power consumption. - 1U rack-mountable switch for easy deployment in enterprise and campus environments.			
Patch Panels (48 ports)  Reference: Tripp Lite 48-Port Patch Panel	Brand: Tripp Lite Product Name: Tripp Lite 48-Port 1U Rackmount Cat6 110 High Density Patch Panel 568B, RJ45 Ethernet (N252-048-1U) Features: - Connector Type: RJ45 - Number of Ports - 48 Ports - Size: 1U of space - Comes with 110 type punch down termination - Removable "upper-deck" for easy punch down termination	1090.43	2	2180.86

	- Built-in wire management loom - Color coded for 568A/568B wiring Special Features: - Data Transfer - Low Voltage			
Patch Panels (24 ports)  Reference: Tripp Lite 24-Port Patch Panel	Brand: Tripp Lite Product Name: Tripp Lite 24-Port 1U Rackmount Cat6 110 Patch Panel 568B, RJ45 Ethernet(N252-024) Features: - Connector Type: RJ45 - Number of Ports - 24 Ports - Rack mountable on a 19 rack - Size: 1U of space - Comes with 110 type punch down termination - EIA/TIA 2/32 spacing - meets and exceeding EIA/TIA TSB-40 Cat6 connecting hardware specifications - Ports clearly numbered both on front and back - Color coded for both EIA/TIA 568A & 568B installations - Fit for Cat5, Cat5e, and Cat6 Ethernet cable - Recommended UTP Cat6 22-24 AWG solid cable	241.20	2	482.40
Cat 6 Ethernet Cable 305m with 23 AWG and 4 twisted pairs	Brand: NavePoint Connector Type: RJ45 Features: - Engineered with	296.50	9	2668.50

 Product detail: CAT 6 Ethernet Cable 305m	cost-effective Copper Clad Aluminum (CCA) conductors - Speeds: 10/100/1000 Mbps. - Frequency: 550 MHz - Compatible Devices: Connecting computers, routers, VoIP phones, IP cameras, printers, gaming consoles, Ethernet extenders, switch boxes, and more, providing versatile networking solutions Special Feature: - Tangle free			
Connector  Reference: AMP Tyco RJ45 CAT6 8P8C Modular Plug Network Lan Connector (100 PCS)	Brand: AMP Tyco Model: AMP Tyco RJ45 CAT6 8P8C Unshielded Modular Plug Network Lan Connector Features: - Head: 8 Pins - Application : RJ45 , CAT6 - Size: Approx 24*13*10mm	24.90	9	224.10
Server  Reference: Cisco UCS C480M5 High-Performance Rack Server	Cisco UCS C480M5 High-Performance Rack Server - Form factor: 4U rackmount - Processors: Dual Intel Xeon Scalable processors (2nd generation) - Memory: Up to 24 x	20000	5	100000

	16GB DDR4 DIMMs for a total of 384GB - Storage: Up to 32x 2.5-inch hot- swappable SAS/SATA HDDs or SSDs - Networking: Dual 10GBASE-T Intel x550 network adapters - High-performance PCIe Gen 3 slots - Support for up to 12 NVMe SSDs - Integrated management controller (iMC) - Cisco UCS Manager software			
			Total cost	127046.41

1.1 Research and References

Sufficient research has been done as we choose the above devices to support our network system. We had learnt that patch panels are important as patch panels avoid the damage of switch ports due to the multiple plugs and pulls of the cables ("How to Install Patch Panel and Switch?", 2020). Hence, we decided to add patch panels into our budget list. Research on devices among a variety of brands has been done as well and is elaborated below. A reference list on the research we had done is also attached at the end of the report.

1.2 References included and are appropriate

A reference list on the research we had done is also attached at the end of the report and also in the table of list of devices.

1.3 & 1.4 Characteristics of LAN devices and its specifications to accomplish the needs and requirements.

For router we choose Cisco instead of TP-Link because we need enterprise-grade performance, security, and scalability. Besides, Cisco can fulfill complex requirements or serve critical infrastructure. Next, we have a skilled IT team to configure and maintain the system.

For firewall, we choose Fortinet instead of Cisco because Fortinet offers high performance at a more affordable price. Fortinet has user-friendly solutions for SMBs or enterprises without compromising on security. Fortinet also offers integrated UTM features and SD-WAN in a single device.

For switch, we choose Cisco instead of Huawei because our requirement about the network is mission-critical as it requires cutting-edge technology, or integrates heavily into a Cisco ecosystem. Besides, we think that we have the budget and skilled personnel to handle advanced configurations.

For patch panel, we choose Tripp Lite instead of TRENDnet because Tripp Lite offers a durable, high-performance solution for large-scale or critical networking environments. It also provides setup demands features like shielding, high density, and support for advanced network speeds (e.g., 10GbE).

For server, we choose Cisco UCS C480M5 instead of Lenovo ThinkSystem SR630 because Cisco UCS C480M5 is a more powerful and scalable server. It boasts a higher maximum CPU capacity, enabling it to handle more demanding workloads, and a higher maximum memory capacity, which can help to improve performance for memory-intensive applications. It also offers more storage options, providing the flexibility to store more data and choose the most suitable storage type.

2.0 Report - Questions and Answers

1. **Are you surprised by the prices? How were you surprised?**
   Answer: Yes, the prices of networking devices can be quite surprising. As we don't know that the devices can be quite expensive before we do research for this project, especially when exploring enterprise-grade equipment like Cisco routers and switches. The high cost of these devices often reflects their advanced features, reliability, and brand reputation. Another surprising aspect is the variance in pricing between brands and models. While premium brands like Cisco offer cutting-edge technology and top-tier support, budget-friendly options still meet the needs of less demanding environments at a fraction of the cost. The realization that these prices also account for factors like build quality, long-term durability, and enhanced security features can help make sense of the numbers, even though they still seem steep at first glance.

2. **Have you ever considered cost as a factor for choosing networking devices?**
   Answer: For us, cost is always an important factor when selecting networking devices, but it's not the only one. As our group's budget is RM 2 millions, hence balancing the budget with the specific needs of the network is critical. For instance, while it's tempting to go for cheaper devices to save costs, it's important to think about the long-term implications, such as durability, scalability, and maintenance expenses. Total Cost of Ownership (TCO) is a key consideration—cheaper devices may save money upfront, but premium devices with better warranties and support often prove more economical in the long run. In an academic setup, prioritizing cost-effective devices for general areas while investing in high-performance ones for specialized labs can strike the right balance. For example, using TP-Link or Ubiquiti for less demanding environments and reserving Cisco for high-tech labs allows us to manage costs effectively while still ensuring quality.

3. **What are the major differences between the same devices from different brands? For example, Cisco and Huawei Routers.**
   Answer:
   Router: Cisco vs Tp-Link
   For target audience, Cisco is designed for enterprise-level networks, businesses, and critical infrastructure while Tp-Link is primarily aimed at home users, small businesses, and budget-conscious buyers.
   For performance, Cisco has high performance as it is built for high-throughput and low-latency operations in demanding environments meanwhile Tp-Link has good performance as it is adequate for home and small office environments but may struggle under heavy loads..
   For security, Cisco provides enterprise-grade security features such as intrusion prevention, advanced firewalls, and zero-trust architecture while Tp-Link provides basic security features such as WPA3, firewalls, and basic VPNs for consumer and small business use.
   For price, Cisco tends to be more expensive to reflect its focus on enterprise and critical systems meanwhile Tp-Link is more affordable as it focuses on delivering value for money for home and small business users.

Switch: Cisco vs Huawei

The popular series of Cisco switches are the enterprise switches, Catalyst series and Nexus switches. Cisco Catalyst switches are designed for core layers in campus networks, while the Nexus is mainly for data centers. Whereas, for Huawei switches, the popular one is the campus switches.

For target audience, Cisco is geared toward enterprises, data centers, service providers, and mission-critical networks meanwhile Huawei aims to serve enterprises, SMBs, and telecom operators with cost-effective solutions.

For performance, both Cisco and Huawei brands provide high-performance switches. Cisco uses IOS for stability and advanced management, while Huawei employs VRP which offers flexibility and traffic optimization.

For cost, Cisco switches are more expensive which reflects their premium features and reliability. Whereas, Huawei provides cost-effective solutions, appealing to budget-conscious users.

Patch panel: Tripp Lite vs TRENDnet

For target audience, Tripp Lite is designed for enterprise-grade and data center environments while TRENDnet is aimed at small to medium-sized businesses (SMBs) and budget-conscious users.

For its features, Tripp Lite offers high-density patch panels, supporting large-scale networks meanwhile TRENDnet provides standard patch panels, often for Cat5e and Cat6 cables and focused on basic features like numbered ports and simple design.

For shielding and performance, TRENDnet emphasizes shielding for environments with potential EMI, whereas Tripp Lite patch panels are mre general-purpose, catering to standard networking needs.

For PoE compatibility, Tripp Lite frequently includes PoE features which may not be standard in all TRENDnet models.

For build and design, TRENDnet often uses metal shielding for added durability and stability, while Tripp Lite focuses on flexible setups with easy cable management.

For price, Tripp Lite offers a higher price point, reflecting its professional-grade quality and features, while TRENDnet is more affordable and budget-friendly.

Server : Cisco UCS C480M5 High-Performance Rack Server VS Lenovo ThinkSystem SR630

The Cisco UCS C480M5 High-Performance Rack Server is a 4U rackmount system powered by dual 2nd-generation Intel Xeon Scalable processors meanwhile Lenovo ThinkSystem SR630 is a 2U rackmount server designed with up to 2nd Gen Intel Xeon Scalable processors, supporting configurations with up to 28 cores.

For memory capacity, Cisco UCS C480M5 supports up to 24 DDR4 DIMM slots, allowing a maximum memory capacity of 384GB meanwhile Lenovo ThinkSystem SR630 provides up to 12 DDR4 DIMM slots, enabling a maximum memory capacity of 192GB.

For storage, Cisco UCS C480M5 accommodates up to 32 2.5-inch hot-swappable SAS/SATA HDDs or SSDs, and it includes dual 10GBASE-T Intel x550 network adapters meanwhile Lenovo ThinkSystem SR630 allows up to 16 2.5-inch hot-swappable SAS/SATA HDDs or SSDs, and its networking capabilities include dual 10GbE SFP+ ports.

For its additional feature, Cisco UCS C480M5 also supports up to 12 NVMe SSDs and features an integrated management controller (iMC) meanwhile Lenovo ThinkSystem SR630 supports up to 6 NVMe SSDs and offers management through the BMC with IPMItool.

Meeting Minutes #6

DATE/TIME	2 Dec 2024 10:00 am
LOCATION	Physical
AGENDA	1. Discuss the question on Task 3
	2. Task distribution for each person
	3. Research on network devices for the academic institution
MEETING MC	KOO XUAN

ATTENDANCE

NAME	TIME	REASON FOR ABSENCE
CHIN PEI WEN	1000	-
KOO XUAN	1000	-
LING YU QIAN	1000	-
TAN ZHAO HONG	1000	-

Minutes

No.	Item Discussed	Details	Person-In-Charge
1	Understand the task requirement	Slide showed the question and rubric given on Task 3	All members
2	Research on network devices for the academic institution	All members discussed the importance of selecting appropriate network devices for the academic institution.	All members
		Members shared their research findings on routers, switches, wireless devices, and patch panels from various brands like Cisco, Huawei, and Asus.	

3	Selection of LAN Devices Based on Requirements and Budget	We state out the specifications and features to identify devices for our project.	All members
		Finding the prices of the devices we selected	
		We choose and select the most suitable devices for the project.	
		All members agreed to the suggested devices based on our budget.	
		Arrange the references used by all members.	
4	Device Comparison Between Different Brands	Members discussed the major differences between different brands of devices which focused on their performance, scalability, and price.	All members
5	Meeting ended	1230	All members

Sources of researches

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[12]“24-port Cat5/5e Unshielded Patch Panel - TRENDnet TC-P24C5E,” *Trendnet.com*, 2024. https://www.trendnet.com/products/patch-panels/TC-P24C5E

[13]“Wall Mount Patch Panel – 12-Port Blank Angled Wall Mount Keystone Patch Panel | TRENDnet - TRENDnet TC-KP12V,” *Trendnet.com*, 2024. https://www.trendnet.com/langen/support/support-detail.asp?prod=150_TC-KP12V