UNIVERSITI TEKNOLOGI MALAYSIA

SECR 1213 - 06
Network Communications

Lecturer: Dr. Ts. Raja Zahilah binti Raja Mohd Radzi

Task #2
Preliminary Analysis

NETLINK SOLUTIONS

Group 4: NetLink Solutions

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CONTENTS

1. Task Explanation

The given task is all about planning via preliminary analysis, to gather as much information as possible about the requirements, devices, preferences, constraints, …. etc.

Taking some questions into consideration so we can decide which is more suitable in terms of longevity, cost-efficiency, and best applicable performance, the questions we took into consideration are to be backed up by the faculty representative, and online researches, with every question having an effect on the design and cost.

The compatibility and usability were answered based on some aspects that were asked and answered by the faculty representative in each and every question.

Some of the key discussions are as follows:

- User preference and compatibility
- Network system establishment and requirements
- Hardware and software-based establishments
- Network based security and device connectivity
- Cost based establishment
- Mutual offerings
- Link build up between all facilities of the primarily designed architecture
- 4IR relations
- Better possibilities in the system

In the later phases of the task the team decided the feasibility based on the given questions below. And also, through researches, taking into consideration maintenance and future expanding upgrades.

2. Meeting Minutes #1

Date/time	**25/10/2024, 8:00 p.m.**
Location	**Google Meet (online)**
Meeting discussion task	1. **The task.** 2. **The suggest idea.** 3. **The source of information.** 4. **Next meeting.**
Meeting MC	**Abdalla Ali Abdalla Ali**

Attendance

Name		**Time**	**Reason of absence**
1	Abdalla Ali Abdalla Ali	8:00	**N/A**
2	Nouredin Mamdouh	8:00	**N/A**
3	Mohammed abdelgawwad	8:00	**N/A**

Minutes

No	**Item discussed**	**Result**	**Person in charge/Time**
1.	The task	Noureldin thoroughly read the task and explained eachpart in details, while explaining some terms, the team had a good understanding of the overalltask.	**Nouredin Mamdouh (8:00 pm - 8:19 pm)**
2.	The suggested idea.	Mohammed suggested to briefly think about all aspects of the network in a step-by-step approach, as network engineers and designers, and what we supposed to do.	**Mohammed abdelgawwad (8:20 pm - 8:29 pm)**

3.	The resources of the information	Abdalla suggested to firstly try to come up with simple questions by analyzing the tasks, and discussing basic questions first then getting into more complex question to discuss with the FC representative.	**Abdalla Ali (8:29 pm - 8:35 pm)**
4.	Next meeting	Next meeting said Noureldin to be held at Sunday after we all gathered question to be discussed	**Nouredin Mamdouh (8:35 pm - 8:39 pm)**
Meeting Ended			**8:39 pm**

3. Meeting Minutes #2

Date/time	**27/10/2024, 9:00 p.m.**
Location	**Google Meet (online)**
Meeting discussion task	**1. The suggested questions**
Meeting MC	**Abdalla Ali Abdalla Ali**

Attendance

Name		**Time**	**Reason of absence**
1	Abdalla Ali Abdalla Ali	9:00 pm	**N/A**
2	Nouredin Mamdouh	9:00 pm	**N/A**
3	Mohammed Abdelgawwad	9:00 pm	**N/A**

Minutes

No	**Item discussed**	**Result**	**Person in charge/Time**
1.	The suggested questions	Nouredin discussed his questions, while discussing which is appropriate and which is not. Mohammed also did the same. And Abdalla did the same, the member gathered their questions to discuss with the FC representative.	Nouredin Mamdouh (9:00 pm - 9:19 pm) Mohammed Abdelgawwad (9:19 pm -9:32 pm) Abdalla Ali (9:32pm - 9:44 pm)
Meeting ended			**9:45 pm**

4. Questions and Answers

I. What is best connection type in terms of cost and outcome in lab (wired vs wireless)?

Wired Connections are generally preferred for lab environments as they:

- Provide better and fast connections with less to no interruption.
- Offer superior protection and decrease the signal load.
- Are less expensive from the perspective of their capacity for maintenance in highly used channels.

Wireless could be added as a second but would provide for very powerful access points thus adding to both the cost and complexity.

II. What is the best cabling system for the networking in the labs?

Category 6A Ethernet Cable (Cat6A) is ideal for lab environments due to its:

- Forwarding capability with up to 10 Gbps.
- Minimized noise and inter connections.
- The cost efficiency when performance requirements are high.

Where the need is higher, then fiber optic cables may be used especially for the backhaul connections to other floors or to the server room, though they are pricey.

III. How many people on average will be there at the lounge using the WIFI?

In accordance to normal number of student and staff in an area like the lounge expects to have average of fifty to one hundred users busy at any one time. This estimation makes it easier to quantity the density needed for Wi-Fi access points so as to get the right density to support the coverage and speed needed.

IV. The minimum speed required in each of the labs, conference room, and student lounge?

- Labs: High internet speed of minimum 1 Gbps per lab is recommended for 30 workstations to be used with multimedia applications. Such speed is desirable for the

use of video streaming, applications hosted on the cloud, and sharing of files, which are general practices in colleges, schools and educational environments.

- Conference Room: Video conferencing rooms require the minimum bandwidth of 50-100 Mbps per user to deal with high-quality video stream. When selecting a server with an estimated 10–15 users stabilized video calls require a speed of at least 1 Gbps.
- Student Lounge: It was found that for a high-density area where 50-100 users (students, staff and visitors) may use the rooms simultaneously, the total connectable bandwidth of 1.5-2 GB/sec is suitable for a combination of light browsing, streaming, and light multimedia tasks.

V. What are the best cost-efficient requirements for the lab workstation?

For cost efficiency in workstations, consider:

- Processor: Intel Core i5 or AMD Ryzen 5 for an everyday use in various jobs.
- RAM: Minimum 8GB, recommended should be 16GB for optimum performance when running multiple programs at the same time.
- Storage: SSD (250GB) to improve system's performance without straining the firm's budget excessively.
- Flat monitor screen between (21–24 inches)

The general computational workload of these specifications is just adequate for usual lab operations such as code writing and data manipulation with moderate levels of virtualization.

VI. What are the devices that should be in the hybrid classroom?

The hybrid classroom should include:

- Large flat screen for collaborative viewing of content across the formal and informal classroom.
- Short-throw, high-lumens video projectors or overhead multimedia displays for video and computer graphics.
- Anything that goes into making video conferencing happen, for instance: Webcams High quality microphones and speakers.

Interface that used for controlling of connected devices such as smart boards and projectors.

These components build up a versatile, communicative environment, which is suitable for a containing hybrid teaching.

VII. what is the most suitable bandwidth for the network?

The total network bandwidth of the internal data traffic should therefore be around 10 Gbps, based on the various types of high-density and multimedia focused areas. The peak traffic external internet bandwidth must be around 5 Gbps to achieve simultaneous intense usage.

VIII. What are the security measures for the network?

Recommended security measures include:

- For the outer layer security, Firewall with intrusion detection/prevention.
- NAC to avoid any unauthorized devices to communicate with the network.
- Annual security update, patch on all the network equipment's.
- Multiple VLAN's must be created for separate departments in the event that one is compromised by a virus.

Wireless connection (Wi-Fi) secured protocols, known as WPA3.9. What power backup compromised by a virus.

IX. How many servers do we need and most suitable server requirement for the network?

Server Quantity: In this configuration It will be enough to use 1-3 servers:

- A single server for both managing the network and controlling access to this network.
- One back-end server required to retain the information in case of failure.
- Additional to that, an option channel, if needed, for mission critical applications such as Video Conferencing.

Server Specs:

- Processor: A perfect choice is again the Intel Xeon or AMD EPYC processors that should have at least 8 cores.
- RAM: Minimum 32GB to work thus expandable to support multitasking.

- Storage: SSD for quicker response time while the NAS or SAN could be used for the scaling up solution.

Network: 10Gb Ethernet for interconnects with fault tolerance and high through put.

X. Devices' requirements for the wireless network specification?

Access Points: Employ high density Wi-Fi 6 or WIFI 6E enterprise graded access point for better throughput and efficiency.

Controller: A central Wi-Fi for adjusting network parameters, controlling the access of wireless users, and sharing bandwidth throughout the building.

Security Gateway: Interior design should incorporate an enterprise security gateway for wireless security policies and access.

XI. Which types of network devices are necessary for the Cisco Networking Lab to meet educational and instructional needs?

The Cisco lab should be equipped with:

- Managed switches: Layer 3 switches that will enable students set up and manage the networking protocols.
- Routers: At least one router that can run OSPF, EIGRP and BGP, all of which are routing protocols.
- Firewalls: In the case of teaching the network security principles.
- Cabling: Teaching interfaces and required cable connections for practical exposure.
- Virtual Lab Environment: Lab apparatus including switches and routers for the practical learning activities like Cisco Packet Tracer or GNS3.

XII. what ISP company should be used for planning for connection establishment?

One can think of ISPs who provide fiber connections that are highly dependable, like Telekom Malaysia, TIME Internet, UNIFI ...etc.

Looking for packages offering:

- Broad and stable broadband connection with minimum speed of 1Gbps for quality data connection.

- Service Level Agreements (SLAs) particular to maintenance and availability.
- Additional paid services for managed services support and maintenance supply.

XIII. Is there any network system you would prefer us to reuse/mimic?

If the existing Faculty of Computing network has a scalable, reliable setup, we will consider:

- Using similar ideas about VLAN, IP address and devices brands and models that has been proven to be successful earlier.
- Imitating previously effective security measures in regard to the policy and setup of computer systems.

This will make deployment more efficient and also minimize the number of compatibility problems that are likely to be encountered.

XIV. What are the best network protocols that can be used in the labs?

For lab environments, these network protocols would be suitable:

- TCP/IP: For basic network communication and to connect to the world wide web.
- IPv4 and IPv6: Make sure that they both are present in the devices for later compatibility.
- DHCP: Dynamic allocation of IP address, which is effective in the context of the lab environment, where devices often swap.
- HTTPS and SSL/TLS: For internal data communication within the network.
- VLANs: Allow creation of sub logical networks within the same physical domain to improve separation of the networks.

5. Feasibility

The following were viewed as important and informed the network infrastructure for the Faculty of Computing new building.

Key areas of feasibility include:

Cost Structure and 4IR Alignment: A key area of value alignment targets 4IR compliance in terms of system design, that is, optimal of high-performance laboratories and equipment with regard to cost constraints, as well as to match future demand.

Reliable Network Connectivity: Internal 10 Gbps, External 5 Gbps will cater current as well as future needs to specific areas of high traffic such as Labs and Lounges.

Optimal Hardware and Software Selection: Cat6A cables and fiber optic are used to provide fast data transmission, while some mid-range workplaces have been chosen with regard to optimal cost and performance.

Specific choices of devices' requirements to meet the needs for the labs, student lounge and the overall network (workstations, connection point, servers, routers, …etc.)

Secure Infrastructure: Firewalls and VLANs, along with intrusion systems provide a good level of protection, against internal and external threats.

ISP and Protocol Compatibility: ISP choices and the utilization of standard protocol (TCP/IP, VLAN) ensure reliable service with the downstream potential to accommodate growth and extend the connections to related devices. Each of these considerations guarantee a sustainable, secure and reasonably priced network that meets expectations of the stakeholders, now and in the future, both now and in the future as the academic institution develops.

6. Appendix

References

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