



UTM
UNIVERSITI TEKNOLOGI MALAYSIA

Malaysia-Japan
International
Institute of Technology
(MJIIT)

SECR1213 NETWORK COMMUNICATION

20242025 – SEMESTER 2

PHASE 2

Question Answering and Feasibility Test

FACULTY OF MJIIT

Group: A&C

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Part 1 Q&A

1. What is the minimum network performance requirement, such as bandwidth, latency, and packet loss tolerance, for each lab?

For a lab accommodating 30 users, a minimum bandwidth of **7 Mbps per user** is recommended. This equates to a total bandwidth requirement of **210 Mbps** (7 Mbps x 30 users) to ensure smooth operation, especially if multiple devices are accessed simultaneously. [1]

For optimal network performance in labs, the minimum requirements generally include a latency of under 20 ms for real-time applications and a packet loss tolerance of less than 1%. These thresholds ensure efficient data transmission and user experience, especially in environments requiring real-time communication and collaboration. [2]

2. What are the equipment requirements for the video conferencing room, including HD cameras, sound systems, and other necessary tools?

For an effective video conferencing room equipment requires HD cameras since it is essential to have high quality image; in this case, it's normally PTZ that is Pan-Tilt-Zoom, sound system which has high-quality speakers and microphone which cancels echo. Others are big displays or projectors for common display, Control System- a touch panel to control audio video and display sharing plus the light controls for video optimization. (For our conference room we've included a piano for creative breaks and beautiful flowers to enhance the ambiance. This comprehensive setup will elevate the meetings and collaborations to new heights.) [3]

3. What is the equipment needs for the hybrid classroom, such as interactive whiteboards, remote conferencing tools, and wireless projection systems?

If you are to teach a class that is partly face to face and partly online you will need good audio visuals such as, Cams of high definition with P/T/Z features to

capture the entire classroom, Microphones that are installed at the ceiling to capture sound. For dynamic interaction, there has to be the presence of an online whiteboard or at least a screen sharing tool that can facilitate interaction of all the learners who are attending the face-to-face meeting from those who are receiving the interaction asynchronously. Further, there are needs for wireless projection system and good/reliable internet quality to facilitate the flow of real time data.[4]

4. What specific equipment, like routers, switches, or firewalls, is required for the Cisco lab?

A Cisco lab requires fundamental hardware which include routers such as the Cisco 1941 & 2901, switches, especially from the Catalyst series like 2960 or 3560 and firewalls from the Cisco ASA series. This configuration allows practical and active involvement in real network setup and configuration with basic routing and security consistency with the CCNA standards. [5]

5. What is the equipment needs for the IoT lab, including quantities of microcontrollers, sensors, and embedded boards, and any brand preferences?

For an IoT lab, the necessary devices consist of approximately 30 microcontrollers (Arduino or Raspberry Pi), different sensors as thermal, movement as well as light ones, and embedded boards (for example STM32 or ESP8266 for wireless functionalities). These devices allow the students to work on realistic IoT projects and can be purchased from familiar non-counterfeit brands.[6]

6. How will the 15% projected increase in students and staff over four years impact network capacity requirements?

Based on the effective growth in the number of students and staff members up to 15% for four years; the load on the networks presents the main challenge for the Faculty of Computing. Surging from 1,800 students to about 2,070 as well as a corresponding increase in staff; there is increased demand for bandwidth, hardware, and connectivity. This growth creates the need for efficient and effective network solutions at a large level, and undefined higher bandwidth to support multiple users at the same time and undefined security measures to combat different threats.[7]

7. Is there a long-term plan for network expansion, such as adding new labs or functional areas?

When designing the new building you need to put into account if the faculty decides to add new labs for AI and other labs, but they don't have definite plans to do so in the near future is just that as stated in the project brief they want to have some scalability. The faculty representative said.

8. Is there a need for backup power (e.g., UPS) or redundant network lines to ensure stability during outages?

Yes, backup power supplies are essential for labs in case a disaster occurs or any emergencies prevent power to reach the lab. We can use suppliers such as: UPSs (uninterruptible power supplies), engine generators, and batteries.

UPSs: UPSs are generally placed between the systems and the power supply, and contain a system of batteries, chargers, switches, and inverters to maintain charge while conveying power to systems.

Batteries: Batteries are typically set up in parallel to the load and source to allow for float charging and to seamlessly power the system when necessary

Backup power supplies should be kept in secure facilities, maintained and monitored to prevent any degradation in performance. [8]

9. What network security equipment is required, like firewalls, IDS, or IPS, to ensure security?

To ensure the security of your network, a combination of hardware and software solutions is essential. Here are some of the key network security equipment we should consider:

- **Firewalls**

Firewalls are one of the most fundamental network security appliances.

- **Intrusion Detection Systems (IDS)**

Network-based intrusion protection systems proactively monitor all the traffic going through your network.

- **VPN Gateways**

With the rise of remote work, every company needs to ensure that their internal network resources are accessible securely from anywhere. [9]

10. Are there specific requirements for network traffic monitoring to prevent misuse and enhance efficiency?

Effective network traffic monitoring is crucial for preventing misuse, enhancing efficiency, and ensuring overall network security. Here are some key requirements:

1) Choose a data source of best fit:

To start exploring the depths of your network, you must gain brief visibility of the data

2) Discover main applications running on your network:

discovering how users are accessing your network will allow you to track usage back to the user's origin.

3) Apply network monitor tools:

there are multiple network monitoring tools you'll want to consider utilizing to have total control of your network's traffic and security such as:

- Wireshark
- SolarWinds Network Performance Monitor
- Data Dog

By addressing these requirements and implementing effective network traffic monitoring solutions, organizations can significantly improve network security, performance, and overall efficiency. [10]

11. Our budget is RM1.3 million; when the budget is insufficient, which aspects should be prioritized?

The main aspects that should be prioritized are technology and devices that will be used in the laboratory. Here are the main devices: [11]

Hardware:

- **Routers and Switches**
- **Firewalls**
- **Servers**
- **Cables and Accessories**

Software:

- **Cisco Packet Tracer, GNS3, or EVE-NG**
- **VMware or VirtualBox**
- **Network Monitoring Tools**

12. Is it possible to reduce equipment burden through outsourcing services like cloud services?

Yes, outsourcing through cloud services can greatly reduce budget and equipment burdens. Cloud models like:

•Software-as-a-Service (SaaS)

enables users to access and utilize cloud-based applications via the internet. In this setup, the cloud service provider manages the hosting, delivery, and maintenance of the software, resulting in cost savings.

•Infrastructure-as-a-Service (IaaS)

This offers essential cloud computing services—like computing power, networking, and data storage—over the internet as needed. With these virtual services, users do not have to purchase, store, or maintain physical data servers and other equipment on-site.

•Platform-as-a-Service (PaaS)

This provides users with a comprehensive cloud platform that includes hardware, software, and infrastructure, enabling them to develop, run, and manage applications without the need for costly, bulky, and inflexible on-site facilities.

This flexibility helps companies manage costs effectively while accessing scalable infrastructure. [12]

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Part 2 Project feasibility

Efficient network systems, advanced equipment and complete laboratories are crucial to ensuring a high-quality learning experience for future users. Project feasibility covers budget, technology, management, scalability and future growth. Therefore, we hope that through the prepared materials, these laboratories will create a comfortable learning and working environment for students and faculty.

Budget feasibility:

The budget is **FEASIBLE** if the total project budget is expected to be less than **RM1.3 million**. However, if all expenses approach or exceed the budget limit, adjustments will need to be made for additional equipment and backup equipment. With proper planning and selection, a budget of RM1.3 million is feasible

Hardware requirements analysis

1. **Routers and Switches:** Depending on the lab and network size, multiple routers and switches may be required, with an estimated cost of **MYR 100,000 to MYR 300,000**.
2. Firewall: Choose high-performance firewall equipment, which costs approximately **MYR 50,000 to MYR 150,000**. Server is **between MYR 150,000 and 300,000**. Cables and **accessories at MYR 50,000 to MYR 100,000**.

Software requirements analysis:

1. Network monitoring tools and virtualization software (such as Wireshark, SolarWinds, DataDog, etc.), estimated cost is **MYR 50,000 to MYR 150,000**.
2. Additional equipment requirements is about **MYR 100,000 to MYR 200,000**. Hybrid Classroom Equipment is **MYR 100,000 to MYR 200,000**.

Emergency and redundant equipment is **MYR 50,000 to MYR 100,000** to ensure the stability of the laboratory in the event of a power outage.

Based on the above budget, the total cost may range from MYR 750,000 to MYR 1,500,000. If the amount exceeds MYR 1,300,000, the investment in emergency and redundant equipment can be reduced, or the remaining experimental equipment can be reasonably purchased.

Technical feasibility forecast:

Current technology can meet the basic requirements of 4IR in terms of network performance and equipment support, and the technical feasibility is high.

1. Network performance requirements: The laboratory requires a bandwidth of 210 Mbps and a latency of less than 20 milliseconds to support real-time applications and high-concurrency user scenarios. Modern network technology can meet these needs.

2. IoT lab support: The IoT lab requires about 30 microcontrollers, various sensors, and embedded circuit boards for real-time data collection and processing. Current technology can effectively support a variety of IoT applications and meet the interconnection needs of smart devices in 4IR.

Management feasibility:

The system is relatively simple to manage and has reasonable maintenance costs. By rationally selecting management tools and equipment, the complexity and cost of management and maintenance can be effectively reduced and the efficient operation of the system can be ensured.

1. Management convenience: Modern network systems usually support centralized management platforms, allowing administrators to monitor and manage all devices through a single interface, thereby simplifying the management process and reducing complexity.

2. Reasonable maintenance costs: Although initial equipment purchases (such as routers, switches, firewalls, etc.) require larger investments, the durability and low failure rates of modern equipment can often reduce long-term maintenance costs. In addition, many equipment manufacturers provide technical support and maintenance services, and reasonable maintenance contracts can further reduce risks and unexpected expenses.

Scalability and future growth:

This design has good scalability and can effectively cope with the increase in users, diversification of equipment types and the introduction of new technologies, ensuring the sustainable development and efficient operation of the system.

1. Design scalability: The current design uses a modular architecture to make it easy to add or replace routers, switches, and access points as needed. This design makes the system scalable and able to quickly adapt to changing needs. The equipment and technology selected meet the latest industry standards and are compatible with new equipment, reducing barriers to future upgrades.

2. Adapt to future network demand growth: The design takes into account future bandwidth demand growth, supports high bandwidth and low latency performance, and can meet the future needs of multiple users and high data traffic. As the number of IoT and smart devices increases, network design supports more connections and data transmission, ensuring stability and efficiency in device-dense environments.

Meeting Minutes

DATE/TIME		26/10/2024 10:00a.m.----12:00a.m.	
LOCATION		Webex online meeting	
AGENDA		Discuss about task2	
MEETING MC		Bu Guoshun	
ATTENDENCE			
NAME	TIME		REASON OF ABSENCE
Kahlan Sultan Mohammed	10:00am—12:00am		N/A
Liu Ruoyang	10:00am—12:00am		
Buguoshun	10:00am—12:00am		
Abdulrahman Siad	10:00am—12:00am		
MINUTES			
NO.	ITEM DISCUSSED	IDEAS/SUGGESTIONS AND PERSON GIVING IT	PERSON IN CHARGE AND DATE
1	Questions design	Liu will take charge of this part	Liu Ruoyang(26/10)
2	Question answering	Kahlan and Abdul will answer the questions through research and interview	Kahlan Sultan Mohammed (27/10) Abdulrahman Siad (28/10)
3	Feasibility test	Bu will test the feasibility of the project through considering our budget, which is RM 1.3M	Bu Guoshun(29/10)
4	Next meeting	Whenever the preparation of task 3 begins.	Everyone(27/10)
5	Meeting ended	12:00	Everyone(27/10)

Projected Marks

Task2

ITEM	MARKS
10 questions	
Questions are appropriate to project and beneficial to better understanding	2/2
Questions are answered correctly and appropriately	2/2
Questions are researched through FC representative and reputable sources.	1/1
Answers are correctly referenced (with reference and citation)	2/2
Feasibility	
Feasibility answer	1/1
Feasibility reasoning is logical and appropriate	2/2
Total	10/10