



UTM
UNIVERSITI TEKNOLOGI MALAYSIA

Network Design for Faculty of Computing Block N28B

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SECR1213

Section:

08

Group:

CATS

Title of Assignment:

PROJECT TASK 6

ABSTRACT

This report describes the knowledge gained by the group throughout the journey in completing Project Task 1 to Project Task 5. All project tasks are strongly related to one another as the true main objective of all projects is about completing a stakeholder's request on building a new building, suited with cutting edge technology, sustainability and most importantly, an efficient networking system which is future-proof. The report also covers the solutions given by the group for each project task after intensive research on the Internet, referring to online documents and websites from reputable sources and discussion among group members.

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INTRODUCTION

The following report presents an overview of the entire process of designing a new building for the Faculty of Computing, Block N28B alongside a networking system. The report includes the compilation of all tasks from 1 to 5 and the reflections of each member of the team on each task.

The aim of the project is to design a building and a network system that is able to support an increasing number of students and staff, while also being cost effective and easy to manage and scalable in the long-term.

The scope of this project covers the planning, design, and implementation of the network infrastructure of the new building including the selection required network devices, cabling, and IP address assignment.

PROJECT BACKGROUND & OVERVIEW OF THE CLIENT'S STATUS AND ISSUE

Faculty Of Computing (FC) was created and established in 1984 where it was known as the Institute of Computer Science initially. The Administrative Computing Unit was dismantled in 1991, and the Institute was given faculty recognition as the Faculty of Computer Science and Information Systems. As the Institute got the new faculty recognition, there was an increase in the number of new students, staff, as well as the need for facilities for the new faculties.

As the year goes by, the faculty anticipate a higher growth percentage of both staff and students. The faculty are expecting some problems in terms of the facilities and others. As an initiative, the faculty plans to build new buildings to facilitate the growth of students and employees. The building will include several rooms for students and lecturers to use. The most important ones are the network lab, Internet of Things lab, two general labs, a student lounge and a video conferencing room.

The faculty is also planning to buy new equipment to sustain the growth. As the stakeholders are planning to prepare for future needs now so that they do not have much to concern regarding the next 20 years.

COMPILED TASK 1-5

TASK 1

Introduction

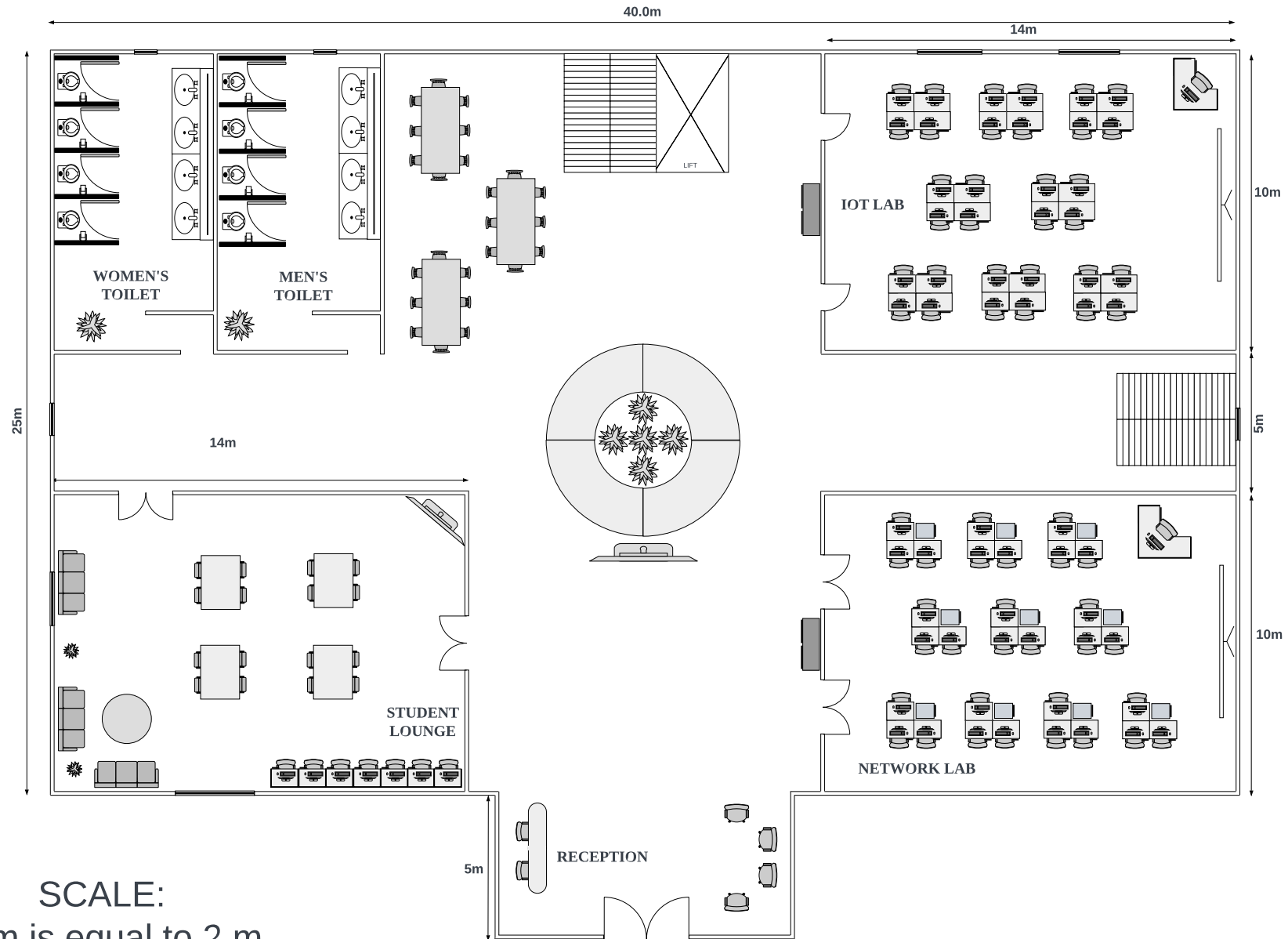
The following report is the floorplan regarding the proposal of a new building for the Faculty of Computing, Block N28B. The building will be 2-storey tall. A Network Lab, an IOT Lab, a student lounge, and a reception area will be built on the ground floor. As for the first floor, it consists of 2 general purpose labs, a video conference room, and a cafe.

Each lab will be equipped with cutting edge technology that is high performance, easily managed, able to support high performance to the core backbone and many more modern features to allow the Faculty of Computing to sustain, develop and expand in the near future. Additional equipment will be provided to labs with specific requirements to ensure efficiency and fault tolerance.

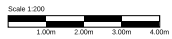
The video conferencing room, student lounge will also be equipped with a wireless access point for convenient and high-speed Internet access to the academic staff and students.

In addition, there will be basic facilities such as restrooms included on both floors for both men and women. An elevator is built to provide better accessibility for the handicapped.

GROUND FLOOR

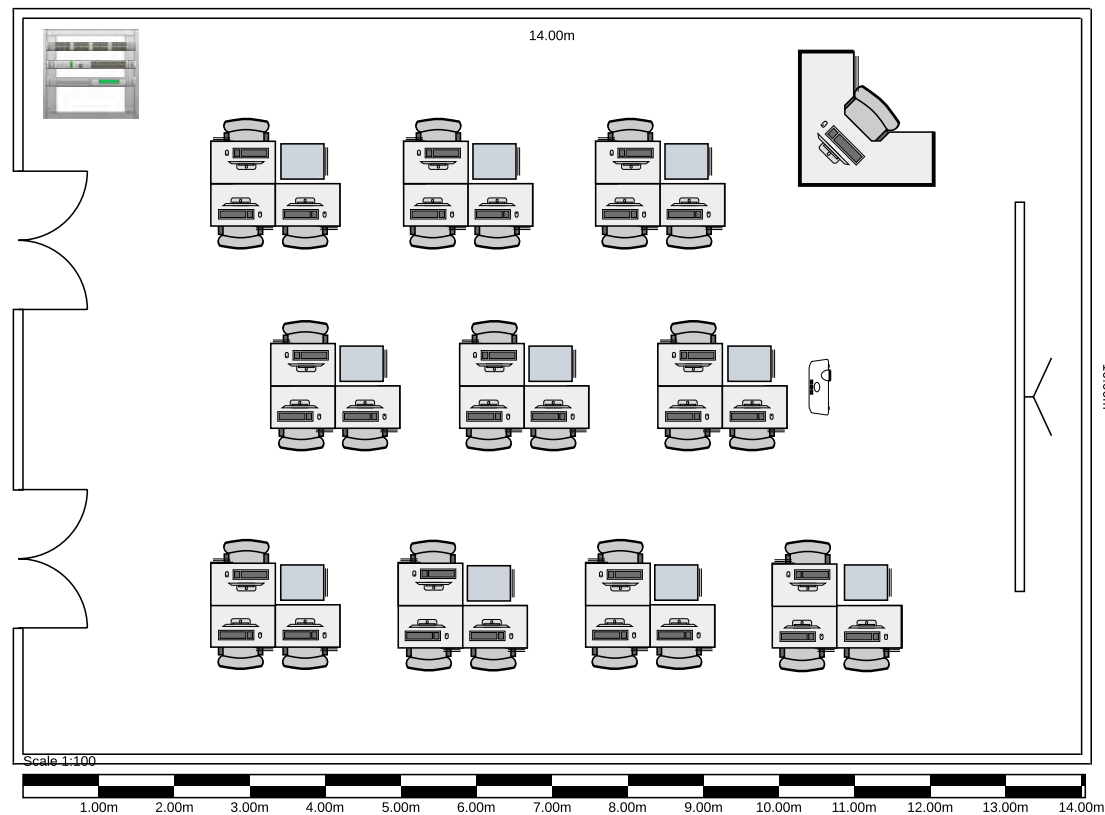


40m



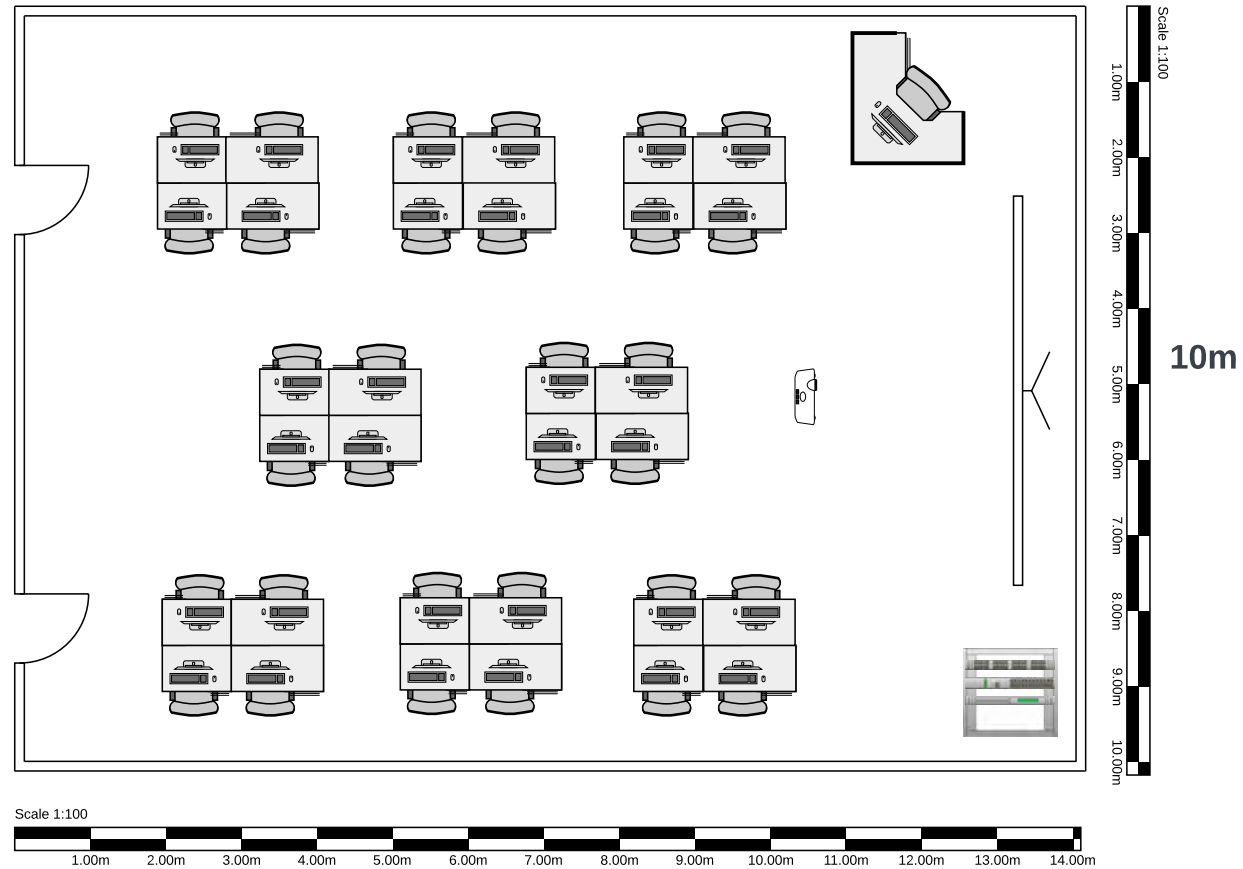
SCALE:
1 cm is equal to 2 m

NETWORK LAB



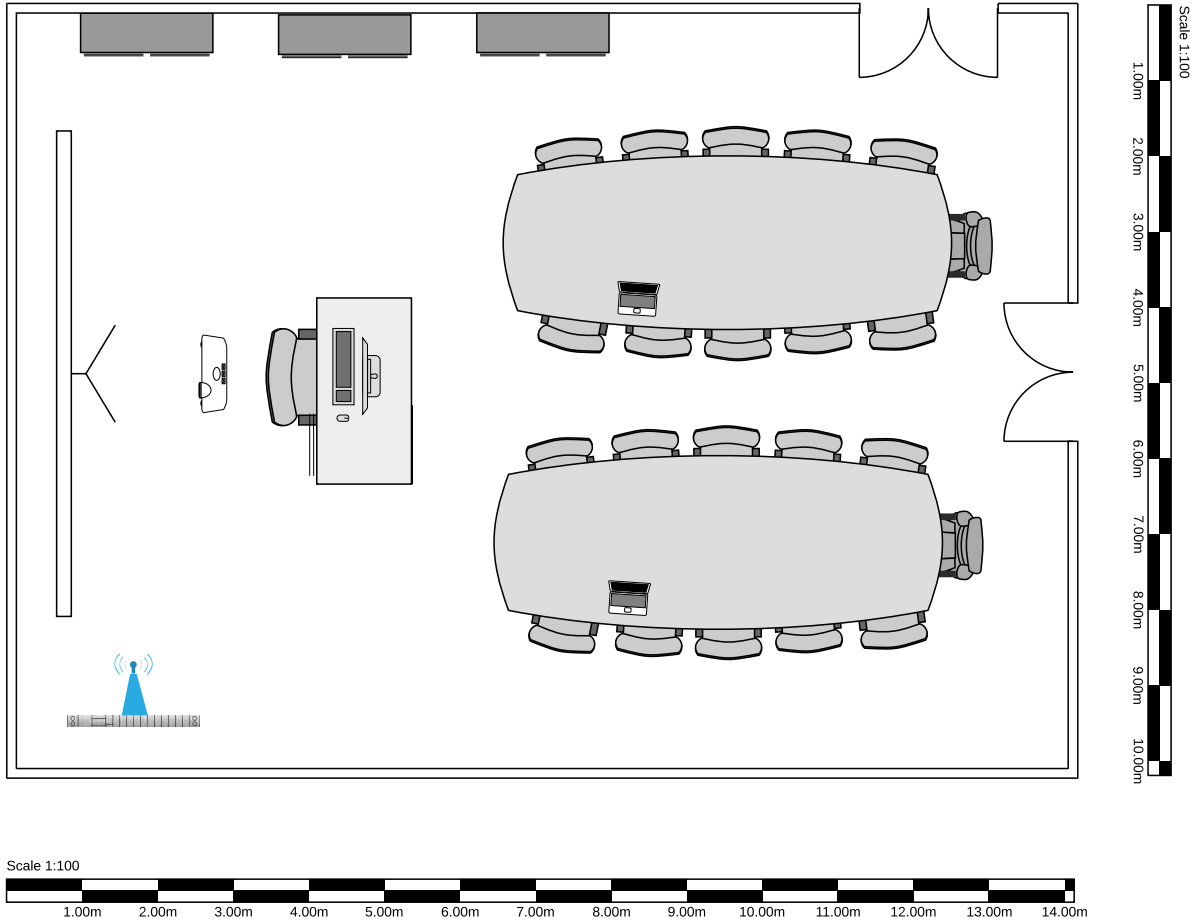
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IOT LAB



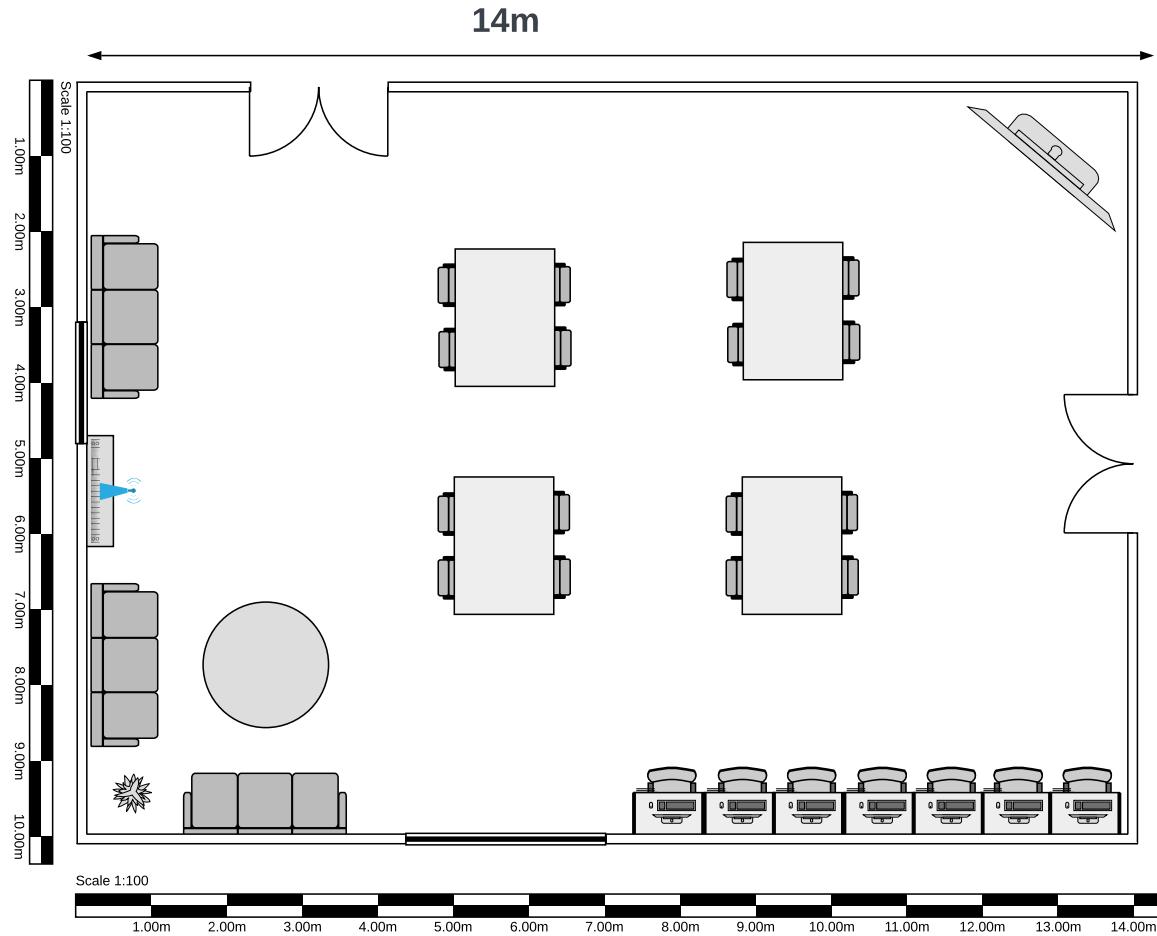
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VIDEO CONFERENCING ROOM



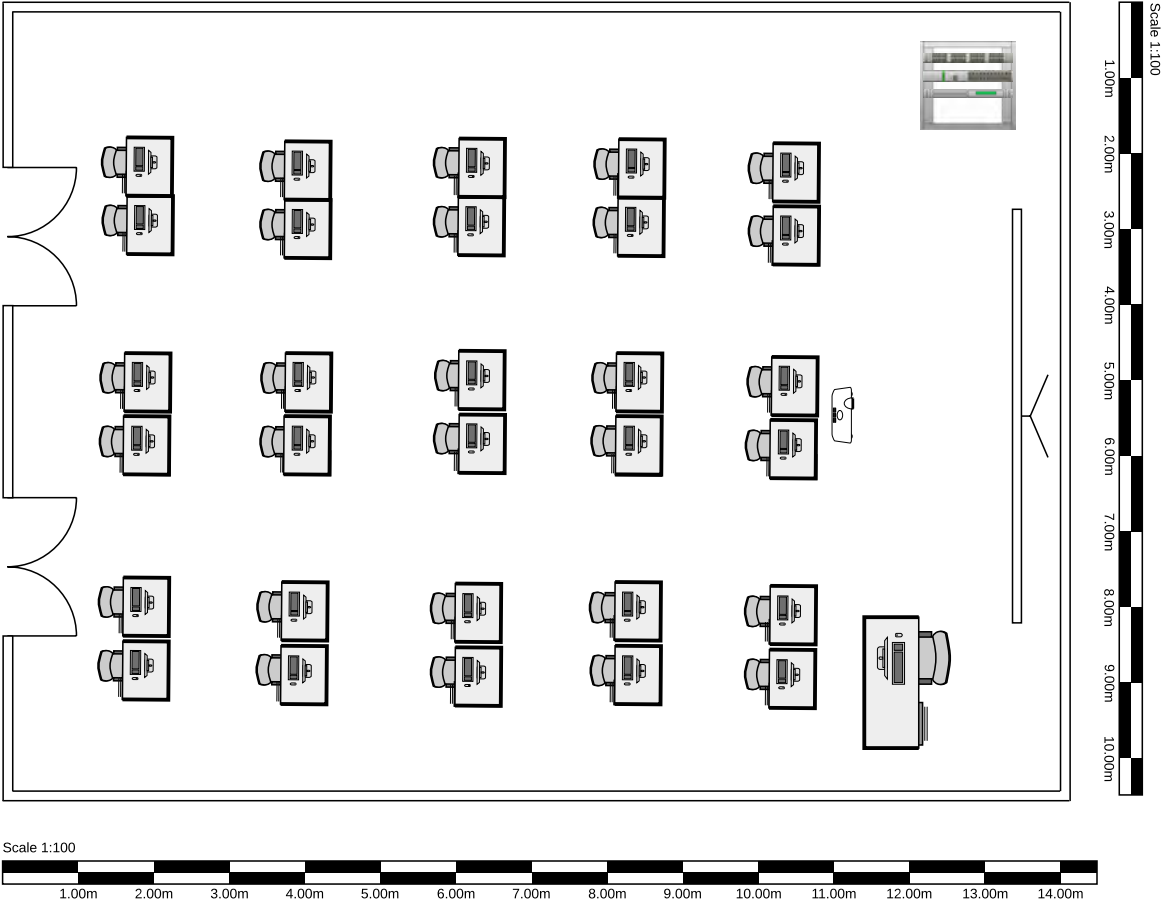
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STUDENT LOUNGE



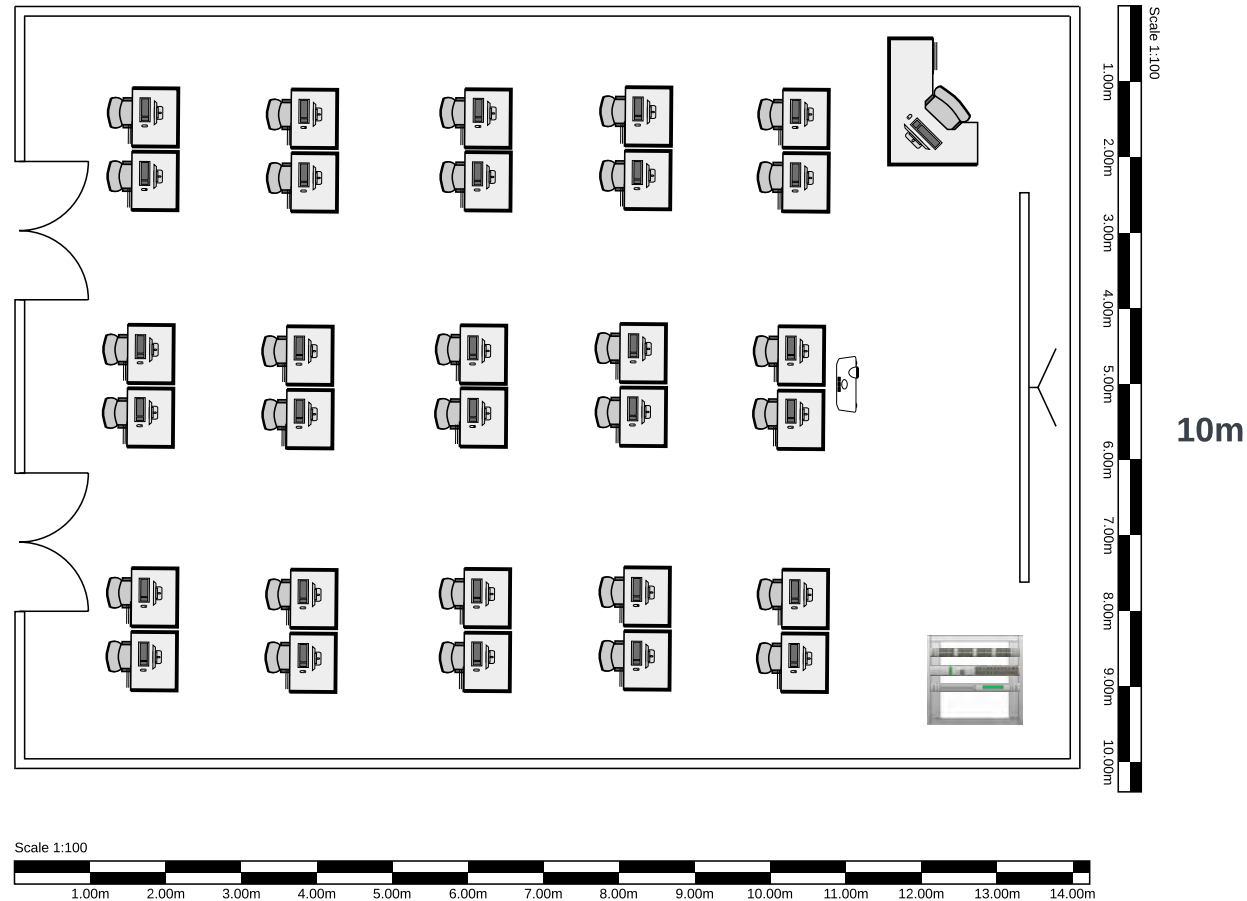
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GENERAL
LAB 1



SCALE:
1cm is equivalent to real world 1m

GENERAL LAB 2



SCALE:
1cm is equivalent to real world 1m

Reflection

MEMBER	REFLECTION
AMMAR BIN JAMALLUDIN	Creating the floorplan was definitely an interesting experience as it was the first time I had done any sort of building design. It was not too difficult but it did take some time to get used to and learn to design using LucidChart.
CHOK RONG JIE	In Project Task 1, even though it is more focused toward the architecture side of things, Network Communication knowledge is vital in this task as every piece of equipment needs to be placed inside the floor plan in mind of a networking system.
MUHAMMAD SYAHMI BIN SALEH	Task 1 is a phase where we need to think about the design, comparing and deciding the best design for our building design. We get to learn new thing as designing is not an easy task.
MUHAMMAD TAUFIQ BIN JURIMI	Task 1 was a fun experience, since we need to learn how to create a floor plan. We used a website called LucidChart. Since we divided the task into two parts, first floor and second floor I get to pair with Syahmi and the finished floor plan turns out amazing. The only frustrating part is that the website sometimes freezes when we try to copy a lot of components. Other than that, everything went well.

TASK 2

Introduction

For the purpose of understanding the requirements of the project in more detail, 11 questions are generated which will be answered by us through researching and interviewing the faculty representative. The answers to the following questions will greatly assist us in designing the network system according to the user's requirements. In addition, a feasibility report has been done on the project to further provide evidence of the project being viable.

List of Questions

1. What is the equipment needed in each laboratory?

The general network equipment that are essential in each lab are the workstations which include the CPU, a monitor, a keyboard and mouse. For the establishment of the network system itself, routers, switches and cables such as ethernet and fiber optic cable are required. Dr. Hazinah (2022) mentioned that for the network lab, it will be equipped with extra 3 switches and 3 routers per bay, where 1 bay contains 3 workstations, therefore a total of 30 extra switches and 30 extra routers will be installed for the network lab. As for the IOT lab, the workstations will be implemented with IOT kits.

2. What are the minimum specifications of each workstation in the labs?

There are several key specifications needed such as at least 8GB of RAM, a discrete GPU, good quality CPU and not too large hard disk size (Dr. Hazinah, 2022). Thus, in order to meet the requirement for current cutting edge technology, our choice of minimum specification for workstation in the labs are:

Processor: AMD Ryzen 5 5600G or Intel Core i5-12400

Graphics: NVIDIA GeForce RTX 2060

Memory: 8GB DDR4

Storage: 256 GB SSD, 1TB HDD

Monitor: 60 Hz 24-inch 1080p

3. What operating system will be used in each workstation?

Each workstation will be installed with Windows 10 Home or Windows 11 as the operating system. This is due to Microsoft Windows being the most widely used operating system, thus it will be familiar to most students. Each workstation will also be installed with virtual machine software like VMWare if Linux OS or macOS are needed to be used.

4. What is the minimum bandwidth expected for each lab?

The minimum expected bandwidth for each workstation is 100Mbps or higher. This is to ensure a stable network connection is established and has little to no packet loss. Moreover, more data can flow through the network per second, thus making the network more efficient and reliable. But according to Dr. Hazinah (2022), as we connect to the UTM backbone network, there might be some deviations and uncertainties to achieve the expected bandwidth speed.

5. What type of media will be used for this network plan?

There are two types of physical media in use for the network plan, **Unguided media** which is wireless network such as WiFi. The users can access the network easily and freely anywhere in the building once they are connected to the internet. **Guided media** is wired network connection such as ethernet. Ethernet connection is more reliable with the tradeoff of wide range network access such as WiFi because it has a high data transmission rate, which is up to 10 Gbps. Ethernet cable will also provide in transferring data as data is transferred physically through cable connected to the computers.

6. What cables are needed to ensure maximum efficiency for the network system?

Category 6a ethernet cables will be used for the workstations in the building. It can support data transmission rates up to 10 Gbps even with a length of up to 100m. Another option is fibre optic cable as these cables transfer data at high speed with the added bonus that it is fairly affordable. Liu, X. (2019) said that fibre optics allow large-scale optical cross-connections and improved fibre transmission capacity. Fibre optic cables are future proof as it enables the network to run at greater speeds without having to replace the cable in the near future.

7. What type of network topology is going to be implemented for each lab?

Star topology is chosen to be implemented for each lab as all devices are connected to a centralised computer or server, also known as a hub in a star-shaped arrangement. All nodes and devices communicate with each other through the hub by sending data through it. This network topology is suitable for the building as it can be controlled by the central console using the management software. This topology makes it easy to identify network faults, offers excellent performance, is expandable, and is simple to install (Bisht et al., 2015). This is due to the software only requiring communication with the switch to access full traffic management features. Although more expensive than the typical bus topology, it is fault tolerant as if any one of the devices fails, the remaining devices still run normally.

8. What are the security measures in place for the network system?

The network system can be equipped with Firewall, both hardware and software. The firewall prevents undesired inbound network traffic and aids in defending the server from malware and viruses injected by hackers. Also, we will use VPN to hide the user's actual IP address and create a secure, encrypted tunnel to access the Internet (Dr. Hazinah, 2022).

9. What precautions are taken if the network system was to fail at any moment?

In order to avoid any network system failure, every configuration in a lab setting requires testing to avoid misconfiguration and unforeseen errors. Furthermore, periodic maintenance is needed for the devices to upkeep their condition and check for faulty parts. Backup power supplies will also be included in case of a power failure, this ensures the whole network system will not fail immediately and provide time for the maintenance team to handle the situation.

10. How to connect all devices to the power outlet while ensuring device safety?

A surge protector will be used to connect all devices to the power. Surge protector or surge protection devices (SPDs) are offered in an electrical system to safeguard electrical equipment. Due to the SPDs being installed on these lines, the voltage between the DC lines and the ground terminal is suppressed when a sudden voltage surge occurs (Yan. et al., 2019). Surge protector also enables users to connect more electronic devices together and conserving space for other devices.

11. How to make sure the computers in each lab maintain a great and consistent performance?

Computer drivers should be updated, junk files should be cleaned regularly and any driver, hardware or software issue should be fixed as soon as possible. This should be done maintenance and appointing staff to each lab to do a maintenance check twice per month is advised. Also, staff in charge need to upkeep accurate documentation of operational procedures to eliminate any uncertainty and perplexity on the part of students and administrative personnel regarding various operational issues (Gercek et al., 2006).

Feasibility Study

It is feasible for this project to be initiated in Universiti Teknologi Malaysia. According to the budget provided, the faculty representative of the Faculty of Computing's needs can be met. As cutting-edge technology is one of the top priorities, the workstations are chosen with sufficient research by the consultant team to manage the expected annual growth of staff and students in the next 20 years, which is 10% growth per year to avoid the need of expanding either the number of workstations and the size of the network system. The requirements of the workstations and the network system itself will stay relevant throughout technological advancement as workstations are an essential part of the laboratories.

In each lab, category 6a cables will be used to connect each workstation to the network. Everyone will have access to high-speed internet. Fibre optic cables will also be used for the network cabling since they have a very large bandwidth with the added benefit of allowing data packets to travel far without signal degradation. In addition, fibre optic cables are also considerably light, thin and flexible. Thus, it can be used in locations with tight spaces. These fibre optic cables will be used throughout the building's rooms, Network Lab, IOT Lab, general labs, and video conferencing room.

Network security is a major concern as malware, viruses and hacker attacks are common across the Internet. Hardware and software firewalls will be installed to all network systems to prevent undesired inbound network traffic and protect the workstation. The network system would also be protected by a virtual private network (VPN) to hide the user's actual IP address and create a secure, encrypted tunnel for them to access the Internet. Furthermore, the faculty representative will handle the installation of antivirus programmes like Avast and Kaspersky would be installed on every workstation to maximise network security.

On top of all of this, in terms of management feasibility, the workstations and network system will also easily be managed as minimal manpower is required to do the maintenance of both the workstations and the network system. The minimization of frequent maintenance is also taken into consideration when choosing the requirement for workstations and network system devices to prevent excessive budget usage.

Reflection

MEMBER	REFLECTION
AMMAR BIN JAMALLUDIN	By creating the questions and then answering them. We were able to get a much better understanding of the direction and details of the project. This helped in making informed decisions during the project. From that, I have learned the importance of understanding the project before beginning to work on it.
CHOK RONG JIE	In Project Task 2, I have learnt on how to figure out the questions necessary in constructing a networking system, not just blindly search the answers to questions that would not contribute to planning of a networking system.
MUHAMMAD SYAHMI BIN SALEH	From the questions we created and answered, we managed to know the requirements and the main thing that we needed in this project. This task taught me to understand and get the main point of a process after that we start doing it.
MUHAMMAD TAUFIQ BIN JURIMI	Task 2 requires us to do a lot of research and conduct an interview. There are a lot of considerations that we need to figure out before buying and planning all the network devices. I realised I know so little about network systems and got to learn a lot from researching and interviewing Dr Hazinah.

TASK 3

Introduction

The following report will cover the list of network devices to be included in the network system for the floor plan. The total amount of network devices needed will be determined and the total cost will also be calculated as well. Comparison between certain network device brands will also be made for choosing the brand of network devices best suited for the planned network system. Our budget for the network devices is RM2.2 million.

List of Network Devices

Type Of Device	Specifications	Quantity	Price Per Unit (RM)	Total Price (RM)
Workstation HP ENVY Desktop TE01-2275xt PC  Product Details: https://www8.hp.com/h20195/v2/GetDocument.aspx?docname=c08198857 Product Price: https://www.hp.com/us-en/shop/pdp/hp-envy-desktop-te01-2275xtbundle-pc	• Windows 11 Home • 11th Generation Intel® Core™ i7 processor • Intel® Core™ i7-11700 • NVIDIA® GeForce RTX™ 3060 (12 GB GDDR6 dedicated) • 16 GB memory • 2 TB HDD storage; 256 GB SSD storage • 6.12 x 12.09 x 13.28 in • 13.14 lb	134	5,025.65	673437.10

Monitor  Product Details : Dell 24 FHD Computer Monitor - SE2422H Dell Malaysia	Display Size ● 23.8" Resolution ● Full HD (1920x1080 @ 75 Hz) Display Input Type ● 1 HDMI (HDCP), 1 VGA Aspect ratio ● 16:9	134	599.00	80266.00
Keyboard and Mouse Dell Wireless Keyboard and Mouse - KM3322W  Product Details: https://www.dell.com/en-my/shop/dell-wireless-keyboard-and-mouse-us-english-km3322w/apd/580-akdo/pc-accessories		134	120.00	16080.00

Switch (For all labs) Cisco Catalyst 9300X  Product Details : Cisco Catalyst 9300 Series Switches - Cisco Product Price: CATALYST 9300X Price - Cisco Global Price List (itprice.com)	Ports: 48 port Cisco UPOE+, 48x 10G Multigigabit PoE: 90 W Cisco UPoE+ Forwarding Performance: 1488 Mbps Switching Capacity: 2,000 Gbps	7	77970.68	545,794.76
Switch (Network Lab Add-On) Cisco C1000-24P-4G-L  Product Details: https://www.router-switch.com/c1000-24p-4g-l.html	Number of Ports : 24× Gigabit Ethernet Ports 4× 1G SFP Uplinks PoE: 195 W Cisco UPoE+ Forwarding Performance: 41.67 Mbps Forwarding Bandwidth: 28 Gbps Switching Bandwidth: 56 Gbps	30	6,163.69	184,910.70

Router Cisco ISR 4451  Product Details: https://www.router-switch.com/cisco-isr4451-x-k9-p-5293.html#tab-specification	Aggregate Throughput : 1Gbps - 2Gbps Number Of WAN/LAN Ports: 4 Number of SFP Ports: 4 Default Memory : 4GB Maximum Memory : 16GB Default Flash Memory: 8GB Maximum Flash Memory : 32GB	1	53754.26	53,754.26
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Routers (Network Lab Add-On) CISCO1941-2.5G/K9  Product Details: https://www.router-switch.com/cisco1941-2-5g-k9-p-1909.html	Compliant Standards IEEE 802.3ah, IEEE 802.1ah, IEEE 802.1ag DRAM Memory 2.5 GB Flash Memory 256 MB (installed) / 8 GB (max) Router Interfaces 1x10Base-T/100Base-TX/1000Base-T - RJ-45 Management : 1 x console - RJ-45 Management : 1 x console - mini-USB Type B Serial : 1 x auxiliary - RJ-45 USB : 2 x 4 PIN USB Type A	30	5422.19	162665.70
Patch Panel Panduit DP48688TG  Product Details: https://www.panduit.com/en/products/copper-systems/patch-panels-accessories/populated-patch-panels/dp48688tgy.html	Number of Ports : 48× Ethernet Ports	7	4118.84	28831.88

IoT kits Arduino Oplà IoT Kit  Product Details: https://store-usa.arduino.cc/products/arduino-opla-iot-kit	• Arduino MKR IoT Carrier • Arduino MKR WiFi 1010 • Plastic encasing • Micro USB cable • Moisture sensor • PIR sensor • Sensor cables	8	601.30	4810.4
Fiber optic cable FLYPROFiber LC to LC Fiber Patch Cable OM4 10M 	• OM4 LC/LC Multimode • 7.5mm Minimum Bend Radius • High Rated 50/125um Fiber and Cladding • 33ft/10 meter	100	83.76	8376.00

Ethernet cable RS PRO Cat6 Ethernet Cable (100m) 	● CAT6 ● Terminated ● RJ45 to RJ45 ● Straight Through wire configuration ● 100 meter ● Outer Sheath Material: LSZH ● Shield Type: U/UTP ● RoHs Compliant	25	369.33	9233.25
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Ethernet head connector AMP 8P8C Crystal Head Modular Plug Connector for Network LAN RJ45 Cat 6  Cat 6 100pcs / box Product Detail and Price: https://shopee.com.my/AMP-8P8C-Crystal-Head-Modular-Plug-Connector-for-Network-LAN-RJ45-Cat-6-(100pcs)-i.62782098.1316880747?sp_atk=cbe27ccb-36e6-4fc7-8af3-53bc33a1fd23&xptdk=cbe27ccb-36e6-4fc7-8af3-53bc33a1fd23	● RJ45 Connectors Modular Plug ● Compatible with All the routers / hubs / network connections RJ45 ● 8 Pins Network Cable Heads / Plugs ● Gold Plated Leads ● Application : RJ45 6 ● Brand : AMP Tyco	10	27.00	270.00
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Communication outlet 2 Port Faceplate  Product Detail and Price: https://shopee.com.my/RJ45-Faceplate-CAT5e-Tel-Keystone-1-Port-1-Gang-Single-Port-2-Port-2-Gang-Double-Port-Data-Wall-Socket-Outlet-i.551573671.15227713697?sp_atk=4a3117ba-ff00-4606-9797-9c4abe6681a7&xptdk=4a3117ba-ff00-4606-9797-9c4abe6681a7	• Data Wall Socket Outlet Faceplate • Size : 86 x 86mm • Material : Flame Retardant PC • Input : Single Port / Double Ports • Color : White • Finishing : Curve Surface • Application : Data Wall Socket suitable use for Keystone Modular Jack Data/Tel Type	100	4	400.00
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Modular Jack Keystone Cable Matters Keystone Jack (50pcs)  Product Details and Price: https://www.cablematters.com/pc-623-164-50-pack-cat6-rj45-keystone-jack-and-punch-down-stand.aspx	• Cat 6 RJ45 Heavy duty keystone jacks • 10 Gigabit Ethernet cat 6 performance • Backwards compatible to 10/100 Ethernet • Meets or exceeds Category 6 performance in compliance with the ANSI/TIA/EIA 568-C.2 standard • UL listed keystone jack (E486099) with T568A and T568B color-coded labels • Heavy duty construction includes an impact-resistant and fire-retardant housing	3	258.43	775.29
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Firewall Fortinet FortiGate-60F  Product Detail: https://www.fortinet.com/content/dam/fortinet/assets/data-sheets/fortigate-fortiwifi-60f-series.pdf Product Price: https://shop.winpro.com.my/products/fortigate-60f	• IPS: 1.4 Gbps • NGFW: 1 Gbps • Threat Protection: 700 Mbps • Interfaces Multiple: GE RJ45 Variants with internal storage WiFi variants	1	2612.00	2612.00
Wireless Access Point Cisco Catalyst 9136I Access Point  Product Details: https://www.cisco.com/c/en/us/products/collateral/wireless/catalyst-9100ax-access-points/nb-06-cat9136-access-point-ds-cte-en.html?oid=dstwls028547	• Wi-Fi 6E (802.11ax) support • Data rates up to 3.4 Gbps • 2.4-GHz, 5-GHz, & 6-GHz antenna	2	13243.91	26487.82

Projector Epson Pro EX9240 	• 4,000 lumens of color and white brightness1 • Full HD 1080p resolution delivers crisp text and images • True 3-Chip, 3LCD technology • Wireless, Miracast® and two HDMI ports • Easy image adjustments and convenient control	5	3,751.43	18757.15
			Total	1,817,462.31

Reflection

1. Are you surprised by the prices? How were you surprised?

Yes! The price of the devices are much higher compared to initial expectations. Enterprise level networking devices are much more expensive compared to home networking devices. This is our first time diving deep into searching for networking devices. We were quite shocked because some appliances, like switches and routers, seem small but can be very expensive. But after doing some research we do realize that enterprise devices are just so much better in term of performance than home level devices, so the performance justifies the price.

2. Have you ever considered cost as a factor for choosing networking devices?

Yes. As we need to consider the network devices to use in the labs, quality of the devices used also needs cost consideration. A quality equipment will undoubtedly last longer than one from a different brand. However, not all high-quality brands or products are more expensive. We already look up and contrast a few different device brands and do pricing research to make sure the cost won't go beyond our budget in order to assure a safe move. It is really important for us to justify the item and price chosen so that we can make sure the project is economically feasible and avoid overspending.

3. *What are the major differences between the same devices from different brands? For example, Cisco and Huawei Routers.*

3.1 ROUTERS

Brand	CISCO	HUAWEI
Model	Cisco ISR 4451 	Huawei AR2240 
Aggregate Throughput	1Gbps-2Gbps	1Gbps
Default Memory(data plane)	2GB	2GB
Maximum Memory (Data Plane)	2GB	2GB
Number Of LAN/WAN Ports	4	4
Number Of SFP Ports	4	-
Default Flash Memory	8GB	8GB

Maximum Flash Memory	32GB	8GB
Price	RM53,754.26	RM 15 218.54

Table 3.1 : Differences between CISCO and HUAWEI routers.

Table 3.1 shows the brands, model, aggregate throughput, default and maximum memory for data plane and flash memory, number of LAN/WAN ports, number of SPF ports and price.

Firstly, from the table we could see that the Cisco router offers higher aggregate throughput which is 1-2 Gbps compared to the Huawei router which only offers 1 Gbps. Next, both Cisco and Huawei brand offer the same number of LAN/WAN ports which is 4 ports. However, Cisco brand routers offer a higher number of SFP ports which is 2 compared to Huawei brand with no SFP ports. Both Cisco and Huawei brand offer the same amount of default and maximum data plane memory which is 2 GB.

Furthermore, the Cisco brands offer 8GB default flash memory and Huawei only offers 2GB of default flash memory. Next, Cisco brand router offers higher maximum flash memory which is 32GB compared to Huawei only 8GB. Last but not least, Huawei offers a lower price rate which is RM 15218.54 compared to Cisco which is RM53,754.26. However Cisco brand seems to be the better choice.

As a conclusion based on the comparison above, the Cisco brand router is better than the Huawei brand router.

3.2 SWITCHES

Brand	HPE	Cisco
Model	HPE SN6000B 	Catalyst 9300X Fiber Series Model C9300X-48HX-E 
Port	24/48 port	48 port Cisco UPOE+, 48x 10G Multigigabit
PoE	-	90 W Cisco UPoE+
Forwarding Performances	10000 Mbps	1488 Mbps
Switching Capacity	768 Gbps	2,000 Gbps
Flash Memory	16 GB	16 GB
Price	RM 108257.43	RM 77970.68

Table 3.2 Difference between switches manufactured by Cisco and Huawei.

Table 3.2 shows the comparison between model , port, PoE support, switching bandwidth, flash memory and price of both switches.

The reason for the massive difference in forwarding performance, switching capacity and flash memory is Cisco's Model C9300X-48HX-E is specifically designed for enterprise usage and as for HPE SN6000B is specifically designed for campus usage.

Even though Cisco's Model C9300X-48HX-E capabilities can be seen as excessive for the planned network system, it can be seen as an upside as UPoE+, short for Universal Power over Ethernet, eliminating the need of wall circuits for endpoints and reinforcing uninterruptible power supply systems.

The price for Cisco Model C9300X-48HX-E is lower compared to the HPE SN6000B which is RM 77970.68 compared to RM 108257.43 even though it is more suitable for our plan. This shows that Cisco Model C9300X-48HX-E is the better choice.

In conclusion, Cisco's Model C9300X-48HX-E is chosen to be a part of the planned network system.

MEMBER	REFLECTION
AMMAR BIN JAMALLUDIN	Task 3 started off a little overwhelming due to the amount of options available. However, I learned how important it is to make detailed comparisons in order to help in the decision making process.
CHOK RONG JIE	In Project Task 3, I have learnt how to identify the network devices which make up a networking system and how to make use of the budget provided to not order too much or too little of a single network device.
MUHAMMAD SYAHMI BIN SALEH	Task 3 taught us to find the best quality of devices and the quantity needed before buying it. We also need to make calculations so that the costs will not exceed the budget given. This task taught us to plan something well before doing it.
MUHAMMAD TAUFIQ BIN JURIMI	This task is quite hard since I know little information about network devices. I got confused about which components to use in our project. I also realised that there are a lot of variations of network devices in the market right now. Then, every problem is resolved after we do meetings together and research about the devices and prices.

TASK 4

Introduction

The following report will sketch the cabling for each of the work areas identified in the floorplan. The cabling diagram will include the type of cables used and the total length for each cable used. The amount of connections, patch cords and switch ports needed for each work area will also be listed. The arrangement of network devices and workstations will be shown alongside the way the devices are connected with cables.

Work Areas

Ground Floor

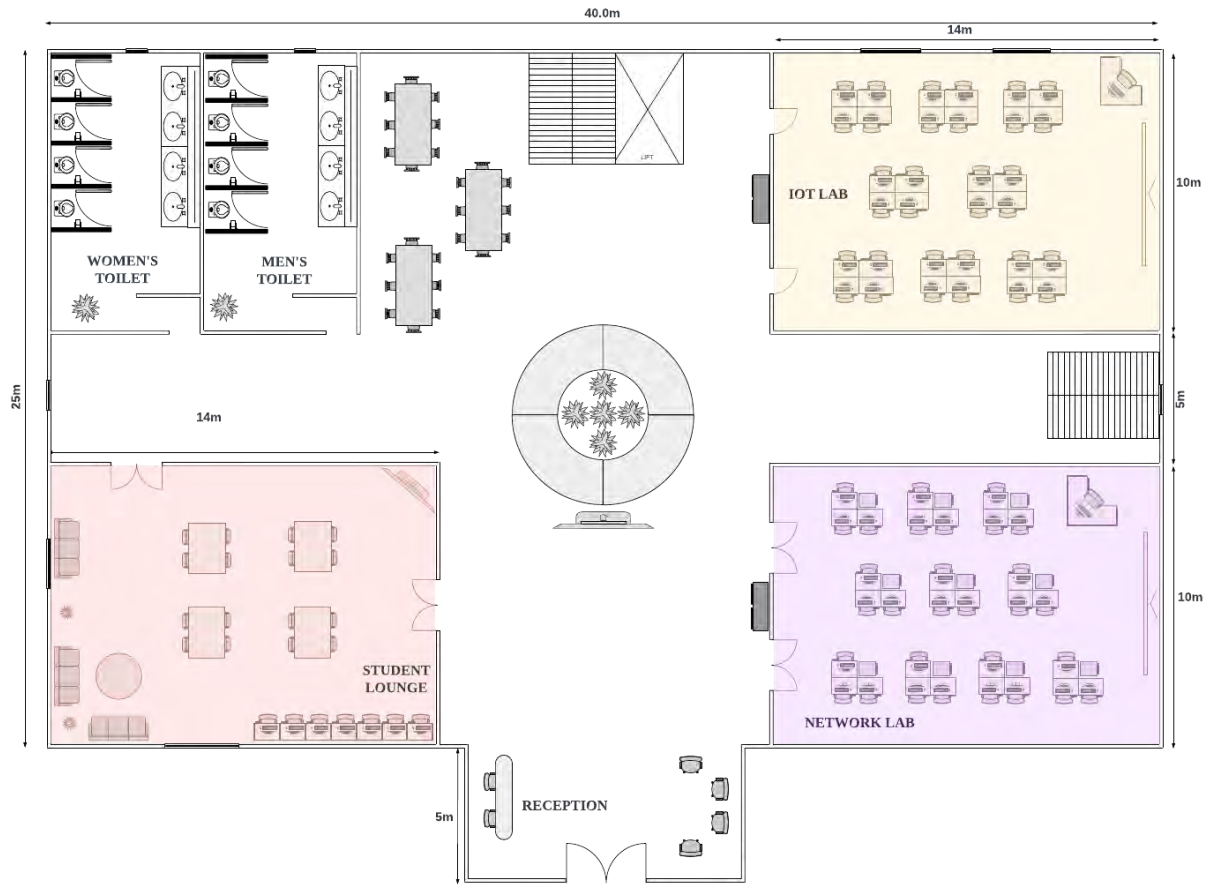


Figure 9

Length = 40.0m

Width = 30.0m

Floor 1

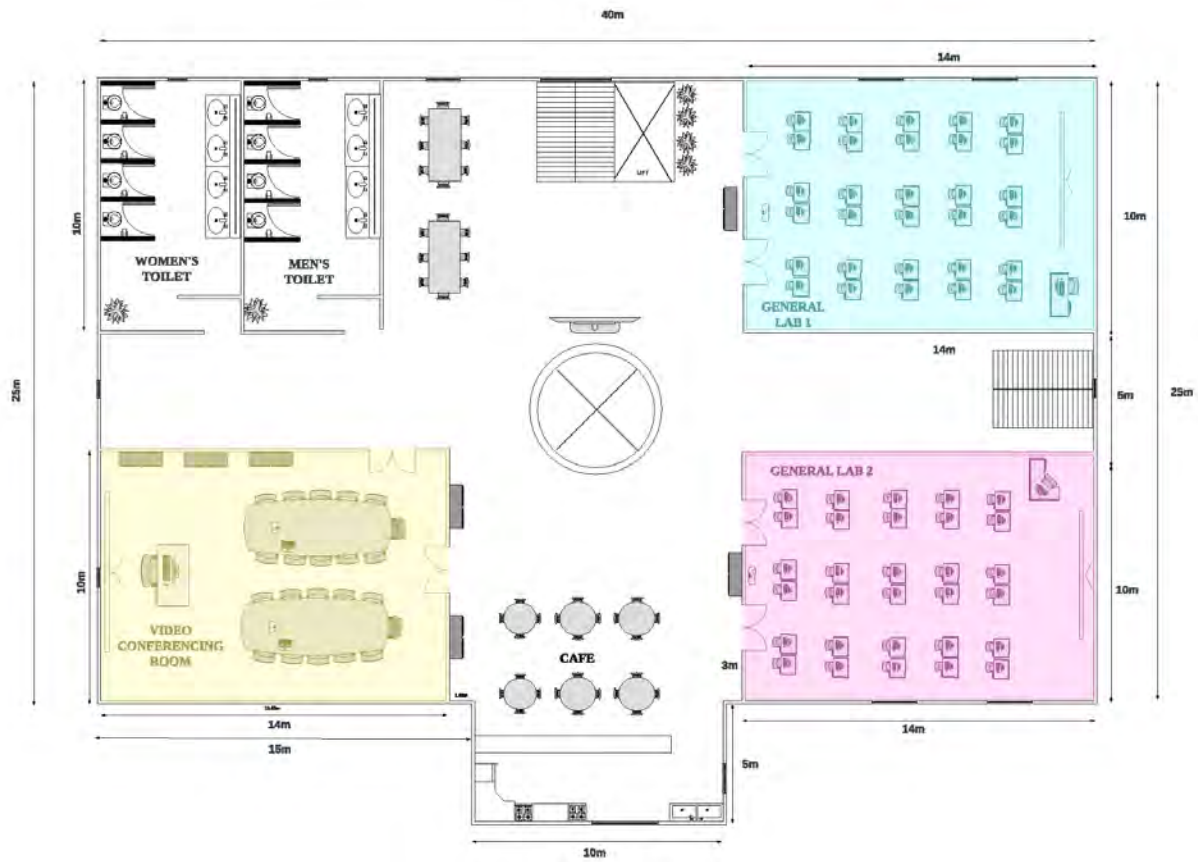


Figure 10

Length = 40 m

Width = 30 m

Building Height

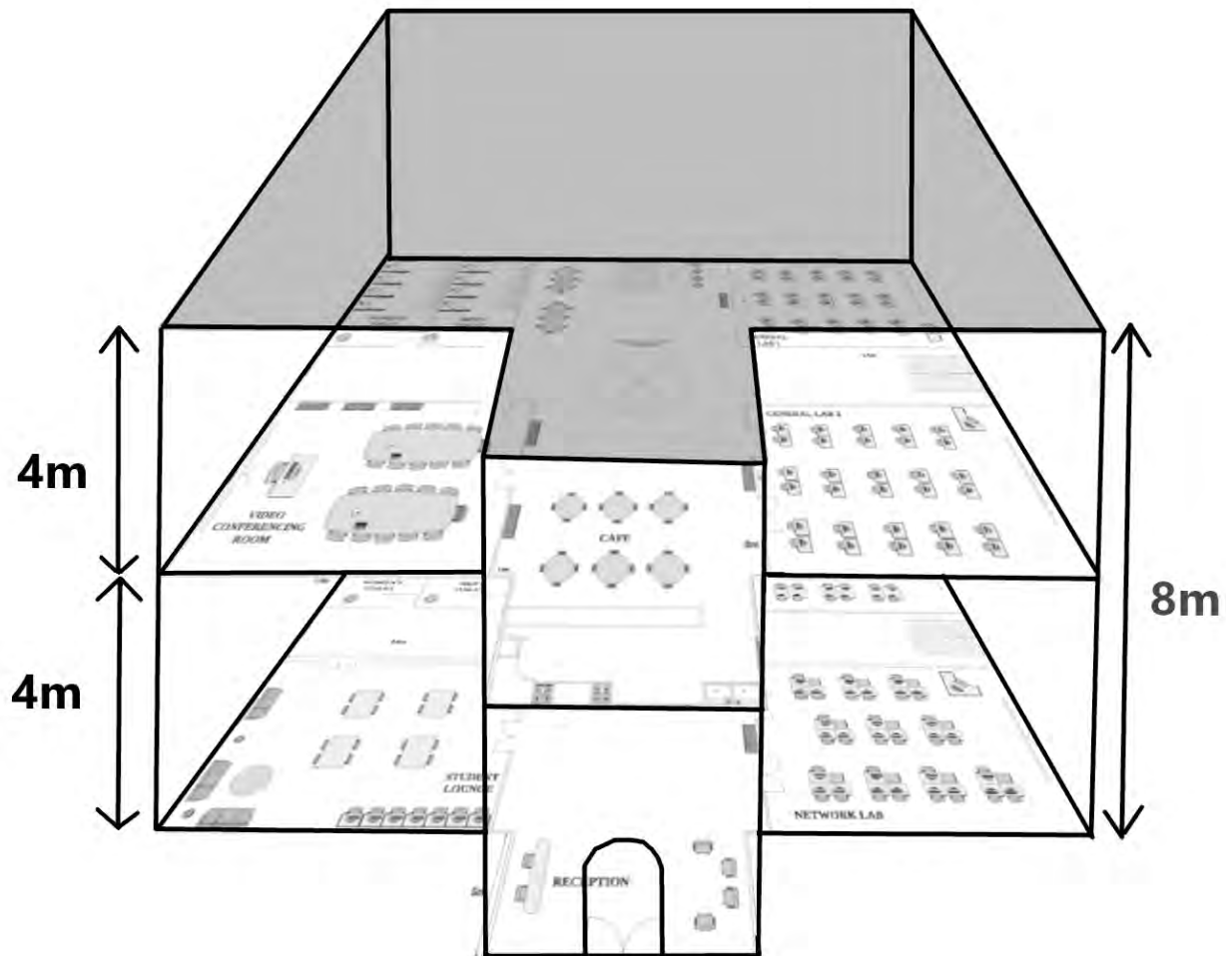


Figure 11

Height = 8m (4m per floor)

Network Topology

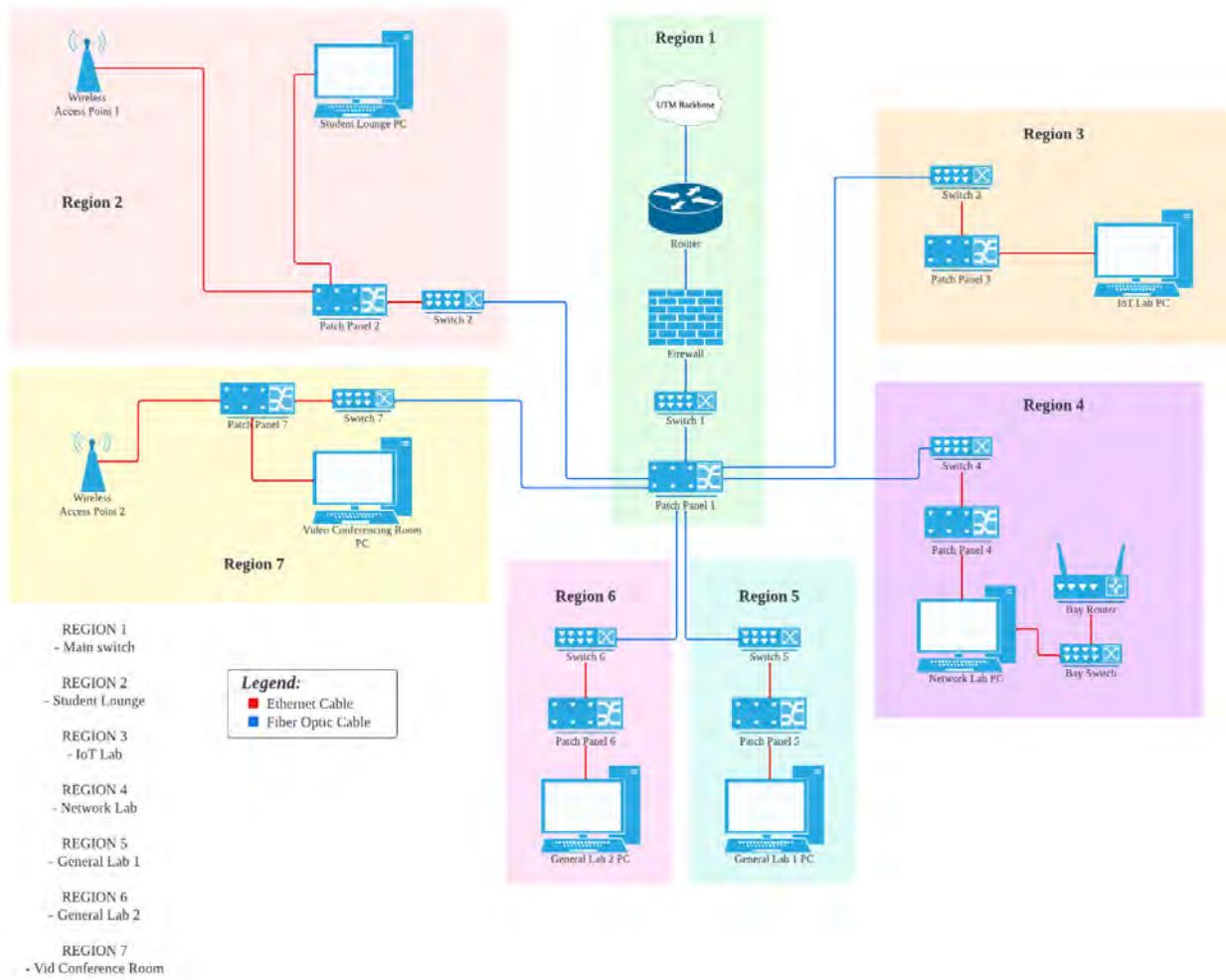


Figure 12

Horizontal Ground Floor

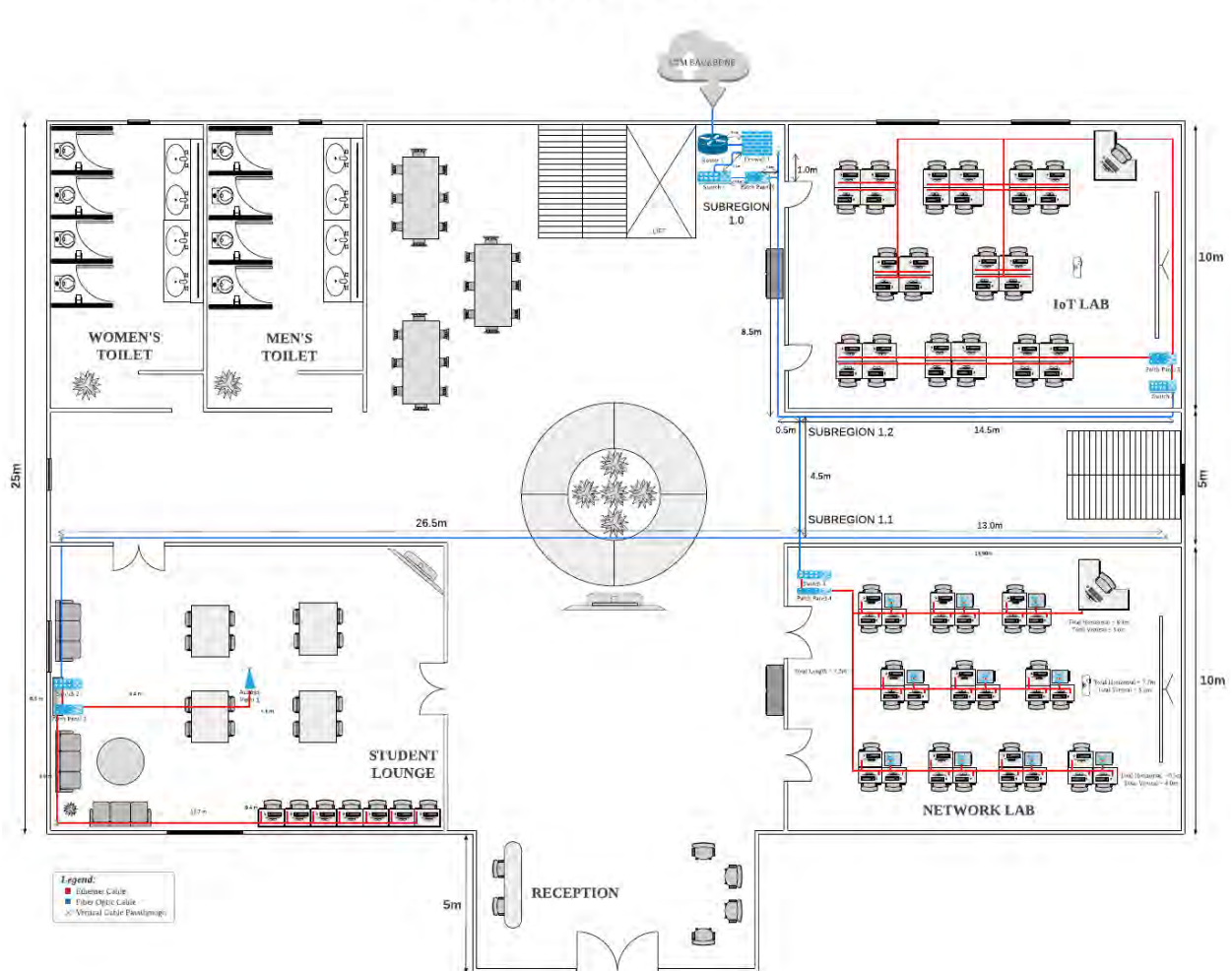


Figure 13

Horizontal First Floor

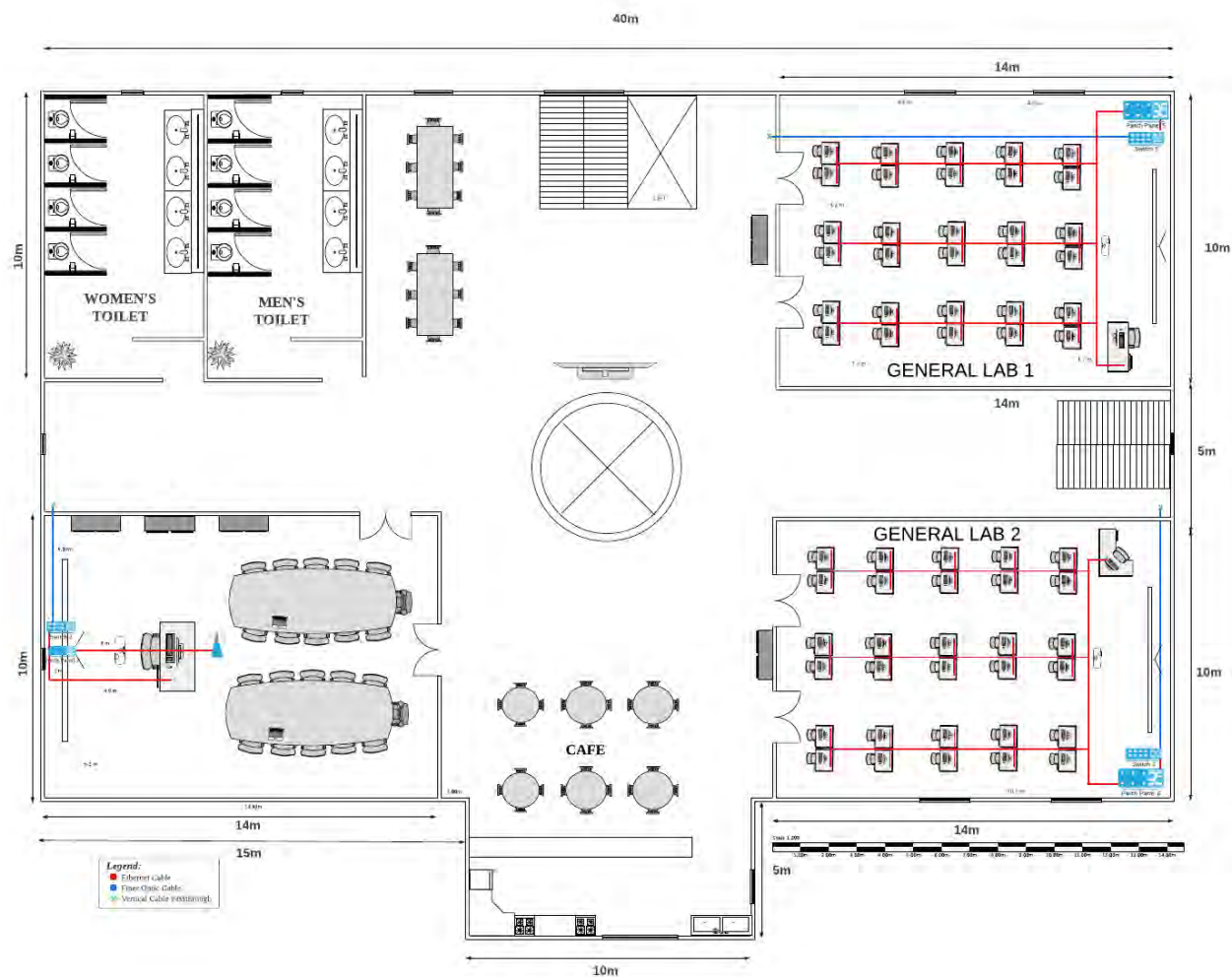


Figure 14

Vertical Cabling - Ground Floor

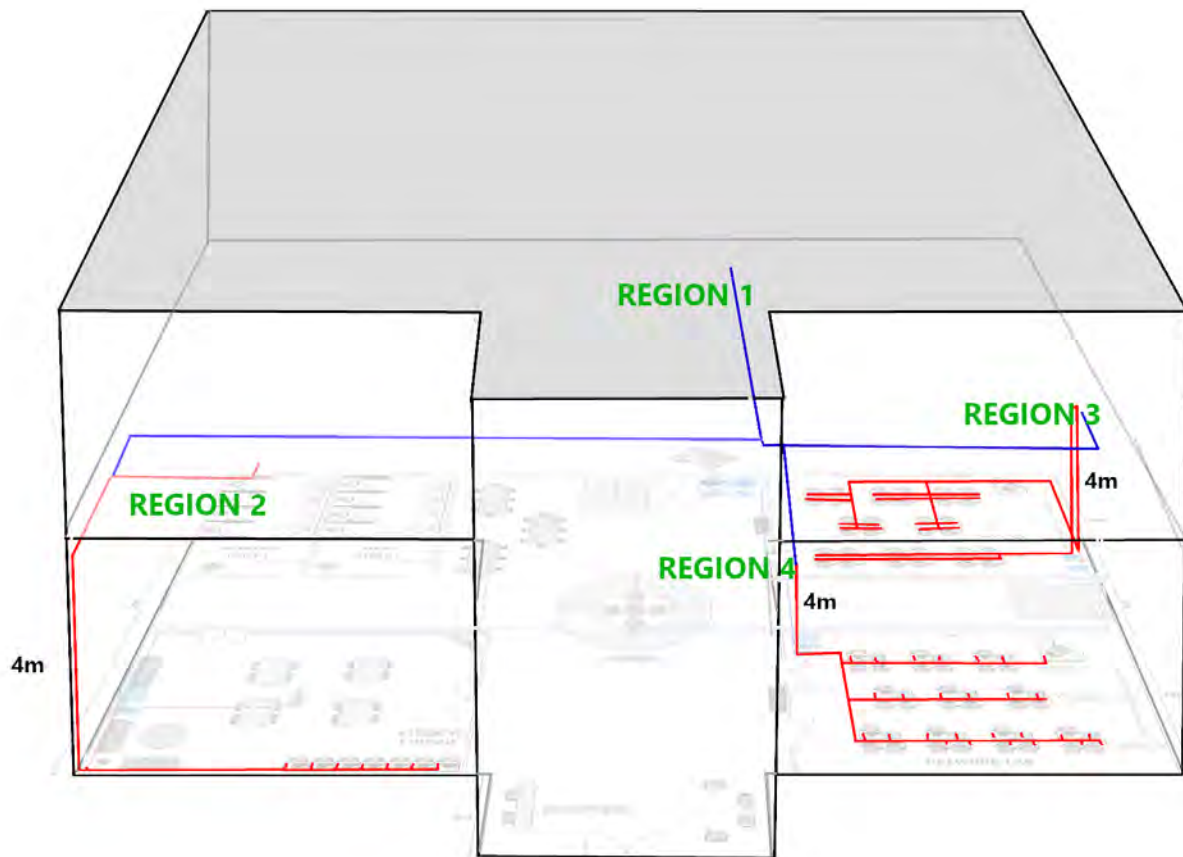


Figure 15

Vertical Cabling - First Floor

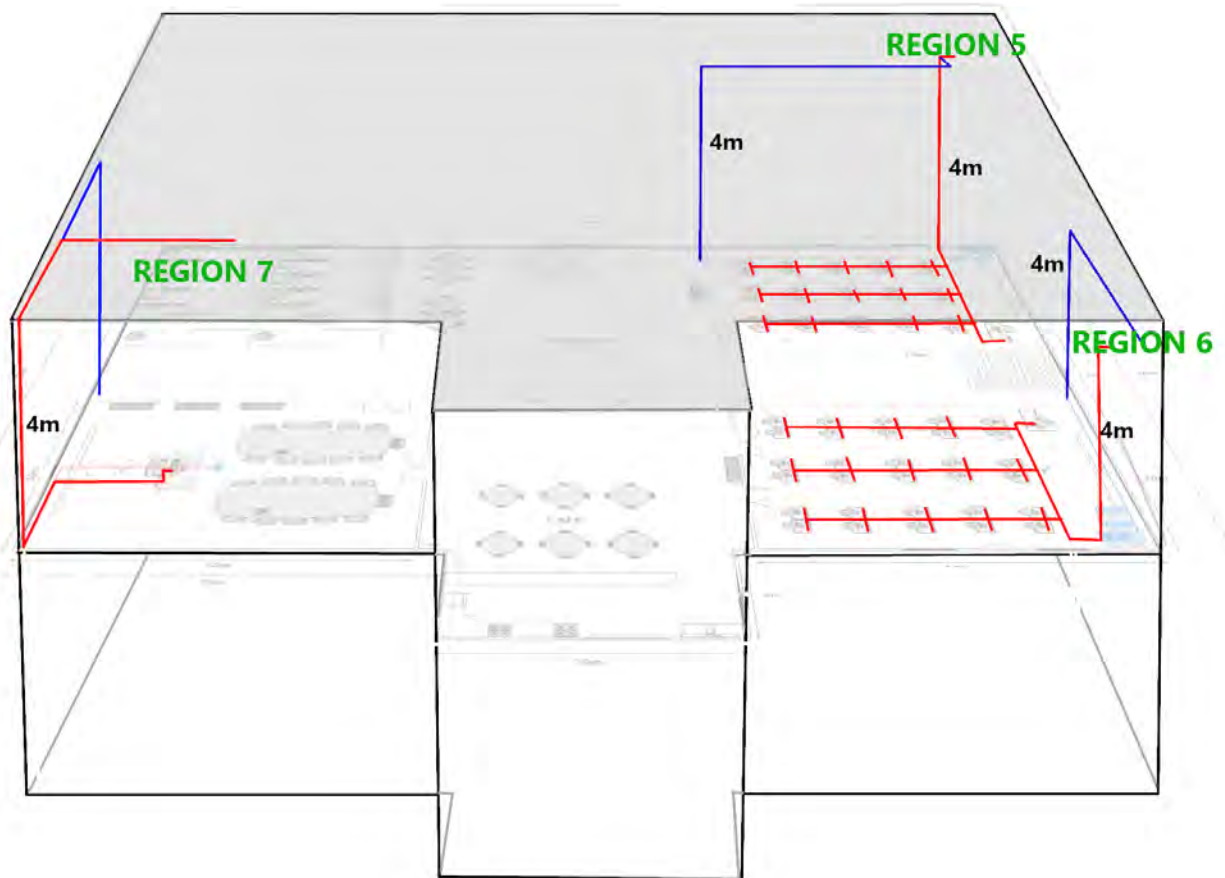


Figure 16

Vertical Cable - Overall

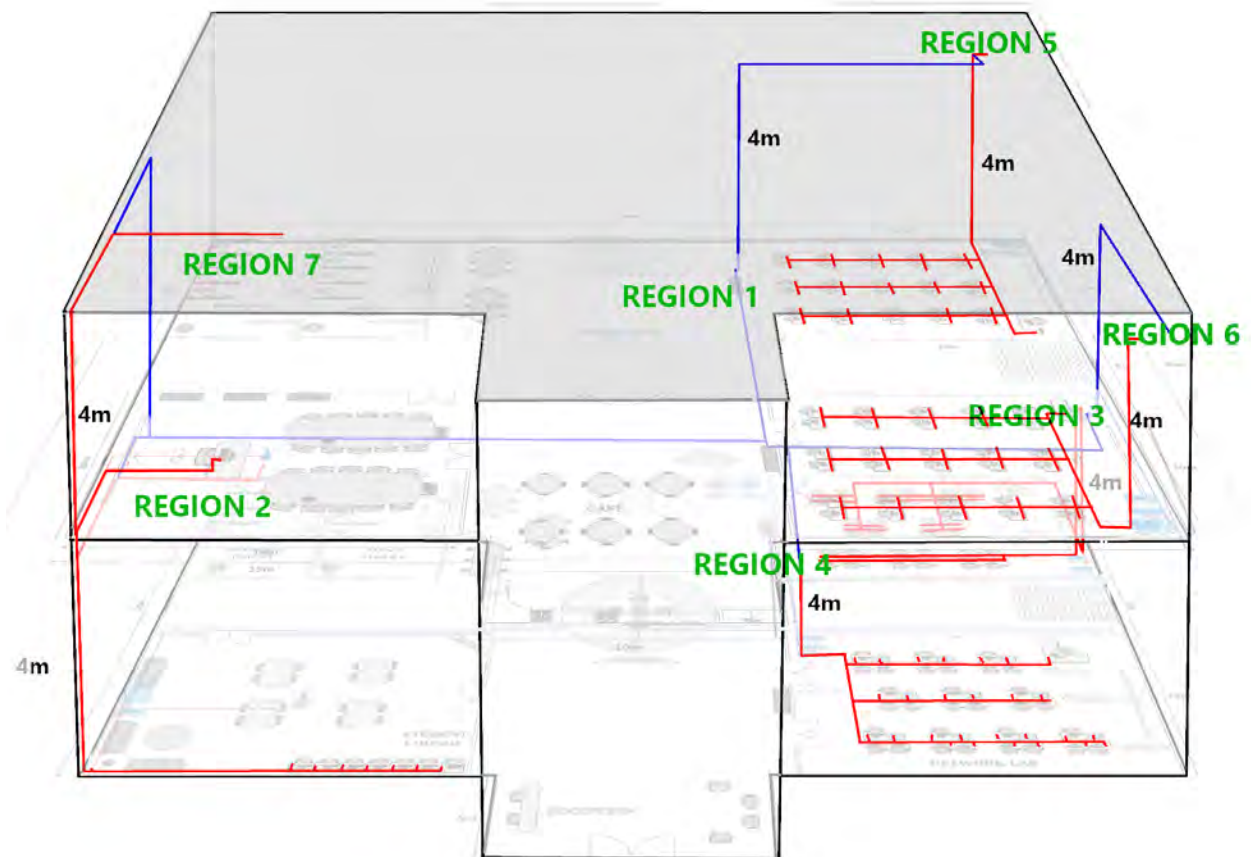


Figure 17

Connections, Patch Cords And Switch Ports

Region	No. of Connections	Description
1	9	Connection 1: UTM Backbone to router
		Connection 2: Router to firewall
		Connection 3: Firewall to Switch 1
		Connection 4: Switch 1 to Patch Panel 1
		Connection 5: Patch Panel 1 to Switch 2
		Connection 6: Patch Panel 1 to Switch 3
		Connection 7: Patch Panel 1 to Switch 4
		Connection 8: Patch Panel 1 to Switch 5
		Connection 9: Patch Panel 1 to Switch 6
2	9	Connection 10: Switch 2 to Patch Panel 2
		Connection 11 to 17: Patch Panel 2 to PC1-PC7
		Connection 18: Patch Panel 2 to Wireless Access Point 1
3	34	Connection 19: Switch 3 to Patch Panel 3
		Connection 20 to 52: Patch Panel 3 to PC1-PC33
4	32	Connection 53: Switch 4 to Patch Panel 4
		Connection 54 to 84: Patch Panel 4 to PC1-PC31
5	32	Connection 85: Switch 5 to Patch Panel 5
		Connection 86 to 116: Patch Panel 5 to PC1-PC31
6	32	Connection 117: Switch 6 to Patch Panel 6
		Connection 118 to 148: Patch Panel 6 to PC1-PC31
7	3	Connection 149: Switch 7 to Patch Panel 7
		Connection 150: Patch Panel 7 to PC1
		Connection 151: Patch Panel 7 to Wireless Access Point 2

Total Connections	151
Patch Cords	141
Switch Ports	336

Cable Type And Length

Ethernet Cable - Category 6

Category 6 ethernet cables are used in this building. One of the reasons why it was chosen to be used is because it is capable of transmitting data at speeds up to 10Gbps over distances of up to 100m (J. A. Kay et. al., 2014). Thus, since the size of the building is less than 100m height, width, and length-wise, repeaters would not be necessary in order to connect every device to the network. In addition, category 6 cables are also more durable and resistant to interference compared to previous versions, making them a reliable choice for the building. As such, the use of these cables ensure that the network can handle high volumes of data transmission without any disruptions.

Fiber Optic Cable

Fibre optic cables are also used. As it can transmit data at very high speeds, up to 100 Gbps or even more, it is used to connect Switches 2-6 to the main switch. This would ensure that there are no bottlenecks in the network. Fibre optic technology is growing rapidly, even future availability of substantially more bandwidth is possible thanks to the ongoing decline in price of fibre optic components (Idachaba, F.E. et al, 2014). In addition, these cables are immune to electromagnetic interference as well as being physically durable, making them a great long-lasting choice for network infrastructure.

Horizontal Cabling

Cabling in Region 1

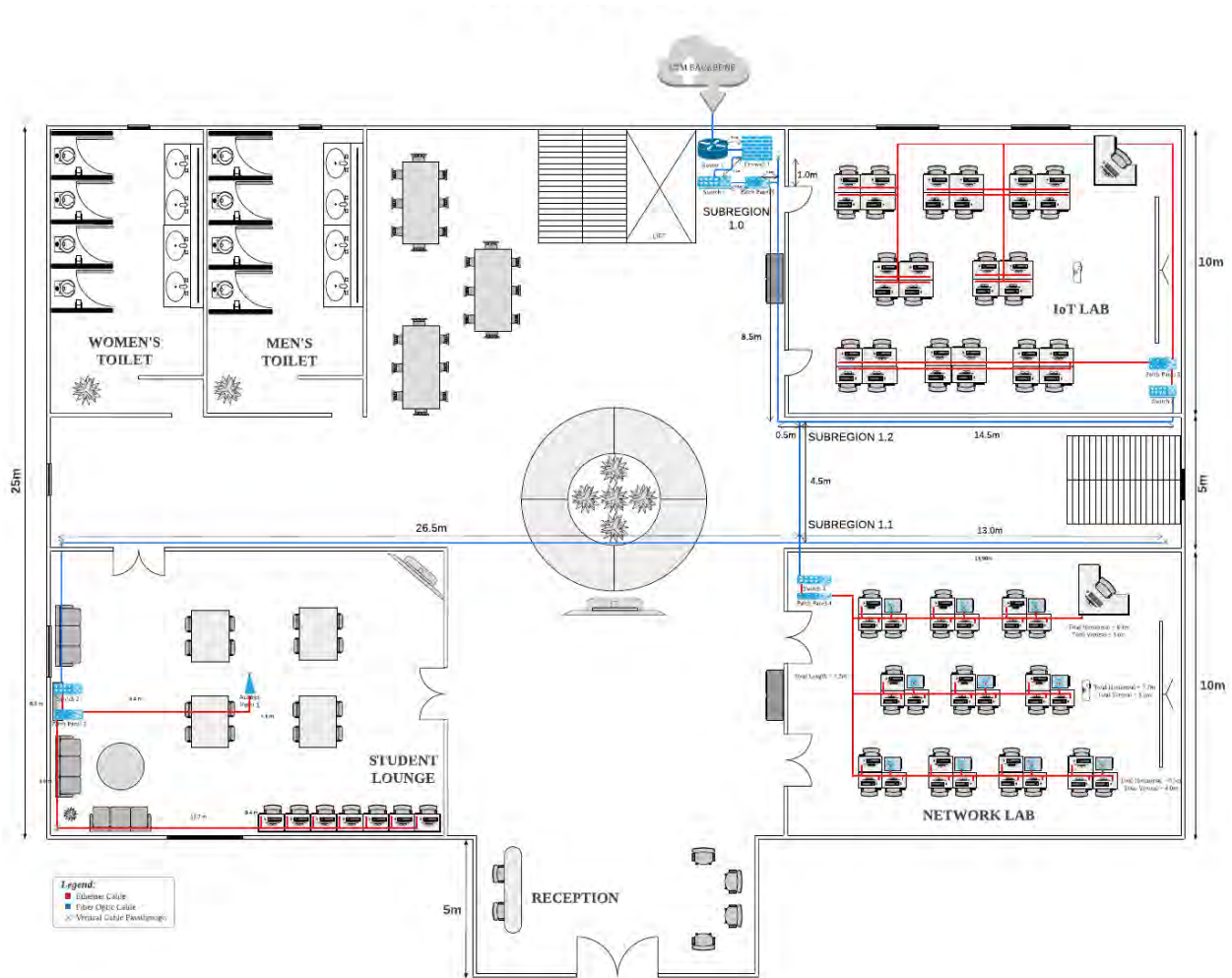


Figure 18

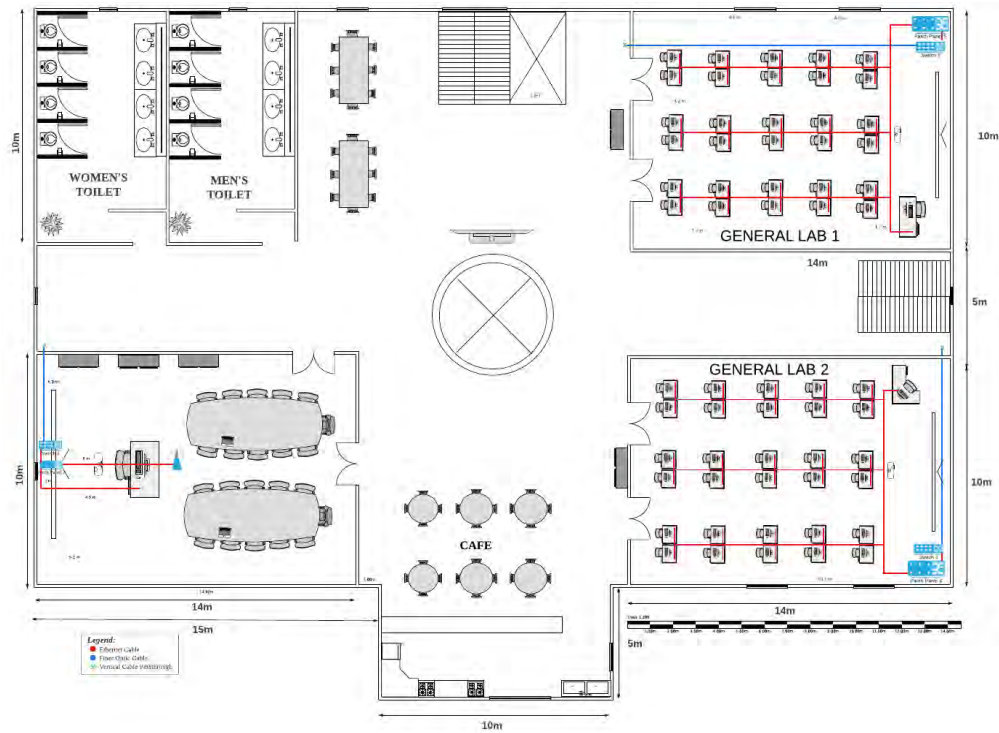


Figure 19

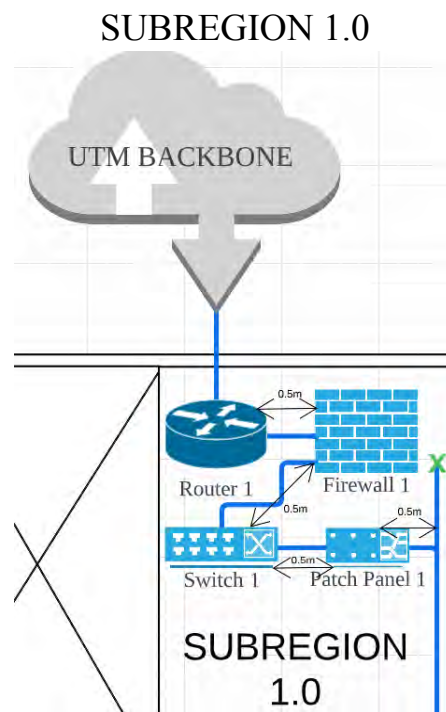


Figure 20

Fiber Optic Cabling

Connection	Calculation	Length (m)
Subregion 1.0	$0.5 + 0.5 + 0.5 =$	1.5
Student Lounge to Subregion 1.0	$26.5 + 4.5 + 0.5 + 8.5 + 0.5 =$	40.5
Video Conferencing Room to Subregion 1.0	$26.5 + 4.5 + 0.5 + 8.5 + 0.5 =$	40.5
IoT Lab to Subregion 1.0	$14.5 + 0.5 + 8.5 + 0.5 =$	24.0
Network Lab to Subregion 1.0	$4.5 + 0.5 + 8.5 + 0.5 =$	14.0
General Lab 1 to Subregion 1.0	$1.0 + 0.5 =$	1.5
General Lab 2 to Subregion 1.0	$13.0 + 4.5 + 0.5 + 8.5 + 0.5 =$	27.0
	Total	149.0

∴ Total Length of Fiber Optic Cabling in Region 1 = 149.0m

Ethernet Cabling

-

Cabling in Region 2: Student Lounge

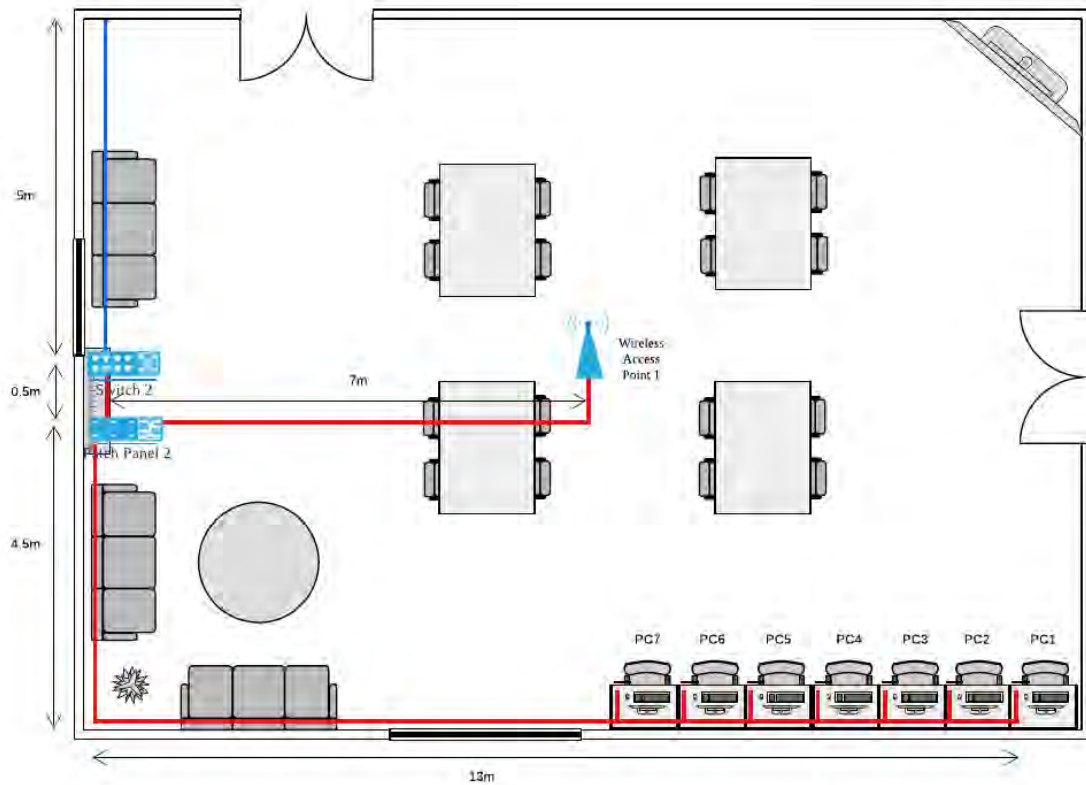


Figure 21

Fiber Optic Cabling

Connection Source	Connection Destination	Length (m)
Outside	Switch	5.5
	Total	5.5

$\therefore$ Total Length of Fiber Optic Cabling in Region 3 = 5.5m

Ethernet Cabling

Connection Source	Connection Destination	Length (m)
Switch 2	Patch Panel 2	0.5
Patch Panel 2	PC 1	17.5
	PC 2	16.5
	PC 3	15.5
	PC 4	14.5
	PC 5	13.5
	PC 6	12.5
	PC 7	11.5
	Access Point 1	7.0
Total		109.0

∴ Total Length of Ethernet Cabling in Region 2 = 109.0m

Cabling in Region 3: IoT Lab

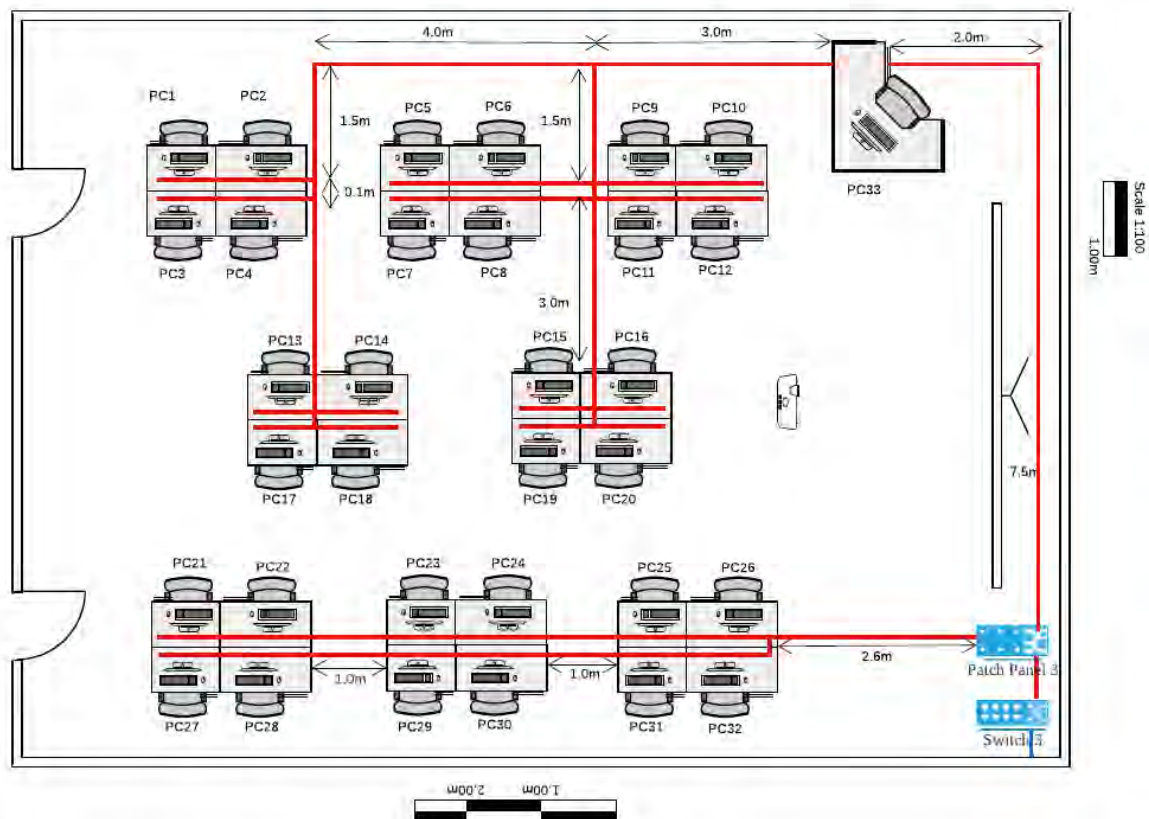


Figure 22

Fiber Optic Cabling

Outside to Switch = 0.5m

∴ Total Length of Fiber Optic Cabling in Region 3 = 0.5m

Ethernet Cabling

Connection Source	Connection Destination	Length (m)
Switch 3	Patch Panel 3	0.5
Patch Panel 3	PC 1	20.0
	PC 2	19.0
	PC 3	20.1
	PC 4	19.1
	PC 5	16.0
	PC 6	15.0
	PC 7	16.1
	PC 8	15.1
	PC 9	15.0
	PC 10	16.0
	PC 11	15.1
	PC 12	16.1
	PC 13	22.1
	PC 14	22.1
	PC 15	18.1
	PC 16	18.1
	PC 17	23.1
	PC 18	23.1
	PC 19	19.1
	PC 20	19.1
	PC 21	10.6
	PC 22	9.6
	PC 23	8.6
	PC 24	7.6
	PC 25	6.6
	PC 26	5.6

	PC 27	10.6
	PC 28	9.6
	PC 29	8.6
	PC 30	7.6
	PC 31	6.6
	PC 32	5.6
	PC33	9.5
	Total	474.1

∴ Total Length of Ethernet Cabling in Region 3 = 474.1m

Cabling in Region 4: Network Lab

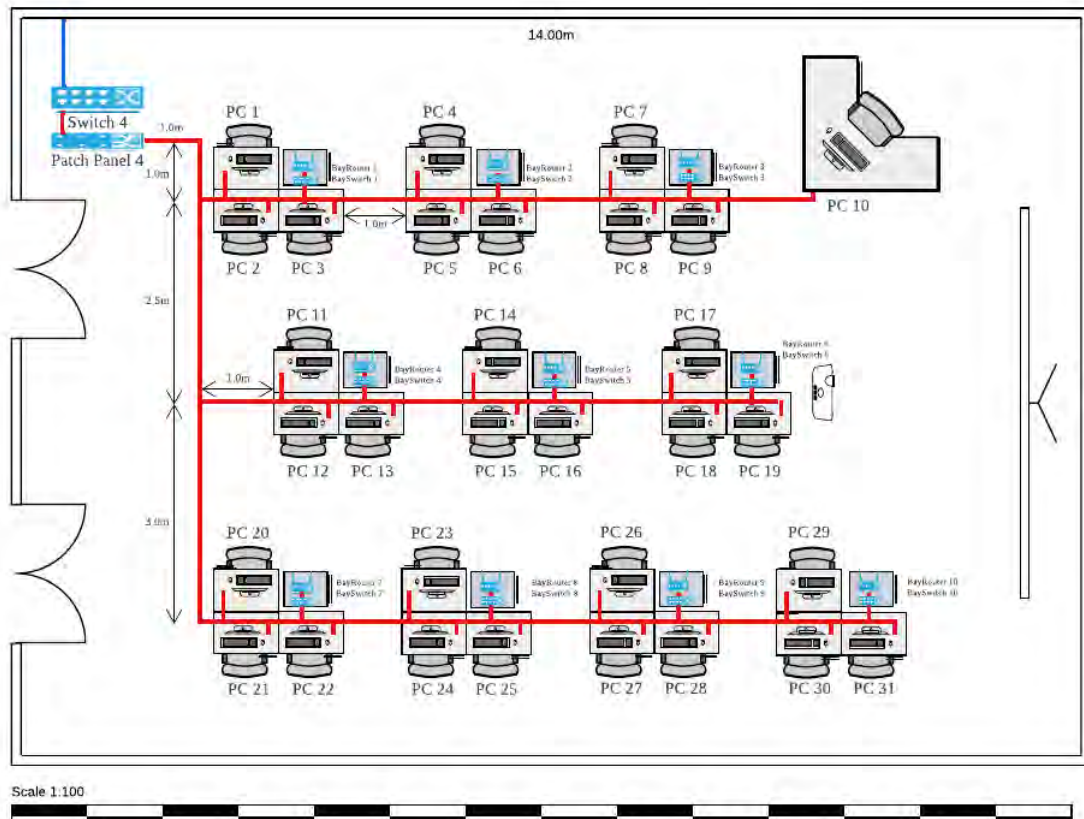


Figure 23

Fiber Optic Cabling

Outside to switch = 0.5m

$\therefore$ Total Length of Fiber Optic Cabling in Region 4 = 0.5m

Ethernet Cabling

Connection Source	Connection Destination	Length (m)
Switch 4	Patch Panel 4	0.5
Patch Panel 4	PC 1	3.0
	PC 2	3.0
	PC 3	4.0
	PC 4	6.0
	PC 5	6.0
	PC 6	7.0
	PC 7	9.0
	PC 8	9.0
	PC 9	10.0
	PC 10	11.5
	PC 11	6.5
	PC 12	6.5
	PC 13	7.5
	PC 14	9.5
	PC 15	9.5
	PC 16	10.5
	PC 17	12.5
	PC 18	12.5
	PC 19	13.5
	PC 20	8.5
	PC 21	8.5
	PC 22	9.5
	PC 23	11.5
	PC 24	11.5
	PC 25	12.5
	PC 26	14.5
	PC 27	14.5
	PC 28	15.5
	PC 29	17.5
	PC 30	17.5
	PC 31	18.5
	Total	317.5

In addition, there are 10 groups of 3 PCs, each connected to a network bay that has 1 router and 1 switch. Thus:

PC to router: 1.0m

Router to switch: 0.5m

Total Length = $1.0(30) + 0.5(10) = 35.0\text{m}$

$\therefore$ Total Length of Ethernet Cabling in Region 4 = $317.5\text{m} + 35.0\text{m} = 352.5\text{m}$

Cabling in Region 5: General Lab 1

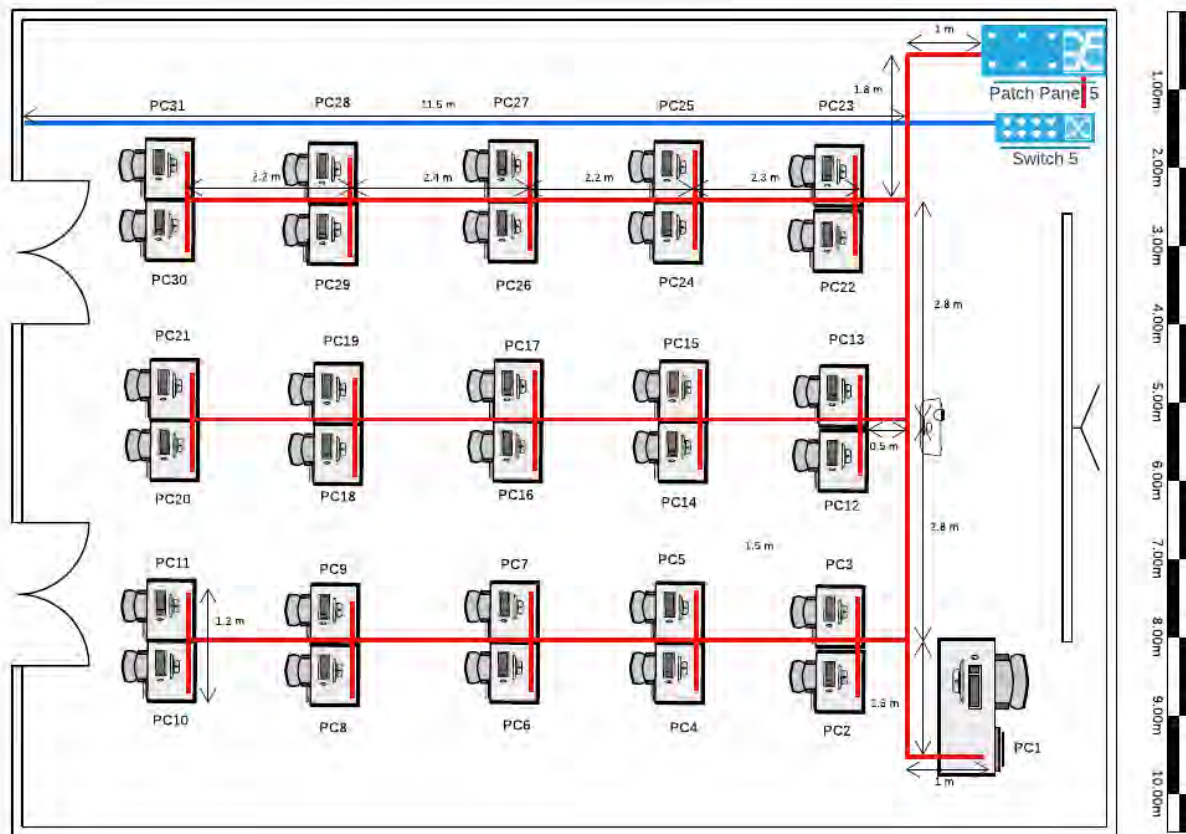


Figure 24

Fiber Optic Cabling

Outside to Switch = 11.7 m

∴ Total Length of Fiber Optic Cabling in Region 5 = 11.7 m

Ethernet Cabling

Connection Source	Connection Destination	Length (m)
Switch 5	Patch Panel 5	0.5
Patch Panel 5	PC 1	10.9
	PC 2	9.5
	PC 3	9.5
	PC 4	11.8
	PC 5	11.8
	PC 6	14.0
	PC 7	14.0
	PC 8	16.4
	PC 9	16.4
	PC 10	18.6
	PC 11	18.6
	PC 12	6.7
	PC 13	6.7
	PC 14	9.0
	PC 15	9.0
	PC 16	11.2
	PC 17	11.2
	PC 18	13.6
	PC 19	13.6
	PC 20	15.8
	PC 21	15.8
	PC 22	3.9
	PC 23	3.9
	PC 24	6.2
	PC 25	6.2
	PC 26	8.4
	PC 27	8.4
	PC 28	10.8
	PC 29	10.8
	PC 30	13.0
	PC 31	12.0
	Total	348.2

$\therefore$ Total Length of Ethernet Cabling in Region 5 = 348.2m

Cabling in Region 6: General Lab 2

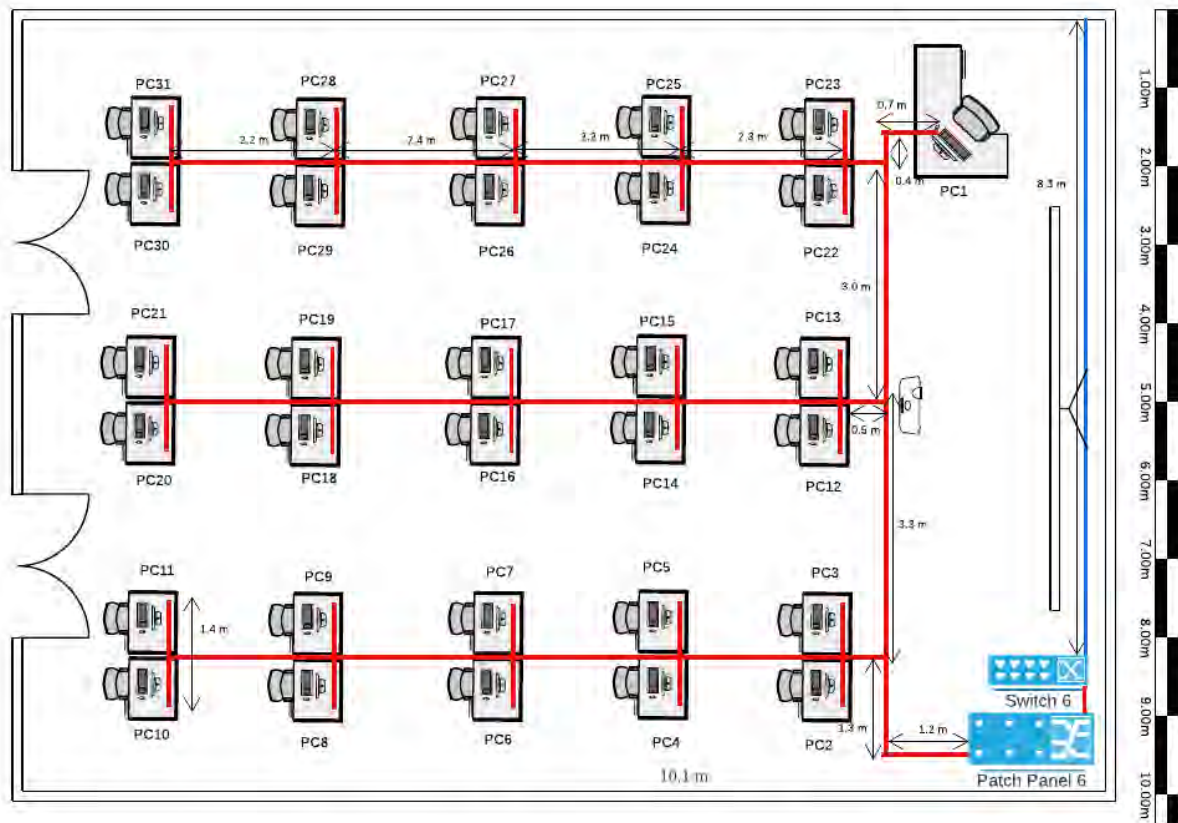


Figure 25

Fiber Optic Cabling

Outside to Switch = 8.7 m

∴ Total Length of Fiber Optic Cabling in Region 6 = 8.7 m

Ethernet Cabling

Connection Source	Connection Destination	Length (m)
Switch 6	Patch Panel 6	0.5
Patch Panel 6	PC 1	9.9
	PC 2	3.7
	PC 3	3.7
	PC 4	6.0
	PC 5	6.0
	PC 6	8.2
	PC 7	8.2
	PC 8	10.6
	PC 9	10.6
	PC 10	12.8
	PC 11	12.8
	PC 12	7.0
	PC 13	7.0
	PC 14	9.3
	PC 15	9.3
	PC 16	11.5
	PC 17	11.5
	PC 18	13.9
	PC 19	13.9
	PC 20	16.1
	PC 21	16.1
	PC 22	10.0
	PC 23	10.0
	PC 24	12.3
	PC 25	12.3
	PC 26	14.5
	PC 27	14.5
	PC 28	16.9
	PC 29	16.9
	PC 30	19.1
	PC 31	19.1
	Total	354.2

∴ Total Length of Ethernet Cabling in Region 6 = 354.2m

Cabling in Region 7: Video Conference Room

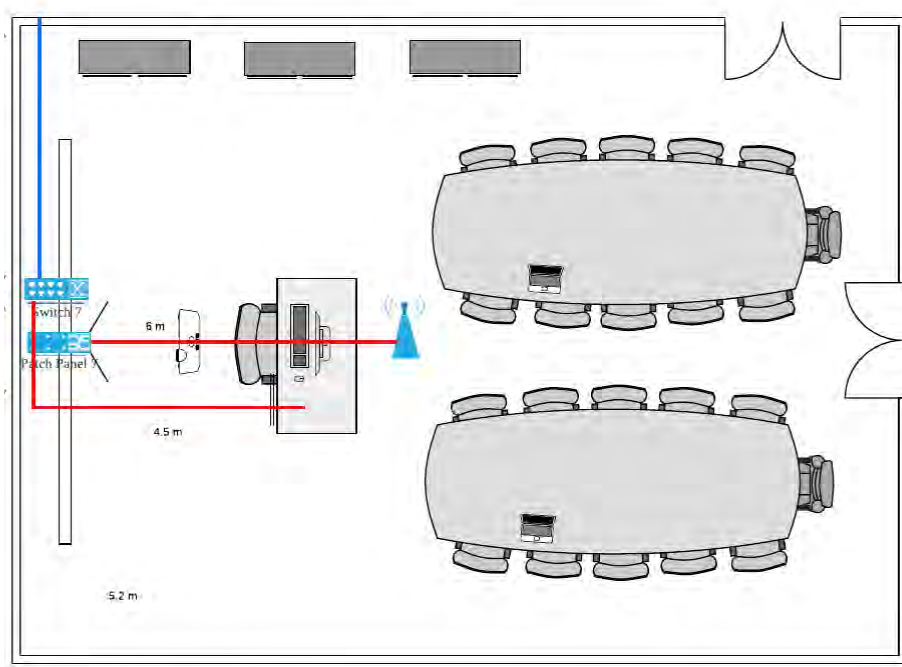


Figure 26

Fiber Optic Cabling

Outside to Switch = 5.0 m

$\therefore$ Total Length of Fiber Optic Cabling in Region 7 = 5.0 m

Ethernet Cabling

Connection Source	Connection Destination	Length (m)
Patch Panel 7	Access Point 2	6.0
	PC Video Conference	6.0
Switch 7	Patch Panel 7	0.5
Total		12.5

$\therefore$ Total Length of Ethernet Cabling in Region 7 = 12.5 m

Vertical Cabling

Ground Floor

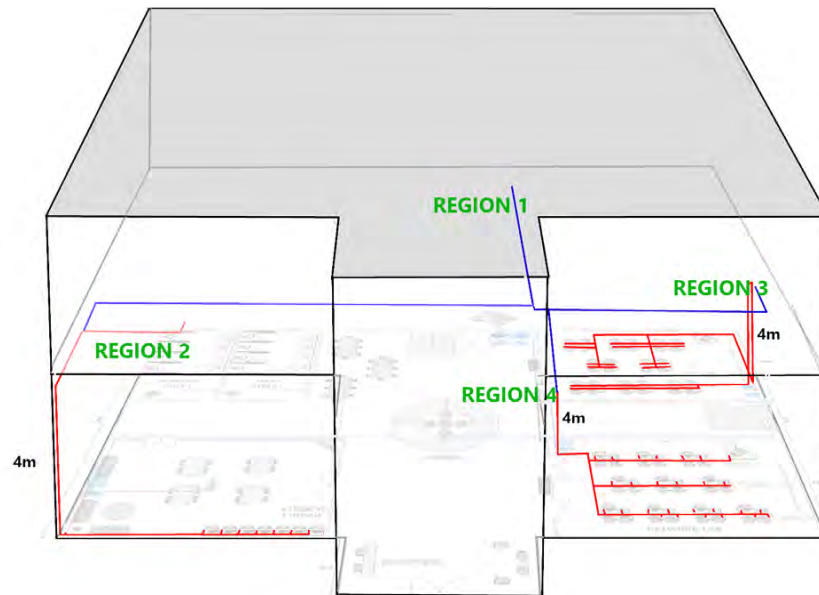


Figure 27

Fiber Optic Cabling

-

Ethernet Cabling

Region	Length (m)	Number of Cable	Total (m)
1	-	-	0.0
2	4.0	7	28.0
3	4.0	33	132.0
4	4.0	31	124.0
Total			284.0

$\therefore$ Total Length of Ethernet Cabling in Region 7 = 284.0 m

First Floor

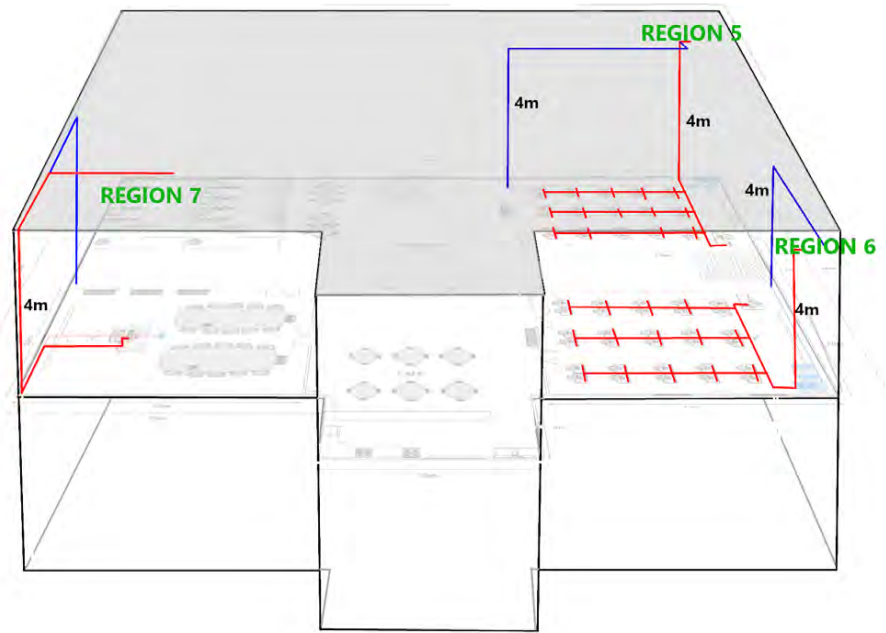


Figure 28

Fiber Optic Cabling

Region	Length (m)	Number of Cable	Total (m)
5	4.0	1	4.0
6	4.0	1	4.0
7	4.0	1	4.0
Total			12.0

∴ Total Length of Fiber Optic Cabling in Region 7 = 12.0 m

Ethernet Cabling

Region	Length (m)	Number of Cable	Total (m)
5	4.0	31	124.0
6	4.0	31	124.0
7	4.0	1	4.0
Total			252.0

∴ Total Length of Ethernet Cabling in Region 7 = 252.0 m

Overall Fibre Optic Cabling

Region	Length (m)
Vertical Ground Floor	0.0
Vertical First Floor	12.0
Region 1	149.0
Region 2	5.5
Region 3	0.5
Region 4	0.5
Region 5	11.7
Region 6	8.7
Region 7	5.0
TOTAL	192.9

Overall CAT6 Ethernet Cabling

Region	Length (m)
Vertical Ground Floor	284.0
Vertical First Floor	252.0
Region 1	0.0
Region 2	109.0
Region 3	474.1
Region 4	352.5
Region 5	348.2
Region 6	354.2
Region 7	12.5
TOTAL	2186.5

We use 5% significance level or error estimation. Therefore,

For Fiber Optic Cabling,

$$105\% * 192.9 = \mathbf{202.55m}$$

For Ethernet Cabling,

$$105\% * 2186.5 = \mathbf{2295.83m}$$

Reflection

MEMBER	REFLECTION
AMMAR BIN JAMALLUDIN	Task 4 was definitely one of the more challenging tasks as it was time-consuming. Measuring the distance of cabling needed took quite a bit of time, but, as everyone worked on it, it did not take too much time.
CHOK RONG JIE	Project Task 4, I have learnt on how to do the wiring efficiently for every work area in the floor plan. I also learnt how to properly calculate the length of wiring required for a work area.
MUHAMMAD SYAHMI BIN SALEH	Task 4 asked us to design the connection cable and count the needed length of cables and type of cables we need to use where it takes much time. This task required us to use the knowledge and teamwork so that it will be easier.
MUHAMMAD TAUFIQ BIN JURIMI	Task 4 was quite fun, dealing with floor plan and the cabling. While it is quite time consuming, I find it interesting to create my own cabling, and arrange it the best way possible so that the cabling is done neatly. Vertical cabling is the most interesting part, as we can kind of see our building and the network cabling becoming 3D or 'real'.

TASK 5

Introduction

The following report will outline the process of subnetting and IP assignation of the network given the Network Address of 173.136.128.0/23. The report will include the workings involved in the division of subnets and allocation of IP addresses to each lab and room.

Assumption and Calculation of IP Address Division

Main IP

173.136.128.0/23

Network	Host
173.136.1000000	0.00000000

Total IP Addresses = $2^9 = 512$

Divide the IP address depending on the needs of every work area.

IoT and Lab Network Lab needs 100 IP Addresses each

$$2^x = 100$$

$$X \log 2 = \log 100$$

$$X = \log 100 / \log 2$$

$$X = 6.6439$$

X = 7 bits to borrow from Host Portion

General Lab 1 and General Lab 2 needs 60 IP Addresses each

$$2^x = 60$$

$$X \log 2 = \log 60$$

$$X = \log 60 / \log 2$$

$$X = 5.9069$$

X = 6 bits to borrow from Host Portion

Student Lounge needs 60 IP Addresses

$$2^x = 60$$

$$X \log 2 = \log 60$$

$$X = \log 60 / \log 2$$

$$X = 5.9069$$

X = 6 bits to borrow from Host Portion

Video Conference needs 30 IP Addresses

$$2^x = 30$$

$$X \log 2 = \log 30$$

$$X = \log 30 / \log 2$$

$$X = 4.9069$$

X = 5 bits to borrow from Host Portion

Backbone Region 10 IPs

$$2^x = 10$$

$$x \log 2 = \log 10$$

$$x = \log 10 / \log 2$$

$$x = 3.3219$$

X = 4 bits to borrow from Host Portion

Subnet Division

Subnet Number	Network Address	Broadcast Address	Range of Usable IP Address	Subnet Mask
1	173.136.128.0	173.136.128.127	173.136.128.1 - 173.136.128.126	/25 OR 255.255.255.128
2	173.136.128.128	173.136.128.255	173.136.128.129 - 173.136.128.254	/25 OR 255.255.255.128
3	173.136.129.0	173.136.129.63	173.136.129.1 - 173.136.129.62	/26 OR 255.255.255.192
4	173.136.129.64	173.136.129.127	173.136.129.65 - 173.136.129.126	/26 OR 255.255.255.192
5	173.136.129.128	173.136.129.191	173.136.129.129 - 173.136.129.190	/26 OR 255.255.255.192
6	173.136.129.192	173.136.129.223	173.136.129.193 - 173.136.129.222	/27 OR 255.255.255.224
7	173.136.129.224	173.136.129.239	173.136.129.225 - 173.136.129.238	/28 OR 255.255.255.240

Network Topology

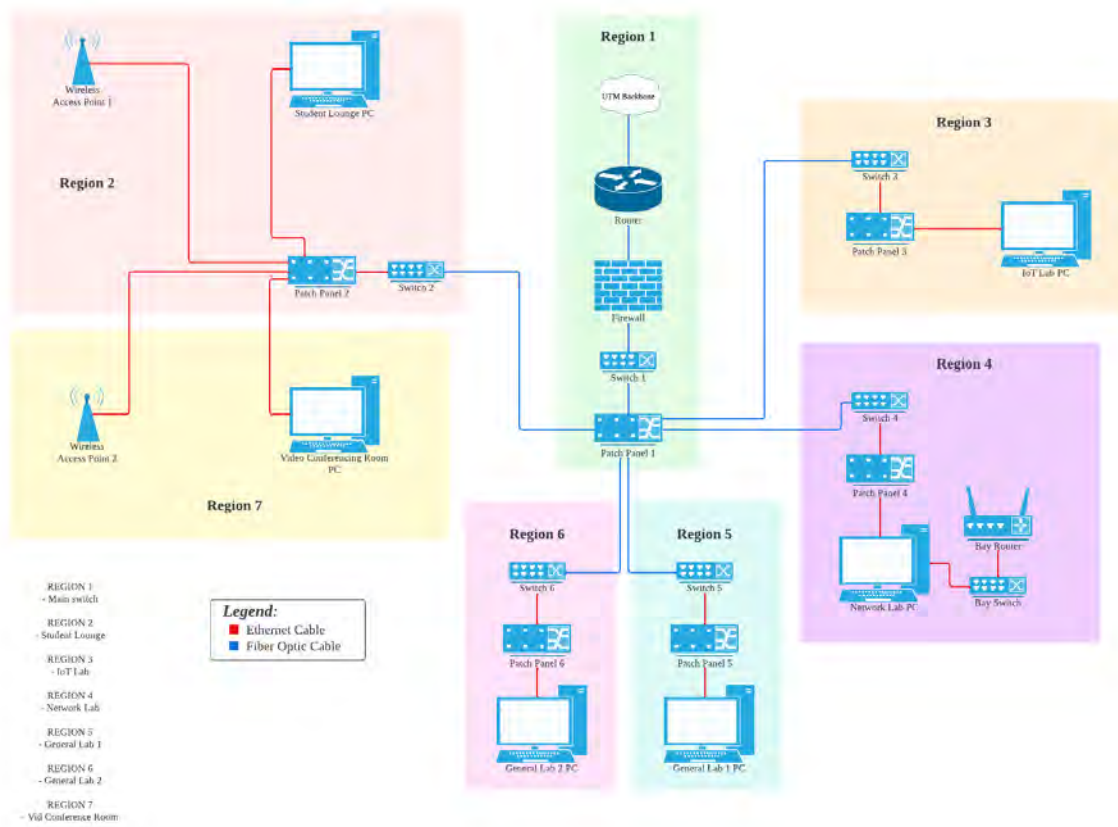


Figure 29

Subnet 1 - Region 3 (IoT Lab)

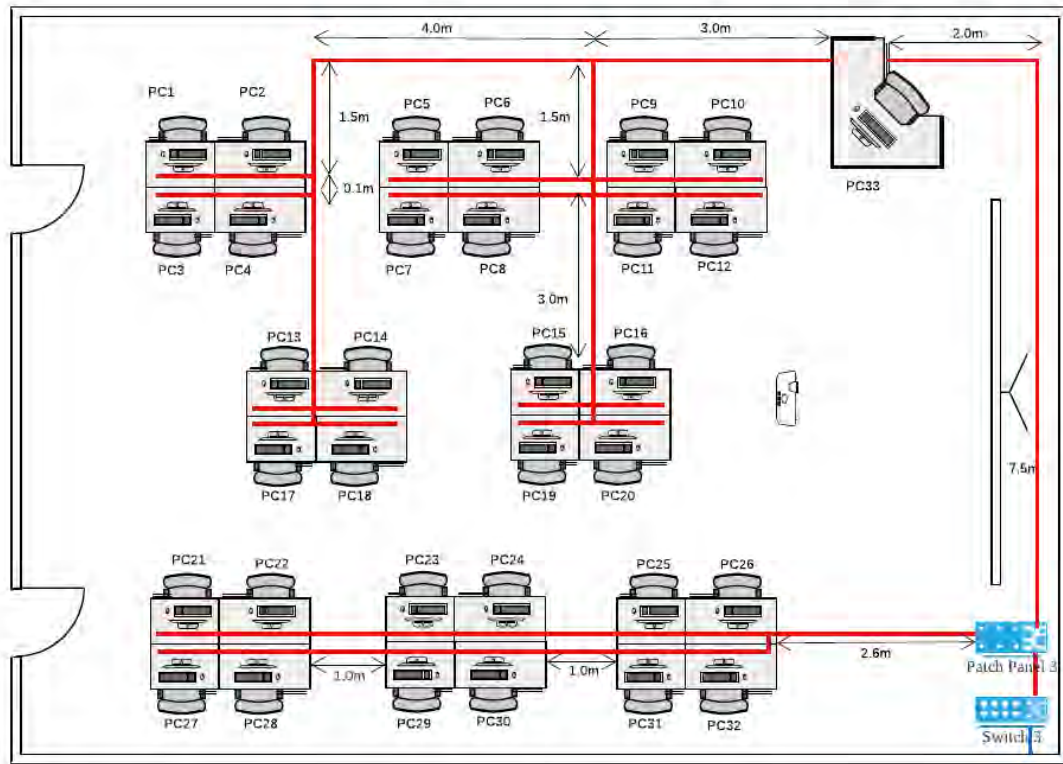


Figure 30

Network Device	IP Address
Switch 3	173.136.128.1
PC1 - PC33	173.136.128.2 - 173.136.128.34

Subnet 2 - Region 4 (Network Lab)

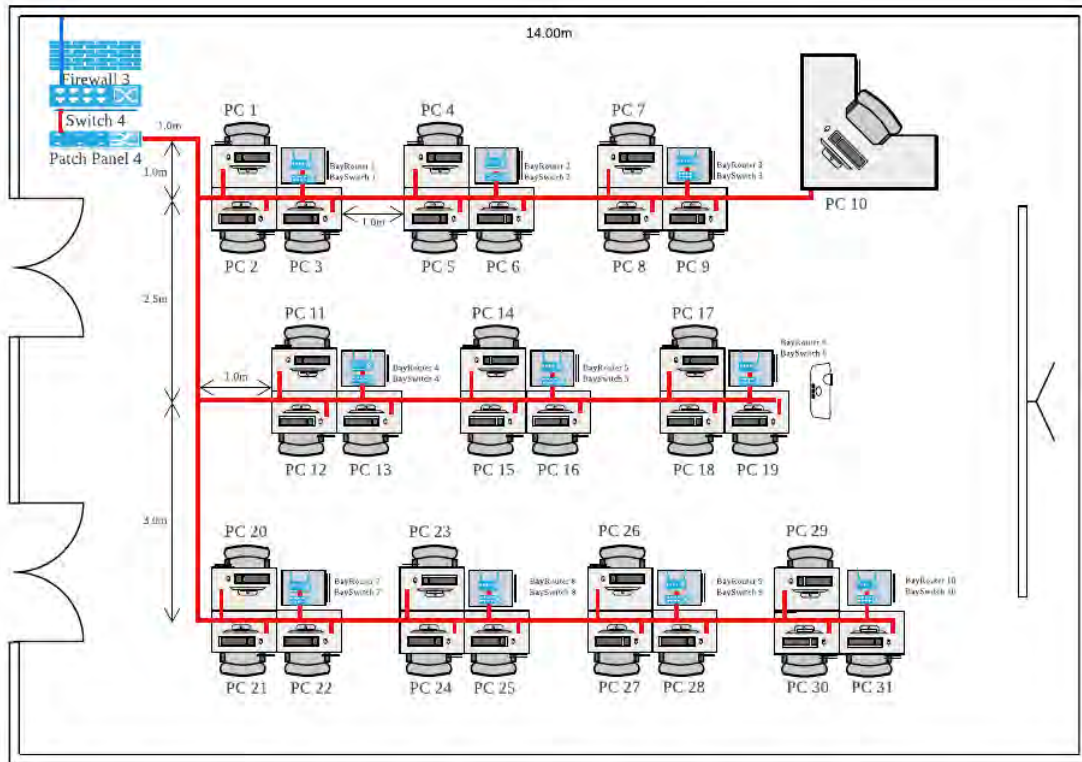


Figure 31

Network Device	IP Address
Switch 4	173.136.128.129
PC1 - PC31	173.136.128.130 - 173.136.128.160

Subnet 3 - Region 2 (Student Lounge)

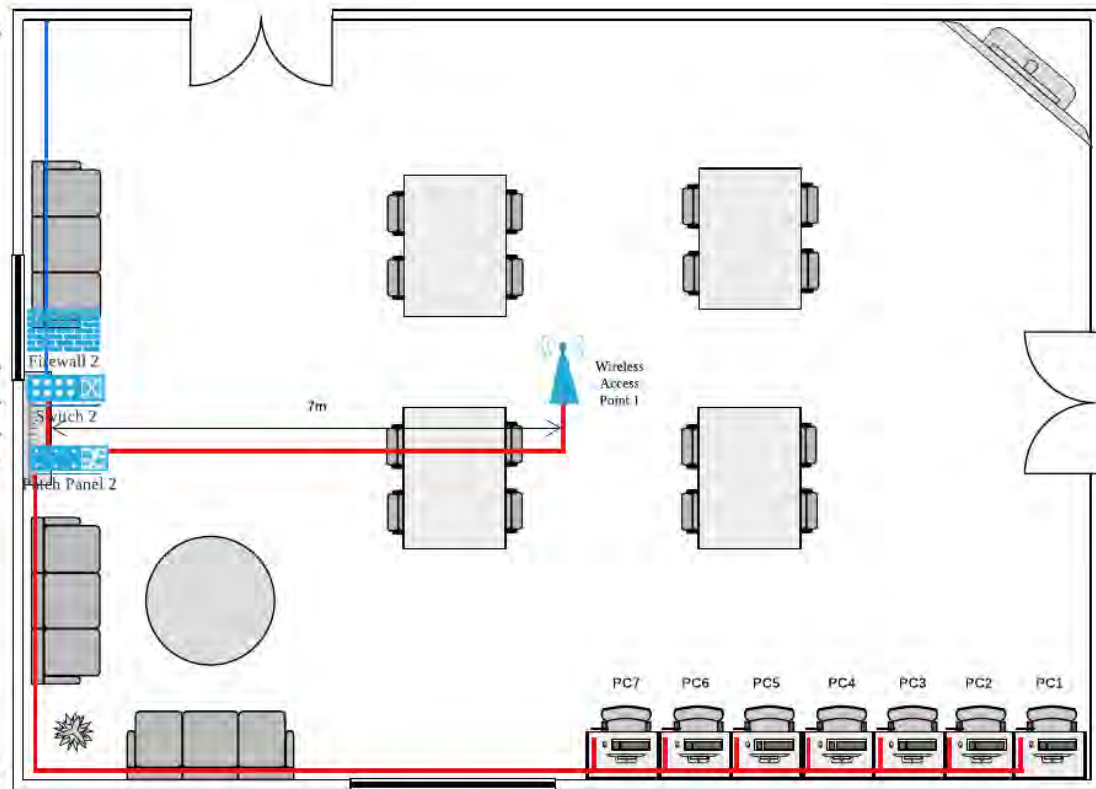


Figure 32

Network Device	IP Address
Switch 2	173.136.129.1
Wireless Access Point 1	173.136.129.2
PC1 - PC7	173.136.129.3 - 173.136.129.9

Subnet 4 - Region 5 (General Lab 1)

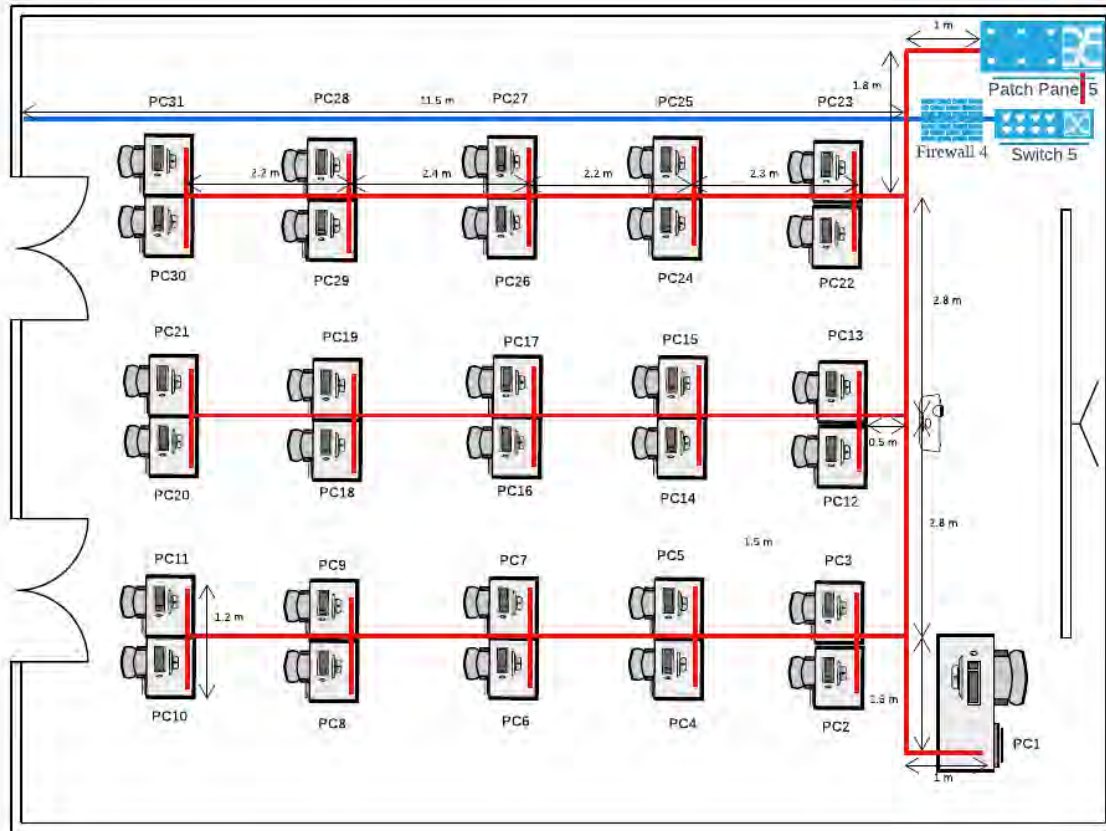


Figure 33

Network Device	IP Address
Switch 5	173.136.129.65
PC1 - PC31	173.136.129.66 - 173.136.129.96

Subnet 5 - Region 6 (General Lab 2)

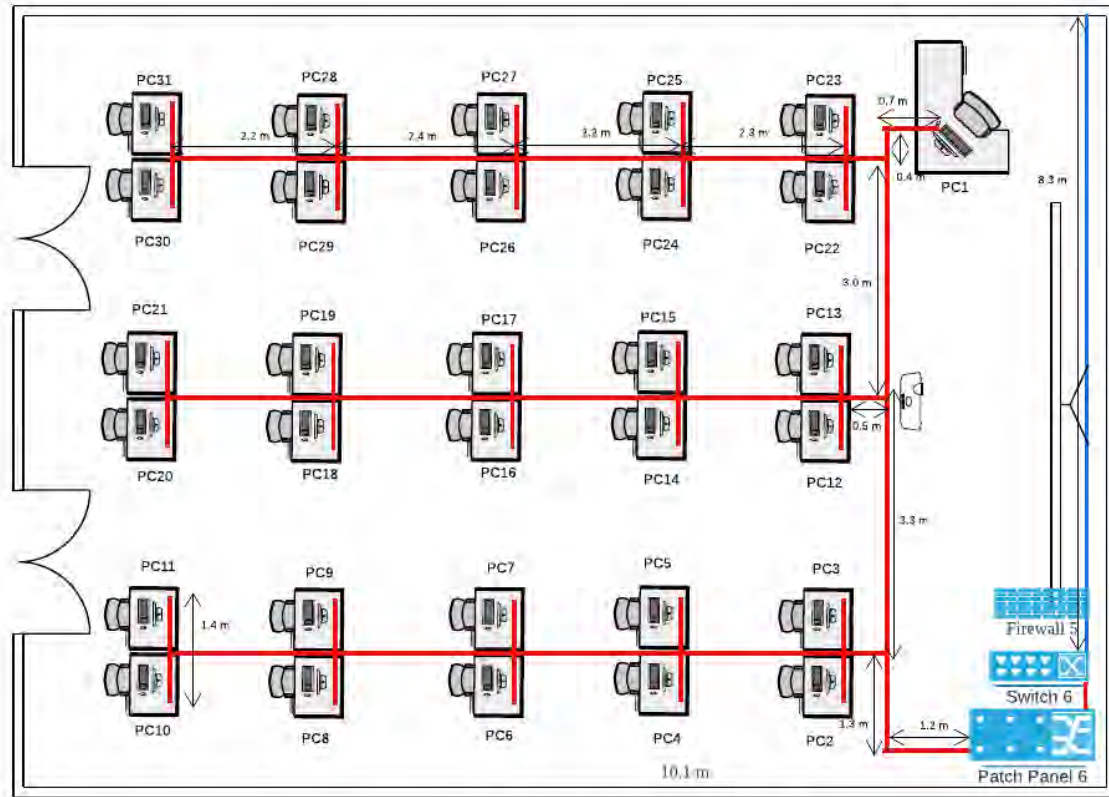


Figure 34

Network Device	IP Address
Switch 6	173.136.129.129
PC1 - PC31	173.136.129.130 - 173.136.129.160

Subnet 6 - Region 7 (Video Conferencing Room)

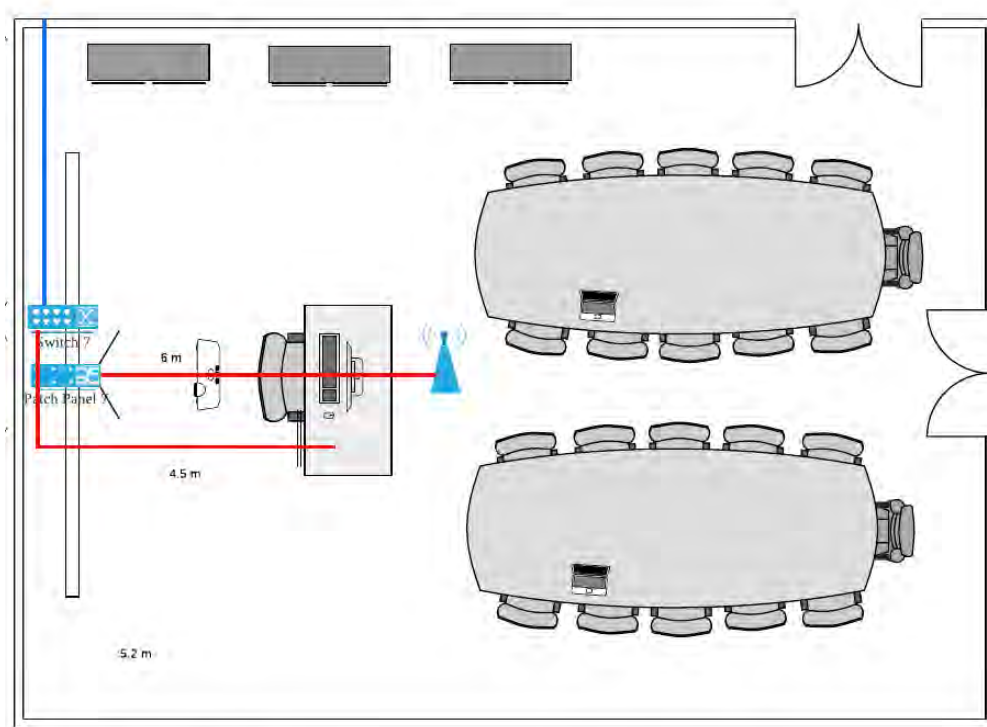


Figure 35

Network Device	IP Address
Switch 7	173.136.129.193
Wireless Access Point 2	173.136.129.194
PC1	173.136.129.195

Subnet 7 - Region 1 (Backbone)

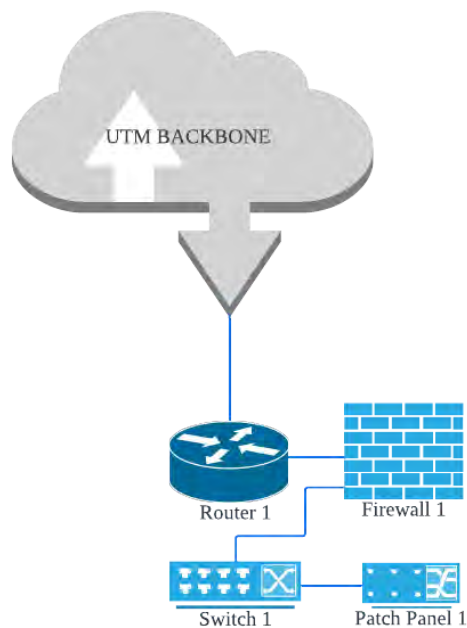


Figure 36

Network Device	IP Address
Router 1	173.136.129.225
Switch 1	173.136.129.226

Reflection

MEMBER	REFLECTION
AMMAR BIN JAMALLUDIN	By first discussing among the group about how many IP addresses are needed and how to split them, it made the work much less difficult. I learned how important it is for everyone in a group to understand the goal of what they are working towards in order to make work much easier.
CHOK RONG JIE	In Project Task 5, I am required to learn how to split the IP addresses provided by the stakeholder among the subnet that is made in Task 4 using methods taught in class.
MUHAMMAD SYAHMI BIN SALEH	This task is a challenging task where we need to be careful in counting the IP and subnet and cannot be careless or else we need to do it again. Conclusion, be more careful in everything you do.
MUHAMMAD TAUFIQ BIN JURIMI	This task is quite easy. We discussed together how to subnet our network system. Then, Chok Rong Jie did the calculation for the IP Address, and the others just need to assign it to the regions. Thanks to Chok Rong Jie since he calculated the IP address really well, we are able to finish task 5 with less problems.

CONCLUSION

In conclusion, all the project tasks can be described as a step-by-step tutorial on how to complete the contract about constructing a building fit with high end technology, sustainability and an efficient networking system.

Our achievements throughout the project is that we are able to work together and make this project a success. We were able to collaborate and helped each other willingly in order to overcome many difficulties that each project task had to offer. The floor plan and cabling turns out amazing, and we were quite happy with how it turned out.

Our strength in this project is that we communicate with each other frequently. Therefore, ideas are exchanged to produce a report that everyone can be happy with. Since we discuss a lot through WhatsApp and Google Meet, we are able to clarify most problems.

We also realised that we are pretty weak in terms of network communication knowledge. There are a lot of parts that we got confused about. There are a lot of network devices out there that we genuinely never heard of, and we learnt about it in this project. Our lack of network communication knowledge was also shown in the previous task, and Dr Hazinah already corrected our mistake.

We suggest that the project requires us making a presentation video, about why we chose the floor plan design, how our network cabling works and why we chose the devices in task 3. A video presentation together will allow us to explore more about network cabling and thus everyone will be able to share their own ideas through the presentation.

Overall, the project taught us a lot of important and valuable knowledge about Network Communication that is useful for our future career and examinations.

TEAM MEMBERS AND RESPONSIBILITIES

MEMBER	RESPONSIBILITIES
CHOK RONG JIE	Group Leader, Minute Meetings TASK 1 - Floor Design, Ground Floor Plan TASK 2 - Questions, Researching, Interview, Feasibility Study TASK 3 - List of Network Devices, Reflection TASK 4 - Ground Floor Network Diagram, Cable Type and Length TASK 5 - Assumption and Calculation of IP Address Division, Subnet Division TASK 6 - Abstract, Reflection, Conclusion
AMMAR BIN JAMALLUDIN	TASK 1 - Floor Design, Ground Floor Plan TASK 2 - Questions, Researching, Feasibility Study, References TASK 3 - List of Network Devices, Comparisons TASK 4 - Network Topology, Ground Floor Network Diagram, Connections/Cords, Cable Type and Length TASK 5 - IP Address Allocation for each region TASK 6 - Introduction, Reflection
MUHAMMAD SYAHMI BIN SALEH	TASK 1 - Floor Design, First Floor Plan TASK 2 - Questions, Researching, Feasibility Study, References TASK 3 - List of Network Devices, Comparisons TASK 4 - Work Areas, First Floor Network Diagram, Cable Type and Length TASK 5 - IP Address Allocation for each region TASK 6 - Project Background and Overview of the Client's Status and Issues, Reflection
MUHAMMAD TAUFIQ BIN JURIMI	TASK 1 - Floor Design, First Floor Plan TASK 2 - Questions, Researching, Interview, Feasibility Study TASK 3 - List of Network Devices, References TASK 4 - Work Areas, Vertical Network Diagram, First Floor Network Diagram, Cable Type and Length, References TASK 5 - IP Address Allocation for each region TASK 6 - Table of Figures, Reflection, References

REFERENCES

- Liu, X. (2019). Evolution of fiber-optic transmission and networking toward the 5G era. *Iscience*, 22, 489-506.
<https://doi.org/10.1016/j.isci.2019.11.026>
- Yan, Z., Hongcai, C., Yaping D. (2019). Lightning protection design of solar photovoltaic systems: Methodology and guidelines, *Electric Power Systems Research*, Volume 174, 105877, ISSN 0378-7796,
<https://doi.org/10.1016/j.epsr.2019.105877>.
- Bisht, N., & Singh, S. (2015). Analytical study of different network topologies. *International Research Journal of Engineering and Technology (IRJET)*, 2(01), 88-90.
https://www.academia.edu/12594789/IRJET_ANALYTICAL_STUDY_OF_DIFFERENT_NETWORK_TOPOLOGIES
- Gercek, G., & Saleem, N. (2006). Designing a Versatile Dedicated Computing Lab to Support Computer Network Courses: Insights from a Case Study. *Journal of Information Technology Education: Research*, 5(1), 13-26.
<http://www.learntechlib.org/p/111530/>
- Malik, A., Verma, H. K., & Pal, R. (2012). Impact of Firewall and VPN for securing WLAN. *International Journal*, 2(5).
- HK Mammi. (2022). 'Project Task 2 Interview'. Interviewed by Chok Rong Jie, 6 Dec.
- Ngo, D. (2022, October 6). *TP-link archer AX73 review: A solid option*. Dong Knows Tech.
Retrieved December 6, 2022, from
<https://dongknows.com/tp-link-archer-ax73-ax5400-router-review/>
- AMD ryzen 5 5600G vs Intel core i5-12400: What is the difference?* VERSUS. (n.d.). Retrieved December 6, 2022, from
<https://versus.com/en/amd-ryzen-5-5600g-vs-intel-core-i5-12400>

S5730-SI Series Switches. (n.d.). Huawei Enterprise. Retrieved December 6, 2022, from <https://e.huawei.com/my/products/enterprise-networking/switches/campus-switches/s5730-si>

Cisco UPOE+ 90W Power over Ethernet. (2022, February 25). Cisco. Retrieved December 6, 2022, from <https://www.cisco.com/c/en/us/solutions/enterprise-networks/upoe/index.html>

Cisco Catalyst 9300 Series Switches Data Sheet. (2022, November 17). Cisco. Retrieved December 6, 2022, from <https://www.cisco.com/c/en/us/products/collateral/switches/catalyst-9300-series-switches/nb-06-cat9300-ser-data-sheet-cte-en.html>

Limited, R. S. (n.d.). *Huawei S5730-68C-SI-AC+SFP Price - Huawei Price List 2022*. Retrieved December 6, 2022, from <https://itprice.com/huawei-price-list/s5730-68c-si-ac+sfp.html>

J. A. Kay, R. A. Entzminger and D. C. Mazur, "Industrial Ethernet- overview and best practices," Conference Record of 2014 Annual Pulp and Paper Industry Technical Conference, Atlanta, GA, USA, 2014, pp. 18-27, doi: 10.1109/PPIC.2014.6871144.

Idachaba, F.E. and Ike, Dike U. and Orovwode, H. (2014) Future Trends in Fiber Optics Communication. In: the World Congress on Engineering 2014, July 2 - 4, 2014, London, U.K..

APPENDICES

TASK 1 MEETING MINUTES

MEETING MINUTES 1

NETWORK COMMUNICATION PROJECT

GROUP: CATS

DATE: **21 OCTOBER 2022**

TIME: **8:00 P.M. - 8:50 P.M.**

PLATFORM: **GOOGLE MEET**

ATTENDANCE:

NO	NAME	MATRIC NUMBER
1.	MUHAMMAD TAUFIQ BIN JURIMI	A21EC0095
2.	MUHAMMAD SYAHMI BIN SALEH	A21EC0208
3.	CHOK RONG JIE	A21EC0169
4.	AMMAR BIN JAMALLUDIN	A21EC0160

ABSENT (WITH REASONS):

NO	NAME	MATRIC NUMBER

MEETING AGENDA:

NO.	MEETING AGENDA	TIME
1	● Discuss the website to use to draw the floor plan. ○ Lucidchart website is chosen as it offers a free plan with access to a big variety of floor plan elements.	8.00 P.M.
2	● Extracting the main points in the case study such as the number of rooms and their specifications. ○ 2 floors are needed for the new building. ○ Must have 4 Labs, 1 Video Conferencing Room and 1 Student Lounge. ○ 4 Labs are then categorized into 2 General Lab, 1 Network Lab and 1 IOT Lab.	8.05 P.M.
3	● Floor Plan Designing. ○ Discuss what other rooms to add besides the main ones mentioned in the case study.	8.25 P.M.
4	● Distribute tasks. ○ Ground Floor - <i>Chok Rong Jie</i> and <i>Ammar bin Jamalludin</i> ○ 1st Floor - <i>Muhammad Taufiq bin Jurimi</i> and <i>Muhammad Syahmi Bin Saleh</i>	8.35 P.M.
5	● Meeting ended.	8.50 P.M.

PHOTOS OF MEETING MINUTES 1

CHOK RONG JIE A21EC0169 is presenting

The screenshot shows a Zoom meeting interface. The main window displays a presentation of a floor plan titled "Project 1: Floor Plan". The floor plan shows a layout with rooms, corridors, and furniture. The presentation is being shared by CHOK RONG JIE A21EC0169. The meeting controls at the bottom show the time as 8:28 PM and the participant list on the right includes CHOK RONG JIE A21EC0169, Ammar Jamalludin, Syahmi Saleh, and You.

8:28 PM | nth-ovgi-qct

CHOK RONG JIE A21EC0169 is presenting

The screenshot shows a Zoom meeting interface. The main window displays a presentation titled "CASE STUDY" with the subtitle "Faculty of Computing Upgrade needs". The presentation content includes background information and goals for the new system. The presentation is being shared by CHOK RONG JIE A21EC0169. The meeting controls at the bottom show the time as 8:29 PM and the participant list on the right includes CHOK RONG JIE A21EC0169, Ammar Jamalludin, Syahmi Saleh, and You.

8:29 PM | nth-ovgi-qct

MEETING MINUTES 2

NETWORK COMMUNICATION PROJECT

GROUP: CATS

DATE: **24 OCTOBER 2022**

TIME: **12:05 A.M. - 1.10 A.M.**

PLATFORM: **GOOGLE MEET**

ATTENDANCE:

NO	NAME	MATRIC NUMBER
1.	MUHAMMAD TAUFIQ BIN JURIMI	A21EC0095
2.	MUHAMMAD SYAHMI BIN SALEH	A21EC0208
3.	CHOK RONG JIE	A21EC0169
4.	AMMAR BIN JAMALLUDIN	A21EC0160

ABSENT (WITH REASONS):

NO	NAME	MATRIC NUMBER

MEETING AGENDA:

NO.	MEETING AGENDA	TIME
1	● Discuss about the shape of the building before deciding where the other rooms are going to be allocated. ○ Chok Rong Jie suggested a hexagon-shaped building as every room can be centralized ○ Muhammad Taufiq bin Jurimi disagrees with the suggestion as its not cost efficient as cutting floor tiles to match the shape of the building adds additional budget. ○ All attendees comes up with 4 more designs and draw them in Jamboard and vote for the one see fit ○ Design number 3 is chosen as the T-shaped building can best make use of the empty spaces outside as a parking lot.	12.05 A.M.
2	● Doing the floor plan together and roughly laying out the resources for each of the rooms. ○ Discuss what other rooms to add besides the main ones mentioned in the case study.	12.43 A.M.
3	● A page with resources is created and puts all the possible applications that each room may require. ● Each of the attendants roughly layout the 4 Labs and Student Lounges. ● The other facilities such as the washrooms, the staff room, stairs, main entrances, exits and et cetera are listed out to remind the attendants to add it in the floor plan.	8.35 P.M.
4	● Meeting ended.	1.10 A.M.

PHOTOS OF MEETING MINUTES 2

CHOK RONG JIE A21EC0169 is presenting

Microsoft Bing

Measure Distance & Area

Click or tap into the map to create a new point. Tap and drag an existing point to move it. Right-click or tap and hold on a point to remove it.

Distance: 254 m (542 ft)

Reset 551 Close shape

Map showing a building labeled "School of Computing N2BA" and "N2BA, School Of Computing". The map includes a street named "M07" and a road named "M06".

12:41 AM | wpj-vnhm-eid

Participants: CHOK RONG JIE A21EC0169, Syahmi Saleh, Ammar Jamalludin, You

CHOK RONG JIE A21EC0169 is presenting

NET COMM BUILDING

Set background Clear frame

Four hand-drawn architectural sketches of building structures are displayed on the screen.

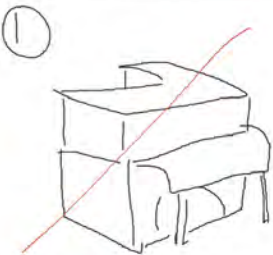
12:37 AM | wpj-vnhm-eid

Participants: CHOK RONG JIE A21EC0169, Syahmi Saleh, Ammar Jamalludin, You

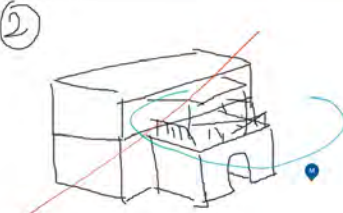
CHOK RONG JIE A21EC0169 is presenting

NET COMM BUILDING

1



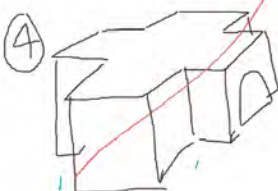
2



3



4



12:53 AM | wpj-vnhm-eid







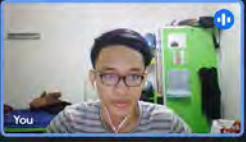
CHOK RONG JIE A21EC0169



Syahmi Saleh



Ammar Jamalludin



You

MEETING MINUTES 3

NETWORK COMMUNICATION PROJECT

GROUP: CATS

DATE: **24 OCTOBER 2022**

TIME: **1:50 P.M. - 3.20 P.M.**

PLATFORM: **GOOGLE MEET**

ATTENDANCE:

NO	NAME	MATRIC NUMBER
1.	MUHAMMAD TAUFIQ BIN JURIMI	A21EC0095
2.	MUHAMMAD SYAHMI BIN SALEH	A21EC0208
3.	CHOK RONG JIE	A21EC0169
4.	AMMAR BIN JAMALLUDIN	A21EC0160

ABSENT (WITH REASONS):

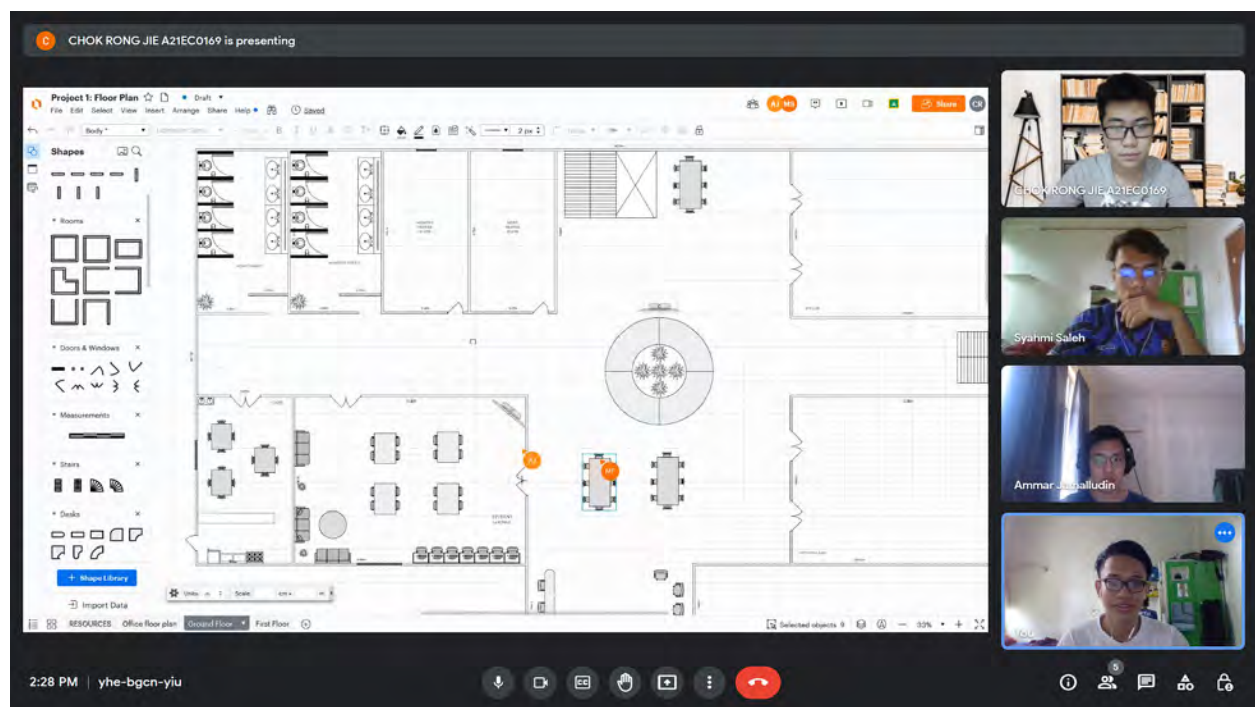
NO	NAME	MATRIC NUMBER

MEETING AGENDA:

NO.	MEETING AGENDA	TIME
1	● Working on the floor plan for the Ground floor and First floor. ○ Chok Rong Jie worked on the layout of the IOT Lab and the ground floor. ○ Ammar bin Jamalludin worked on the layout of the student lounge, network lab and the ground floor. ○ Muhammad Taufiq bin Jurimi and Muhammad Syahmi Bin Saleh worked on the first floor layout and design.	1.50 P.M.
2	● Adding details to the floor plan ○ All attendants add furnishings to each room of the floors they are working on.	2.25 P.M.
3	● Making changes to the floor plan ○ Chok Rong Jie does some minor changes to the layout and design for the ground floor toilets. ○ Muhammad Taufiq bin Jurimi and Muhammad Syahmi Bin Saleh made some changes to the first floor layout of the staff rooms and added a server room and a pantry beside it. ○ Ammar bin Jamalludin made minor adjustments to the position of the student lounge to make room for a cafe.	2.40 P.M.

4	● Roughly reviewing the floor plan ○ All attendants discuss the possible additions and changes to the floor plan. Considerations are also pointed out to remind each other the risks of the placement of certain rooms and furnishing.	2.55 P.M.
5	● Meeting ended	3.20 P.M.

PHOTOS OF MEETING MINUTES 3



CHOK RONG JIE A21EC0169 is presenting

Project 1: Floor Plan

File Edit Select View Insert Arrange Share Help Saved

Body Liberation Sans 10 pt B I U A T

Shapes

- Cubicle Walls
- Tables & Chairs
- Cubicles - Prebuilt
- Tables - Prebuilt

Import Data

Resources: Office floor plan Ground Floor First Floor

3:12 PM | yhe-bgcg-yiu

CHOK RONG JIE A21EC0169

Ammar Jamalludin

Syahmi Saleh

You

Project 1: Floor Plan: Lucidchart

File Edit Select View Insert Arrange Share Help Saved

Body Liberation Sans 10 pt B I U A T

Shapes

- Applian...
- Kitchen
- Couches

+ Shape Li...

Import Data

Units: m Scale: cm

Ground Floor First Floor

Selected objects 0

11%

2:22 PM 24-Oct-22

meet.google.com/yhe-bgcg-yiu

Ammar Jamalludin

Syahmi Saleh

CHOK RONG JIE A21EC0169

You

MEETING MINUTES 4

NETWORK COMMUNICATION PROJECT

GROUP: CATS

DATE: **25 OCTOBER 2022**

TIME: **10:05 P.M. - 11:30 P.M.**

PLATFORM: **GOOGLE MEET**

ATTENDANCE:

NO	NAME	MATRIC NUMBER
1.	MUHAMMAD TAUFIQ BIN JURIMI	A21EC0095
2.	MUHAMMAD SYAHMI BIN SALEH	A21EC0208
3.	CHOK RONG JIE	A21EC0169
4.	AMMAR BIN JAMALLUDIN	A21EC0160

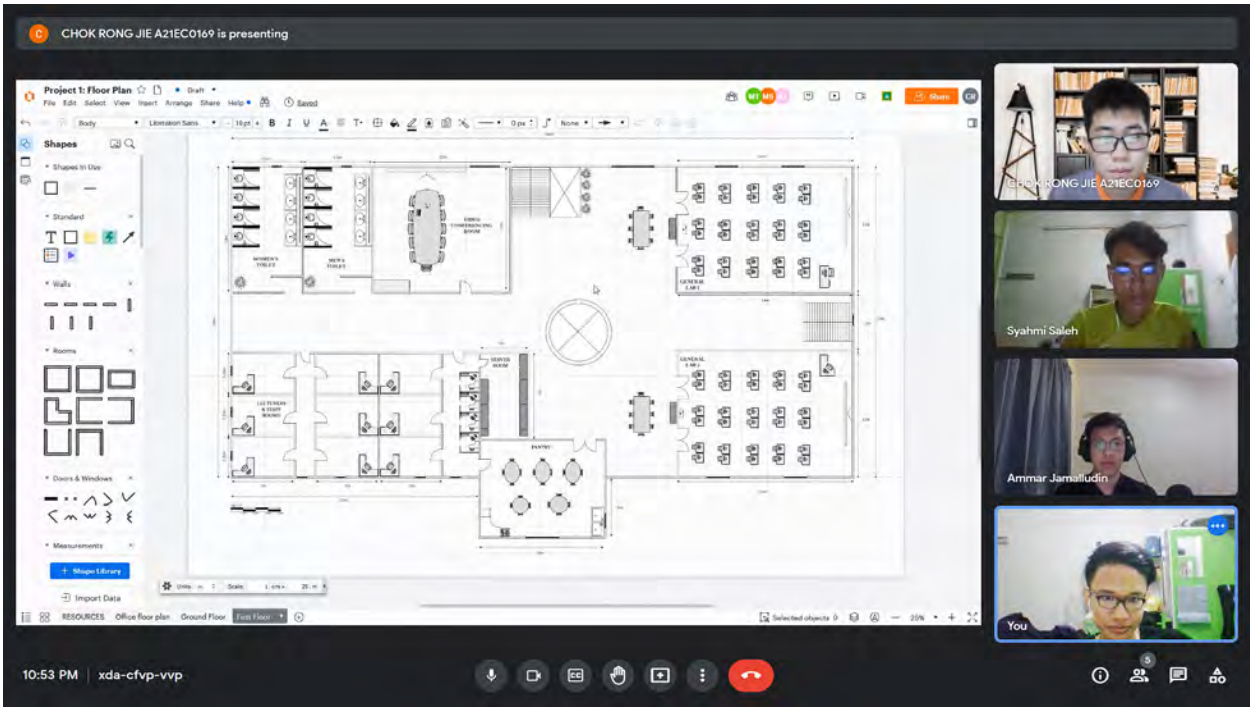
ABSENT (WITH REASONS):

NO	NAME	MATRIC NUMBER

MEETING AGENDA:

NO	MEETING AGENDA	TIME
1	● All attendants make minor changes to the floor plan. ○ Ammar bin Jamalludin, Muhammad Taufiq bin Jurimi, Muhammad Syahmi Bin Saleh working on making a suitable scale for the floor plan. ○ Chok Rong Jie checks the elements of each room to ensure nothing is missing in the floor plan.	10.05 P.M.
2	● The floor plan was being finalized and drawn by everyone according to the scale that can be referred to in the floor plan.	10.45 P.M.
3	● All attendants review the floor plan once more. ○ Ensure every room is fitted with enough applications. ○ Ensure the space utilization is optimal for the floor plan.	10.55 P.M.
4	● Meeting ended.	11.30 P.M.

PHOTOS OF MEETING MINUTES 4



MEETING MINUTES 5

NETWORK COMMUNICATION PROJECT

GROUP: CATS

DATE: 4 NOVEMBER 2022

TIME: 12:20 P.M. - 2.00 P.M.

PLATFORM: GOOGLE MEET

ATTENDANCE:

NO	NAME	MATRIC NUMBER
1.	MUHAMMAD TAUFIQ BIN JURIMI	A21EC0095
2.	MUHAMMAD SYAHMI BIN SALEH	A21EC0208
3.	CHOK RONG JIE	A21EC0169
4.	AMMAR BIN JAMALLUDIN	A21EC0160

ABSENT (WITH REASONS):

NO	NAME	MATRIC NUMBER

MEETING AGENDA:

NO	MEETING AGENDA	TIME
1	● All attendants revise the floor plan after receiving consultation. ○ Everyone discusses the changes to the scale as feedback states that it is confusing to understand. ○ A suitable scale is agreed upon and implemented into the floor plan. The decided scale is 1 cm to represent 2 m ○ Everyone worked on resizing the entire floor plan to fit in an A4 size paper.	12.20 P.M.
2	● All attendants reevaluate the rooms which can be omitted to prevent the floor plan to become too complicated for the network wiring. ○ The floor plan is deemed to be too big and all dimensions are reduced by 5 meters. ○ The lecturer rooms and the server room are chosen to be removed from the floor. ■ The lecturer rooms can be located elsewhere. ■ The server room is costly and redundant as each lab will have their own server installed in each lab.	1.00 P.M.
3	● All attendants rearrange every room and add more components to the empty spaces in the floor plan. ○ The cafe is moved to the first floor replacing the pantry. ○ The video conferencing room is made bigger.	1.30 P.M.
4	● Meeting ended.	2.00 P.M.

PHOTOS OF MEETING MINUTES 5

CHOK RONG JIE A21EC0169 is presenting

Project 1: Floor Plan

Shapes

WOMEN'S TOILET

MEN'S TOILET

GENERAL LAB 1

GENERAL LAB 2

ENTRY

SCALE: 1 cm is equal to 2 m

12:46 PM | qtb-cmac-xyj

CHOK RONG JIE A21EC0169

Syahmi Saleh

Amriza Amalludin

FAKULTI KOMPUTERAN

You

CHOK RONG JIE A21EC0169 is presenting

Project 1: Floor Plan

Shapes

WOMEN'S TOILET

MEN'S TOILET

GENERAL LAB 1

GENERAL LAB 2

ENTRY

SCALE: 1 cm is equal to 2 m

1:03 PM | qtb-cmac-xyj

Amriza Amalludin

CHOK RONG JIE A21EC0169

Syahmi Saleh

FAKULTI KOMPUTERAN

You

MEETING MINUTES 6

NETWORK COMMUNICATION PROJECT

GROUP: CATS

DATE: **5 NOVEMBER 2022**

TIME: **12:00 P.M. - 2 P.M.**

PLATFORM: **GOOGLE MEET**

ATTENDANCE:

NO	NAME	MATRIC NUMBER
5.	MUHAMMAD TAUFIQ BIN JURIMI	A21EC0095
6.	MUHAMMAD SYAHMI BIN SALEH	A21EC0208
7.	CHOK RONG JIE	A21EC0169
8.	AMMAR BIN JAMALLUDIN	A21EC0160

ABSENT (WITH REASONS):

NO	NAME	MATRIC NUMBER

MEETING AGENDA:

NO	MEETING AGENDA	TIME
1	● All attendants continue to discuss on the adjustments and additions to each room in the floor plan. ○ Muhammad Taufiq Bin Jurimi suggested the addition of servers to each lab. ○ Chok Rong Jie suggested the components to be added to the empty spaces. ○ Muhammad Syahmi Bin Saleh and Ammar Bin Jamalludin checked the floor plan and pointed out the indication of the length of each room needs adjustments.	12.00 P.M.
2	● All attendants implement the adjustment and addition discussed. ○ Each lab has added a server of their own. ○ Workstations in the IOT Lab are rearranged for the ease of network cabling. ○ Another table has been added to the video conferencing room to incorporate more people into a meeting. ○ More tables and chairs are added to the empty spaces of the floor plan. ○ The indication for the length of each room has been correctly implemented.	12.50 P.M.
3	● All attendants review the floor plan once more to check for possible oversight.	1.50 P.M.
4	● Meeting ended.	2.00 P.M.

PHOTOS OF MEETING MINUTES 6

CHOK RONG JIE A21EC0169 is presenting

Press **F11** to exit full screen

The main window displays a software interface for creating a floor plan. The title bar reads "Project 1: Floor Plan". The interface includes a menu bar (File, Edit, Select, View, Insert, Arrange, Plans, Help), a toolbar, and a "Shapes" panel on the left with various icons. The central workspace shows a detailed floor plan of a building. Key areas labeled include "WOMEN'S TOILET", "MEN'S TOILET", "STUDENT LOUNGE", "IOT LAB", and "NETWORK LAB". Dimensions like "16m" and "10m" are indicated. A status bar at the bottom of the software window shows "1:40 PM | mec-qwss-kch".

On the right side, there is a vertical stack of four video feeds showing participants:

- Top: CHOK RONG JIE A21EC0169 (the presenter)
- Second: Eyahmi Saleh
- Third: Ammar Jemalludin
- Bottom: You (viewer)

At the bottom of the video conference window, there is a control bar with icons for microphone, video, chat, hand, and a red end call button.

TASK 2 MEETING MINUTES

MEETING MINUTES 1

NETWORK COMMUNICATION PROJECT

GROUP: CATS

DATE: 6 NOVEMBER 2022

TIME: 2.50 P.M. - 4.30 P.M.

PLATFORM: GOOGLE MEET

ATTENDANCE:

NO	NAME	MATRIC NUMBER
1.	MUHAMMAD TAUFIQ BIN JURIMI	A21EC0095
2.	MUHAMMAD SYAHMI BIN SALEH	A21EC0208
3.	CHOK RONG JIE	A21EC0169
4.	AMMAR BIN JAMALLUDIN	A21EC0160

ABSENT (WITH REASONS):

NO	NAME	MATRIC NUMBER

MEETING AGENDA:

NO.	MEETING AGENDA	TIME
1	● All attendants discuss the questions that are related to the network system. ○ Each attendant comes up with 2 or more questions and those questions are listed down. ○ A total of 11 related questions are generated.	2.50 P.M.
2	● All attendants answer the question listed. ○ Each attendant assists each other in finding the answers for each question. ○ The references for the answers are listed and cited properly as well.	3.20 P.M.
3	● All attendants check each other's answers and give out comments when answers need additional explanation. ○ More references are added to support the explanation	4.02 P.M.
4	● All attendants review all questions and answers once more.	4.20 P.M.
5	● Meeting ended.	4.30 P.M.

PHOTOS OF MEETING MINUTES 1

CHOK RONG JIE A21EC0169 is presenting

CATS_Task2

File Edit View Insert Format Tools Extensions Help Last used actions...

Reliability of ethernet connections is higher because it is fast. Ethernet is expected to support speeds up to 10Gbps. Ethernet cables will also provide security in transferring data as it is transferred physically through cable connected to the computers.

6. What types of cables are needed in the building? Explain why the cable is chosen.

7. What type of network topology is going to be implemented?

4:07 PM | pth-heyr-phj

Ammy ghaludin

MUHAMMAD SYAHMI BIN SALEH A21E...

You

CHOK RONG JIE A21EC0169 is presenting

Choosing Network Topology Mapping & Diagram Software

The network topology you choose for your enterprise should be deeply rooted in your usage requirements. The number of nodes you have in your network will determine whether you can make it by using a bus topology or whether you're going to need to deploy a more complicated mesh or hybrid setup.

Remember that all topologies have their advantages and disadvantages depending on the environment they're applied within (even those that have become obsolete). Once you've given some thought to what topology you want to use you can make the move to deploy it. You can also learn more about Documenting a Network Topology Using CDP.

One good way to plan ahead is to use a network topology mapping tool to draw up the network layout that you're going to use. Using a tool like SolarWinds Network Topology Mapper will allow you to plot your network on a diagram to view your topological structure in one place.

Network Topology FAQs

What is the best network topology for large businesses?

The best suited network topology for large businesses is the star topology. This is because it is easier to control from a central console as the management software just needs to communicate with the switch to get full traffic management features. A hybrid topology is sometimes encountered as a temporary solution to connect together departments while a new unified system is being planned.

Which network topology is the cheapest?

For small businesses, the bus topology is the cheapest and most reliable topology because it can be run without buying specialist network equipment and doesn't rely on each node being active.

Related: The Best Network Monitoring Tools

WHAT'S IN THIS ARTICLE?

- What is network topology?
- Types of network topology
- What are the types of network topology?
- Which topology should I choose?
- Network Topology Mapping Software
- Choosing Network Topology Mapping & Diagram Software
- Network Topology FAQs
- What is the best network topology for large businesses?
- Which network topology is the cheapest?

SolarWinds is a fast-moving leader

2022 Gartner Radar for Cloud Observability

4:26 PM | pth-heyr-phj

Ammy ghaludin

MUHAMMAD SYAHMI BIN SALEH A21E...

You

MEETING MINUTES 2

NETWORK COMMUNICATION PROJECT

GROUP: CATS

DATE: 7 NOVEMBER 2022

TIME: 8:50 P.M. - 10.20 P.M.

PLATFORM: GOOGLE MEET

ATTENDANCE:

NO	NAME	MATRIC NUMBER
1.	MUHAMMAD TAUFIQ BIN JURIMI	A21EC0095
2.	MUHAMMAD SYAHMI BIN SALEH	A21EC0208
3.	CHOK RONG JIE	A21EC0169
4.	AMMAR BIN JAMALLUDIN	A21EC0160

ABSENT (WITH REASONS):

NO	NAME	MATRIC NUMBER

MEETING AGENDA:

NO.	MEETING AGENDA	TIME
1	● All attendants look through all the questions to discuss the feasibility of the project.	8.50 P.M.
2	● Each attendant writes a paragraph in the feasibility study. ○ Each paragraph is written while referring back to the questions to ensure consistency.	9.13 P.M.
3	● Each attendant checks the other paragraphs and makes corrections to them. ○ Ensure there is enough reasoning in every paragraph. ○ Ensure each paragraph is grammatically correct.	9.40 P.M.
4	● The feasibility study is reviewed thoroughly and the entirety of the report is checked through once more.	10.10 P.M.
5	● Meeting ended.	10.20 P.M.

PHOTOS OF MEETING MINUTES 2

CHOK RONG JIE A21EC0169 is presenting

CATS_Task2

File Edit View Insert Format Tools Extensions Help

Feasibility Study

No yes go by in the advising ex.

9:26 PM | hjs-zkkc-wnn

CHOK RONG JIE A21EC0169

MUHAMMAD SYAHMI BIN SALEH A21E...

Ammar Jamaludin

You

CHOK RONG JIE A21EC0169 is presenting

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There are several different kinds of feasibility studies. Understanding the types of feasibility studies and the technicalities of the concept is important for any business. They are elaborated below:

#1 – Technical Feasibility

Technical feasibility study checks for accessibility of technical resources in the organization. In case technological resources exist, the study team will conduct assessments to check whether the technical team can customize or update the existing technology to suit the new method of workings for the project by properly checking the health of the hardware and software.

Many factors need to be taken into consideration here, like staffing requirements, transportation, and technological competency.

#2 – Financial Feasibility

Financial feasibility allows an organization to determine cost-benefit analysis. It gives details about the investment that has to go in to get the desired level of benefit (profit). Factors such as total cost and expenses are considered to arrive simultaneously. With this data, the companies know their present state of financial affairs and anticipate future monetary requirements and the sources from which the company can acquire them. Investors can largely benefit from the economic analysis done. Assessing the return on investment of a particular asset or acquisition can be a financial feasibility study example.

#3 – Market Feasibility

It assesses the industry type, the existing marketing characteristics and improvements to make it better, the growth evident and needed, competitive environment of the company's products and services. Preparations of sales projections can thus be a good market feasibility study example.

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9:48 PM | hjs-zkkc-wnn

CHOK RONG JIE A21EC0169

MUHAMMAD SYAHMI BIN SALEH A21E...

Ammar Jamaludin

You

MEETING MINUTES 3

NETWORK COMMUNICATION PROJECT

GROUP: CATS

DATE: **4 DECEMBER 2022**

TIME: **9:00 P.M. - 9.50 P.M.**

PLATFORM: **GOOGLE MEET**

ATTENDANCE:

NO	NAME	MATRIC NUMBER
5.	MUHAMMAD TAUFIQ BIN JURIMI	A21EC0095
6.	MUHAMMAD SYAHMI BIN SALEH	A21EC0208
7.	CHOK RONG JIE	A21EC0169
8.	AMMAR BIN JAMALLUDIN	A21EC0160

ABSENT (WITH REASONS):

NO	NAME	MATRIC NUMBER

MEETING AGENDA:

NO.	MEETING AGENDA	TIME
1	All attendants review the feedback given and discuss the main problems stated in the feedback.	9.00 P.M.
2	- Each attendant is given tasks to correct the mistake in the report. <i>Chok Rong Jie and Muhammad Taufiq bin Jurimi</i> reevaluate the questions listed and answers provided. <i>Ammar bin Jamalludin and Muhammad Syahmi Bin Saleh</i> Information taken from external sources are cited properly again.	9.10 P.M.
3	- The feasibility study is rewritten and reviewed again. - Each attendant gives their opinion on which part should be rewritten while referring back to the feedback given.	9.25 P.M.
4	The whole report is reviewed again and checked for grammatical errors.	9.40 P.M.
5	Meeting ended.	9.50 P.M.

PHOTOS OF MEETING MINUTES 3

The screenshot shows a Zoom meeting interface. The main window displays a presentation slide titled "Feasibility Study" with the following text:

Feasibility Study
(Based on the budget given.)

The human has been on the top of everyone's list of resources for study being in technology progress rapidly. The pandemic has affected people worldwide and they need to return to the human to use their skills and creative. Since the introduction of a new course more tasks were required the use of modern technology alongside the human, such as participating in online meetings and classes. The faculty representatives of the Faculty of Computing has requested us to design a three plan with the financially required and cost of a quality, efficient and secure network that can be managed easily to facilitate the UTM affiliated students and additional staff in the same 3 years. As such, we have prepared a three plan that would fulfill all the requirements requested by the client. The building will be designed with features which will maximize sustainability for the users. Handicapped people can use the lift to move between floors more easily. A safe staircase to avoid stairs and there are green and blue roof and garden for convenient access to food.

Furthermore, with the budget given, it is feasible for the building to be built according to the three plan. The following are the reasons why we believe that the project is feasible with the faculty representative's needs.

First of all, we needed high specification components for the conference in the table to meet the setting edge requirements of video devices. Furthermore as an essential part of the information in most of the training and lab sessions will be conducted through the use of videoconferencing. Therefore, it is important for students to use computers for video conferencing. The specification chosen for the videoconferencing can also ensure that the necessary tools in the graphics, text and present and are collected up to date according to current standards.

Besides videoconferencing, this room, cables are chosen for the network cabling for the 100 computers and the three is a very high bandwidth and the other benefit of allowing the parties to travel only the network speed and network. These other videoconferencing will be used as the building's rooms, 100 lab, general lab, and video conferencing room. In this lab, computer the cables will be used to connect each workstation to the network. It is also used for access to high-speed internet.

On the right side of the screen, there is a grid of participants:

- CHOK RONG JIE AZIE
- MUHAMMAD SYAHMI ...
- Ammar Jamalludin
- MUHAMMAD SYAHMI ...
- You

The bottom status bar shows the time as 9:29 PM and the meeting ID as vch-roek-bbb.

TASK 3 MEETING MINUTES

MEETING MINUTES 1

NETWORK COMMUNICATION PROJECT

GROUP: CATS

DATE: **25 NOVEMBER 2022**

TIME: **9:00 P.M. - 9:50 P.M.**

PLATFORM: **GOOGLE MEET**

ATTENDANCE:

NO	NAME	MATRIC NUMBER
1.	MUHAMMAD TAUFIQ BIN JURIMI	A21EC0095
2.	MUHAMMAD SYAHMI BIN SALEH	A21EC0208
3.	CHOK RONG JIE	A21EC0169
4.	AMMAR BIN JAMALLUDIN	A21EC0160

ABSENT (WITH REASONS):

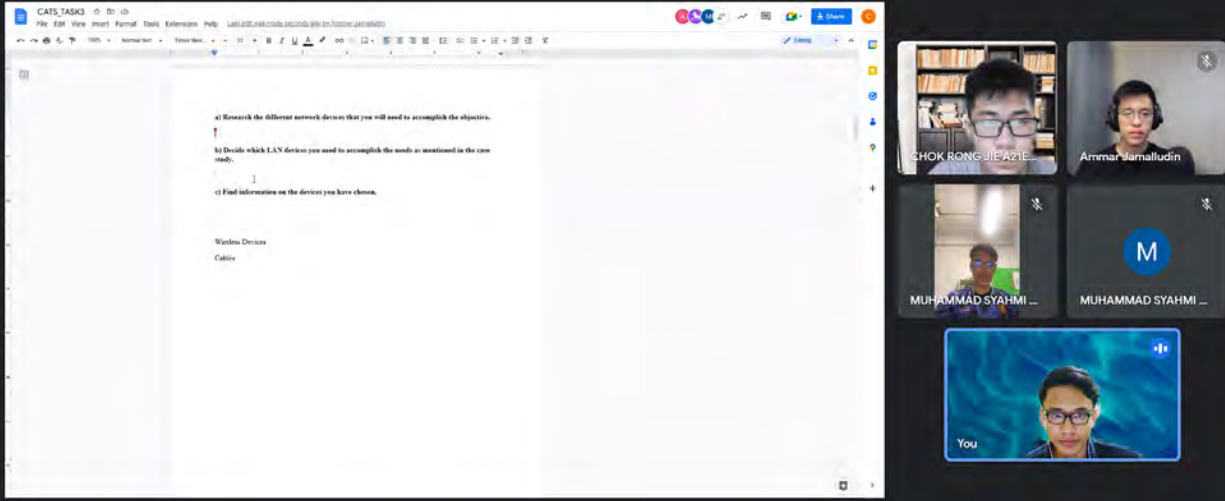
NO	NAME	MATRIC NUMBER

MEETING AGENDA:

NO.	MEETING AGENDA	TIME
1	- Each attendant discuss on the main tasks for Task 3 - List out all the network devices that are going to be used. - Estimate the amount needed for each room in the floor plan and total up the amount required to be purchased. - Search for some network devices brands and make comparisons between them.	9.00 P.M.
2	- Each attendant focuses on researching the network devices required for the network system. - Search on the Internet for examples of network systems and determine the vital network devices.	9.15 P.M.
3	- Distribute network devices to be researched on to each attendant. - Firewall and Cables - <i>Muhammad Taufiq bin Jurimi</i> - Switch and Monitor - <i>Chok Rong Jie</i> - CPU and Router - <i>Muhammad Syahmi Bin Saleh</i> - Wireless Access Point - <i>Ammar bin Jamalludin</i>	9.35 P.M.
4	Meeting ended.	9.50 P.M.

PHOTOS OF MEETING MINUTES 1

CHOK RONG JIE A21EC0169 is presenting



The presentation slide, titled 'CATS TASK3', contains the following text:

a) Research the different network devices that you will need to accomplish the objectives.

b) Decide which LAN devices you need to accomplish the needs as mentioned in the case study.

c) Find information on the devices you have chosen.

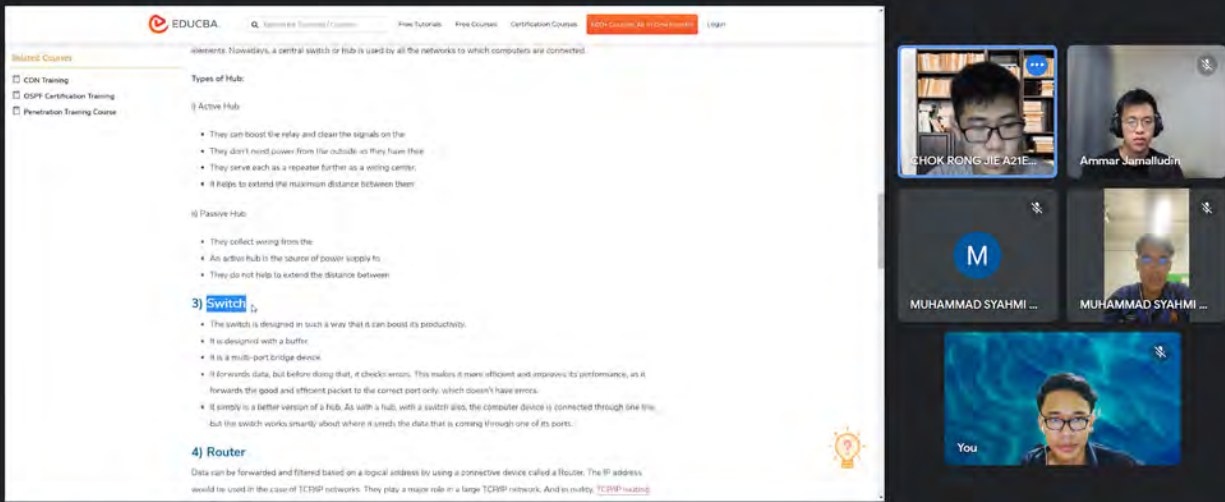
Wireless Devices

Cables

The meeting interface shows five participants in a grid: CHOK RONG JIE AZIE..., Ammar Jamalludin, MUHAMMAD SYAHMI..., MUHAMMAD SYAHMI..., and You.

9:21 PM | exe-ppbx-pdx

CHOK RONG JIE A21EC0169 is presenting



The presentation slide, titled 'EDUCA', contains the following text:

elements. Hubs/switches, a central switch or hub is used by all the networks to which computers are connected.

Types of Hub:

i) Active Hub

- They can boost the relay and clear the signals on the
- They don't need power from the outside as they have their
- They serve each as a repeater further as a wiring center.
- It helps to extend the maximum distance between them

ii) Passive Hub

- They collect wiring from the
- An active hub is the source of power supply to
- They do not help to extend the distance between

3) Switch

- The switch is designed in such a way that it can boost its productivity.
- It is designed with a buffer
- It is a multi-port bridge device
- It forwards data, but before doing that, it checks errors. This makes it more efficient and improves its performance, as it forwards the good and efficient packet to the correct port only, which doesn't have errors.
- It simply is a better version of a hub. As with a hub, with a switch also, the computer device is connected through one line, but the switch works smartly about where it sends the data that is coming through one of its ports.

4) Router

Data can be forwarded and filtered based on a logical address by using a connective device called a Router. The IP address would be used in the case of TCP/IP networks. They play a major role in a large TCP/IP network. And in reality, [TCP/IP routing](#)

The meeting interface shows five participants in a grid: CHOK RONG JIE AZIE..., Ammar Jamalludin, MUHAMMAD SYAHMI..., MUHAMMAD SYAHMI..., and You.

9:42 PM | exe-ppbx-pdx

MEETING MINUTES 2
NETWORK COMMUNICATION PROJECT
GROUP: CATS

DATE: **4 DECEMBER 2022**

TIME: **9.00 P.M. - 10.35 P.M.**

PLATFORM: **GOOGLE MEET**

ATTENDANCE:

NO	NAME	MATRIC NUMBER
1.	MUHAMMAD TAUFIQ BIN JURIMI	A21EC0095
2.	MUHAMMAD SYAHMI BIN SALEH	A21EC0208
3.	CHOK RONG JIE	A21EC0169
4.	AMMAR BIN JAMALLUDIN	A21EC0160

ABSENT (WITH REASONS):

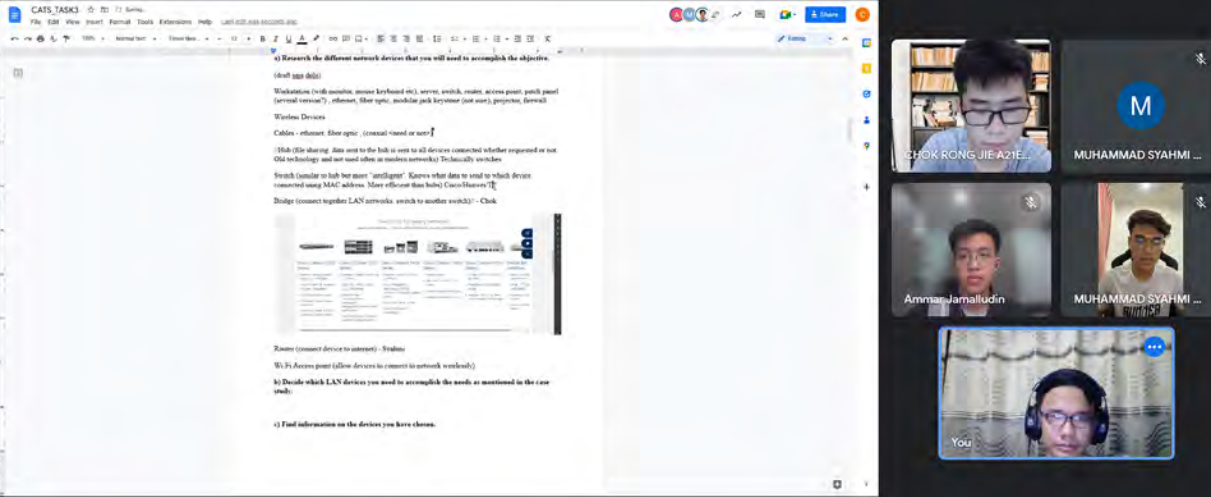
NO	NAME	MATRIC NUMBER

MEETING AGENDA:

NO.	MEETING AGENDA	TIME
1	● Each attendant summarizes their findings and gives their opinions for each network device. ○ Opinion on the additional network devices needed for the network system have also been voiced out and considered carefully.	9.00 PM.
2	● Each attendant inserts their findings in a table for a clearer overview.	9.30 P.M.
3	● Each attendant inserts the amount needed for each network device. ○ The total prices of every network device is also calculated and listed out beside the amount needed for each network device.	9.45 P.M.
4	● The table for comparison of brands is made with the help of all attendants.	10.12 PM
4	● Meeting ended.	10.35 P.M.

PHOTOS OF MEETING MINUTES 2

CHOK RONG JIE A21EC0169 is presenting



The presentation slide, titled 'CATS_TASK3', contains the following text:

1) Research the different network devices that you will need to accomplish the objectives.
(draft app doc)

Workstations (with monitor, mouse keyboard etc), server, switch, router, access point, patch panel (optional network), ethernet, fiber optic, modular patch keyframe (not used), patch panel

Wireless Devices

Cables - ethernet, fiber optic, (copper) stand or rack

Hub (for sharing data sent to the hub is sent to all devices connected whether requested or not. Old technology and not used often in modern networks) Technically switches

Switch (similar to hub but more "intelligent". Knows what data to send to which device connected using MAC address. More efficient than hubs) Cisco-Heavenly

Bridge (connect together LAN networks, switch to another switch) - Check

Router (connect device to internet) - Trunking

Wi-Fi Access point (allow devices to connect to network wirelessly)

2) Decide which LAN devices you need to accomplish the needs as mentioned in the case study.

3) Find information on the devices you have chosen.

The slide also includes a screenshot of a network diagram showing various devices connected in a network topology.

The meeting interface shows four participants in a gallery view:

- CHOK RONG JIE A21E...
- MUHAMMAD SYAHMI ...
- Ammar Jamalludin
- MUHAMMAD SYAHMI ...

The bottom of the screen shows the Zoom controls bar with the time 10:23 PM and the meeting ID vch-rcek-bbb.

MEETING MINUTES 3
NETWORK COMMUNICATION PROJECT
GROUP: CATS

DATE: **6 DECEMBER 2022**

TIME: **9:00 P.M. - 10.35 P.M.**

PLATFORM: **GOOGLE MEET**

ATTENDANCE:

NO	NAME	MATRIC NUMBER
1.	MUHAMMAD TAUFIQ BIN JURIMI	A21EC0095
2.	MUHAMMAD SYAHMI BIN SALEH	A21EC0208
3.	CHOK RONG JIE	A21EC0169
4.	AMMAR BIN JAMALLUDIN	A21EC0160

ABSENT (WITH REASONS):

NO	NAME	MATRIC NUMBER

MEETING AGENDA:

NO.	MEETING AGENDA	TIME
1	● Each attendant makes suggestions on what network devices to be compared. ○ Chok Rong Jie and Ammar bin Jamalludin suggested routers and switches to be compared. ○ Muhammad Taufiq bin Jurimi and Muhammad Syahmi Bin Saleh suggested cable, routers and switches to be compared. ○ Routers and switches are chosen to be compared at the end of discussion.	9.00 P.M.
2	● Discuss on the brands for the routers and switches ○ Routers manufactured from the company TP-Link and Linksys are chosen to be compared. ○ Switches manufactured from the company Cisco and Huawei are chosen to be compared.	9.10 P.M.
3	● Discuss additional information on the network device brands compared. ○ Each attendant discusses the critical information which may be left out due to an oversight.	9.54 P.M.
4	● The entire report is reviewed once more by all attendants and checked for potential grammatical errors.	10.20 P.M.
5	● Meeting ended	10.35 P.M.

PHOTOS OF MEETING MINUTES 3

CHOK RONG JIE A21EC0169 is presenting

CATS 149K3

File Edit View Insert Format Tools Extensions Help

Type Of Device	Description	Quantity	Price Per Unit (RM)	Total Price (RM)
Workstation		1		
Switch				
Switch (network hub)				
Router	Wireless Communication Standard :			
TP Link AX3400 WiFi 6 Router (Antena AX37)	802.11ax, 802.11ac, 802.11b, 802.11g, 802.11n		450.00 RM	
Product Details:	Frequency :			
https://www.tp-link.com/sg/ax3400/	1 GHz			
ax for both ax1800 and 1 ax1800	4804 Mbps			
	Number Of Ports :			
	1 x Gigabit WAN Port			

MUHAMMAD SYAHMI ...

CHOK RONG JIE A21EC0169

MUHAMMAD SYAHMI ...

Ammar Jamalludin

You

9:59 PM | tcw-wugk-vkg

TASK 4 MEETING MINUTES

MEETING MINUTES 1

NETWORK COMMUNICATION PROJECT

GROUP: CATS

DATE: 22 DECEMBER 2022

TIME: 10:15 P.M. - 11:20 P.M.

PLATFORM: GOOGLE MEET

ATTENDANCE:

NO	NAME	MATRIC NUMBER
1.	MUHAMMAD TAUFIQ BIN JURIMI	A21EC0095
2.	MUHAMMAD SYAHMI BIN SALEH	A21EC0208
3.	CHOK RONG JIE	A21EC0169
4.	AMMAR BIN JAMALLUDIN	A21EC0160

ABSENT (WITH REASONS):

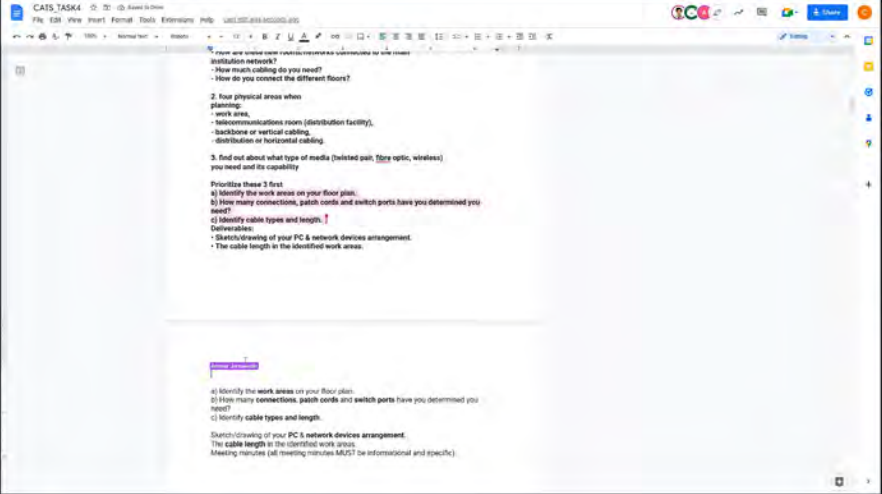
NO	NAME	MATRIC NUMBER

MEETING AGENDA:

NO.	MEETING AGENDA	TIME
1	● All attendants discuss the elements needed to be added for this report. ○ The main contents for the report. ○ The scope of the report.	10.15 P.M.
2	● All attendants list out the tasks that should be done ○ The tasks listed include: ■ Identify work areas in the floorplan. ■ Determine the cable route. ■ Cabling of each work area. ■ Calculate the total length used for each cable type in each work area.	10.25 P.M.
3	● 6 work areas are identified and listed out. ○ Work areas include General Lab 1 and 2, IoT Lab, Network Lab, Student Lounge and Video Conferencing Room	10.55 P.M.
4	● Distribute tasks of sketching the cabling and the calculation of total length of cabling based on work area. ○ General Lab 1 and 2 - <i>Chok Rong Jie</i> ○ Network Lab - <i>Ammar bin Jamalludin</i> ○ Video Conference Room and Student Lounge - <i>Muhammad Taufiq bin Jurimi</i> and <i>Muhammad</i> ○ IoT Lab - <i>Syahmi Bin Saleh</i>	11.00 P.M.
5	● Meeting ended.	11.20 P.M.

PHOTOS OF MEETING MINUTES 1

CHOK RONG JIE A21EC0169 is presenting



The presentation slide, titled 'CATS TASK4', contains the following text:

- 1. Create and install new telecommunications infrastructure for site client installation network?
 - How much cabling do you need?
 - How do you connect the different floors?
- 2. Four physical areas when planning:
 - switch area,
 - telecommunications room (distribution facility),
 - backbone or vertical cabling,
 - distribution or horizontal cabling.
- 3. Find out about what type of media (twisted pair, fibre optic, wireless) you need and its capability.

Then, prioritize these 3 first:

- Identify the work areas on your floor plan.
- How many connections, patch cords and switch ports have you determined you need?
- Identify cable types and length.

Deliverables:

- Distribution drawing of your PC & network devices arrangement.
- The cable length in the identified work areas.

Meeting minutes (all meeting minutes MUST be informational and specific).

Participant video feeds (top row):

- CHOK RONG JIE A21E
- MUHAMMAD SYAHMI ...

Participant video feeds (bottom row):

- Syahrmi Saleh
- Amnar Jamaludin

Participant video feed (bottom center):

- You

10:40 PM | xbh-nryv-ekj

CHOK RONG JIE A21EC0169 is presenting



The presentation slide, titled 'CATS TASK4', contains the following text:

FIGS of Floor Plan (Work)

GROUND FLOOR



SCALE: 1 unit equal to 2m

Participant video feeds (top row):

- CHOK RONG JIE A21E
- Syahrmi Saleh

Participant video feeds (bottom row):

- Amnar Jamaludin
- MUHAMMAD SYAHMI ...

Participant video feed (bottom center):

- You

11:14 PM | xbh-nryv-ekj

MEETING MINUTES 2

NETWORK COMMUNICATION PROJECT

GROUP: CATS

DATE: **23 DECEMBER 2022**

TIME: **10:15 P.M. - 11:45 P.M.**

PLATFORM: **GOOGLE MEET**

ATTENDANCE:

NO	NAME	MATRIC NUMBER
1.	MUHAMMAD TAUFIQ BIN JURIMI	A21EC0095
2.	MUHAMMAD SYAHMI BIN SALEH	A21EC0208
3.	CHOK RONG JIE	A21EC0169
4.	AMMAR BIN JAMALLUDIN	A21EC0160

ABSENT (WITH REASONS):

NO	NAME	MATRIC NUMBER

MEETING AGENDA:

NO.	MEETING AGENDA	TIME
1	• All attendants report on the progress of the cabling of each work area to ensure the need of assistance in other parts.	10.15 P.M.
2	• An overview of both ground floor and first floor is pasted into the report. ○ All attendants further discuss the subnetting part based on each work area. ○ 6 regions are made to indicate the subnetting of each work area. ○ An additional 7th region is made to show the backbone connection from UTM.	10.24 P.M.
3	• Each attendant continue to work on the sketch of the cabling their assigned work areas while ask questions to each other to ensure the work is done correctly.	10.50 P.M.
4	• All attendants discuss the sketching of routing the cable from the UTM backbone to each work area.	11.14 P.M.
5	• Meeting ended.	11.40 P.M.

PHOTOS OF MEETING MINUTES 2

CHOK RONG JIE A21EC0169 is presenting

Press **F11** to exit full screen



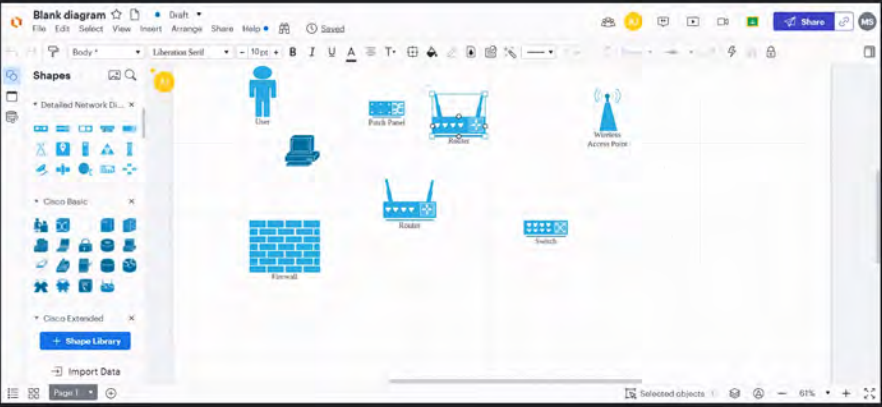
Work Areas - Ground Floor

Width = 10.0m

10:48 PM | mig-hmim-nfb

Participants: CHOK RONG JIE A21EC0169, MUHAMMAD SYAHMI BIN SALEH A21EC0208, Ammar Jamalludin, Syahmi Saleh, You.

MUHAMMAD SYAHMI BIN SALEH A21EC0208 is presenting



Blank diagram

11:34 PM | mig-hmim-nfb

Participants: CHOK RONG JIE A21EC0169, MUHAMMAD SYAHMI BIN SALEH A21EC0208, Ammar Jamalludin, Syahmi Saleh, You.

MEETING MINUTES 3

NETWORK COMMUNICATION PROJECT

GROUP: CATS

DATE: **24 DECEMBER 2022**

TIME: **11:00 A.M. - 12.50 P.M.**

PLATFORM: **GOOGLE MEET**

ATTENDANCE:

NO	NAME	MATRIC NUMBER
1.	MUHAMMAD TAUFIQ BIN JURIMI	A21EC0095
2.	MUHAMMAD SYAHMI BIN SALEH	A21EC0208
3.	CHOK RONG JIE	A21EC0169
4.	AMMAR BIN JAMALLUDIN	A21EC0160

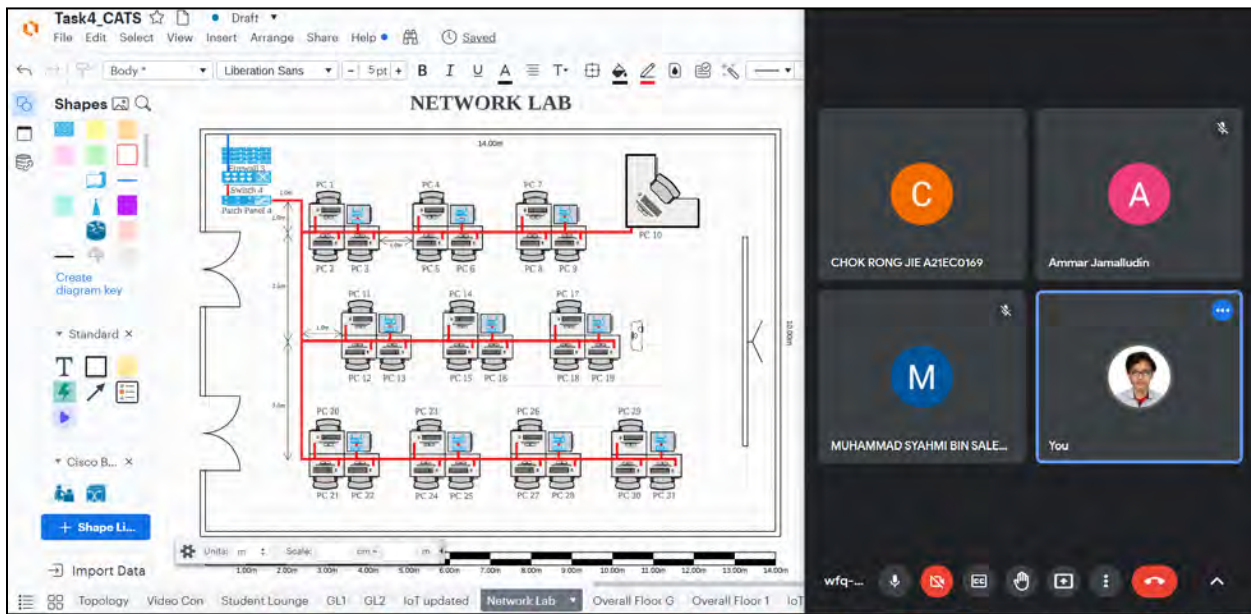
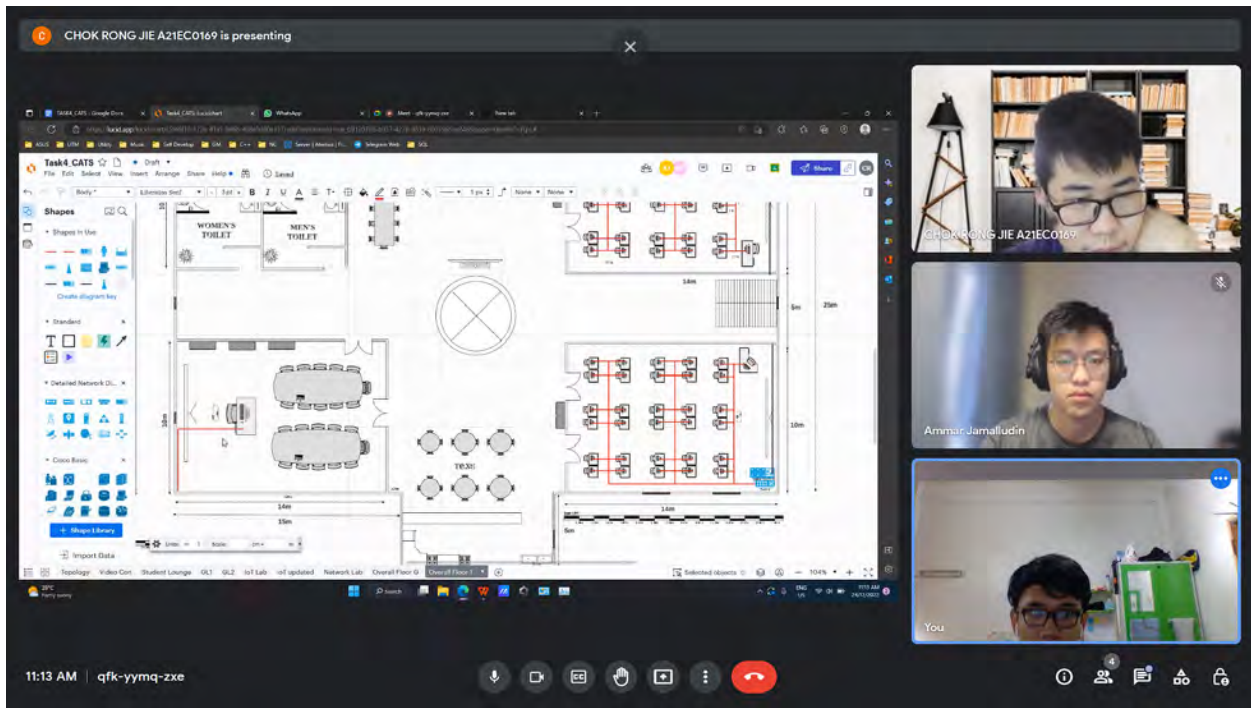
ABSENT (WITH REASONS):

NO	NAME	MATRIC NUMBER

MEETING AGENDA:

NO.	MEETING AGENDA	TIME
1	• All attendants calculate the estimated total length of each cable needed to be used in each work area. ○ All attendants paste their part of the work into the report and tidy up the report.	11.00 A.M.
2	• All attendants review all the calculations of estimated total length of each cable in each area to eliminate all possible errors.	11.40 A.M.
3	• All attendants check the sketching of cabling throughout the entire building to ensure everything is connected to the backbone and cabled correctly with each network device.	12.00 P.M.
4	• All attendants discuss the inclusion of more content into the report that may have been overlooked. ○ Adding extra cable length in case of emergency.	12.10 P.M.
5	• All attendants review the report once more to make sure the writing parts of the report do not contain grammatical errors.	12.35 P.M.
6	• Meeting ended	12.50 P.M.

PHOTOS OF MEETING MINUTES 3



TASK 5 MEETING MINUTES

MEETING MINUTES 1

NETWORK COMMUNICATION PROJECT

GROUP: CATS

DATE: 2 JANUARY 2023

TIME: 11.45 A.M. - 12.45 P.M.

PLATFORM: GOOGLE MEET

ATTENDANCE:

NO	NAME	MATRIC NUMBER
1.	MUHAMMAD TAUFIQ BIN JURIMI	A21EC0095
2.	MUHAMMAD SYAHMI BIN SALEH	A21EC0208
3.	CHOK RONG JIE	A21EC0169
4.	AMMAR BIN JAMALLUDIN	A21EC0160

ABSENT (WITH REASONS):

NO	NAME	MATRIC NUMBER

MEETING AGENDA:

NO.	MEETING AGENDA	TIME
1	- All attendants discuss how to split the IP Addresses based on the IP Address that was provided. - It was decided to start with finding the number of IP Addresses within the Network Address of 173.136.128.0/23.	11.45 A.M.
2	- All attendants assist in calculating the amount of available IP Addresses within the Network Address of 173.136.128.0/23. - All attendants agreed that there are 512 IP Addresses in the provided Network Address.	11.55 A.M.
3	- All attendants continue on the discussion of splitting IP addresses. <i>Muhammad Taufiq Bin Jurimi</i> suggested splitting the IP addresses equally across subnets. <i>Chok Rong Jie</i> suggested splitting the IP addresses based on the needs of each subnet.	12.05 P.M.
4	- A poll is made to determine which method is chosen to split the IP addresses. - Splitting the IP addresses based on the needs of each subnet is chosen according to the results of the poll.	12.19 P.M.
5	- All attendants determine the number of possible IP addresses required for each subnet. - Both of the subnets for IoT Lab and Network Lab possibly need 100 IP addresses. - The subnets of General Lab 1, General Lab 2 and Student Lounge possibly need 60 IP addresses. - The subnet of the Video Conferencing Room possibly need 30 IP addresses. - The subnet for Backbone possibly need 10 IP addresses.	12.30 P.M.
6	Meeting ended.	12.45 P.M.

PHOTOS OF MEETING MINUTES 1

CHOK RONG JIE A21EC0169 is presenting

CATS_Basis - ID: 101

File Edit View Insert Format Tools Extensions Help Load and save (Ctrl+Shift+S) To exit full screen, move mouse to top of screen or press [F11]

Introduction

For the purpose of understanding the requirements of the project in more detail, 15 operators are generated which will be answered by us through answering and answering the queries representative. The answers to the following questions will greatly assist in designing the network system according to the user's requirements. In addition, a feasibility report has been done as the project to further provide evidence of the project being viable.

What IP
173.134.128.0/21

Network Name
173.134.128.0/21 - 0.0

Number of host
 $2^{16} - 2 = 131,070$

8 Routers, 1 Switch

Subnet Number	Network Address	Broadcast Address	Subnet Mask
1			
2			
3			
4			
5			

8. You might also want to sharing your screen. [View meeting](#) 1/10

12:37 PM | kng-gyko-czu

Syahmi Saleh

CHOK RONG JIE A21...

Amirul Hamid

Syahmi Saleh

You

Microphone Camera Chat Hand Gesture Help More Actions End Meeting

MEETING MINUTES 2

NETWORK COMMUNICATION PROJECT

GROUP: CATS

DATE: **3 JANUARY 2023**

TIME: **9.00 P.M. - 11.00 P.M.**

PLATFORM: **GOOGLE MEET**

ATTENDANCE:

NO	NAME	MATRIC NUMBER
1.	MUHAMMAD TAUFIQ BIN JURIMI	A21EC0095
2.	MUHAMMAD SYAHMI BIN SALEH	A21EC0208
3.	CHOK RONG JIE	A21EC0169
4.	AMMAR BIN JAMALLUDIN	A21EC0160

ABSENT (WITH REASONS):

NO	NAME	MATRIC NUMBER

MEETING AGENDA:

NO.	MEETING AGENDA	TIME
1	All attendants review the requirement and the number of possible IP addresses required for each subnet. All attendants proceeded to continue with subnet division and IP addressing afterwards.	9.00 P.M.
2	- All attendants contributed in the given tasks: <i>Chok Rong Jie</i> - Calculation of IP Addresses and Subnet Division <i>Muhammad Taufiq Bin Jurimi</i> - Network Topology and Subnet 1-2 <i>Ammar bin Jamalludin</i> - Introduction and Subnet 3-4 <i>Muhammad Syahmi bin Saleh</i> - Diagrams and Subnet 5-7	9.15 P.M.
3	All attendants check the workings, subnet division, and IP addressing for each lab and room for errors once more.	10.45 P.M.
4	Meeting ended.	11.00 P.M.

PHOTOS OF MEETING MINUTES 2

