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SCHOOL OF COMPUTING, UTMJB

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SECR 1213 – SECTION 11

NETWORK COMMUNICATION

“NETWORK DESIGN FOR SCHOOL OF COMPUTING BLOCK N28B”

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ABSTRACT

As the School of Computing (SC) for educational purpose, they need better equipment that will allow students feel more comfortable and focus during the learning session. All stakeholders want to prepare for future needs to the extent at the best value possible. It is important that during this transition from their old equipment to their new equipment, they do not stop providing access to their users. They want everything to work as they are, and the equipment and devices that we plan to use must be up-to-date and have better performance for the student to do their work. Since these 2-floor buildings provide 4 labs for their students and staff, network and communications among the hardware and software are the most important thing to think of. Without networking, the lab will not give any benefits to its user. So as the networking student, we need to think wisely on how to make sure that all the networking in the lab runs smoothly as the stakeholders ask and make their dreams come true to help more students succeed in their education.

First, the system that we provided must be easy to manage and scale. It is important for us to think of something that will be easy for the user to manage without any user training provided, they know how to use the system. Secondly, we need to improve overall performance and provide protection from network breaches such as Internet Worms, denial-of-service attacks, and e-business application attacks. They want everything to be secure and we need to think of the best anti-virus defender that can protect the software from viruses and attacks. Next, the capability to support high-performance to the core backbone and the ability to support features such as Quality of Service and security in hardware via access control lists (ACLs). Lastly, we must enable secure VPN connections from remote locations.

As a conclusion, we must consider every step that we choose to start the project. We need to do a lot of research to make sure that every phase of the project runs smoothly. We also need to have a consultation with our advisor which is our lecturer and ask him about the opinion and suggestions regarding the project, so that if there are any flaws in our project, we can detect them quickly and think of the other way on how to make it right.

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Introduction

This is a group project with individual review. Its objective is to bring forth what you have learned in class into how it is in the real world. The aim of this group project is to build a small network with all its appropriate components, which is understanding user or customer needs and planning them around the budget given, planning, and designing a network infrastructure for current and future needs, research and application of network devices availability, usability, cost, and services, calculating, and applying network IP addressing and reporting your work to customer. The given tasks that needed to be completed within the given time.

There have 6 tasks overall in this project that require us to complete it within the time given. The scope of project includes task 1 require us to create our own additional two floor building layout that consist of four labs and other additional facilities then draw a floor plan based on requirements given. In Task 2, we need to do a preliminary analysis, especially on current and future requirements and devices to be used. In real life, this portion is usually done through meetings and interview. Once you find this information, you can determine whether the project is feasible or not. Task 3 we need to choose the appropriate LAN devices for the labs. We need to consider all aspects including the performance of the hardware that we choose to use in every labs and floor.

Task 4 we start to make the connections between PC, servers, router, and other devices. We need to make sure that the connections are successful. The devices must be interconnected and need to consider four physical areas when planning which is work area, telecommunications room, backbone or vertical cabling and distribution or horizontal cabling. Task 5 we need to set the IP addressing scheme. In this task. We need to explore how best to divide the subnetwork from the Network Address assigned to our group. Lastly, Task 6 we need to complete our group report for customer evaluation. The objective of the report is to report the work done and reflect upon how it can be made better. The report is based on the guideline and need to expand it to give a clearer view of your work, your suggestions, and reflections.

Project Background

The history of Faculty of Computing (FC) began in 1981 when it was known as Department of Computer Science, under the wings of Faculty of Science. This department began its operation at UTM Gurney Road Kuala Lumpur where it received its first intake of Computer Science Integration Program students. This program integrated the program of Diploma with Bachelor of Science (BSc) of Computer Science. In 1984, the department was established as Institute of Computer Science that consisted of Academic Unit and Administrative Computing Unit. As the years go by, the faculty has seen a significant increasing number of students due to the popularity of its high quality postgraduate academic programs. The number of postgraduate students and staff and demands for more sophisticated facilities has resulted in additional 5-storey building in 2012 to provide a conducive environment for teaching, learning and research.

The School of Computing (SC) currently has 1200 students both undergraduate and postgraduate, 97 academic and 35 supporting staffs. They anticipate a 10% growth in both students and academic staffs in the next 3 years. To facilitate this growth, SC plans to build a new 2-storey building. This new building will house 4 new labs, 2 video conferencing rooms, for virtual project meetings. A total 30 workstations and one multi-terabyte storage server is planned for each lab. Each lab is equivalent to the current Digital Logic Lab in size and are must be equipped with high-speed internet connection. SC Chair wants the building to be “ready for anything” and have reliable, efficient, and secure network that can be easily managed. He also noted that it should be cost effective.

TASK 1

Project Setup

Floor Planner – First Floor

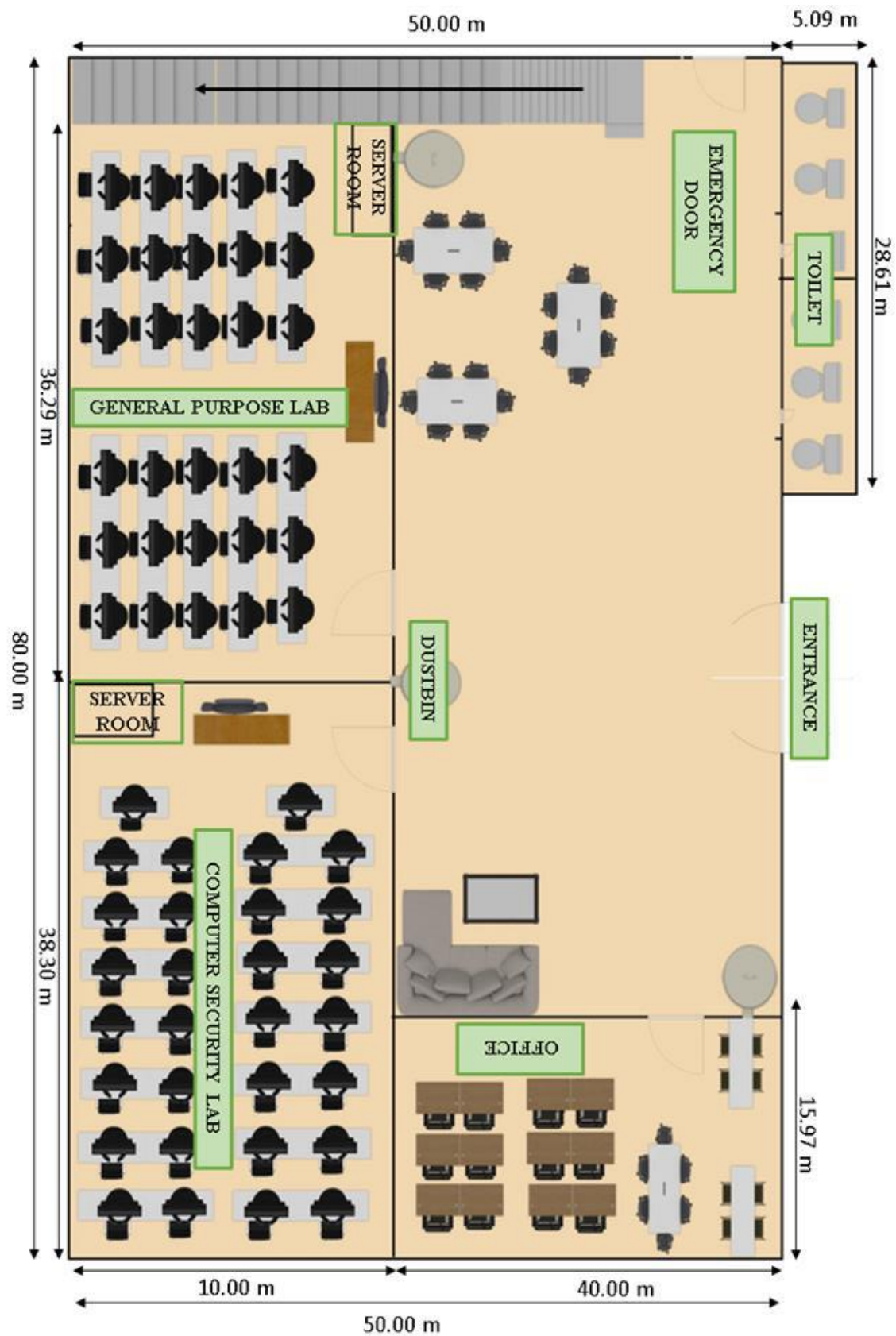


Figure 1: Floor plan for level 1

Floor Planner – Second Floor

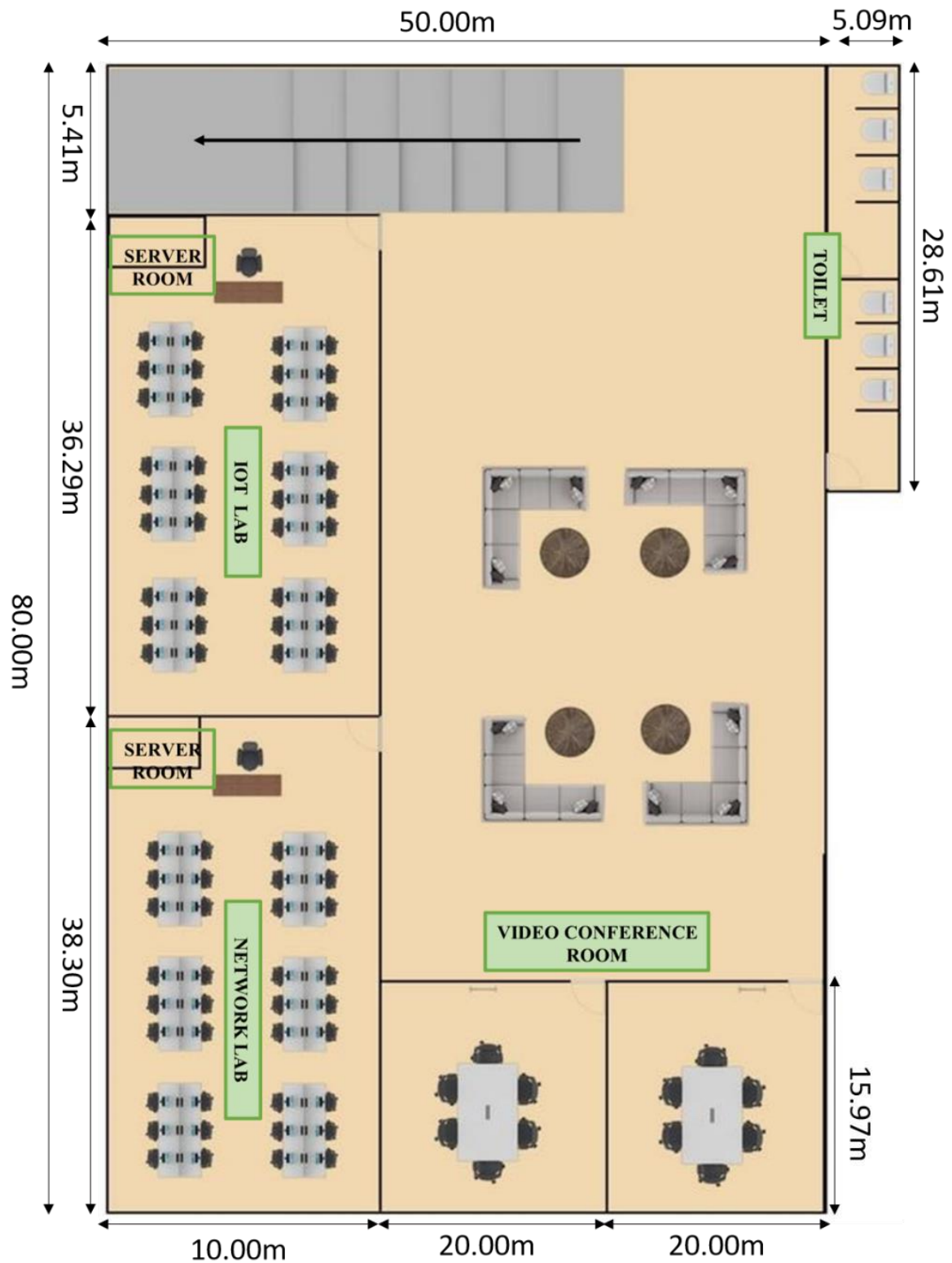


Figure 2: Floor plan for level 2

Reflection on Task 1

Throughout the process of making task 1, the team has gained a new knowledge, especially on designing a building which consist of labs, office, and video conference room. We also learned that it is important to have an emergency door and way if anything bad happen to help the user of the building to relocate safely. The implementation on dividing the room is a bit challenging for use to do since we do not have a basic knowledge on floor planning. But the team manage to do it with the help of our seniors and our beloved lecturer Mr. Fariz on guiding us on making the task 1 for the project.

TASK 2

Initial Design – Preliminary Analysis

List of Questions to Ask the User

1. Which of Internet Service Provider (ISP) is the best for you to use for the building?

- Unifi. This is because it has download speeds of up to 30 Mbps to 800 Mbps and 10mbps to a speed of 200 Mbps to upload. So, there would be no problems in the sense of Internet speed for consumers.

2. What type of network architecture would be acceptable for the building's layout?

- An intermediate network might consist of 15 devices, connected by cables. An entry level server would create shared file storage and allow important files to be safely backed up. But using Lan, because the scale is not too big, because it can cover the whole building.

3. What are the types of servers that will all be used together in the labs?

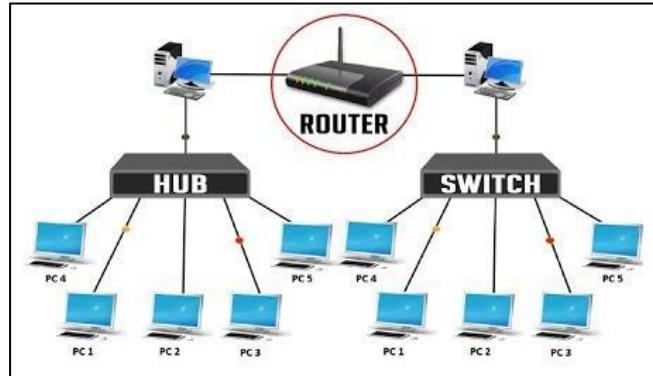
- There are 2 types of servers going to be used, there are file servers and web servers:
- File servers – It can easily access all your files from one central location. It also lets you control access so that there is minimal chance of your business information getting leaked to others.
- Web servers – It is important that your web server performs well so it can deliver site content to visitors as quickly as possible.

4. For every workstation, what is the standard software needed?

- For browsing purposes will be using Internet Explorer, Google Chrome, and Mozilla Firefox.
- For basic documentation purposes will be using (Microsoft Office 2019 – Words, Excel, and PowerPoint)
- For source code editing purposes will be using Notepad++.
- For editing and reading PDF files will be using Adobe Acrobat DC Pro.

5. To construct the network infrastructure, what devices are needed?

- Routers to connect to the switches or hubs that will be used.
- Switches/Hubs to connect with all the computers in each lab.



6. What type of physical media do you want to use for your network plan?

- We will use both wired and wireless. As for wired we will use the Ethernet as the speed offered by an ethernet connection is much greater compared to a wireless connection. It will also have higher levels of security as it can control who is using the network and can prevent the security breaches. Ethernet connections possess supreme reliability because there are no interruptions from radio frequencies. We will provide cables such as Cat5e RJ45 Booted Ethernet Cable as it is efficient to use.
- We will use the wireless as well because wireless networks enable multiple devices to use the same internet connection remotely, as well as share files and other resources. They also allow mobile devices such as laptops, tablets, and mobile phones to move around within the network area freely and still maintain connection to the internet and the network.

7. What is the standard specification hardware that you want to use in every lab?

- Operating System: Windows 7 64
- Processor: Intel Core i5-4590 3.3GHz / AMD FX-8350
- Graphics: AMD Radeon RX 580 8GB or NVIDIA GeForce GTX 1070
- System Memory: 16 GB RAM
- Storage: 1GB Hard Drive Space
- DirectX 11 Compatible Graphics Card

8. What type of antivirus that you want us to install on each PC?



- Compatibility: Windows, Apple Mac, iPhone/iPad, Android
- Removes Malware, Spyware and Adware
- Web Protection
- Block Phishing Website
- Real-Time Protection
- VPN Internet Security
- Scheduled Scans
- Password Manager

9. Type of network topology that you want to use for your network plan.

- Star networks are one of the most common computer network topologies and the best type of network topology as it provides a better performance by preventing the passing of data packets through an excessive number of nodes. Although this topology places a huge overhead on the central hub, with adequate capacity, the hub can handle very high utilization by one device without affecting others. Each device is inherently isolated by the link connects it to the hub. This isolation also prevents any non-centralized failure from affecting the network. As the central hub is the bottleneck, increasing its capacity or connecting additional devices to it increases the size of the network very easily. Easy to detect faults and to remove parts. No disruptions to the network when connecting or removing devices.

10. Type of network protocol that you wish to use in the network plan.

- TCP: Transmission Control Protocol
- TCP is a connection-oriented protocol, as it requires a connection to be established between applications before data transfer. Through flow control and acknowledgement of data, TCP provides extensive error checking. TCP ensures sequencing of data, meaning the data packets arrive in order at the receiving end. Retransmission of lost data packets is also feasible with TCP.
- Advantages:
 - ✓ TCP ensures three things: Data reaches the destination, reaches it on time and reaches it without duplication.
 - ✓ TCP automatically breaks data into packets before transmission.

Feasibility Study

This modern era today provides the users with various of technology that empowered by powerful Internet connection worldwide. The Internet itself has becoming a crucial part in human's daily life. Thus, this paper proposed an overall network designed and floorplan to serve the new building that is about to established in the School of Computing which contains many spaces to be operated by this network. The objectives of this proposed project were there to support this initial planning like secured service, information processing, integration and update, collaboration as well as the scalability. Plus, the system is constructed to accomplish those specific operational objectives mentioned before.

Proceeding the objectives one by one, we want to provide secured service accessible by all the users in the building. This includes serving a safe clerical computing facility to the School of Computing building via installation of trusted security applications. It is intended to be fully practical and substantially inaccessible from admittance by people who do not have the credentials on the system. This approach may diminish the threat of unsanctioned consumption by any outsiders.

Secondly, we are looking forward to implementing the information processing in a better way which is all-round information processing method. We realized that we have so many users that may run the devices at a time, withing the floors or even the building. Due to that reason, the network that will be used soon must permit clients to retrieve, process, and store text, still graphics, audio, and video from any peripheral devices within the same network.

Thirdly, a maintenance of this building should be done periodically to ensure the components, cables, modems, routers, and other networking devices perform as intended. We do not want a chaos to happen while having a video conferencing meeting and online presentation as it may annoys the users in the network. Therefore, integration and update are matter. Since the building used Local Area Network (LAN) connection, the equipment must be reliable, up to date and compatible to all possible connected device to stipulate constructive collaboration throughout the organization.

Next, the networking in the building also must achieve collaborative usage. A collaboration network is a partnership of autonomous people and organizations, supported by a computer network, that collaborate to share resources, such as data and connectivity. The people and organizations may be in different geographic locations as well as from very different professional environments. Thus, the network will merge the capabilities of distinct equipment to provide a collaborative medium that helps users combine their skills regardless of their physical location. A network for this group of people will enable people to give out knowledge and visions effortlessly so they can perform more competently.

Finally, the design of our building and network must be scalable for upcoming project or improvements to be put under the same room easily. Every day, we may come out with several new ideas to improve some aspect of the building that may require some change. But for sure the new cost may be counted. So, at the very beginning the scalability is considered to ensure further adjustment may be done without having to redo the installed network.

On the other hand, the general security of the premise also must be considered for safety purposes. This includes the installation of fire prevention system, door lock system, electrical auto-shut off system and others. In conclusion, we think that we may achieve all the factors discusses in this feasibility study within the given budget to our group.

Reflection on Task 2

On this phase, the team has done brainstorming for ideas on our initial design by meeting using Discord. We then decided on our initial design by using the guidance and question that has been given from the question on UTM eLearning. We also discover on the specification of a certain hardware and software such as TOTALAV which is an antivirus that are compatible for mac and windows user. The imp implementation on what the network topology are we using is decided based on the floorplan that has been done from the previous task. Regarding the network infrastructure, with the knowledge that has been given from our beloved lecturer, we get to develop the base of the network infrastructure and continue to alter based on the floorplan then.

TASK 3

Choosing the Appropriate Lan Devices

List of Devices Needed and Description

Type of devices	Usage	Description	Quantity	Price/unit (RM)	Total (RM)
D-Link 48-Port 10/100/1000 Gigabit Smart Switch 	Allowing devices to communicate and share information among them as well as enabling more connections from the devices to the routers	• Network Technology: 10/100/1000Base-T • Ethernet Technology: Gigabit Ethernet • Power Description • Input Voltage: 110 V AC • 220 V AC • Power Source: Power Supply	6	2,200	13,200
Zyxel LTE3301 Plus Wireless Router 	Supplying internet access in the entire building and prevent dead spot where internet is inaccessible	• Zyxel LTE3301-PLUS 4G LTE • Support of Cat. 6 • AC1200 dual-band concurrent links • Rates: 300/50 Mbps • Compatible with 4G and 3G network connections	1	970	970

Zyxel NWA1123 Pro Nebula Flex Access Point Wireless 	Granting devices to connect to the internet wirelessly if they cannot connect via wired media	• 2.4 GHz, 5 GHz Maximum data transfer rate: 1300 Mbit/s • Ethernet LAN data rates 10, 100, 1000 Mbit/s • Channel bandwidth: 80 MHz Modulation: 16-QAM, 64-QAM, 256 QAM, BPSK, CCK, DBPSK, DPSK, DQPSK, QPSK • Wi-Fi Multimedia (WMM)/(WME) • VLAN support • Wireless isolation	6	960	5,760
Dell PowerEdge R730xd Multi-Terabyte Rack Server 	Storing data and supply access to data in each computer lab	• Intel® Xeon® processor E5 2600 v4 product family • Microsoft® Windows Server® 2008 R2 / 2012 / 2012 R2 / 2016 • Novell® SUSE® Linux Enterprise Server • Intel C610 series chipset • RAM Up to 1.5TB (24 DIMM slots) • Up to 81TB with 18 x 1.8" 960GB SATA SSD = 8 x 3.5" SATA/nearline SAS HDD • Up to 46.8TB with 24 x 2.5" 1.8TB hot-plug SAS -HDD + 2 x 2.5" 1.8TB hot-plug SAS HDD	4	7500	30,000

Startech Cable CAT6a Ethernet UTP Cable 7m 	Providing bigger bandwidth for internet connections for better internet and reliability in data transferring	• Connections: 10Gb • Built: 100% copper wire • Up to: 500MHz • Suitable: 10GBase-T Ethernet Network	230	140	32,200
Startech OM3 LC To LC Multimode Duplex Fiber Optic Patch 7 m 	Providing medium for data transfer that require simultaneous and bi-directional data transfer	• Maximum Data Transfer Rate: 100Gbps • Cable Rating: 10Gbps / 40Gbps / 100Gbps • Fiber Classification: OM3 • Type: Multi Mode • Wavelength: 850nm	100	140	14,000
Cat6a cable 	Providing bigger bandwidth for internet connections for better internet and reliability in data transferring	<u>UGREEN Cat6 Ethernet Patch Cable Gigabit RJ45 Network Wire Lan Cable (round cable)</u> • Connects network components in a wired LAN at data transmission speeds up to 1 Gbps. • 26AWG cable exceeds TIA/EIA standards & 250 MHz bandwidth	230	30	6,900

2x RJ45 Ports Faceplate 	Giving protection and for enhancing the design and appearance of the device	• Use For: RJ45 Cat5/6/7/8 Ethernet Cable. • High quality new PC flame retardant raw materials • Compatible with embedded and outside box	60	4	240
Cat6 48 Port Patch Panel 	Connecting various devices together	<u>Trendnet Cat6 48 Port Unshielded Patch Panel</u> • Category: Cat6 • Easily Identifiable • Number Labels	8	300	2,400
PC Desktop 	Support learning	<u>ThinkCentre M920 Tiny.</u> • Processor: Intel Core i3-9100T • OS: Windows 10 Pro • Storage: 500GB • Memory: 4GB DDR4	140	2900	406,000
Projector 	Screen sharing	<u>Acer P6500 LCD Projector</u> • 1920 x 1080 resolution FHD • Diagonal image size up to 10 meters • Built-in audio	5000	7	35,000

Cat 6 Keystone RJ45 Ethernet 	Female connector used in data communication and particularly in local area networks (LANs)	<u>Startech Keystone RJ45 Ethernet.</u> • Cat6 • Easy to use and install	8	40	320
SonicWall NSa 2650 Hardware Firewall 	Securing connections by providing packet inspection to all files despite their protocols and sizes	• 3.0Gbps firewall inspection • 1.4Gbps application inspection throughput • 1.4Gbps IPS throughput • 1.25Gbps threat prevention throughput • 1.3Gbps VPN throughput • 1 million maximum connection • 14000 new connections per second • 4 X 2.4-GbE • SFP 4 X 2.5-GbE • 12 x 1-GbE • 16GB built in storage	1	13100	13,100
TOTAL					560,190

Budget provided: **RM 2,000,000.**

Total price of required devices: **RM 560,190**

Remaining budget: **RM 1,439,810**

Reflection

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

When we were doing research on the price of the devices needed, we were really surprised when searching the price for a switch, which we stumbled upon switch that cost up to RM3000 especially the CISCO products. We are surprised because back before we research for the price, we thought that the normal price for a block of metal where you could plug in multiple wired connection is something affordable. This means that we did not really know what the use of each part of the server and did not appreciate the complexity of the device.

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

Yes, we have considered price as a factor but not as the main factor since we mainly focus on the performance of the device. After doing the research, we found out that some device that has the same spec could come in a very different price. This is when we take price as a factor which we try to pick the most reasonable one out of the bunch.

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

Cisco products meet the needs of corporations and offices of all dimensions and sorts. As for Huawei, it has some product line-ups that are like Cisco devices but have their specific network hardware line-ups and IT solutions for various network requirements. Besides Cisco and Huawei, there are other brand that are also valuable and reliable, such as FS enterprise Ethernet switches.

Reflection on Task 3

Previously, we thought that when it came to buy networking devices for a newly-build building it would be very easy. Just go to the computer shop and find all devices that are in list. However, the idea was totally wrong. A lot of consideration needed to be taken to ensure that the devices that we bought met the specific usage requirements for the building. Every single device relied on different specification that we must adhere for the devices to function well. For instances, a router that may come with various model, types and prices are not just that. A more specific characteristics to be determined such as number of input LAN ports as well as the transmission rate-how fast can the data transfer run between source and destination. Moreover, we also encountered that the given budget for the project was not all spent via the list of devices needed. In fact, we must consider installation payment, configuration, technical and mechanical stuffs as well as wiring. Everything will cost a value from the given budget.

TASK 4

Making the Connections

Identifying Work Areas - Floor 1

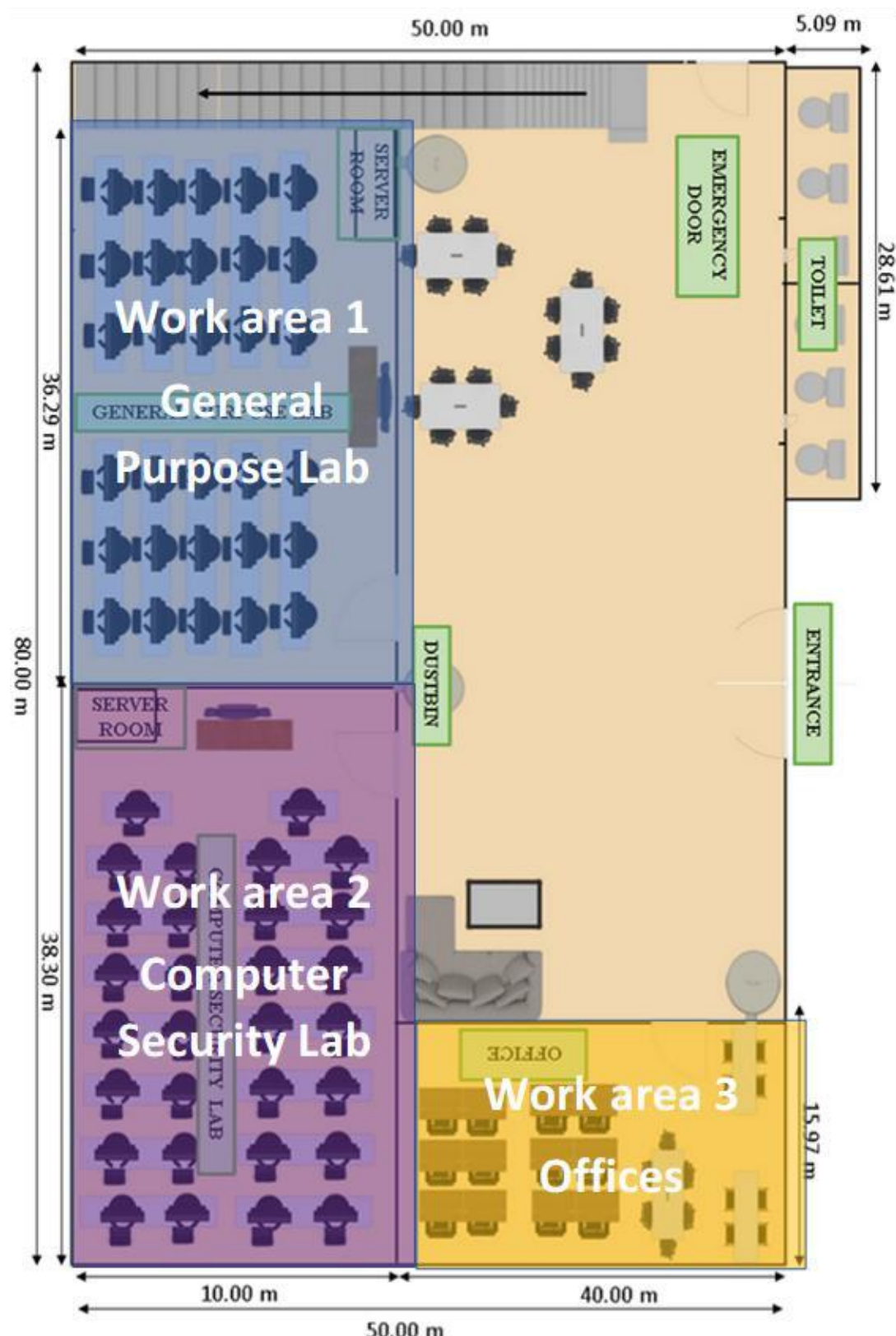


Figure 3: Work areas for level 1

Identifying Work Areas - Floor 2

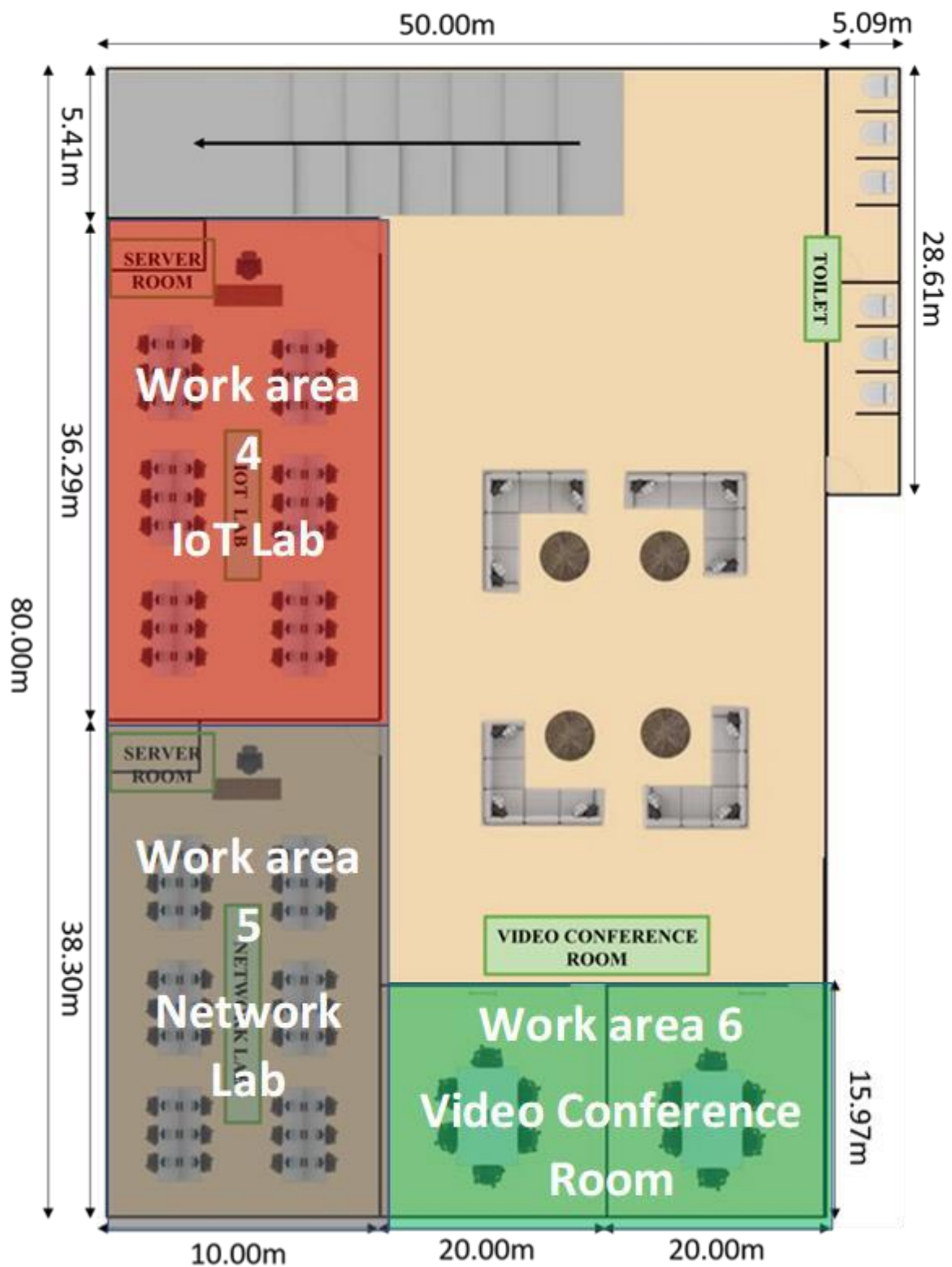


Figure 4: Work areas for level 2

Overall Network Diagram of The Building

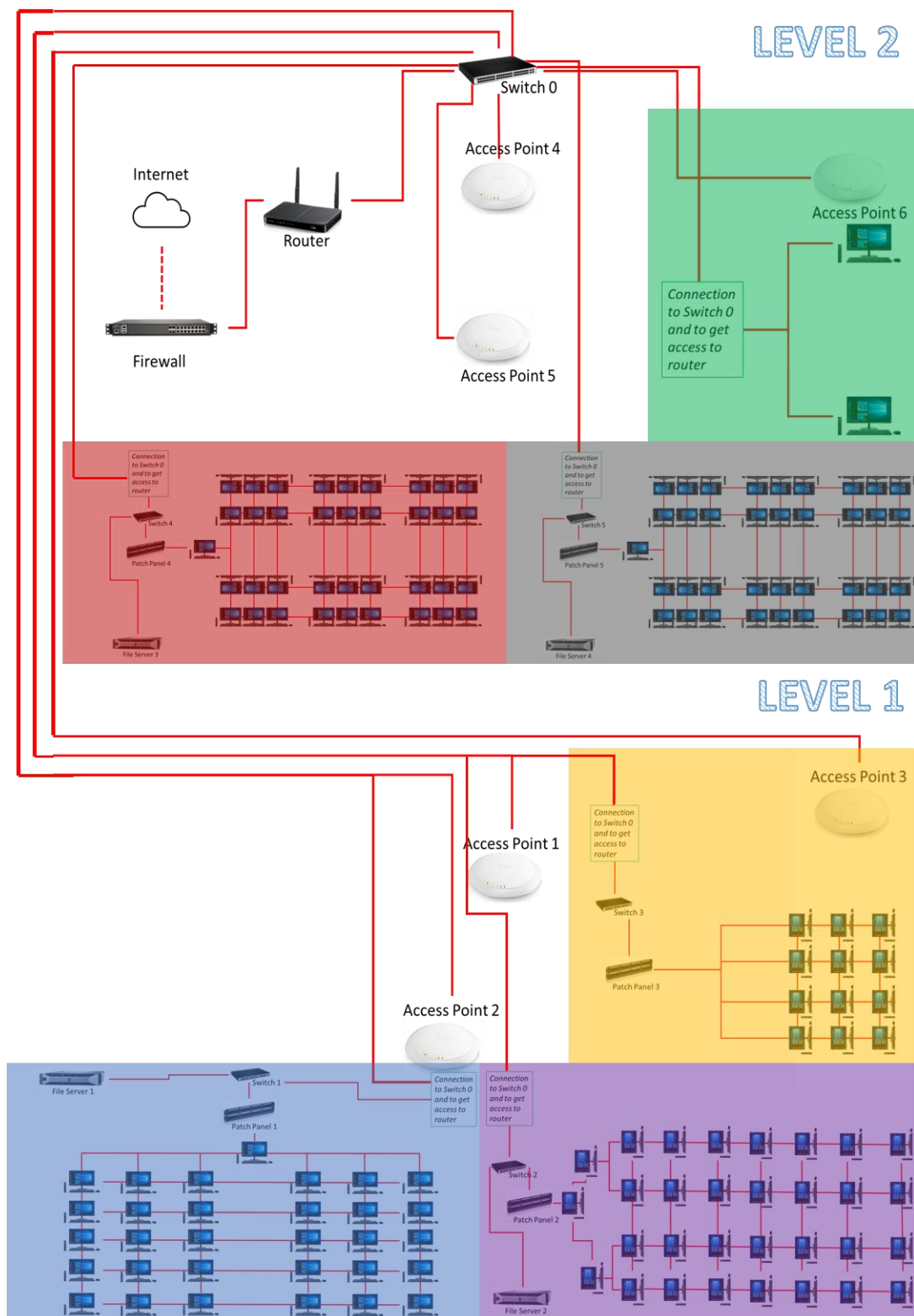


Figure 5: Overall network distribution of the building

Closed-Up Network Diagram

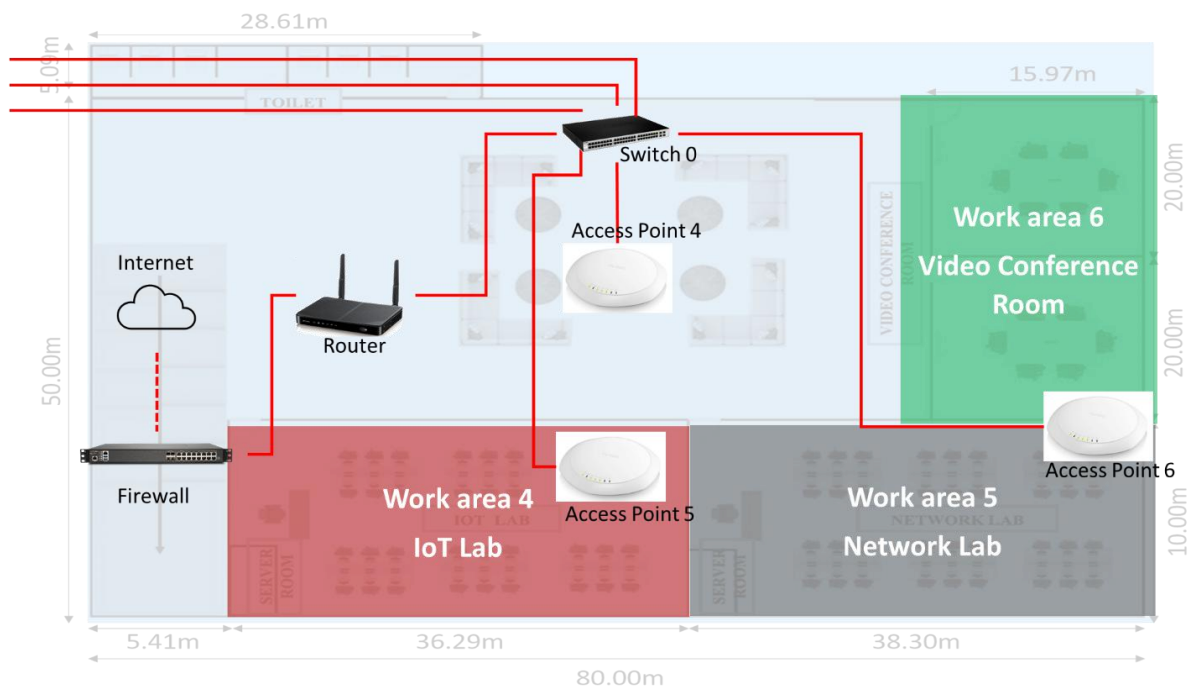


Figure 6: Closer view on network distribution for level 2

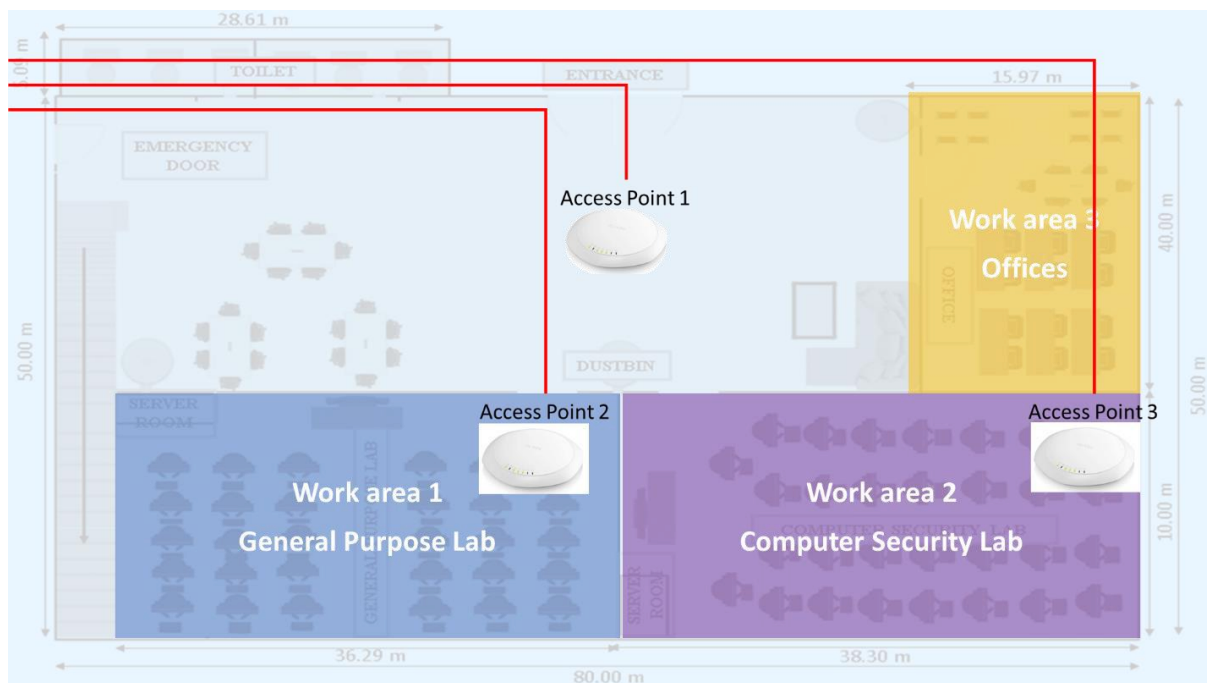


Figure 7: Closer view on network distribution for level 1

Network Distribution – Level 1

Work Area 1: General Purpose Lab

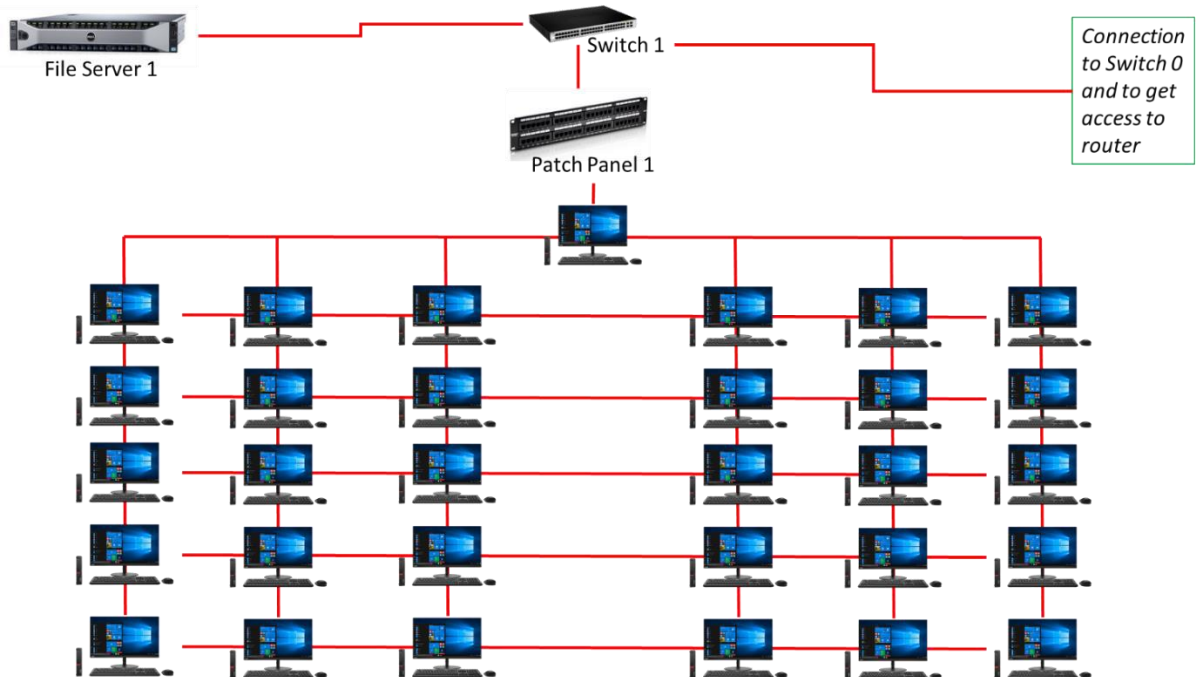


Figure 8: Network distribution in general purpose lab

Work Area 2: Computer Security Lab

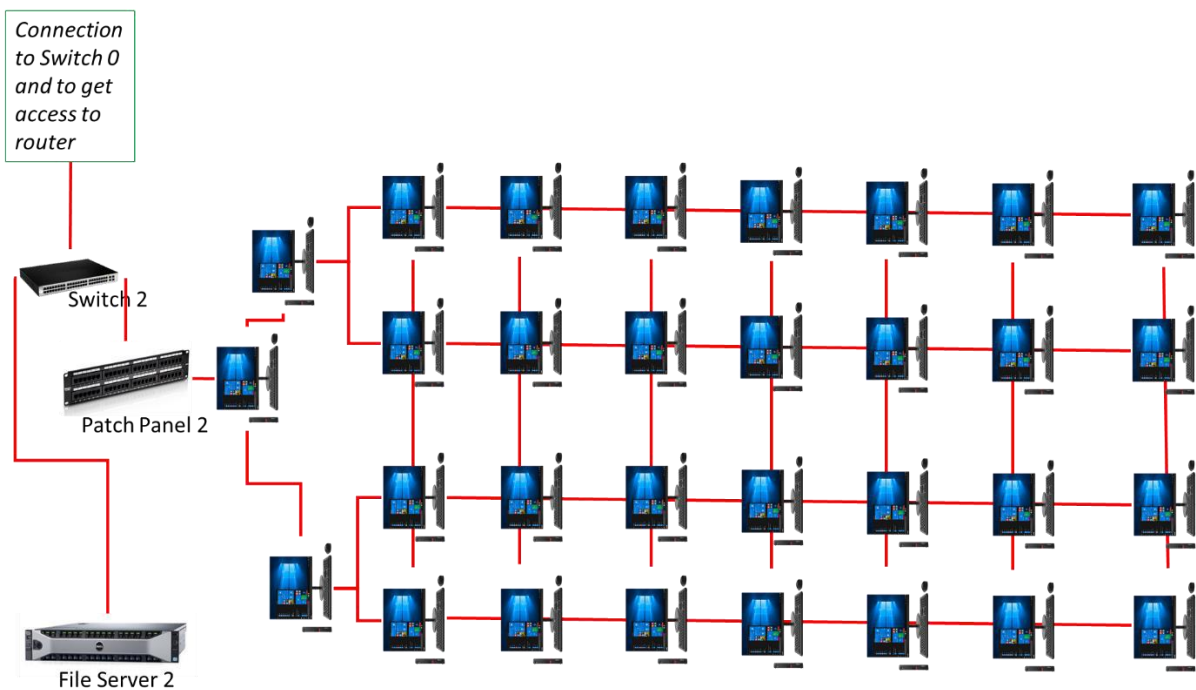


Figure 9: Network distribution in computer security lab

Work Area 3: Offices

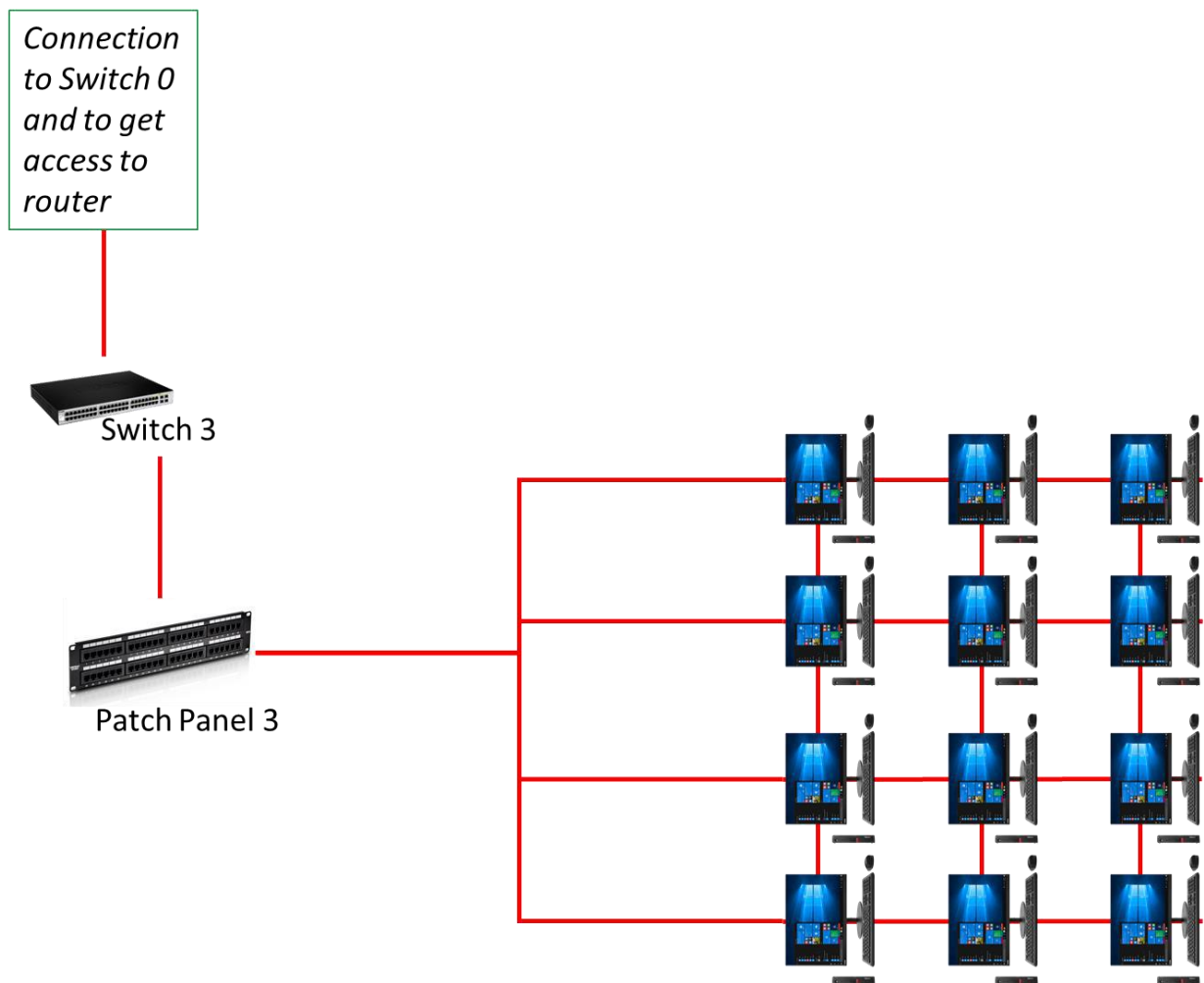


Figure 10: Network distribution in offices

Network Distribution – Level 2

Work Area 4: IoT Lab

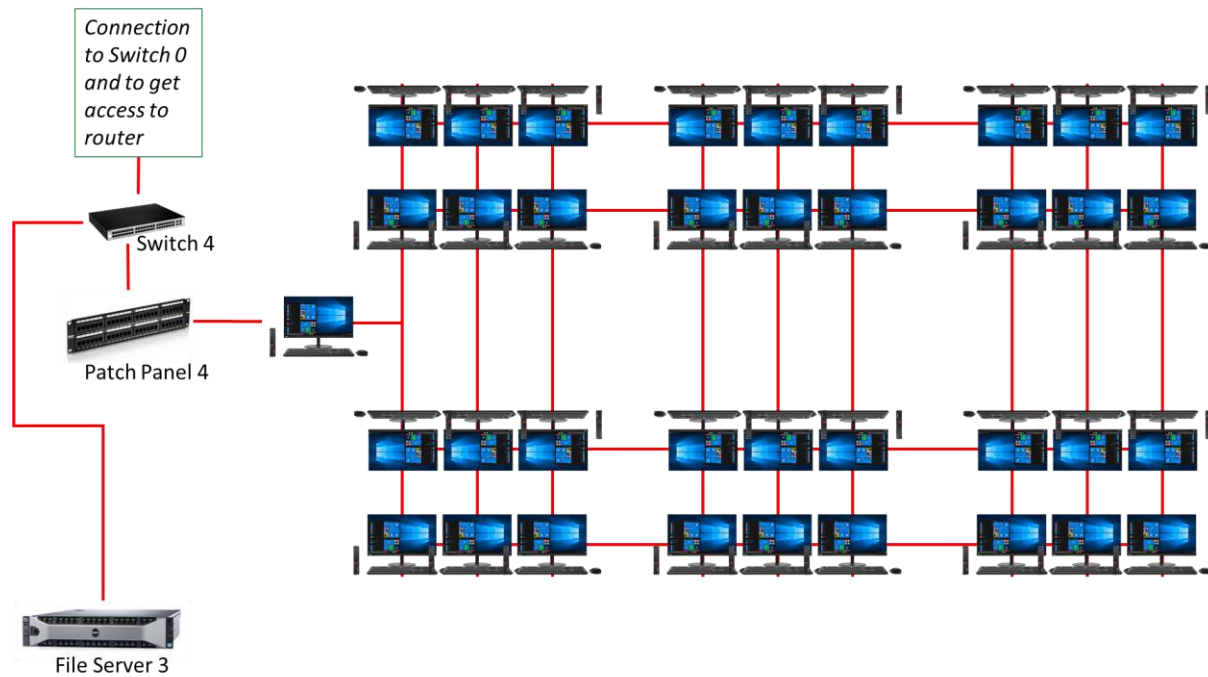


Figure 11: Network distribution in IoT lab

Work Area 5: Network Lab

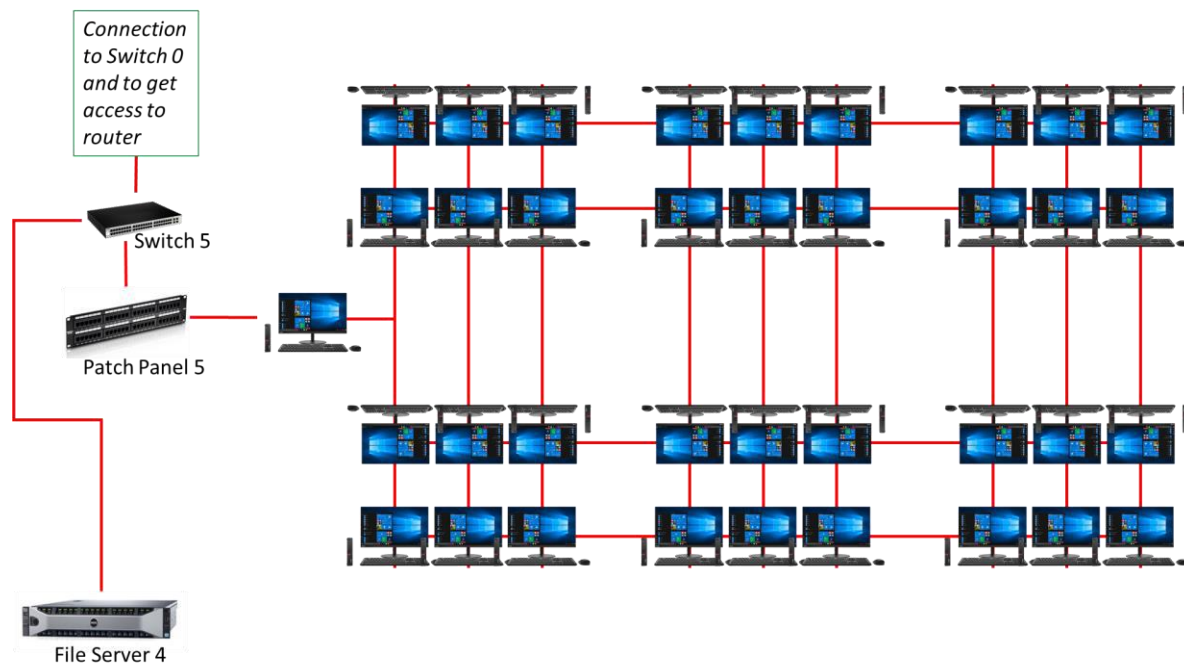


Figure 12: Network distribution in network lab

Work Area 6: Video Conference Room

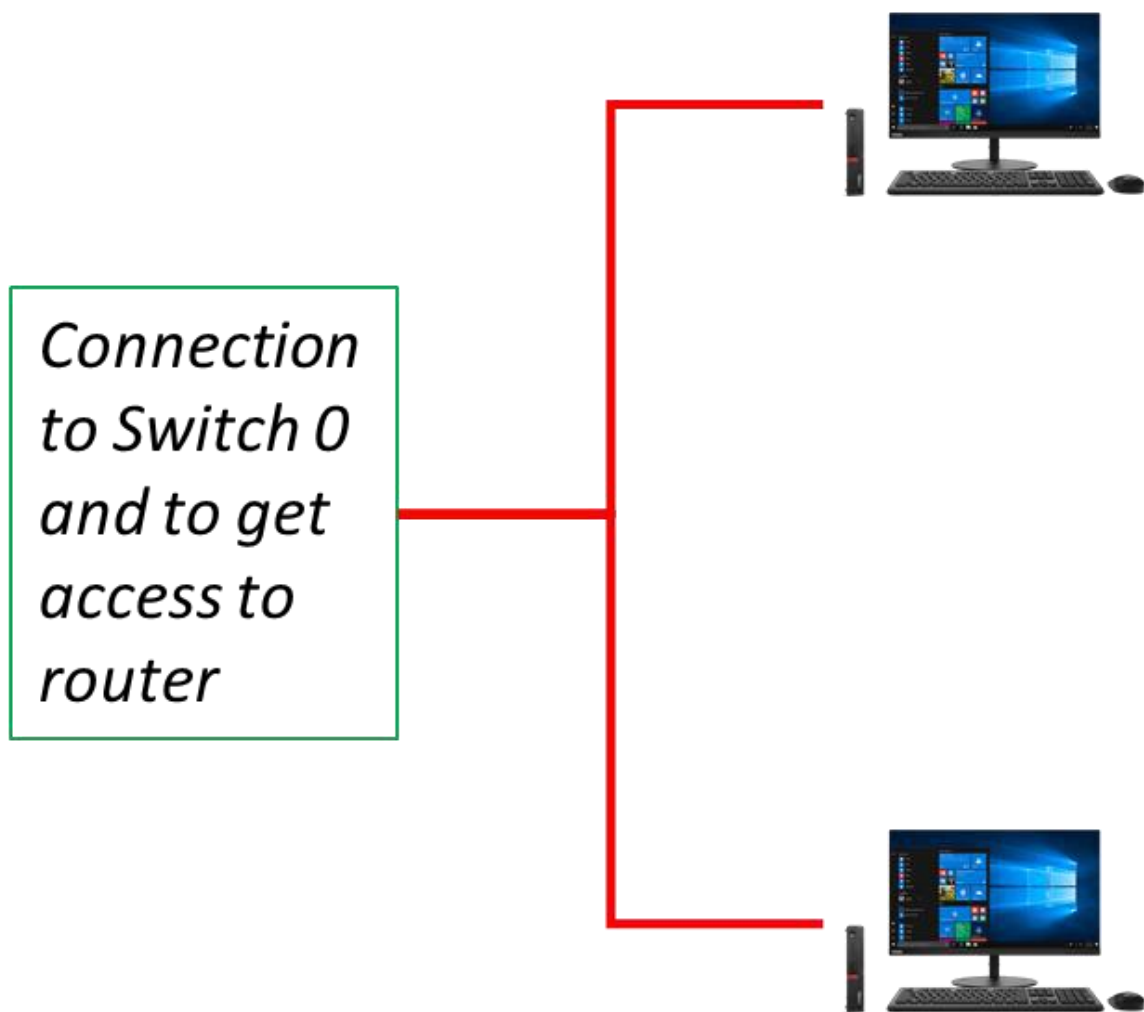


Figure 13: Network distribution in video conference room

Cables & Connections

Determining number of connections, patch cords, and switch ports

Level 1

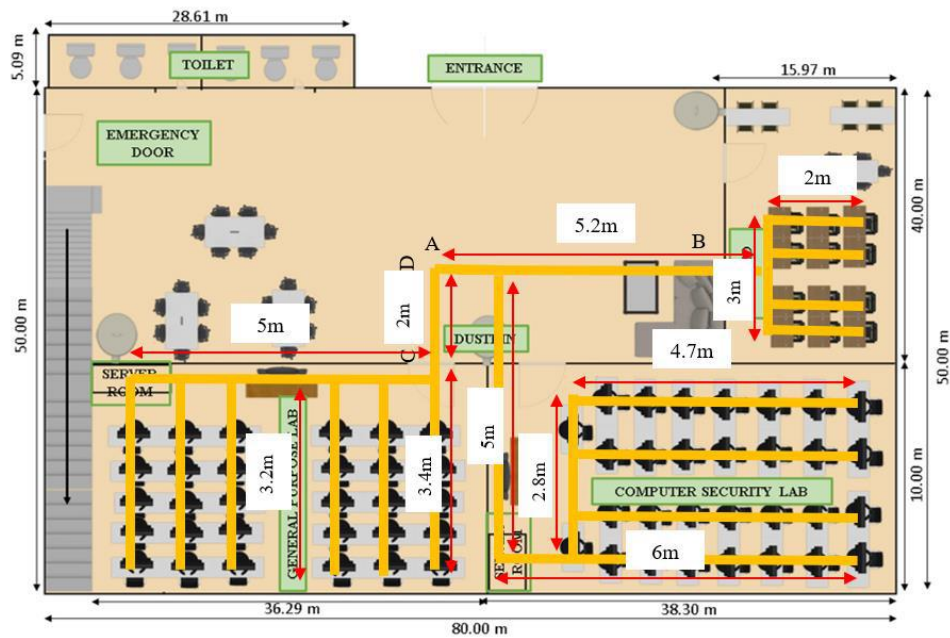


Figure 14: Cables connections for level 1

Level 2

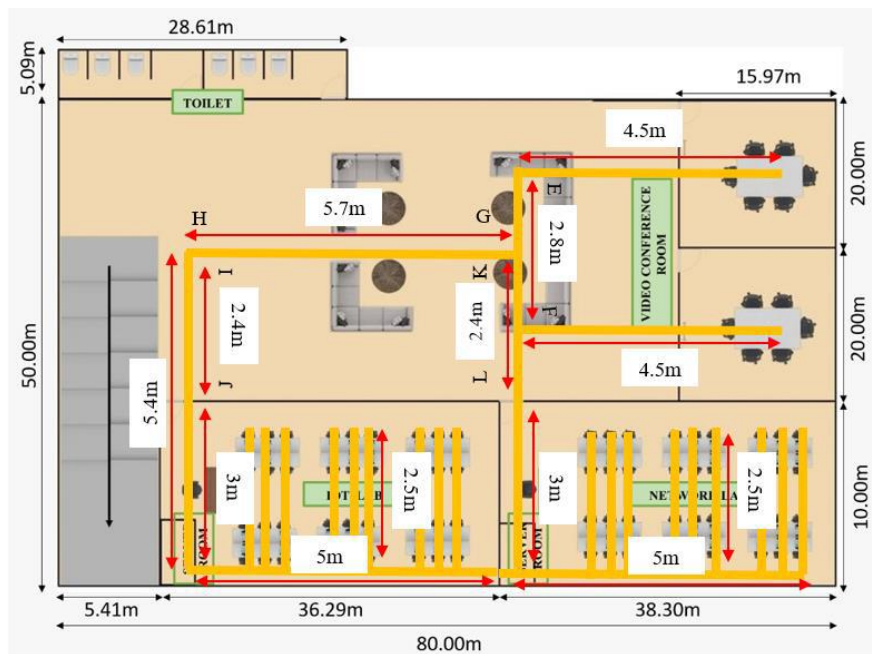


Figure 15: Cables connection for level 2

In our planning, the cable that we used are CAT 6 cable. Based on the floor planning above, the CAT 6 cables are used in both first floor and second floor. It is used throughout the whole building in every lab and to connect each server.

Cable Lengths

Description	Cable Type	Length
1st Floor		
General Purpose Lab	CAT 6 Cable	24.4m
Office	CAT 6 Cable	11.0m
Computer Security Lab	CAT 6 Cable	26.3m
Point A to B	CAT 6 Cable	5.2m
Point C to D	CAT 6 Cable	2.0m
Peripheral connections (Switches, Routers, Patch Panels, Servers)	CAT 6 Cable	150.0m
Total Length – 1 st Floor (m):		218.9m
2nd Floor		
Vid. Conferencing Room 1	CAT 6 Cable	4.5m
Vid. Conferencing Room 2	CAT 6 Cable	4.5m
Network Lab	CAT 6 Cable	30.5m
IoT Lab	CAT 6 Cable	30.5m
Point E to F	CAT 6 Cable	2.8m
Point G to H	CAT 6 Cable	5.7m
Point I to J	CAT 6 Cable	2.4m
Point K to L	CAT 6 Cable	2.4m
Peripheral connections (Switches, Routers, Patch Panels, Servers)	CAT 6 Cable	150.0m
Total Length – 2 nd Floor (m):		233.3m
Total Length (horizontal/distribution cabling)– All Floor (m):		452.2m
Fiber optic cable	Fiber Optic Cable	100.0m
Total Length (vertical/backbone cabling)– All Floor (m):		100.0m
TOTAL LENGTH OF ALL USED CABLE		552.2m

Description	Quantity	Total Ports
Switches	6 devices	288

The total length of cables are 552.20 meters on overall floor plan and the number of ports for used switches is 288 ports.

A patch cord or occasionally termed patch cables is a copper cable that has an RJ45 connector on both ends. It can link up the router switch or hub to computers, printers, and other peripheral devices. For this network connection, we use 452.2 m of patch cord.

Switch ports are Layer 2-only interfaces related with a physical port. A switch port can be an access port, a trunk port, or a tunnel port. In this network, the number of switch ports used are 6, which each of it has 48 ports.

Identifying Cable Lengths & Type

CAT 6 Cable

For the horizontal cabling, we have chosen to add Cat 6A twisted copper wire. The Cat 6A is a twisted copper wire that can handle up to 100 meters of 10 Gigabit Ethernet data speeds at the total 500 MHz bandwidth for a single cable. We can guarantee that this cable can still provide high data transfer rates and high Ethernet efficiency for the building network, and the access layer and network closets are less than 100 meters. In addition, it can also support most of the building's Ethernet applications.

Furthermore, we determined that the unshielded cable for the installation is effective. This is because, the building is in an area with less electromagnetic interference (EMI) effects and far from the airport or medical center which have a high chance to interfere the cable performance. Moreover, the twisted wire itself can also minimize the EMI effect on the cable. Therefore, with the capabilities of the unshielded cable, it can be assured that the Cat 6A cable can still uphold its efficiency at a high level for five to ten years in the future, at least.

Fiber Optic Cable

This fiber optic cable is typically a network wire that transfers data signals along flexible glass threads in the form of light. This cable can transmit data in the distant range at a high speed, usually around terabits per second (Tbps). With a higher bandwidth given, fiber optic cable is an acceptable option to be installed for the Network lab, Computer Security lab and the entrance area.

Wireless

A wireless network allows devices to remain linked to the network, yet to roam to any cables unattached. Wi-Fi signals are amplified by access points, so a computer can be far from a router but still be network-connected.

Reflection on Task 4

In this task, we are required to create and making the connection for our building's network. Based on our floorplan, we have measured the floor plan for the case study to see the maximum distance we have to cover. After we have done with the measuring the floor plan, we have identified the work areas for both (Floor 1 and 2). On Floor 1, there are three physical areas: Office, General Purpose lab and Computer Security lab, which both computer labs consist of server rooms in the lab. On Floor 2, they are also four physical areas: two Conference rooms, IoT lab and Network labs which also consist with server rooms in each lab.

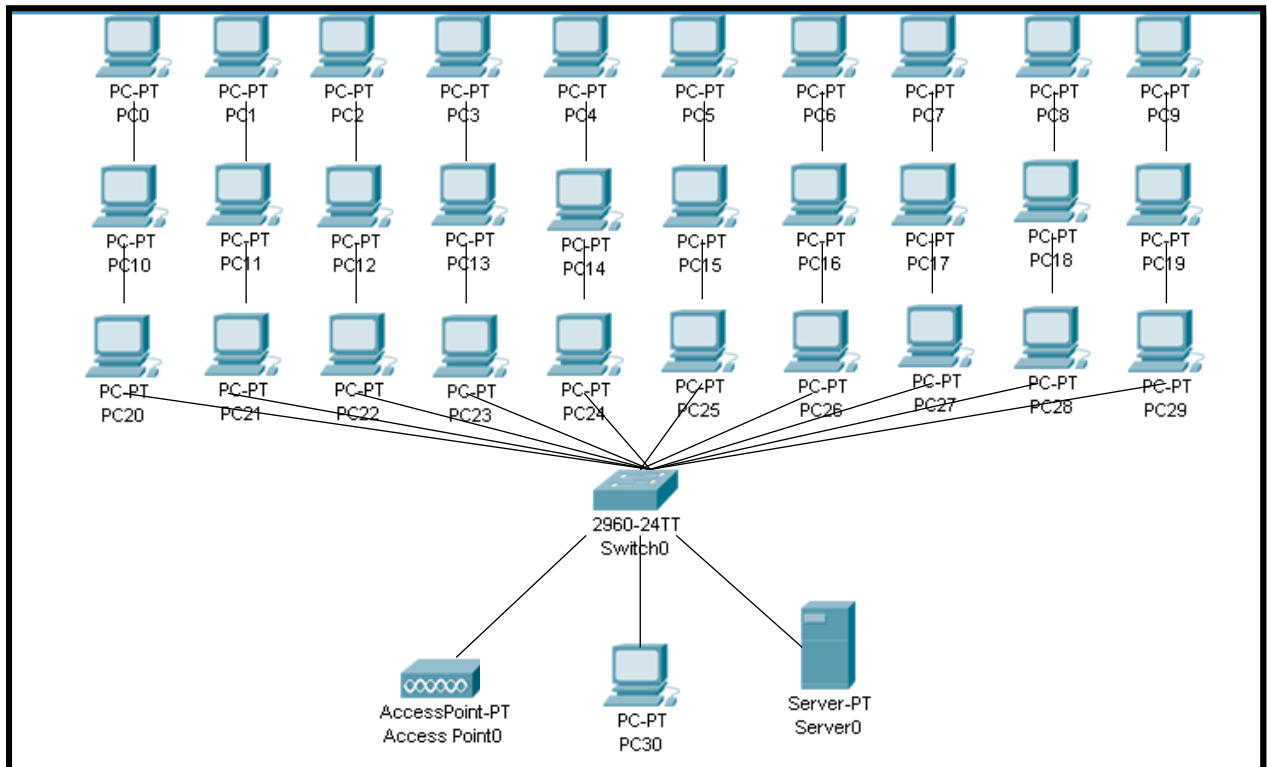
Next, we started to consider the physical connections that must take place for networking to be working successful. Through this task, we have identified the overall cabling structure for the whole building, by considering how many connections, switch ports, patch cords and routers are needed, what type of media are suitable and required and the length of cable required for the identified work areas. For the network distribution, we have carefully considered all the factors required to make the connection of the work areas for networking to be working successfully.

TASK 5

IP Addressing Scheme

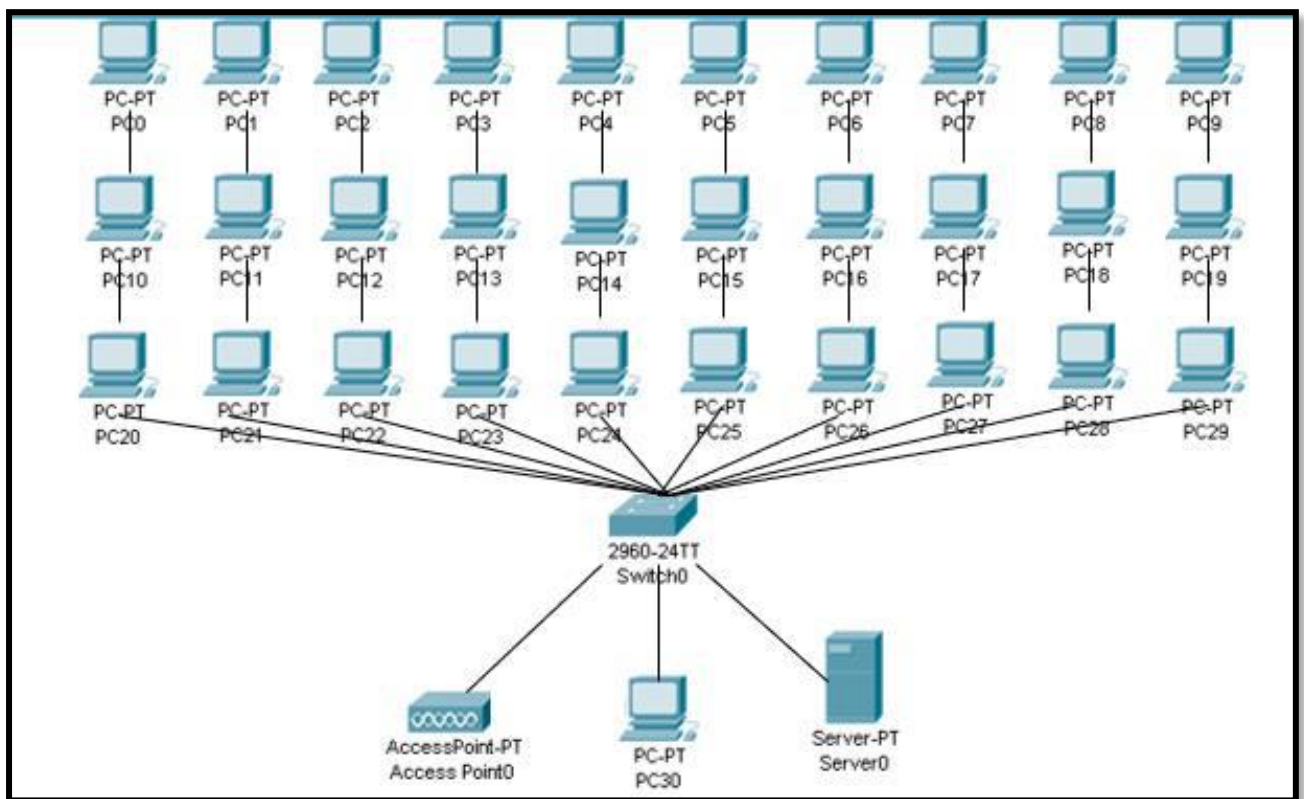
LEVEL 1

Work Area 1: General Purpose Lab



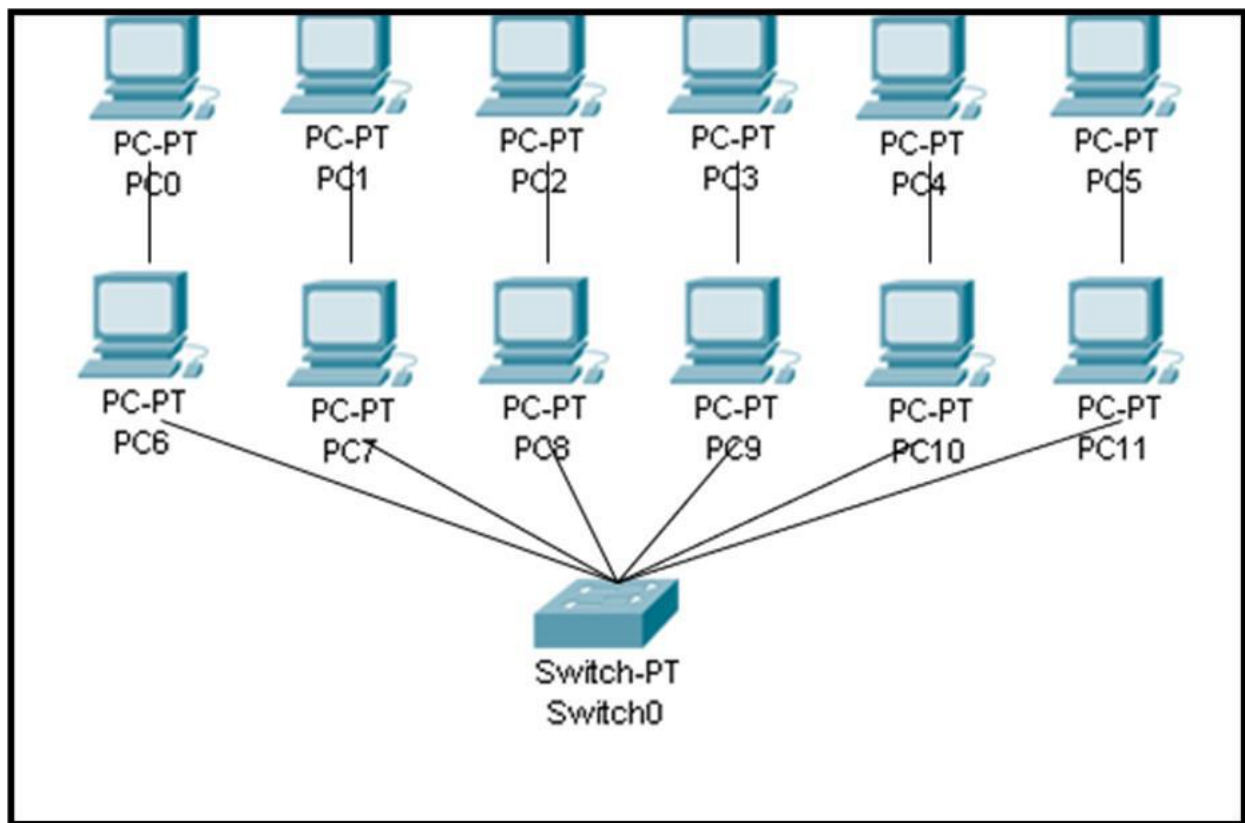
Switch1	192.19.1.1
Server1	192.19.1.2
Access Point2	192.19.1.3
PC0 - PC30	192.19.1.4 – 192.19.1.34

Work Area 2: Computer Security Lab



Switch2	192.19.3.1
Server2	192.19.3.2
Access Point3	192.19.3.3
PC0 - PC30	192.19.3.4 – 192.19.3.34

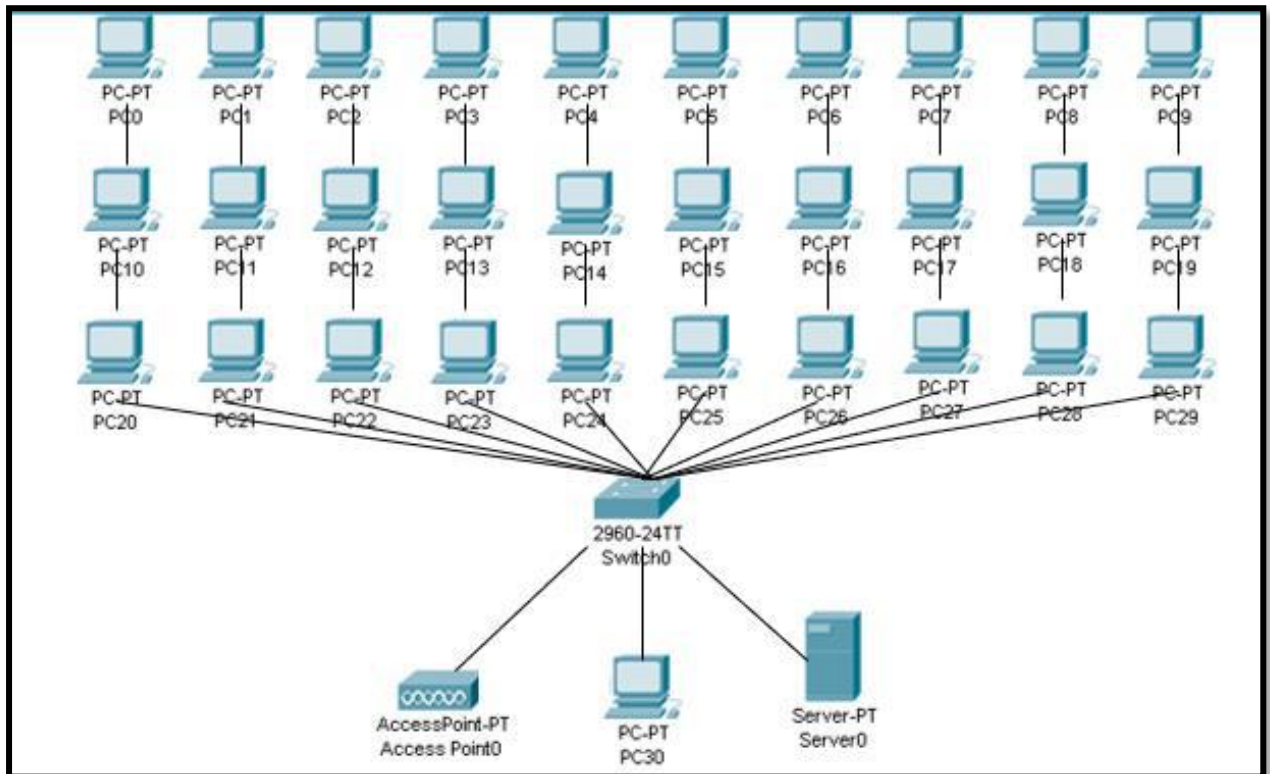
Work Area 3: Offices



Switch0	192.19.5.1
PC0 – PC11	192.19.5.2 – 192.19.5.13

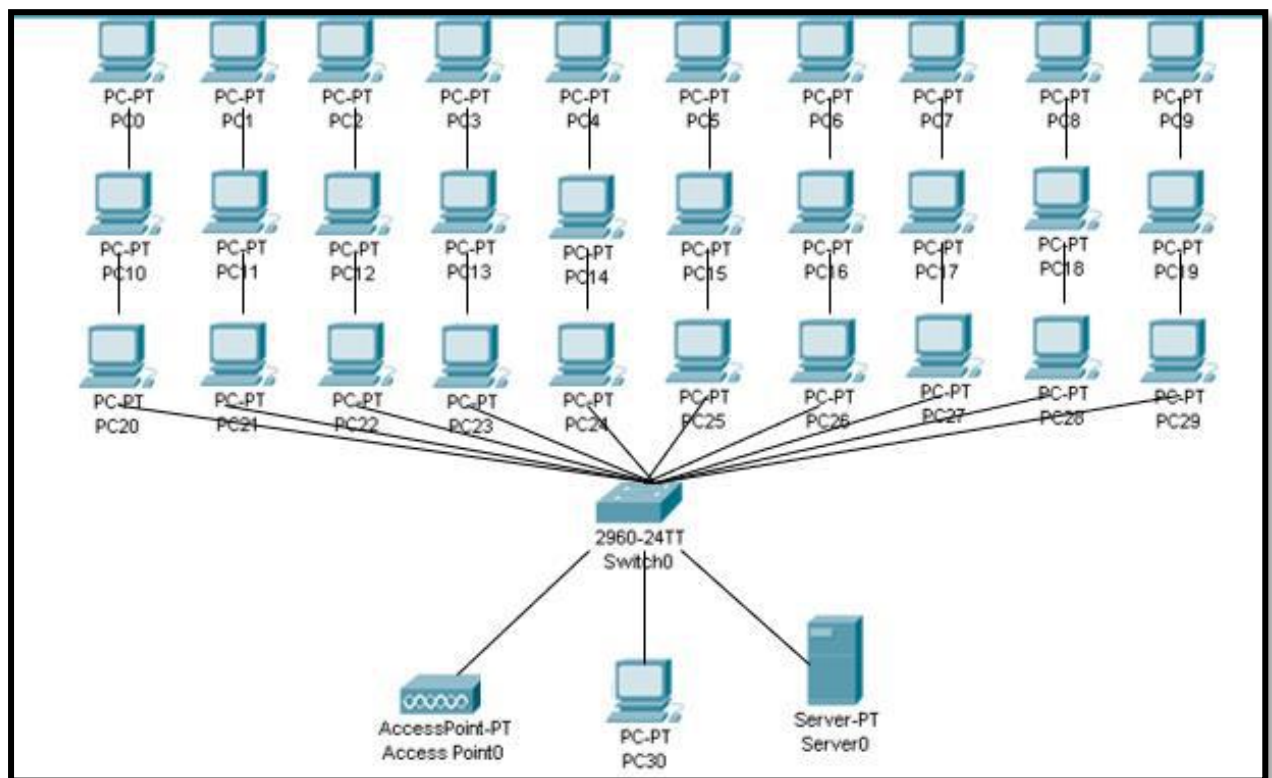
Level 2

Work Area 4: IoT Lab



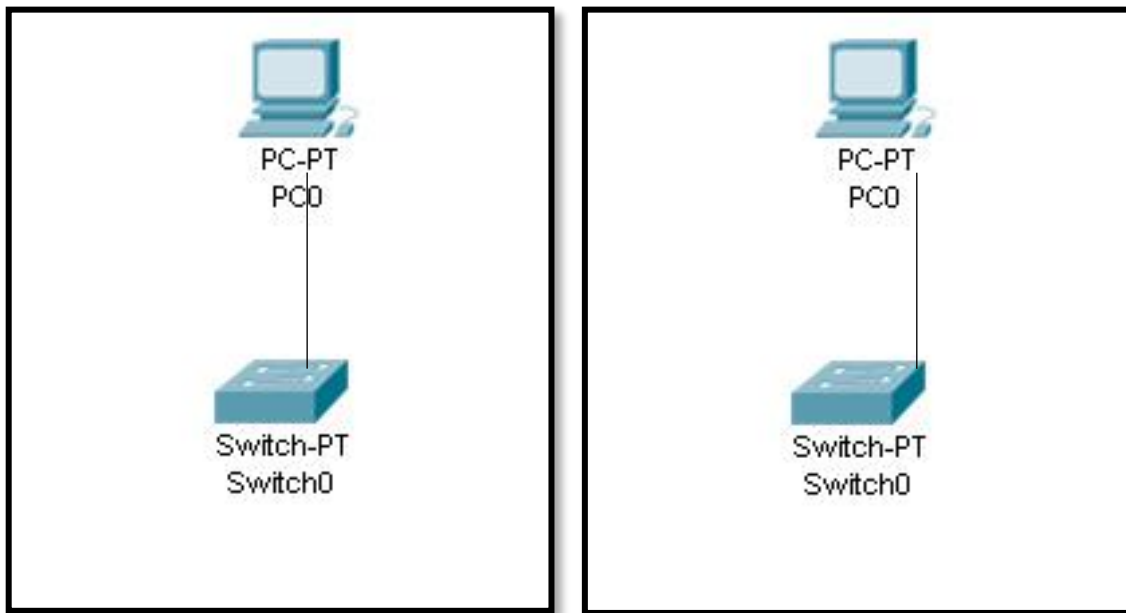
Switch4	192.19.4.1
Server3	192.19.4.2
Access Point5	192.19.4.3
PC0 - PC30	192.19.4.4 – 192.19.4.34

Work Area 5: Network Lab



Switch5	192.19.2.1
Server4	192.19.2.2
Access Point6	192.19.2.3
PC0 - PC30	192.19.2.4 – 192.19.2.34

Work Area 6: Video Conference Room 1 & 2



Switch0	192.19.6.1
PC0 – PC1	192.19.6.2 – 192.19.6.3

Reflection on Task 5

Throughout the process of making task 5, the team has gained a new knowledge, especially on IP addressing scheme which is crucial in making sure that every host can connect to the network without conflict of addresses. By using packet tracer, we get the idea on IP addressing on each device without conflicting the addresses that has been given from the question. The implementation making the work area for the labs and addressing the IP address in each host by using timetable on the report is to help us to distribute the IP addresses with ease.

Extra Information Regarding Project for Clients

As far as we know, the current technology has been elevated to its highest peak of development, especially the Internet. It has become an important part in our life where the technology has been assisting us in connecting with the communities together. Today, the Internet connectivity has evolved from providing us the access to the Internet to powering the complex infrastructure. Hence, our group would like to suggest if the School of Computing willing to spend more the budget for us to provide them with a better performance of the outcome. Throughout this project, we could guarantee that it will be a great contribution and advantages not only towards the School of Computing, even for the Faculty of Engineering and the Universiti Teknologi Malaysia (UTM) itself.

With the more budget received, we could provide the building with the 5G network infrastructure. With 5G is reaching 10 gigabits per second – up to 100 times faster than 4G – 5G networks can deliver the level of performance needed for an increasingly connected society. This would really help the students and communities in making their life easier. With the 5G network infrastructure, it will elevate their performance in completing their work faster without having to worry with the connectivity performance.

Furthermore, if our group managed to provide and perform this project this successfully, it would be a great contribution to the Universiti Teknologi Malaysia (UTM) community as this project will lead to the first university to offer and supply their students with one of the good services among the universities in Malaysia.

Therefore, to provide our client, the School of Computing with a better quality and performance of the outcome, we would suggest that by spend a bit more for this project would really help the Universiti Teknologi Malaysia (UTM) community especially the students by supplying them with the best service.

Team Member Responsibilities

Role	Team Member			
	Haziq Irfan	Iskandar Zulqarnain	Armenda Andryana	Aqilah Syahirah
T1	-Idea construction on level one floor planner -Initial floor planning and round up	-Dimensioning of working areas within logical measures -Rooms positioning	-Sketching initial floor plan for floor 2 -Finalizing the floor plans for both floors	-Creating floor plan for floor 1 -Compile and submit this task
T2	-Feasibility studies on the desired project task -Reasons on feasibility	-Feasibility studies on the desired project task -Compile and submit the task	-Developing questions to be asked to clients regarding this task	-Developing questions to be asked to clients regarding this task
T3	-Reflections on documented list of devices	-Revise the list of devices and calculate budget -Compile and submit the task	-List of device and budget calculation -Finding suitable place to shop the devices	- List of device and budget calculation -Device description
T4	-Overall network distribution in larger viewing angle	-Network distribution on the building by implementing network diagram -Submit this task	-Identifying cables connection such as patches, cords, and switch ports -Cable types and length	-Revising initial floor plans by including dimension -Identified work areas
T5	-Checking on IP addressing schemas	-Checking on IP addressing schemas	-IP addressing scheme and subnetting -Submit this task	-IP addressing scheme and subnetting
T6	-Reflections on Task 1,2 and 5 -Conclusion	-Compiled solution Task 1 to Task 5 -Task 3 reflection -Team Member Responsibilities	-Extra info on project on client view -Reflection on Task 4	-Abstract, Introduction, -Project Background -Meeting Minutes

Conclusion

To sum up what we have gone through this project, we can create what we think as the most suitable floor plan for the 4 labs, considering the right width and length, and provide them with the appropriate internet service. We also managed to do a quick survey to obtain the best price for the devices that are needed without downgrading the quality. The subnet addresses are also successfully determined without much difficulty.

The strength of our floor plan is that the tables and wires placing making the PC and wire easy to be repaired if there is any problem occur. For the video editing lab, the tables and computers are placed in common arrangement and easy to conference with lecturer. For general student lab, we arrange table and computer placed in circles to make it easier for students do discussion.

The weakness of our floor plan is that there is no PC provided in the technician room, so the technician must bring their own laptop and Internet connection if they want to use the room. Furthermore, it is a bit quite challenging for us to do this project since the global pandemic that has been happening for some quite time and still going on. Therefore, there is no physical meeting that has been done between us team throughout the project timeframe. But we manage to go through on our endeavors with the help of internet and guidance from our beloved lecturer.

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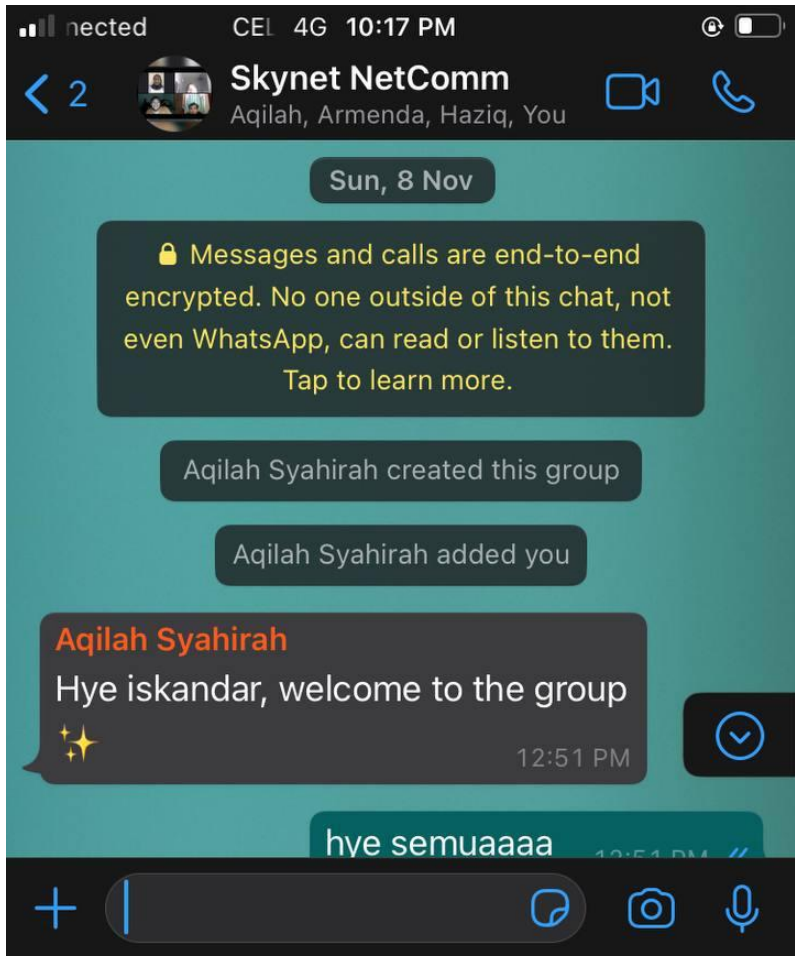
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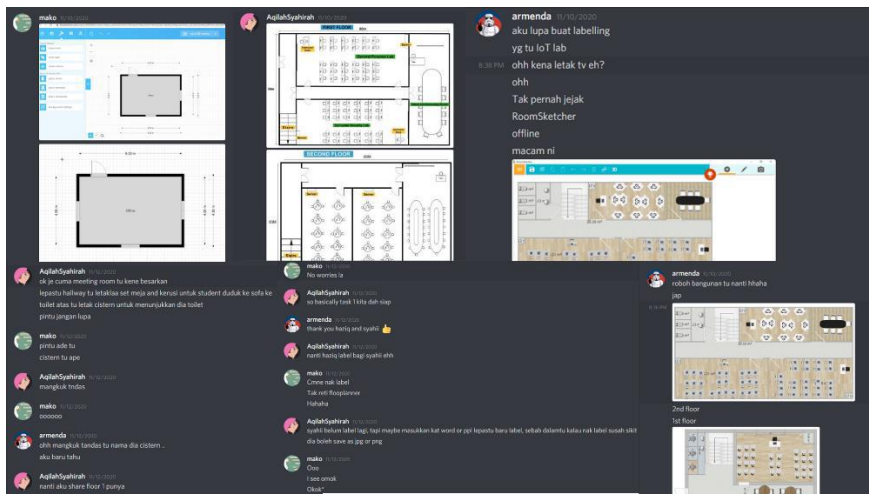
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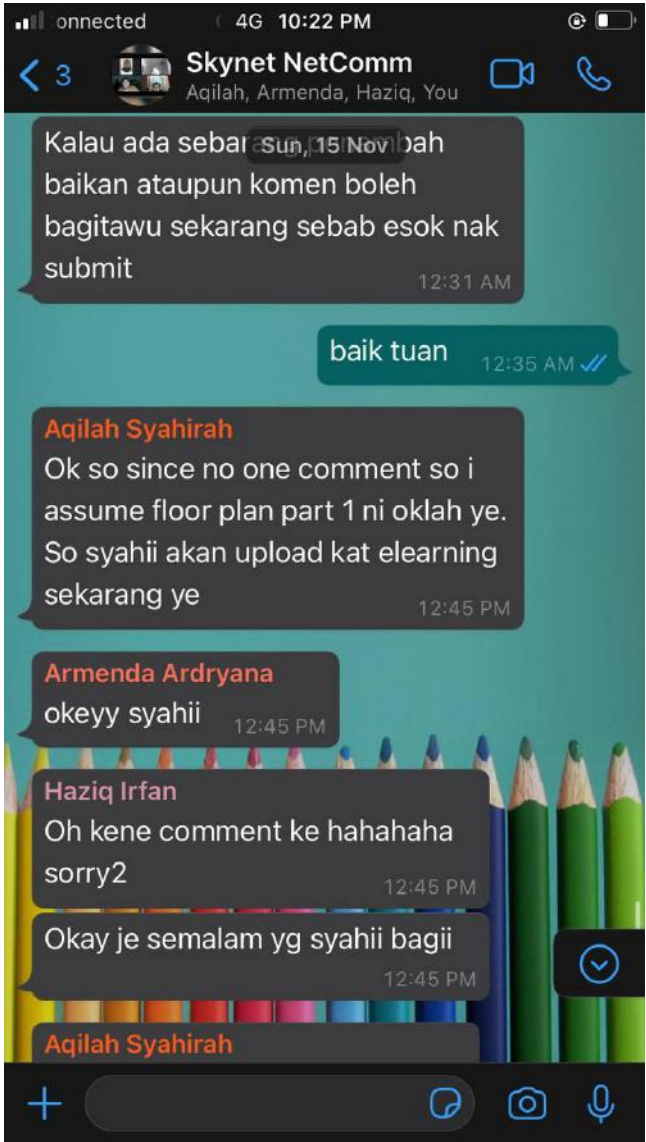
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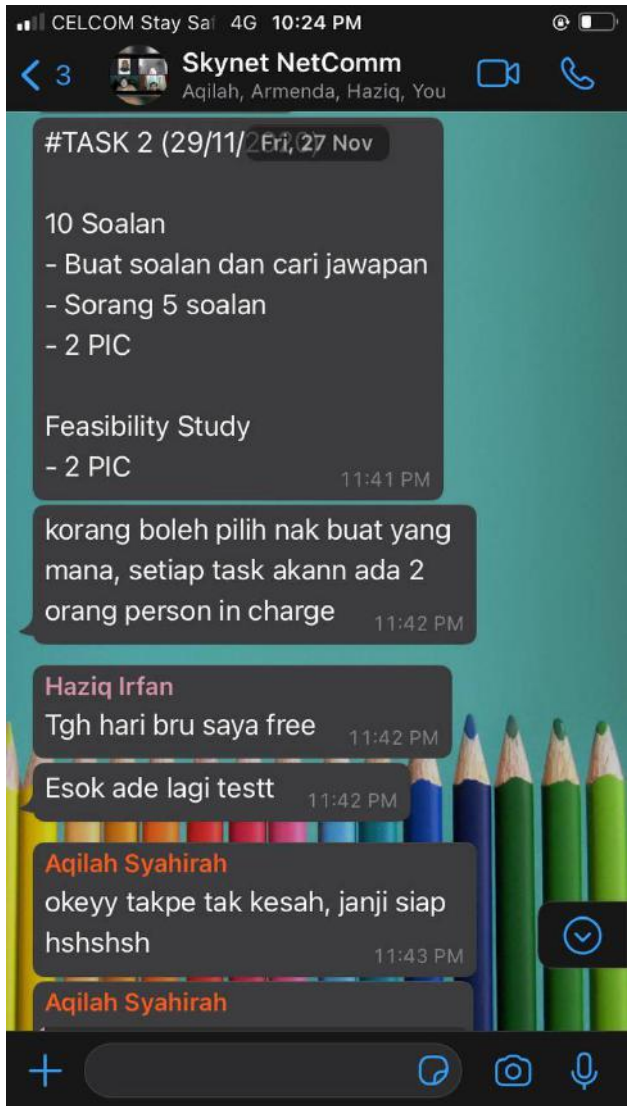
Appendices

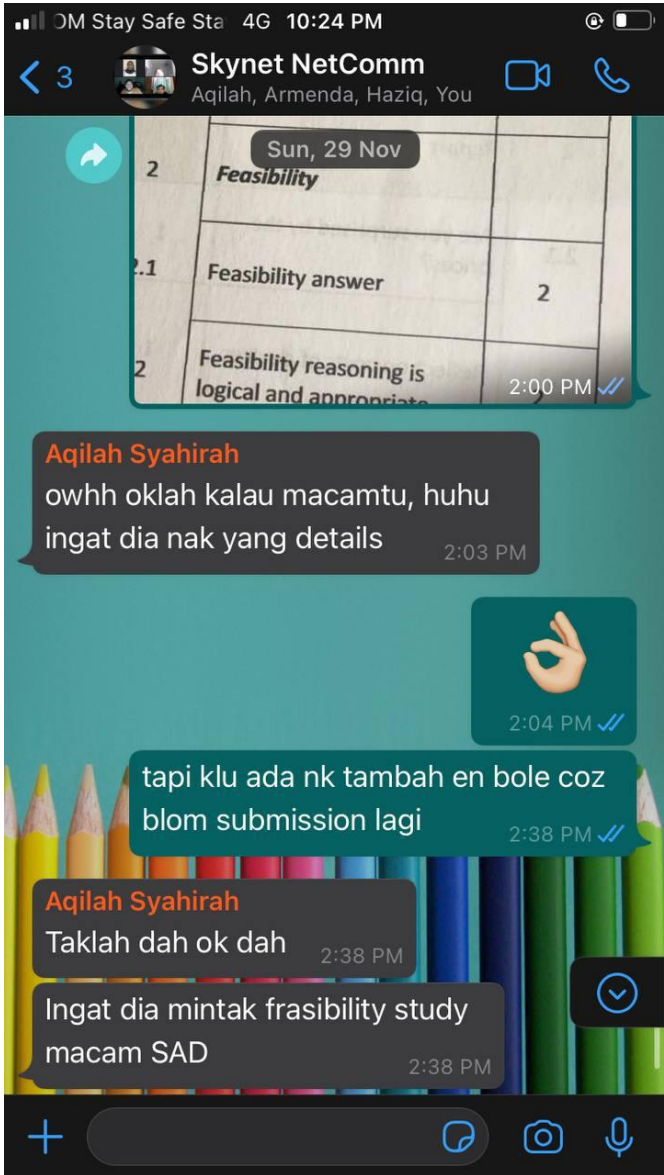
Meeting Minutes of SkyNet

Date	8 TH NOVEMBER 2020 (SUNDAY)
Time	12:30 AM
Attendances	1. HAZIQ IRFAN BIN GHAZALI 2. MUHAMMAD ISKANDAR ZULQARNAIN BIN MOHD ISHAK 3. NUR AQILAH SYAHIRAH BINTI JAYEN @ SUPAAT 4. NUR ARMENDA ANDRYANA BINTI MOHD NOR
Agenda Items	• Find a group member and create a WhatsApp group. • Start discussion about Task 1. • Aqilah created WhatsApp group for our team.
Meeting Evidence	 The screenshot shows a WhatsApp group chat interface. At the top, the status bar indicates 'nected', 'CEL 4G', and '10:17 PM'. The group name is 'Skynet NetComm' with a subtitle 'Aqilah, Armenda, Haziq, You'. A date separator indicates 'Sun, 8 Nov'. A system message states: 'Messages and calls are end-to-end encrypted. No one outside of this chat, not even WhatsApp, can read or listen to them. Tap to learn more.' Below this, two system messages state: 'Aqilah Syahirah created this group' and 'Aqilah Syahirah added you'. A message from 'Aqilah Syahirah' says 'Hye iskandar, welcome to the group' with two star emojis, timestamped '12:51 PM'. At the bottom, a message from 'hve semuaaaa' is partially visible, timestamped '12:51 PM'.

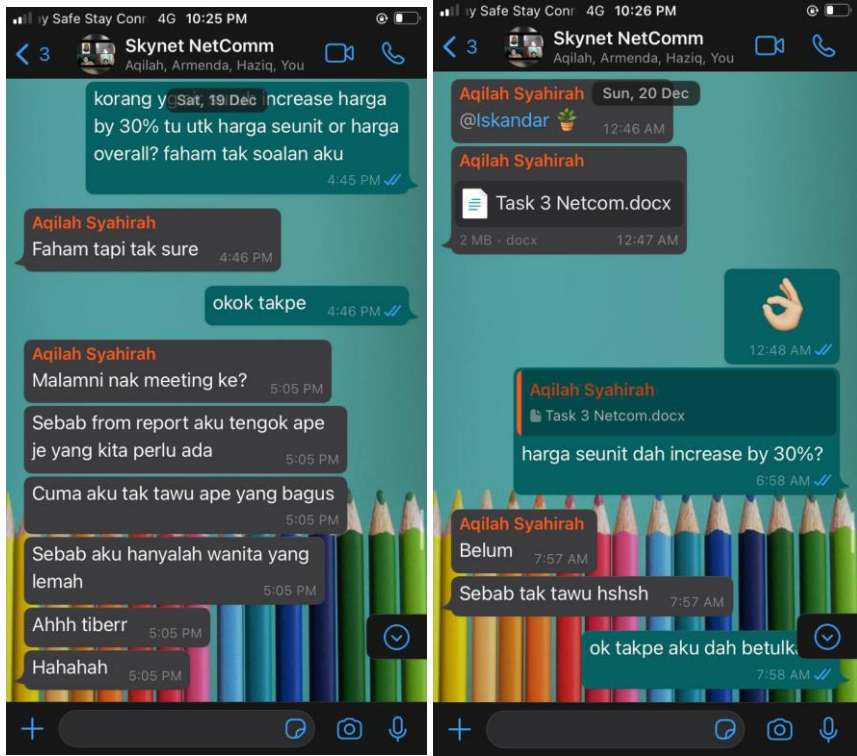
Date	10 TH NOVEMBER 2020 (TUESDAY)
Time	12:00 AM
Attendances	1. HAZIQ IRFAN BIN GHAZALI 2. MUHAMMAD ISKANDAR ZULQARNAIN BIN MOHD ISHAK 3. NUR AQILAH SYAHIRAH BINTI JAYEN @ SUPAAT 4. NUR ARMENDA ANDRYANA BINTI MOHD NOR
Agenda Items	• Divide task among the group members regarding on Task 1. • Discuss about the Use Case of Task 1. • Have a meeting on Discord at 9:00 PM with all group members.
Person In-Charge	• Floor Plan 1 (AQILAH) • Floor Plan 2 (HAZIQ)
Meeting Evidence	 

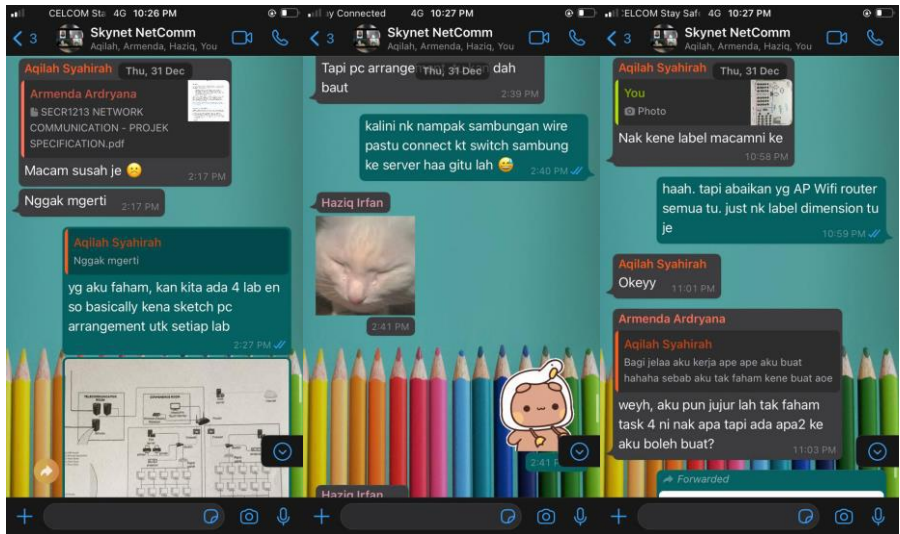
Date	15 TH NOVEMBER 2020 (SUNDAY)
Time	12:30 AM
Attendances	1. HAZIQ IRFAN BIN GHAZALI 2. MUHAMMAD ISKANDAR ZULQARNAIN BIN MOHD ISHAK 3. NUR AQILAH SYAHIRAH BINTI JAYEN @ SUPAAT 4. NUR ARMENDA ANDRYANA BINTI MOHD NOR
Agenda Items	• Compile and submit the report Task 1 (AQILAH)
Meeting Evidence	

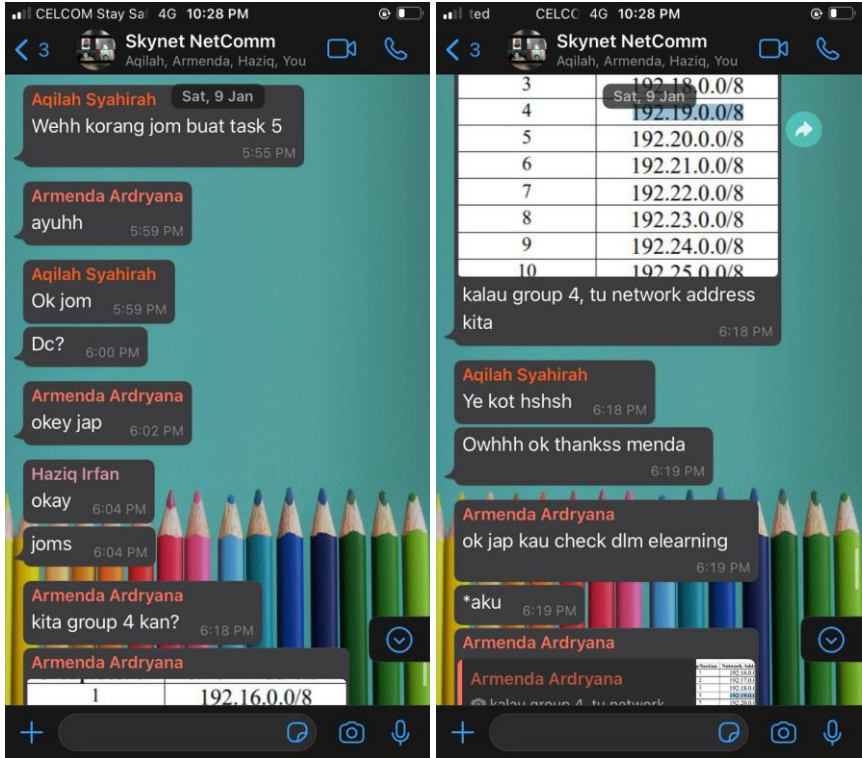
Date	27 TH NOVEMBER 2020 (FRIDAY)
Time	11:40 AM
Attendances	1. HAZIQ IRFAN BIN GHAZALI 2. MUHAMMAD ISKANDAR ZULQARNAIN BIN MOHD ISHAK 3. NUR AQILAH SYAHIRAH BINTI JAYEN @ SUPAAT 4. NUR ARMENDA ANDRYANA BINTI MOHD NOR
Agenda Items	• Discuss Task 2 among group members. • Divide the task among the group members.
Person In-Charge	• Questionnaire (AQILAH & ARMENDA) • Feasibility Study (ISKANDAR & HAZIQ)
Meeting Evidence	 The screenshot shows a WhatsApp chat interface. At the top, the status bar indicates 'CELCOM Stay Sai 4G 10:24 PM'. The chat header shows a group named 'Skynet NetComm' with participants 'Aqilah, Armenda, Haziq, You'. The chat history includes a message from Haziq Irfan: '#TASK 2 (29/11/2020 Fri, 27 Nov)' followed by instructions: '10 Soalan', '- Buat soalan dan cari jawapan', '- Sorang 5 soalan', '- 2 PIC', 'Feasibility Study', '- 2 PIC'. A subsequent message from Haziq Irfan says: 'korang boleh pilih nak buat yang mana, setiap task akann ada 2 orang person in charge'. Then, Haziq Irfan says: 'Tgh hari bru saya free'. Aqilah Syahirah responds: 'Esok ade lagi testt'. Finally, Aqilah Syahirah says: 'okeyy takpe tak kesah, janji siap hshshsh'. The chat interface includes a plus icon for attachments, a search bar, and icons for voice, video, and voice recording.

Date	29 TH NOVEMBER 2020 (SUNDAY)
Time	02:00 PM
Attendances	1. HAZIQ IRFAN BIN GHAZALI 2. MUHAMMAD ISKANDAR ZULQARNAIN BIN MOHD ISHAK 3. NUR AQILAH SYAHIRAH BINTI JAYEN @ SUPAAT 4. NUR ARMENDA ANDRYANA BINTI MOHD NOR
Agenda Items	• Submit report Task 2 (ISKANDAR)
Meeting Evidence	

Date	16 TH DECEMBER 2020 (WEDNESDAY)
Time	05:00 PM
Attendances	1. HAZIQ IRFAN BIN GHAZALI 2. MUHAMMAD ISKANDAR ZULQARNAIN BIN MOHD ISHAK 3. NUR AQILAH SYAHIRAH BINTI JAYEN @ SUPAAT 4. NUR ARMENDA ANDRYANA BINTI MOHD NOR
Agenda Items	• Discuss Task 3 among group members. • Divide the task among the group members.
Person In-Charge	• List of Device and Calculate Budget (AQILAH & ARMENDA) • Reflection (ISKANDAR & HAZIQ)
Meeting Evidence	 The screenshot shows a WhatsApp chat interface. At the top, the status bar shows 'CELCOM Stay S 4G 10:25 PM'. The chat header shows a group named 'Skynet NetComm' with members 'Aqilah, Armenda, Haziq, You'. The chat history includes: - Aqilah Syahirah (Wed, 16 Dec): 'Aku maybe akan muka mengedit pada hari <u>sabtu malam</u> ye.' (6:14 PM) - And kalau nak buat meeting <u>sabtu malam</u> aku free lain semua tak hehe sorry (6:14 PM) - Armenda Ardryana: 'sama <u>sabtu malam</u> je free huhu' (6:15 PM) - Aqilah Syahirah: 'And kalau nak buat meeting sabtu malam aku free lain semua tak hehe sorry' (6:52 PM) - Haziq Irfan Oraitt: 'bole' (6:52 PM) - Tabley: 'bole' (6:52 PM) - Jk: 'bole' (6:52 PM)

Date	20 TH DECEMBER 2020 (SUNDAY)
Time	01:20 PM
Attendances	1. HAZIQ IRFAN BIN GHAZALI 2. MUHAMMAD ISKANDAR ZULQARNAIN BIN MOHD ISHAK 3. NUR AQILAH SYAHIRAH BINTI JAYEN @ SUPAAT 4. NUR ARMENDA ANDRYANA BINTI MOHD NOR
Agenda Items	• Submit report Task 3 (ISKANDAR)
Meeting Evidence	 The evidence consists of two screenshots from a WhatsApp chat titled 'Skynet NetComm' with participants Aqilah, Armenda, Haziq, and You. The left screenshot, dated Saturday, 19 Dec, shows a conversation where someone asks about a 30% price increase for 'harga seunit' and Iskandar responds with 'Faham tapi tak sure' (Understand but not sure). The right screenshot, dated Sunday, 20 Dec, shows Aqilah sending a document titled 'Task 3 Netcom.docx' and asking 'harga seunit dah increase by 30%?' (has the unit price increased by 30%). Iskandar replies 'Belum' (Not yet) and 'Sebab tak tau hshsh' (Because I don't know hshsh).

Date	31 ST DECEMBER 2020 (THURSDAY)
Time	11:30 AM
Attendances	1. HAZIQ IRFAN BIN GHAZALI 2. MUHAMMAD ISKANDAR ZULQARNAIN BIN MOHD ISHAK 3. NUR AQILAH SYAHIRAH BINTI JAYEN @ SUPAAT 4. NUR ARMENDA ANDRYANA BINTI MOHD NOR
Agenda Items	• Discuss Task 4 among group members. • Divide the task among the group members. • Iskandar leads the Task 4 and brief us clearly on how to do it. • After finish, we submit the report.
Person In-Charge	• ISKANDAR
Meeting Evidence	

Date	9 TH JANUARY 2021 (SATURDAY)
Time	06:00 PM
Attendances	1. HAZIQ IRFAN BIN GHAZALI 2. MUHAMMAD ISKANDAR ZULQARNAIN BIN MOHD ISHAK 3. NUR AQILAH SYAHIRAH BINTI JAYEN @ SUPAAT 4. NUR ARMENDA ANDRYANA BINTI MOHD NOR
Agenda Items	• Discuss Task 5 among group members. • Divide the task among the group members. • Aqilah and Armenda leads the Task 5. • We complete Task 5 and submit it.
Person In-Charge	• AQILAH • ARMENDA
Meeting Evidence	

Date	21 ST JANUARY 2021 (THURSDAY)
Time	08:00 PM
Attendances	1. HAZIQ IRFAN BIN GHAZALI 2. MUHAMMAD ISKANDAR ZULQARNAIN BIN MOHD ISHAK 3. NUR AQILAH SYAHIRAH BINTI JAYEN @ SUPAAT 4. NUR ARMENDA ANDRYANA BINTI MOHD NOR
Agenda Items	• Discuss Task 6 among group members. • Divide the task among the group members.
Person In-Charge	• AQILAH - Abstract, Introduction, Project Background, Minutes Meeting • ISKANDAR - Compile Task 1-5, Reflection on Task 3, Team Member & Responsibilities. • HAZIQ - Reflection on Task 1, 2 & 5, and Conclusion. • ARMENDA - Extra Info on Project & Reflection on Task 4
Meeting Evidence	