



**UTM**  
UNIVERSITI TEKNOLOGI MALAYSIA

**FACULTY OF COMPUTING**

**SEMESTER 1 2024/2025**

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**SECR1213 – NETWORK COMMUNICATIONS**

**SECTION 12**

**PROJECT TASK 1**

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**GROUP 12.1 (POWERPUFF)**

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## 4.1 Identify the work areas on floor plan

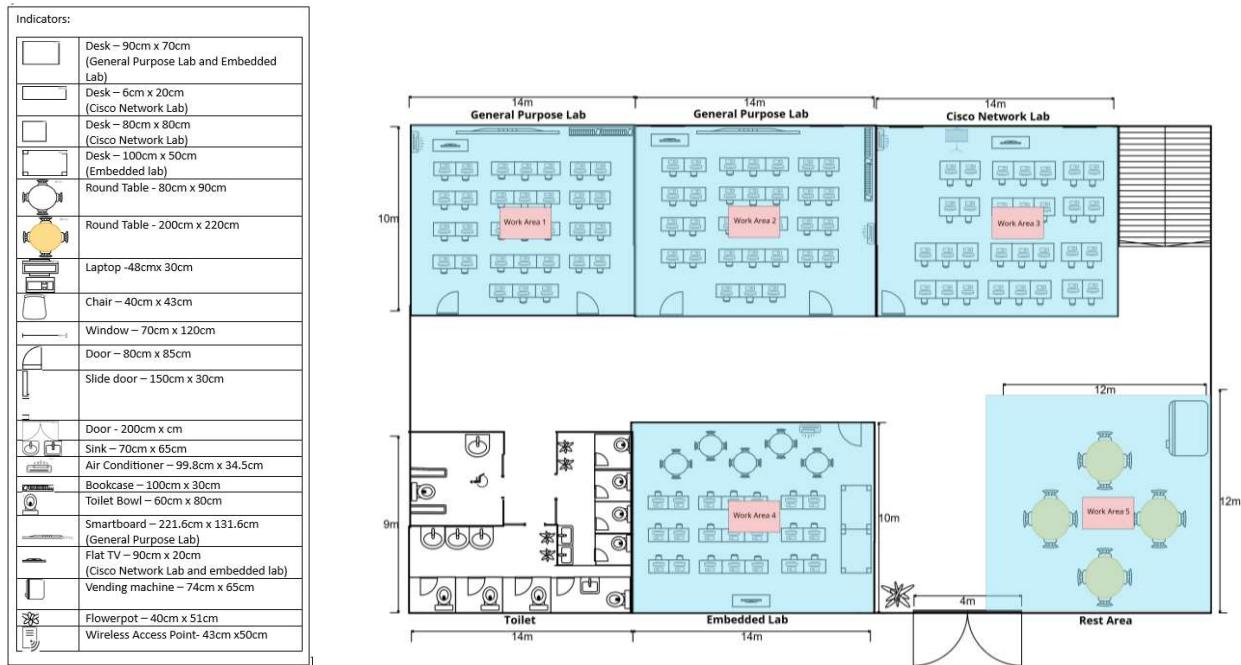


Figure 4.1.1: Work Area at Ground Floor

The facility is divided into five main work areas, each designed for specific purposes to meet the diverse needs of its users. **Work Area 1**, located in the leftmost section, is a General Purpose Lab measuring 14 meters in length and 10 meters in width. It is tailored for general computing and training tasks, such as lectures, workshops, and assignments requiring standard computing setups.

Similarly, **Work Area 2**, the middle General Purpose Lab, also measures 14 meters by 10 meters. Centrally located between the other labs, it supports activities like training sessions, coursework, and collaborative learning. It includes desks and chairs, making it suitable for presentations, tutorials, or team-based work. Each lab is equipped with a total of 31 PC workstations. Consequently, the general labs require three 24-port switches to connect all the workstations.

On the far-right side of the facility is **Work Area 3**, the Cisco Network Lab, which is also 14 meters in length and 10 meters in width. This specialized lab is designed for networking-related activities, offering hands-on experience with routers, switches, and networking cables. It supports advanced tasks such as network configuration, troubleshooting, and simulations, ensuring users gain practical knowledge in networking. There are 30 workstations for students, one workstation and projector for lecturers to work with their teaching materials. In addition to that, one wireless access point will be installed and placed in a corridor outside of the network lab.

Positioned in the bottom-left section is **Work Area 4**, the Embedded Lab, measuring 14 meters by 10 meters and consisting of 21 workstations. With round tables and collaborative setups, it encourages teamwork and project-based learning, making it ideal for tasks involving microcontrollers, sensors, and circuit design.

Lastly, **Work Area 5**, located in the bottom-right section, is the Rest Area, which measures 12 meters in length and 12 meters in width. This non-technical zone is dedicated to relaxation and informal discussions. It features round tables with chairs and a vending machine, creating a casual and welcoming atmosphere for unwinding or brainstorming. Positioned near the main entrance, it offers easy access and serves as a crucial balance to the technical-focused areas, fostering productivity and creativity.



**Figure 4.1.2: Work Area at First Floor**

**Work Area 6** shown in Figure 4.1.2 is a Lecturer Catering Room. The Lecturer Catering Room is a designated space tailored for staff relaxation and informal gatherings. It features a central dining table surrounded by chairs, creating an ideal environment for casual meals or discussions among lecturers. The room is equipped with basic amenities, including a countertop and a sink.

for convenience. This setup ensures that lecturers have a comfortable area to recharge and socialize during breaks, enhancing their overall work experience.

Located in the top-left section of the floor plan, Work Area 7, the Lecturer Offices, provides a private and focused environment for lecturers to carry out their academic and administrative tasks. Each office is equipped with essential furniture, such as desks and chairs, allowing lecturers to prepare lecture materials, conduct research, and grade assignments. These offices balance personal workspace with easy access to communal areas, fostering both productivity and collaboration.

Located in the upper-central section of the floor plan, Work Area 8, the Video Conferencing Room, is purposefully designed to support virtual meetings, presentations, and collaborative work. The room features a high-quality central projector, a dedicated PC, and a strategically positioned screen for optimal visibility. A large conference table surrounded by chairs fosters group discussions and allowed participants to engage effectively in both virtual and in-person settings. This design ensures a professional environment for seamless communication and interaction.

Located in the top-right section of the floor plan, Work Area 9, the Hybrid Classroom, is designed to accommodate both in-person and online learning. It features rows of desks and chairs arranged in a traditional classroom layout, ensuring clear visibility of the instructor and teaching materials. Advanced tools, including projectors, microphones, screens, and camera are integrated to support hybrid teaching methods. This setup enables educators to deliver engaging lessons to both on-site and remote participants, making it a highly versatile learning space.

Located in the center-left section of the floor plan, Work Area 10, the Mini Mart, serves as a convenient retail space for students and staff. It offers quick access to snacks, drinks, and other essential items. Shelves are arranged for easy product display, while a checkout counter ensures efficient service. Positioned near the student lounge, the mini-mart promotes accessibility and convenience, catering to the fast-paced needs of its users.

Located in the center-bottom section of the floor plan, Work Area 11, the Student Lounge, is a welcoming and comfortable space designed for relaxation, socialization, and informal study. It includes a variety of seating options, such as sofas and round tables, catering to individual or group activities. The lounge's inviting design encourages community engagement while providing students with a refreshing escape from academic routines.

Located in the bottom-right section of the floor plan, Work Area 12, the Catering Area, serves as a dining space for both students and staff. Large tables and chairs accommodate group meals or small events, making the area versatile and functional. Its proximity to the mini mart ensures easy access to refreshments, creating a convenient and enjoyable dining experience for everyone.

Lastly, Work Area 12, the server room is specifically designed to provide a dedicated space for the storage and protection of crucial data, along with the implementation of necessary monitoring and security measures. The server room houses a CCTV in addition to two servers.

Consequently, the switch and router is required to connect all PC workstations, the projector, and the four servers.

## 4.2 The distribution and connection of devices

### 4.2.1 Network Distribution Diagram

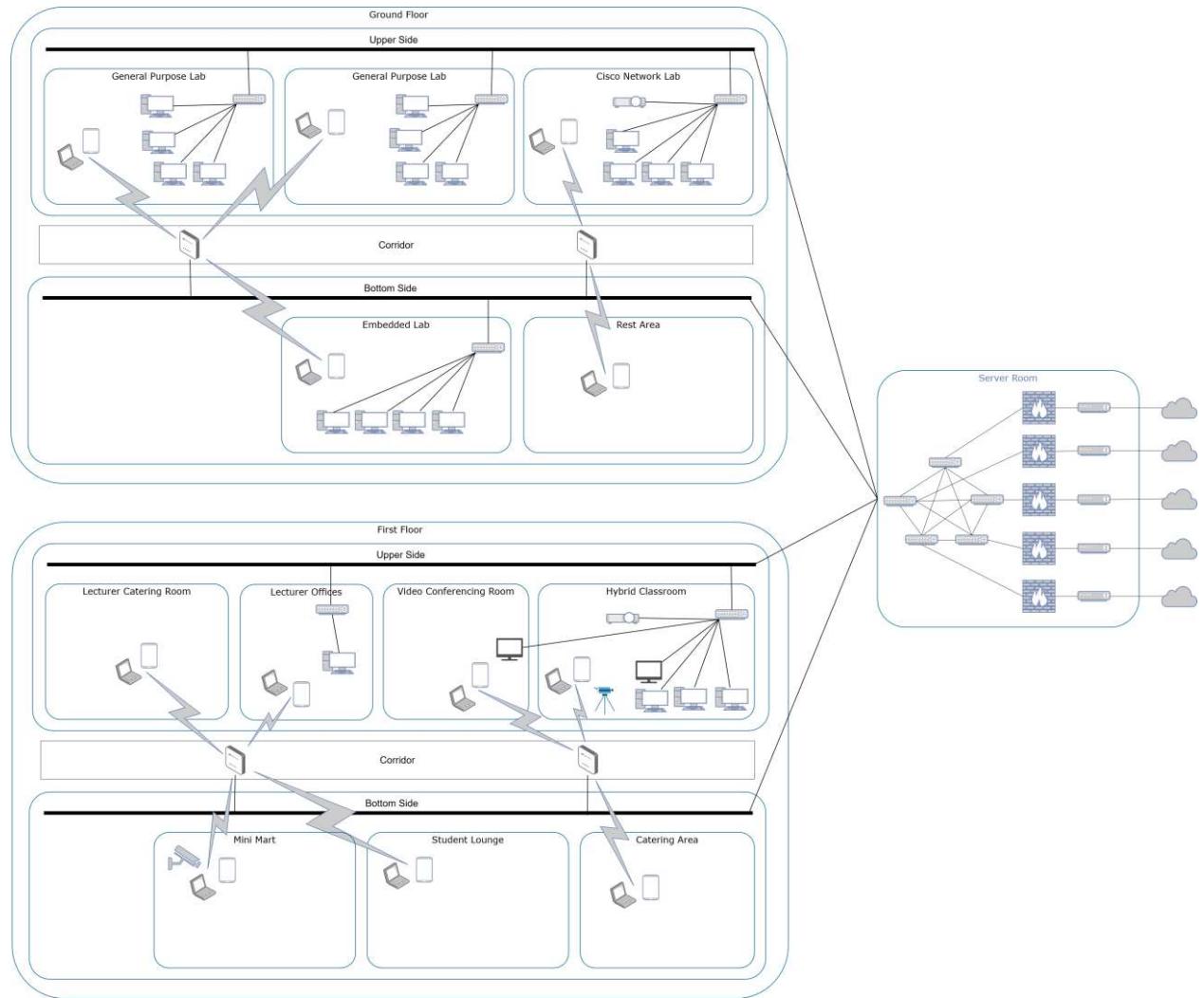


Figure 4.2.1.1: Network Distribution Diagram

The Network Distribution diagram illustrates the arrangement of network devices across different rooms, mainly focusing on how the internet is connected between network devices in these rooms. Figure 4.2.1.1 shows the Network Distribution Diagram for both ground floor and first floor with their upper and lower side. For every room that has wired network devices, they will be connected to a switch in each room, except for Lecturer Offices, Video Conferencing Room and Hybrid Classroom. All the Lecturer Offices will share a switch, and the Video Conferencing Room will share a switch with Hybrid Classroom. For areas that do not have wired network devices such as Lecturer Catering Area, Rest Area, Student Lounge, and the Catering Area, the network devices are connected to the wireless access points located in the corridor of respective floor. This setup

forms different subnets in different rooms to facilitate the efficiency of communication among network devices in each room, reduce latency, and increase transmission speed.

To obtain a clearer view of the network distribution for ground floor and first floor, refer to Figure 4.2.1.2 and 4.2.1.3.

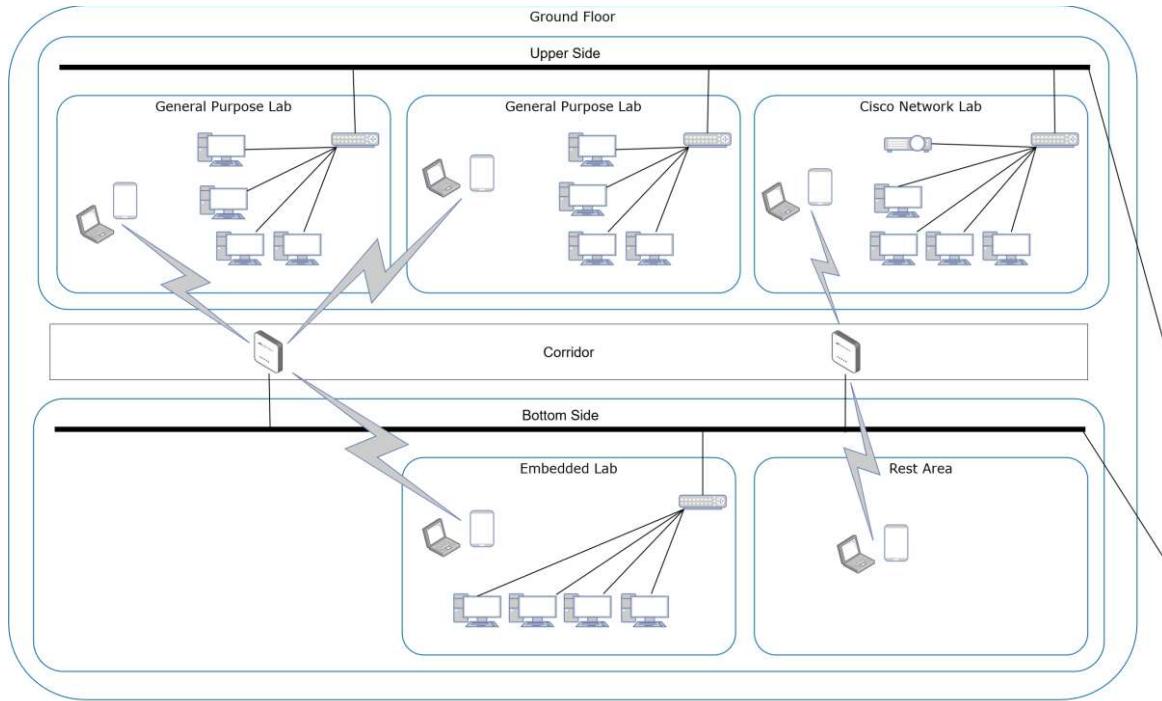


Figure 4.2.1.2: Network Distribution Diagram – Ground Floor

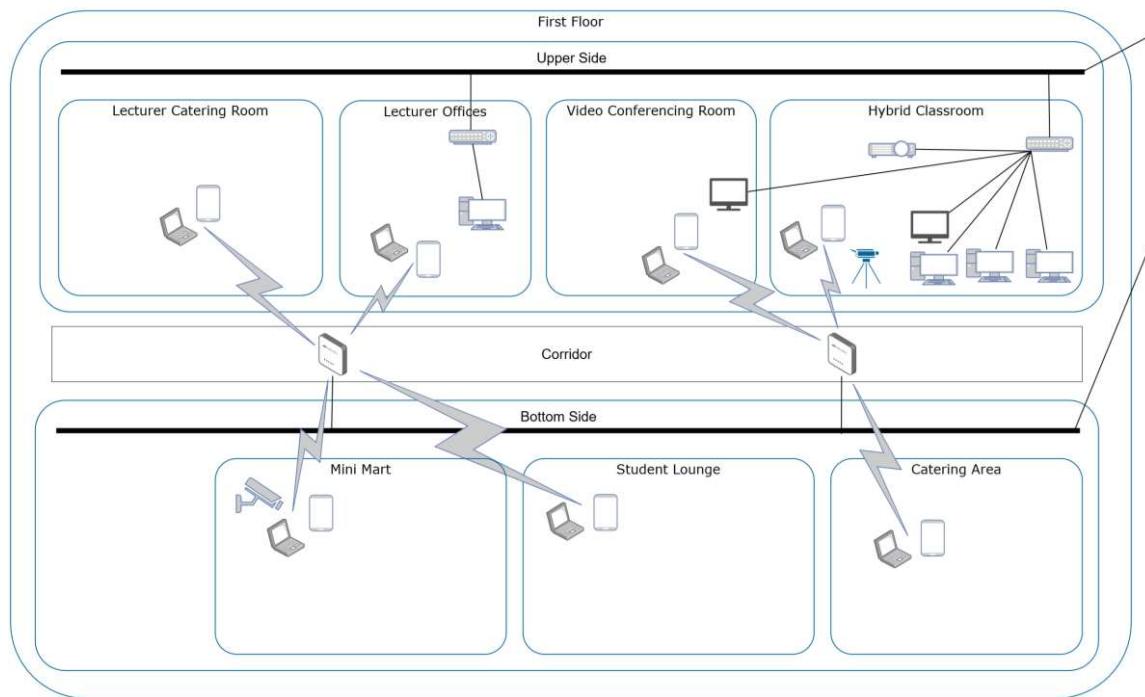


Figure 4.2.1.3: Network Distribution Diagram – First Floor

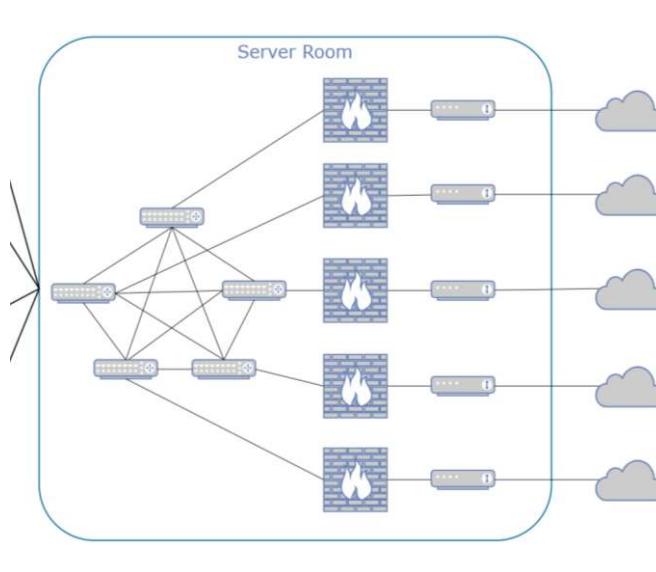


Figure 4.2.1.4: Network Distribution Diagram – Server Room

Figure 4.2.1.4 describes the network distribution of the server room. For the server room, we connect 5 routers together using mesh topology and fiber optic cable. This could ensure the

functionality of other routers if one of the routers eventually fails to function. This is because each router is connected to two routers, if one is down then the router will send frames through the other router to maintain the network connectivity. In addition, each router is independently connected to the Internet to avoid the situation where a router is down but causing the whole network to be destroyed. Therefore, this setup could effectively cope with potential emergencies and network disruption.

4.2.2	Room	Level	Network	Distribution	Diagram
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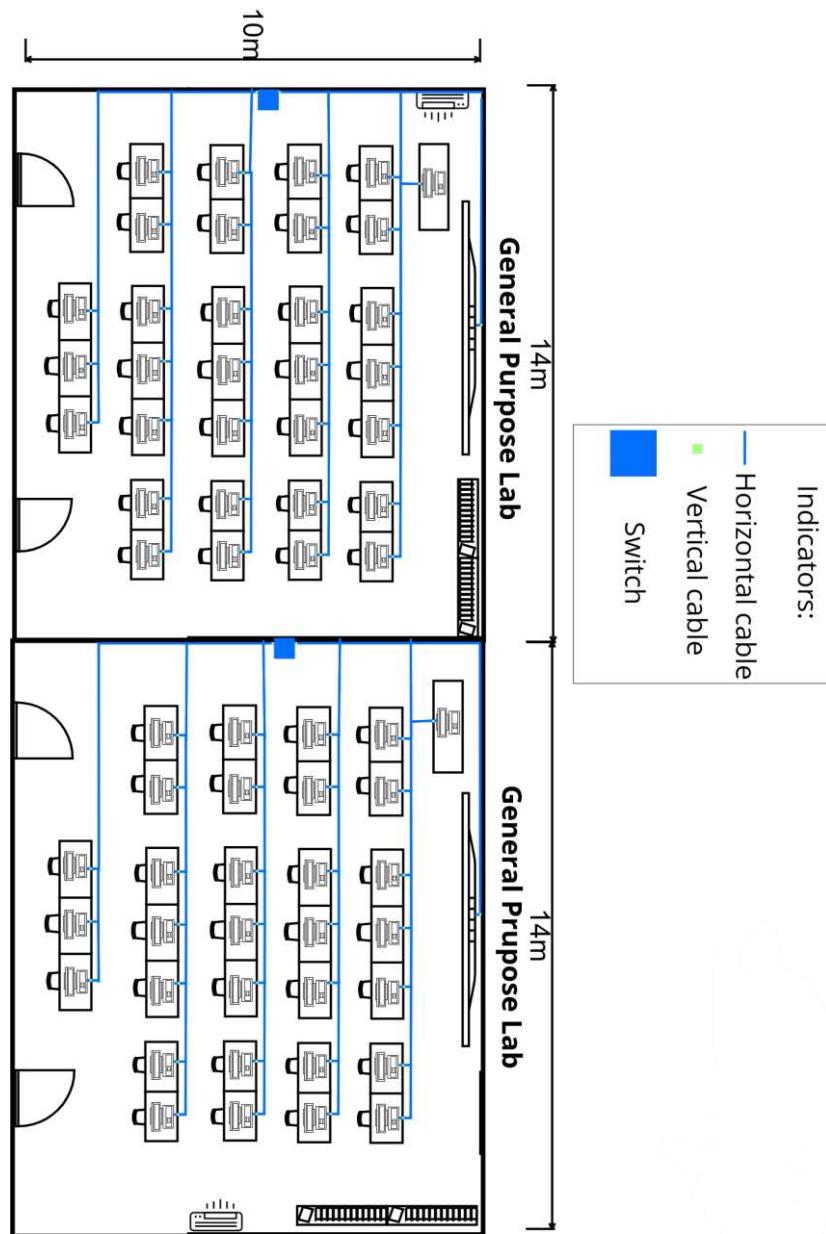


Figure 4.2.2.1: General Lab

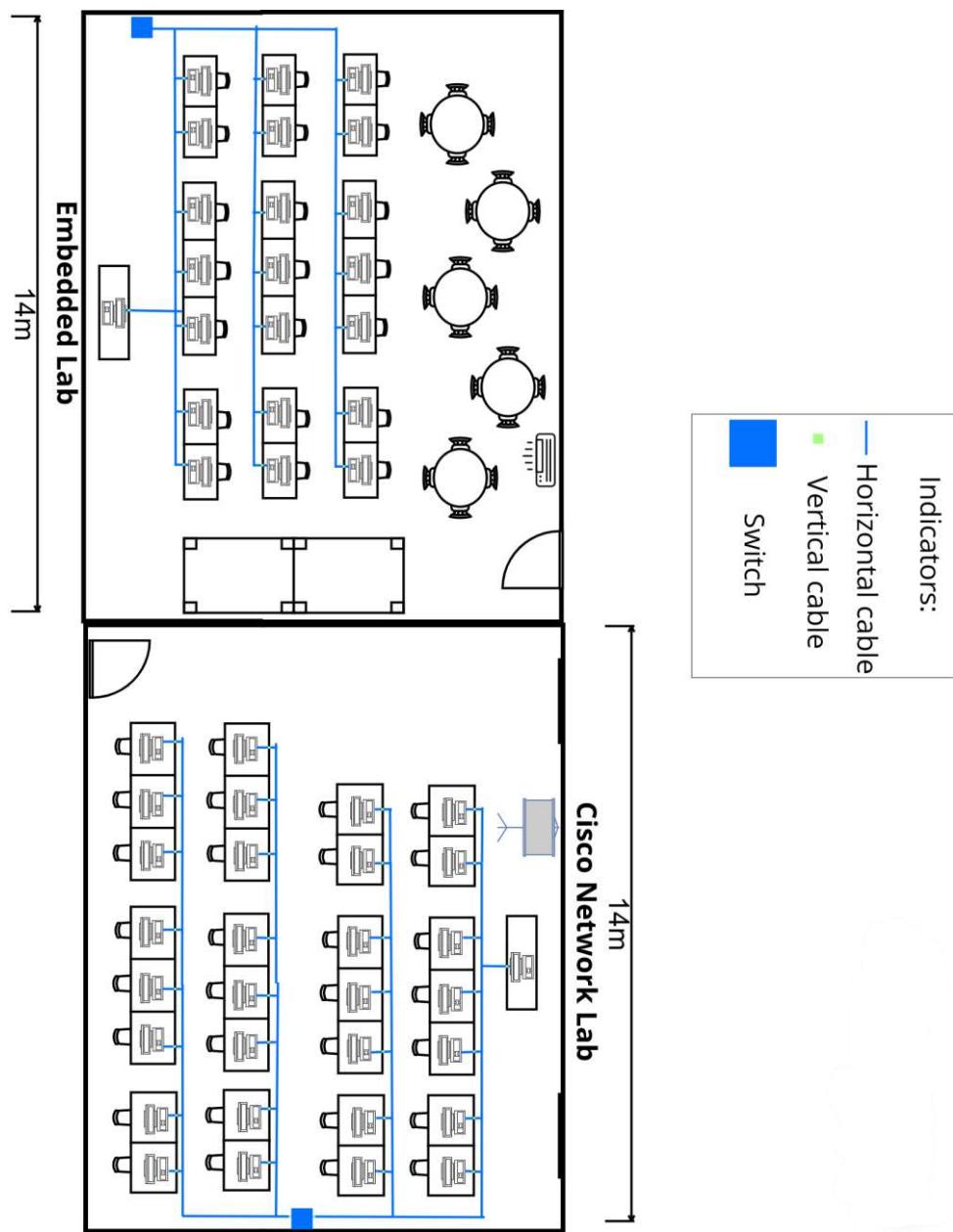
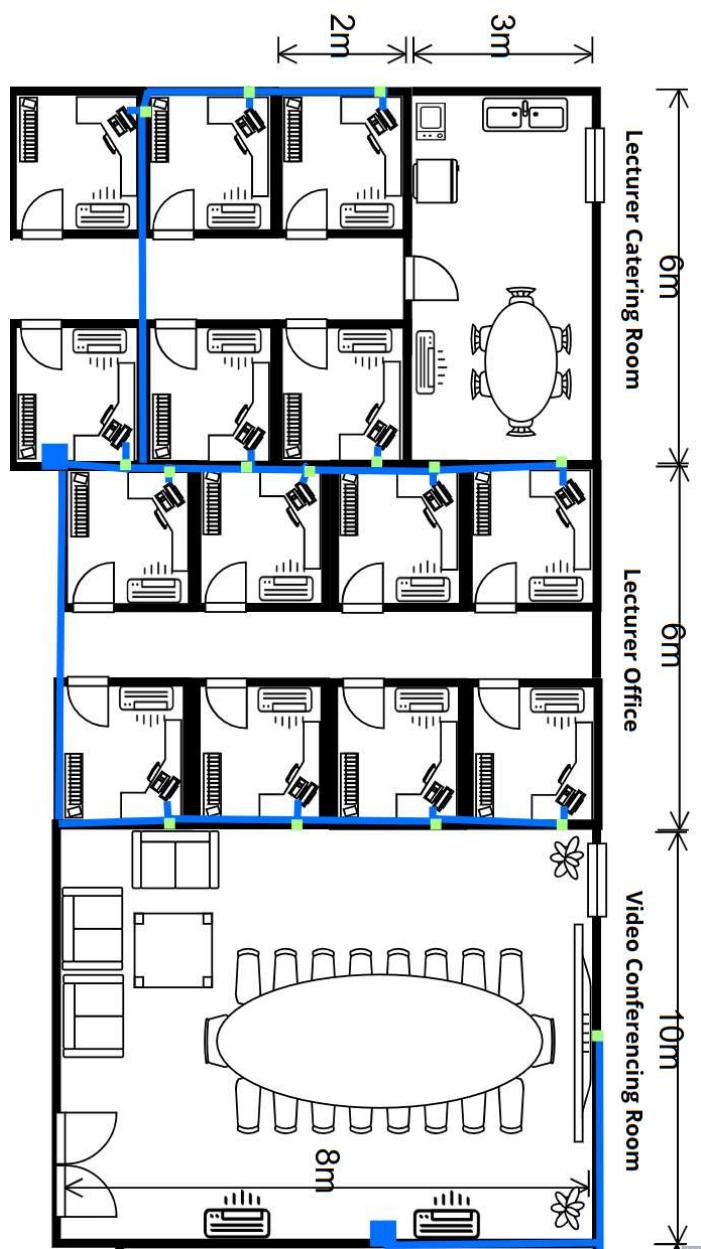


Figure 4.2.2.2: Cisco Network Lab and Embedded Lab





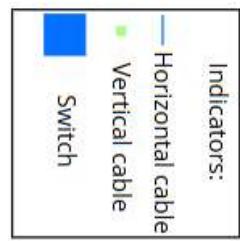


Figure 4.2.2.3: Lecturer Offices and Video Conferencing Room

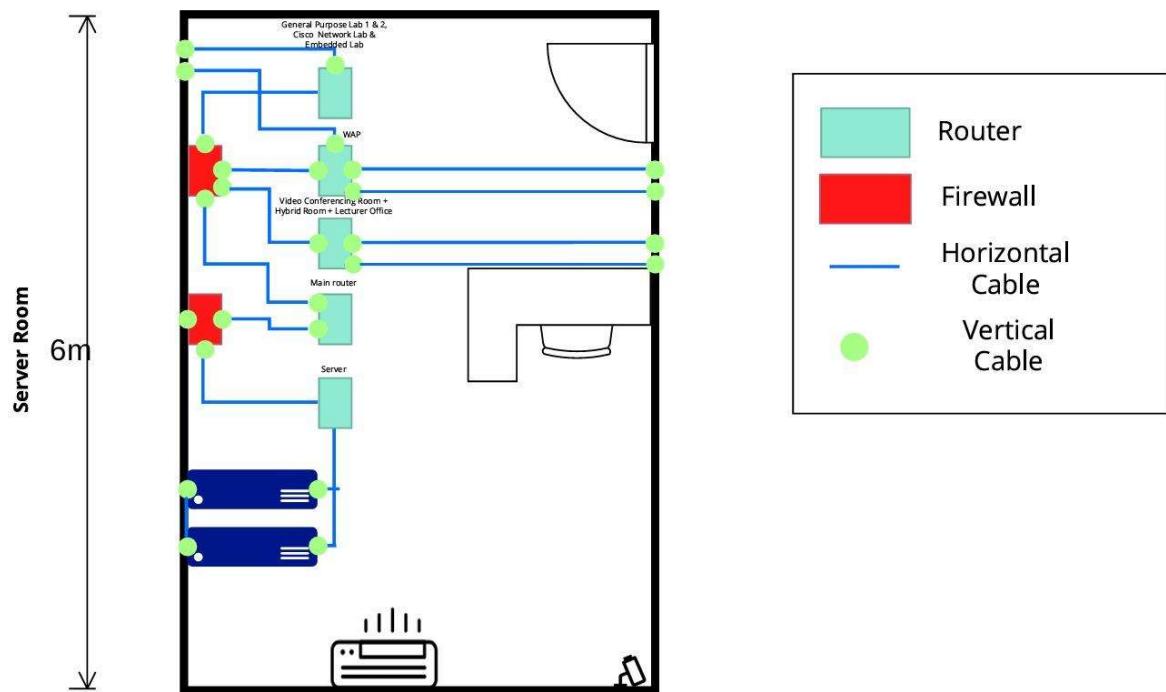


Figure 4.2.2.4: Server Room



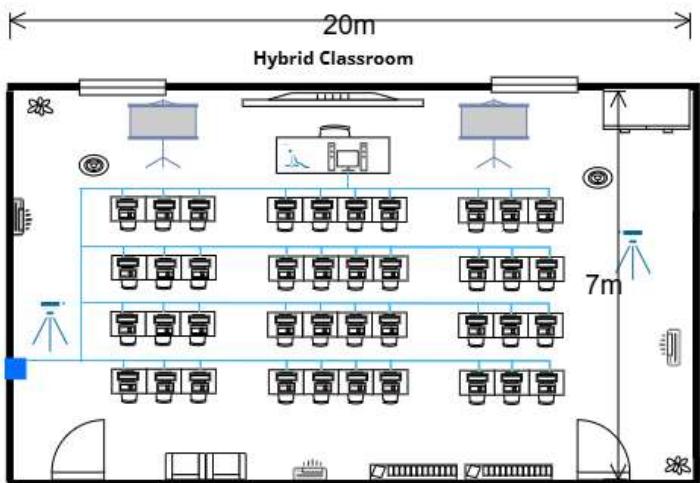
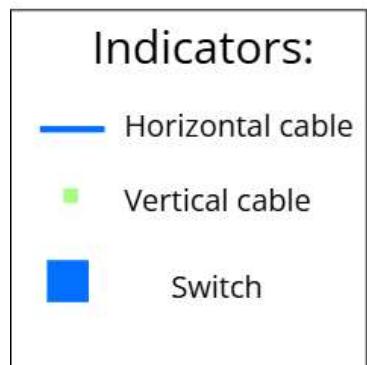
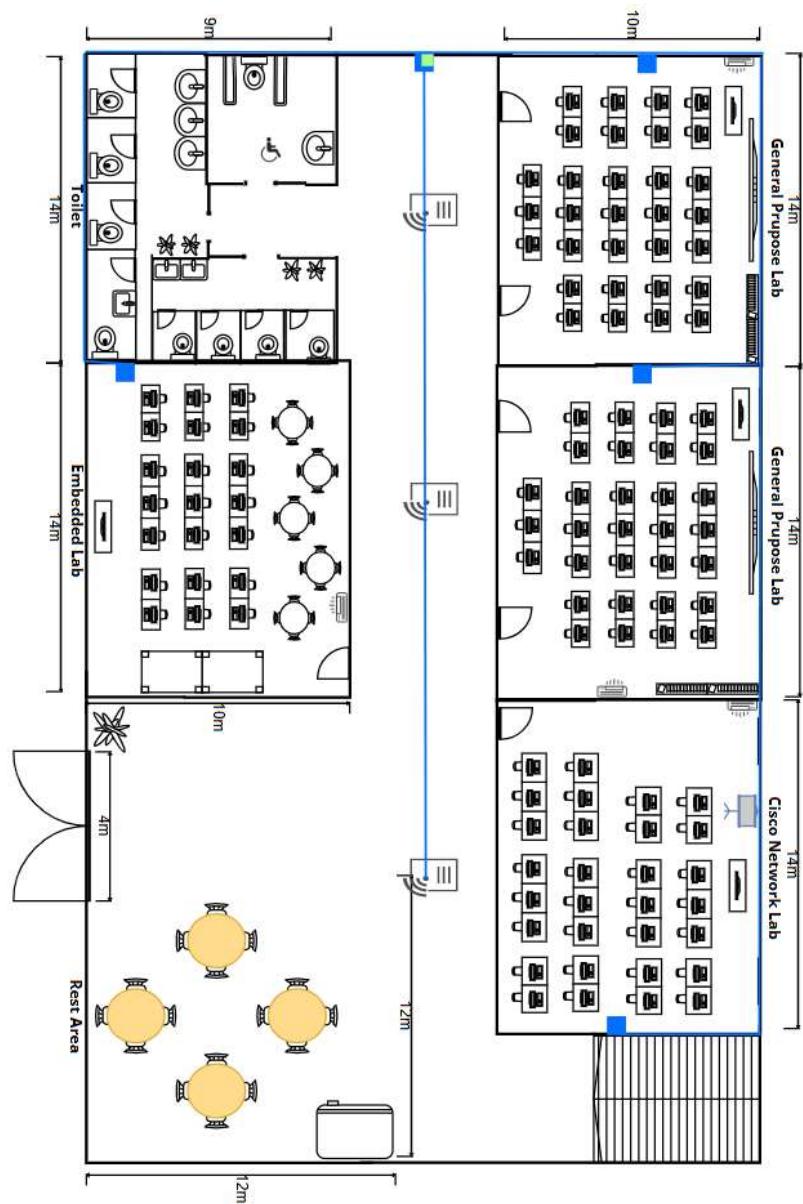


Figure 4.2.2.5: Hybrid Classroom

#### 4.2.3 Floor Diagram



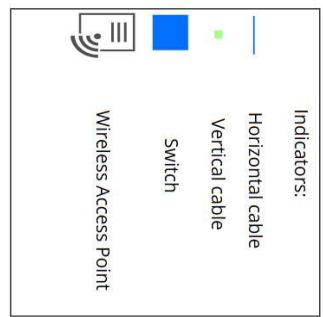


Figure 4.2.3.1 Cable Distribution of Ground Floor

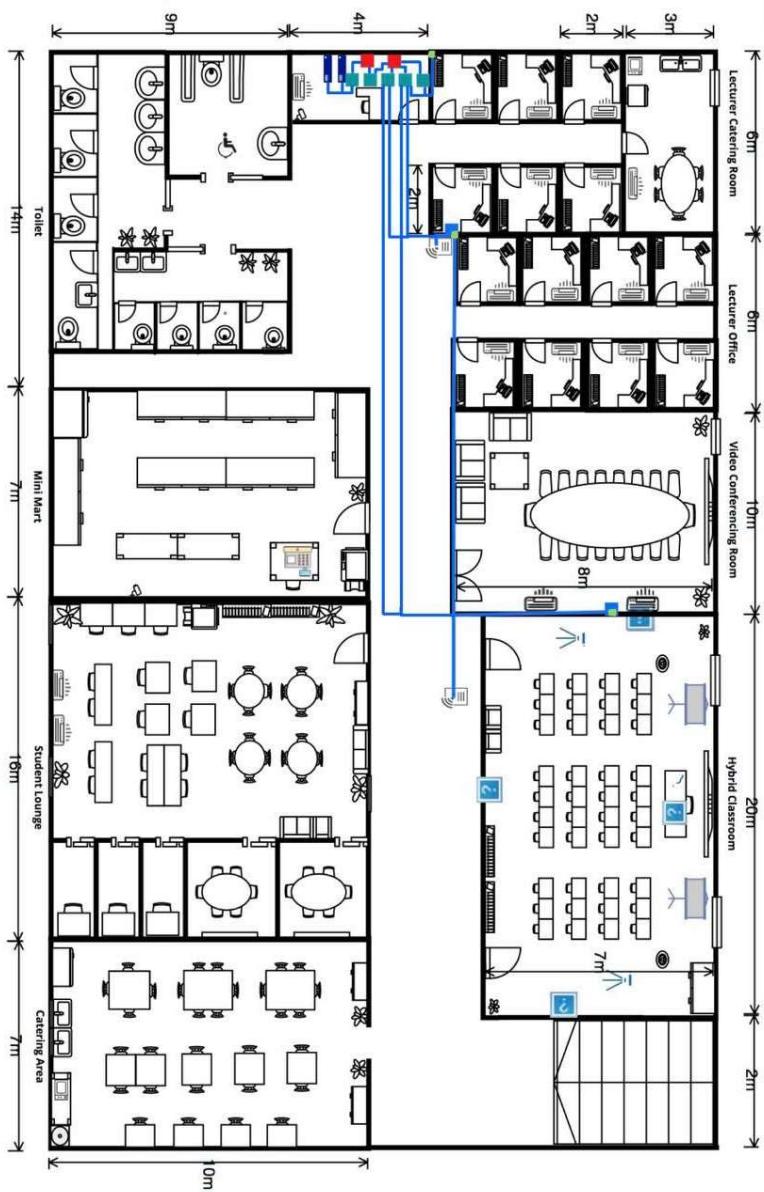




Figure 4.2.3.2 Cable Distribution of First Floor

Figure 4.2.3.1 and Figure 4.2.3.2 show the planned network connections for the building. All the connections will originate from the server room where the meshed routers are located. Each switch will be connected to the router, serving as a direct connection to establish a strong connection to the Internet. Moreover, the diagram can illustrate the interconnection of wireless access points within the network in the ground floor and first floor of the building.

#### **4.3 Number of connections, patch cords and switch ports needed**

<b>Area</b>	<b>Number of Switch Ports Needed</b>
General Lab	34
General Lab	34
Cisco Network Lab	33
IoT Lab	23
Corridor for ground floor	8
Lecturer Office	14
Video Conferencing Room	1
Hybrid Classroom	44
Server Room	12
Corridor for first floor	3
<b>Total:</b>	<b>205</b>

<b>Area</b>	<b>Number of Patch Cords Needed</b>
General Lab	68
General Lab	68
Cisco Network Lab	66
IoT Lab	46
Corridor for ground floor	16
Lecturer Office	28
Video Conferencing Room	2
Hybrid Classroom	88
Server Room	24
Corridor for first floor	6
<b>Total:</b>	<b>410</b>

<b>Area</b>	<b>Number of RJ45 Connector Needed</b>
General Lab	68
General Lab	68
Cisco Network Lab	66
IoT Lab	46
Corridor for ground floor	8
Lecturer Office	28
Video Conferencing Room	2
Hybrid Classroom	88

Server Room	15
Corridor for first floor	6
<b>Total:</b>	<b>493</b>

<b>Area</b>	<b>Number of Subscriber Connector Needed</b>
Corridor for ground floor	8
Server Room	9
<b>Total:</b>	<b>17</b>



#### 4.4 Identify cable types and length

Ethernet Cable – Cat 6				
Area	Length (m)		Total Length (m)	Total Price of Cable Used (RM)
	Horizontal	Vertical		
<b>Ground Floor</b>				
General Purpose Lab 1	69.58	50.50	120.08	1123.95
General Purpose Lab 2	69.58	50.50	120.08	1123.95
Cisco Network Lab	62.08	45.90	107.98	1010.69
Embedded Lab	46.68	34.50	81.18	759.84
Main switch for all labs connects to WAP1, WAP2, WAP3	71.80	-	71.80	672.05
<b>Ground Floor Room Total</b>			<b>501.12</b>	<b>4690.48</b>
<b>First Floor</b>				
Video Conferencing Room	20.00	3.20	23.20	217.15
Server Room	3.80	7.8	11.60	108.58
Lecturer Office	126.60	72.80	199.40	1866.38
Hybrid Classroom	61.28	48.80	110.08	1030.35
Lecturer office to WAP (switch to WAP4)	2.28	-	2.28	21.34
Hybrid + Video Conferencing Room to WAP (switch to WAP5)	12.28	-	12.28	114.94
Firewalls to routers	12.38	15.36	27.74	259.65
Firewall to servers	4.08	7.28	11.36	106.33

<b>First Floor Room Total</b>	<b>397.94</b>	<b>3724.72</b>
<b>Fiber Optic Cable</b>		
<b>Ground Floor</b>		
Path	Length(m)	Price of cables used (RM)
<b>Switches to switch (ALL LABs to main switch for LABs)</b>	<b>81.88</b>	<b>122.82</b>
<b>Server room to ALL LABs (Start from router1 to main switch for LABs)</b>	<b>4.12</b>	<b>6.18</b>
<b>Server room to WAPs (Start from router2 to main switch for LABs)</b>	<b>4.12</b>	<b>6.18</b>
<b>Ground Floor Room Total</b>	<b>90.12</b>	<b>135.18</b>
<b>First Floor</b>		
<b>Server Room to Lecturer Office and Hybrid+ Video Conferencing Room (Start from router3 to switches)</b>	<b>41.20</b>	<b>61.80</b>
<b>Server room to WAPs (Start from router2 to switch for Hybrid + Video Conferencing Room)</b>	<b>41.20</b>	<b>61.80</b>
<b>Servers to server router</b>	<b>7.86</b>	<b>11.79</b>
<b>First Floor Room Total</b>	<b>90.26</b>	<b>135.39</b>

	Length(m)	Price of cables used (RM)
<b>Total Ground Floor</b>	<b>591.24</b>	<b>4825.66</b>
<b>Total First Floor</b>	<b>488.20</b>	<b>3860.11</b>

<b>Total (Ground Floor + First Floor) (m)</b>	<b>1079.44</b>	<b>8112.94</b>
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In our network design, we have calculated the usage of both CAT6 Ethernet cables and fiber optic cables based on the layout of the faculty building. To ensure maximum efficiency and optimal performance, the cable types were strategically selected and distributed. This approach enables seamless connectivity across all devices and supports the specific network requirements of each area within the faculty.

The CAT6 Ethernet cable, a standardized twisted pair cable known for its ability to support up to 10 Gbps speeds over short distances, is ideal for Local Area Network (LAN) connections. Its robust shielding minimizes signal noise, making it a reliable choice for horizontal and vertical cabling within rooms and labs. These cables are used to connect computers and other devices to switches in the ground floor labs, as well as the lecturer offices, hybrid classroom, and video conferencing room on the first floor. Furthermore, CAT6 cables are utilized for connecting firewalls to routers and servers, reinforcing the network's security and enabling stable data flow. Additionally, they provide connections to Wireless Access Points (WAPs) and ensure efficient Power over Ethernet for reducing cabling time and costs.

Fiber optic cables, designed for high-performance and long-distance data transmission, are used to interconnect critical network devices such as servers, switches, and routers. These cables excel in delivering high-speed, accurate data transfer while minimizing signal degradation. In our design, fiber optic cables are primarily used as the backbone of the network, as they are used to link the main server to the Internet Service Provider (ISP), connecting the server room to labs, routers, and the switches across both floors. While fiber optic cables do not directly connect to Wireless Access Points (WAPs), they can connect to switches, which in turn use CAT6 Ethernet cables to link to WAPs. This ensures a reliable and high-speed connection for wireless networks throughout the faculty.

In conclusion, our network design incorporates a strategic combination of CAT6 Ethernet cables and fiber optic cables. With an estimated total of 837.86 meters of CAT6 Ethernet cables and 180.38 meters of fiber optic cables, this setup guarantees a reliable, secure, and high-performance network infrastructure that meets the technological demands of the faculty.

## MEETING MINUTES #1

<b>DATE/TIME</b>	16 Jan 2025 8pm		
<b>LOCATION</b>	Online (Google Meet)		
<b>AGENDA</b>	1. Understand the detail about task 4 2. Discuss the network distribution in our floor plan 3. Distribute task to all members		
<b>Meeting MC</b>	Cheryl Cheong Kah Voon		
<b>ATTENDANCE</b>			
NAME	TIME	REASON FOR ABSENCE	
Lau Yee Wen	8:00PM	-	
Cheryl Cheong Kah Voon	8:00PM	-	
Chua Jia Lin	8:00PM	-	
Gui Kah Sin	8:00PM	-	
<b>MINUTES</b>			
NO.	ITEM DISCUSSED	IDEAS/SUGGESTIONS AND PERSON GIVING IT	PERSON IN CHARGE & DATE
1	Discuss details about task 4	<ul style="list-style-type: none"> <li>- Each member opened the Word document of project Task 4 on their laptops.</li> <li>- All members read and question and rubric together.</li> <li>- The team engaged in a discussion about the requirements for Task 4.</li> </ul>	All members
2	Discuss the network distribution in our floor plan	<ul style="list-style-type: none"> <li>- Jia Lin and Kah Sin suggest the network distribution in the floor plan</li> <li>- Cheryl and Yee Wen suggest the necessary details that need to be standardized.</li> </ul>	All members
3	Task Distribution	<ul style="list-style-type: none"> <li>- Jia Lin distributed the task to all members.</li> <li>- Cheryl was assigned to plan for the network distribution of the general lab.</li> <li>- Yee Wen was assigned to plan the network distribution of hybrid classroom and server room.</li> </ul>	All Members

		<ul style="list-style-type: none"> <li>- Jia Lin was assigned to plan the network distribution of lecturer room and video conference room.</li> <li>- Kah Sin was assigned to plan the network distribution of the student lounge and IoT lab.</li> </ul>	
4	Next meeting	Scheduled for January 20, 2025. Tasks 3 part 1 and 2 need to be completed before the next meeting.	All Members
5	Meeting ended	At 10:00 pm, the meeting ended after all discussions had been done.	All Members

## MEETING MINUTES #2

<b>DATE/TIME</b>	20 Jan 2025 8pm		
<b>LOCATION</b>	Online (Google Meet)		
<b>AGENDA</b>	<ol style="list-style-type: none"> <li>1. Review the current progress for each group member</li> <li>2. Finalize room level network distribution diagram</li> <li>3. Finalize the network distribution diagram</li> <li>4. Check the calculation of the cable length needed</li> </ol>		
<b>Meeting MC</b>	Cheryl Cheong Kah Voon		
<b>ATTENDANCE</b>			
<b>NAME</b>	<b>TIME</b>	<b>REASON FOR ABSENCE</b>	
Lau Yee Wen	8:00PM	-	
Cheryl Cheong Kah Voon	8:00PM	-	
Chua Jia Lin	8:00PM	-	
Gui Kah Sin	8:00PM	-	
<b>MINUTES</b>			
<b>NO.</b>	<b>ITEM DISCUSSED</b>	<b>IDEAS/SUGGESTIONS AND PERSON GIVING IT</b>	<b>PERSON IN CHARGE &amp; DATE</b>
1	Review the current progress for each group member	<ul style="list-style-type: none"> <li>- Each member shares their network distribution diagram for each room</li> </ul>	All members

2	Finalize room level network distribution diagram	<ul style="list-style-type: none"> <li>- Jia Lin suggested labeling the wiring.</li> <li>- Cheryl suggests the height of the switch and tables.</li> <li>- Yee Wen suggested using a lighter color for the cable to make it more visible.</li> <li>- Kah Sin suggests using different colors for vertical and horizontal cables.</li> <li>- All members are sharing their ideas to improve the network distribution diagram.</li> </ul>	All members
3	Finalize the network distribution diagram	<ul style="list-style-type: none"> <li>- All members show their part using the visual paradigm to ensure the network distribution is correct.</li> </ul>	All Members
4	Check the calculation of the cable length needed	<ul style="list-style-type: none"> <li>- Jia Lin reminded the other members about the correct calculation of cable length needed.</li> <li>- All members recheck the length calculation to make sure the accurate result will be obtained.</li> </ul>	All Members
5	Next meeting	Scheduled for January 25, 2025. Tasks 3 all part need to be completed before the next meeting.	All Members
6	Meeting ended	At 10:00 pm, the meeting ended after all discussions had been done.	All Members