



UTM
UNIVERSITI TEKNOLOGI MALAYSIA

Project Task 4

SECR1213 - NETWORK COMMUNICATION

Semester 3, 2024/2025

Section 01

Group : Mozilla

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Table of Content

1.0 Work area on the floor plan	3
1.1 Ground Floor	3
1.2 Level 1	8
2.0 Network Diagram	13
2.1 Ground Floor	13
2.1.1 Server Room	13
2.1.2 Student Lounge	14
2.1.3 General Purpose Lab 1	15
2.1.4 General Purpose Lab 2	16
2.2 First Floor	17
2.2.1 Work area 5, video conferencing room	17
2.2.1 Work area 6, hybrid classroom	18
2.2.3 Work Area 7, cisco lab	19
2.2.4 Work Area 8, embedded lab	20
3.0 Cables and Connection	21
3.1 Floor Plan	21
3.1.1 Ground Floor	21
3.1.2 First Floor	23
4.0 Measurements	25
4.1 Connection, Patch Cords and Switch Port	25
4.2 Cable Type and Length	26

1.0 Work area on the floor plan

1.1 Ground Floor

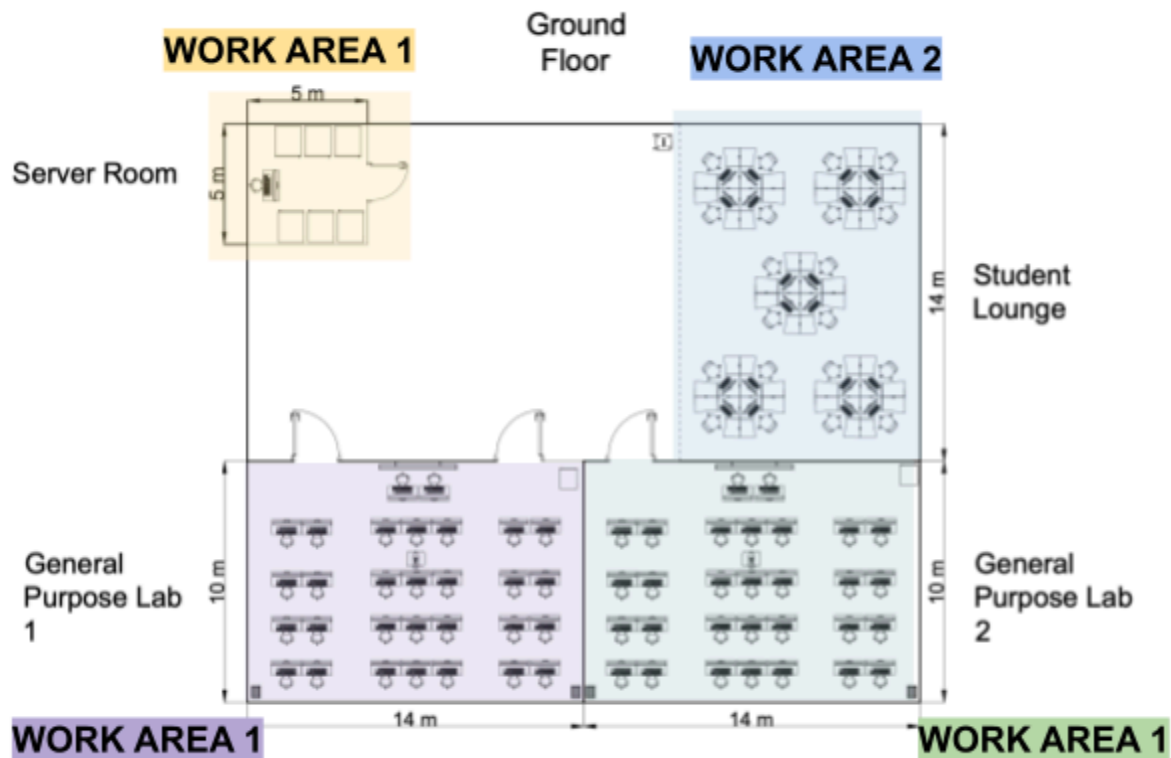


Figure 1.1 Work Area Ground Floor

The ground floor plan of the new building of Faculty Computing comprises four distinct work areas with its own specific function. These areas include Server Room which is the first work area, Student Lounge which is the second work area, General Purpose Lab being the third work area, and lastly the general purpose lab 2 being the fourth work area. The Server Room houses critical IT equipment like servers and networks to ensure smooth computing operations. The Student Lounge provides a comfortable space for students to relax, socialize, or collaborate informally. General Purpose Lab 1 and General Purpose Lab 2 are computer labs equipped for classes, projects, and research, offering ample space for academic activities. Together, these areas support the faculty's teaching, learning, and technical requirements.

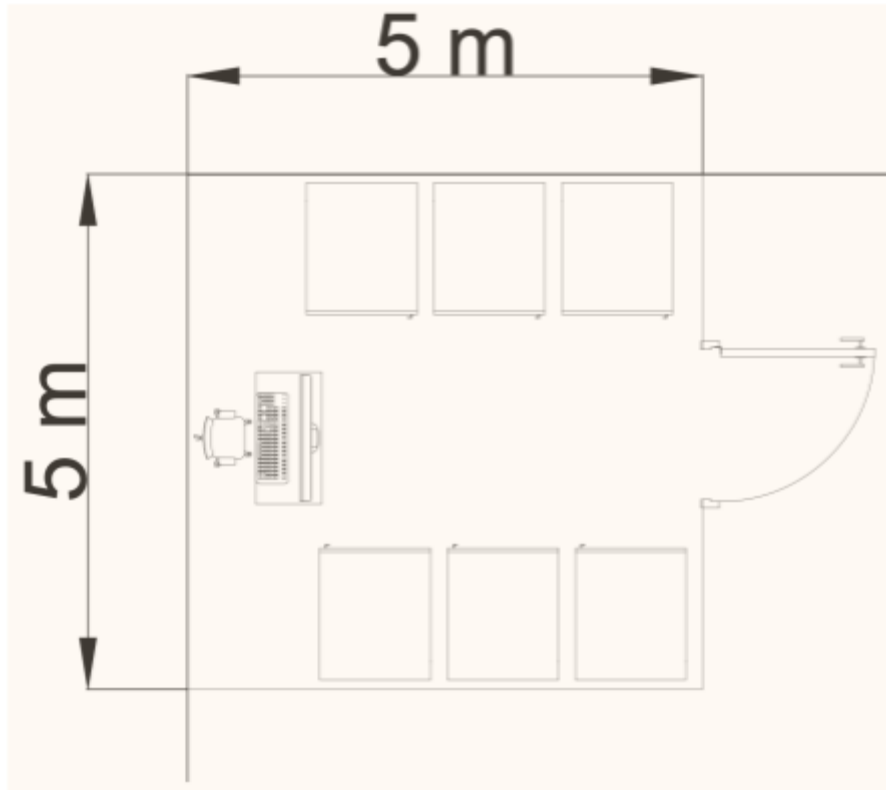


Figure 1.1.1 Work Area 1 Which is the Server Room

Work Area 1, known as the Server Room, serves as the main network hub for the building and is equipped with a Dell EMC PowerEdge T640 Tower Server. This is due to its dependability and ability to manage challenging tasks. The server provides centralized storage, data organization, and effective resource allocation for all linked workstations

A Cisco C8500-12X switch manages the data flow between devices, enhancing network efficiency and ensuring seamless communication. Additionally, a dedicated management PC is available for monitoring and controlling server operations. The Server Room is designed to provide a stable and secure networking environment, supporting the faculty's teaching, learning, and administrative activities.

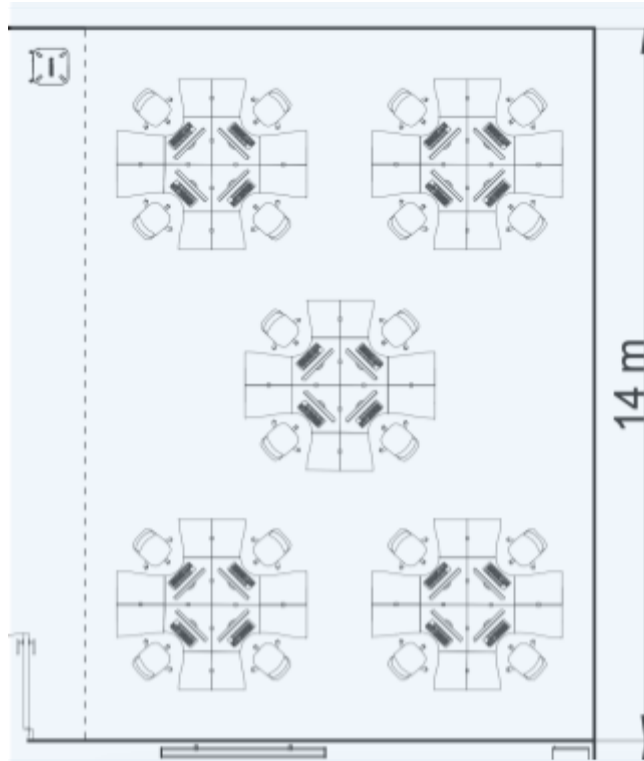


Figure 1.1.2 Work Area 2, Student Lounge

For Work Area 2, student lounges serve as shared workspaces with multiple devices requiring network access. There are a total 10 PCs, a network-enabled NETGEAR WEB 758-111 NAS WiFi 7 and charging station for mobile devices. The network layout utilizes cables RS PRO 7m Cat6 cables for horizontal connections which ensuring reliable speed up to 1 Gbps per devices that link to a WS-C3850-48XS-S Catalyst 3850 Switch SFP+, placed in the nearby telecommunications room to minimize cable lengths while maintaining an organized structure. Estimated total cable length is approximately 60 meters include allowances for wall-mounted routing and corner adjustments

Each device connects to the network through RJ45 Cat 8.1 Tool-less Keystone Jacks, plugged into wall jacks linked to the switch via structured cabling. An Access Point could be deployed to support mobile users and provide robust dual-band Wi-Fi coverage for the lounge. The NETGEAR NAS and USB charging stations add functionality, making the lounge suitable for collaborative and individual work. This setup ensures a high-performance, future-proof network for student activities.

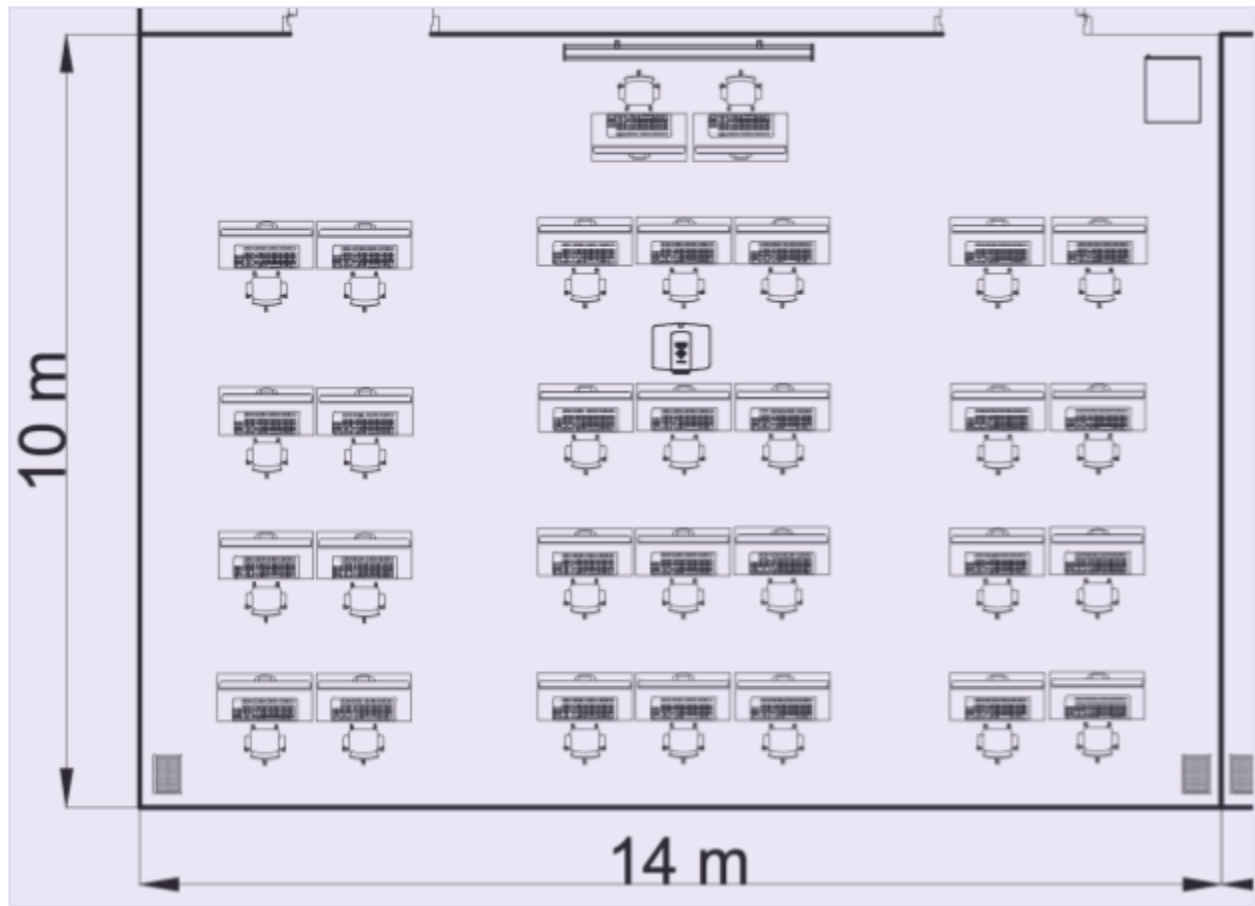


Figure 1.1.3 Work Area 3, General Lab 1

This lab is equipped with 30 PCs, a projector, and a speaker system, all designed to support an engaging and productive learning environment. The PCs provide individual workstations for students, enabling access to educational software, online resources, and collaborative tools. The projector facilitates visual presentations, making it ideal for lectures, demonstrations, and media sharing. The speaker system enhances audio quality for presentations and multimedia content, ensuring clear communication and an immersive experience during sessions. A server on top right corner, Dell EMC PowerEdge T640 Tower Server, which acts as the backbone, hosting files, applications, and centralized resources to ensure efficient data management and accessibility.

In addition to these components, the lab network is designed for seamless connectivity. The PCs are connected to the server and a NETGEAR PR175SC48-SM Wireless Access Point (WiFi 7) through a Cisco Catalyst WS-C3850-48XS-S Switch SFP+ and a patch panel, which simplifies cable management and future network expansions. The server provides centralized storage and resource management for both students and lecturers. The Wireless Access Point Supports Wi-Fi-enabled devices such as laptops and tablets, while the patch panel organizes connections efficiently. Together, this setup creates a robust and versatile environment to support diverse educational activities.

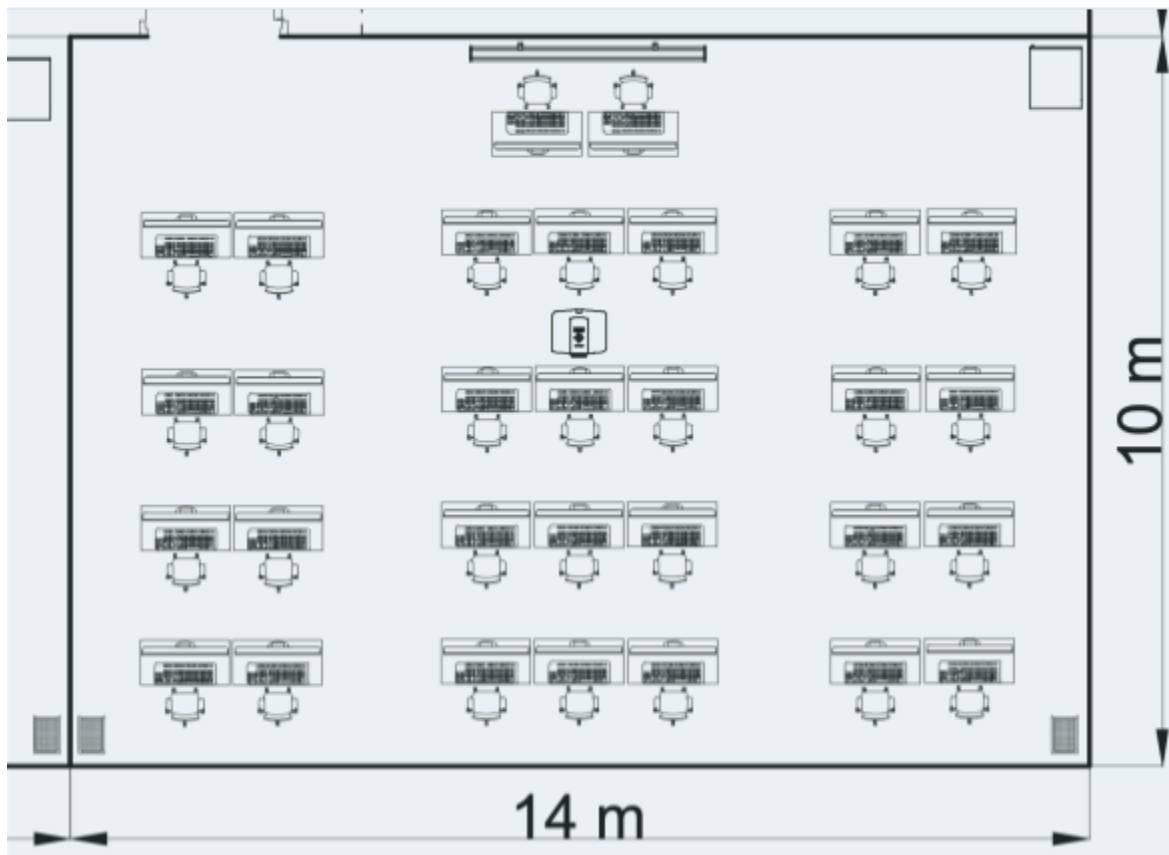


Figure 1.1.4 Work Area 4, General Lab 4

This lab is equipped with 30 PCs, a projector, and a speaker system, all designed to support an engaging and productive learning environment. The PCs provide individual workstations for students, enabling access to educational software, online resources, and collaborative tools. The projector facilitates visual presentations, making it ideal for lectures, demonstrations, and media sharing. The speaker system enhances audio quality for presentations and multimedia content, ensuring clear communication and an immersive experience during sessions. A server on the top right corner, Dell EMC PowerEdge T640 Tower Server, which acts as the backbone, hosting files, applications, and centralized resources to ensure efficient data management and accessibility.

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1.2 Level 1

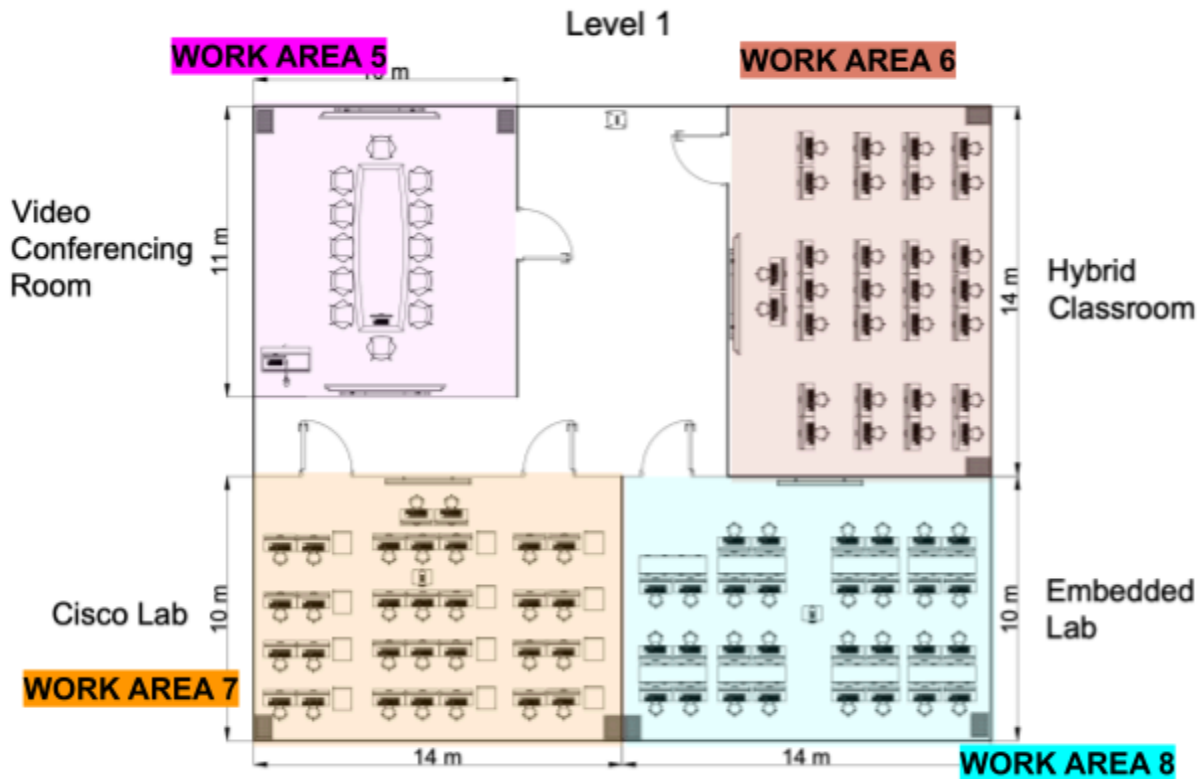


Figure 1.2 Work Areas for level 1

On the first floor, the new faculty building features another four work areas. Work Area 5 is the Video Conferencing Room, Work Area 6 is the hybrid classroom, Work Area 7 is the Cisco Lab, and work area 8 is the embedded lab. The Video Conferencing Room is equipped for virtual meetings, online classes, and remote collaboration. The Hybrid Classroom supports both in-person and online learning with interactive tools for effective teaching. The Cisco Lab provides hands-on training in networking, including configuring and troubleshooting Cisco equipment. The Embedded Lab focuses on embedded systems, offering resources for projects like microcontrollers and IoT devices. These areas are designed to support advanced learning and practical skills in technology.

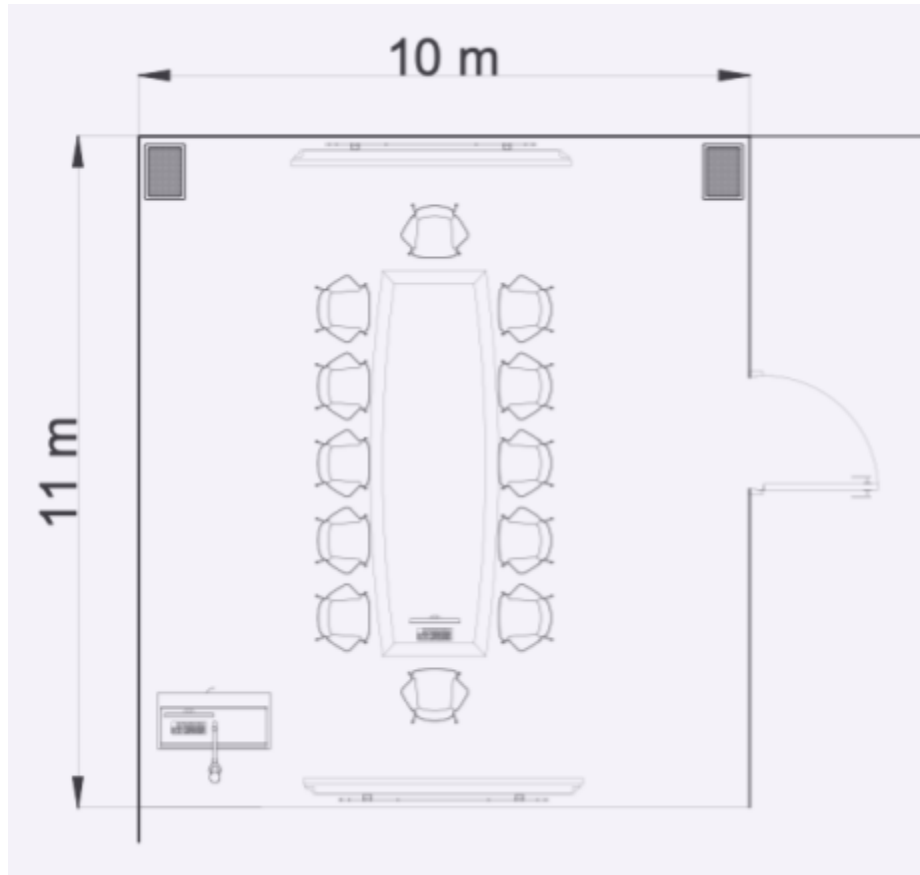


Figure 1.2.1 Work Area 5, conferencing room

Work Area 5, Video Conferencing Room is equipped with two PCs, two smartboards, and two speakers to ensure smooth communication. The two PCs allow for multitasking, such as managing presentations and troubleshooting. The two monitors enable viewing the conference on one screen while displaying additional content on the other. The two speakers provide clear, balanced audio for all participants.

A wireless access point, positioned 4 meters from the top-right corner, ensures strong and reliable Wi-Fi coverage. The NETGEAR WEB 758-111 NAS WiFi 7 supports high-speed connections for video calls, while the WS-C3850-48XS-S Catalyst 3850 Switch SFP+ expands the network and offers additional ports for connecting devices, maintaining a stable, efficient network for the room.

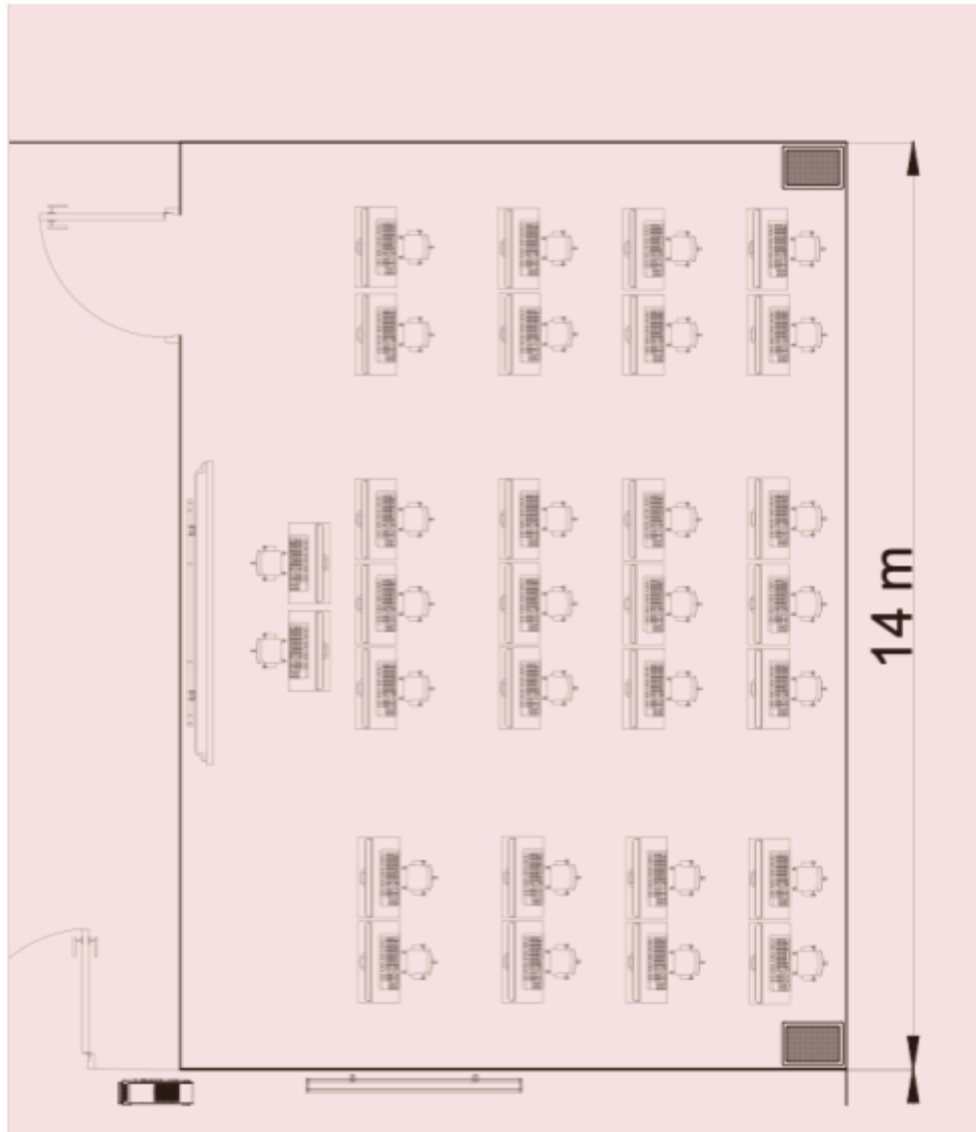


Figure 1.2.2 Work Area 6, Hybrid Classroom

In Work Area 6, the Hybrid Classroom, there are 30 PCs, two speakers, and one smartboard to support both in-person and remote learning. The 30 PCs give students access to the tools they need for coursework and collaboration. The two speakers ensure clear audio for remote communication and multimedia. The smartboard allows the instructor to interact with content, making lessons more engaging.

The Wi-Fi access point, located less than 4 meters from the top-left corner, provides strong connectivity for all devices. The NETGEAR WEB 758-111 NAS WiFi 7 ensures fast and reliable wireless connections, while the WS-C3850-48XS-S Catalyst 3850 Switch SFP+ manages network traffic and provides extra ports for devices, ensuring a stable, efficient network for the classroom.

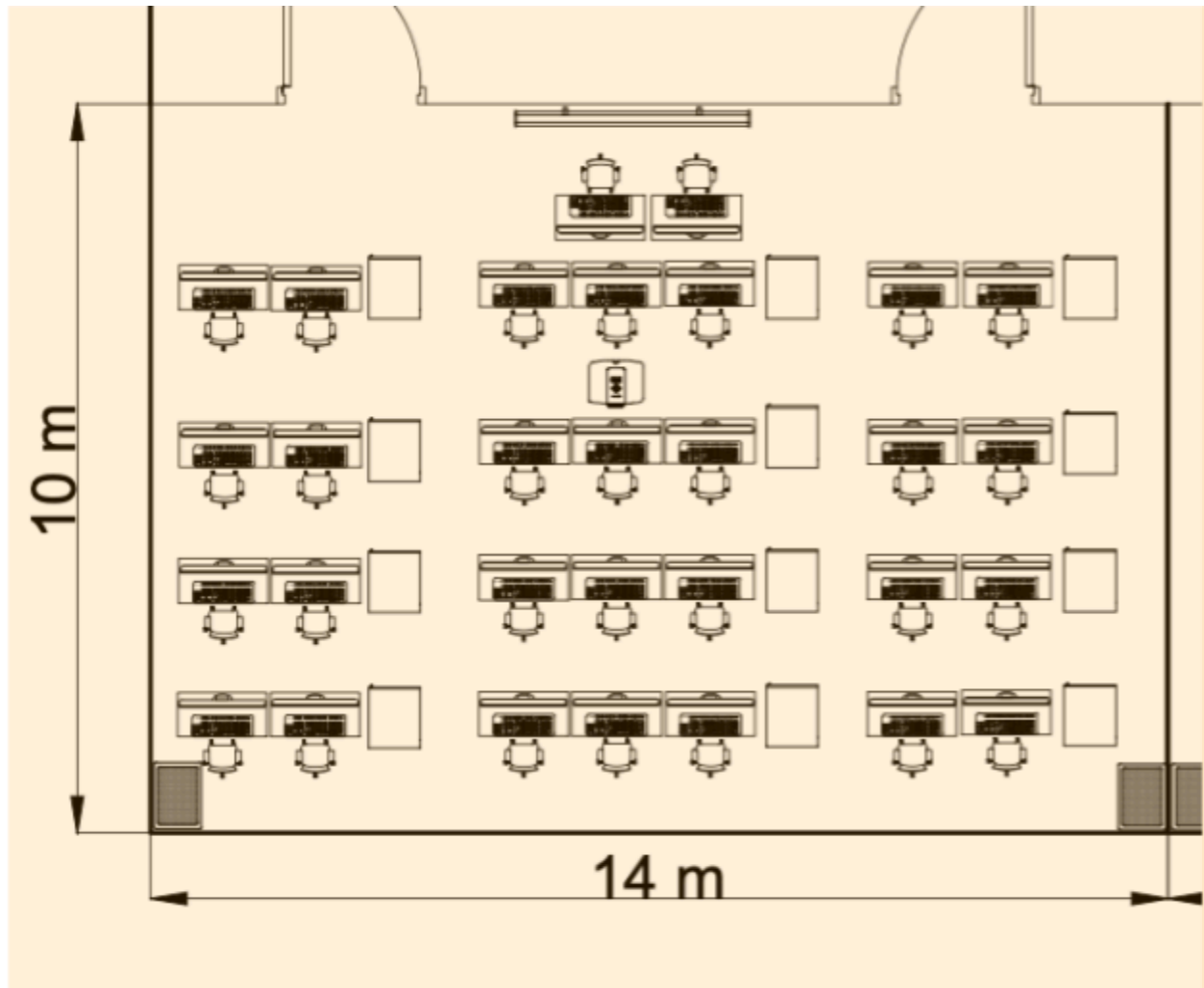


Figure 1.2.3 Work Area 7, Cisco Lab

In the Cisco lab , there are 30 workstations that are designed for teaching and practicing networking concepts using Cisco technologies. This cisco lab consists of server, Wifi, projector, speaker, switch, router.

To support all workstations, we are using Dell EMC PowerEdge T640 Tower Server which supports centralized storage, enabling the lab to handle large datasets and configurations efficiently. For Wifi we are using Netgear Web 758-111 Nas Wifi 7 as implementation and testing of wireless security protocols and performance analysis. In addition, WS-C3850-48XS-S Catalyst 3850 Switch SFP+ is the one that we used for enabling communication and data transfer between workstation, server and other network devices. Last but not least, router C8500-12X is being used to ensure that data sent from one device reaches its destination efficiently.

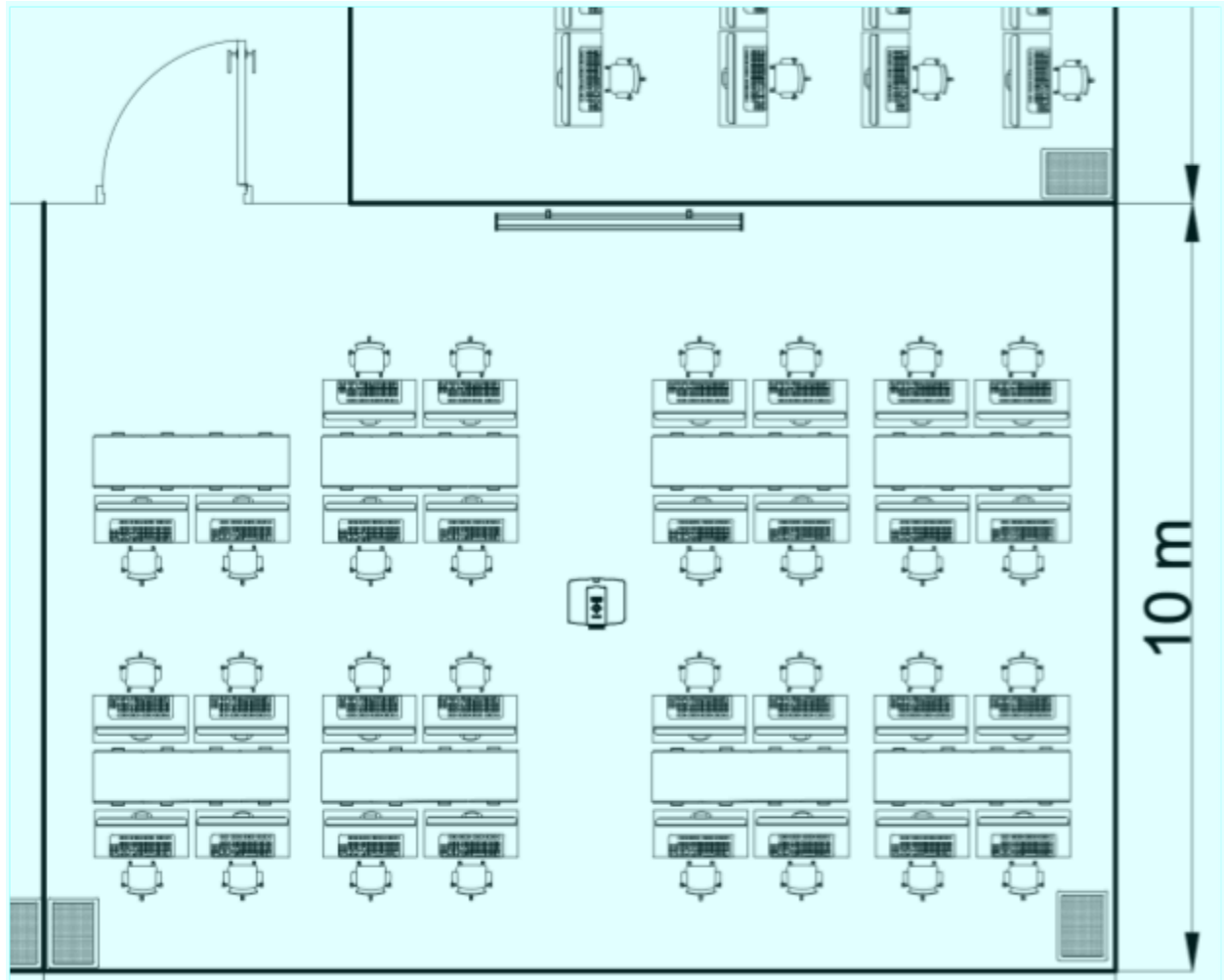


Figure 1.2.4 Work Area 8, Embedded Lab

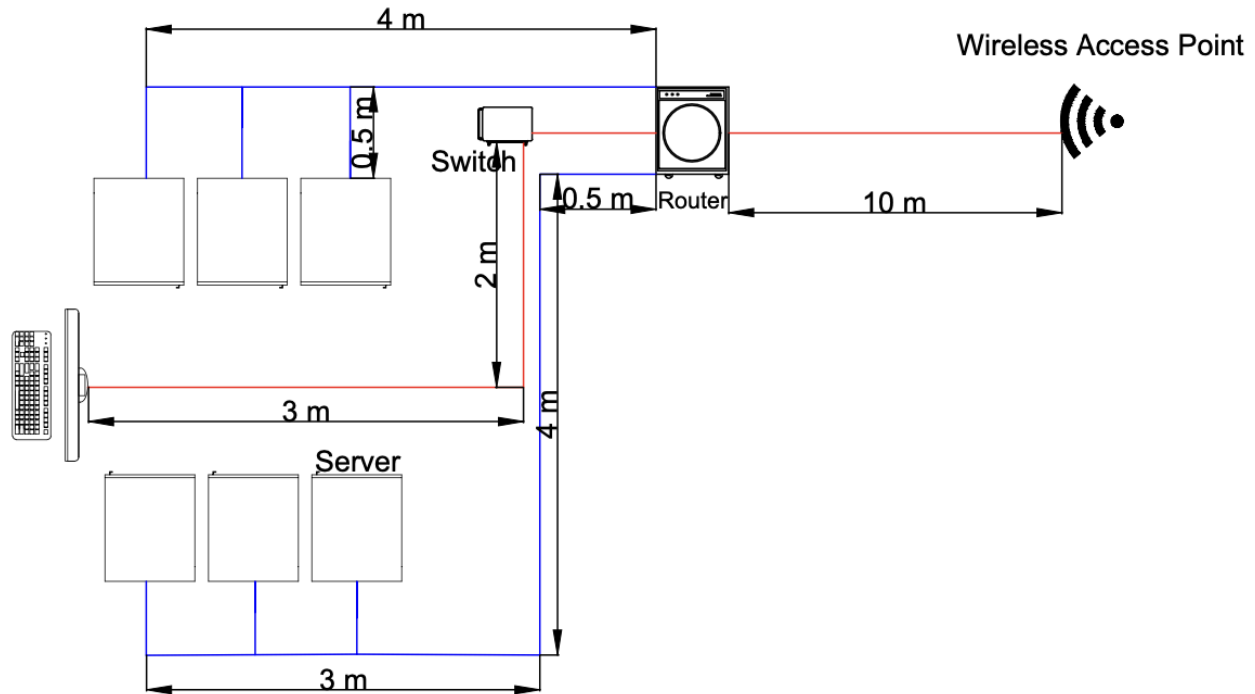
For embedded labs, 30 workstation is a specialized environment designed for learning, experimenting and developing embedded systems. It typically includes hardware components like microcontroller, sensors and actuators, as well as software tools for programming and simulation. The lab consists of a projector, speaker, Wifi, server and also a switch.

The lab also features a projector and speaker for instructional content, connected through a WS-C3850-48XS-S Catalyst 3850 Switch SFP+ Switch and patch panel to the NETGEAR WEB 758-111 NAS WiFi 7 for robust wireless connectivity. Additionally, Dell EMC PowerEdge T640 Tower Server supports development tools, file storage, and network management, creating an efficient and collaborative learning environment.

2.0 Network Diagram

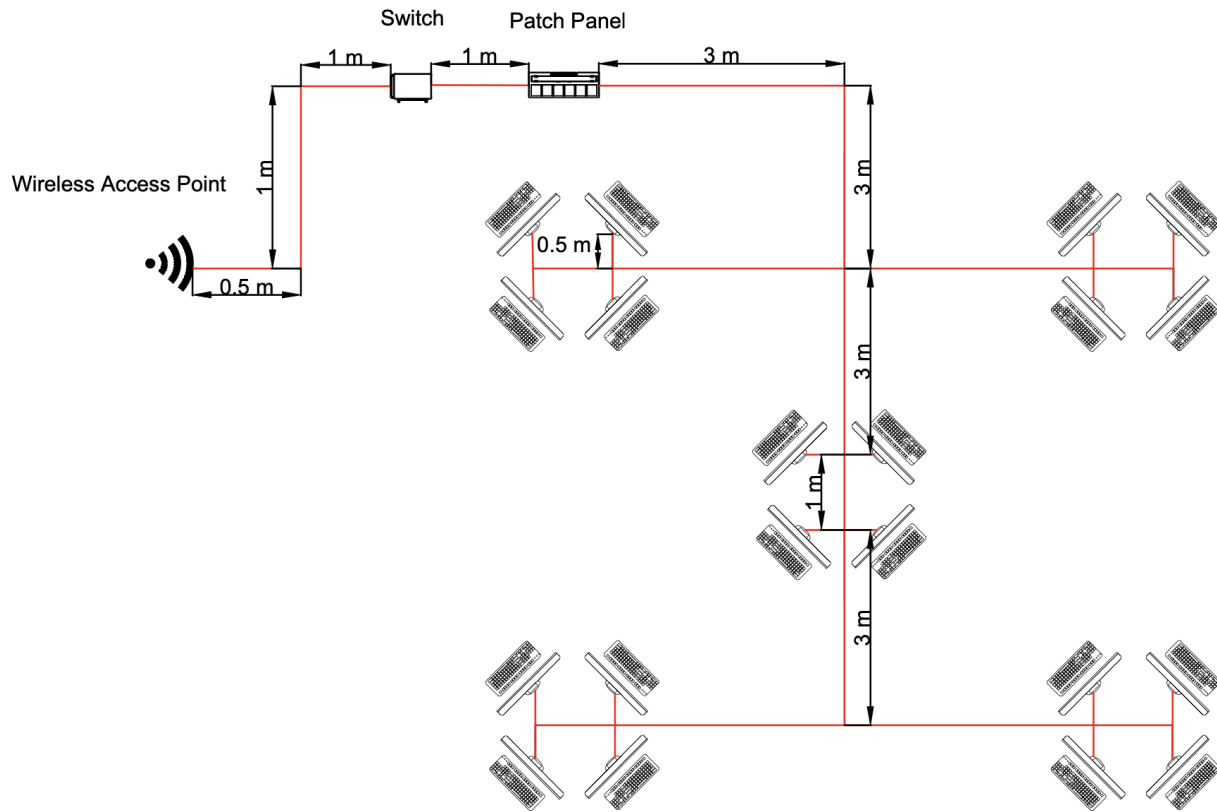
2.1 Ground Floor

2.1.1 Server Room



In the server room, the PC and all six servers are connected to the switch, which facilitates communication within the local network. The switch is then connected to a router, which acts as the gateway to the internet, managing traffic between your local network and the wider web. This ensures that internal devices can access the internet while also protecting them with network security features. Additionally, Wireless Access Point (WAP) connected to the switch, providing Wi-Fi connectivity for wireless devices such as laptops, smartphones, and tablets. This setup allows for both wired and wireless devices to communicate efficiently within the network and access the internet, ensuring a robust and flexible IT infrastructure.

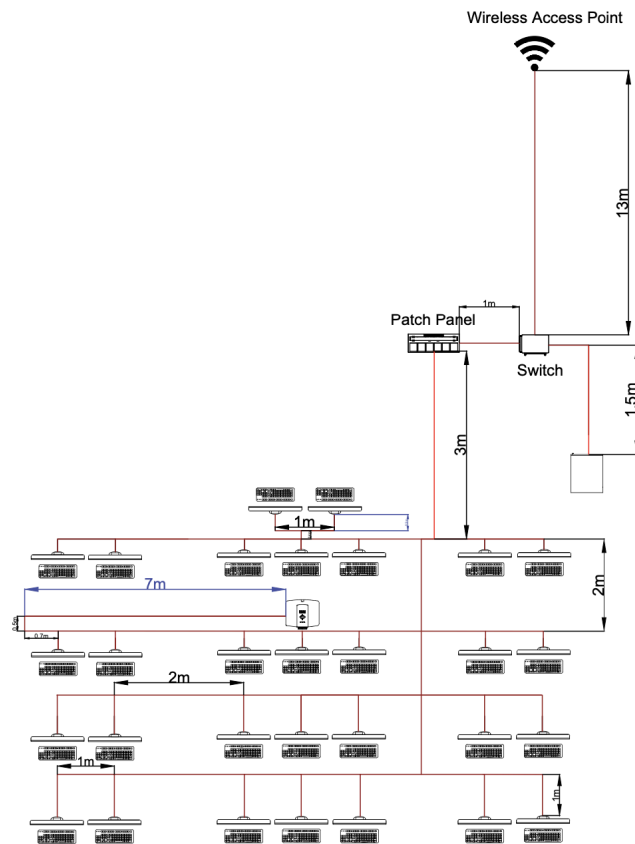
2.1.2 Student Lounge



In the student lounge there is a Wireless Access Point that is connected through a Patch Panel and Switch. The Patch Panel serves as a central hub for organizing and managing network cables to make it easier to arrange and maintain the connections. Data traffic can be managed efficiently by having Switch connect with Multiple devices in Local Area Network (LAN) then could have smooth communication between devices.

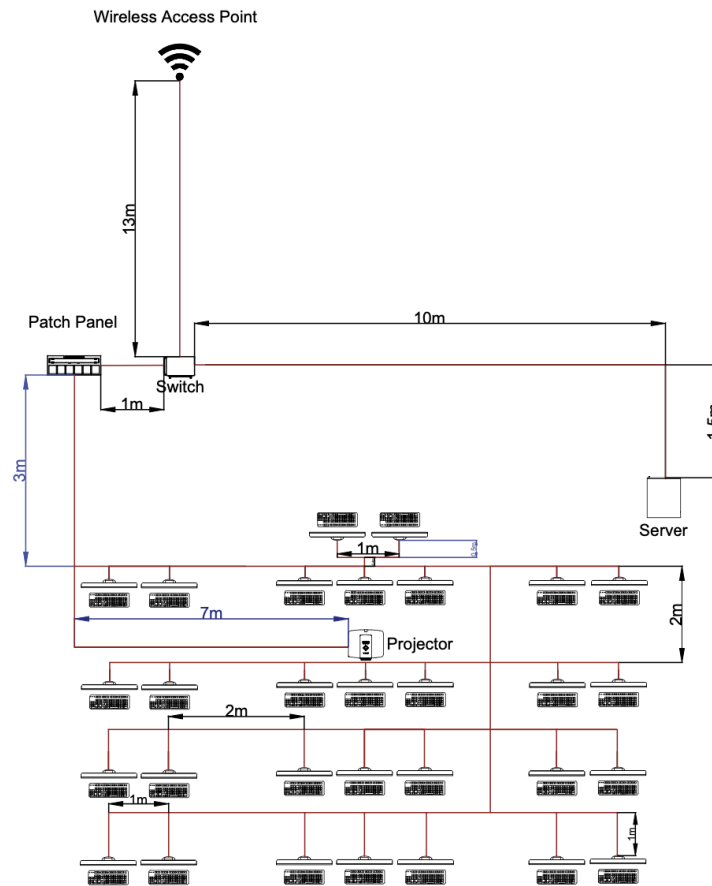
Wireless devices are able to connect to the network without requiring physical cables due to the existence of Wireless Access Point. It links to the Switch via a cable to support the Wi-Fi network. As illustrated in the diagram, the red lines represent CAT8 cables, chosen for their ability to handle greater bandwidth and faster data transfer speeds, which are essential for demanding activities like internet surfing, streaming, and group projects in the lounge.

2.1.3 General Purpose Lab 1



In this general-purpose lab network setup, each networking device plays a specific role in facilitating communication and connectivity as shown in the figure. The total of 30 PCs are connected to the server and Wireless Access Point (WAP) through the patch panel and switch by Cat 8 cable with a total length of approximately 89.1 meters, represented by the red lines in the figure. The choice of Cat 8 cable ensures higher data transmission speeds and minimizes signal degradation. The server is responsible for providing services and resources to the network, hosting files, applications, or services required by both students and lecturers. This allows students and lecturers to access centralized resources and data, ensuring efficient management and storage of educational materials. The switch acts as a central networking device that connects all computers, the server, and other devices within the network, directing data only to the intended device to improve network efficiency. The Wireless Access Point enables wireless connectivity for Wi-Fi-enabled devices such as laptops, tablets, and smartphones used by students and lecturers. Additionally, the projector is connected to the patch panel for wireless access via the Wireless Access Point, enabling presentations and other media sharing in the lab. Cables from computers, the server, switch, and WAP are terminated at the patch panel, which centralizes cable management and simplifies modifications or expansions to the network.

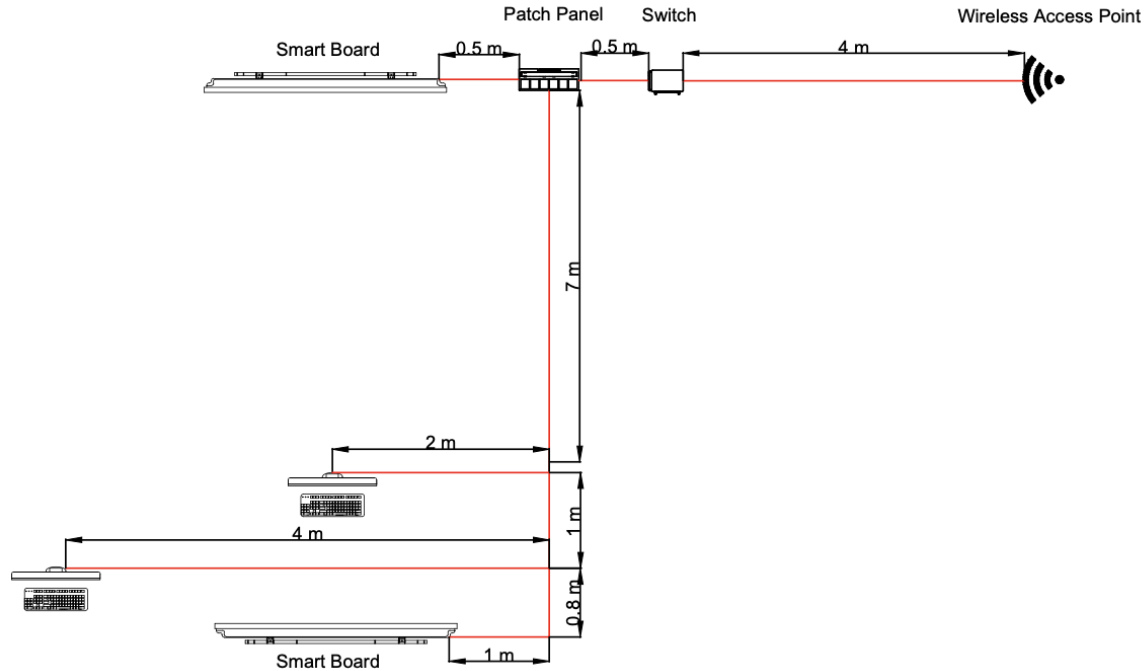
2.1.4 General Purpose Lab 2



In this network setup for the general-purpose lab, each device serves a specific function to ensure effective communication and connectivity, as illustrated in the diagram. A total of 30 PCs are linked to the server and Wireless Access Point (WAP) through the patch panel and switch, using approximately 97.9 meters of Cat 8 cable, represented by the red lines in the diagram. The use of Cat 8 cable ensures optimal data transmission speeds and reduces the likelihood of signal degradation. The server plays a crucial role in providing the network with essential services and resources, including hosting files, applications, and other tools necessary for both students and lecturers. This centralized system allows easy access to data and ensures efficient storage and management of educational materials. The switch connects all network devices, such as computers, the server, the projector, and others, and directs traffic only to the appropriate device, enhancing overall network performance. The Wireless Access Point provides wireless connectivity for mobile devices like laptops, tablets, and smartphones, commonly used by both students and lecturers. In addition, the projector is connected through the patch panel, enabling seamless media sharing and presentations via the Wireless Access Point. All network cables, including those for the computers, server, switch, and WAP, are routed through the patch panel, streamlining cable management and allowing for easy network modifications or expansions.

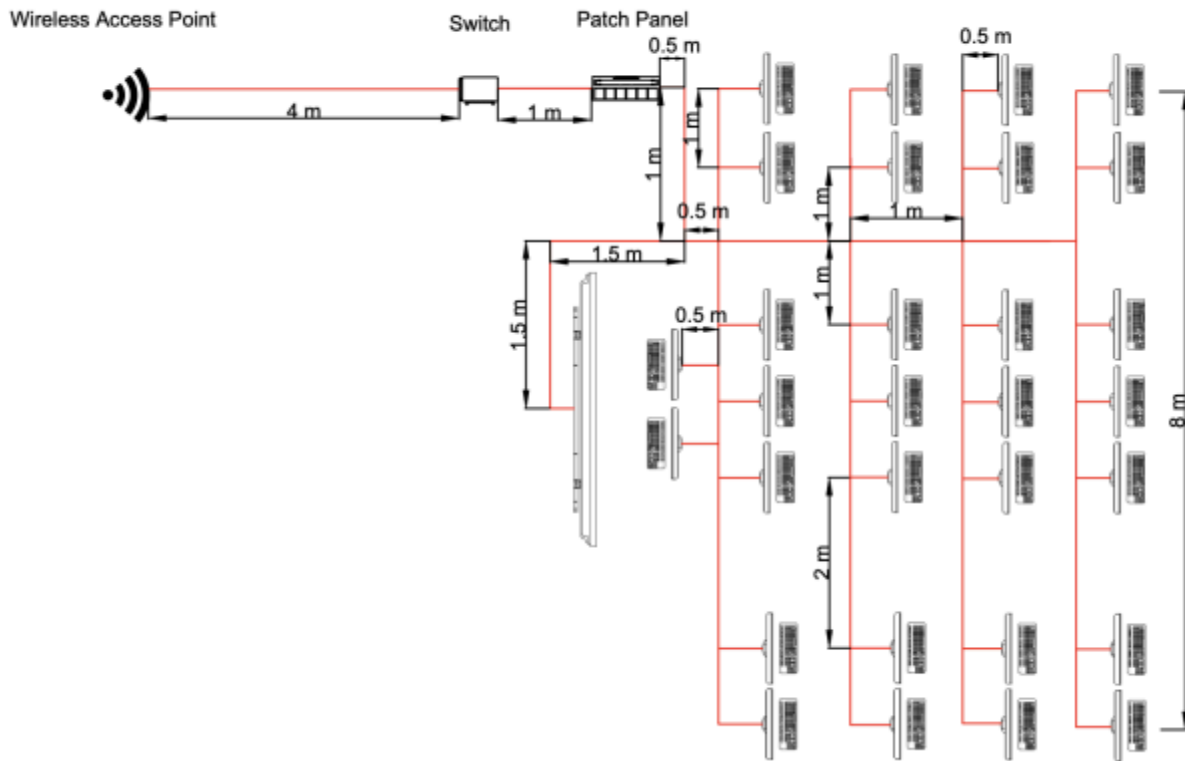
2.2 First Floor

2.2.1 Work area 5, video conferencing room



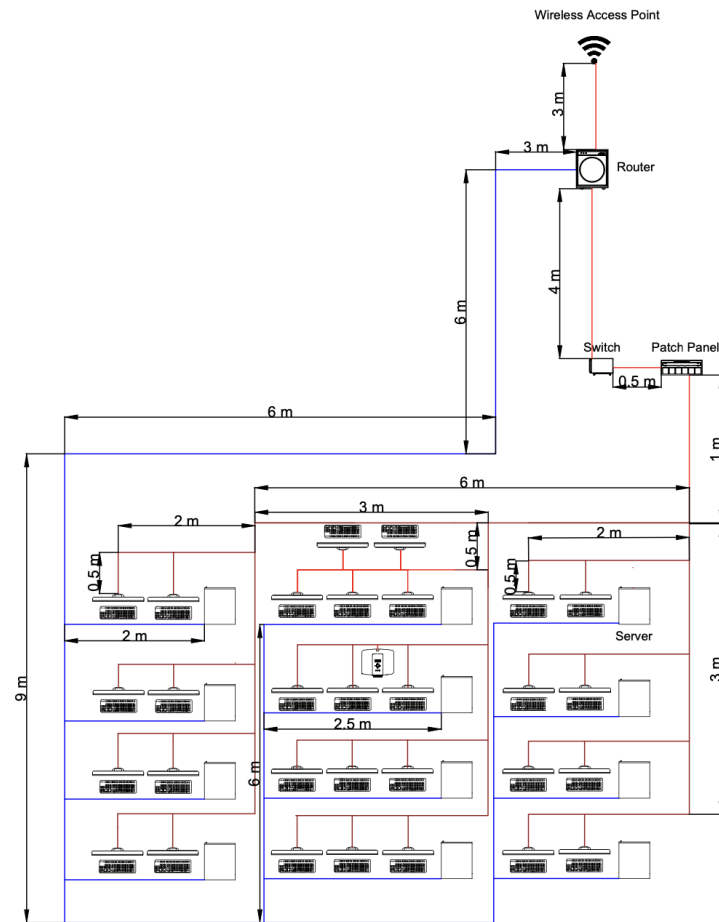
In the video conferencing room, the switch will be connected to both the Wireless Access Point (WAP) and the patch panel. The projector will be linked to the switch through the patch panel. All devices are connected using Cat 8 cables, which support high data transfer rates and meet the bandwidth demands of Wi-Fi 7 technology. With a length of 20.8 meters, the Cat 8 cables ensure minimal signal degradation while maintaining optimal performance. The switch serves as the central networking device, managing both wired and wireless connections efficiently. The WAP is responsible for providing reliable wireless connectivity, allowing devices in the room to seamlessly connect to the network. This setup is designed to support the creation of a video conferencing room with robust and dependable connectivity, ensuring excellent performance during virtual meetings.

2.2.1 Work area 6, hybrid classroom



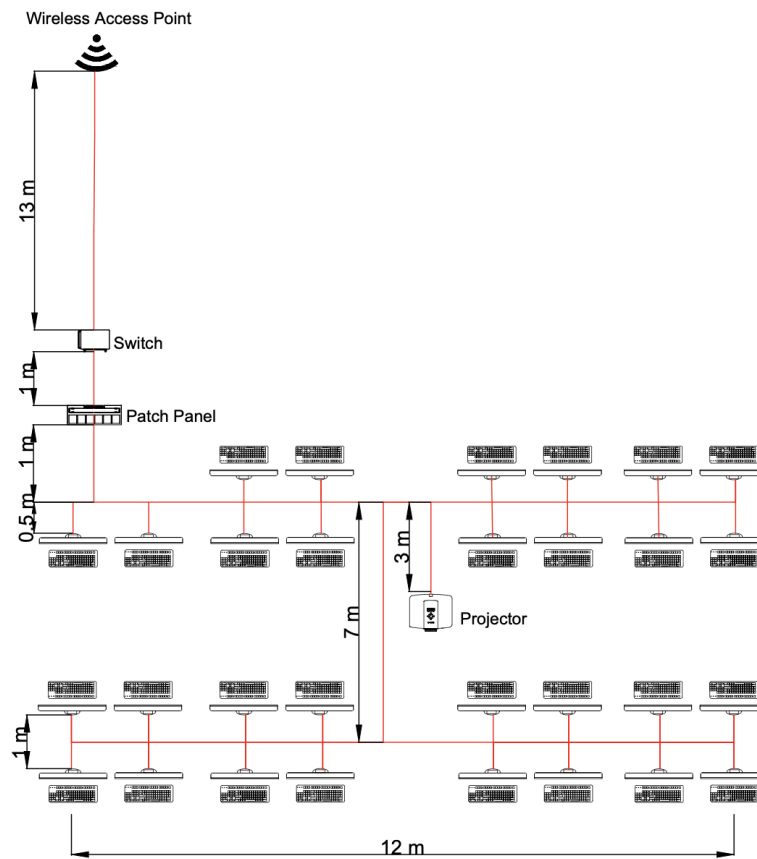
For the hybrid classroom, each of the 30 workstations is connected via Ethernet cables to the patch panel, which helps to organize and manage the network connections. The patch panel is then connected to the switch, which serves as the central hub for the network, allowing all the workstations to communicate with each other. The smart board is also connected to the switch to ensure it can communicate with all workstations and access the internet if needed. The wireless access point is connected to the switch to provide Wi-Fi coverage for wireless devices such as laptops, tablets, and smartphones, ensuring flexibility for students and lecturers. The switch controls routing data between the workstations, smart board, and WAP, ensuring smooth and efficient communication within the classroom network. This setup allows it as an ideal environment for a hybrid classroom where students can use a variety of devices and access both local and online resources seamlessly.

2.2.3 Work Area 7, cisco lab



These 30 workstations are connected to a central hub represented by the Dell EMC PowerEdge T640 Tower Server, which acts as the central repository for data storage, processing, and overall network management in the labs. Wireless connectivity is provided by the strategically placed Netgear WEB 758-111 NAS Wi-Fi 7 Access Point, offering high-speed wireless coverage throughout the lab. This Wi-Fi 7 access point ensures seamless connectivity and improved performance for devices within its range, enhancing mobility and flexibility. The wired data traffic is efficiently managed by the WS-C3850-48XS-S Catalyst 3850 Switch, equipped with SFP+ ports for high-speed fiber optic connections. This switch facilitates smooth communication between workstations, the server, and other networked devices, ensuring optimized performance of the wired connections. The network's physical connections are organized and managed through a patch panel, which serves as the centralized interface. Each workstation, server, Wi-Fi access point, and Catalyst 3850 Switch are connected via structured Cat 8 cabling with a total length of 122 meters. This ensures high-speed data transmission with minimal signal degradation, supporting the advanced bandwidth requirements of Wi-Fi 7 technology. This setup guarantees a tidy, maintainable network configuration with flexibility for easy adjustments or expansions as necessary.

2.2.4 Work Area 8, embedded lab

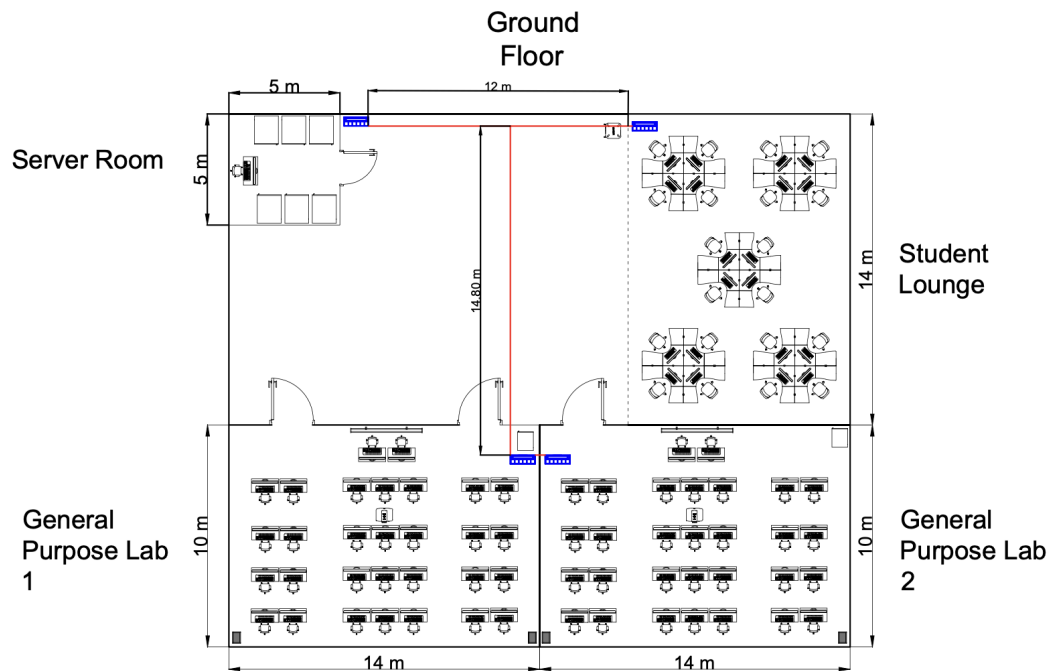


In the embedded lab, Each workstation is equipped with a computer connected to a central network switch via Ethernet cables to ensure stable and fast data communication. The patch panel is being used to organize and manage all the network cables and link to the switch. The switch then will connect to the wireless access point to allow mobile devices and workstation to access the network wirelessly. A projector is installed to display instructional content and presentations. It is connected to one of the workstations, which acts as the source for the content. The projector can also connect to the switch via the patch panel, enabling it to access networked content directly ensuring all components in the lab are well-connected and can communicate effectively,

3.0 Cables and Connection

3.1 Floor Plan

3.1.1 Ground Floor



For floor plan Ground floor above, connection cable 8 is being used to connect from the server room, student lounge, general purpose lab 1 and general purpose lab 2. Each of these areas has its own switch, which acts as an intermediary, facilitating network communication. The cabling is neatly installed along the walls and connects to the switches in every work area, ensuring all devices have network access. From the server to the student lounge is 12 meters, from it then 14.8 m to general purpose lab one and two. This structured cabling system not only supports robust network performance but also allows for easy future expansions.

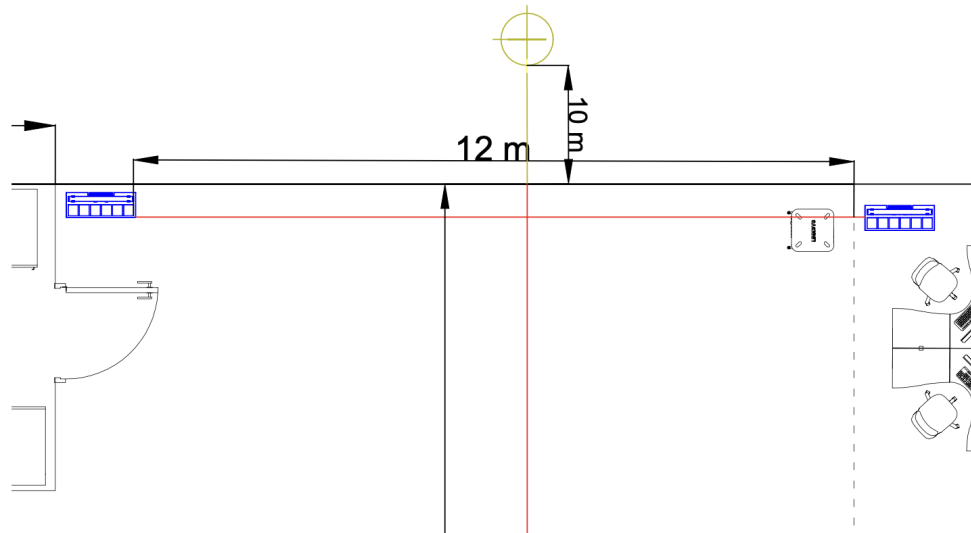
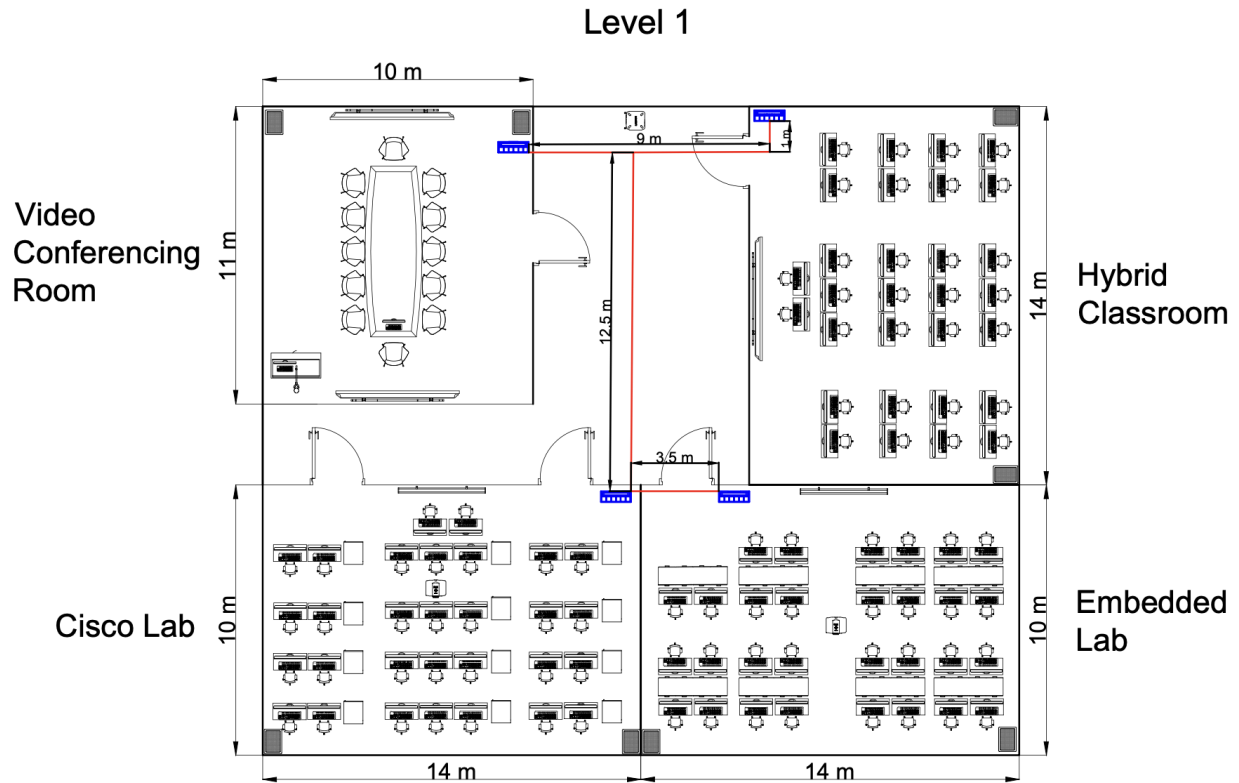


Figure 3.1.2.2 Backbone Cabling for ground floor

On the ground floor, backbone cabling connects the server room, which serves as the central hub, to the student lounge and general-purpose labs 1 and 2. Using Cat 8 cables, the backbone cabling spans 12 meters from the server room to the student lounge and an additional 14.8 meters to the general-purpose labs. Each area has its own switch, which facilitates network communication and ensures reliable access to centralized resources. Horizontal cabling within each work area connects local devices like PCs, wireless access points, and projectors to their respective switches. This structured cabling supports robust data transfer, efficient organization, and easy maintenance.

3.1.2 First Floor



For the first floor, connection cable 8 is used to connect the video conferencing room, hybrid classroom, embedded lab, and Cisco lab. Each of these areas has its own switch, which acts as an intermediary to facilitate network communication. The cabling is neatly installed along the walls and connects to the switches in every work area, ensuring all devices have network access. From the video conferencing room to the hybrid classroom it is 9 meters. Then from it it is 12.5 meters to connect cisco lab and embedded lab. This structured cabling system not only supports robust network performance but also allows for easy future expansions.

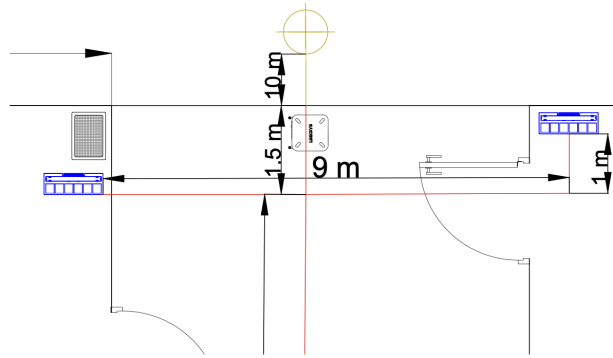


Figure 3.1.2.2 Backbone Cabling for 1st floor

On the first floor, backbone cabling extends from the server room to connect the video conferencing room, hybrid classroom, Cisco lab, and embedded lab. The backbone connections span 9 meters from the video conferencing room to the hybrid classroom and another 12.5 meters to the Cisco and embedded labs. Local switches in each area manage horizontal cabling, which links devices such as PCs, smartboards, and wireless access points to the network. This arrangement ensures seamless communication within each room and reliable access to the central network for advanced learning and research activities.

4.0 Measurements

4.1 Connection, Patch Cords and Switch Port

The number of patch cords matches the cables connected to the patch panel, and the number of switch ports corresponds to the cables entering and exiting the switch. The total number of connections is directly related to the number of switch ports. This setup ensures that every cable is properly accounted for to provide network connectivity across the building, with patch cords enabling the connections and switch ports serving as entry and exit points. The overall number of connections equals the number of active switch ports.

Work Area	Number of connection	Number of Patch Cords	Number of Switch Ports
Server room	1	1	1
Student Lounge	10	10	12
General Purpose Lab 1	30	30	32
General Purpose Lab 2	30	30	32
Floor 1	101	101	112
Video Conference room	2	2	4
Hybrid Classroom	30	30	32
CISCO Lab	30	30	32
Embedded Lab	30	30	32
Floor 2	92	92	100
Total	193	193	212

4.2 Cable Type and Length

The RS PRO 100m Cat8 Ethernet cable (SFTP Shielded, Unterminated) is chosen for its unparalleled performance in high-speed networking. With support for data transfer speeds of up to 40 Gbps and a bandwidth of 2000 MHz, Cat 8 ensures fast and efficient data transmission, making it ideal for demanding applications such as data centers, high-performance computing, and industrial environments. Its shielded and foil twisted pair construction provides excellent protection against electromagnetic interference and crosstalk, ensuring stable and reliable performance even in electrically noisy surroundings. Additionally, the durability and robust design of RS PRO cables make them a reliable choice for long-term use in critical network infrastructure.

Although Cat 8 is certified for a maximum segment length of 30 meters, it is the best choice for scenarios requiring top-tier speed and minimal latency within short to medium distances. By segmenting the total length of 522.8 meters using switches or repeaters, the network can fully leverage the capabilities of Cat 8 while maintaining optimal performance. This ensures a future-proof solution capable of handling modern high-speed demands and emerging technologies, making Cat 8 the preferred option for high-performance and interference-sensitive environments.

Work Area	Cable Type	Length(m)
Ground Floor		
Server	CAT 8 Cable	28.5 m
Student Lounge	CAT 8 Cable	43.5 m
General Purpose Lab 1	CAT 8 Cable	89.1 m
General Purpose Lab 2	CAT 8 Cable	97.9 m
Total Length(m)		259 m
First Floor		
Video Conference room	CAT 8 Cable	20.8 m
Hybrid Classroom	CAT 8 Cable	57 m
CISCO Lab	CAT 8 Cable	122 m
Embedded Lab	CAT 8 Cable	64 m
Total length(m)		263.8 m
Total length of cable used		522.8 m

MEETING MINUTE

MEETING MINUTES

DATE/TIME		24/12/2024 2.30pm	
LOCATION		MA6	
AGENDA		Discussion about person in charge	
Meeting MC		Naza	
ATTENDANCE			
NAME		TIME	REASON FOR ABSENCE
Nazatul		1430	
Raudhah		1430	
Athirah		1430	KFK Meeting
Syafina		1430	Going home
MINUTES			
NO.	ITEM DISCUSSED	IDEAS/SUGGESTIONS AND PERSON GIVING IT	PERSON IN CHARGE & DATE
1	Instruction detail	Give instruction on how to divided work	Naza - 24/12
2	Appoint the person in charge for each work areas	Make a roulette which person is incharge which work area	Raudhah - 24/12
3	Create a detailed explanation for each room.	Start to create a detailed explanation for each room	Naza & Raudhah - 24/12
4	Next meeting	25/12 - determine what room would be considered work area	Raudhah & 25/12

5	Meeting ended	1700	
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MEETING MINUTES

DATE/TIME		26/12/2024 8.30am	
LOCATION		MA6 & Online	
AGENDA		Discussion about arrangement device	
Meeting MC		Raudhah	
ATTENDANCE			
NAME		TIME	REASON FOR ABSENCE
Nazatul		0830	-
Raudhah		0830	-
Athirah		0830	-
Syafina		0830	-
MINUTES			
NO.	ITEM DISCUSSED	IDEAS/SUGGESTIONS AND PERSON GIVING IT	PERSON IN CHARGE & DATE
1	Discussed workflow	Update the incomplete work	Raudhah
2	Complete the Network Diagram	Using autocad to complete diagram with accurate cabling	Raudhah
3	Finalized the work	Clean the report format	Syafina
4	Next meeting	Task 5	Athirah

5	Meeting ended	1500	
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