CMPG 315 Group Project

Group 16 - Members

Name		*Student Number*
Romeo Manyike	**Group Leader**	43370314
Katelyn Joynt		45248494
Precious Masetla		45645892
Thoriso Mbambisa		45702004
Michel Cynthia Sibanda		38780089

Project Specifics

Project Scope	The project involves designing and implementing a cost-effective network infrastructure for a company relocating to a new office building. • The network must support all existing and newly acquired computer and office equipment, while adhering to budget constraints. In addition, the project includes the development of a lightweight, portable text messaging application for Windows, with functionality for both in-office and remote users.

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Group Task 1: Preparation

Reflective Essays

Romeo Manyike – 43370314

Engaging with these online courses has not only broadened my technical knowledge but also helped me grow crucial soft skills such as communication, organization, adaptability, and critical thinking.

The Cisco Packet Tracer training enhanced my logical reasoning and attention to detail. By working through realistic network scenarios, I acquired a more systematic approach to troubleshooting and learned how to effectively communicate technical issues and solutions skills that are important when collaborating with others.

The Project & Project Management course served as a powerful reminder of the value of careful preparation, good time management, and leadership. It taught me how to arrange complex tasks, prioritize properly, and adapt to changing circumstances, skills that I can use in both academic group projects and future professional situations.

The Git and GitHub classes were extremely useful for strengthening collaborative abilities. When working as part of a distributed team, I realized how important version control and clear documentation and communication are.

The Time Management course provided practical tools for boosting productivity. Techniques like setting SMART goals and using the Pomodoro method have already helped me manage my time better and stay focused.

These learning experiences have equipped me with a stronger sense of responsibility and teamwork. The soft skills I've developed are just as valuable as the technical ones and will continue to support my growth in both academic and professional environments.

Words: [227]

Katelyn Joynt - 45248494

I gained great insights into proper time-management, what activities I should focus on to properly spend my time in an effective manner and how to achieve desired results within my own time-goals. I think with these new skills, time-management within our group project will lead to us achieving our desired results.

GitHub will be a valuable asset in the creation of our group's messaging app and after the completion of the course, I feel much more confident in my ability to properly navigate all the features present. GitHub is definitely necessary for properly tracking who is working on what part of our project.

Packet Tracer simulates simple home networks, office networks, IoT networks, and even complex enterprise networks. I learned that Packet Tracer can be used to represent a physical network, which is a crucial aspect of the messaging app we need to develop. The course was very clear and concise in explaining the important parts of the application.

I believe that through the courses provided to us, we are given the necessary tools to successfully complete the project, especially in regards to the courses surrounding Packet Tracer and GitHub as these are concepts that some (or many of us) are less familiar with.

Words: [204]

Precious Masetla - 45645892

It has been said that you learn something new every day. You can never know enough. Through the course of time management, I took away that my mornings are what matters the most. If I can put enough time and effort into programming my morning, then the rest of my day will be productive. I must always put my energy into what matters. If I put 20% of my effectiveness and full attention, then it will yield 80% of my success. GitHub is a platform that very smartly stores and traces the work contributed by each member of a group. I have learned that I can commit my work to a certain repository and create my own space [repository] to share my work. With this project being as big as it is I will be committing a lot of work and therefore will need an application like GitHub to store it away safely. Packet tracer is a platform that helps me configure real life networks but on a PC. It gives me an idea of how the network will physically look and more on the connective side of things. I learnt which cables normally go in which parts on certain devices. This is helpful to know for when I have to develop my own network which I which is what my group and I will be doing for this project.

Words: [230]

Thoriso Mbambisa – 45702004

By completing these online courses, I gained valuable knowledge, insight and soft skills which can be applicable in all aspects of my life.

The Time Management course provided useful strategies that helped me better organize my study time, prioritize tasks, and reduce procrastination—skills I now actively apply in my daily schedule. The Git and GitHub courses gave me a thorough understanding of the environment and the difference between Git and GitHub. How to both navigate and use both git and GitHub. Overall, these courses have strengthened my communication and organization skills, especially in terms of managing code contributions and tracking project progress. Even though the Project Management course covered material I had already acquired, it reaffirmed the value of teamwork, leadership, and planning—skills that are critical in any group environment. Building and testing virtual networks was made possible by the Cisco Packet Tracer training, which was very beneficial. This promoted critical thinking and problem-solving skills in addition to deepening my technical grasp. I liked how the course was hands-on and emphasized the value of flexibility and perseverance when dealing with new tools or obstacles.

To sum up, these courses have greatly improved my soft skills, especially in communication, problem-solving, and time management. They have given me useful tools that I can use both in and out of school.

Words: [220]

Michel Cynthia Sibanda – 38780089

Time management

This online course taught me that time management is not about completing tasks in a day but rather about investing time in ways that could yield results. Anything that does not yield results is a waste of time. I also realized that having to think about what to do next, especially the obvious, is a waste of time and mental energy; instead, we need a framework that organizes our entire day and helps us choose what to focus on.

Get started with GitHub and becoming an expert in git and github

This course taught me that GitHub works with Git to add additional features, such as storing repositories on their servers, while Git is the source control software that enables me to create snapshots while distributing my creations and modifications over time. Git is also used to avoid data loss and to propagate file changes over time through source control.

Project and project management

This course taught me that a project is a temporary effort undertaken to create a unique product, service, or result and key principles of project management, which is that all projects are carried out under certain constraints such as cost, time, scope, risk, quality, and resources.

Getting started with cisco packet tracer

Lastly, this course introduced me to network simulation and modelling. I gained a foundational understanding of essential networking concepts, such as routing, switching, and security.

The above courses have enhanced my personal and professional growth; therefore, I look forward to applying my new skills in real-world situations.

Words: [255]

Group's Working Procedure

Summary of Our Work Ethic

When Work Would Be Done

Group members will contribute based on availability, ensuring steady progress throughout the project. Work may be done after classes, at home, late at night if needed, or during group meetings.

Where Work Would Be Done

Individual work will typically be done in quiet environments such as the library, at home, or during free time in class. Additionally, group work may take place in a library meeting room, or in suitable spaces on campus.

Manner of Work Being Done

All members are expected to:

- Complete tasks to the best of their ability
- Meet deadlines and maintain high standards
- Support one another without taking advantage
- Seek clarification or feedback when needed
- Collaborate effectively while respecting each other's strengths

What Group Considers a Delinquency

To maintain a positive and productive group environment, the following behaviours are not acceptable:

- Unexplained absence from meetings.
- Lack of contribution or engagement.
- Missing deadlines or neglecting tasks.
- Failing to carry one's share of the workload.
- Disrespect toward team members.
- Dishonesty in communication or task completion.
- Delivering poor-quality or rushed work.

Communication Channels and Collaborations

To ensure efficient communication, the group primarily used a dedicated WhatsApp group (Created on the 29th of March). This platform was chosen over email due to its immediacy and ability to reduce misunderstandings. The WhatsApp group facilitated the coordination of both in-person and virtual meetings, and served as a central space for sharing relevant documents and updates.

During these meetings, members discussed progress, clarified expectations, and distributed workloads collaboratively. This consistent communication helped maintain alignment and accountability throughout the project.

Group Task 2: Continuous Reporting

Group Member Meetings & Notes

Attendance List							
Member	Student Number	3 April 2025	21 April 2025	29 April 2025	5 May 2025	9 May 2025	11 May 2025
Romeo Manyike	43370314	✓	✓	✓	✓	✓	✓
Katelyn Joynt	45248494	✓	✓	✓	✓	✓	✓
Precious Masetla	45645892	✓	✓	✓	✓	✓	✓
Thoriso Mbambisa	45702004	✓	✓	✓	✓	✓	✓
Michel Cynthia Sibanda	38780089	✓	✓	✓	✓	✓	✓

(Note: Virtual meetings are indicated in grey.)

Meeting Notes

3 April 2025

The group's initial meeting was conducted on Microsoft Teams, following the election of Romeo as the group coordinator via a poll held on WhatsApp. During the meeting, Romeo introduced the project and led a group review of the task list and overall objectives.

The team agreed to complete Project Task 1 by 7th April. It was also decided that all members would submit their reflective essays to Katelyn, who would be responsible for compiling the final documentation.

Finally, the group scheduled a follow-up meeting for 21st April to begin working collaboratively on the Packet Tracer component of the project.

21 April 2025

The group began the meeting by reviewing the project documentation and discussing the technical requirements. After evaluating available options, the team agreed to use Packet Tracer version 8.2.2 for the project.

Next, Romeo was appointed as the GitHub coordinator.

The group reviewed the Packet Tracer guidelines to clarify individual and collective responsibilities. Tasks were then assigned as follows:

- Katelyn – Technician's Office
- Michelle – Reception / Waiting Area
- Thoriso – 13 Offices
- Precious – Kitchen
- Romeo – Meeting Room / Board Room

The team also began discussions on the project budget, which Katelyn volunteered to compile.

Work then progressed into layout planning and network topology selection:

- Katelyn and Precious focused on the layout and topology for the Machine Room
- Thoriso and Michelle worked on the layout and topology for the Open Floor Space

Finally, the group scheduled a virtual meeting for the 29th of April.

29 April 2025

During this meeting, the group agreed that the network topology would be developed more efficiently if handled by a smaller team. As a result, Thoriso and Katelyn were appointed to lead this task, incorporating elements previously implemented by other group members.

Meanwhile, Romeo, Michelle, and Precious began working on the research and coding for the messaging application, ensuring ample time to identify and resolve any potential errors early in the development process.

The team scheduled the next meeting for 5th of May 2025.

5 May 2025

This group meeting took place in a seminar room at the library. Katelyn and Thoriso reported ongoing issues with the network topology and dedicated most of the session to troubleshooting these errors.

The team agreed that the coding team (Precious, Romeo, and Michelle) would continue working independently to expedite the development of the messaging application. During the meeting, they brainstormed possible features and ideas for the application.

Additionally, Katelyn and Thoriso planned to meet again on the 7th of May to continue addressing the technical issues with the network topology.

9 May 2025

This meeting was held in a seminar room at the library. Thoriso focused on finalizing the network topology, which was largely complete and functional by this stage.

Katelyn, who had already begun working on the group's final documentation, used the session to compile parts of the project budget and draft the network topology description.

Romeo presented the current progress on the messaging application, after which the group discussed and agreed on a few additional features to help the app stand out.

The team collectively agreed that all components should ideally be finalized by the next meeting on 11th of May, to ensure a timely submission of the completed project.

11 May 2025

The group convened in an empty lecture hall to review progress. Thoriso confirmed the completion of the network topology, while the development team reported that the majority of the application's functionality had been implemented. The group collectively agreed to finalise the majority of the project on this day, allowing the remaining time to be dedicated to completing the documentation and making the necessary preparations for the project demonstration.

Group Members' Tasks & Responsibilities

In order to ensure the success of the CMPG315 group project, tasks were strategically delegated according to each member's strengths and areas of interest. The following outlines the roles and responsibilities adopted by each group member:

Romeo serves as the group coordinator and the lead developer of the messaging application. As the coordinator, he is responsible for organizing group meetings, recording minutes, and ensuring that all members adhere to the agreed-upon timeline and internal work ethic. He oversees the direction of the messaging application, ensuring progress is monitored and that deliverables meet the project requirements.

Precious and Michelle are members of the application development team, working collaboratively with Romeo to implement the required features of the messaging app. Their tasks include writing functional code, testing the application's performance and portability, and brainstorming improvements to enhance the user experience.

Thoriso and Katelyn are jointly responsible for the network topology component of the project. Their duties include designing the Packet Tracer simulation, aligning the network configuration with the client's budget and hardware constraints, and troubleshooting any implementation issues that arise.

In addition to her technical role, Katelyn is also in charge of compiling the final project documentation. This includes gathering all required written materials, such as meeting minutes, budget breakdowns, reflective essays, and component descriptions, and ensuring that the documentation aligns with the project submission guidelines.

This division of labour has enabled the group to work concurrently on major project components, balancing the technical workload while maintaining steady progress toward the project's completion and successful on-time submission.

Completed Task Sheet

Task Number	Task Name	Starting Date (Date)	Date of Completion (Date)	Duration (Days)	Priority	State of Completion	Assigned To
Group Task 1	Project Planning & Coordination	2025/03/28	2025/04/03	6	High	Completed	Romeo (Lead)
	Reflective Essays	2025/04/03	2025/04/07	4	Medium	Completed	All Members
Group Task 2	Continuous Reporting	2025/04/03	2025/05/13	40	High	Completed	Katelyn
Group Task 3	Initial Packet Tracer Setup	2025/04/21	2025/04/29	8	Low	Completed	All Members
	Technician Office Layout (Packet Tracer)	2025/04/21	2025/04/29	8	Low	Completed	Katelyn
	Reception Area Layout	2025/04/21	2025/04/29	8	Low	Completed	Romeo
	Office Layout	2025/04/21	2025/04/29	8	Low	Completed	Thoriso
	Kitchen Layout	2025/04/21	2025/04/29	8	Low	Completed	Precious
	Meeting Room Setup	2025/04/21	2025/04/29	8	Low	Completed	Michelle
	Finalize Network Topology Design	2025/04/29	2025/05/11	12	High	Completed	Thoriso, Katelyn
	Finalize Packet Tracer Video Demonstration	2025/05/11	2025/05/13	2	Medium	Completed	Thoriso
Group Task 4	Develop Messaging App - Initial Coding	2025/04/29	2025/05/05	6	Medium	Completed	Romeo, Michelle, Precious
	Continue App Development & Testing	2025/05/05	2025/05/12	7	High	Completed	Romeo, Michelle, Precious
	Draft Budget and Documentation	2025/05/05	2025/05/12	7	High	Completed	Katelyn
	Final Review and Integration	2025/05/11	2025/05/13	2	Medium	Completed	All Members
	Submission Preparation	2025/05/12	2025/05/13	1	Medium	Completed	All Members

Figure 1: Group 16 Task Sheet

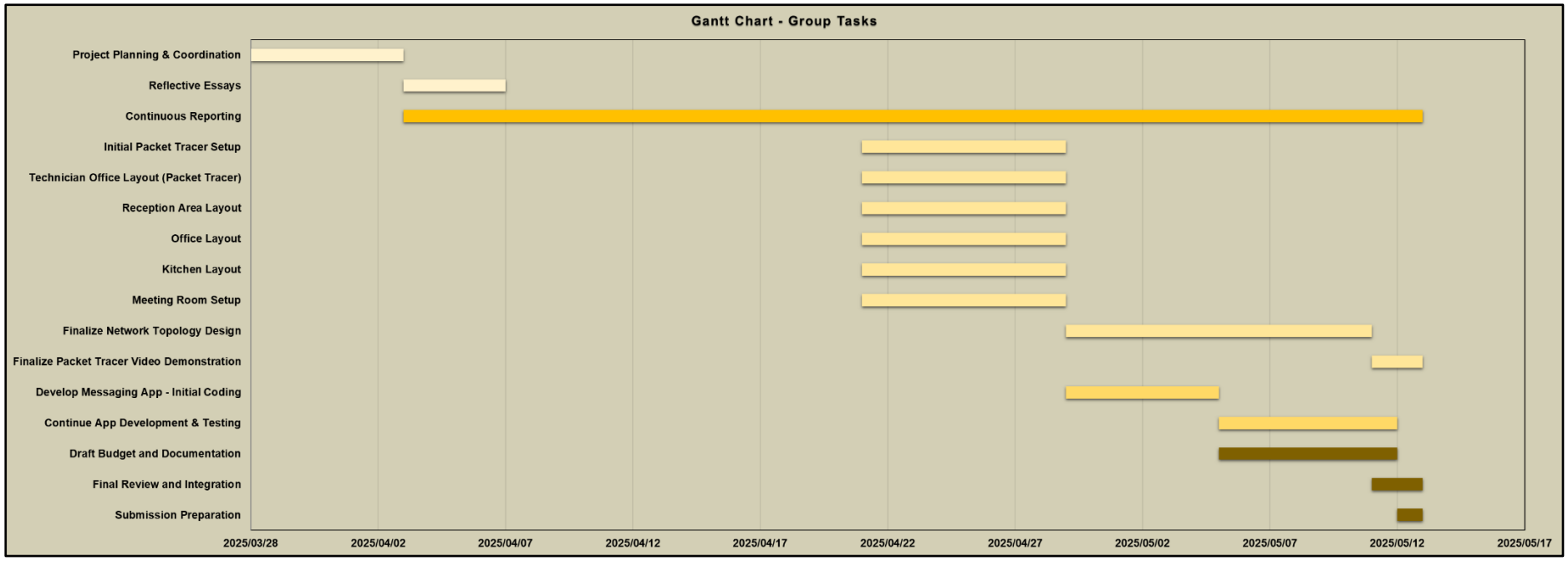

Figure 2: Group 16 Gantt Chart

GitHub Repository

For our project, we utilized a GitHub repository to collaboratively share and manage the files related to the Packet Tracer network design and the messaging application. This allowed us to maintain version control and streamline development among the team members working on the technical components. However, for general file sharing, such as documents, reports, and presentations, we primarily relied on our WhatsApp group, which provided a quick and convenient way to communicate and distribute non-code-related materials in real-time.

Link to the GitHub Repository

https://github.com/romeo-rsa3/Packet-Tracer-315.git

Group Task 3: Topological Network Design

Problem Overview

The network design must accommodate a single-story commercial building measuring approximately 100 by 50 meters. This space includes multiple work areas such as thirteen offices, a technicians' office, a reception and waiting area, a kitchen, a meeting room, an open-plan workspace, and a dedicated machine room. The building is designed to support both wired and wireless connectivity. Wired devices are expected to achieve synchronous speeds of 50 Mb/s, while Wi-Fi devices should support 10 Mb/s. Each staff member will use between one and four Wi-Fi-enabled devices, which must be treated as untrustworthy from a security perspective. All devices require reliable internet access, and the building's existing fibre ISP connection, terminating in the machine room, is considered sufficient for overall bandwidth needs.

There are several issues that need to be addressed in the network design. Ensuring strong and consistent Wi-Fi coverage across the entire building is a significant challenge, especially in high-density areas like the open floor space and meeting room. Strategic placement of wireless access points, proper channel management, and possibly the implementation of Wi-Fi 6 standards will be necessary. Guest Wi-Fi in the reception area must also be securely isolated from the internal network to protect sensitive data. Bandwidth management is another concern, particularly as the network must support a large number of users and devices simultaneously. To maintain performance, Quality of Service (QoS) should be used to prioritize critical traffic such as teleconferencing and server access.

Scalability and redundancy are also important design considerations. With most of the core network infrastructure concentrated in the machine room, the risk of a single point of failure is high unless redundant links and failover mechanisms are put in place. The network must be scalable to accommodate business growth, requiring managed switches and modular hardware wherever possible. Security is a further concern due to the large number of untrusted Wi-Fi devices. This requires strong segmentation, VLANs, MAC filtering, and possibly enterprise-level authentication like 802.1X. All of this must be implemented while maintaining a user-friendly experience for employees and guests.

Cable management also presents a challenge, particularly with over 100 wired access points—many of which are located in the open floor space with raised flooring for under-desk cabling. Proper organization, labelling, and routing of cables is essential to ensure future maintenance can be carried out efficiently and safely.

Work-from-home support is another key aspect of the network design. The existing servers in the machine room are capable of supporting centralized storage, intranet hosting, and remote access. To enable secure work-from-home operations, VPN access or remote desktop solutions should be implemented to allow encrypted, authenticated connections to the internal network. Remote server management capabilities must be in place for technicians to maintain and monitor systems off-site. Effective policies for file synchronization, data access, and automated backups will help ensure that remote staff can remain productive while minimizing risk to the company’s data and infrastructure.

Description of the Network Topology

The network topology we designed is loosely based on a centralized star topology, which ensures efficient communication, ease of maintenance, and scalability. At the heart of the network is a managed switch that serves as the central connection point for all devices within the machine room. Each device, including the server, user PCs, and a network printer, connects individually to this switch using Ethernet cables. This approach allows for isolated cable management, meaning if a single cable is damaged or fails, the rest of the network remains unaffected and operational.

A router is connected to the central switch to provide a secure connection to external networks, such as the internet. The router also manages IP addressing and handles traffic routing beyond the local network. We chose a managed switch rather than an unmanaged one to allow for future network segmentation using VLANs and to support better traffic control and monitoring features. Additionally, a wireless access point is connected to the switch to provide Wi-Fi connectivity to mobile and wireless devices within the area. This ensures that both wired and wireless devices can access the same network resources effectively.

Repeaters were not included in the design because all cable runs are well within the 100-meter range limit for Ethernet, making them unnecessary. Overall, the selected components provide a robust, scalable, and efficient network that balances wired reliability with wireless flexibility, while the centralized structure simplifies network expansion and troubleshooting.

Total Budget

For the Wi-Fi connectivity, D-Link DAP-1360 Indoor Access Points will be installed to enable staff to connect to the internet. Each unit is priced at R740 and is easy to install, helping to reduce overall labour costs.

For network switching, the TP-Link TL-SF1008D will be used, offering 8 Ethernet ports per switch to support multiple wired connections.

To provide internet access, the TP-Link Archer AX6000 will serve as the primary router. This high-performance router, costing R3500, supports Gigabit Ethernet for fast and reliable connectivity.

Additional routing will be handled by TP-Link Archer C6 AC1200 devices, which will function as sub-routers to extend and manage the network across different areas.

The pricing of the devices was primarily based on market rates obtained from reputable online retailers such as Amazon.com and Takealot.com. Installation costs were estimated using the average industry-standard fees currently associated with the setup and configuration of the respective devices.

Devices	
30 D-Link DAP-1360	22200
40 TP-Link TL-SF1008D	6800
3 TP-Link Archer C6 AC1200	2550
1 TP-Link Archer AX6000	3999
Total Cost of Devices:	42960
Labour Costs	
Installation of 30 D-Link DAP-1360	45000
Installation of 40 TP-Link TL-SF1008D	20000
Installation of 3 TP-Link Archer C6 AC1200	6000
Installation of 1 TP-Link Archer AX6000	3500
Total Labour Costs:	74500
Total Labour Costs (20% contingency):	89400
Total Cost:	**132360**

The total project cost, including both device and labour costs, with an added 20% contingency to account for unforeseen expenses, amounts to R132360. To ensure sufficient budget coverage and avoid any potential shortfalls, this amount can be rounded up to R140000.

Budget Breakdown

13 Offices

13 offices will accommodate 2 to 4 employees each, using desktops or laptops with Ethernet ports. Each office will be provided with 1 wired access points to ensure reliable internet connectivity, and Wi-Fi will be available to support 2 to 4 wireless devices per person. The office located in the upper left corner of the layout will serve as a storage area and will not require any network access. Two 24-Port switches will be used to provide the wired access points to each office. The wireless access points will be used to provide a Wi-Fi connection to staff.

Devices	
1 D-Link DAP-1360	740
2 TP-Link TL-SF1008D	340
Total:	1080
Labour Costs	
Installation of 1 D-Link DAP-1360	1500
Installation of 2 TP-Link TL-SF1008D	1000
Total:	2500
Total Cost for One Office:	3580
Total Cost:	**42960**

*1 Office acts as a storage closet and does not need to be taken into consideration for cost calculations.

Technician's Office

The Technicians' Office will support 2 technicians using either desktop or laptop computers. It will include 2 wired access points for office tasks and an additional 4 wired access points for equipment maintenance purposes. This office will have direct wired access to the machine room to facilitate network administration. Wi-Fi will also be available for up to 8 devices per technician. The technicians' office consists of two technicians using a desktop each which is connected to a switch. There is also a wired switch (that has seven ports) that connects directly to the machine room.

Devices	
6 D-Link DAP-1360	4440
2 TP-Link TL-SF1008D	340
Total:	4780
Labour Costs	
Installation of 6 D-Link DAP-1360	9000
Installation of 2 TP-Link TL-SF1008D	1000
Total:	10000
Total Cost:	**14780**

Reception/Waiting Area

The Reception and Waiting Area will support 2 staff members, each with a dedicated wired access point. Staff will have full Wi-Fi access to support 2 to 4 personal devices per person. One networked printer will be available in this area, and guests will have access to a limited Wi-Fi network that is securely isolated from internal systems.

Devices	
2 D-Link DAP-1360	1480
2 TP-Link TL-SF1008D	340
Total:	1820
Labour Costs	
Installation of 2 D-Link DAP-1360	3000
Installation of 2 TP-Link TL-SF1008D	1000
Total:	4000
Total Cost:	**5820**

Kitchen

The Kitchen will be fitted with 4 wired access points intended for IoT devices such as smart appliances or environmental sensors. Wi-Fi access will also be available for staff use.

Devices	
4 D-Link DAP-1360	2960
1 TP-Link TL-SF1008D	170
Total:	3130
Labour Costs	
Installation of 4 D-Link DAP-1360	6000
Installation of 1 TP-Link TL-SF1008D	500
Total:	6500
Total Cost:	**9630**

Meeting Room/Board Room

The Meeting Room/Boardroom is designed to accommodate between 20 and 30 individuals and will be equipped for teleconferencing. It will have 2 wired access points to connect dedicated teleconferencing hardware and will also support staff devices via Wi-Fi.

Devices	
2 D-Link DAP-1360	1480
1 TP-Link TL-SF1008D	170
Total:	1650
Labour Costs	
Installation of 2 D-Link DAP-1360	3000
Installation of 1 TP-Link TL-SF1008D	500
Total:	3500
Total Cost:	**5150**

Machine Room/Server Room

In line with company policy, all core networking hardware, including servers, routers, and major switches, are housed in this room. Only switches with fewer than 8 ports may be deployed elsewhere in the building. The company already owns the three servers used in this room, which provide essential services such as centralised file storage, project hosting, remote work support, and intranet access. These servers are also configured to deliver key network functions like DHCP, NAT, and DNS. The room contains four routers, six switches, and the three main servers (DHCP, Web, and DNS), all of which are primarily accessed remotely from the technicians' office. The ISP fibre line terminates in the machine room, ensuring that all Internet traffic passes through this point, although it does not necessarily flow through the servers themselves. No Wi-Fi is provided in the room, and there are no wired access points aside from the available ports on the network equipment.

Devices	
3 TP-Link Archer C6 AC1200	2550
1 TP-Link Archer AX6000	3999
6 TP-Link TL-SF1008D	1020
Total:	7569
Labour Costs	
Installation of 3 TP-Link Archer C6 AC1200	6000
Installation of 1 TP-Link Archer AX6000	3500
Installation of 6 TP-Link TL-SF1008D	3000
Total:	12500
Total Cost:	**20069**

Open Floor Space

The open floor space is described as a multi-functional office space that needs to be adaptable to accommodate various tasks and projects. The room is big enough to accommodate 75 – 120 people and the floor is raised to allow cables to effortlessly run under the desks to the machine room. One hundred wired access points are available to allow for devices to connect to the network via Ethernet. Staff have a reliable Wi-Fi connection and five networked printers are available. The room's devices will be connected to 12 24-Port switches which is connected to one main switch. Five printers will be connected to one 8-Port switch, making them accessible to the rest of the network. Four access points will be used to provide a Wi-Fi connection to staff members.

Devices	
4 D-Link DAP-1360	2960
14 TP-Link TL-SF1008D	2380
Total:	5340
Labour Costs	
Installation of 4 D-Link DAP-1360	6000
Installation of 14 TP-Link TL-SF1008D	7000
Total:	12000
Total Cost:	**17340**

How Users would Connect Remotely

Which Remote Software Should Be Used, And Why

To support remote access, users of the network would connect through a secure Virtual Private Network (VPN) using client-side software such as Cisco AnyConnect or OpenVPN. These options are cost-effective, widely supported, and can be centrally managed by IT staff. Cisco AnyConnect is particularly well-suited for enterprise environments and can integrate with existing Cisco infrastructure if used. OpenVPN, while free and open-source, may require more manual configuration but is flexible and reliable. The budget should account for licensing if using AnyConnect.

Security Implications

From a security standpoint, implementing remote access introduces certain risks. One of the main concerns is lateral movement. Once a remote device is connected, an attacker who compromises that device may attempt to move through the internal network. To mitigate this, network segmentation using VLANs, strict access control lists (ACLs), and role-based permissions should be enforced. Additionally, multi-factor authentication (MFA) should be required for all remote logins to reduce the likelihood of credential-based attacks.

Bring Your Own Device Considerations

The organization must also account for Bring Your Own Device (BYOD) scenarios. Allowing employees to use personal laptops, tablets, or phones introduces a layer of risk, especially if those devices are not properly secured or patched. A comprehensive BYOD policy should be implemented, including the use of Mobile Device Management (MDM) solutions, mandatory endpoint protection, and network access control (NAC) to check device compliance before allowing a connection. Devices that do not meet security standards should be restricted to isolated guest VLANs or denied access entirely.

Establishment Of A Cooperative Virtual Workspace

To support collaboration while working remotely, the company should establish a cooperative virtual workspace using tools like Microsoft Teams, Slack, or Google Workspace. These platforms enable real-time communication, file sharing, video conferencing, and project tracking in a centralized and secure environment. They can be integrated with single sign-on (SSO) for ease of access and administration. Using cloud-hosted collaboration tools also reduces the load on internal servers and improves accessibility for remote staff across different locations and time zones. Together, these solutions create a secure and productive remote working environment that aligns with modern hybrid work models.

Evaluation of the Network

Does the Network Fullfill requirements?

Yes, the network design fulfills the outlined requirements. It accommodates all physical spaces in the building, including offices, the technician area, meeting rooms, reception, kitchen, and open workspace, by providing sufficient wired access points and strong wireless coverage. The central machine room houses all core infrastructure, including routers, servers, and major switches, in compliance with company policy. Bandwidth expectations are also met, ensuring each wired device can access 50 Mb/s and each wireless device can access 10 Mb/s. The setup accounts for the presence of both wired and wireless users, supports remote access needs, and anticipates the high density of Wi-Fi devices by deploying access points strategically throughout the building.

Strengths of the Network Setup

The network's biggest strength lies in its structured and centralized design, which enhances control, scalability, and performance. The central machine room ensures that critical infrastructure is secure, ventilated, and physically isolated. The use of managed switches allows for advanced configurations such as VLAN segmentation and traffic prioritization, which are key in such a large and diverse environment. The raised flooring in the open area simplifies cable routing and future expansion, while the inclusion of access points in all critical locations ensures full Wi-Fi coverage. The network also supports teleconferencing, IoT devices, guest access, and the needs of both desktop and mobile users.

Potential Issues with the Network Setup

While the design meets most needs, it does present some potential issues. High device density, especially in the open-plan workspace and meeting rooms, may lead to wireless congestion or interference if access point placement and channel allocation are not managed carefully. Another concern is the single point of failure risk created by centralizing all routing and switching in the machine room; without proper redundancy, a hardware failure could impact the entire network. Furthermore, supporting a large number of Wi-Fi devices, many considered untrustworthy, requires strict security configurations to prevent unauthorized access or lateral movement across the network.

Maintenance Considerations and Critical Components

The machine room will require the most frequent and specialized maintenance, as it houses the core routers, servers, and switches. Keeping this space secure, clean, and well-cooled is essential. Because nearly all network traffic passes through this room, any issue here could disrupt services across the building. To ease maintenance, equipment should be mounted in labeled racks with clear cable management and allow remote monitoring and configuration access. Wireless access points also require occasional firmware updates and troubleshooting, especially in high-use areas. Structured cabling, documented configurations, and change logs will all facilitate smoother maintenance over time.

Components Likely to Remain in a Virtual Office Transition

In the event the company transitions to a fully virtual office, much of the on-premises infrastructure would become redundant, but some components would still remain essential. The machine room servers would likely continue to operate to provide internal services such as centralized file storage, remote development environments, or intranet hosting. The VPN gateway and remote access systems would also remain critical for secure employee access to company resources. Additionally, any cloud-integrated systems would continue to be used. However, most physical workstations, printers, and localized access points in the office would no longer be necessary.

Issues Encountered

Our group managed the project workload remotely by coordinating through online tools such as WhatsApp for easier communication, for sharing files and documentation. We held occasional virtual meetings on Microsoft Teams to discuss progress, assign tasks, and troubleshoot any issues we encountered while developing the network topology, as described in the meeting notes.

One of the key advantages of working remotely was the flexibility in scheduling, we could contribute at times that best suited our individual routines. It also helped us become more independent and accountable for our own work.

However, a disadvantage was the occasional miscommunication or delay in response, especially when clarifying technical details. Another challenge was not being able to physically work together when troubleshooting errors in Packet Tracer, which sometimes slowed down problem-solving leading to crunch-time nearing the deadline of the project.

Despite this, we learned the importance of clear documentation, proactive communication, and using version control methods to avoid overwriting each other’s work, this was made easier with our GitHub repository.

Overall, the experience helped us strengthen our time management and collaboration skills in a virtual environment.

Group Task 4: Text Messaging App Development

Reflection of the Messaging App

The process of creating the Orbit Messenger text messaging app was quite educational and involved a number of difficulties, especially with regard to user experience, portability, and connectivity.

One of the main hurdles was transitioning from a locally hosted environment to a fully functional cloud-based system, as the app was initially restricted to the development machine. Deploying the Node.js backend to Render.com and configuring essential environment variables was a major milestone that allowed the application to operate across different devices.

Another key improvement was switching from a local MongoDB instance to MongoDB Atlas, which made the database accessible online. This step, however, involved navigating through connection issues caused by misconfigured firewall settings and credentials.

Aesthetic and usability issues were also addressed—Electron's build configuration was refined to include a custom icon and a portable .exe, enhancing professionalism and accessibility. In addition, significant UI refinements were made using Flexbox to centre panels and align components more effectively, contributing to a cleaner, space-themed interface.

These challenges highlighted the importance of attention to deployment details, environment configurations, and user-centric design.

The experience ultimately strengthened our understanding of full-stack development, cloud hosting, and cross-platform application delivery.

Issues Encountered

During the development of the Orbit Messenger text messaging application, several technical and design-related challenges were encountered and systematically resolved.

- **Internet Connectivity and Backend Hosting**
  Making sure the program communicates over the Internet rather than a local network was one of the project's main needs. Deploying the backend server to a cloud hosting platform was necessary for this. At first, the program only worked on localhost; it would not run in a demo environment or on another machine. The Node.js backend was hosted on Render.com following an evaluation of deployment possibilities. To bring the server up, it was essential to properly set up environment variables such the MongoDB URI and PORT.

- **Switching from Local MongoDB to MongoDB Atlas**
  Initially, the project was linked to a nearby MongoDB database. This, however, rendered the application reliant on the development machine and non-portable. Configuring users, network access, and the proper connection URI was necessary while switching to MongoDB Atlas, a cloud-hosted database. It required some time to fix any firewall settings or password misconfigurations that prohibited the backend from connecting.

- **Frontend Connectivity Errors**
  Despite the successful deployment of the server, the frontend persisted in attempting to connect to localhost. As a result, registration and login failed. Renderer.js's hardcoded URLs were identified as the cause of the problem, and they needed to be changed to use the deployed Render URL (https://...onrender.com). To point to the live backend, all fetch() and socket.IO connection calls were fixed.

- **Electron Icon and Build Configuration**
  Making the Electron app both portable and aesthetically pleasing presented another difficulty. At first, the application needed to be installed and didn't have an icon. A fully portable.exe version of the application was produced by correctly configuring electron-builder and adding an.ico file, which enables the application to operate on any Windows computer without the need for installation.

- **User Interface Alignment and Styling**
  At first, the user interface appeared asymmetrical, particularly while logging in. The general design was improved to fit a simple, space-themed aesthetic, and CSS changes were done to centre the chat and login panels using flexbox. This improved user experience and met the requirement for a usable and user-friendly GUI.

Conclusion

Group's Experience with the Project

Throughout the development of the project, our group encountered a variety of challenges, both technical and logistical. However, these obstacles provided valuable opportunities for growth and collaboration. One of the most important lessons we learned was the significance of clear and consistent communication, especially in a remote working environment. Establishing realistic development deadlines and assigning responsibilities early on helped us manage the workload more effectively and ensured steady progress.

As part of the project, we were introduced to Cisco Packet Tracer, a tool none of us had used before. Gaining hands-on experience with its features, especially in designing and simulating network topologies, greatly expanded our understanding of practical networking concepts beyond theory. Similarly, the development of the Orbit Messenger messaging application presented a unique challenge, pushing us to explore new coding techniques and development workflows. Building a fully functional messaging app from scratch enhanced our skills in full-stack development, particularly in integrating front-end and back-end components and deploying applications on cloud platforms.

Overall, the group maintained a positive and cooperative dynamic throughout the project. While we did experience occasional scheduling conflicts, they were resolved amicably through open communication and flexibility. The absence of interpersonal conflict allowed us to focus our efforts on collaboration and problem-solving. The experience has not only strengthened our technical abilities but also our capacity to work effectively as a team in a professional setting.