**CA1 NETF Report Assignment**

By Group 5

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# 1 Benefits of having a network in the company

Computer networks consist of interconnecting many computing devices together such that they can exchange data and share resources with one another. These network devices follow a system of rules, called network protocols, to transmit information to one another over wired or wireless technologies (AWS, 2022).

With the advancement of internet technologies, modern-day network solutions deliver more than just connectivity. They are also crucial for the digital transformation and success of businesses today. Thus, computer networks are essential for companies (AWS, 2022).

Hence, having a computer network in a company brings a wide array of benefits, some of which we will be discussing below.

## Reliability

Having a corporate network provides reliability as information is stored in one centralised database. This helps when a piece of equipment fails due to unforeseen circumstances as there will always be a fail-safe as an alternative to resolve the problem. Thus, this prevents the worst-case scenario where the whole company can no longer produce work because of one equipment failure.

For example, in a company, if a workstation crashes, files on it might become inaccessible. These files might however be available for access on the backup server or the main server where they hold crucial or relevant files that other workstations might need to access. Hence, despite a PC crashing, other PCs that might need to retrieve a similar file on the crashed PC will be able to access it through the servers, prompting smooth working and further handling without interruption (Kumar, 2021).

## Supporting flexible work environments.

Another benefit of having a network in the company is that it supports flexible working environments. For example, you are able to bring your tablet or laptop into a meeting and start writing a document. Then, you may move back to your own office computer and continue working on the document, exactly where you left off (Inspired Techs, 2017).

You may also be able to view and continue working on your document on your smartphone at home when connected to the company’s VPN. All this is only possible as the document resides in a central file server from your company’s network, allowing you to access the document on other devices.

Hence, this means that working environments are not fixed and can be changed accordingly at any given moment so long as there are means to connect to the company’s network and access the servers.

## Increased efficiency for resource and file sharing

Connecting printers, computers, tablets, and even smartphones to the company's network allows them to easily access files stored on the server. Emailing or sending files from one device to another should not be necessary. There's also no need for copying files to USB drives or buying separate printers for each workstation. Any device linked to the company's network can print, copy, update and save an accessed resource or file (Invision, 2019).

## Improved Digital Security

Lastly, having a network in a company improves the digital security of the company.

The server can be configured to give appropriate access levels to dedicated staff members such that only staff of a selected department can access such files.

For example, salary.xlsx, the file that stores all the salary for every staff member in the company can only be viewed by the manager head of each department. Furthermore, only the finance department’s head can edit and change contents within that file. This shows proper access control , giving employees appropriate file permissions in a company’s network.

# Internet access plan for company (includes costs)

The internet access plan for the company will be chosen based on the considerations mentioned below. We will first compare prices of different fibre broadband plans for business from the 4 internet service providers in the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Internet Speed** | **Internet Plan** | **M1** | **Starhub** | **ViewQwest** | **Singtel** |
| 100 Mbps | Static IP |  |  | $203 / month | $300 / month |
| ~ 300 to 400  Mbps | Dynamic IP | $99 / Month for 12 months | $168 / month for 12 months | $128 / month | $119 / month  for 24 months |
| ~ 500 to 700 Mbps | Dynamic IP | $128 / month for 24 months | $248 / month for 12 months | $149 / month | $189 / month  for 24 months |
| 1Gbps | Dynamic IP | $168 / month for 24 months | $398 / month for 12 months | $230 / month | $239 / month  for 24 months |
| 1 Gbps | Static IP | $348 / month |  | $525 / month |  |

Different internet Plans offered by various internet service providers (Singtel, 2022), (M1, 2022), (Starhub, 2022) and (ViewQwest, 2022).

Some considerations we took for choosing the internet access plan for company:

1. Internet Speed
2. Cost effectiveness
3. Reputation of the internet service provider
4. Static IP plan

After evaluating between the different plans of different internet service providers, we have ultimately decided on the **1Gbps Static IP plan** that **M1** offers for **$348 per month**. We will explain why we chose this plan below.

## Internet Speed

For the company’s network, we decided to select a plan with a high speed as we have a total of 90 staff members. Having a higher speed will allow staff members to have lesser loading times when transferring files and smoother surfing of the internet.

As the company expands and the staff members increases, there would not be a need to change the internet access plan for a higher speed immediately as the initial plan would be sufficient enough. Hence, we chose the M1’s 1Gbps static plan as it should be sufficient for both now and the future.

## Cost effectiveness

Another factor we considered as well when choosing an internet access plan for the company is the cost. This plan that we are choosing has a wide array of benefits that comes together with it. Such benefits include high bandwidth, 8 static IP addresses that we can use and security features (M1, 2022). Other plans provided by other service providers offer lesser benefits by giving free hardware such as laptops, monitors and routers.

Hence, after considering the cost together with the benefits each internet access plan provides, we chose the M1 1Gbps Static IP plan as we found it to be the most cost effective.

## Reputation of M1

M1 is one of the well-known internet service providers in Singapore. It has a rather good reputation as an internet service provider where its customer service excels when compared to other internet service providers.

For example, internet service providers such as ViewQwest, Starhub and Singtel face issues such as poor customer service (Seedly, 2022). This means that if a connectivity issue arises, it might take longer to resolve as the customer support that these internet service providers provide might not be the best.

Hence, M1 has better reputation when compared to other internet service providers in Singapore and it is ideal for them to be the provider for the internet access plan.

## Static IPv4 Address

One important thing to take note is that we would want static addresses associated with the internet access plan as a static address allows for easier configuration of the network for remote access for staff members working remotely at home.

Only both M1 and ViewQwest offers static IP with 1Gbps speed. The difference however between the two is that M1 is considerably much cheaper and comes with more benefits.

Therefore, we are going to rely on M1 to provide internet service for the company in our proposed network setup after careful consideration on the options we had available.

# Proposed Network Setup

## Network Topology

In this segment, we will discuss both logical and physical topology as well as equipment and medium that will be used for the setting up of our proposed network. We will also explain the topology and the reasons why the network was setup in such a way.

### Prerequisites for Network Setup

One prerequisite would be having access to or owning the tools necessary to properly crimp RJ45 cables.

In this assignment, we will also be assuming that each room can house upwards to 25 people and their respective workstations. In the table below, we will state the room assigned for each branch of staff for the company.

Table

Description automatically generated

|  |  |  |
| --- | --- | --- |
| **#08-123**  (22 Interior Designers) | #08-124  (Empty) | **#08-125**  (15 office admin and 1 IT staff) |
| **#07-123**  **(**23 Interior Designers and 1 IT staff) | #07-124  (Empty) | **#07-125**  (1 CEO, 2 Directors, 3 Deputy Directors, and servers) |
| **#06-123**  (22 Senior Interior Designer) | #06-124  (Empty) | #06-125  (Empty) |

### Logical Topology

With reference to the logical topology diagram of the network in section **4.1.2 Logical Topology**

The logical topology of the network comprises of 4 main switches in a mesh topology. Each one of these switches are extended stars that are interconnected between switches in a star topology in the different rooms where each room houses a virtual local area network. This is to ensure fault tolerance such that if one of the main switches fails, the whole network will remain active and not go down.

We also have 2 routers that serves as a connection between the 4 main switches in a mesh topology and the servers. These routers will also be used to connect the different rooms that each houses a virtual local area network to create an internetwork. The reason we used 2 routers as well is for fault tolerance such that if one router fails, the whole network will continue to remain active, ensuring the network’s high availability.

Each room contains a switch that connects the various workstations together in a star topology to form a local area network for each room. These switches are a single point of failure in the network such that if the switch in a room goes down, the network connection in that room will become unavailable and workstations will be unable to connect to the company’s network.

Lastly, there will be a firewall used to ensure the security of the network. For example, to protect from attacks outside the network such as denial of service attacks or to filter and restrict workstations from accessing dangerous or malicious content on the internet.

### Physical Topology

With reference to the physical topology diagram of the network in section **4.1.2 Physical Topology**

The physical topology of the network is very similar to the layout of the logical topology of the network. The 4 main switches with are connected in a mesh topology would be split into halves, where a pair of switches would be designated to Unit **#07-125** and **#08-125** while the other is at Unit **#07-123** and **#08-123**. To connect the pair of switches that are between buildings, we would be using a false ceiling and fibre-optic cables which are plenum-rated as it has immunity to electrical interference and is highly secure to electronic eavesdropping.

For the remaining connections in the 4 main switches in the mesh topology, it will be connected using Shielded Twisted-Pair (STP) cabling in an extended star topology as it would reduce crosstalk and interference from occurring which interferes with the transmission of data.

We would then have 2 routers that are connected to the 4 main switches via a mesh topology. These routers would be located at the equipment room in **#07-125** for easier maintenance. However, since we are connecting these 2 routers in a mesh topology, we would need to use fibre-optic cables for the connections between the buildings to ensure the confidentiality of the data.

The rest of the cabling can be done with Shielded Twisted-Pair (STP) as the routers are situated in relatively noisy EMI environment. So having an Unshielded Twisted-Pair (UTP) might become problematic due to the likelihood of crosstalk and electromagnetic interference.

In each room in the building, there will be a switch, which is connected to one of the 4 main switches via their respective SFP ports. These switches will be connected to the various workstations in a star topology within that room. The cabling that will be used in these areas can be either be Shielded Twisted-Pair (STP) or Unshielded Twisted-Pair (UTP). Though we would recommend using STP to reduce the possibility of electromagnetic interference and crosstalk.

Within our equipment room at **#07-125**, we would be housing 2 routers, as previously mentioned, 1 primary data server, 1 backup data server and 1 firewall.

### Protocols

In this section of the report, we will be discussing the various protocols that will be used in the company’s network

#### Switch Protocols

**Full-Duplex & Auto negotiate mode**

The switches will all operate in full-duplex mode to ensure maximum speed of frame transmissions as full-duplex mode allows connected devices to transmit and receive simultaneously, eliminating the possibility of a collision which half-duplex mode faces. Auto negotiate mode will also be on to allow the switch to run on its highest performance setting by determining the link speed and duplex mode.

**Fragment-free switching**

The method of frame forwarding we will use on the switch will be fragment-free switching where the switch reads enough of the frame to guarantee that it’s at least the minimum size for the network type. The reason we chose this method of frame forwarding is to maximize the speed of the switches.

For example, Store-and-forward switching, the switches speed will be at its slowest as it will have to read and check each frame being sent to the switch to reduce all possible frame errors. This however can all be done in the network interface card where the Frame Check Sum (FCS) and the Cyclic Redundancy Check (CRC) will be compared once again.

Furthermore,Cut-through switching might be the fastest for switching performance, but it forwards all errors including frame fragments which fragment-free switching prevents.

Hence, we chose fragment-free switching as our method of frame forwarding in our switches.

**Multiple Spanning Tree Protocol (MSTP)**

Multiple Spanning Tree Protocol is an enhancement to the existing Spanning Tree Protocol (STP) where both ensures a loop-free topology in ethernet networks. Both enable switches to detect when there is a potential for a switching loop. If a loop is detected, it makes one of the switching ports to block mode, preventing it from forwarding frames thus breaking the loop.

The reason we chose MSTP over STP is because MSTP enables grouping and mapping VLANs into different spanning tree instances. Each instance properly defines a single forwarding topology for an exclusive set of VLANs. By contrast, STP or RSTP networks contains only a single spanning tree instance for the entire network, which contains all the VLANs (Wikipedia, 2022).

Since we are also using VLANs in our network, hence this protocol is the most appropriate compared to Spanning Tree Protocol (STP) or Rapid Spanning Tree Protocol (RSTP) .

**Virtual Local Area Networks (VLAN)**

Another protocol we will be using is Virtual Local Area Networks (VLAN) where the ports of each of the 4 main switches will properly be configured to separate the different rooms into their respective virtual local area networks.

This is so that the different departments such as the admin office and the interior designers can be properly separated, improving management and security of the network.

**Switch Port Security**

Switch Port Security will prevent outsiders from tapping into the company’s network. It enables an administrator to limit how many, and which MAC addresses can connect to a port. If an unauthorized computer attempts to connect, the port can be disabled, and the administrator can be alerted of the intrusion by an alert sent.

This will improve the security of the company’s network as only authorized workstations can be connected to the network.

#### Router Protocols

**Interior gateway protocols (IGP)**

We will be using Interior gateway protocols (IGP) on our routers as our company’s network is an autonomous system because the whole internetwork is managed by only our company. This can be divided into two categories, Distance-vector protocols and Link-state protocols.

**Link-state protocol**

For our network, we will be using Link-state protocols instead of Distance-vector protocols. Link-state protocolsshare information with other routers by sending the status of all their interface links to other routers. It has a faster speed of convergence when compared to Distance-vector protocols such that it spreads bad news faster to alert administrators of any problems occurring in the network. Furthermore, it has no count to infinity problem and no persistent loops, only transient loops which are problems that Distance-vector protocols faces (Singh, 2021).

Hence, we chose Link-state protocols as we found it to be the better protocol when compared with Distance-vector protocols.

**Bridge Mode**

Bridge mode is a networking feature that enables two routers to coexist without any issues. Once bridge mode is enabled on one router, it creates a mesh topology with the other router (Owais, 2021). This also makes it such that IP address conflicts do not happen on both routers. Hence, we would be using bridge mode in our network to create a mesh topology for the routers.

**NAT / PAT**

After using bridge mode on one of the routers such that IP address conflicts do not arise, one of the routers will then use network address translation with port address translation (NAT/PAT) to translate the public static IPv4 address from the internet access plan to a private address with proper port address translation with it. This is because we only are currently using 1 public static IPv4 address for the company’s network and hence requires NAT/PAT to translate it to private addresses with ports.

#### Firewall Protocols

**Access Control List**

The reason we will be using access control list in firewall is to improve the security of the company’s network.

The firewall will be configured to only allow a specific range of IP addresses to access the company’s network. This specific range of IP addresses are based on the VPN that staff members working at home remotely will be using to connect to the company’s network.

Furthermore, all workstations in the company’s network will not be allowed to access known malicious websites to ensure safety for the workstation and the network.

#### Network Protocols

**HTTP and HTTPS**

For network protocols, we will be using both HTTP and HTTPS to allow staff members to access to webpages from the internet on their workstations. This will allow them to surf and browse the internet if needed on their workstations.

**Secure File Transfer Protocol (SFTP)**

We will also be using secure file transfer protocol (SFTP) to provide file and printing services to staff members by transferring and receiving files from their workstation to the main server for processing and storing or for printing with the printer. We are using secure file transfer protocol (SFTP) instead of file transfer protocol (FTP) as SFTP transmits encrypted data safely while FTP transmits the data in plain text, making it a major security concern.

### Communication Media Used

The medium that will be used to connect our networks together. Below are some of the cables which we will be utilizing within our proposed network.

#### CAT 7 STP Cable (plenum-rated)

|  |  |
| --- | --- |
| Cost | $499.99 |
| Length | 300 metres |
| Max Bandwidth | 750 MHz |
| Max Transmission Speed | 10 Gbps |

A picture containing indoor, blue, plastic

Description automatically generated

(Amazon, 2022)

One of the cables that we will be using in our proposed network would be a CAT 7 STP cable. The reasons for us choosing to use a CAT 7 Cable as opposed to other alternatives such as a CAT 8 cable which would be brought down due to the cost.

CAT 7 STP has an advantage as opposed to CAT 5 and below as they are not only shielded, but it also has a maximum transmission speed of 10 Gbps. This allows for higher scalability of the network as one doesn’t need to re-wire the cables when higher speeds are available.

CAT 8 cable is not used as it would be much more expensive as compared to a CAT 7 cable. Additionally, it wouldn’t be worth the extra cost to go from 10 Gbps to 25 Gbps as the transmission speed of 10 Gbps would suffice in for our proposed network (Electronic-Notes, 2022).

#### CAT 7 RJ45 Connector

|  |  |
| --- | --- |
| Cost | $34.99 |
| Number per pack | 50 |
| Number of connectors needed | 232 |
| Total Cost | $174.95 |

A picture containing indoor

Description automatically generated

(Amazon, 2022)

Since we bought 300 metres of CAT 7 STP cables, we would need to appropriate amount of CAT 7 RJ45 connector to utilize the cable. In total the number of RJ45 connectors we would need is 232 RJ45 connectors

#### Fibre Optic cable (plenum-rated)

|  |  |
| --- | --- |
| Cost | $68.10 |
| Length | 25 metres |
| Max Transmission Speed | 10 Gbps |
| Multi-Mode Fibre | |
| Optical fibre Non-conductive Plenum (OFNP) | |

A picture containing cable, connector

Description automatically generated

(Amazon, 2022)

The other cable that will be used in our proposed network would be Fibre Optic cables. One of the few reasons why we chose to use Fibre optic cable is due to the security of the data that is being transferred through the cable.

Since fibre optic cables uses pulses of light to transmit data as opposed to electricity, it would be immune to electrical interference, which also in turns means that it is highly secure against electronical eavesdropping.

This feature is vital in our proposed network as we would need to connect to our 4 main switches through a unit that does not belong to the company. If an insecure method of data transmission is used, such as UTP cables, it would be highly likely that the cable can be tapped into to listen for all the data transmissions.

Hence, this would be why we will be using fibre optic cables in our proposed network. It is also worth noting that the switches must be connected to one another via fibre optic cabling through the SFP Ports.

## Hardware recommendation

**Levono ThinkPad E15 Gen 3 Laptop**

|  |  |
| --- | --- |
| Cost | $1059 |
| RAM | 16 GB |
| Storage Space | 512 GB |
| Processor | 1.8 GHz AMD Ryzen 7 5700U 8-Core |
| Amount to buy | 1 per staff member |

A picture containing text, electronics, computer

Description automatically generated (B&H Photo-Video-Audio, 2022)

Ever since the start of the COVID pandemic, staff members have been encouraged and forced to work remotely at home. With this in mind, using a home workstation that might be possibly not configured correctly or infected is rather dangerous and even hazardous to the security of a corporate’s network.

Thus, for our proposed internet access plan, we decided that the workstations being used at the company should be laptops instead of desktops. This way, staff members will also be able to bring along the company’s laptop for work at home and be able to remotely access the corporate’s network safely without compromising the security of the corporate’s network as well.

The laptop we recommend for workstations is the Levono ThinkPad E15 Gen 3 Laptop. we found this laptop to be the most cost effective with the consideration of its RAM and hard drive storage when compared to other laptops with similar price ranges. The details will be shown above.

|  |  |  |
| --- | --- | --- |
| Cost | | $148.53 |
| Number of Ports | | 24 |
| SFP Ports | | 4 |
| Fully Managed Switch | | |
| Supports Gigabit Ethernet | | |
| Has VLAN capabilities | | |
| Amount to buy | 4 | |

**S3700-24T4F, 24-Port Gigabit Ethernet L2+ Fully Managed Switch**

A picture containing text, electronics, computer

Description automatically generated

(FS Singapore, 2022)

We recommend buying this swich, S3700-24T4F, 24-Port Gigabit Ethernet Switch to be used as the 4 main switches in the mesh topology. The reason we chose this switch is because of it was one of the cheaper smart switches with a lot of ports available. With more ports, the switch has high scalability as more ports are free to be utilised when the company’s network is expanding. With 4 small form-factor pluggable (SFP) ports, it is able to connect to the other main switches in the mesh topology. Furthermore, this smart switch supports gigabit ethernet, allowing us to fully utilise our 1Gbps Static IP plan from M1 and also has abundant VLAN features, allowing us to use Multiple Spanning Tree Protocol (MSTP) for the company’s network.

**Switch: NETGEAR 48-Port Gigabit Ethernet Smart Switch (GS748T)**

|  |  |  |
| --- | --- | --- |
| Cost | | $577.46 |
| Number of Ports | | 48 |
| SFP ports | | 4 |
| Smart Managed Switch | | |
| Supports Gigabit Ethernet | | |
| Amount to buy | 5 ( 1 per room ) | |

A close-up of a building

Description automatically generated with low confidence

(Amazon, 2022)

We recommend buying this switch, NETGEAR 48-Port Gigabit Ethernet Smart Switch (GS748T) to be used in each virtual local area network housed in each room. The switch will be used to connect all workstations using an ethernet cable to the main 4 switches in the mesh topology. One reason why we chose this switch in particular was because it has more than enough ports to connect all 23 workstations in a room in our proposed solution. With many free ports available, it has high scalability for when the company’s network expands, allowing more workstations to be added and connected to the switch. Furthermore, it comes with features such as Advanced VLAN & QoS IGMP Advanced Security Link Aggregation IPv6, which will be useful in the setup of Multiple Spanning Tree Protocol (MSTP) and security management for the local area network respectively.

**Firewall: Cisco RV345P 16 Port Dual WAN Gigabit Firewall VPN Routers**

|  |  |  |
| --- | --- | --- |
| Cost | | $855.00 |
| Number of Ports | | 16 |
| Supports Gigabit Ethernet | | |
| VPN Capabilities | | |
| Power over Ethernet | | |
| Amount to buy | 1 | |

A picture containing electronics

Description automatically generated

(Lazada, 2022)

We recommend buying this firewall, Cisco RV345P 16 Port Dual WAN Gigabit Firewall VPN Routers PoE to be used to give the company’s network firewall protection and high internet access. This firewall was priced decently and included many important and essential features such as supporting VPN capabilities which will help staff members working at home remotely to connect to the company’s network. It also has 16 LAN ports to connect to other networking devices and 2 WAN ports for load balancing and resiliency. (Cisco, 2022).

**Router: TP-Link ER7206 (TL-ER7206)**

|  |  |  |
| --- | --- | --- |
| Cost | | $249.94 |
| Number of Ports | | 5 |
| SFP ports | | 1 |
| Supports Gigabit Ethernet | | |
| VPN Capabilities | | |
| Convenient VLAN Support | | |
| Amount to buy | 2 | |

A picture containing text, electronics, projector

Description automatically generated

(newegg, 2022)

We recommend buying this router, TP-Link ER7206 (TL-ER7206) to be used to route packets between the different VLANs for each room. This router was priced rather modestly considering it contains many features such as having firewall capabilities, VPN capabilities, convenient VLAN support, supporting of gigabit ethernet and many others. Having firewall capabilities will further strengthen the security of the network while VLAN support will enable the router to properly distinguish the different VLANs in the internetwork. Furthermore, it supports gigabit ethernet, showing a high scalability such that it would not be needed to replace the router when the network continues to expand in the foreseeable future (newegg, 2022).

**Hpe ProLiant DL360 G10 Intel C621/Xeon Silver 4210R/32GB Server**

|  |  |  |
| --- | --- | --- |
| Cost | | $3637.99 |
| Internal Memory | | 32GB |
| Processor family | | Intel Xeon Silver |
| Used in Ethernet LAN | | |
| Amount to buy | 2 | |

A picture containing text, electronics, clock radio

Description automatically generated

(Techinn, 2022)

We recommend buying this server to be placed together with many of the same type in a server rack. One will be the file server for the company which will hold all the files from all interior designs to admin office documents and even important documents used by the higher ups of the company. Another will be used as a backup server that will hold all these files in its memory and also upload them according to 3rd party cloud services like AWS cloud service. To have more internal memory, simply insert a 1 by 32GB memory stick into one of the empty 1 by memory slot. The reason why we chose this server in particular is because of its cost effectiveness. Usually, servers are sold above a price range of $5000. This server was rather cheap and also came with software benefits such as HPE InfoSight providing a cloud-based analytics tool that predicting and preventing problems when the network is affected or HPE Persistent Memory offering the flexibility to deploy as dense memory or fast storage and enables per-socket memory capacity of up to 3.0 TB (Hewlett Packard Enterprise, 2022).

## Software recommendation

These are the software that we would recommend using alongside with our proposed network solution.

### Virtual Private Network (VPN)

If a staff member of the company were to be working from home, they could log into a business VPN to access the documents and data which are stored in the file servers.

There are a lot of business VPN services to choose from to help secure and protect the company’s document and data, however we would recommend choosing **NordLayer** as it has a strong brand reputation as well as offering a dedicated business VPN server for internal use. Furthermore, since it is also a cloud-based business VPN, the setup required would be at a minimum (Desire Athow, 2022).

### Network monitoring for routers

As for the software that will be used for network monitoring in our proposed network, we will be recommending the use of the ManageEngine OpManager.

We are recommending this network monitoring software as it will help with managing network traffic, bandwidth usage and monitoring networking devices such as routers. With OpManager also providing a variety of features, integrations and settings for overall flexibility and customization to suit the needs of the company (ManageEngine, 2022).

### Antivirus

We will be using an enterprise antivirus to protect the corporate’s backend servers as well as the employees’ computers from security-related issues such as viruses, threats, and web-based attacks.

The antivirus we will be recommending is the Kaspersky antivirus as they provide flexibility and extended control towards the company’s IT administrators. With this antivirus, the company’s IT department can delegate their resources respectively to manage the company’s network security (Kaspersky, 2022).

## Security Issues

Potential security issues and threats the corporate network could face when using our proposed network.

### Security Vulnerability: Insider Threat

One of the possible vulnerabilities that a corporate network could face would be an insider threat, where one employee becomes rogue and decides to compromise the corporate network, potentially deleting all the files and data within the file server.

### Measures taken to address security issues

Countermeasure taken to circumvent the previously mentioned security issue and threat that could happened onto a corporate network.

#### Backups on AWS cloud service

In the unlikely event that something catastrophic happens to our main file server and backup data server, such as a natural disaster destroying the entire building or an insider threat, we will be using cloud service to further backup our data onto the cloud.

For this case, we will be utilizing Amazon Web Service’s (AWS) Cloud Service to back up the company’s data for in the case of an emergency. We will be using AWS Storage Gateway as the first 100GB of cloud storage would be free, leaving the remaining required space to be further upgraded if necessary (Amazon, 2022).

#### Use of Fibre Optic

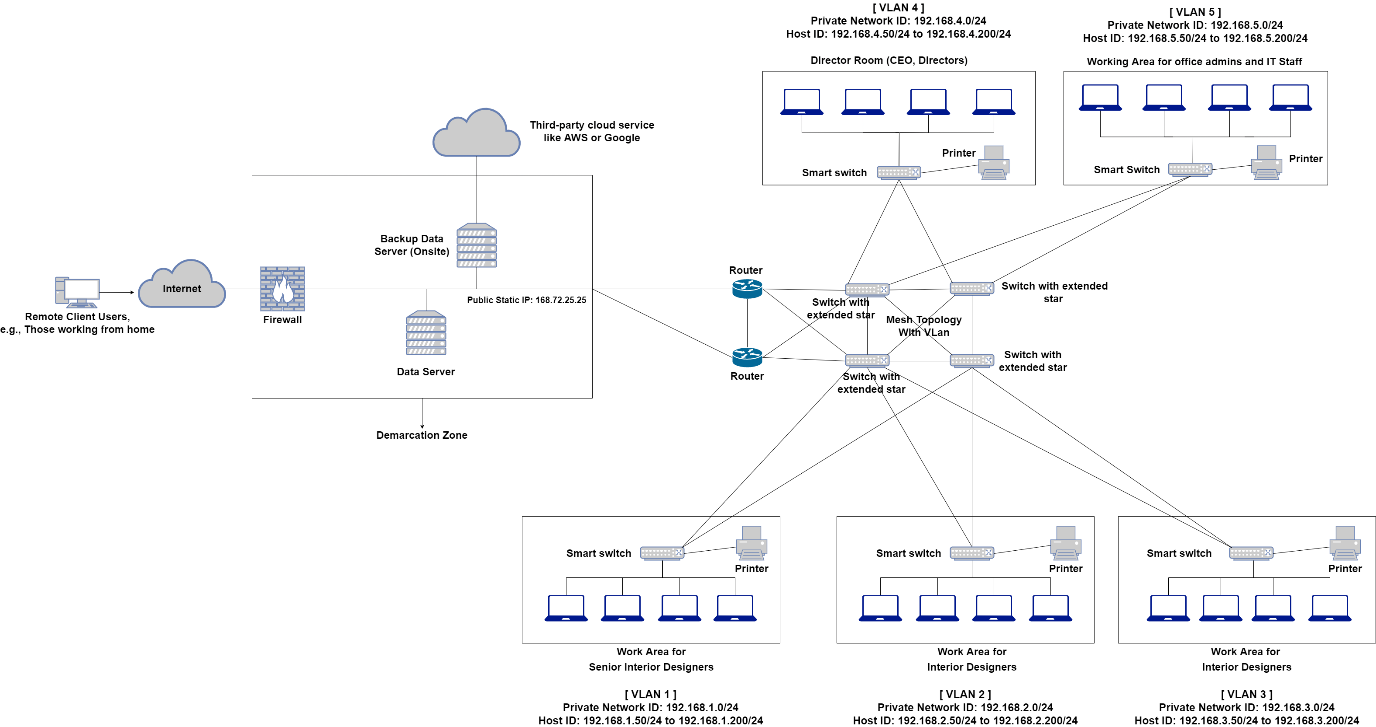
The use of fibre optic cabling for the 4 main switches in the mesh topology is to prevent the tapping of information being transferred across the wire.

Fibre-Optic cabling is used as it is immune to both electrical interference as well as being highly secure to electronical eavesdropping. Although fibre optic cabling is more expensive as compared to other options such as STP and UTP, it’s essential for the security of the data. As a rival competitor could potentially wire tap into the cables running through **Unit** **#07-124** and **#08-124** if an unsecure medium was used such as a UTP cable.

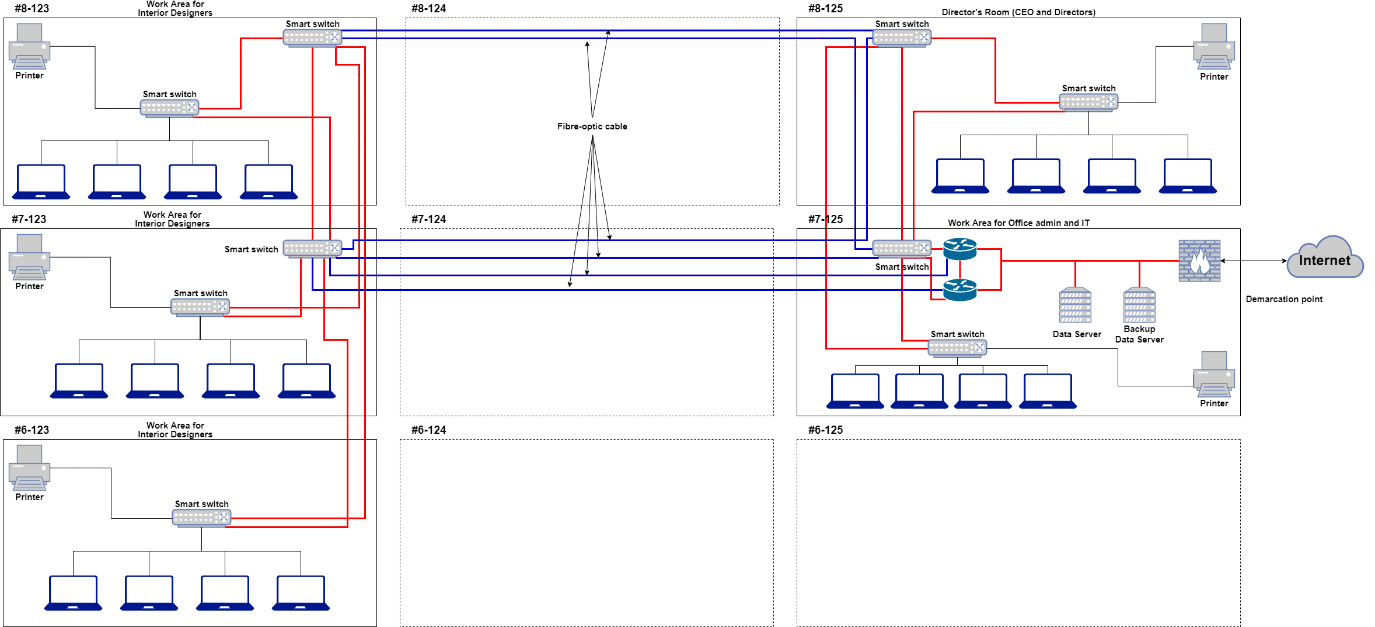
Since fibre-optic cables uses light signals to carry data, it is not susceptible to electrical eavesdropping.

# Network Diagram

### Logical Topology Diagram



### Physical Topology



Link for both logical and physical topology diagrams: <https://viewer.diagrams.net/?tags=%7B%7D&highlight=0000ff&edit=_blank&layers=1&nav=1&page-id=sMHCOvwnnGIUdPW8x1Fl&title=Network%20Diagram.drawio#Uhttps%3A%2F%2Fdrive.google.com%2Fuc%3Fid%3D1RUEKLILeuBBPEVASVhsKrp7pJmCCMKVi%26export%3Ddownload>

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