

ASSIGNMENT COVER PAGE

Programme		Course Code and Title	
Diploma in Computer Studies		DNS1244: Networking and Operating System	
Student's name / student's id		Lecturer's name	
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Assignment [1] title	Assignment 1: Report writing (Group work with individual writing component)		

This assessment assesses the following course learning outcomes

# as in Course Guide	UOWM KDU Penang University College Learning Outcome
CLO1	Explain the fundamentals and workings of data communications & computer networks and various communication protocols.

Student's declaration	
I certify that the work submitted for this assignment is my own and research sources are fully acknowledged.	
Student's signature:	Submission Date: 22/10/2021
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Assignment 1

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MAIN REPORT

TASK 1: CASE STUDY

• Introduction

A local area network (LAN) is a group of computers that are connected over a network and are confined within the same geographical area, such as a building like an office or home (Gavin, 2018). According to the requirements, a LAN for a network laboratory is to be designed and developed for the company TodayNew Sdn. Bhd. The network needs to be able to accommodate 30 students initially and it must be able to facilitate future expansions so that it can support more users in the future. To fulfil these requirements, there are several key considerations and decisions to be made.

First and foremost, a suitable network topology must be carefully chosen for the network. According to SolarWinds (2019), a network topology describes the logical or physical arrangement of various nodes, devices, and their connections with relation to one another. Therefore, it is crucial to choose a proper topology because the base structure and layout of the network will greatly influence the rest of the decisions to be made. A network layout diagram will also be designed for the proposed network to give the client an idea of how the network will be installed and arranged.

Next, the connecting devices and communicating channels to be used in the network must be decided. As described by Cisco (2021b), a LAN should consist of a collection of devices connected via cables or wireless connection, and other network devices like access points, switches, routers, etc. With that in mind, careful consideration must be given to the proper type of cables and network devices used to enable reliable connections between devices. Since this laboratory will be used by students, printers may also need to be set up in the network to provide scanning and printing services. Hence, the necessity for a printer server should also be considered. This consideration will mainly be based on the benefits a printer server could bring.

Then, a network switching method to be used in the LAN of the network laboratory must be determined and applied consistently to the LAN. A network switching method needs to be chosen to ensure that data uses the best route to travel around the network and arrive at end destinations as fast as possible in a possibly large network, where there could be multiple paths from sender and receiver (javaTpoint, 2021). Aside from being able to improve data access speeds, determining a network switching method can also help preserve the network as a network path can only handle so much data traffic at one time before getting overloaded (Hein, 2019).

After that, network security measures should be taken and made effective in the network. It is important to expect unauthorized network access attempts from outside of the network to protect the network from being sabotaged or hijacked. Once a network is successfully compromised, the perpetrators would use the network to carry out malicious activities such as identity theft, malware attacks, website reroutes and many more (Gadsden, 2021). To prevent this from happening, network protection rules must be sufficiently set to ensure what goes out from the network remains anonymous and what comes into the network is not malicious.

Lastly, it is also crucial for the network to possess maintenance measures for the short and long term. Maintenance measures are taken to guarantee the sustainability of the network and ensure that it does not break down during operational hours. Network downtimes are not an ideal situation, especially for businesses as it causes many negative implications to the business, such as lost productivity, lost opportunities and much worse, brand damage (Felter, 2019).

- **Most Suitable Network Topology**

Based on the information provided by Biggs (2018), Keliwar (2020), Keary (2021), and SolarWinds (2019), the main factors which should be considered when selecting the most suitable network topology include initial costs, scalability, performance, the difficulty of installation and maintenance, and reliability. After thorough research and comparisons, the best topology selected for the network laboratory is the **star topology**. Other topologies that were considered are mesh, ring, bus, and tree topology. They were not selected because, in comparison, the star topology has more useful advantages and its disadvantages are not too negatively impactful.

In terms of **initial costs**, star topology is cheaper than mesh and tree topology, mainly because the number of cables needed to install the star topology is much lesser (GeeksforGeeks, 2020; TechDifferences, 2019). Bus and ring topology are cheaper than star topology because they require a smaller number of cables, while star topology requires a central hub to be installed and maintained in addition to cables (Keliwar, 2020; SolarWinds, 2019). However, they are deemed unsuitable due to their various disadvantages in other factors.

Another factor to consider is **scalability**, star topology is most suitable because it can accommodate the initial network size and can also easily scale the size up or down without shutting down the network. If network expansion is needed, the number of additional cables needed is equal to the number of new nodes, and the central hub just needs to be upgraded if its previous capacity is insufficient. Mesh and tree topology have low scalability because it requires lots of planning, cable rearrangement, and many additional cables, thus making upgrades difficult and costly (SolarWinds, 2019). Bus and ring topology has low scalability as they are only suitable for smaller networks. This is mainly because adding new nodes to bus or ring networks will greatly decrease performance (Keliwar, 2020), this will be further explained in the next factor.

Another factor is **performance**, star topology has greater performance than bus and ring topology because data transmission mainly relies on the central hub. If the network becomes slow, the hardware of the central hub just needs to be upgraded. Bus and ring topology have low performance because the backbone or connecting cables have limited bandwidth, thus adding new nodes into the network will increase network traffic and slow data transmission speeds; it is also further slowed down because signals can only travel in 1 direction at a time. Mesh and tree topology have the best performance (SolarWinds, 2019), but they have much higher costs.

The next factor is **reliability**, star topology is more reliable than bus and ring topology because network stability and performance rely only on the central hub. If any nodes or cables go down due to damage or for maintenance and upgrades, the rest of the network still function as normal. Although the whole network goes down if the central hub fails, this is unlikely if the central hub is well-maintained. For bus topology, damage or failure in the backbone could cause the entire network to shut down; for ring topology, any node or cable failure could also cause the same outcome (Keliwar, 2021). Mesh and tree topology are more reliable than star topology (SolarWinds, 2019), but they have unnecessarily higher costs and greater burdens.

As for **difficulty of installation and maintenance**, star topology is more convenient than mesh and tree topology as its design is much simpler, and it requires lesser cables because its layout consists of every node having only a single connection to the central hub. This also allows for very easy fault isolation, making maintenance and repairs quite convenient (SolarWinds, 2019). Bus and ring topology is even simpler to install and maintain (Keliwar, 2021) but is not suitable for the proposed network due to all the reasons explained previously.

- **Connecting Devices & Communicating Channels Used**

Based on a star network topology, the connecting devices and the communicating channel that should be used to develop the network are network interface cards, a central hub, routers, wireless access points, and Ethernet cables which are shielded twisted-pair cables:

Connecting devices:

A **network interface card (NIC)** is a hardware component, typically a circuit board or chip, which is installed on almost any networked device so it can connect to a network (Faircloth, 2014; TechTarget, 2021). NICs enables the communication of different devices in the star network because they have a unique MAC address that identifies each device. So, it is ensured that all data can be sent to the correct device (Faircloth, 2014) based on their destination MAC address.

In a star network, a **central hub** is a centralized node in the network that helps connect all peripheral devices in a network and handles all major data processing as a single server (N-able, 2018). Normally, it is either a network hub or a switch (Computer Hope, 2018). After some consideration, it is decided that a switch is more useful as the central hub for the star network because switches allow data to be sent to their designated destination. It obviously gives more data privacy than a network hub that broadcasts received data to all devices that are connected to it (Irving, 2015; Orenda, 2017).

A **router** is a device that connects two or more packet-switched networks or subnetworks (Cloudflare, 2021). It is used to develop the network because while hubs and switches are designed to link devices together on private networks, routers are meant to link different private networks together (Cooper, 2021). Therefore, a router needs to be connected to the LAN to allow devices to connect to the Internet, which is a large network of networks, and communicate with devices outside of the LAN.

A **wireless access point (WAP)** is a network device that acts as a medium for devices to connect to a local area network wirelessly. It can be used in the star network for extending the wireless coverage of an existing network, thereby increasing the number of users that can connect to it without a wired connection. A high-speed Ethernet cable runs from a router to an access point, which transforms the wireless signal into a wired one and allows devices to send signals to the router as if they are physically connected together (LigoWave, 2021).

Communicating channels:

After careful consideration among available options, it is decided that **twisted pair cables** are more suitable for the star network, specifically **shielded twisted pair (STP) cables**. This decision is influenced by factors like cable installation, cost and working environment.

In terms of cable installation and cost, twisted pair (TP) cables are the easiest to install and maintain, and very affordable when compared to coaxial cables and optical fibres. This is because optical fibres and coaxial cables need more care to install and maintain due to their structural properties. According to Sparklight (2021), TP cables may be more than enough for an organization to not experience any latency within its internal network. In other words, it still gives good network performance at a very low cost.

In a network laboratory working environment, STP cables are preferred over unshielded twisted pair cables too as Sheldon (2013) mentions that twisted pair cables are majorly used in

telephone networks, data networks and cable shielding, while an article from Jem Electronics (2018) emphasizes that shielded cables are useful in any environments where there is a high chance of electronic interference, which is highly possible within a network laboratory. Therefore, STP cables are used to reduce the chance of crosstalk, which is the disturbance of signals caused by electric fields interfering with one another (Hanna, 2021), by keeping noise from exiting the cable and being protected from external interference (Jem Electronics, 2018).

- **Importance of a Server/Printer for the Network**

According to information by Bethea (2021), Svehla (2019) and TechTarget (2010), a printer server is a network device or software that accepts printing requests, manages them in the printing queue, and sends them to printers in the LAN. Considering that the laboratory network will accommodate 30 students initially and continue to expand in the future, it is decided that a printer server would be beneficial for the network to manage potentially large volumes of print requests. Below are some reasons why the printer server is important for the network.

Firstly, a printer server makes it **easier for a flexible and efficient printing system to be set up** in the network (Svehla, 2019). Using a printer server, the IT team no longer need to manually install or update printer drivers or software on every computer in the network, which reduces installation and maintenance burdens. They simply need to configure the printer server and connect it to the network. As the network grows, the printer server can easily be configured to add new users and update user permissions when needed (Svehla, 2019). This would therefore be useful for the lab network which will house multiple printers and support 30 users and more over time.

Additionally, a printer server is **capable of handling complex environments**. In an environment where there are many network users manually making numerous print requests simultaneously, printers could get overwhelmed with requests, causing large backlogs of unprocessed requests or users getting impatient (Svehla, 2019). Thus, a printer server would be useful as it can equally distribute print requests to printers, prioritize important requests and show the status of users' requests in the print queue, effectively preventing backlogs and increasing user satisfaction.

Besides that, a printer server can **increase print security**. The printer server can be configured with SSL/TLS (Secure Sockets Layer/Transport Layer Security) encryption protocol that encrypts data sent to the printer server, preventing potential attackers from accessing the data transferred to printers (ThinPrint, 2021; F5, 2021). This can effectively keep sensitive data that are sent to printers in the network safe and secure.

Lastly, a printer server can also help **extend the lifespan of printers**. Without a printer server, users can manually make requests to selected printers, this can unintentionally cause certain printers to be overworked while other printers receive a lesser workload. For overworked printers, their lifespan is shorter due to increased wear and tear (White, 2021). Therefore, a printer server would be beneficial because printer servers help distribute print requests equally among the available printers. This can prevent users from overworking an individual printer with larger volumes of requests while other printers receive lesser volumes of requests. In the long run, this can help reduce costs as there would be a lesser need for printer repairs or maintenance.

- **Switching Method Used in the Network**

After considerable research and comparisons, **packet switching** was chosen for the network laboratory based on information provided by Avi Networks (2021) and Dalvi, S (2021). Given that the network must support 30 students and should have the capacity to support additional users in the future, packet switching was chosen because it offers numerous benefits that outweigh that of other switching methods such as circuit switching and message switching, and its drawbacks are minor.

Unlike circuit switching or message switching networks, packet switching networks split lengthy messages into tiny packets and insert headers according to Transmission Control Protocol/Internet Protocol (TCP/IP) stack specified forms. These headers provide a variety of valuable information, such as the source address, destination address, packet length, port number, protocol field, and checksum, among other things, and packets are then sent one after the other (Avi Networks, 2021). Sequence numbers are used to construct packets at the receiver.

In terms of **cost-effectiveness**, the overall cost of the operational network plays a critical part in network design, sometimes to the point where it may make or break network implementation in its early phases. The packet switching approach does not require large secondary storage to store the packets, thus reducing costs for storage purposes, and therefore the network's operating cost is limited to a smaller footprint (Javatpoint, 2021). The cost is also an essential consideration because the network will initially support 30 students, but it should expand in the future to accommodate more connected clients in the network. As the network grows, so does the operational cost, thus packet switching will be more cost-effective in the long run.

Another factor is **reliability**. In the packet switching method, if one of the nodes is overloaded, packets can all be rerouted through other interconnected routes, but the shortest path is always favoured. As a result, the packet switching technique always maintains a stable communication link (Dalvi, 2021). Furthermore, the network will be used by 30 students in the present phase and much more in the future, thus network reliability to maintain the whole network linked for everyone is also a major decision criterion, which is addressed by implementing the packet switching approach.

As for **efficiency**, packet switching does not mandate any established way prior to transmission, and several users can utilise the same communication channel at the same time, allowing people to make extremely effective use of the bandwidth. Less network bandwidth is wasted because of improved efficiency. Because the circuit does not need to be reserved even when it is not in use, the approach is more efficient. When packet switching is utilised, network efficiency increases since a continuously reserved circuit consume network capacity (Avi Networks, 2021).

Moreover, packet switching **works effectively for data transfer**, transmitting digital data directly to its target. Transmission of data in a packet-switched network is generally of high quality since the network employs error detection and data distribution verification with the purpose of error-free transmissions (Avi Networks, 2021). Unlike circuit switching, it is more efficient for data transmission since it does not need the establishment of a route between the transmitter and receiver, and data is transferred instantaneously.

- **Measures to Handle Security Issues in the Network**

According to Check Point (2021) and Cisco (2021c), network security is crucial for the protection of a network, its underlying infrastructure, and data from unauthorized access, data breaches, theft, and other threats. Thus, to ensure that the laboratory network and the data within are safe from various forms of network breaches and cyberattacks, a range of security measures needs to be taken to establish a strong and reliable network security system.

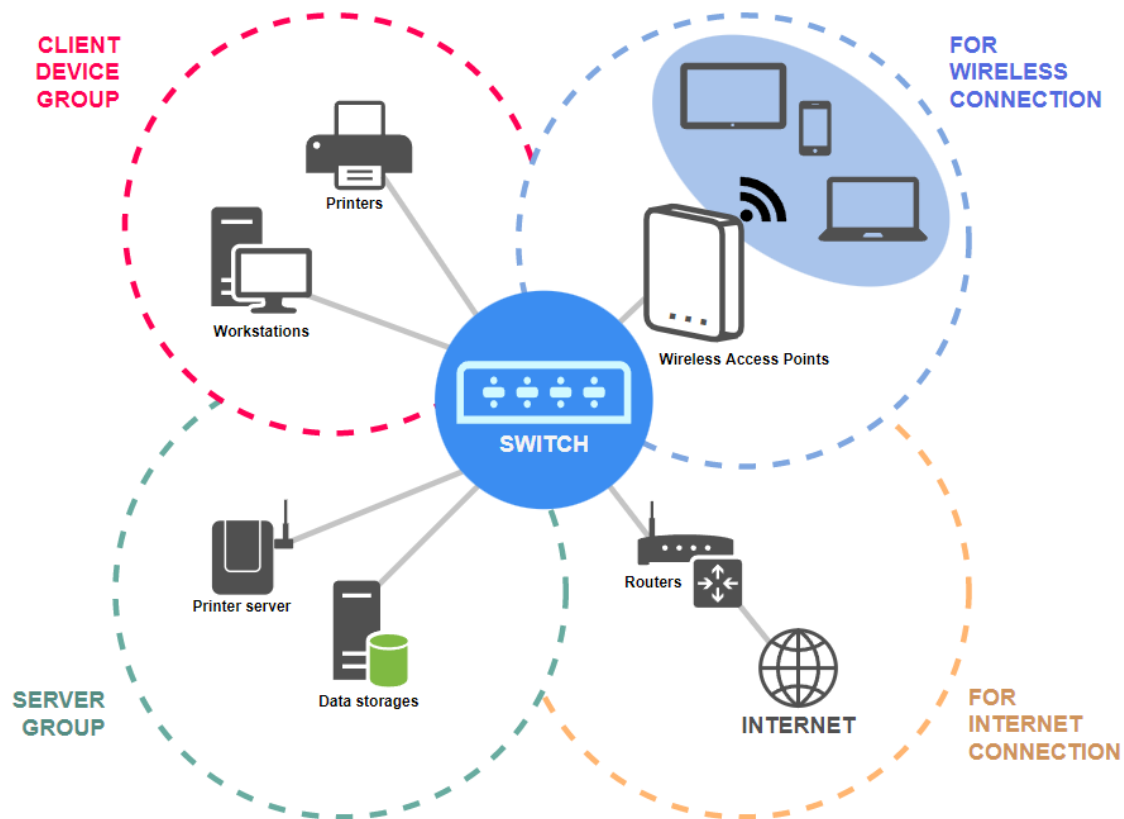
The first measure is to set up a **firewall**. A firewall monitors incoming and outgoing traffic in the network and determines whether they should be accepted or blocked based on a pre-defined set of security rules. It acts as the network's first line of defence, a barrier that keeps the network secure by blocking malicious traffic from the Internet. (Cisco, 2021a; Forcepoint, 2021a). The firewall will be set up in 2 forms - hardware and software. The router that is used for internet connection will be the **hardware firewall**, it comes with a built-in firewall and intrusion prevention system (IPS) which continuously monitors the network, reports suspicious activity to the network administrator, and proactively prevents attacks (Forcepoint, 2021b; Stevens, 2019). **Software firewalls** such as Windows Defender Firewall which comes with Windows OS will be installed on every computer. The router will also be configured with **WPA3 encryption**, which is the latest and most advanced Wi-Fi security protocol, for increased protection (Wi-Fi Alliance, 2021).

Another security measure is installing **antivirus** software on every device in the network. Although firewalls can prevent unauthorized access and block malicious traffic, harmful malware like viruses, trojans and spyware could sometimes bypass the firewall. This may happen when network users download infected files or plugin an infected USB directly into a computer (eXpd8, 2019; Meade, 2019). Furthermore, a firewall could have problems blocking malware if it is not configured properly or its settings are not regularly updated, which could make it vulnerable to certain, newer types of malware (Gyles, 2021; Dryden Municipal Telephone System, 2021). Therefore, antivirus software will act as a second line of defence in the network to protect the devices and data stored in them. If malware manages to enter the network and infect devices, the antivirus software will be able to detect, identify, and remove the malware along with infected files (Gyles, 2021).

The next measure to be taken is **physically securing** the network. Even with various measures taken against cybersecurity threats, physical threats should also be considered. For example, trespassers could just plug their device into empty ports on a router or switch to access the network, physically damage network equipment, etc. (Geier, 2014). Therefore, a good security plan will be set up for the building in which the laboratory is located to prevent unauthorized outsiders from entering. Network infrastructure equipment such as routers and switches must be kept secure in a locked room, network cables will be hidden and not easily accessible by anyone aside from network engineers (Gallop, 2019; Geier, 2014). Furthermore, to prevent unauthorized access of unused ports on routers and switches, **MAC address filtering** will be used to deny access from devices with unidentified MAC addresses (Mitchell, 2019).

Lastly, another important measure to take is providing **cybersecurity awareness training** for users of the laboratory network. Teaching users how to responsibly use computers in the network and to be aware of common cyber threats is a crucial step for increasing network security. For example, users must be taught to avoid responding to suspicious emails from unknown senders, avoid suspicious links or shady websites, refrain from installing unauthorized or unlicensed software, identify fraud and phishing tactics, etc. (Travelers, 2021). Taking all these measures will greatly boost the security of the network by reducing the chances of cyberattacks.

- **Network Layout Design**



The diagram above shows the layout design of the star network topology planned for the laboratory. Each peripheral device is convergingly wired towards the switch that acts as the central hub. These devices are workstations, printers, servers, wireless access points, and routers, as seen in the diagram. This way, devices will be able to connect and communicate with each other through the switch whose job is to manage and route data according to their destinations. In the diagram, the connected devices are grouped into different groups, which are client device group, server group, wireless connection group and Internet connection group.

The devices in both client device and server groups are network devices that are imitating the client-server model. They can communicate with each other because client devices can send or request data from servers by specifying their address in the network. Some client devices selected for the network are workstations and printers. For servers, data storage servers and a printer server are selected.

In the Internet connection group, some routers connect to the central hub. The routers are used to allow communication with external networks and enable Internet connection for the network. Routers do this by establishing a connection between the LAN network and the Internet's WAN through the use of another device called the modem (HelloTech, 2021).

Most importantly, the network allows more devices to connect to it by having wireless access points. This is done so that the network can provide an alternative way for devices to connect to the network, which is via wireless connections; examples of such devices are smartphones, tablets, and laptops. This also reduces the use of cables which ultimately reduces cable installation costs and labour costs.

- **Measures Taken for Short and Long-Term Network Maintenance**

Just as all things should be treated with care, a network should also be maintained in both short and long terms to prolong its lifespan. In the short term, networks are maintained to establish stronger network connections and stabilize network traffic. According to the Paessler Editorial Team (2021), a well-maintained LAN network is important to maintain the strength of network signals and keep channel overlap to a minimum.

According to Telagen Company (2018), one way to maintain the network in the short term is to simply **troubleshoot networking issues whenever they arise**. They say that when warning signs that are coming from the network are ignored for too long, disruptive problems which are potentially expensive to repair may surface. A few troubleshooting tricks like physically checking hardware conditions, checking for system and software updates, and utilizing Window's Network Diagnostics (Benitez, 2019) can help prevent that from happening by detecting any network issues that could have gone unnoticed. Thorough troubleshooting can also be done by requesting for the help of a network maintenance provider, which could also help highlight network vulnerabilities and obtain plenty of suggestions that are valuable and are cost-effective solutions.

Another way to maintain the LAN network in the short term is **doing cleaning jobs**. For example, it is essential to periodically clean away the dust that accumulates in devices. The dust has always been the mortal enemy of computers, and it goes without saying that this applies to networking devices too. Dust build-up in computers causes the components of computers to retain heat and makes it more difficult for the internal fans to dissipate heat from the system, thereby decreasing the efficiency of the entire system. Therefore, ensuring that dust does not get clogged up in any networking equipment helps in sustaining network performance. However, dust cleaning jobs must be done carefully as vital components may be damaged and broken if done incorrectly (Vanguard Cleaning Systems, 2019).

The network also needs to be configured so that it can be maintained even when accommodating network expansions in the long term. As Oracle (2010) once wrote in an article, the longer a network is in place and functioning properly, the more the organization might want to expand its features and services. So, one should expect that networks will always have the opportunity to evolve.

Naturally, to ensure that the network can be expanded successfully in the future, **the flexibility of the existing network infrastructure should be evaluated**. Network hardware that facilitates network expansions should be considered and initially chosen for the network. For example, network devices like hubs and switches should be seen as network bridges and allow sufficient ports to be free (Versitron, 2021). This effectively prevents the problem of not having enough ports to connect new networks or devices to the existing network from happening. Therefore, by evaluating the existing network infrastructure, it can be determined which hardware should be replaced to pave the way for additional networks.

Lastly, to maintain a network in the long term, organizations should also **conduct thorough revisions of the organization's site surveys**. These site surveys include floor plans, energy resources and network documentation (Guzejko, 2016). This is because in any case when the organization needs to expand its building's space to accommodate the increasing number of network users, the network needs to be reconfigured based on all information provided by these surveys. They are used to determine whether networking devices need to be relocated and how due to the expansion while ensuring that the network can be expanded without affecting its original performance and connectivity between devices across its extended network links.

TASK 2: INDIVIDUAL WORK

TAN PENG HENG (0205430):

In the year 2021, networks and operating systems are very common and also important to society, it brings a lot of benefits to society. Network and Operating System is the common things that will be used to support a network device such as, smartphone, Laptop, Personal Desktop and more. The network was used for network devices to access the Internet from the router, LAN network, and more. Besides that, the operating system was designed to let the user of the network devices more easily and effectively utilize it by some good interface design and provide for users to interact with the devices easily. There were also some examples of the operating system such as Linux, Microsoft Windows Server 2008, Mac OS X, and more. Below I will provide some benefits of the network and operating system to society.

First, the network can **strengthen business connections**. The network can be used for making connections between the clients and the organizations. For example, organizations use the network to assist and solve clients' problems. Out of that, the network can **increase job opportunities in society**. Organizations can use a website to expands the range of the job opportunity that offered by the organizations. For example, using the network to have a post the announcement about the job offered at the website such as JobStreet, interviewing the candidates by using Google Meet, and more. Besides that, the network can help us to **gain more knowledge**. There was so much knowledge that the society cannot learn just by going to school, since the network was worldwide and there are full of many news and knowledge that the society can learn from it. Example, Google and Youtube have many contents creator that creates a different kind of content and tutorial. So, by using a network the society could access different platforms to gain different knowledge easily (Michael Page, 2021).

Next, the operating system can **increase the user's friendly** between the user and the network devices. Operating system interface design is important for improving the user friendly with the user and the network devices because the interface design such as icons, buttons, various menus will make the users easier to navigate the devices. For example, the setting icon could direct let the user know the icon is for setting and the employees can speed up their work progress when the network devices are user-friendly since they no need to read and understand the function by text. Out of that, the operating system can also **increase the security of the network devices**. The operating system was also built to secure the network devices from the virus, data loss, and more, an organization's data loss will cost many troubles and the operating system will mostly come with a security program to encrypt data. Example Windows have included a service known as Window Defender that will remove malicious files and more. Besides that, the operating system is also multitasking. The operating system is **multitasking** can help the users up to organizations to processing tasks faster and accurately (Banger, 2021; Roomi, 2021).

In conclusion, networks and operating systems bring so many benefits to society such as network strengthens the business connections, increase job opportunities and operating systems in increase user friendly between the user and the network device, increase security, and more. Last, the network and operating system will be a part of the future and I hope it will be better in the future.

THOR WEN ZHENG (0205096):

Yes, networking and operating systems bring benefits to society. Since the start of the Digital Revolution in the late 1900s up to this day, the level of human technology has been advancing at an unimaginably rapid rate, especially in recent decades (Schwab, 2016; Ward, 2019). Now, humans have access to computing power and near-instant communications at their fingertips. However, all of this would not be possible without networking and operating systems, which act as the foundations for all of the modern human technology.

One of the benefits of networking is it enables convenient **communication**. Networking allows devices to communicate and transfer information with one another from different locations, as long as they are connected to the same network, usually the Internet, a massive interconnection of all networks across the world (Britannica, 2020a; Britannica, 2020b; Miller, 2015). This allows people to instantly connect and communicate with others anywhere in real-time, provided that they have Internet connectivity (Steele, 2019). This offers a range of advantages like helping people maintain familial relationships and friendships over long distances, easily making new friends, improve work efficiency in organizations, and so on.

Networking also greatly contributes to society by **making knowledge and information easily accessible**. With networks throughout the world being interconnected, vast amounts of information stored in web servers can easily be found and accessed via the Internet (Britannica, 2020b). All that information can be extremely useful for all sorts of people. For example, students can conveniently find information that would be useful for their schoolwork, everyone can gain extra knowledge on unfamiliar topics, people who cannot afford education can be self-educated, and people can also read news online to be more informed on local and worldwide events. Eventually, this will make people more knowledgeable and intelligent in the long run.

Operating systems are also highly beneficial to society as they are the most fundamental and important system that keeps all processes in a computer running (Isaac Computer Science, 2021). Without them, most digital technology would not even function now. Thus, one significant benefit of operating systems is they **increase overall work productivity** in society (Intelligent Technical Solutions, 2020). With operating systems making technology function, computers and machines are able to automate work processes and perform tasks systematically at high speeds. People involved in tedious and tiring work can be assisted by computers to complete their tasks faster. Time and money can also be saved as human errors are either avoided or greatly reduced.

Operating systems are also crucial because they **enable computer networking** in the first place. As previously mentioned, computer devices cannot function without an operating system (Isaac Computer Science, 2021). Non-functional computer devices connected to a network are of no use at all. Furthermore, functional computers running with standard operating systems are still unable to communicate with one another without network operating systems (NOS), because a networking operating system is needed to allow and coordinate communication between devices in a network (Jahejo, 2021). Therefore, society can only enjoy the benefits brought by networking thanks to operating systems working behind the scenes.

To summarize, networking and operating systems usually go hand-in-hand, working together to make life better for society by enabling high-speed communications, making treasure troves of knowledge accessible to the world, increasing work productivity, etc. Needless to say, more people should be encouraged to dive into the world of networking and operating systems, or Computer Science in general, in order to discover and nurture more young talents in the tech industry, so that human technology will continue to advance and bring positive changes to society.

LIM ZHE YUAN (0204677):

Since the introduction of networking concepts, computer networking has gotten more prevalent in today's world and even more so for years to come. There is no doubt that networking and operating system do bring benefits to society, that is why they are even worth all the hype today.

In terms of networking, one of its more visible benefits is **boundless communication** (Miller, 2015). As mentioned earlier, the Internet is a large network of computer networks. The existence of the Internet has undeniably played an important role in connecting people from different backgrounds and social statuses together. People who want to stay connected with their loved ones are not hindered by their physical locations and can communicate with people from the other side of the planet. This is only made possible because communication platforms online utilize the networks that had been established by the Internet a long time ago.

Another benefit of networking is the convenience of **instant resource sharing** (Miller, 2015). Regardless of wired or wireless networking, the ability to exchange information and resources instantly with people connected to a network became a unique perk in itself. It eliminates the limitations of being face-to-face and allows people to essentially obtain a variety of latest, outside information in the comfort of their own homes. It not only lets companies promote collaboration among team members by sharing resources within their network, but individuals can also foster self-studying tendencies using shared online resources.

Fast information dissemination is also a benefit that networking brought to society. Making use of its benefit of boundless communication and instant resource sharing, information can be disseminated rapidly across the entire network. For example, companies utilize this benefit to advertising businesses that are hardly managing to make themselves known. Everyone can also receive important notices and updates in a matter of minutes. Emergencies can be negated by widely spreading information using computer networking methods and lending the help of outsiders, such as finding a lost person or a blood donor.

On the other hand, network operating systems have also brought their own benefits to society, specifically for network managers. Operating systems like Windows, MacOS and Linux all provide a **simple graphical user interface** (GUI) for users to control networks. According to Roomi (2021), the interface provided by GUIs are much more user friendly compared to command line interfaces because data are represented using visually appealing representations, which all makes GUI representations of network tools in network control panels easier to understand. By taking user-friendliness into account, good user experience will ultimately be assured too.

Security is also another aspect of network operating systems that benefit the society. People do not need to worry much about sensitive data stored on network storages, as it is the responsibility of an operating system to keep each data inside them secure. Operating systems make sure to encrypt all of its data bit to bit. Besides data encryption, network operating systems also come pre-installed with security programs, for example Windows Defender, to actively remove any malwares from network devices (Roomi, 2021).

Lastly, the ability to **multitask** (Roomi, 2021) is one of the underrated benefits of network operating systems to the society. Network operating systems can simultaneously attend to multiple tasks at the same time. It allows processes that can be left unattended to run in the background and shifts most of the network's attention to tasks that matters the most. This can drastically increase network performance as work is being done as efficiently as possible.

DESHIGAN A/L GANESAN (0205213):

Yes, networking and operating systems unquestionably help society. Networking connects people in society by allowing any information to be exchanged with many people with a simple click. An operating system is a wonderful item that makes life simpler for the user. If it wasn't present, many binary commands would be necessary to create any basic commands. All this labor has gotten a lot easier thanks to the operating system.

Cost savings in computer networking has made a significant impact. The ability to share resources between devices is enabled by a good computer network. When your PCs are networked, you'll need less hardware, and hardware is expensive (GroupOne, 2021). When employees' PCs are networked, they won't require separate printers or backup storage. There will be fewer software upgrades to install, and staff will be able to share document scanning software. One of the most cost-effective features of this networking solution is the ability to share technological assets across employees.

Furthermore, we have a **high storage capacity** with networking since all your essential files are stored on central file servers. Workers in a company will have access to these files and will be able to learn from the information to enhance business operations. The amount of storage systems required for the company's data is reduced with the use of a central server. You gain storage space because of increased employee productivity due to file access (GroupOne, 2021).

Communication is built on the foundation of information. Modern networking enables real-time data transmission from any location with an internet connection. Companies get more mobility with remote workers in the workplace who need to work outside of the office when your team has access to network files from any device. Employees can work more autonomously if they have more data given to them (GroupOne, 2021). Worker access to the network fosters the firm development required to achieve long-term business objectives. You may access your data when you log into another device if you have a problem with one. This ensures network security and eliminates the risks of crucial information being lost.

For operating systems, a graphical user interface (GUI) is a considerably more **user-friendly interface** than a command-line interface. It features a wide range of icons, buttons, menus, and other graphical representations that are all easy to understand. Consequently, individuals may simply interact with and communicate with the system (Manghnani, 2021). The operating system's graphical user interface allows users to quickly access hardware functionalities without needing users do not need to write lines of code to access hardware.

Besides that, an operating system has the responsibility of ensuring the **security** of any information contained within it. This is achieved by bit-by-bit encrypting data. In addition, most operating systems come with a security programme pre-installed (Manghnani, 2021). For instance, Windows features a security programme, Windows Defender that vigorously removes malware and other malicious activity. Users can also use their anti-malware software.

People can **share resources** thanks to the operating system. Examples of such resources include printers, fax machines, modems, and media players. Aside from that, the operating system enables the transfer of various objects to connect devices, such as movies, photos, and programmes. Additionally, the email service may be used to send data between many persons. As a result, multitasking has emerged as a critical component of operating systems. Users may accomplish many things at the same time using the operating system. It is not necessary to shut one window to open another (Manghnani, 2021).

ROSSHEN A/L RAMESH (0204467):

In my opinion, I think networking and operating system does bring benefits to the society, focusing mainly on organisations that depends on this. There are a few benefits that I would like to state in my justification. The first one is the ability to share files, data and information. This is more beneficial for large organisations to maintain their data in an organised manor and to facilitate access for certain people. Moreover, the second benefit I can think of is sharing hardware. For instance, a printer can be shared among other users in a network so that there is no need for individual printers to be used for each and every computer in an organisation. This will significantly reduce the cost of purchasing printers or any other similar hardware devices. Furthermore, the third benefit is sharing software. Users can share software within a network easily. Networkable version softwares are available for reasonable prices compared to individually licensed version of the same software. Therefore, large organisations can reduce the cost of buying softwares by networking the computers. Moving on, the fourth benefit is easy communication. It is very easy to communicate through a network. People can communicate efficiently through a network consisting a group of people. They can enjoy the benefits of emails, instant messaging, video conferencing, chat rooms and many more. Lastly, the fifth benefit is increased security. Your files and programs on a network can be password protected. Those files and programs can only be accessed by authorized users. This is an important benefit of networking when there are concerns about security issues. Also, each and every user has their own set of privileges to prevent them from accessing restricted files and programs.

REFERENCE LIST

Avi Networks. (2021) *What is Packet Switching? Definition & FAQs | Avi Networks*. Available at: <https://avinetworks.com/glossary/packet-switching/#:~:text=What%20is%20a%20Packet%20Switched,25,%20and%20TCP/IP> (Accessed: 6 October 2021).

Banger, E. R. S. (2021) *Explain Importance, Advantages and Disadvantages of Operating System*. DigitalThinkerHelp. Available at: <https://digitalthinkerhelp.com/explain-importance-advantages-and-disadvantages-of-operating-system/> (Accessed: 12 Oct 2021).

Benitez, C.J. (2019) *8 Easy-to-Do Ways to Troubleshoot Network Connection*. HelpDeskGeek. Available at <https://helpdeskgeek.com/networking/8-easy-to-do-ways-to-troubleshoot-network-connection> (Accessed 11 October 2021).

Bethea, A. (2021) *How Does a Printer Server Work?* Hearst. Available at: <https://smallbusiness.chron.com/prINTER-server-work-41750.html> (Accessed: 7 October 2021).

Biggs, J. (2019) *6 Factors When Choosing a Network Topology*. Meldium. Available at: <https://www.meldium.com/6-factors-when-choosing-a-network-topology/> (Accessed: 5 October 2021).

Britannica (2020a) *Computer network*. Available at: <https://www.britannica.com/technology/computer-network> (Accessed: 13 October 2021).

Britannica (2020b) *Internet*. Available at: <https://www.britannica.com/technology/Internet> (Accessed: 13 October 2021).

Check Point (2021) *What is Network Security?* Available at: <https://www.checkpoint.com/cyber-hub/network-security/what-is-network-security/> (Accessed: 8 October 2021).

Cisco (2021a) *What Is a Firewall?* Available at: <https://www.cisco.com/c/en/us/products/security/firewalls/what-is-a-firewall.html> (Accessed: 8 October 2021).

Cisco (2021b) *What Is a LAN?* Available at: <https://www.cisco.com/c/en/us/products/switches/what-is-a-lan-local-area-network.html> (Accessed: 18 October 2021).

Cisco (2021c) *What Is Network Security?* Available at: <https://www.cisco.com/c/en/us/products/security/what-is-network-security.html> (Accessed: 8 October 2021).

Cloudflare (2021) *What is a router?* Available at <https://www.cloudflare.com/learning/network-layer/what-is-a-router/> (Accessed 10 October 2021).

Computer Hope (2018) *Star Topology*. Available at <https://www.computerhope.com/jargon/s/startopo.htm> (Accessed 10 October 2021).

Cooper, S. (2021) *Hub Vs Switch Vs Router*. Comparitech. Available at <https://www.comparitech.com/net-admin/hub-vs-switch-vs-router/> (Accessed 10 October 2021).

Dalvi, S. (2021) *Circuit switching packet switching*. [online] Slideshare.net. Available at: <https://www.slideshare.net/sdsnehaldalvi/circuit-switching-packet-switching> (Accessed: 7 October 2021).

Dryden Municipal Telephone System (2021) *What can't a firewall protect against?* Available at: <https://www.dmts.biz/fags-firewalls/what-cant-a-firewall-protect-against/> (Accessed: 9 October 2021).

eXpd8 (2019) *I Have Anti-Virus Software. Do I Need A Firewall As Well?* Available at: <https://www.expd8.com/do-i-need-firewall-if-i-have-anti-virus-software/> (Accessed: 9 October 2021).

F5 (2021) *What is SSL/TLS Encryption?* Available at: <https://www.f5.com/services/resources/glossary/ssl-tls-encryption> (Accessed: 7 October 2021).

Faircloth (2014) *Network Interface Card*. ScienceDirect. Available at <https://www.sciencedirect.com/topics/computer-science/network-interface-card> (Accessed: 10 October 2021).

Felter, B. (2019) *Top 5 Ways System Downtime Could Impact Your Company*. Vxchnge. Available at <https://www.vxchnge.com/blog/ways-system-downtime-could-impact-company> (Accessed 18 October 2021).

Forcepoint (2021a) *What is a Firewall?* Available at: <https://www.forcepoint.com/cyber-edu/firewall> (Accessed: 8 October 2021).

Forcepoint (2021b) *What is an Intrusion Prevention System (IPS)?* Available at: <https://www.forcepoint.com/cyber-edu/intrusion-prevention-system-ips> (Accessed: 8 October 2021).

Gadsden, T. (2021) *Signs you've been hacked and how to prevent hacking*. Allconnect. Available at <https://www.allconnect.com/blog/how-to-fix-a-hacked-router> (Accessed 18 October 2021).

Gallop, D. (2019) *7 Tips for Office LAN Security*. Securicy. Available at: <https://www.securicy.com/blog/7-tips-for-office-lan-security/> (Accessed: 9 October 2021).

Gavin, B. (2018) *What Is a Local Area Network (LAN)?* How-To Geek. Available at <https://www.howtogeek.com/353283/what-is-a-local-area-network-lan/> (Accessed 18 October 2021).

GeeksForGeeks (2020) *Difference between Star Topology and Tree Topology*. Available at: <https://www.geeksforgeeks.org/difference-between-star-topology-and-tree-topology/> (Accessed: 5 October 2020).

Geier, E. (2014) *8 ways to improve wired network security*. NetworkWorld. Available at: <https://www.networkworld.com/article/2175048/8-ways-to-improve-wired-network-security.html> (Accessed: 9 October 2021).

GroupOne Consulting, Inc. (2021) *Importance of Computer Network in Business ~ GroupOne*. Available at: <https://www.grouponeit.com/importance-of-computer-network-in-business/> (Accessed 16 October 2021).

Guzejko, J.J. (2016) *IT on the Move: What to Consider for Your Expanding Network*. BizTech Magazine. Available at <https://biztechmagazine.com/article/2016/08/it-move-what-consider-your-expanding-network> (Accessed 11 October 2021).

Gyles, S. (2021) *Antivirus Software Versus a Firewall: What Is the Difference?* VPNoverview. Available at: <https://vpnoverview.com/antivirus/difference-antivirus-firewall/> (Accessed: 9 October 2021).

Hanna, K.T. (2021) *What is crosstalk?* TechTarget. Available at <https://www.techtarget.com/searchnetworking/definition/crosstalk> (Accessed 10 October 2021).

Hein, D. (2019) *How Network Routing Influences A Network's Performance*. Solutions Review. Available at <https://solutionsreview.com/network-monitoring/how-network-routing-influences-a-networks-performance/> (Accessed 18 October 2021).

HelloTech (2021) *What Is the Difference Between a Router and a Modem?* Available at <https://www.hellotech.com/blog/what-is-the-difference-between-a-router-and-a-modem> (Accessed 14 October 2021).

Intelligent Technical Solutions (2020) *6 Ways Technology Increases Productivity*. Available at: <https://www.itsasap.com/blog/6-ways-technology-increases-productivity> (Accessed: 14 October 2021).

Irving (2015) *What's the Difference? Hub vs Switch vs Router*. FS Community. Available at <https://community.fs.com/blog/do-you-know-the-differences-between-hubs-switches-and-routers.html> (Accessed 10 October 2021).

Isaac Computer science (2021) *Role of the operating system*. Available at: https://isaaccomputerscience.org/concepts/sys_os_role_of_os?examBoard=all&stage=all (Accessed: 14 October 2021).

JavaTpoint (2021) *Switching techniques*. Available at <https://www.javatpoint.com/computer-network-switching-techniques> (Accessed 18 October 2021).

Jem Electronics (2018) *The Difference Between Shielded vs Unshielded Cables*. Available at <https://blog.jemelectronics.com/shielded-vs-unshielded-cables> (Accessed 10 October 2021).

Keary, T. (2021) *6 Network Topologies Explained & Compared*. Comparitech. Available at: <https://www.comparitech.com/net-admin/network-topologies-advantages-disadvantages/> (Accessed: 5 October 2021).

Keliwar, S. (2020) 'A Secondary Study Examining the Effectiveness of Network Topologies: The Case of Ring, Bus, and Star Topologies', *International Journal of Communication and Computer Technologies*, volume 8 issue 2 [Online]. Available at: <https://ijccts.org/fulltext/18-1584171634.pdf> (Accessed: 5 October 2021).

LigoWave (2021) *Difference Between Access Point and Router*. <https://www.ligowave.com/difference-between-access-point-and-router> (Accessed 12 October 2021).

Manghnani, C. (2021) *Advantages and Disadvantages of Operating System - The Crazy Programmer*. Thecrazyprogrammer.com. Available at: <https://www.thecrazyprogrammer.com/2019/12/advantages-and-disadvantages-of-operating-system.html> (Accessed 17 October 2021).

Meade, T. (2019) *Key Differences Between Firewall and Antivirus*. Colocation America. Available at: <https://www.colocationamerica.com/blog/differences-between-firewall-and-antivirus> (Accessed: 9 October 2021).

Michael Page (2021) *Top 12 benefits of professional networking and how to get started*. Available at: <https://www.michaelpage.com.au/advice/career-advice/career-progression/benefits-networking> (Accessed: 16 Oct 2021).

Miller, B. (2015) *14 Main Advantages and Disadvantages of Computer Networking*. GreenGarage. Available at: <https://greengarageblog.org/14-main-advantages-and-disadvantages-of-computer-networking> (Accessed: 13 October 2021).

Mitchell, B. (2019) *MAC Address Filtering: What It Is and How It Works*. Lifewire. Available at: <https://www.lifewire.com/enabling-mac-address-filtering-wireless-router-816571> (Accessed: 9 October 2021).

N-able (2018) *Centralized Networks vs Decentralized Networks*. Available at <https://www.n-able.com/blog/centralized-vs-decentralized-network> (Accessed: 10 October 2021).

Oracle (2010) *Expanding a Network*. Available at <https://docs.oracle.com/cd/E19455-01/806-0916/ns-ov-6/index.html> (Accessed 11 October 2021).

Orenda (2017) *Do You Know the Difference Between Hub, Switch & Router?* Medium. Available at <https://medium.com/@fiberstoreorenda/do-you-know-the-difference-between-hub-switch-router-b74c2e8a8143> (Accessed 10 October 2021).

Paessler Editorial Team (2021) *Characteristic of Well- Maintained LAN*. Paessler AG. Available at: <https://blog.paessler.com/12-characteristics-of-a-well-maintained-lan> (Accessed: 10 October 2021).

Printerland (2016) *What Is A Print Server?* Available at: <https://www.printerland.co.uk/blog/how-does-a-print-server-work/> (Accessed: 7 October 2021).

Roomi, M. (2021) *5 Advantages and Disadvantages of Operating System | Limitations & Benefits of Operating System*. HiTechWhizz. Available at <https://www.hitechwhizz.com/2021/02/5-advantages-and-disadvantages-limitations-benefits-of-operating-system.html> (Accessed 17 October 2021).

Schwab, K. (2016) *The Fourth Industrial Revolution: what It means, how to respond*. World Economic Forum. Available at: <https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/> (Accessed: 13 October 2021).

Sheldon (2013) *Fiber Optic Cable vs Twisted Pair Cable vs Coaxial Cable*. FS Community. Available at <https://community.fs.com/blog/the-difference-between-fiber-optic-cable-twisted-pair-and-cable.html> (Accessed: 10 October 2021).

SolarWinds (2019) *What Is Network Topology? Best Guide to Types and Diagrams*. Available at: <https://www.dnsstuff.com/what-is-network-topology> (Accessed: 5 October 2021).

Sparklight (2021) *Coaxial Cable vs. Twisted Pair*. Available at <https://business.sparklight.com/the-wire/tech-talk/business-internet/coaxial-cable-vs-twisted-pair> (Accessed 10 October 2021).

Steele, C. (2021) *Why is Computer Networking Important?* Available at: <http://www.digitaldividecouncil.com/why-is-computer-networking-important/> (Accessed: 13 October 2021).

Stevens, C. (2019) *Does Your Business Need a Firewall If You Have a Router?* Available at: <https://www.business.org/it/cyber-security/does-your-business-need-a-firewall-if-you-have-a-router/> (Accessed: 8 October 2021).

Svehla, C. (2019) *Print Servers or Direct IP Printing: Which Is Right for My Business?* Available at: <https://www.tricerat.com/blog/advantages-print-servers> (Accessed: 7 October 2021).

TechDifferences (2019) *Difference Between Star and Mesh Topology*. Available at: <https://techdifferences.com/difference-between-star-and-mesh-topology.html> (Accessed: 5 October 2021).

TechTarget (2021) *network interface card (NIC)*. Available at <https://www.techtarget.com/searchnetworking/definition/network-interface-card> (Accessed 10 October 2021).

TechTarget (2010) *What is printer server?* Available at: <https://whatis.techtarget.com/definition/print-server> (Accessed: 7 October 2021).

Telagen Company (2018) *What is Network Maintenance*. Available at: <https://worldwideservices.net/network-maintenance-guide-upkeep/> (Accessed: 10 October 2021).

The Connectivity Center (2021) *The Benefits of Print Servers*. Available at: <https://connectivitycenter.com/knowledge-center/the-benefits-of-print-servers/> (Accessed: 7 October 2021).

ThinPrint (2021) *Print Servers vs. Serverless Printing*. Available at: <https://www.thinprint.com/en/solutions/print-server-serverless-printing/> (Accessed: 7 October 2021).

Travelers (2021) *Cyber Security Training for Employees*. <https://www.travelers.com/resources/business-topics/cyber-security/cyber-security-training-for-employees> (Accessed: 9 October 2021).

Vanguard Cleaning Systems (2019) *What Dust Does to Computer Equipment*. Available at <https://www.vanguardsv.com/2019/03/what-dust-does-to-computer-equipment/> (Accessed 11 October 2021).

Versitron (2021) *Which is the Best Network Device – Hub or Switch or Router?* Available at <https://www.versitron.com/blog/which-is-the-best-network-device-hub-or-switch-or-router> (Accessed 12 October 2021).

Ward, K. (2019) *Timeline of Revolutions*. Manufacturing Data Summit. Available at: <https://manufacturingdata.io/newsroom/timeline-of-revolutions/> (Accessed: 13 October 2021).

White, A. (2021) *18 Tips to Extend the Life of a Printer*. TechGearoid. Available at: <https://techgearoid.com/articles/tips-to-extend-the-life-of-a-printer/> (Accessed: 7 October 2021).

Wi-Fi Alliance (2021) *Security*. Available at: <https://www.wi-fi.org/discover-wi-fi/security> (Accessed: 9 October 2021).

[DNS1244 Networking and Operating System]

**MARKING RUBRIC
ASSIGNMENT [1]**

Report Writing (15%)

REPORT COMPONENT (100%)

LEARNING OUTCOME	MARKING CRITERIA	SCALE					
		Fail (0-49)	3 rd Class (50-59)	2 nd Lower Class (60-69)	2 nd Upper Class (70-79)	1 st Class (80-100)	YOUR MARKS
CLO1: Explain the fundamentals and workings of data communications & computer networks and various communication protocols.	Task 1 Introduction On Networking related to the topic (10%)	Weak or no introduction of the topic. Purpose of the writing is unclear or missing. Topics were not addressed properly.	Basic introduction that states topic but lacks interest. One or more topics were not addressed.	Adequate introduction and states the topic. All topics are addressed, and most questions answered with 1 sentence about each.	Proficient introduction that is interesting and states topic. All topics/questions are addressed, and most questions answered with at least 2 sentences about each.	Exceptional introduction that grabs interest of reader and states topic. All topics/questions are addressed, and all questions answered with at least 2 sentences about each.	
	Task 1 Quality of analysis on LAN network, topology devices and switching methods (30%)	Failed to provide a level of information that answers the question. Statements are internally contradictory without explanation.	Statements are sometimes on target and sometimes off center. Segments of the writing hang together but other parts are unclear or contradictory with no good resolution.	Statements are on target and sometimes off center but with minimal explanation.	Most statements are at the best level of information that answers the question. Statements are usually mutually supporting and follow from one another.	Statements are at the best level of information that answer the question. Statements are mutually supporting and follow from one another.	
	Task 1 Style of Writing (20%)	The report writing does not meet the criteria for the assignment (too short or incomplete, too long, and/or completely off-topic). Reference section is missing.	Many ideas require clarification and/or are off-topic or have marginal relevance to the assignment. Many grammatical and/or spellings errors throughout the paper. The paper is very challenging to read due to poor writing flow. Improper reference section	Ideas are stated clearly and are related to the topic, with only adequate grammatical and/or spelling errors. Reference section with minor flaws	Most ideas are stated clearly and are related to the topic, with only minor grammatical and/or spelling errors. Reference section is in minimal	Writing is clear and relevant, with no grammatical and/or spelling errors – polished and professional. Reference section properly formatted.	
	Task 1 Sources (Floor Diagram and other relevant Networking Diagram) (10%)	Some sources are not accurately documented. Diagrams and tables are not accurate OR do not add to the reader's understanding of the topic.	All sources (information and graphics) are accurately documented, but many are not in the desired format. Some diagrams and table are not accurate OR do not add to the reader's understanding of the topic	All sources (information and graphics) are documented, but an adequate amount is not in the desired format. Diagrams and table are neat and accurate and sometimes add to the reader's understanding of the topic.	All sources (information and graphics) are accurately documented, but a few are not in the desired format. Diagrams and table are accurate and add to the reader's understanding of the topic.	All sources (information and graphics) are accurately documented in the desired format. Diagrams and table are neat, accurate and add to the reader's understanding of the topic.	

	Task 2 Justifications (Individual) (20%)	Little or no justification is offered. Inadequate justification.	Some attempt of justification, but the work is weak. The justification is missing or ill-considered.	The justification is on balance acceptable. The justification is limited and do not show the necessary broader perspective. Not outstanding in any respect.	A sound justification that covers a good range of issues. The justification is appropriate and may show a broader perspective. No section has serious weaknesses, and there may be excellent or outstanding features. On balance the work is good but not wholly excellent.	Outstanding justification is stated clearly with sharp discussion and are relevant to the topic.	
	Task 2 Citation and references (10%)	Missing or no citation and major flaws on the format. Reference section is missing.	Very minimal amount of cited works, with incorrect format. Improper reference section.	Adequate amount cited works, both text and visual, are done in the correct format. Inconsistencies evident. Reference section with minor flaws.	All, both text and visual, are done with minimal errors on the format or reference.	All cited works, both text and visual, are done in the correct format with no errors. Reference section properly formatted.	
	Total (100%)						