

**ASIA PACIFIC UNIVERSITY**

**TECHNOLOGY & INNOVATION**

**CT043-3-1-IN**

**INTRODUCTION TO NETWORKING**

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# Work Breakdown Structure

|  |  |  |
| --- | --- | --- |
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# Building Network Diagram

According to the diagram below, there are a total of four routers, with one for each floor. The two routers on the left side of the diagram belong to the Court A building, and the top left router is for the second level, followed by the bottom left router, which was put on the first floor, while the two routers on the right side are controlled by the Court B building. The order of the routers in Court B will be the same as in Court A, with the second level utilizing the top right router and the first floor using the bottom right router.

Figure 1: Network diagram of both Court A and Court B

Diagram, schematic

Description automatically generated

# Floor Topology Configuration with Justification

|  |  |
| --- | --- |
| **Floor** | **Topologies** |
| **Vista Court A First Floor** | **Ring, Star** |
| **Vista Court A Second Floor** | **Ring, Star** |
| **Vista Court B First Floor** | **Ring, Star** |
| **Vista Court B Second Floor** | **Ring, Star** |

## Vista Court A First Floor (Soong Yau Joe TP068977)

**Ring Topology**

Diagram, schematic

Description automatically generatedA ring topology has said to be formed when there are three or more devices appeared and each of them were having two connections with other devices to form a ring silhouette diagram. As there are other topologies being present and starting to be the top choice for those who want to construct their topologies with some certain amount of concern, the scarcity of using ring topology in the network is increasing (Chapman, 2021) and this really makes ring topology becomes legacy as the time pass by. However, this does not indicate this type of topology had been completely disappear in today’s world. Ring topology itself still carries some distinct advantages which allows them to stand out in front of others.

Figure 2: Ring Topology at First Floor of Court A

Based on the Figure 2 above, it shows the switch from the reception, meeting room, health clinic, and the counseling room were connected with each other and form a ring topology. The simplicity of installation and configuration when applying this topology has become one of the main reasons to use in these four departments (Hawthorne, 2022) which will allow the addition process of switches to be easier when the time has come. Additionally, ring topology does not require any collision avoider and detector during the process of transmitting data which may help in reducing the cost of maintenance spend by the school. With all these pros from the star topology, these four departments are able to exchange information more effectively and timely.

**Star Topology**

Star topology is becoming more ubiquitous and being used intensively in many local area network due to huge amount of advantages it offers. When there are few devices that were been connected to a central hub or switch, this will eventually leads to the formation of star topology. The hub itself will act as a medium to allow fluent communications of those devices within the networks.

Diagram

Description automatically generated

Figure 3: Star Topology at First Floor of Court A

The star topology is widely spread in every department that located at the first floor. One of the benefits that star topology gives to the user is that whenever there is a breakage of the link between a specific device and the central hub, it will not lead to a pervasive breakage to other network links (UKEssays, 2018). Next, it is easier to add on extra devices in this topology without interrupting other functioning network. Furthermore, when it comes to troubleshooting of this topology, the process will not be as complex as some other topologies as because of the design and the relation between devices and hub.

Nonetheless, there will be some drawbacks followed by the benefits and one of it will be the high cost of the star topology due to the excessive amount of cables required in the installation. It becomes pretty obvious for people to realise another disadvantage to occur in this topology when they had understood how does the star topology being set up which is the hub act as a central point for all the devices. Hence, when the hub itself is experiencing some problems or facing malfunction issue, all the devices that are connecting to it will be affected as well.

## Vista Court A Second Floor (Ng Shao Hwa TP065019)

**Ring Topology**

Diagram

Description automatically generated with medium confidenceRing topology is where device connections form a circular data pathway in a network architecture. Each device in this arrangement is linked to precisely two of its neighbors, creating the points of a circle that resembles a ring structure. Switches or repeaters are utilized in this network's Ring topology, which has a lot of nodes, to convey data and avoid data loss. A hoop network refers to all the devices in a ring topology. In this scenario, packets go back and forth between devices until they arrive at their destination. In this case, data moves in a unidirectional fashion or only in one direction. (pulkitagarwal03pulkit, 2022)

Figure 4: Network diagram of switches on second floor court A

Ring topology is used on the second floor of Vista Court A. The diagram above shows the switches from different departments are connected to form a ring topology. One of the reasons why ring topology is chosen is because data moves in a single path, thus, reducing the possibility of packet collisions and increasing the speed of transferring or retrieving the packets from different departments. Moreover, introducing more switches in the future will not affect the network's performance with this topology. (pulkitagarwal03pulkit, 2022)

However, there are always two sides to a coin, one of the drawbacks to using the ring topology is data packets must traverse through every node to get to their destination because of the Uni-directional Ring, which might cause traffic or lag in the network. Furthermore, another disadvantage is the entire network can be affected if one workstation crashes (pulkitagarwal03pulkit, 2022).

**Star Topology**

Star topology is formed when each node is separately connected to a hub or switch-like central connection point. A star topology requires more cable than other topology types, but it has the advantage that if a cable fails, only one node will be affected. A central device is connected to every device in the network. When a device wishes to transfer information to other devices, it must first send the information to the hub device before sending the data to the target device. (pulkitagarwal03pulkit, 2022)

Star topology is applied in each department on the second floor of Vista Court A. The departments are smart classrooms, computer labs, and a library. The main reason why star topology is used is that, as stated above, star topology ensures that if one device crashes, it will not affect the other devices. This is essential as the computer labs and smart classrooms will connect many end devices to the network at a time, and star topology assures that if one user crashes, others will not be affected (Prasanna, 2022).

Yet again, there are some disadvantages while using the star topology. One of them is highly dependent on the central core or hub. The performance of the network and the number of nodes it can support are determined by the central network device. Besides, since all the devices cannot function without the hub, thus, if the hub fails, everything else fails. (Prasanna, 2022)

A picture containing diagram

Description automatically generated

Figure 5: Network diagram of smart classrooms

Smart classroom

The diagram above shows the star topology design in the smart classroom. The end devices in the two classrooms, smart classrooms 1 and 2, are all connected to a single switch that acts as the hub. As stated above, the flexibility of adding or removing additional devices provided by star topology in essential, especially when the number of users in the smart classroom is not constant.

Diagram

Description automatically generated

Figure 6: Network diagram of computer labs

Computer labs

The diagram above shows the star topology used in computer labs. Similar to the smart classrooms, all end devices in the computer labs are connected to one switch, forming a star topology. The capability to add or remove more devices is crucial in computer labs.

A picture containing text, sign, outdoor, parking

Description automatically generated

Figure 7: Network diagram of library

Library

The diagram above shows the network diagram of the library that uses star topology. In the library, where there are always lots of students and staff staying in the library to do research or revision, the star topology ensures that if one user's device crashes, other users can continue with their work without any interference.

## Vista Court B First Floor (Soo Jiun Guan TP068687)

**Ring Topology**

For ring topology, it connects each device and nearby devices to a closed ring structure. The last node will be connected to the first node, and then complete the loop, which also creates a circular data path. In a ring network, all nodes check the packets of data sent through the ring and then travel to the next until reaching the destination. It also requires all nodes must be active to ensure transmission can be worked successfully. Ring topologies may be used in either LANs or WANs. (Computer Hope, 2018)

Diagram

Description automatically generated

*Figure 8: Ring Topology on first floor of Vista Court B*

This topology is implemented on the first floor of Vista Court B. Figure above as shown the switches are interconnected to a circle shape. The reason for using ring topology is it offers equal access to all devices of the network. Although it has disadvantages, but the income brought by its advantages overweigh its disadvantages. There are several advantages and disadvantages of ring topology listed below:

Advantages:

* Data can be transferred between the nodes at a faster rate
* Its operation cost is economical due to doesn’t need a long-length cable
* Chances of data collision are reduced as it allows data to flow in only one direction
* Network control server is not required to manage data transmission

Disadvantages:

* Construction of necessary cabling is difficult
* The failure of any cable or node may cause the entire network to fail and it is difficult to detect
* All data that travels over the network must pass through every node on its way to the destination node and it reduces network performance

**Star Topology**

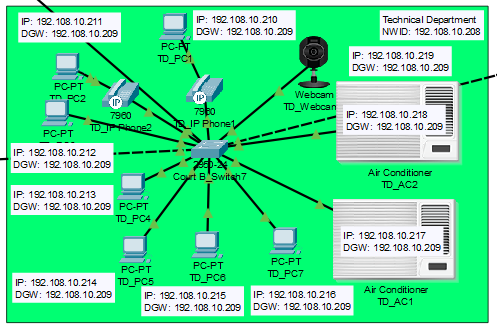
In a star topology, it requires a direct point-to-point connection between devices and intermediary network device (hub, switch, or router). Each node will send data to the central node and then data will be transmitted from here to the destination node, therefore all nodes communicate with each other with the help of the central node. From a technical perspective, it is no limited to number of devices that can be connected in a star topology, but network performance will degrade if many devices are connected. This topology works well for many smaller networks and offset many drawbacks of ring or bus topologies.

Diagram

Description automatically generatedDiagram

Description automatically generated

Diagram

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Description automatically generated

*Figure 9: Star Topologies on first floor of Vista Court B*

This topology is supplied to every department on first floor of Vista Court B. Star topologies configurations as shown above. All end devices of each department are connected to a single central device. The main reason for using this topology is it is convenient for management and maintenance, as well as even if one circuit is unavailable, it will not affect the operation of the entire network. The following sentences are other advantages and disadvantages of star topology:

Advantages:

* Each node is connected to a central node, so reduces chances of data collisions
* Ease of failure detection because the error circuits are usually easy to identify
* Adjunction or removal of node is available without disrupting the rest of the network
* By configuring multiple stars with an intermediary network device in the centre, user can expand the network scale

Disadvantages:

* If the central device is broken, the entire network goes down
* The performance and number of nodes the network can handle are depended on the central device
* The central device requires more resources and costs to operate normally and maintain regularly

## Vista Court B Second Floor (Lee Swee Kee TP069430)

**Ring topology**

图示

描述已自动生成A ring topology is the connection of devices in a circular pattern. Each network device has two neighbours, while the first node connects to the very last node to tie the ring together. A dual ring topology is created when a ring topology is designed to be multidirectional. A dual-ring topology gives direct links to each node, one from each side. Therefore, data can be transmitted anticlockwise. Each band operates directly until a ring is disabled in the case of a network collapse. When this occurs, the function ring instantly wraps around the disabled circle to help insure flow of data. As a result, the dual-ring topology is excellent for situations with wiring concerns or individual largely that are not constantly rebuilt. Dual ring topologies adds an additional degree of security by being more immune to disruptions. For example, if a ring fails inside a node, the other ring may move up and replace it. Ring topologies were also inexpensive to implement.

*Figure 10: Ring Topology on second floor of Vista Court B*

As a result, when deciding on a network topology, the second layer bases its decision on this topology. Because most of the gadgets in the school's numerous departments are fixed assets, they will not be updated regularly, and the necessary equipment will be acquired all at once. Hence, we chose the ring topology, a more efficient and resource-saving network design. This is due to the ease with which the ring topology can be configured, which may save a significant amount of configuration money. At the same time, the school's large-scale device replacement A star topology is one in which every access point is linked to a single central switch may overcome the drawback that the ring topology cannot add devices at whim.

**Star topology**

A star topology is one in which every network device is overtly or covertly linked to any other component. The central data centre is a facility that is regarded a manager, whilst additional endpoints are termed users. The base station manages data transmission for the whole network and serves as a repeater. In a star topology, devices are linked together via coaxial cable, twisted pair cable, or fibre optic cable. We can control the entire network thanks to the central switch. As a result, even if nodes other than the central node fail, the network will continue to function. This shields the star topology against failures that are not necessarily present in other topology setups. Similarly, extra servers may be added without shutting down the network, as in a ring topology.

图示

描述已自动生成Star topology uses less wires than other topologies in regarding physical network construction. This makes them simple to set up and control in the long run. The general simplicity of the routing protocol makes things simpler for operators to address network management faults.

*Figure 11: Star Topology on second floor of Vista Court B*

As seen above, all switches are linked to the same router. So, as long as the router is working properly, nothing will go wrong. This also implies that the person in control only needs to monitor one of the locations, which decreases the effort and expense of monitoring. Furthermore, if you need to add new devices, you may do so without disrupting the ring topology, and the consequences will be minimal.

# IP address and Justification

An IP address is referred to as an Internet Protocol address. Internet Protocol (IP) is a set of standards that governs online interactions, such as communicating to websites and sending emails. An end device or network is distinguished by its IP address on the internet. Internet Protocol controls the method of allocating a particular IP address to each device. It makes it simple to identify which internet-connected devices are transmitting, receiving, and returning data from the internet. The Internet Protocol is also responsible for managing internet traffic. IPv4 and IPv6 are two different types of IP addresses. It is simple to differentiate between them if we look at the number and sequence. The four integers that make up an IPv4 address, such as 192.168.10.1, are range from 0 to 255 and separated by periods. On the other hand, the IPv6 address is compensated precisely in eight groups of four hexadecimal numbers, each separated by a colon (Patrizio, 2019).

There are five classes in IP address, IP class A, class B, class C, class D, and class E. (*5 Classes of IPv4 Addresses [Class A, B, C, D and E]*, n.d.) Our group has chosen IP class B and class C to use in our assignment. In class B IP address, the range of IP is between 128 to 191. We decide to go with the class B IP address in court A because the primary use of court A is for the academic area. The number of students and staff using the network to study or teach can be a lot. Thus, a class B IP address that suits medium to large-sized networks can allocate 65534 hosts per network and has a better performance in accommodating the academic building if the school plans to expand the building’s area in the future is ideal to apply in court A. (Williams, 2022)

Next, class C IP address is applied in court B. Small local area networks (LANs) usually use Class C IP addresses. The first three octets of class C IP are the network id that can accommodate up to 2 million networks. There can be 254 hosts in a network thanks to the last octet (8-bit), and Class C network numbers range from 192 to 223. Court B is mainly for administrative purposes. Hence, class C IP address that is appropriate for small-sized companies or colleges and can reduce the loss of unused IP addresses is perfect to use in Court B. (Williams, 2022)

## Vista Court A First Floor (Soong Yau Joe TP068977)

IP Address Table for Vista Court A First Floor

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Floor | Room | Host | Range of IP address | Default  Gateway | Subnet  Mask | Network ID | Next Hop IP |
| 1 | Reception | 9 | 130.20.0.2 – 130.20.0.10 | 130.20.0.1 | 255.255.255.240 | 130.20.0.0 | 192.108.40.1  192.108.80.2  192.108.50.2 |
| 1 | Cafeteria | 8 | 130.20.0.18 – 130.20.0.25 | 130.20.0.17 | 255.255.255.240 | 130.20.0.16 | 192.108.40.1  192.108.80.2  192.108.50.2 |
| 1 | Waiting Room | 1 | 130.20.0.34 | 130.20.0.33 | 255.255.255.240 | 130.20.0.32 | 192.108.40.1  192.108.80.2  192.108.50.2 |
| 1 | Auditorium 2 | 6 | 130.20.0.66 – 130.20.0.71 | 130.20.0.65 | 255.255.255.224 | 130.20.0.64 | 192.108.40.1  192.108.80.2  192.108.50.2 |
| 1 | Auditorium 1 | 9 | 130.20.0.72 – 130.20.0.80 | 130.20.0.65 | 255.255.255.224 | 130.20.0.64 | 192.108.40.1  192.108.80.2  192.108.50.2 |
| 1 | Meeting Room | 5 | 130.20.0.98 – 130.20.0.102 | 130.20.0.97 | 255.255.255.240 | 130.20.0.96 | 192.108.40.1  192.108.80.2  192.108.50.2 |
| 1 | Health Clinic | 3 | 130.20.0.103 – 130.20.0.105 | 130.20.0.97 | 255.255.255.240 | 130.20.0.96 | 192.108.40.1  192.108.80.2  192.108.50.2 |
| 1 | Counseling Room 1 + Counseling Room 2 | 6 | 130.20.0.114 – 130.20.0.119 | 130.20.0.113 | 255.255.255.240 | 130.20.0.112 | 192.108.40.1  192.108.80.2  192.108.50.2 |

The table above displayed an array of IP addresses that are available in the first floor of Vista Court A where all the addresses had undergone VSLM process. When it comes to the subnet mask, almost all the rooms are using 255.255.255.240 except for both of the auditorium room which they are using 255.255.255.224 as their subnet mask. All the department will have three similar next hop IP which are 192.108.40.1, 192.108.80.2 and 192.108.50.2. The reception used the host IP addresses start from 130.20.0.2 to 130.20.0.10 with the total number of 9 hosts which also means 130.20.0.0 was used as the Network ID while for the 130.20.0.1 was assigned as the default gateway.

The cafeteria with 8 hosts is having the IP addresses ranging from 130.20.0.18 to 130.20.0.25 where 130.20.0.16 and 130.20.0.17 will be the Network ID and the default gateway respectively. The waiting room itself contains only one host with an IP address of 130.20.0.34 with a Network ID of 130.20.0.32 and default gateway of 130.20.0.33. 130.20.0.66 until 130.20.0.71 will be the range of the IP addresses in the auditorium 2 with 6 hosts and 130.20.0.64 will be the Network ID followed by the default gateway 130.20.0.65.

With a number of 9 hosts available in the auditorium 1, the IP addresses will be from 130.20.0.72 to 130.20.0.80 and it will have the same default gateway and Network ID as the auditorium 2. The meeting rooms and health clinic both share the same Network ID and default gateway which is 130.20.0.96 and 130.20.0.97. The distinction between them is just the number of hosts and the range of IP addresses used within them.

Meeting rooms contains 5 hosts which makes the addresses being utilized from 130.20.0.98 to 120.30.0.102 whereas for the health clinic will be from 130.20.0.103 to 130.20.0.105 since it only has 3 hosts. Lastly, each of the counseling room has the identical and same amount of 3 hosts which will be sum up to 6 hosts. Both the counseling room share the same Network ID and default gateway which is 130.20.0.112 and 130.20.0.113 and the range of IP addresses from 130.20.0.114 to 130.20.0.119.

## Vista Court A Second Floor (Ng Shao Hwa TP065019)

IP Address Table for Vista Court A Second Floor

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Floor | Room | Host | Range of IP address | Default  Gateway | Subnet  Mask | Network ID | Next Hop IP |
| 2 | Computer Labs | 14 | 130.20.0.130 – 130.20.0.143 | 130.20.0.129 | 255.255.255.224 | 130.20.0.128 | 192.108.30.2  192.108.40.2  192.108.70.2 |
| 2 | Smart classrooms | 14 | 130.20.0.162-130.20.0.175 | 130.20.0.161 | 255.255.255.224 | 130.20.0.160 | 192.108.30.2  192.108.40.2  192.108.70.2 |
| 2 | Library | 11 | 130.20.0.194 -130.20.0.204 | 130.20.0.193 | 255.255.255.240 | 130.20.0.192 | 192.108.30.2  192.108.40.2  192.108.70.2 |

The table above shows the IP address for the second floor of Vista Court A. We have applied VLSM to assigning the IP addresses for the devices. There are two computer labs, each containing 7 devices. I have combined them into one, so there are 14 devices total. By doing VLSM, the range of IP addresses for the computer labs is 130.20.0.130 to 130.20.0.143. The default gateway for all the devices is 130.20.0.129. The network id for the computer labs is 130.20.0.128.

Next, similarly to the computer labs, smart classrooms also apply the same concept. By combining the two smart classrooms into one, we obtain 14 devices in total. The range of IP addresses after doing VLSM is 130.20.0.162 to 130.20.0.175. Then, the default gateway for all the devices is 130.20.0.161. The network id for the smart classroom is 130.20.0.160. The subnet mask for both computer labs and smart classrooms is 255.255.255.224.

Lastly, the library has 11 devices. The range of IP addresses is from 130.20.0.194 to 130.20.0.204. Then, the default gateway for all the devices in the library is 130.20.0.193, and the network id is 130.20.0.192. The subnet mask for the library is 255.255.255.240. Due to each floor having a router, thus from court A second floor will be connecting to the other three routers. Hence, the next hop IP addresses for all the departments is 192.108.30.2, 192.108.40.2, and 192.108.70.2.

## Vista Court B First Floor (Soo Jiun Guan TP068687)

IP Address Table for Vista Court B First Floor

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Floor | Room | Host | Range of IP address | Default  Gateway | Subnet  Mask | Network ID | Next Hop IP |
| 1 | Conference Room +  Server Room +  Corridor | 25 | 192.108.10.66 - 192.108.10.90 | 192.108.10. 65 | 255.255.255.224 | 192.108.10.64 | 192.108.50.1 192.108.60.2 192.108.70.1 |
| 1 | Financial Department +  Consulting Room +  Consulting Centre | 21 | 192.108.10.98 - 192.108.10.118 | 192.108.10.97 | 255.255.255.224 | 192.108.10.96 | 192.108.50.1 192.108.60.2 192.108.70.1 |
| 1 | Administrative Room +  Restroom | 24 | 192.108.10.130 - 192.108.10.153 | 192.108.10.129 | 255.255.255.224 | 192.108.10.128 | 192.108.50.1 192.108.60.2 192.108.70.1 |
| 1 | Technical Department | 10 | 192.108.10.210 – 192.108.10.219 | 192.108.10.209 | 255.255.255.240 | 192.108.10.208 | 192.108.50.1 192.108.60.2 192.108.70.1 |
| 1 | Lobby +  Security Room | 4 | 192.108.10.242 – 192.108.10.245 | 192.108.10.241 | 255.255.255.248 | 192.108.10.240 | 192.108.50.1 192.108.60.2 192.108.70.1 |

The table above shows the IP addresses for the first floor of Vista Court B. VLSM is available to enhance the usability of subnets. The next hop IP addresses for this entire floor are 192.108.50.1, 192.108.60.2 and 192.108.70.1.

Firstly, conference room + server room + corridor have 25 hosts. The used host range of IP address is 192.108.10.66 to 192.108.10.90. The default gateway is 192.108.10.65 and the subnet mask is 255.255.255.224, as well as network ID is 192.108.10.64.

Secondly, financial department + consulting room + consulting centre have 21 hosts. The used host range of IP address is 192.108.10.98 to 192.108.10.118. The default gateway is 192.108.10.97 and the subnet mask is 255.255.255.224, as well as network ID is 192.108.10.96.

Thirdly, administrative room + restroom have 24 hosts. The used host range of IP address is 192.108.10.130 to 192.108.10.153. The default gateway is 192.108.10.129 and the subnet mask is 255.255.255.224, as well as network ID is 192.108.10.128.

Fourthly, technical department have 10 hosts. The used host range of IP address is 192.108.10.210 to 192.108.10.219. The default gateway is 192.108.10.209 and the subnet mask is 255.255.255.240, as well as network ID is 192.108.10.208.

Finally, lobby + security room have 4 hosts. The used host range of IP address is 192.108.10.242 to 192.108.10.245. The default gateway is 192.108.10.241 and the subnet mask is 255.255.255.248, as well as network ID is 192.108.10.240.

## Vista Court B Second Floor (Lee Swee Kee TP069430)

IP Address Table for Vista Court B Second Floor

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Floor | Room | Host | Range of IP address | Default  Gateway | Subnet  Mask | Network ID | Next Hop IP | |
| 2 | Staff Room C + Staff Room B + Corridor | 56 | 192.108.10.0 - 192.108.10.22 | 192.108.10.1 | 255.255.255.192 | 192.108.10.0/26 | 192.108.30.2  192.108.60.2  192.108.80.2 | |
| 2 | Staff Room A + Staff Lounge + Staff Pantry | 26 | 192.108.10.160 - 192.108.10.175 | 192.108.10.161 | 255.255.255.224 | 192.108.10.160/27 | 192.108.30.2  192.108.60.2  192.108.80.2 | |
| 2 | Waiting Zone + Balcony + Meeting Room + Service Counter | 13 | 192.108.10.192 - 192.108.10.203 | 192.108.10.193 | 255.255.255.240 | 192.108.10.192/28 | 192.108.30.2  192.108.60.2  192.108.80.2 | |
| 2 | Secretary Room + Manager Room | 9 | 192.108.10.224 - 192.108.10.233 | 192.108.10.225 | 255.255.255.240 | 192.108.10.224/28 | 192.108.30.2  192.108.60.2  192.108.80.2 |

The table above shows the IP addresses for the second floor of Vista Court B. I divided all the devices on the second floor into four parts, the first part is Staff Room C, Staff Room B and Corridor, with a total of 56 devices. I put included PC, laptop, air conditioner, CCTV and RFID reader. With VLSM, the ip address range is 192.108.10.0 - 192.108.10.63. The default gateway for all devices is 192.108.10.1, the subnet mask is 255.255.255.192, the network ID is 192.108.10.0,

The second part is Staff Room A, Staff Lounge, and Staff Pantry, with a total of 56hosts. The IP address range after VLSM is 1192.108.10.160 - 192.108.10.191. Then, the default gateway for all devices is 192.108.10.161. The network ID of the smart classroom is 192.108.10.160 and the subnet mask is 255.255.255.224.

The third part is Waiting Zone, Balcony, Meeting Room, and Service Counter with a total of 13 hosts. The ip address range is 192.108.10.192 - 192.108.10.207. The default gateway for all devices is 192.108.10.193, the subnet mask is 255.255.255.240, and the network ID is 192.108.10.192.

The last part of the management area has the secretary Room, the manager Room has 9 devices, and the IP address range is 192.108.10.224 - 192.108.10.239. Then the default gateway for all devices in the library is 192.108.10.225 and the network ID is 192.108.10.224/28. The subnet mask for the library is 255.255.255.240 as in Part 3. Since there are routers on each floor, the second floor from Stadium B will connect to the other three routers. Therefore, the next hop IP addresses for all departments are 192.108.30.2, 192.108.60.2, 192.108.80.2.

## IP Configurations of Various End Devices

For **PCs**, **laptops,** and **servers**, they have the same way to configure their IP addresses, default gateways and subnet masks. After entering setup, click the “Desktop” tab (1) and then select the “IP Configuration” (2) in the upper left corner.

Graphical user interface, application

Description automatically generated

*Figure 12: Desktop setup*

After that, type in IP address, default gateway and subnet mask in the specified location.

Graphical user interface, application

Description automatically generated

*Figure 13: IP Configuration setup*

For some IoT devices such as **webcams**, **air conditioners**, **RFID readers**, **printers, alarms, speakers,** and **appliances**, click the end device and choose the “Config” tab (1). Then, input the default gateway in the “Settings” (2) under “Global”.

Graphical user interface, application

Description automatically generated

*Figure 14: Config Settings*

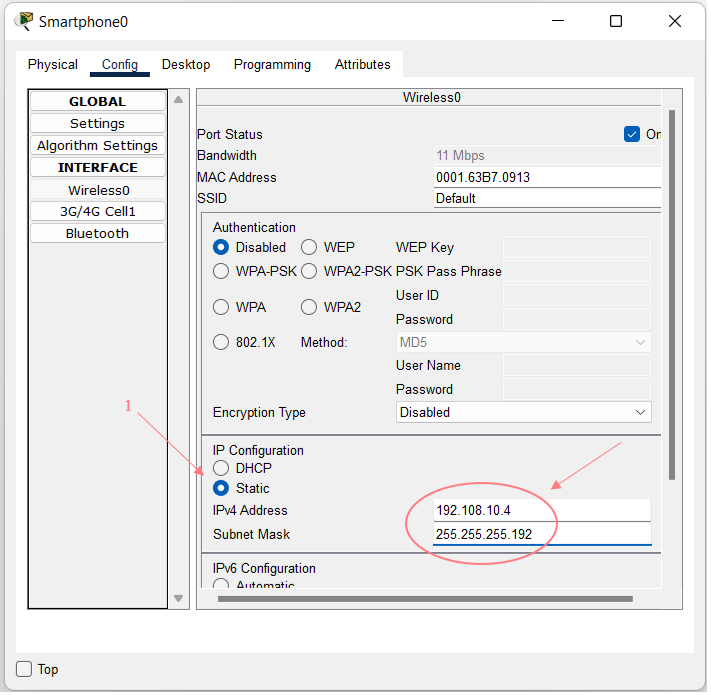
Afterwards, select the Fast Ethernet interface that are connected to switch or hub and then enter IP address and subnet mask.

*Graphical user interface, application

Description automatically generated*

*Figure 15: Fast Ethernet Interface*

Unlike the above IoT devices, IP addresses and subnet masks of **smartphones** and **tablets** should be filled in the wireless interface. DHCP (1) also needs to be changed to static in order to enter manually.



*Figure 16: Wireless Interface*

# Conclusion

The team had delivered a comprehensive guidance and information from the process of configuring the IP addresses of different types of devices to the allocation of the IP addresses in every department. The network diagram simulation for this project becomes way easier to set up thanks to the simple and direct accessibility of the Cisco Packet Tracer with the version of 8.2. When it comes to the use of topologies for this project, star topology and ring topology both become the top selection for both buildings.

The characteristics of these chosen types of topologies had been showcased in this project and this encompassed the pros and cons of them. The understanding of the advantages and those drawbacks of every topology is the main key for the team member to figure out the most appropriate topology chosen in their own floor. Every group member had gained a chance to interact with each other and make the process of exchanging ideas and knowledges become more effective.

All the group members were managed to design their own floor plans and eventually came out with a precise work that fulfilled the requirements. Subsequently, all the team members had assigned a suitable range of IP addresses to those departments they are handling. In the final step of the construction of the network diagram, every router from each floor was connected with each other to ensure that every both buildings are able to communicate with each other seamlessly.

# Peer Evaluation

## Soong Yau Joe TP068977

|  |  |  |  |
| --- | --- | --- | --- |
| **Groupmates** | **Lee Swee Kee TP069430** | **Ng Shao Hwa TP065019** | **Soo Jiun Guan**  **TP068687** |
| **Participated in group discussion** | **Yes** | **Yes** | **Yes** |
| **Helped to monitor group progress** | **Yes** | **Yes** | **Yes** |
| **Contributed useful ideas** | **Yes** | **Yes** | **Yes** |
| **Completed work on time** | **Yes** | **Yes** | **Yes** |
| **Submitted good quality of work** | **Yes** | **Yes** | **Yes** |
| **Communicated effectively with group members** | **Yes** | **Yes** | **Yes** |
| **Helped others with their work when needed** | **Yes** | **Yes** | **Yes** |
| **Good relationship with group members** | **Yes** | **Yes** | **Yes** |
| **Overall was a valuable member of the team** | **Yes** | **Yes** | **Yes** |

## Ng Shao Hwa TP065019

|  |  |  |  |
| --- | --- | --- | --- |
| **Groupmates** | **Lee Swee Kee TP069430** | **Soo Jiun Guan**  **TP068687** | **Soong Yau Joe**  **TP068977** |
| **Participated in group discussion** | **Yes** | **Yes** | **Yes** |
| **Helped to monitor group progress** | **Yes** | **Yes** | **Yes** |
| **Contributed useful ideas** | **Yes** | **Yes** | **Yes** |
| **Completed work on time** | **Yes** | **Yes** | **Yes** |
| **Submitted good quality of work** | **Yes** | **Yes** | **Yes** |
| **Communicated effectively with group members** | **Yes** | **Yes** | **Yes** |
| **Helped others with their work when needed** | **Yes** | **Yes** | **Yes** |
| **Good relationship with group members** | **Yes** | **Yes** | **Yes** |
| **Overall was a valuable member of the team** | **Yes** | **Yes** | **Yes** |

## Soo Jiun Guan TP068687

|  |  |  |  |
| --- | --- | --- | --- |
| **Groupmates** | **Lee Swee Kee TP069430** | **Ng Shao Hwa TP065019** | **Soong Yau Joe**  **TP068977** |
| **Participated in group discussion** | **Yes** | **Yes** | **Yes** |
| **Helped to monitor group progress** | **Yes** | **Yes** | **Yes** |
| **Contributed useful ideas** | **Yes** | **Yes** | **Yes** |
| **Completed work on time** | **Yes** | **Yes** | **Yes** |
| **Submitted good quality of work** | **Yes** | **Yes** | **Yes** |
| **Communicated effectively with group members** | **Yes** | **Yes** | **Yes** |
| **Helped others with their work when needed** | **Yes** | **Yes** | **Yes** |
| **Good relationship with group members** | **Yes** | **Yes** | **Yes** |
| **Overall was a valuable member of the team** | **Yes** | **Yes** | **Yes** |

## Lee Swee Kee TP069430

|  |  |  |  |
| --- | --- | --- | --- |
| **Groupmates** | **Ng Shao Hwa TP065019** | **Soo Jiun Guan**  **TP068687** | **Soong Yau Joe**  **TP068977** |
| **Participated in group discussion** | **Yes** | **Yes** | **Yes** |
| **Helped to monitor group progress** | **Yes** | **Yes** | **Yes** |
| **Contributed useful ideas** | **Yes** | **Yes** | **Yes** |
| **Completed work on time** | **Yes** | **Yes** | **Yes** |
| **Submitted good quality of work** | **Yes** | **Yes** | **Yes** |
| **Communicated effectively with group members** | **Yes** | **Yes** | **Yes** |
| **Helped others with their work when needed** | **Yes** | **Yes** | **Yes** |
| **Good relationship with group members** | **Yes** | **Yes** | **Yes** |
| **Overall was a valuable member of the team** | **Yes** | **Yes** | **Yes** |

# Self-Reflection

## Soong Yau Joe TP068977

This entire project had gave me an opportunity to comprehend about the vitality role of network play in today’s digital society and enable me to apply those skills and theories that I had learnt in the lab class into this project via the utilization of Cisco Packet Tracer. Furthermore, this group task allow me to cooperate with other members in the group to foster my communication skill effectively since discussion had become a significant requirement at the very beginning till the end of this project. To emphasize on the previous statement, all of the members in this group are very friendly and thoughtful which makes the atmosphere of every discussion become comfortable. The repetition practice of configuring the IP addresses in my responsible floor had strengthen my muscle memory which makes the configuration process become faster and greatly reduced those mistakes that I frequently made as time goes on. Additionally, this project enhanced my understanding in the use of VLSM method. Last but not least, I had acquired the skill of configuring the router as well as connecting multiple routers together to establish the connections between floors and buildings. Overall, I feel very grateful to have Dr. Kamalakannan Machap to be my lab teacher as he always deliver a clear-cut guidance during the class followed by his laughter and his passion in teaching.

## Ng Shao Hwa TP065019

Firstly, I had the opportunity to learn how to use Draw.io to design the appropriate floor plan for my chosen floor based on the requirements given. Next, I learned how each topology works, its benefits and drawbacks, as well as selecting the suitable topology to use in the assignment. Besides, I have learned the basics of networking, such as how switches and routers work and what cables to connect to different end devices. Furthermore, I learned how to use Cisco Packet tracer to design the network design for the departments in my floor plan. Finally, the most important part I learned from this assignment was how to assign the IP addresses, default gateway, and network IDs for each end device, as well as how to set up static routing. It was confusing and hard to understand at first, but with the help of my lecturer, Dr. Kamalakannan, and my teammates, I was able to get the hang of it in the end. I wanted to thank my teammates for being cooperative and helpful throughout the assignment. As the group leader, I am glad that I have three teammates that are active in meetings and willing to help each other with their doubts. I am grateful we accomplished our assignment in time, and I could not do it without them.

## Soo Jiun Guan TP068687

Through this group assignment, I learnt how to use Draw.io to design a simple floor plan, as well as understanding the basic facilities required by various departments for implementation on my chosen floor. In addition, it also increased my understanding when using Cisco Packet Tracer that learnt in the course to produce a network diagram based on the floor plan. Moreover, a reasonable allocation of IP addresses and suitable topology were utilized on the assignment to allow each device to communicate successfully, which also made me know their pros and cons. When I got stuck, I am fortunate to have a responsible lab teacher, Dr. Kamalakannan Machap and helpful teammates who helped me to solve the problems in order to make the assignment can go smoothly so I am very grateful for their assistance and coordination. Furthermore, our team leader has constantly followed up on our assignment progress and reminded us that where we need to pay attention to ensure we can submit before the deadline. It is worth mentioning that this meaningful experience will be critical to my future career in the IT industry.

## Lee Swee Kee TP069430

In this assignment, I applied Draw.io for the first time as my software for drawing floor plans. It is not only able to draw floor plans, after I dig deep into his usage, I found that he is also a good tool for drawing flowchart, useful for my phyton assignment. In addition, I also deepened my use of Cisco packet tracer in this assignment, so that I no longer rely on the recording of the course or the exercises I did. The three teammates of this assignment are all very friendly and helpful teammates. They had a huge impact on my whole assignment, everyone helped me more or less and told me what to do, so I'm very grateful. Not only that, even though I was very lazy, I didn't start my assignment until a moment later, and they didn't urge me to believe that I could complete it, so I am also very grateful for their trust in me, allowing me to complete it with confidence All my work. Finally, I would also like to thank Dr. Kamalakannan Machap for his clear guidance throughout the course, allowing me to master the basic skills of cisco packet tracer and networking.

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