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INTRODUCTION TO NETWORKING (GROUP ASSIGNMENT)

CT043-3-1-IN

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# **1.0** **Student 1 -** **Abdulrahman Gamil Mohammed Ahmed-TP071012.**

## **1.1 Topology and justification:**

**1.1.1 Kuala Lumpur first floor:**

On the first floor of the KL building, it will use a specific type of LAN topology which is called star topology. The star topology, often known as a star network, is one of the most widely used forms of network layouts. In this design, each node is connected to a switch, computer, or other hub-like device. Other network nodes act as clients while the primary network device performs the role of a server (Computer Hope, 2022). Depending on the kind of network card in each computer or device either an ethernet cable is used to connect the device to the network or the device is connected wirelessly to an access point to allow it to use the network. The devices that use wireless connections to connect to the network include laptops, smartphones, tablets Etc.

**1.1.2 Justification:**

The star topology is the most optimal for implementation in the Kuala Lumpur building considering the structure of the floor and the number of devices at hand. Furthermore, this network topology has primarily been implemented because our organization will look to grow in the future and so will its digital needs, hence the star topology will allow the organization to add workstations in the future easily (Absar et al.,2014). Also, if any nodes in the network malfunction, it will be easier to detect it in the start topology (Mousa et al., 2019).

**1.1.3 Benefits of the Star Topology:**

* Managing the network from a main place using a hub, switch, or central computer.
* Adding new computers to the network is simple.
* It is reliable as if one cable or device fails then all the other devices will still work.
* It is high performing as no data collision can take place.
* It is robust in nature and No disruptions occur to the network when connecting or removing devices
* If N devices are connected to the switch, then there will be N cables hence making it easier to manage and detect failures in the subnet

**1.1.4 Drawbacks of Star Topology:**

* Deployment may be more expensive if a switch or router is used as the main network device.
* The performance of the network and the number of nodes it can support are determined by the central network device.
* If the network's primary computer, hub, or switch malfunctions, all PCs are cut off from it.
* Requires more cables than a linear bus topology.
* The switch/hub connecting all the devices will require more maintenance as it is the central piece of the network to which all the devices are connected.

**1.2 The IP addressing tables:**

The tables show the IP addresses for the all-end devices that were implemented on the first floor in Kuala Lumpur branch and the statics of them (default gateway, subnet mask and IP address). The devices are connected to the LAN with two possible ways to make the connection. The first way is the wireless connection by the smartphones, tablets, and laptops. The second method is wire connection and most of the hosts to the network are connected wirily (P. Cs, printers, smoke detectors, fire sprinklers, TVs, CCTVs, coffee machines, a humidifier, a server, RFIDs, A/Cs, IP phones and a speaker).

**1.2.1The IP address and subnet are chosen:**

We chose the following subnets since each floor's network has between 30 and 50 end devices. Class C is more than enough for our LANs; thus, we chose that IP address. The 3 borrowed bits from the host octet were also used to determine the subnet mask. We can create eight subnets that cover all 4 floors of the two buildings. three bits that were taken from the host octet, hence the calculation of the three bits equals to 224 in decimal category.

* Therefore, the subnet mask is:

255.255.255.224

* IP address:

195.200.10.0/27

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SUBNET | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256 |
| HOSTS | 256 | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |
| PREFIX LENGTH | /24 | /25 | /26 | /27 | /28 | /29 | /30 | /31 | /32 |

0 0 0 - .0

0 0 1 - .32

0 1 0 - .64

0 1 1 - .96

1 0 0 - .128

1 0 1 - .160

1 1 0 - .192

1 1 1 –

**1.2.2 the IP address table for the router in K.L:**

| **Device** | **Interface** | **Network Address** | **IP Address** | **Usable Address Range** | **Broadcast Address** | **Default Gateway** |
| --- | --- | --- | --- | --- | --- | --- |
| **Router –R1(K.L.)** | S0/0/0 | 195.200.10.0  /27 | 195.200.10.1/27 | FROM 195.200.10.1 TO 195.200.10.30 | 195.200.10.31/  27 | N/A |
| Fa0/0 | 195.200.10.32  /27 | 195.200.10.33 /27 | FROM 195.200.10.33 TO 195.200.10.62 | 195.200.10.63/  27 | N/A |
| Fa1/0 | 195.200.10.64 /27 | 195.200.10.65/27 | FROM 195.200.10.65 TO 195.200.10.94 | 195.200.10.95/  27 | N/A |
| Fa2/0 | 195.200.10.96 /27 | 195.200.10.97 /27 | FROM 195.200.10.97 TO 195.200.10.126 | 195.200.10.127/27 | N/A |
| Fa3/0 | 195.200.10.128  /27 | 195.200.10.129 /27 | FROM 195.200.10.129 TO 195.200.10.158 | 195.200.10.159/27 | N/A |

The above table illustrates the interfaces of the only router on the Kuala Lumpur building and there are four interfaces that gave the ability to connect switches. The router used is PT Empty router to give the opportunity to extend with more switches in the future by adding more interfaces on the device and then connect it and have a new subnet. There are five network addresses, one for the connection between routers (195.200.10.0/27), and the rest are divided to the entire building (two network addresses for each floor (195.200.10.32/27, 195.200.10.64/27, 195.200.10.96/27, 195.200.10.128/27)). The IP address is the first host for each network ID by (33,65,97,129) respectively. The available hosts for each LAN are 30 devices as a maximum. The broadcast addresses carry the last host (63,95,127,159) respectively.

**1.2.3 the IP address table .32:**

**Server room:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **device** | **Interface** | **Network address** | **IP address** | **Usable Address range** | **Broadcast Address** | **Default Gateway** |
| **Webcam1** | Fa0 | 195.200.10.32 | 195.200.10.34 | N/A | N/A | 195.200.10.33 |
| **Server 1** | Fa0 | 195.200.10.32 | 195.200.10.35 | N/A | N/A | 195.200.10.33 |
| **Fire sprinkler 1** | Fa0 | 195.200.10.32 | 195.200.10.36 | N/A | N/A | 195.200.10.33 |
| **A/C 1** | Fa0 | 195.200.10.32 | 195.200.10.37 | N/A | N/A | 195.200.10.33 |
| **A/C 2** | Fa0 | 195.200.10.32 | 195.200.10.38 | N/A | N/A | 195.200.10.33 |
| **RFID 1** | Fa0 | 195.200.10.32 | 195.200.10.39 | N/A | N/A | 195.200.10.33 |
| **Access point 1** | P0 | N/A | N/A | N/A | N/A | N/A |

**Internet and CCTV monitor room:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **P.C.1** | Fa0 | 195.200.10.32 | 195.200.10.40 | N/A | N/A | 195.200.10.33 |
| **IP Phone 1** | Fa 0 | N/A | N/A | N/A | N/A | N/A |
| **P.C.2** | Fa0 | 195.200.10.32 | 195.200.10.41 | N/A | N/A | 195.200.10.33 |
| **IP Phone 2** | Fa 0 | N/A | N/A | N/A | N/A | N/A |
| **RFID 2** | Fa0 | 195.200.10.32 | 195.200.10.42 | N/A | N/A | 195.200.10.33 |
| **Cloud 1** | Eth6 | N/A | N/A | N/A | N/A | N/A |
| **TV 1** | Coax7 | N/A | N/A | N/A | N/A | N/A |
| **Cloud 2** | Eth6 | N/A | N/A | N/A | N/A | N/A |
| **TV 2** | Coax7 | N/A | N/A | N/A | N/A | N/A |
| **Cloud 3** | Eth6 | N/A | N/A | N/A | N/A | N/A |
| **TV 3** | Coax7 | N/A | N/A | N/A | N/A | N/A |
| **Cloud 4** | Eth6 | N/A | N/A | N/A | N/A | N/A |
| **TV 4** | Coax7 | N/A | N/A | N/A | N/A | N/A |
| **A/C 3** | Fa0 | 195.200.10.32 | 195.200.10.43 | N/A | N/A | 195.200.10.33 |
| **Printer 1** | Fa0 | 195.200.10.32 | 195.200.10.44 | N/A | N/A | 195.200.10.33 |
| **Webcam 2** | Fa0 | 195.200.10.32 | 195.200.10.45 | N/A | N/A | 195.200.10.33 |
| **Laptop 1** | Wireless | 195.200.10.32 | 195.200.10.52 | N/A | N/A | 195.200.10.33 |
| **Laptop 2** | Wireless | 195.200.10.32 | 195.200.10.53 | N/A | N/A | 195.200.10.33 |

**Cafeteria:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Humidifier 1** | Fa0 | 195.200.10.32 | 195.200.10.46 | N/A | N/A | 195.200.10.33 |
| **Coffee machine 1** | Fa0 | 195.200.10.32 | 195.200.10.47 | N/A | N/A | 195.200.10.33 |
| **Fire sprinkler 2** | Fa0 | 195.200.10.32 | 195.200.10.48 | N/A | N/A | 195.200.10.33 |
| **Smoke detector 1** | Fa0 | 195.200.10.32 | 195.200.10.49 | N/A | N/A | 195.200.10.33 |
| **A/C 4** | Fa0 | 195.200.10.32 | 195.200.10.50 | N/A | N/A | 195.200.10.33 |
| **Webcam 3** | Fa0 | 195.200.10.32 | 195.200.10.51 | N/A | N/A | 195.200.10.33 |
| **Smartphone 1** | Wireless | 195.200.10.32 | 195.200.10.54 | N/A | N/A | 195.200.10.33 |
| **Smartphone 2** | Wireless | 195.200.10.32 | 195.200.10.55 | N/A | N/A | 195.200.10.33 |
| **Tablet 1** | Wireless | 195.200.10.32 | 195.200.10.56 | N/A | N/A | 195.200.10.33 |

these tables shows the IP addresses of the end devices that implemented in the server room, internet and CCTV monitor room and the cafeteria .There are 6 devices that carry IP address, ( 3 webcams, one server, two fire sprinklers, 4 A/Cs, 2 PCs, one smoke detector, a printer, one coffee machine and one humidifier and 2 RFID for the security of the most important room in the company.)All the 18 devices are connected with the router by the switch that connects the Fa0/0 and carry the .32 network address. 7 devices do not carry an IP address which is the 2 IP phones, 4 TVs and one access point. The default gateway is 195.200.10.33 for all the devices in this LAN even wirily or wirelessly.

**1.2.4 The IP address table.64:**

**Waiting room:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **device** | **Interface** | **Network address** | **IP address** | **Usable Address range** | **Broadcast Address** | **Default Gateway** |
| **Coffee machine 2** | Fa0 | 195.200.10.64 | 195.200.10.66 | N/A | N/A | 195.200.10.65 |
| **Webcam 4** | Fa0 | 195.200.10.64 | 195.200.10.67 | N/A | N/A | 195.200.10.65 |
| **Speaker 1** | Fa0 | 195.200.10.64 | 195.200.10.68 | N/A | N/A | 195.200.10.65 |
| **Fire sprinkler 2** | Fa0 | 195.200.10.64 | 195.200.10.69 | N/A | N/A | 195.200.10.65 |
| **Smoke detector 2** | Fa0 | 195.200.10.064 | 195.200.10.70 | N/A | N/A | 195.200.10.65 |
| **A/C 5** | Fa0 | 195.200.10.64 | 195.200.10.71 | N/A | N/A | 195.200.10.65 |
| **A/C 6** | Fa0 | 195.200.10.64 | 195.200.10.72 | N/A | N/A | 195.200.10.65 |
| **Cloud 5** | Eth6 | N/A | N/A | N/A | N/A | N/A |
| **TV 5** | Coax7 | N/A | N/A | N/A | N/A | N/A |
| **Smart phone 3** | Wireless | 195.200.10.32 | 195.200.10.57 | N/A | N/A | 195.200.10.33 |
| **Smart phone 4** | Wireless | 195.200.10.32 | 195.200.10.58 | N/A | N/A | 195.200.10.33 |

**Reception area and elevator:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **device** | **Interface** | **Network address** | **IP address** | **Usable Address range** | **Broadcast Address** | **Default Gateway** |
| **Printer 2** | Fa0 | 195.200.10.64 | 195.200.10.73 | N/A | N/A | 195.200.10.65 |
| **P.C.4** | Fa0 | 195.200.10.64 | 195.200.10.74 | N/A | N/A | 195.200.10.65 |
| **IP Phone 4** | Fa 0 | N/A | N/A | N/A | N/A | N/A |
| **P.C.5** | Fa0 | 195.200.10.64 | 195.200.10.75 | N/A | N/A | 195.200.10.65 |
| **IP Phone 5** | Fa 0 | N/A | N/A | N/A | N/A | N/A |
| **Webcam 5** | Fa0 | 195.200.10.64 | 195.200.10.76 | N/A | N/A | 195.200.10.65 |
| **A/C 7** | Fa0 | 195.200.10.64 | 195.200.10.77 | N/A | N/A | 195.200.10.65 |
| **Smoke detector 3** | Fa0 | 195.200.10.64 | 195.200.10.78 | N/A | N/A | 195.200.10.65 |
| **Webcam 6** | Fa0 | 195.200.10.64 | 195.200.10.79 | N/A | N/A | 195.200.10.65 |

The IP addresses of the end devices used in the reception area and waiting room are displayed in these above tables. There are 14 devices with IP addresses, including 3 cameras, one coffee machine, one fire sprinkler, 3 air conditioners, 2 PCs, a printer, 2 smoke detectors, and a speaker. The switch that connects Fa1/0 and has a.64 network address is used to connect all 14 devices to the router. Two IP phones and one TV all the three devices lack an IP address. All devices connected to this LAN, whether wired or wirelessly, use 195.200.10.65 as their default gateway. Two smartphones in the waiting room are connecting to the access point with .32 network ID.

# **2.0 Student 2 - Ibraheem Mohammed Imadeldin Awad-TP070765**

## **2.1 Topology and Justification:**

### **2.1.1 Kuala Lumpur second floor Topology:**

On the second floor of the KL building, it will use a specific type of LAN topology which is called star topology. The star topology, often known as a star network, is one of the most widely used forms of network layouts. In this design, each node is connected to a switch, computer, or other hub-like device. Other network nodes act as clients while the primary network device performs the role of a server (Computer Hope, 2022). Depending on the kind of network card in each computer or device either an ethernet cable is used to connect the device to the network or the device is connected wirelessly to an access point placed somewhere around the floor so that all to wireless devices connected to the network to have a fast and stable connection, so performance of those devices is not hindered. The devices that use wireless connections to connect to the network include laptops, smartphones, tablets etc.

### **2.1.2 Benefits of the Star Topology:**

Managing the network from a main place using a hub, switch, or central computer.

* Adding new computers to the network is simple.
* It is reliable as if one cable or device fails then all the other devices will still work.
* It is high performing as no data collision can take place.
* It is robust in nature and No disruptions occur to the network when connecting or removing devices
* If N devices are connected to the switch, then there will be N cables hence making it easier to manage and detect failures in the subnet

### **2.1.3 Drawbacks of Star Topology:**

* Deployment may be more expensive if a switch or router is used as the main network device.
* The performance of the network and the number of nodes it can support are determined by the central network device.
* If the network's primary computer, hub, or switch malfunctions, all PCs are cut off from it.
* Requires more cables than a linear bus topology.
* The switch/hub connecting all the devices will require more maintenance as it is the central piece of the network to which all the devices are connected.

**2.1.4 Justification for selecting Star Topology:**

The star topology is the most optimal for implementation in the Kuala Lumpur building, second floor based on the structure of the floor and the number of devices at hand. Furthermore, this network topology has been implemented because the organization will look to grow in the future and so will its digital and networking needs as with expansions comes more end devices and network devices. Although there are drawbacks to using the star topology, the advantages outweigh them, making it the best choice of topology. This is another justification for implementing the star topology. The star topology will allow the organization to add all those devices and more whenever the organization decides to expand (Absar et al.,2014). Also, if any nodes in the network malfunction, it will be easier to detect it in the start topology (Mousa et al., 2019).

## **2.2 IP addressing and justification:**

### **2.2.1 Kuala Lumpur second floor IP addressing:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Device** | Interface | Network Address | IP address | **Default Gateway** |
| **IP Phone 1** | Fa 0 | N/A | N/A | N/A |
| **PC 1** | Fa0 | 195.200.10.96 | 195.200.10.98 | 195.200.10.97 |
| **A/C 1** | Fa0 | 195.200.10.96 | 195.200.10.99 | 195.200.10.97 |
| **Fire Sprinkler 1** | Fa0 | 195.200.10.96 | 195.200.10.100 | 195.200.10.97 |
| **Printer 1** | Fa0 | 195.200.10.96 | 195.200.10.101 | 195.200.10.97 |
| **Fire monitor 1** | Fa0 | 195.200.10.96 | 195.200.10.102 | 195.200.10.97 |
| **Security camera 1** | Fa0 | 195.200.10.96 | 195.200.10.103 | 195.200.10.97 |
| **Cloud 1** | Eth 6 | N/A | N/A | N/A |
| **Projector 1** | Coax 7 | N/A | N/A | N/A |
|  |  |  |  |  |
| **A/C 2** | Fa0 | 195.200.10.96 | 195.200.10.104 | 195.200.10.97 |
| **IP Phone 2** | Fa0 | N/A | N/A | N/A |
| **PC 2** | Fa0 | 195.200.10.96 | 195.200.10.105 | 195.200.10.97 |
| **Fire Sprinkler 2** | Fa0 | 195.200.10.96 | 195.200.10.106 | 195.200.10.97 |
| **Fire monitor 2** | Fa0 | 195.200.10.96 | 195.200.10.107 | 195.200.10.97 |
| **Security camera 2** | Fa0 | 195.200.10.96 | 195.200.10.108 | 195.200.10.97 |
|  |  |  |  |  |
| **Security Camera 4** | Fa0 | 195.200.10.128 | 195.200.10.130 | 195.200.10.129 |
| **IP Phone 4** | Fa0 | - | - | - |
| **PC 4** | Fa0 | 195.200.10.128 | 195.200.10.131 | 195.200.10.129 |
| **IP Phone 5** | Fa0 | - | - | - |
| **PC 5** | Fa0 | 195.200.10.128 | 195.200.10.132 | 195.200.10.129 |
| **IP Phone 6** | Fa0 | - | - | - |
| **PC 6** | Fa0 | 195.200.10.128 | 195.200.10.133 | 195.200.10.129 |
| **Fire monitor 4** | Fa0 | 195.200.10.128 | 195.200.10.134 | 195.200.10.129 |
| **Fire Sprinkler 4** | Fa0 | 195.200.10.128 | 195.200.10.135 | 195.200.10.129 |
| **A/C 4** | Fa0 | 195.200.10.128 | 195.200.10.136 | 195.200.10.129 |
|  |  |  |  |  |
| **Security Camera 5** | Fa0 | 195.200.10.128 | 195.200.10.137 | 195.200.10.129 |
| **Fire Sprinkler 5** | Fa0 | 195.200.10.128 | 195.200.10.138 | 195.200.10.129 |
| **IP Phone 7** | Fa0 | - | - |  |
| **PC 7** | Fa0 | 195.200.10.128 | 195.200.10.139 | 195.200.10.129 |
| **Fire monitor 5** | Fa0 | 195.200.10.128 | 195.200.10.140 | 195.200.10.129 |
| **A/C 5** | Fa0 | 195.200.10.128 | 195.200.10.141 | 195.200.10.129 |
| **Printer 2** | Fa0 | 195.200.10.128 | 195.200.10.142 | 195.200.10.129 |
|  |  |  |  |  |
| **Security Camera 3** | Fa0 | 195.200.10.96 | 195.200.10.109 | 195.200.10.97 |
| **IP phone 3** | Fa0 | - | - | 195.200.10.97 |
| **PC 3** | Fa0 | 195.200.10.96 | 195.200.10.110 | 195.200.10.97 |
| **Fire monitor 3** | Fa0 | 195.200.10.96 | 195.200.10.111 | 195.200.10.97 |
| **A/C 3** | Fa0 | 195.200.10.96 | 195.200.10.112 | 195.200.10.97 |
| **Fire Sprinkler 3** | Fa0 | 195.200.10.96 | 195.200.10.113 | 195.200.10.97 |
|  |  |  |  |  |
| **Wireless devices** |  |  |  |  |
| Laptop 1 | Wireless | 195.200.10.128 | 195.200.10.143 | 195.200.10.129 |
| Laptop 2 | Wireless | 195.200.10.128 | 195.200.10.144 | 195.200.10.129 |
| Laptop 3 | Wireless | 195.200.10.128 | 195.200.10.145 | 195.200.10.129 |
| Laptop 4 | Wireless | 195.200.10.128 | 195.200.10.146 | 195.200.10.129 |
| Laptop 5 | Wireless | 195.200.10.128 | 195.200.10.147 | 195.200.10.129 |
| Tablet 1 | Wireless | 195.200.10.128 | 195.200.10.148 | 195.200.10.129 |
| Wireless access point | P0 | - | - | - |

### **2.2.2 IP addressing Justification:**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SUBNET | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256 |
| HOSTS | 256 | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |
| PREFIX LENGTH | /24 | /25 | /26 | /27 | /28 | /29 | /30 | /31 | /32 |

0 0 0 - .0

0 0 1 - .32

0 1 0 - .64

0 1 1 - .96

1 0 0 - .128

1 0 1 - .160

1 1 0 - .192

1 1 1 -

128   64   32 16   8   4    2   1

1      1     1   0    0   0    0   0

 Therefore, the subnet mask is:

255.255.255.224

Network addresses for the first subnet: 195.200.10.96 //27

Network addresses for the second subnet: 195.200.10.128 /27

The table shows the IP addresses for the all-end devices that were implemented on the second floor of the Kuala Lumpur branch second floor (default gateway, subnet mask and IP address range and default gateways). The devices are connected to the LAN with two possible ways to make the connection. The first method is connecting devices via a wireless connection for tablets and laptops. The second method is wired connection by which all the end devices in the network (desktop and laptop computers, printers, fire monitors, fire sprinklers, projector, security cameras, air conditioning units, and IP phones) are connected.

In the CEO room the devices have the IP address range of 195.200.10.98 to 195.200.10.103. There are 6 devices that have IP addresses, and they are the first air conditioning unit, fire sprinkler and fire monitor, desktop computer, and security camera. The room also contains one of the 2 switches used to create the subnets. The Branch manager’s room has devices with the IP range of 195.200.10.104 to 195.200.10.108 with all the devices in the room having an IP address except the IP phone. The devices that have IP addresses are the second air conditioning unit, fire sprinkler and fire monitor, desktop computer, and security camera. The administrative office has the IP range of 195.200.10.109 to 195.200.10.113. The devices that have IP addresses are the third air conditioning unit, fire sprinkler and fire monitor, desktop computer, and security camera. Those three rooms have their devices connected to one switch making them under the same subnet.

The Finance department is the largest department on the floor as it houses 3 desktop computers and three IP phones connected to them, an air conditioning unit, a fire monitor, and a fire sprinkler. It has the IP address range of 195.200.10.130 to 195.200.10.136. The HR department contains the second switch on the floor. It has the IP address range of 195.200.10.137 to 195.200.10.148 as it has the wireless access point which is used to connect all the wireless devices to the network. There are 5 laptop computers and a tablet, and all those devices are spread throughout the floor with the CEO room having a laptop and the only tablet on the floor and every other room has one of the remaining laptops. The 2 printers are placed are placed in different areas on the floor to provide easy access to the employees that need to print important documents.

# **3.0 Student 3 - Abdul Shafey Khan-TP061166**

## **3.1 Topology and Justification:**

## **3.1.1 Topology of CyberJaya Building First floor:**

There are various forms of LAN topologies available, however, the ring topology will be used on the first floor of Cyber Jaya to create a network. Local area networks have used ring topology networks the most. A ring network is an enclosed group of processing parts. There is a distinct predecessor and sequel component for each ring node. It can withstand a single error, allowing communication between processing units to continue even if one of them malfunctions (Henningsson et al., 2022).

## **3.1.2 Advantages of the Ring Topology:**

* It provides reliable performance for small groups of workstations or huge networks with similar workloads.
* It is simple to extend.

(Henningsson et al., 2022)

## **3.1.3 Disadvantages of the Ring Topology:**

* The network is disrupted by the addition and removal of nodes.
* The network is challenging to troubleshoot.

(Marenda et al., 2018)

## **3.1.4 Justification for Selecting Ring Topology:**

The author analyzed all other topologies available and found the ring topology to be most optimal for implementation considering the structure of the floor and number of devices at hand. There are 21 devices that are on the first floor that spread according to their requirement in various areas. The structure concept of all rooms is comparable except the rest room and many same nodes are present throughout the facility. Two pairs of computer workstations, IP phones, and printers have been included in the reception area. This is like the CTO room where a workstation, laptop, IP phone, and photocopier have been incorporated since it is a technical area where staff can come and use common equipment such as the photocopier. Furthermore, this network topology has primarily been implemented because our organization will look to grow in the future and so will its digital needs hence the ring topology will allow the organization to add workstations in the future easily (Absar et al., 2014). All areas of the floor are air-conditioned except the restroom and the whole vicinity is under constant surveillance by the CCTV cameras except for the restroom to maintain the privacy of the employees. The cameras are placed in strategic locations to avoid any blind spots. All wires have been well hidden in the ground under thick padding to minimize the chance of injury. Lastly, the reception area has a piano area to allow employees to relax with soothing music along with the delicacies available in the pantry area.

# **3.2 IP Addressing and Justification:**

## **3.2.1 First Floor of Cyberjaya IP Addressing Table:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***FIRST FLOOR OF CYBERJAYA*** | | | | | | |
| **Reception Area** | | | | | | |
| **AC 1** | Fa0 | 195.200.10.160 | 195.200.10.162 | N/A | N/A | 195.200.10.161 |
| **Printer 1** | Fa0 | 195.200.10.160 | 195.200.10.163 | N/A | N/A | 195.200.10.161 |
| **IP Phone 1-2** | Fa 0 | - | - | N/A | N/A | - |
| **PC 1** | Fa0 | 195.200.10.160 | 195.200.10.164 | N/A | N/A | 195.200.10.161 |
| **Access point 1** | P1 | N/A | N/A | N/A | N/A | 195.200.10.161 |
| **Smartphone 1** | Wireless | 195.200.10.160 | 195.200.10.165 | N/A | N/A | 195.200.10.161 |
| **Speaker** | Fa0 | 195.200.10.160 | 195.200.10.166 | N/A | N/A | 195.200.10.161 |
| **PC 2** | Fa0 | 195.200.10.160 | 195.200.10.167 | N/A | N/A | 195.200.10.161 |
| **Printer 2** | Fa0 | 195.200.10.160 | 195.200.10.168 | N/A | N/A | 195.200.10.161 |
| **Security Cam 1** | Fa0 | 195.200.10.160 | 195.200.10.169 | N/A | N/A | 195.200.10.161 |
| **Cyberjaya Branch Manager’s Room** | | | | | | |
| **Printer 3** | Fa0 | 195.200.10.160 | 195.200.10.170 | N/A | N/A | 195.200.10.161 |
| **Laptop 1** | Fa0 | 195.200.10.160 | 195.200.10.171 | N/A | N/A | 195.200.10.161 |
| **Smartphone 2** | Wireless | 195.200.10.160 | 195.200.10.172 | N/A | N/A | 195.200.10.161 |
| **IP Phone 3** | Fa 0 | - | - | N/A | N/A | - |
| **AC 2** | Fa0 | 195.200.10.160 | 195.200.10.173 | N/A | N/A | 195.200.10.161 |
| **Security Cam 2** | Fa0 | 195.200.10.160 | 195.200.10.174 | N/A | N/A | 195.200.10.161 |
| **CTO Room** | | | | | | |
| **PC 3** | Fa0 | 195.200.10.160 | 195.200.10.175 | N/A | N/A | 195.200.10.161 |
| **IP Phone 4** | Fa 0 | - | - | N/A | N/A | - |
| **Printer 4** | Fa0 | 195.200.10.160 | 195.200.10.176 | N/A | N/A | 195.200.10.161 |
| **Smartphone 3** | Wireless | 195.200.10.160 | 195.200.10.177 | N/A | N/A | 195.200.10.161 |
| **AC 3** | Fa0 | 195.200.10.160 | 195.200.10.178 | N/A | N/A | 195.200.10.161 |
| **Laptop 2** | Fa0 | 195.200.10.160 | 195.200.10.179 | N/A | N/A | 195.200.10.161 |
| **Smartphone 4** | Wireless | 195.200.10.160 | 195.200.10.180 | N/A | N/A | 195.200.10.161 |
| **Security Cam 3** | Fa0 | 195.200.10.160 | 195.200.10.181 | N/A | N/A | 195.200.10.161 |
| **Pantry Area** | | | | | | |
| **Printer 5** | Wireless | 195.200.10.160 | 195.200.10.182 | N/A | N/A | 195.200.10.161 |
| **AC 4** | Fa0 | 195.200.10.160 | 195.200.10.183 | N/A | N/A | 195.200.10.161 |
| **Smartphone 5** | Wireless | 195.200.10.160 | 195.200.10.184 | N/A | N/A | 195.200.10.161 |
| **PC 4** | Fa0 | 195.200.10.160 | 195.200.10.185 | N/A | N/A | 195.200.10.161 |
| **Smartphone 6** | Wireless | 195.200.10.160 | 195.200.10.186 | N/A | N/A | 195.200.10.161 |
| **Speaker 2** | Fa0 | 195.200.10.160 | 195.200.10.187 | N/A | N/A | 195.200.10.161 |
| **Security Cam 3** | Fa0 | 195.200.10.160 | 195.200.10.188 | N/A | N/A | 195.200.10.161 |

## **3.2.2 IP addressing Justification:**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SUBNET | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256 |
| HOSTS | 256 | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |
| PREFIX LENGTH | /24 | /25 | /26 | /27 | /28 | /29 | /30 | /31 | /32 |

0 0 0 - .0

0 0 1 - .32

0 1 0 - .64

0 1 1 - .96

1 0 0 - .128

1 0 1 - .160

1 1 0 - .192

1 1 1 -

128   64   32 16   8   4    2   1

1      1     1   0    0   0    0   0

Hence, the subnet mask is:  **255.255.255.224**

This section of the report will illustrate the table which illustrates the IP addresses for all node devices installed on the first floor of the Cyberjaya office building. The headings of the table will include default gateway, subnet mask, and IP address range. Smartphones on the floor have been connected via a wireless connection whereas other devices (laptops, desktop workstations, printers, ACs, speakers, IP phones, and have been connected via a wired connection.

The main area on the first floor of Cyberjaya is the reception area and all devices on it have IP addresses ranging from 195.200.10.170 to 195.200.10.174. The first AC unit, speaker, printers, desktop computers and the first security camera are the only equipment with IP addresses except for the IP phone. Secondly, the Branch manager's room contains devices with IP addresses ranging from 195.200.10.175 to 195.200.10.181, except for the IP phone. The devices on the floor include the second AC unit, laptop, printer, printer and second security camera. Thirdly, the Chief technical officer's room contains devices with IP addresses ranging from 195.200.10.1 to 195.200.10.148. Devices include, third AC unit, laptop, printer, smartphones and third security cam. Lastly, the Pantry area contains devices with IP addresses ranging from 195.200.10.182 to 195.200.10.188. Devices include, second speaker, second AC unit, desktop workstations, printers, smartphones and fourth security cam.

**4.0 Student 4 -Abdul Rahman Awadh Masoud-TP069361**

**4.1 Cyber Jaya second floor:**

In CyberJaya branch second floor we used Star topology, in a star topology, all devices on the network are connected to a central device, such as a hub or a switch. Each device has a dedicated point-to-point connection to the central device, and communication between devices on the network occurs through the central device. networks that use a star topology include home networks and local area networks (LANs) in small businesses. The star topology is also commonly used in the implementation of token ring networks.

**4.****1.1 Reasons for Selecting Star Topology:**

On the second floor of the Cyberjaya building, it will use a specific type of LAN topology which is called star topology. The star topology, often known as a star network, is one of the most widely used forms of network layouts. In this design, each node is connected to a switch, computer, or other hub-like device. Other network nodes act as clients while the primary network device performs the role of a server (Computer Hope, 2022). Depending on the kind of network card in each computer or device either an ethernet cable is used to connect the device to the network or the device is connected wirelessly to an access point placed somewhere around the floor so that all to wireless devices connected to the network to have a fast and stable connection, so performance of those devices is not hindered. The devices that use wireless connections to connect to the network include laptops, smartphones, tablets Etc.

### **4.1.2 Benefits of the Star Topology:**

* Managing the network from a main place using a hub, switch, or central computer.
* Adding new computers to the network is simple.
* It is reliable as if one cable or device fails then all the other devices will still work.
* It is high performing as no data collision can take place.
* It is robust in nature and No disruptions occur to the network when connecting or removing devices
* If N devices are connected to the switch, then there will be N cables hence making it easier to manage and detect failures in the subnet

### **4.1.3 Drawbacks of Star Topology:**

* Deployment may be more expensive if a switch or router is used as the main network device.
* The performance of the network and the number of nodes it can support are determined by the central network device.
* If the network's primary computer, hub, or switch malfunctions, all PCs are cut off from it.
* Requires more cables than a linear bus topology.
* The switch/hub connecting all the devices will require more maintenance as it is the central piece of the network to which all the devices are connected.

**4.1.4 Justification for selecting Star Topology:**

The star topology is the most optimal for implementation in the Cyberjaya building considering the structure of the floor and the number of devices at hand. Furthermore, this network topology has primarily been implemented because our organization will look to grow in the future and so will its digital and networking needs as with expansions comes more end devices and network devices. The star topology will allow the organization to add all those devices and more whenever the organization decides to expand (Absar et al.,2014). Also, if any nodes in the network malfunction, it will be easier to detect it in the start topology (Mousa et al., 2019). The advantage of a star topology is that it is easy to set up and manage, and it can be expanded easily by adding additional devices. In addition, if one device fails, it does not affect the operation of the other devices on the network. However, the central device is a single point of failure, so if it fails, the entire network goes down.

**4.2 IP Addressing second floor Cyberjaya:**

**1.2.2 the IP address table for the router in K.L:**

| **Device** | **Interface** | **Network Address** | **IP Address** | **Usable Address Range** | **Broadcast Address** | **Default Gateway** |
| --- | --- | --- | --- | --- | --- | --- |
| **Router –R1(K.L.)** | S0/0/0 | 195.200.10.0  /27 | 195.200.10.1/27 | FROM 195.200.10.1 TO 195.200.10.30 | 195.200.10.31/  27 | N/A |
| Fa0/0 | 195.200.10.160  /27 | 195.200.10.161 /27 | FROM 195.200.10.161TO 195.200.10.190 | 195.200.10.191/  27 | N/A |
| Fa1/0 | 195.200.10.192/27 | 195.200.10.193/27 | FROM 195.200.10.193 TO 195.200.10.222 | 195.200.10.223/  27 | N/A |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |
| **Cyber Jaya Floor 2** |  |  |  |  |  |  |
| **Server room** |  |  |  |  |  |  |
| **Server1** | Fa0 | 195.200.10.193 | 195.200.10.195 | N/A | N/A | 195.200.10.194 |
| **Webcam1** | Fa0 | 195.200.10.193 | 195.200.10.196 | N/A | N/A | 195.200.10.194 |
| **A/C1** | Fa0 | 195.200.10.193 | 195.200.10.197 | N/A | N/A | 195.200.10.194 |
| **A/C2** | Fa0 | 195.200.10.193 | 195.200.10.198 | N/A | N/A | 195.200.10.194 |
| **Access wireless point1** | P1 | N/A | N/A | N/A | N/A | N/A |
| **Webcam 2** | Fa0 | 195.200.10.193 | 195.200.10.199 | N/A | N/A | 195.200.10.194 |
| **A/C3** | Fa0 | 195.200.10.193 | 195.200.10.200 | N/A | N/A | 195.200.10.194 |
| **Laptop1** | wireless | 195.200.10.193 | 195.200.10.201 | N/A | N/A | 195.200.10.194 |
| **Ip phone1** | Fa0 | - | - | N/A | N/A | N/A |
| **P.C1** | Fa0 | 195.200.10.193 | 195.200.10.202 | N/A | N/A | 195.200.10.194 |
| **Printer1** | Fa0 | 195.200.10.193 | 195.200.10.203 | N/A | N/A | 195.200.10.194 |
| **P.C2** | Fa0 | 195.200.10.193 | 195.200.10.204 | N/A | N/A | 195.200.10.194 |
| **A/C4** | Fa0 | 195.200.10.193 | 195.200.10.205 | N/A | N/A | 195.200.10.194 |
| **Laptop2** | Wireless | 195.200.10.193 | 195.200.10.206 | N/A | N/A | 195.200.10.194 |
| **Laptop3** | Wireless | 195.200.10.193 | 195.200.10.207 | N/A | N/A | 195.200.10.194 |
| **Laptop4** | wireless | 195.200.10.193 | 195.200.10.208 | N/A | N/A | 195.200.10.194 |
| **Ip phone2** | Fa0 | - | - | N/A | N/A | N/A |
| **Webcam3** | Fa0 | 195.200.10.193 | 195.200.10.209 | N/A | N/A | 195.200.10.194 |
| **A/C5** | Fa0 | 195.200.10.193 | 195.200.10.210 | N/A | N/A | 195.200.10.194 |
| **A/C6** | Fa0 | 195.200.10.193 | 195.200.10.211 | N/A | N/A | 195.200.10.194 |
| **Webcam 4** | Fa0 | 195.200.10.193 | 195.200.10.212 | N/A | N/A | 195.200.10.194 |
| **TV1** | Coax7 | N/A | N/A | N/A | N/A | N/A |
| **Smartphone1** | wireless | 195.200.10.193 | 195.200.10.213 | N/A | N/A | 195.200.10.194 |
| **Smartphone2** | wireless | 195.200.10.193 | 195.200.10.214 | N/A | N/A | 195.200.10.194 |
| **Tablet1** | wireless | 195.200.10.193 | 195.200.10.215 | N/A | N/A | 195.200.10.194 |
| **cloud1** | Eth 6 | N/A | N/A | N/A | N/A | N/A |
| **Webcam5** | Fa0 | 195.200.10.193 | 195.200.10.216 | N/A | N/A | 195.200.10.194 |
| **RFID Reader** | Fa0 | 195.200.10.193 | 195.200.10.217 | N/A | N/A | 195.200.10.194 |

**4.2.2 IP addressing second floor Cyberjaya justification:**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SUBNET | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256 |
| HOSTS | 256 | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |
| PREFIX LENGTH | /24 | /25 | /26 | /27 | /28 | /29 | /30 | /31 | /32 |

0 0 0 - .0

0 0 1 - .32

0 1 0 - .64

0 1 1 - .96

1 0 0 - .128

1 0 1 - .160

1 1 0 - .192

1 1 1 -

128   64   32 16   8   4    2   1

1      1     1   0    0   0    0   0

Therefore, the subnet mask is:

255.255.255.224

For the second floor in Cyberjaya there is only one (1) subnet mask: 255.255.255.244, In addition to the Network addresses for the subnet is: 195.200.10.193 that we used for the devices in the floor. The server room is on the second floor, and the IP addresses range from 195.200.10.194 to 195.200.10.198 which has one router, two A/C’s, one server and a webcam. For the router we used (PT-ROUTER-NM-1CGE) that provides Gigabit Ethernet copper connectivity for access routers. As for the fastEthernet1/0 config is 195.200.10.193. In addition, one switch that is all the devices connected to.

Two offices each office has one pc and one IP phone, IP phones have no configuration, and the PCs cannot connect to the switch directly, it must connect to the IP phone first and from the IP phone to the switch. In the meeting room contains devices with IP addresses ranging from 195.200.10.205 to 195.200.10.212, except for the TV for the exact purpose of using the cloud, this particular reason for the circumstance the cloud doesn't have IP addresses. It contains wireless access point that connects the wireless devices with a password like: Tablets, phones and laptops. And each of these devices has an IP address.

# **5.0 Work Breakdown Structure:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Group Component**  Floor plan – (Layout) Justification  Network diagram and configuration (Packet Tracer) | Abdulrahman Gamil Mohammed Ahmed (TP071012) | Ibraheem Mohammed Imadeldin Awad  (TP070765) | Abdul Shafey Khan  (TP071166) | AbdulRahman Awadh Masoud  (TP069361) |
| **Kuala Lumpur branch (1st floor)**  Topology and IP addressing Justification | ✓ |  |  |  |
| **Kuala Lumpur branch (2nd floor)**  Topology and IP addressing Justification |  | ✓ |  |  |
| **Cyber Jaya branch (1st floor)**  Topology and IP addressing Justification |  |  | ✓ |  |
| **Cyber Jaya branch (2nd floor)**  Topology and IP addressing Justification |  |  |  | ✓ |

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# **7.0 Conclusion.**

**7.1 Alternate Roles:**

Each of the students in the group was responsible for 1 floor of each of the 2 buildings and the work was broken down as shown below and in the Work breakdown structure in part 5.0.

Abdulrahman Gamil: 1.0 till the next student’s part, Cisco packet tracer file, Leader, Cover Page, Table of contents.

Ibraheem Mohammed: 2.0 till the next student’s part, Cisco packet tracer file, Organizing the document, Cover Page, Table of contents, Routing.

Khan Abdul Shafey: 3.0 till 3.2.2. Developing the Cisco packet tracer file.

Abdul Rahman Awadh: 4.0 till 4.1.5. Developing the Cisco packet tracer file.

**7.2 Gantt Chart:**

**Expected Timeline:**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Week** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| **Introduction** |  |  |  |  |  |  |  |  |  |  |  |
| **Design Floor Plan** |  |  |  |  |  |  |  |  |  |  |  |
| **Justification** |  |  |  |  |  |  |  |  |  |  |  |
| **Network and Diagram** |  |  |  |  |  |  |  |  |  |  |  |
| **Topology**  **justification** |  |  |  |  |  |  |  |  |  |  |  |
| **Ip addressing**  **And justification** |  |  |  |  |  |  |  |  |  |  |  |
| **Check up** |  |  |  |  |  |  |  |  |  |  |  |

**Actual Timeline:**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Week** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| **Introduction** |  |  |  |  |  |  |  |  |  |  |  |
| **Design Floor Plan** |  |  |  |  |  |  |  |  |  |  |  |
| **Justification** |  |  |  |  |  |  |  |  |  |  |  |
| **Network and Diagram** |  |  |  |  |  |  |  |  |  |  |  |
| **Topology**  **justification** |  |  |  |  |  |  |  |  |  |  |  |
| **Ip addressing**  **And justification** |  |  |  |  |  |  |  |  |  |  |  |
| **Check up** |  |  |  |  |  |  |  |  |  |  |  |

**7.3 Peer Evaluation:**

Student Name / TP Number: Abdulrahman Gamil Mohammed Ahmed / TP071012

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Abdulrahman Gamil Mohammed Ahmed  TP NO: 071012 | Abdul Rahman Awadh Masoud  TP NO:069361 | Ibraheem Mohammed Imadeldin  TP NO:070765 | Abdul Shafey Khan  TP NO:  071166 |
| Participated in group discussion |  | Yes | Yes | Yes |
| Helped to monitor group progress |  | No | 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 |  | No | Yes | No |
| 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 |

Student Name / TP Number: Ibraheem Mohammed Imadeldin Awad / TP 070765

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Ibraheem Mohammed Imadeldin Awad  TP NO: 070765 | Abdulrahman Gamil Mohammed Ahmed  TP NO:071012 | Abdul Shafey Khan  TP NO:071166 | Abdul Rahman Awadh Masoud  TP NO:069361 |
| 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 |

Student Name / TP Number: Khan Abdul Shafey/TP071166

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Khan Abdul Shafey  TP NO: 071166 | Abdulrahman Gamil Mohammed Ahmed  TP NO:071012 | Ibraheem Mohammed Imadeldin Awad  TP NO:071166 | Abdul Rahman Awadh Masoud  TP NO:069361 |
| 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 |

Student Name / TP Number: Abdul Rahman Awadh Masoud/ TP069361

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Abdul Rahman Awadh Masoud  TP NO:069361 | Member 2: Abdulrahman Gamil Mohammed Ahmed  TP NO:071012 | Member 3: Ibraheem Mohammed Imadeldin Awad  TP NO:071166 | Member 4: Khan Abdul Shafey  TP NO: 071166 |
| 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 |