INDIVIDUAL ASSIGNMENT

TECHNOLOGY PARK MALAYSIA

AICT003-4-2-NWN

NETWORKS AND NETWORKING

UCDF1905 ICT (SE)

HAND OUT DATE: Week 4: 12th August 2020

HAND IN DATE: Week 14: 28th October 2020

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INSTRUCTIONS TO CANDIDATES:

1. Students are advised to underpin their answers with the use of references (cited using the Harvard name system of Referencing)
2. Late submission will be awarded zero (0) unless Extenuating circumstances (EC) are upheld.
3. Cases of plagiarism will be penalized.

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1.0 Introduction

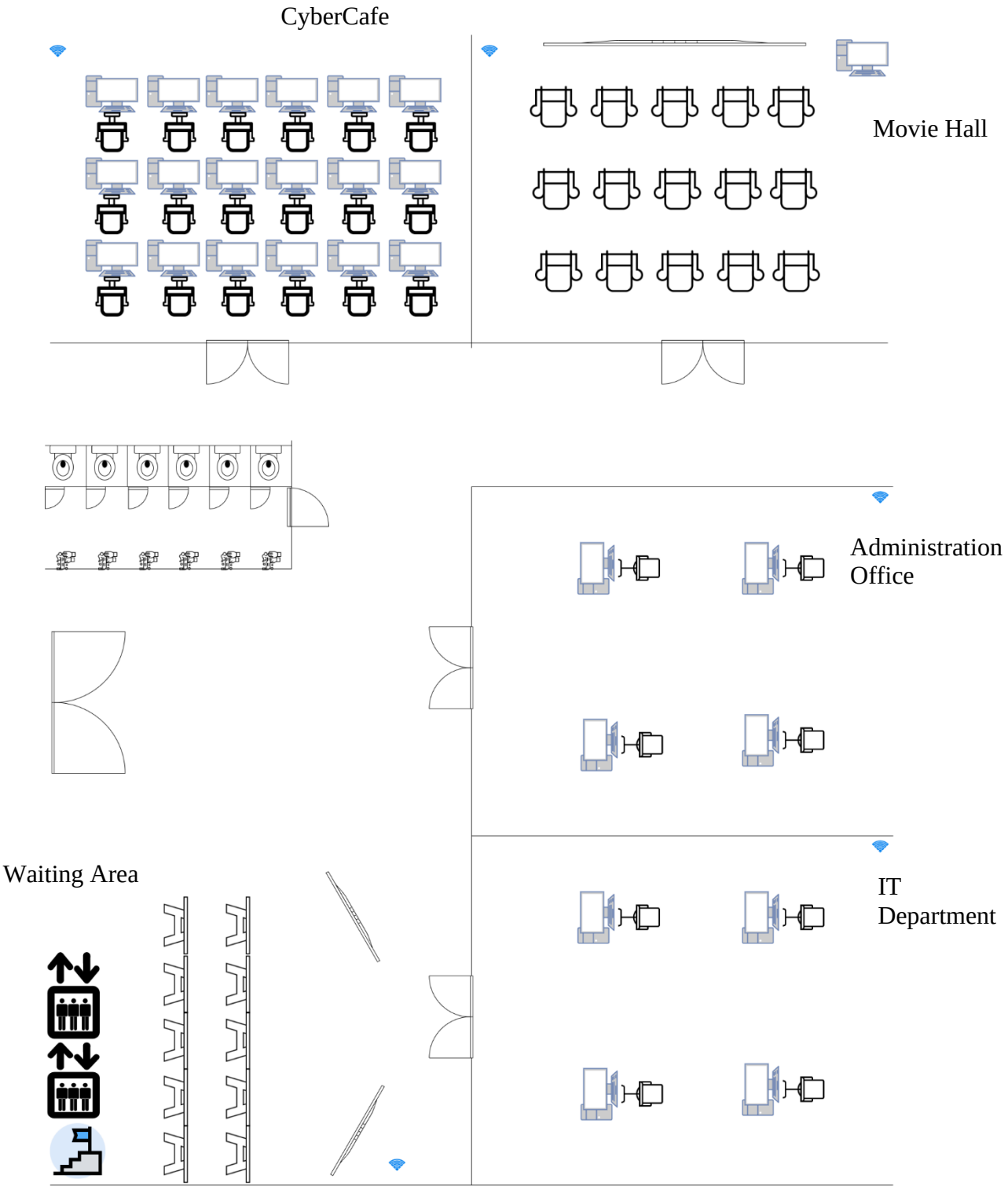
This report will explain about the floor plan, network topology, IP addressing, configuration techniques used and more that is used for the designing of network for MT Tuition Centre.

MT Tuition Centre is a tuition centre which has a cybercafé, movie hall, administration office, IT department, waiting areas, classrooms, computer labs, teacher room, discussion rooms, library, and a snack room.

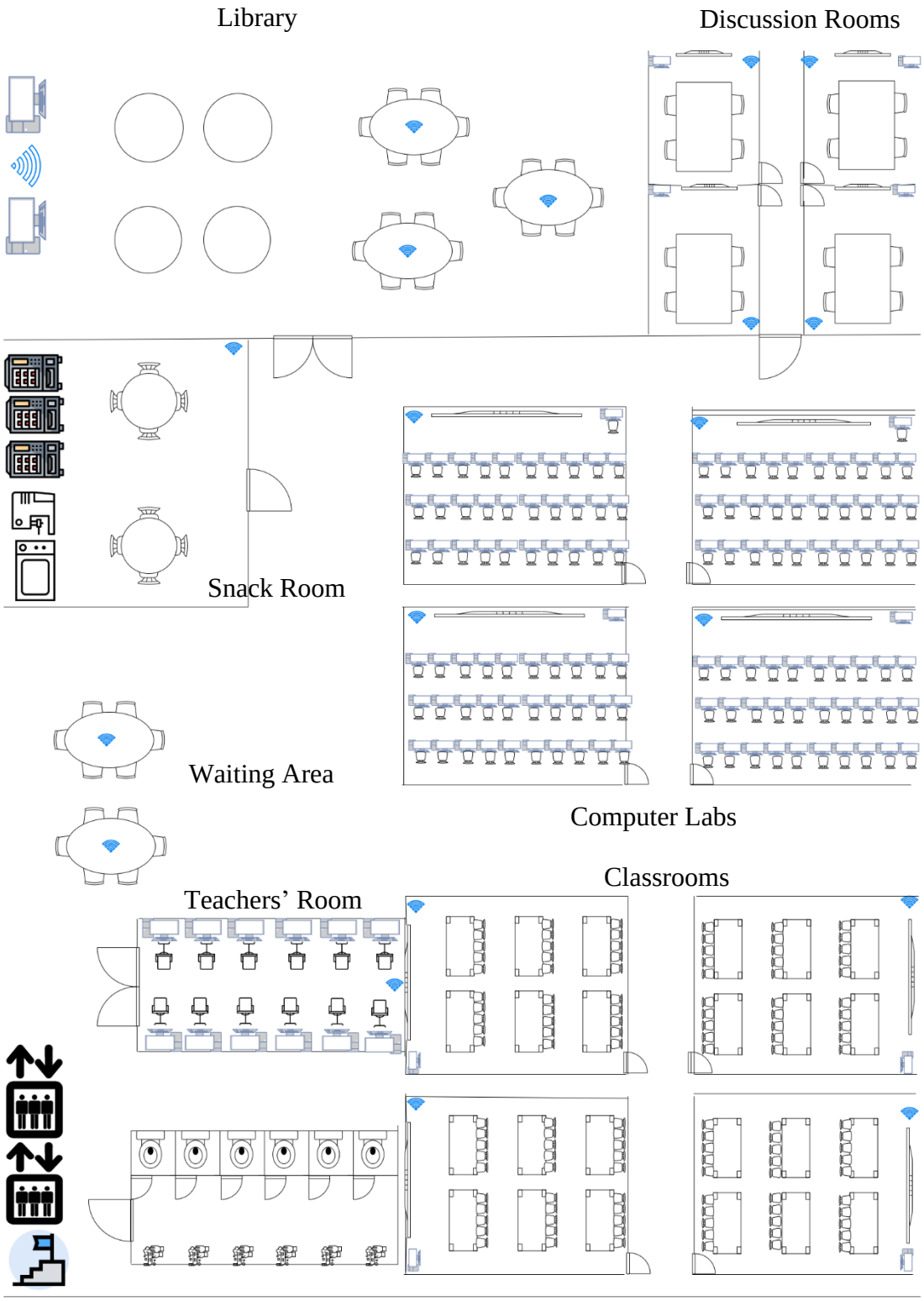
The network designed will provide sufficient coverage of WiFi network to all students and staff in the tuition centre. The network is also connected to a shared server farm located a few kilometers away.

2.0 Floor Plan

2.1 Ground Floor

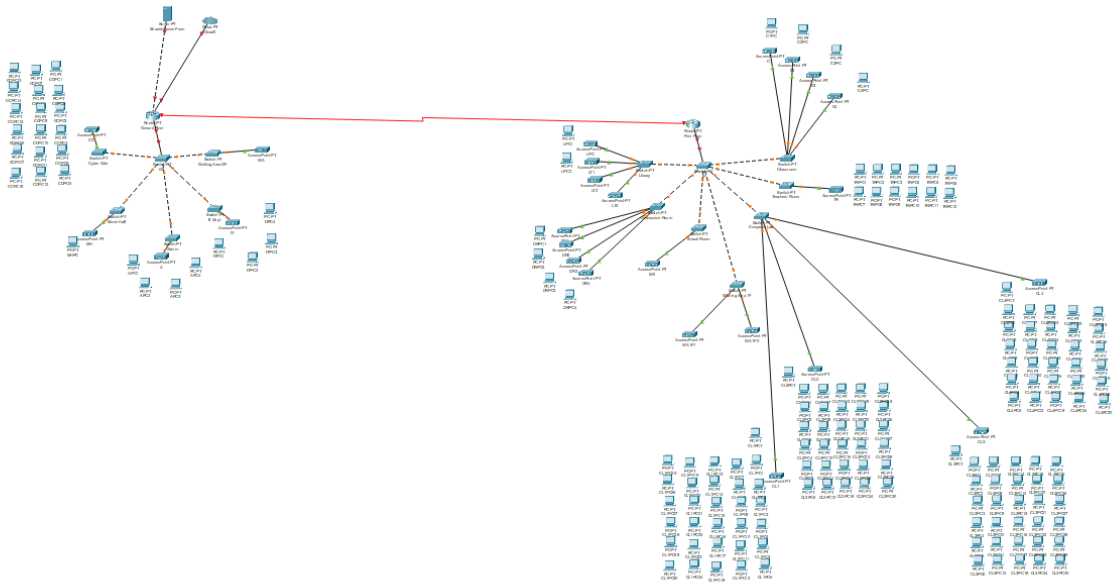


2.2 First Floor

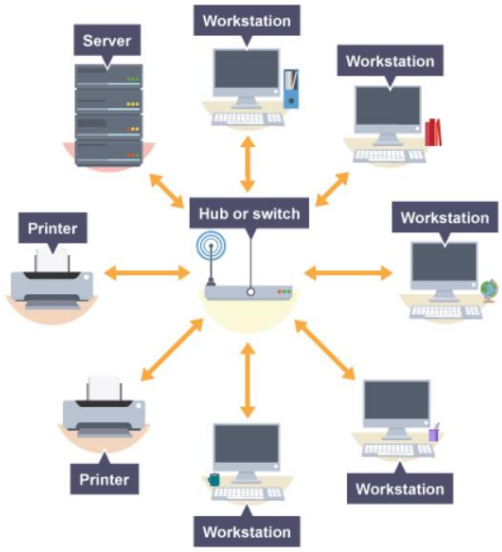


3.0 Network Topology

Network topology is the way a network is arranged, including the physical or logical description of how links and nodes are set up to relate to each other (Anon, 2019). There are a few types of network topologies, such as the star topology, bus topology, ring topology, tree topology, mesh topology and hybrid topology. The network topology used in the design for MT Tuition Centre is the star topology.



The diagram above shows the network design for MT Tuition Centre.



The diagram above shows a star network, where devices are connected to a central hub or switch.

In a star network, each device on the network has its own cable that connects to a switch or hub. A hub then sends every packet of data to every device, whereas a switch only sends a packet of data to the destination device (Anon, n.d.).

There are a few advantages in using a star network. First, it is very reliable. It is said so because it is independent, the other devices will continue to work even if one cable or device fails. It is also high performing as no data collisions can occur (Anon, n.d.).

There are also disadvantages for this type of topology. It is expensive to install as it uses the most cables as compared to the other network topologies. It also requires extra hardware, such as hubs or switches. Then, the devices connected to a certain hub or switch will have no network connection if the hub or switch fails (Anon, n.d.).

Despite all of the disadvantages, the star topology is still found to be the most suitable because the tuition centre is planned to have a fast and reliable network infrastructure to achieve its innovative goals, which means that cost isn't a problem. Then, they also have an IT Department, which is able to fix the connection if a switch or hub fails.

4.0 IP Addressing

Device	Interface	IP Address	Subnet Mask	Default Gateway
Tuition Centre	Fa1/0.1	**192.168.100.1**	**255.255.255.192**	N/A
	Fa1/0.2	**192.168.100.105**	**255.255.255.248**	N/A
	Fa1/0.3	**192.168.100.97**	**255.255.255.248**	N/A
	Fa1/0.4	**192.168.100.113**	**255.255.255.248**	N/A
	Fa1/0.5	**192.168.100.65**	**255.255.255.224**	N/A
	Se3/0	**192.168.100.121**	**255.255.255.252**	N/A
	Fa0/0.1	192.168.200.129	255.255.255.224	N/A
	Fa0/0.2	192.168.200.225	255.255.255.248	N/A
	Fa0/0.3	192.168.200.193	255.255.255.240	N/A
	Fa0/0.4	192.168.200.161	255.255.255.224	N/A
	Fa0/0.5	192.168.200.1	255.255.255.128	N/A
	Fa0/0.6	192.168.200.209	255.255.255.240	N/A
	Fa0/0.7	192.168.200.233	255.255.255.248	N/A
Server	Fa1/0	**192.168.11.1**	**255.255.255.128**	**N/A**
	Fa7/0	**192.168.11.129**	**255.255.255.128**	**N/A**
	Se2/0	**192.168.100.122**	**255.255.255.252**	**N/A**
CC	Vlan 110	**192.168.100.66**	**255.255.255.224**	**192.168.100.65**
MH	Vlan 120	**192.168.100.114**	**255.255.255.248**	**192.168.100.113**
A	Vlan 130	**192.168.100.98**	**255.255.255.248**	**192.168.100.97**
IT	Vlan 140	**192.168.100.106**	**255.255.255.248**	**192.168.100.105**
WAGF	Vlan 150	**192.168.100.2**	**255.255.255.192**	**192.168.100.1**
Library	Vlan 210	192.168.200.130	255.255.255.224	192.168.200.129
DR	Vlan 220	192.168.200.226	255.255.255.248	192.168.200.225
SR	Vlan 230	192.168.200.194	255.255.255.240	192.168.200.193
WA1F	Vlan 240	192.168.200.162	255.255.255.224	192.168.200.161
CL	Vlan 250	192.168.200.2	255.255.255.128	192.168.200.1
TR	Vlan 260	192.168.200.210	255.255.255.240	192.168.200.209
C	Vlan 270	192.168.200.234	255.255.255.248	192.168.200.233
Server	NIC	**192.168.11.126**	**255.255.255.128**	**192.168.11.1**
CC18	NIC	**192.168.100.94**	**255.255.255.224**	**192.168.100.65**
MH1	NIC	**192.168.100.118**	**255.255.255.248**	**192.168.100.113**
A4	NIC	**192.168.100.102**	**255.255.255.248**	**192.168.100.97**
IT4	NIC	**192.168.100.110**	**255.255.255.248**	**192.168.100.105**
WAGF62	NIC	**192.168.100.62**	**255.255.255.192**	**192.168.100.1**
L30	NIC	192.168.200.158	255.255.255.224	192.168.200.129
DR4	NIC	192.168.200.230	255.255.255.248	192.168.200.225
SR14	NIC	192.168.200.206	255.255.255.240	192.168.200.193
WA1F30	NIC	192.168.200.190	255.255.255.224	192.168.200.161
CL124	NIC	192.168.200.126	255.255.255.128	192.168.200.1
TR12	NIC	192.168.200.222	255.255.255.240	192.168.200.209
C4	NIC	192.168.200.238	255.255.255.248	192.168.200.233

The table above shows the IP addressing designed for the network.

The IP addressing for each of the devices uses VLSM, which is Variable Length Subnet Mask, to calculate. VLSM is used to increase the usability of subnets as they can be of variable size (Anon, 2020). There are 3 network address that is used to calculate, which is 192.168.11.0, 192.168.100.0 and 192.168.200.0. 192.168.11.0 is used for the server connection, 192.168.100.0 is used for all ground floor devices, while 192.168.200.0 is used for all devices in first floor. This is so that the location of the devices can be easily differentiated by the IP addresses. It is also because that there are almost 256 devices in some areas, giving an area a network address of its own provides enough IP addresses to be used and allows future expansion.

192.168.11.0/24						
Router	2					
Subnet Mask	Hosts	Network Address	First Usable Host Add	Last Usable Host Add	Broadcast Address	Number of Addresses
/25	1	192.168.11.0	192.168.11.1	192.168.11.126	192.168.11.127	128
/25	1	192.168.100.128	192.168.11.129	192.168.11.254	192.168.11.255	128

The diagram above show the subnetting scheme used to design the IP addresses for server farm devices.

192.168.100.0/24	VLSM					
		WAGF	62			
		CC	18			
		A	4			
		IT	4			
		MH	3			
		Router GF - Server				
			1			
		Network Address				
Subnet Mask	Hosts	192.168.100.0	First Usable Host Addres	Last Usable Host Add	Broadcast Address	Number of
/26	62	192.168.100.64	192.168.100.1	192.168.100.62	192.168.100.63	64
/27	18	192.168.100.96	192.168.100.65	192.168.100.94	192.168.100.95	32
/29	4	192.168.100.104	192.168.100.97	192.168.100.102	192.168.100.103	8
/29	4	192.168.100.112	192.168.100.105	192.168.100.110	192.168.100.111	8
/29	3	192.168.100.120	192.168.100.113	192.168.100.118	192.168.100.119	8
/30	1	192.168.100.124	192.168.100.121	192.168.100.122	192.168.100.123	4
/30	NA	192.168.100.128	192.168.100.125	192.168.100.126	192.168.100.127	4
/26	NA	192.168.100.192	192.168.100.129	192.168.100.190	192.168.100.191	64
/26	NA		192.168.100.193	192.168.100.254	192.168.100.255	64

The diagram above show the subnetting scheme used to design the IP addresses for ground floor devices.

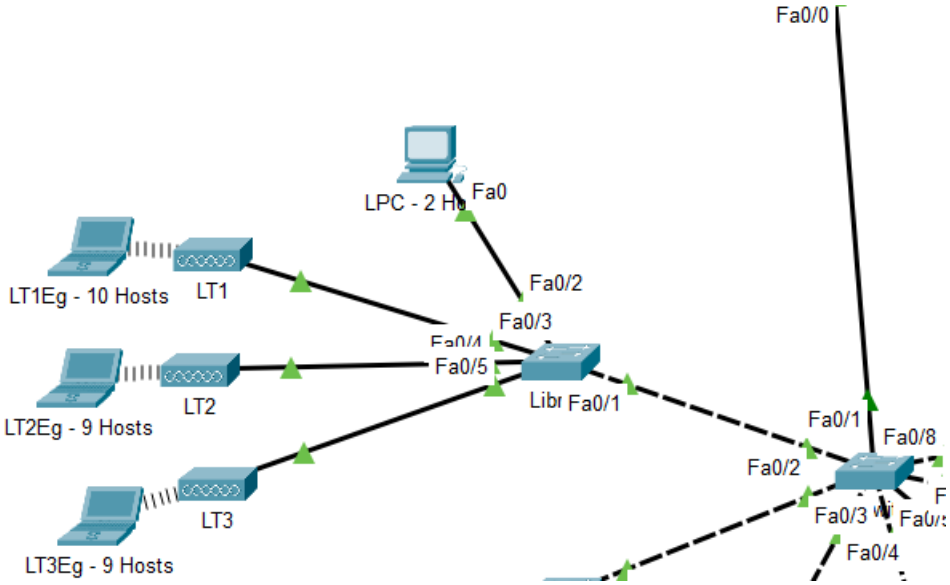
192.168.200.0	DHCP					
CL	124					
L	30					
WA1F	30					
SR	14					
TR	12					
DR	4					
C	4					
Subnet Mask	Hosts	Network Address	First Usable Host Add	Last Usable Host Addı	Broadcast	Number of
/25	124	192.168.200.0	192.168.200.1	192.168.200.126	192.168.2(	128
/27	30	192.168.200.128	192.168.200.129	192.168.200.158	192.168.2(	32
/27	30	192.168.200.160	192.168.200.161	192.168.200.190	192.168.2(	32
/28	14	192.168.200.192	192.168.200.193	192.168.200.206	192.168.2(	16
/28	12	192.168.200.208	192.168.200.209	192.168.200.222	192.168.2(	16
/29	4	192.168.200.224	192.168.200.225	192.168.200.230	192.168.2(	8
/29	4	192.168.200.232	192.168.200.233	192.168.200.238	192.168.2(	8
/28	Unused	192.168.200.240	192.168.200.241	192.168.200.255	192.168.2(	16

The diagram above show the subnetting scheme used to design the IP addresses for first floor devices.

5.0 Configuration Techniques

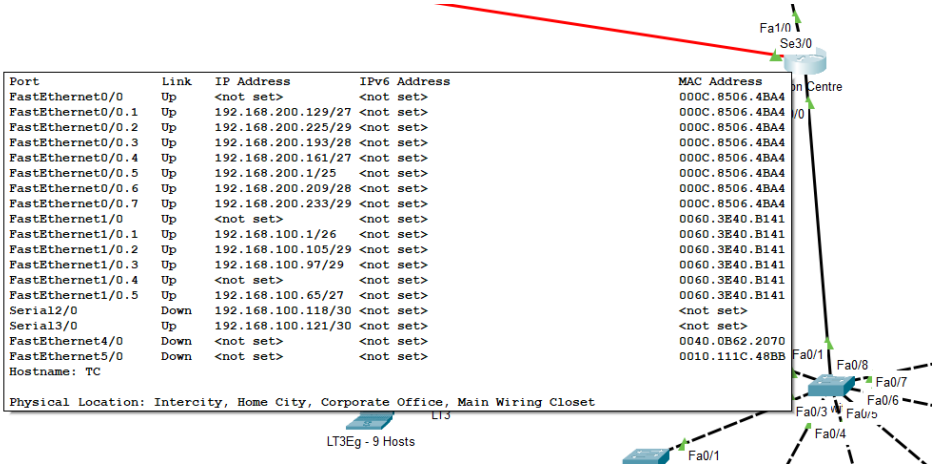
5.1 Virtual LAN (VLAN)

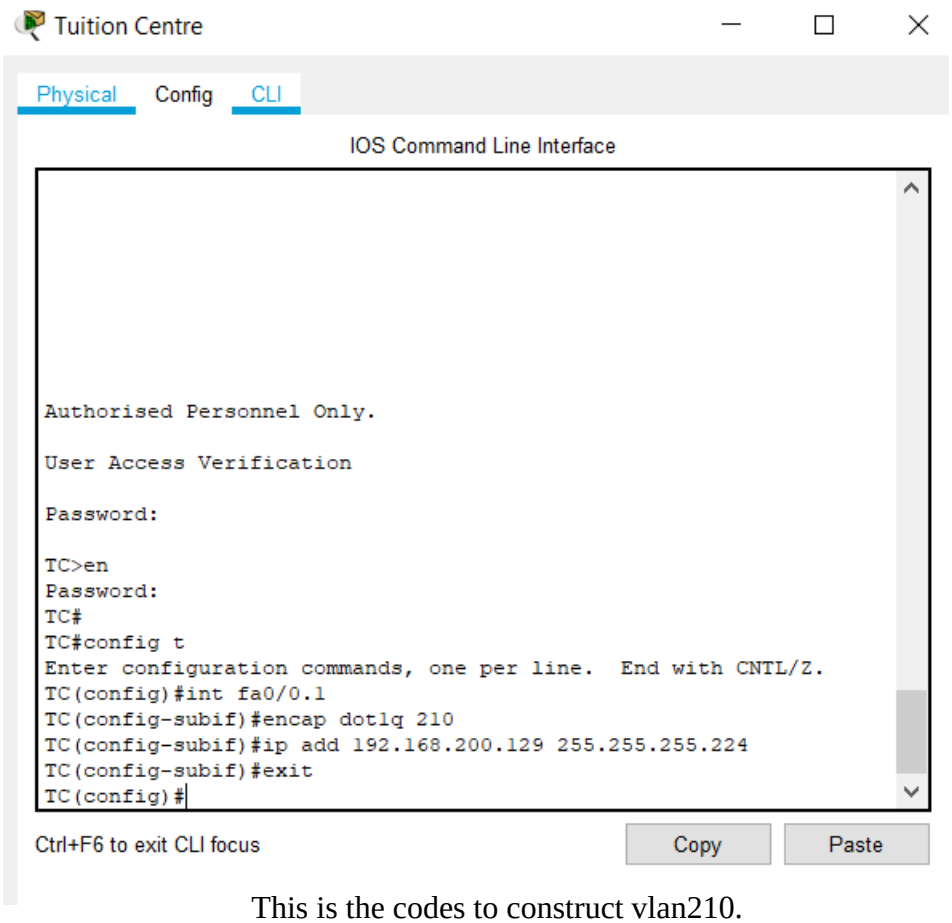
VLAN is a subnetwork which can group together collections of devices on separate physical local area networks (LANs). LAN is a group of computers and devices that share a communication line or wireless link to a server within the same geographical area (Rouse M., n.d.). For example, this is one of the VLANs set up (Vlan210).



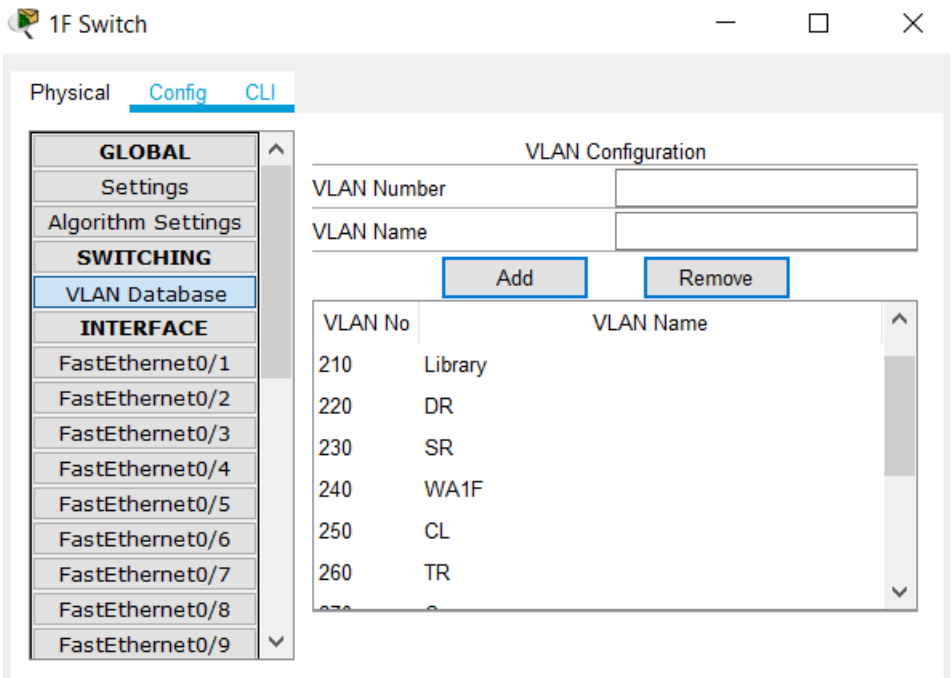
The diagram above is vlan210, where the devices in the library is grouped.

We have grouped the group of computers virtually, without having to be in a group physically. They are all connected virtually to the interface fa0/0.1 on the router as shown as the diagram below.

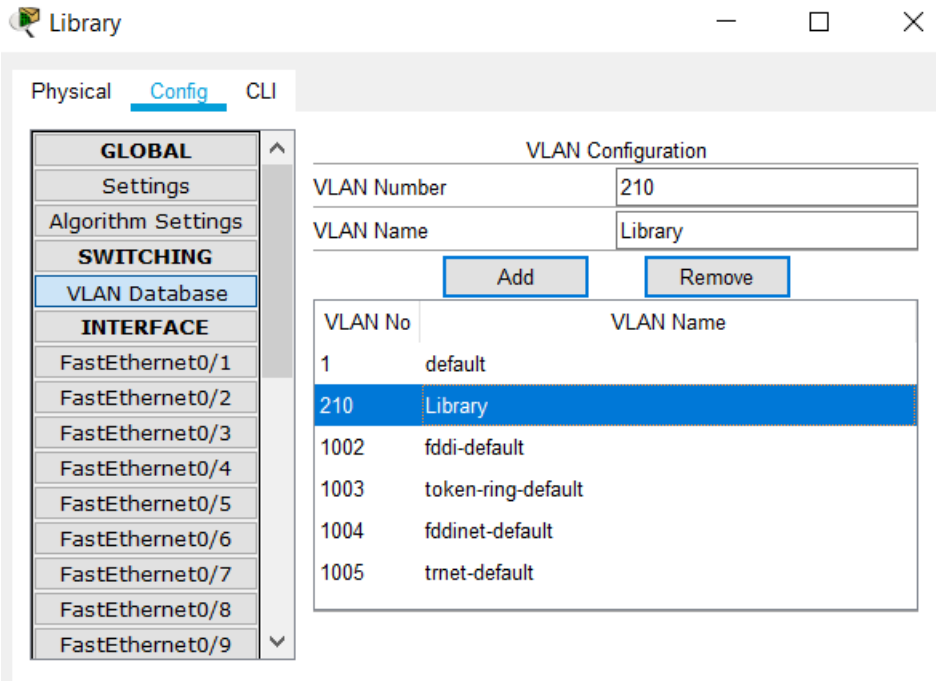




This is the codes to construct vlan210.



It is also needed to add all VLANs into the VLAN database at the first floor switch.



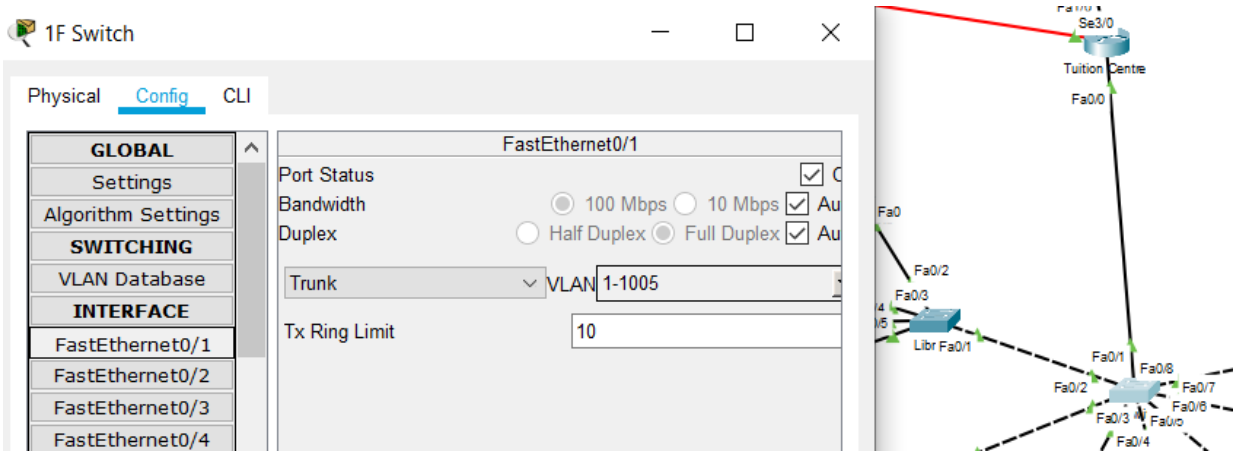
It is also needed to add the VLAN into the VLAN database at the library switch.

After these few steps, any devices that is connected to the library switch is in a group.

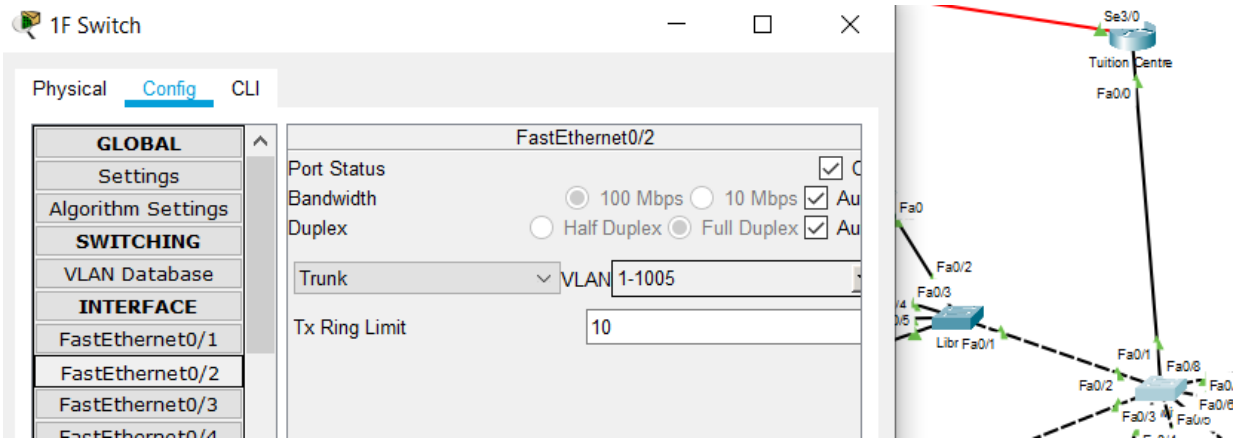
5.2 InterVLAN

InterVLAN is a way of routing where the traffic is forwarded between different VLANs by implementing a router in the network (Anon, n.d.). Diagrams below will show how is Vlan210 (library) going to communicate with Vlan220 (discussion room) by InterVLAN.

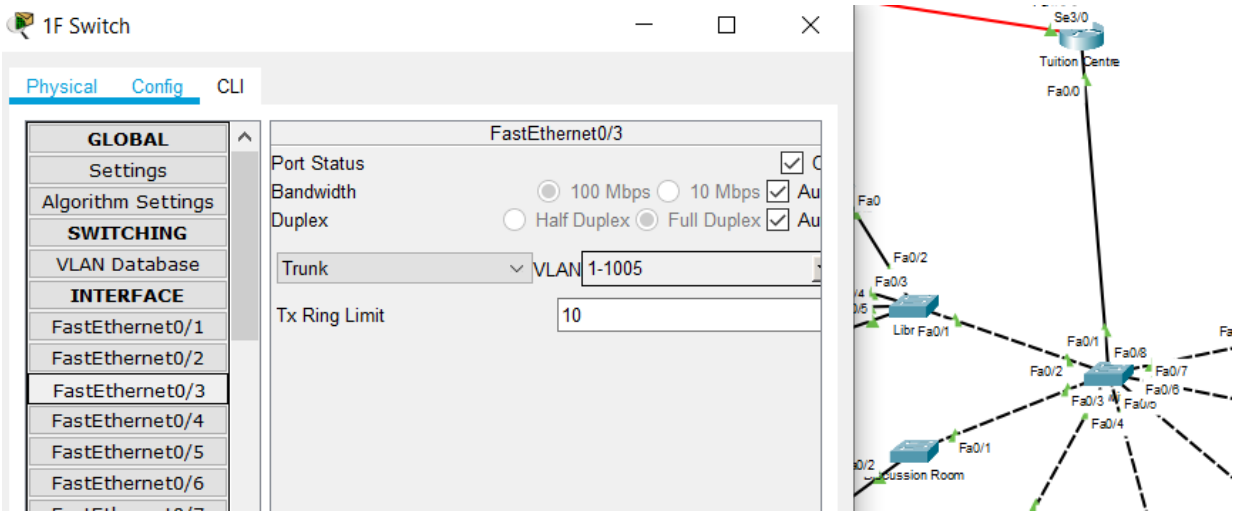
After Vlan220 is set up, the links between the switches and router should be set as "trunk".



Trunk in fa0/1, the interface that is connected from the ground floor switch to the router.

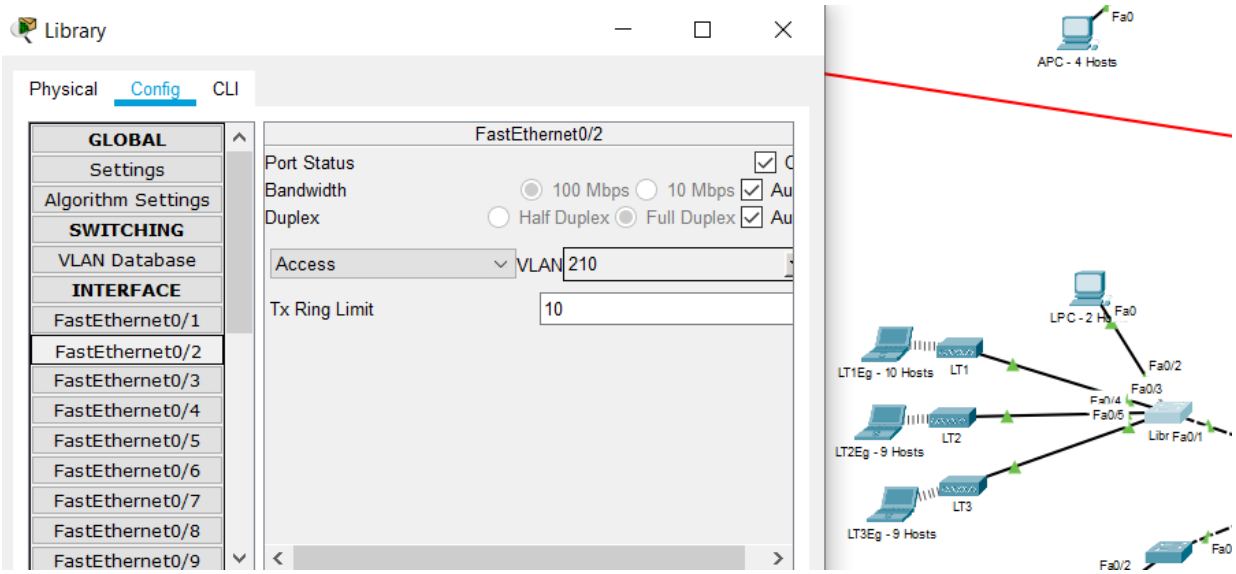


Trunk in fa0/2, the interface that is connected from the ground floor switch to the library switch.

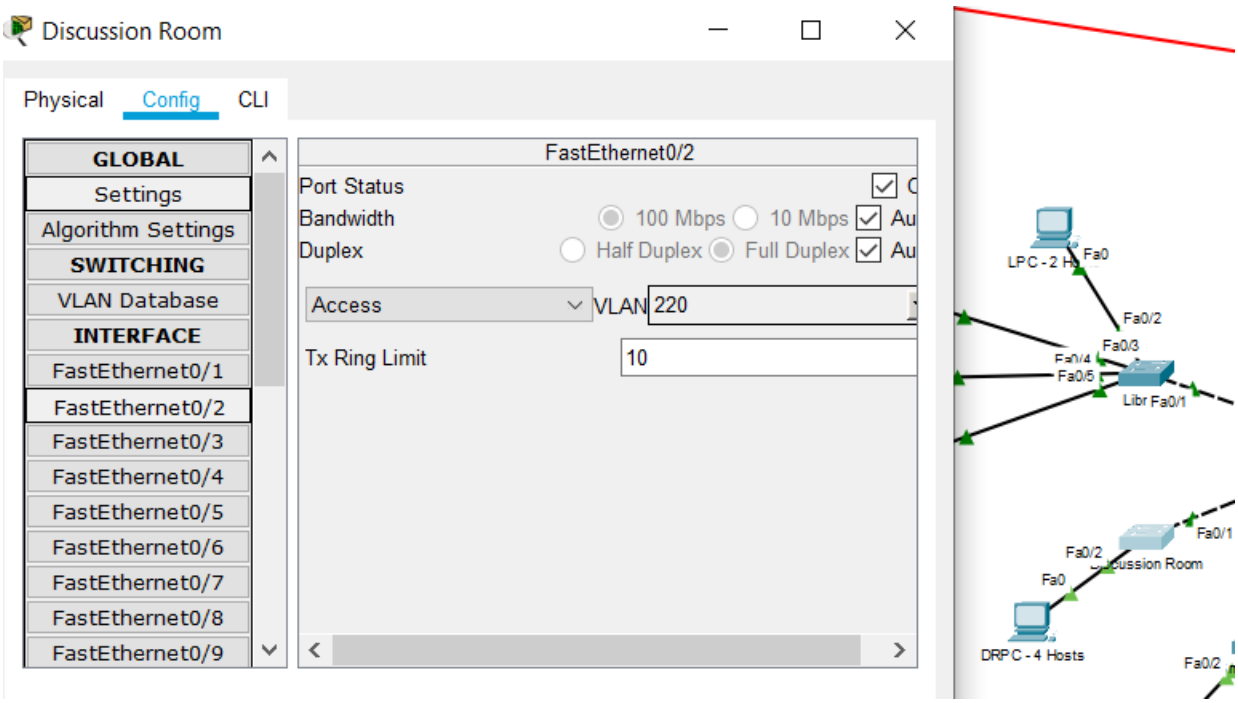


Trunk in fa0/3, the interface that is connected from the ground floor switch to the discussion room switch.

Then, the links between the switches and the devices should be set as “access” with the appropriate VLAN names.



Access in fa0/2, the interface that is connected from the library switch to one of the computers.



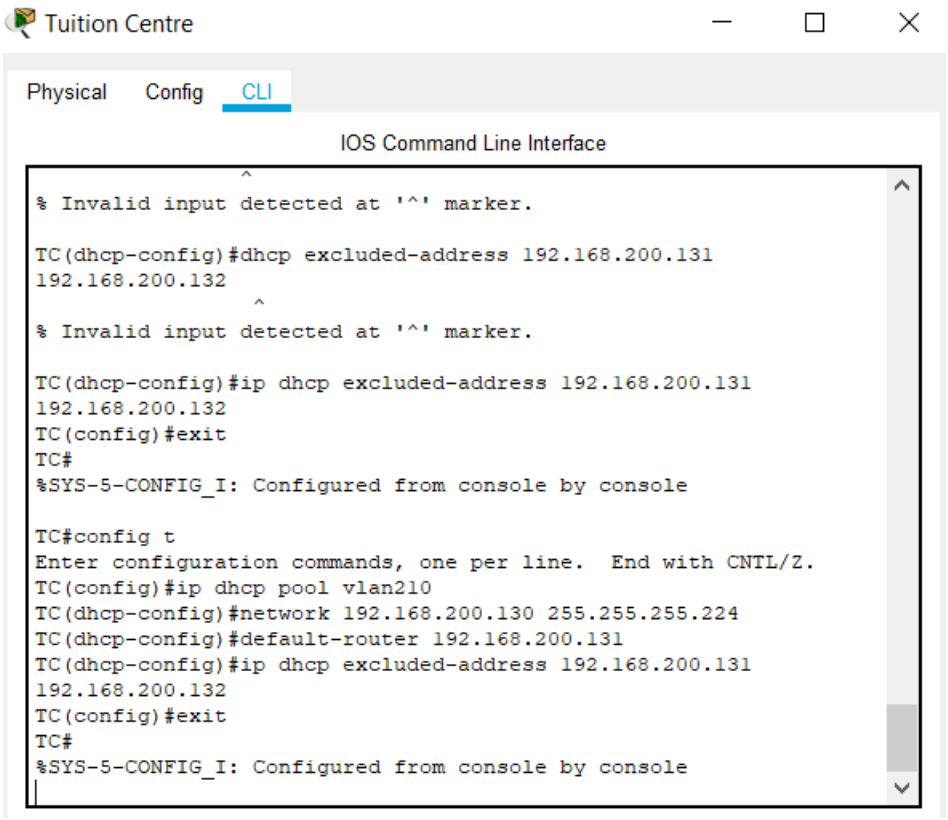
Access in fa0/2, the interface that is connected from the discussion room switch to one of the computers.

After these, the devices at different VLANs should be able to communicate with each other.

5.3 Dynamic Host Configuration Protocol (DHCP)

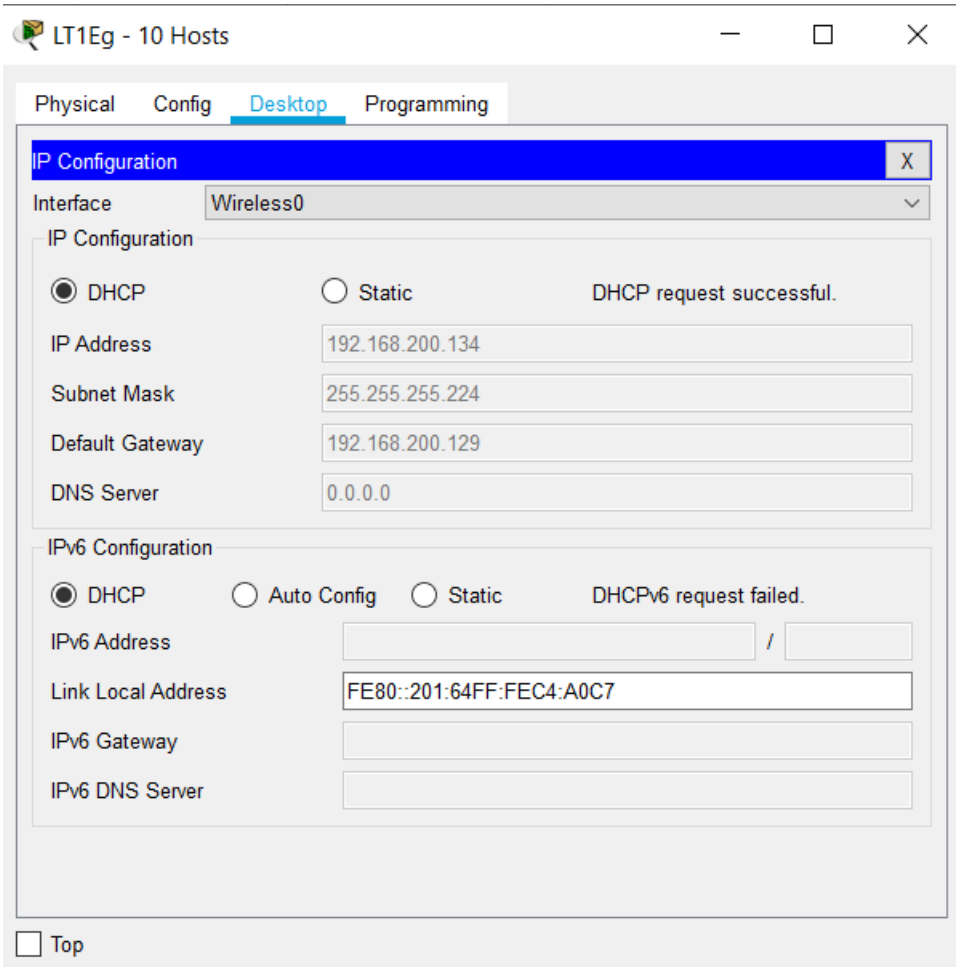
DHCP is a network management protocol used to automate the process of configuring devices on IP networks (Anon, n.d.). Here is an example of how the DHCP at library devices are set up.

First, a DHCP pool at the router has to be registered.



The DHCP pool set for vlan210.

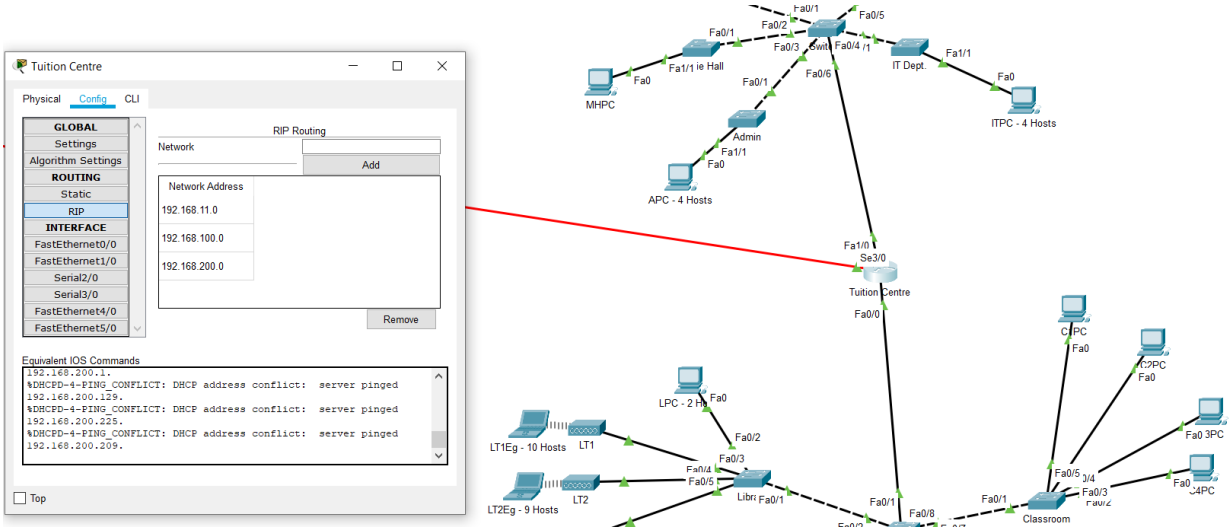
Now, select DHCP when configuring the IP address for devices at vlan210.



The IP address for one of the computers at library (Vlan210) is set up by DHCP.

5.4 Router Routing Information Protocol (RIP)

Router RIP is a dynamic routing protocol which uses hop count as a routing metric to find the best path between the sources and the destination network (Anon, 2019). This is how router RIP is set up at the network.



This is router RIP set up at the tuition centre router.

Data from the 3 networks are now allowed to be transported to each other.

5.5 Router and Switch Securing Techniques

5.5.1 Password at console line

This is to secure access to the console line.

```
Test>en
Test#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Test(config)#line console 0
Test(config-line)#password test
Test(config-line)#login
Test(config-line)#exit
Test(config)#exit
Test#
%SYS-5-CONFIG_I: Configured from console by console

Test#exit
```

After these lines of codes, the console line is secured, and will require a password to access to the console line.

```
User Access Verification

Password:

Test>
```

5.5.2 Password at the Privileged Mode Access

This is to secure access to the privileged mode.

```
Test>en
Test#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Test(config)#enable password test2
Test(config)#exit
Test#
%SYS-5-CONFIG_I: Configured from console by console

Test#exit
```

s

```
User Access Verification

Password:

Test>en
Password:
Test#
```

Ctrl+F6 to exit CLI focus Copy Paste

6.0 Conclusion

After being appointed to design this network, I have learnt how to build a network with the techniques as said above.

7.0 References

1. Anon (2019) *What is Network Topology? Best Guides to Types and Diagrams* DNS Stuff [Online] Available at: https://www.dnsstuff.com/what-is-network-topology [28 October 2020]

2. Anon (n.d.) *Network Types and Topologies* Bitesize [Online] Available at: https://www.bbc.co.uk/bitesize/guides/z36nb9q/revision/6 [Accessed 28 October 2020]

3. Anon (2020) *Introduction of Variable Length Subnet Mask* GeeksforGeeks [Online] Available at: https://www.geeksforgeeks.org/introduction-of-variable-length-subnet-mask-vlsm/ [Accessed 28 October 2020]

4. Anon (n.d.) *Inter-VLAN Routing* CCNA Blog [Online] Available at: https://www.ccnablog.com/inter-vlan-routing/ [Accessed 28 October 2020]

5. Anon (n.d.) *What is DHCP?* Efficient iP [Online] Available at: https://www.efficientip.com/what-is-dhcp-and-why-is-it-important/ [Accessed 28 October 2020]

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7. Rouse M. (n.d.) *VLAN* SearchNetworking [Online] Available at: https://searchnetworking.techtarget.com/definition/virtual-LAN [Accessed 28 October 2020]