Course: Data Communication & Networking

Course Instructor: Sir Safdar

"Data Communication & Networking CCP REPORT"

1) Introduction:

In this report, we the data networking and communication infrastructure for INT UNI, connecting the Karachi, Lahore, and Islamabad campuses. The objective of this project is to design a robust and efficient network using Cisco Packet Tracer. The network architecture includes routers, multi-layer switches, VLANs, PCs, and servers, enabling seamless communication and data exchange among different departments within the university system.

2) Network Design:

The network design incorporates a tree topology, which provides scalability, redundancy, and efficient data flow. The three campuses are interconnected using three routers, ensuring reliable connectivity between them. Each router is connected to a multi-layer switch, which serves as the backbone for the respective campus. Additionally, three switches are connected to each multi-layer switch, representing the Student, SSC (Student Services Center), and Marketing departments. The network design ensures secure communication and limited access based on departmental requirements.

3) Topology:

The network structure consists of the following components:

a) Three routers are deployed to connect the Karachi, Lahore, and Islamabad campuses. These routers act as gateways, facilitating inter-campus communication and routing data between different departments.

b) Three multi-layer switches are employed, one for each campus. These switches provide advanced switching capabilities and routing functionalities. They ensure efficient data forwarding within the respective campus and handle inter-VLAN communication.

c) Switches: Each multi-layer switch is connected to three switches representing the Student, SSC, and Marketing departments. These switches are responsible for connecting the individual PCs within each department and controlling the flow of data.

d) VLANs (Virtual Local Area Networks): VLANs are implemented to logically segregate network traffic based on departmental requirements. Three VLANs are created: Student, SSC, and Marketing. Each VLAN operates independently, ensuring isolation and security between departments.

e) PCs: A single PC is connected to each switch, representing the workstations within each department. These PCs enable users to access the university management system and perform various tasks specific to their roles.

f) ServersAn IP address server is deployed to assign IP addresses dynamically to every PC within the network. This server ensures efficient IP address management and enables seamless communication between devices.
A Facebook server is also integrated into the network to provide communication and collaboration capabilities to the SSC and Marketing departments. Access to the Facebook server is restricted to these departments only, ensuring that the Student department is unable to communicate with it.

4) IP Schemes:

- The 10.10.10.17 network is used for connectivity between the routers in Karachi and the Cloud.
- The 10.10.10.0 network is present in the connection between Karachi's router and Islamabad's router.
- The 10.10.10.3 network is used for connectivity between the routers in Islamabad and Lahore.
- The 20.0.0.0 network is used for connectivity between the cloud router and cloud server.
- The router in Lahore and the router on the Facebook server are connected through the 30.0.0.0 network.
- A cloud server's IP address is 20.0.0.2.
- Facebook's server has the IP address 30.0.0.2.
- Karachi's Student has the IP address 192.168.1.2.
- A Student in Islamabad has the IP address 192.168.4.2.
- Lahore's Student has the IP address 192.168.11.2.
- The SSC in Karachi has the IP address 192.168.2.2.
- The SSC in Islamabad has the IP address 192.168.5.2.
- The SSC in Lahore has the IP address 192.168.10.2.
- Karachi's marketing uses the IP address 192.168.3.2.
- Islamabad's Marketing uses the IP address 192.168.6.2.

- Lahore's Marketing uses the IP address 192.168.9.2.

b) Network Functionality:

The network is built to meet the following needs and functionalities:

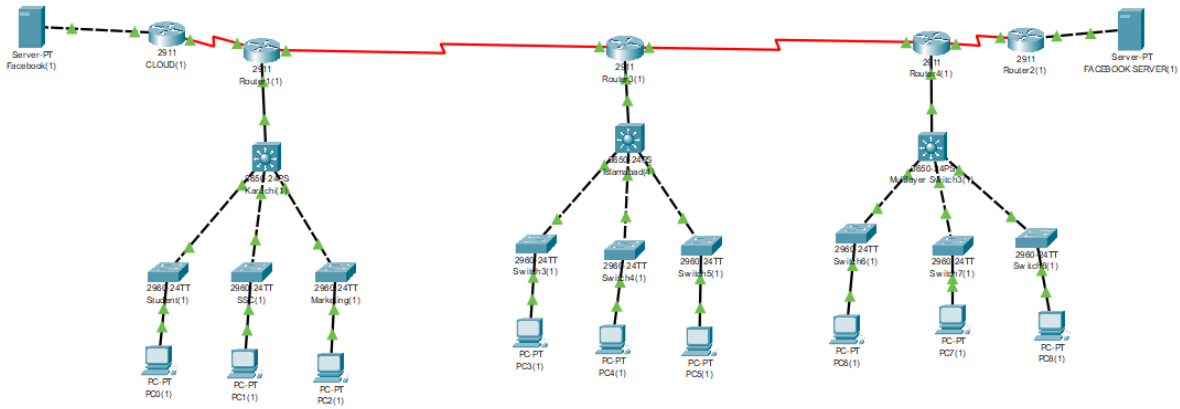
- Connectivity: The network provides reliable connectivity between the Karachi, Lahore, and Islamabad campuses, enabling seamless communication and data transfer.
- Departmental Isolation: The Student department is isolated from the SSC and Marketing departments, restricting communication between them. This ensures data privacy and prevents unauthorized access.
- Inter-departmental Communication: The SSC and Marketing departments can communicate with each other, promoting collaboration and coordination between these departments.
- IP Address Management: The IP address server efficiently assigns IP addresses to every PC in the network, eliminating manual configuration and ensuring optimal resource utilization.
- Facebook Server Access: The SSC and Marketing departments have access to the Facebook server for internal communication and collaboration purposes. The Student department is restricted from accessing the Facebook server.

c) Conclusion:

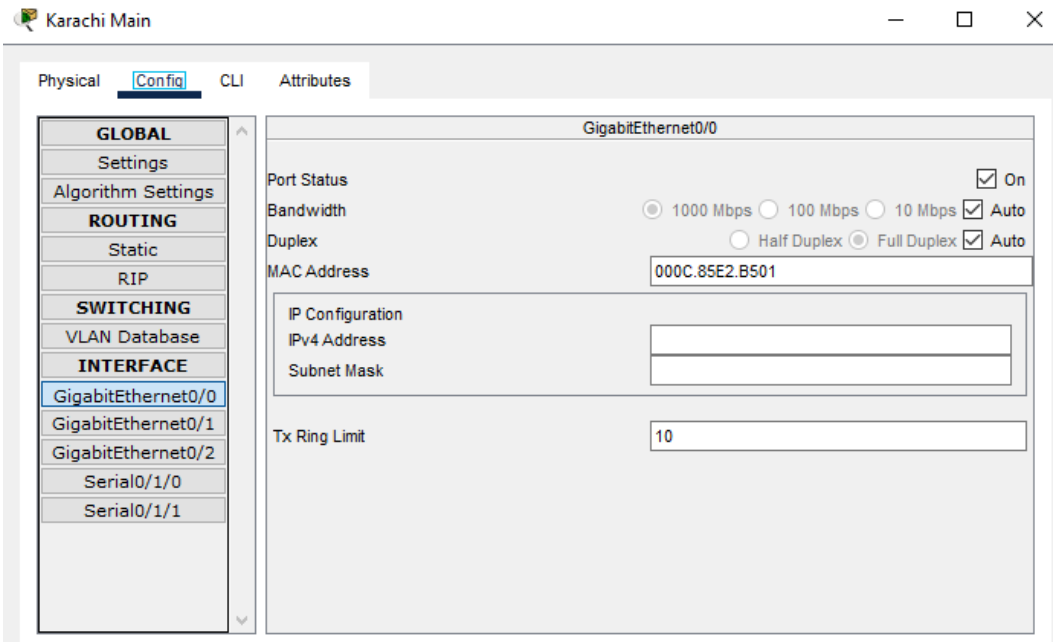
In conclusion, the INT UNI's data networking and communication project successfully establishes an efficient network infrastructure connecting the Karachi, Lahore, and Islamabad campuses. The network design incorporates routers, multi-layer switches, VLANs, and servers to facilitate secure and isolated communication among different departments. The project fulfills the requirements outlined and demonstrates the practical implementation of networking concepts in a real-world scenario.

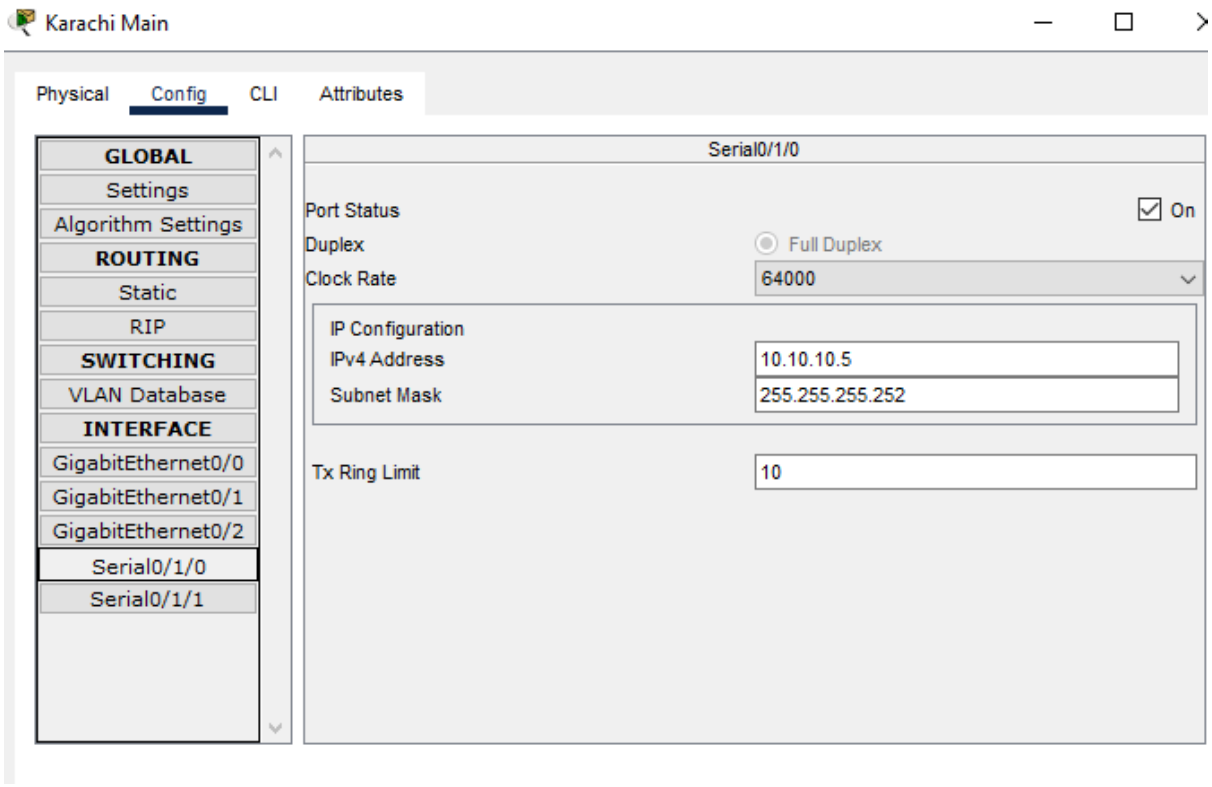
d) Screenshots:

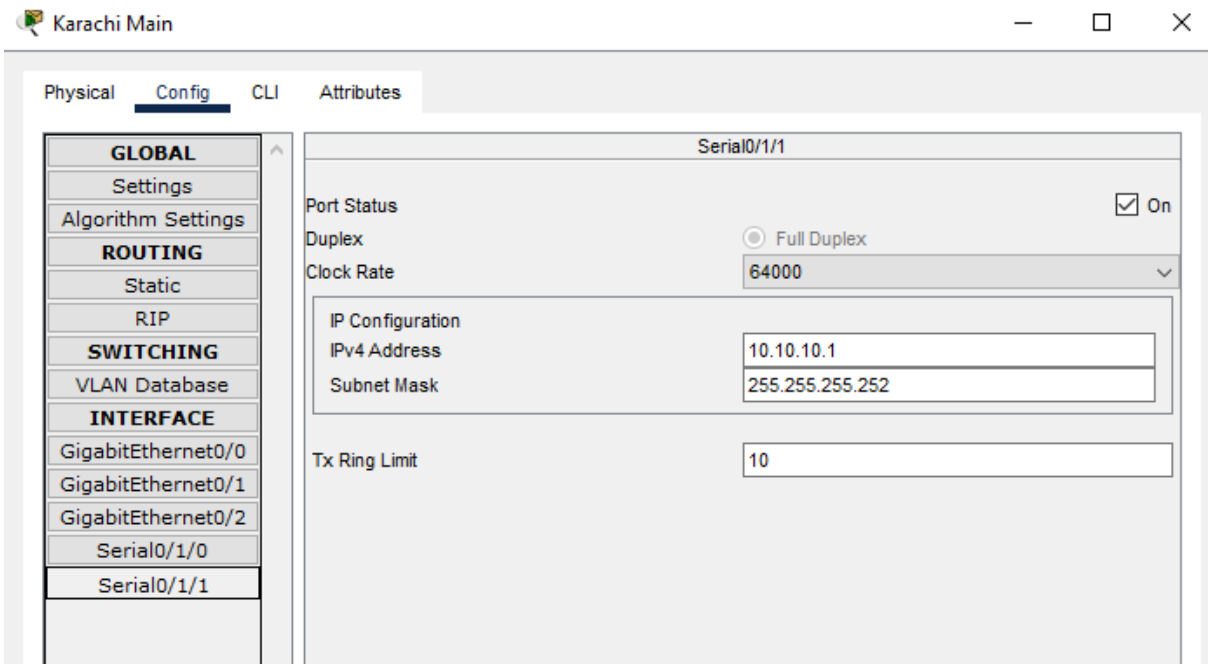
Main Interface:



Karachi Main Router:




Karachi Main
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
GigabitEthernet0/0
GigabitEthernet0/1
GigabitEthernet0/2
Serial0/1/0
Serial0/1/1
Serial0/1/0
Port Status
On
Duplex
Full Duplex
Clock Rate
64000
IP Configuration
IPv4 Address
10.10.10.5
Subnet Mask
255.255.255.252
Tx Ring Limit
10


Karachi Main
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
GigabitEthernet0/0
GigabitEthernet0/1
GigabitEthernet0/2
Serial0/1/0
Serial0/1/1
Serial0/1/1
Port Status
On
Duplex
Full Duplex
Clock Rate
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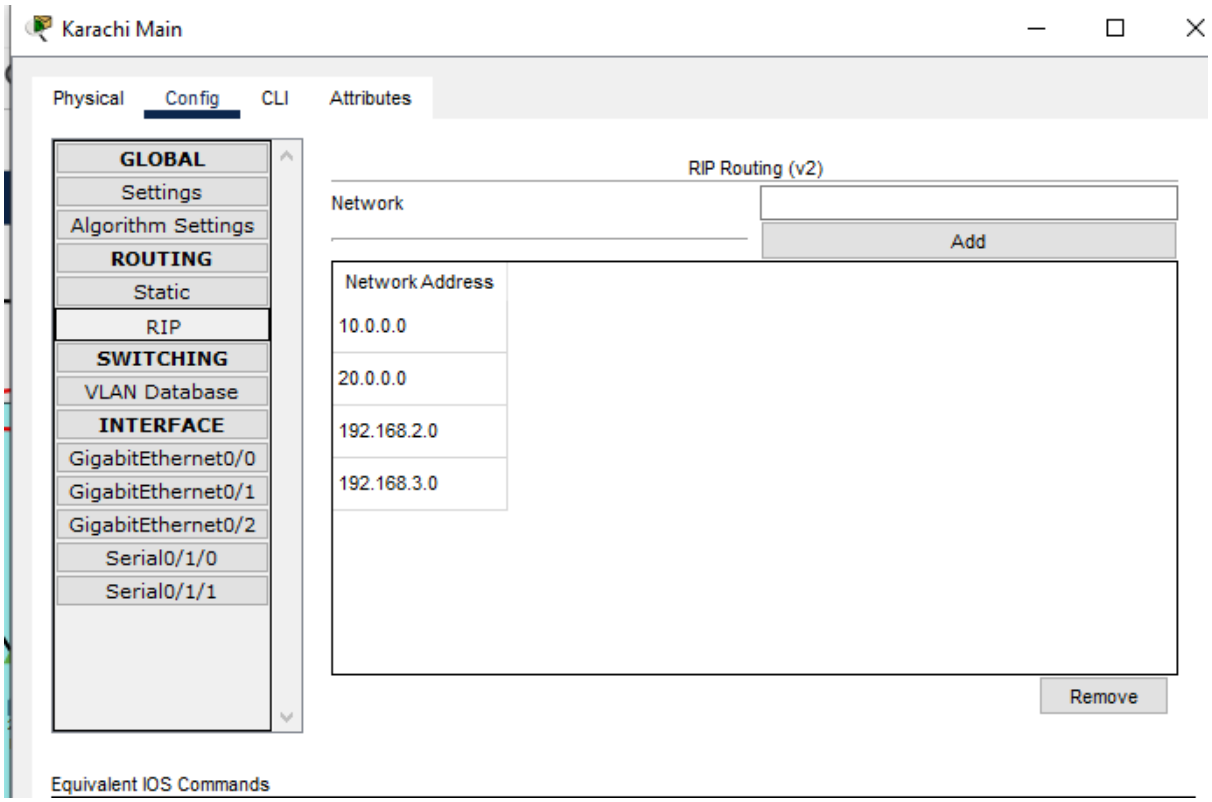
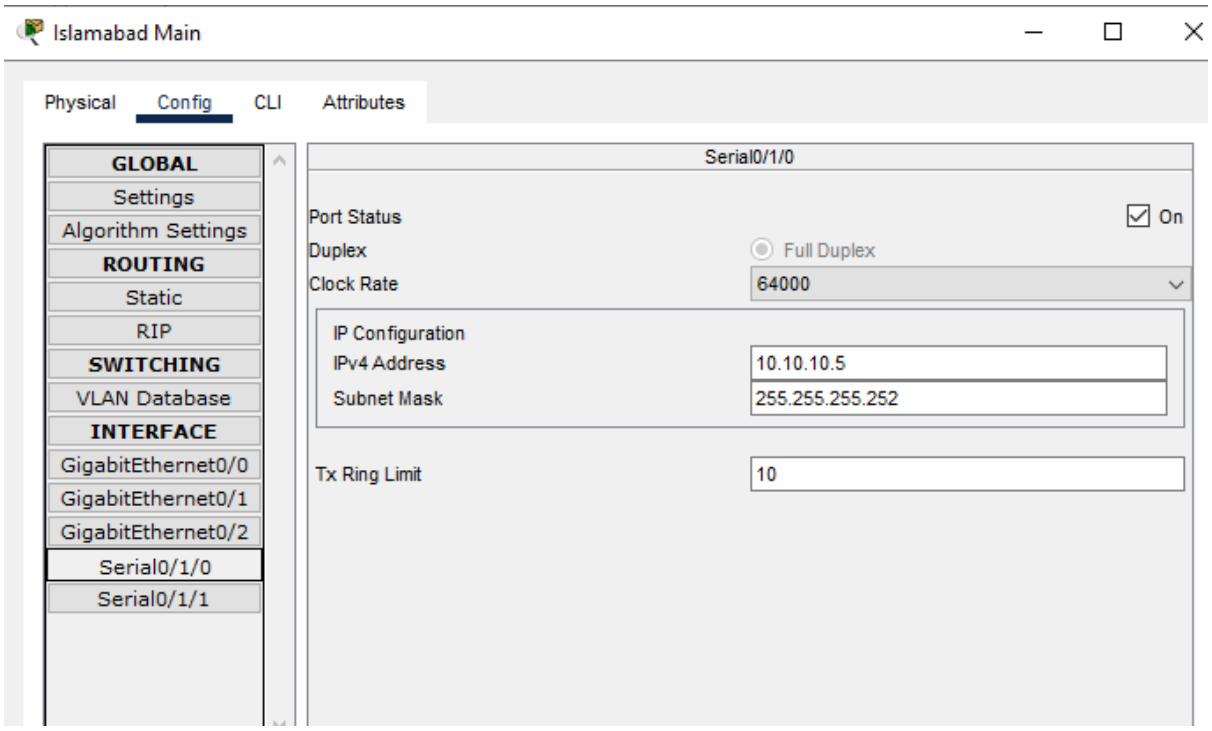
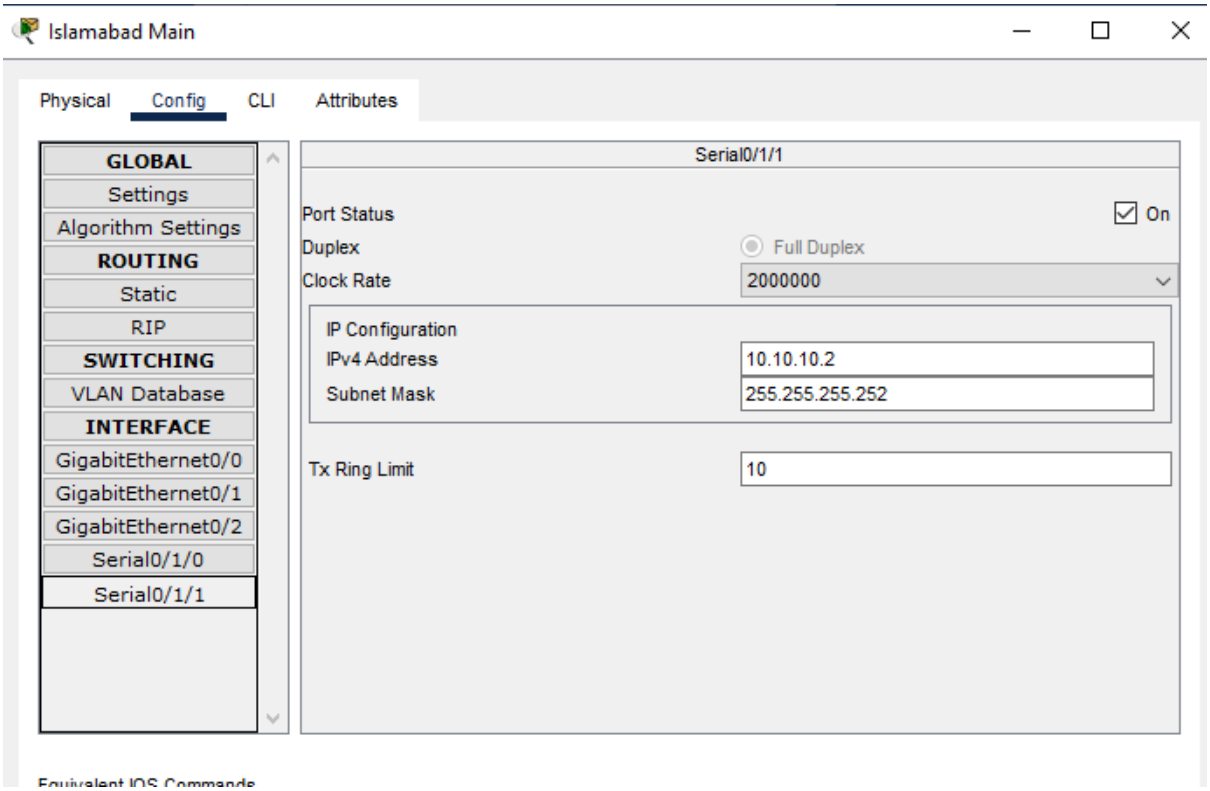
IP Configuration
IPv4 Address
10.10.10.1
Subnet Mask
255.255.255.252
Tx Ring Limit
10



Islamabad Main Router:




Islamabad Main
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
GigabitEthernet0/0
GigabitEthernet0/1
GigabitEthernet0/2
Serial0/1/0
Serial0/1/1
Serial0/1/1
Port Status
On
Duplex
Full Duplex
Clock Rate
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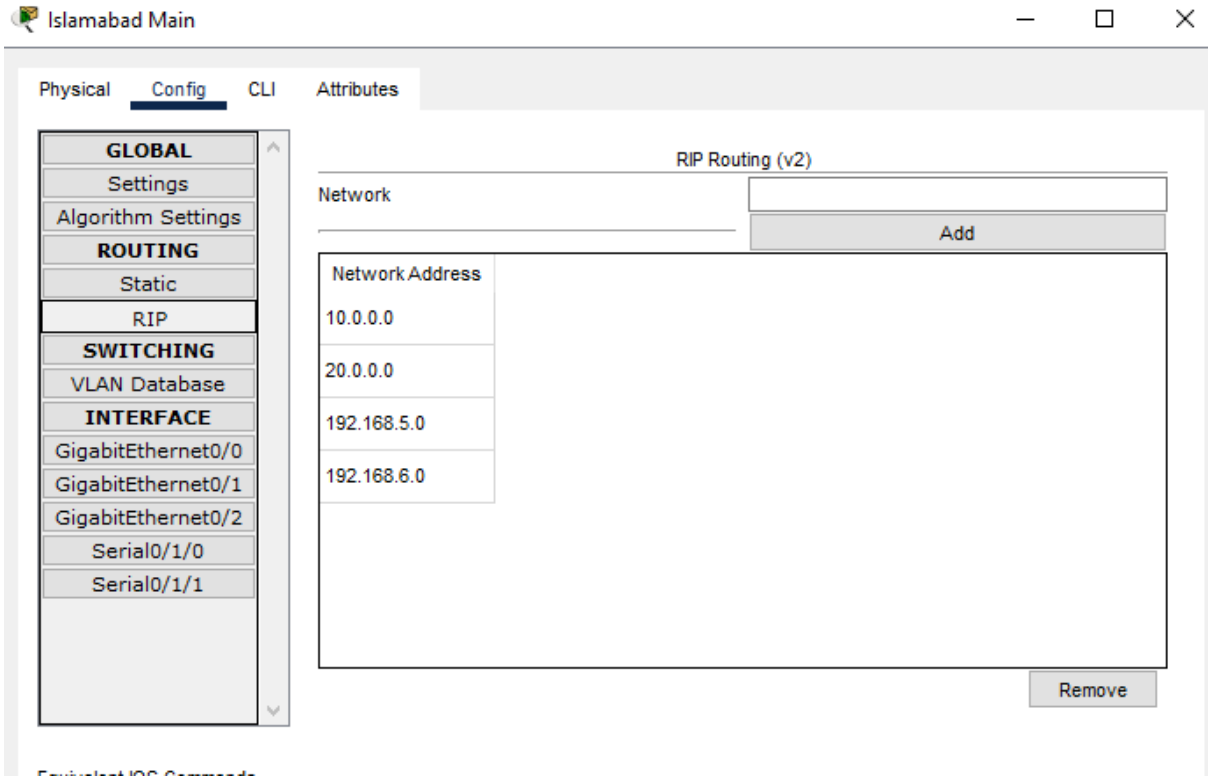
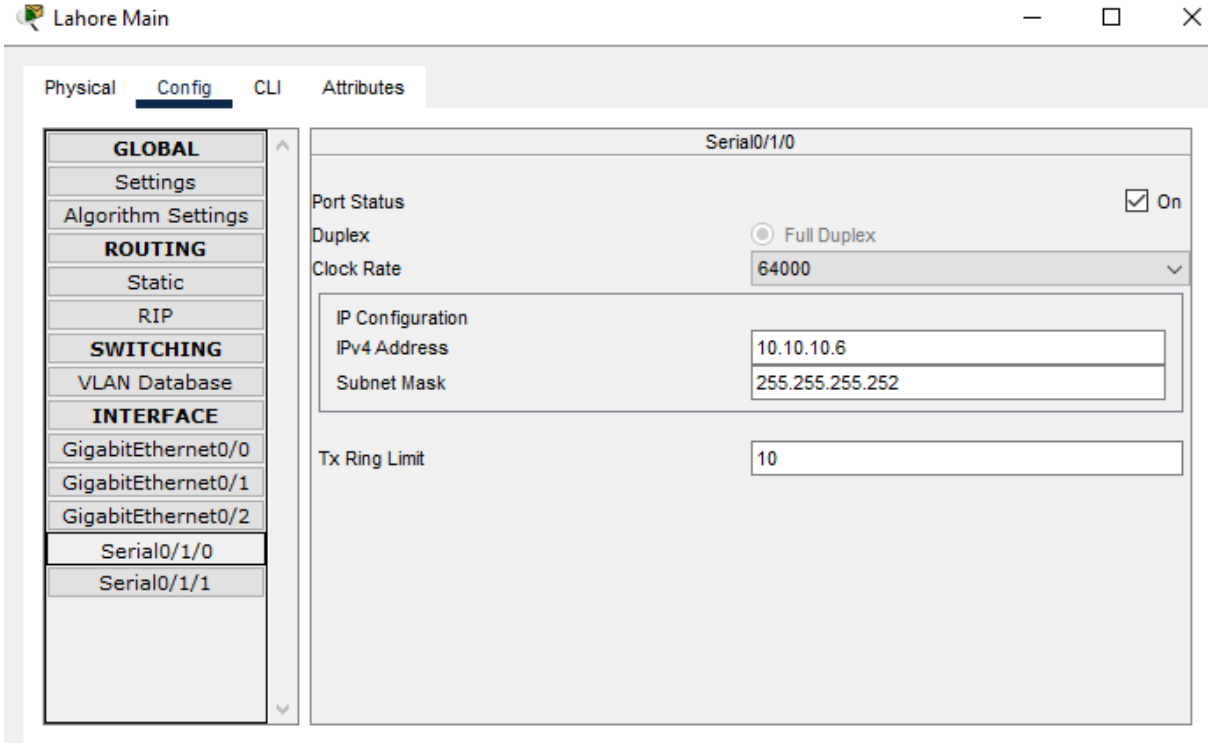
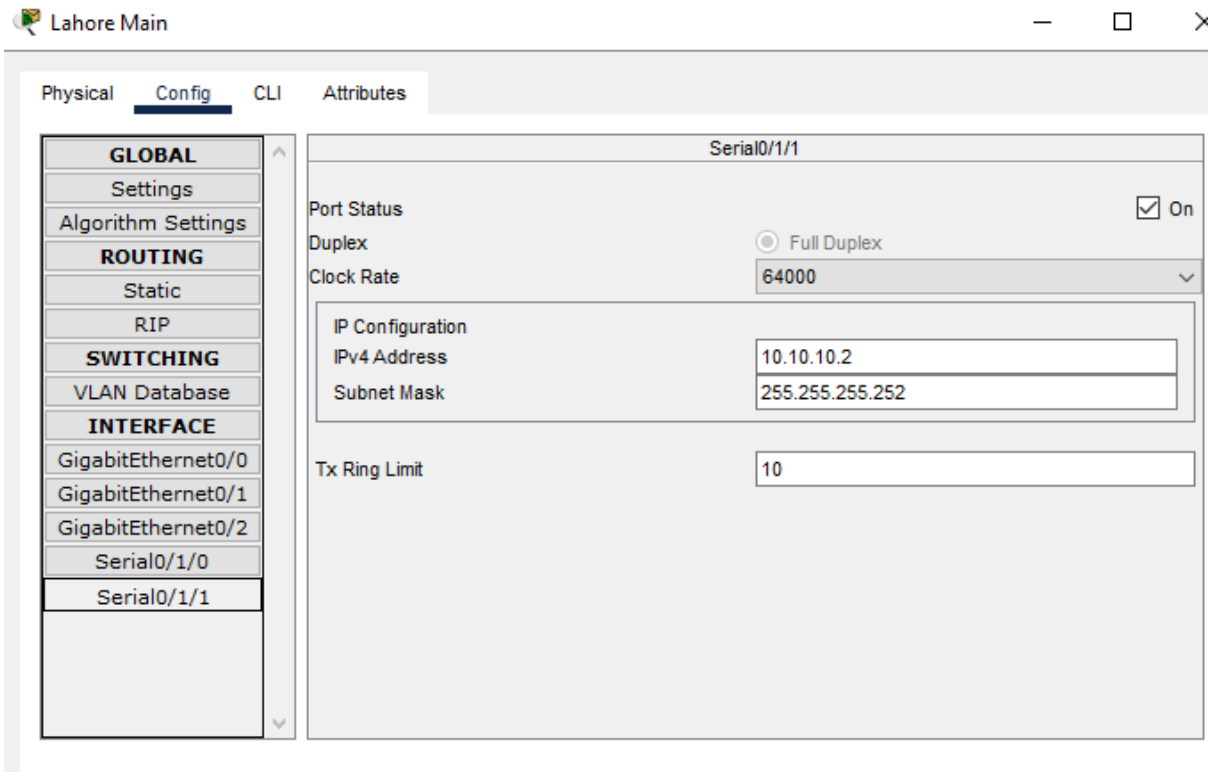
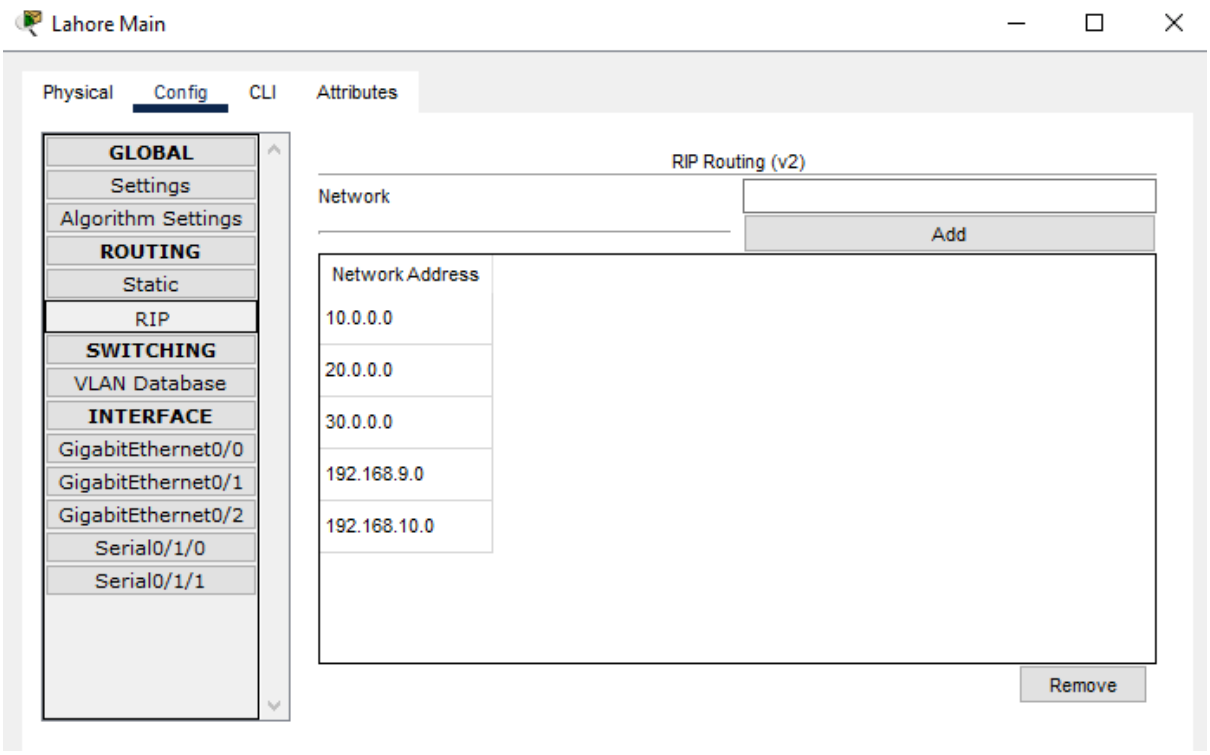
IP Configuration
IPv4 Address
10.10.10.2
Subnet Mask
255.255.255.252
Tx Ring Limit
10


Islamabad Main
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
GigabitEthernet0/0
GigabitEthernet0/1
GigabitEthernet0/2
Serial0/1/0
Serial0/1/1
RIP Routing (v2)
Network
Add
Network Address
10.0.0.0
20.0.0.0
192.168.5.0
192.168.6.0
Remove

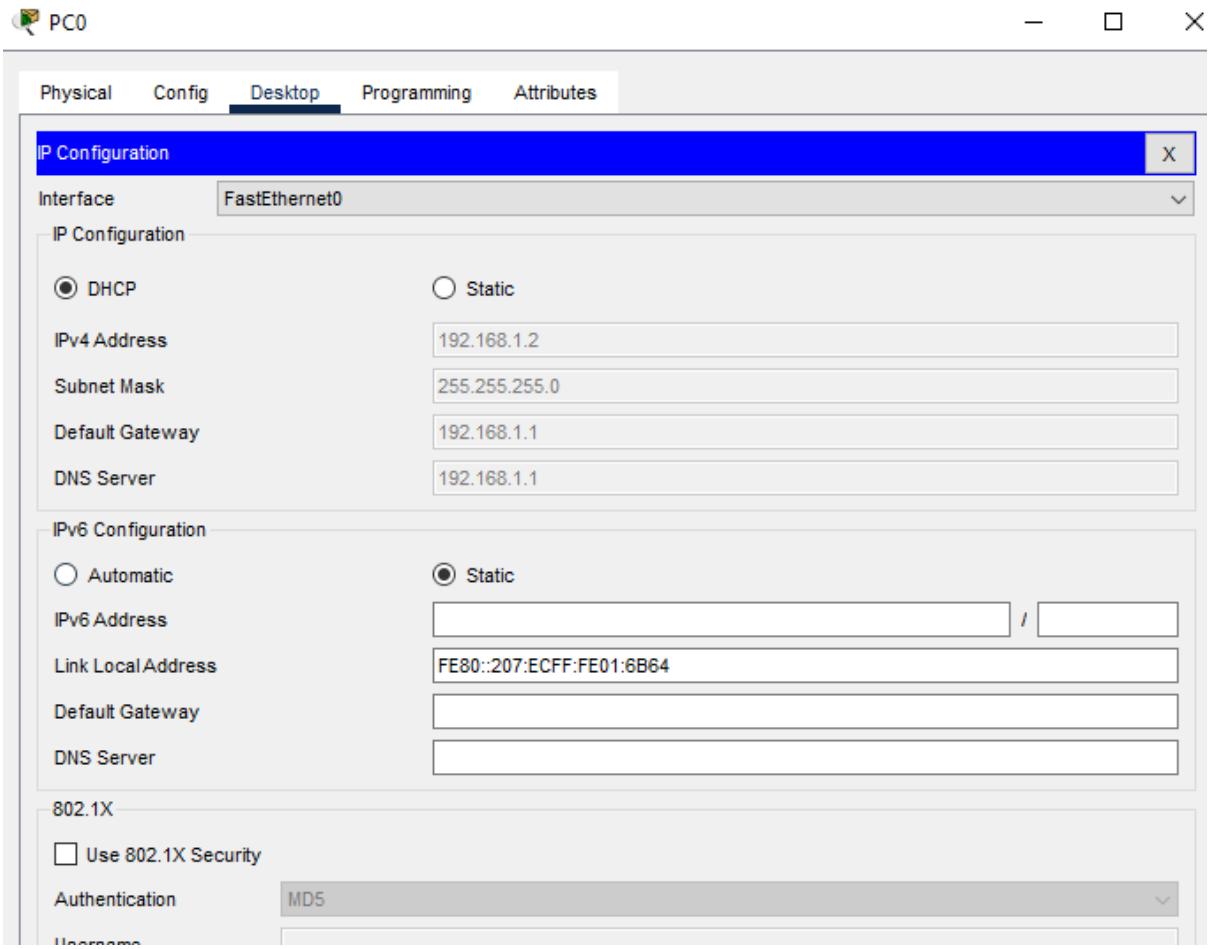
Lahore Main Router:

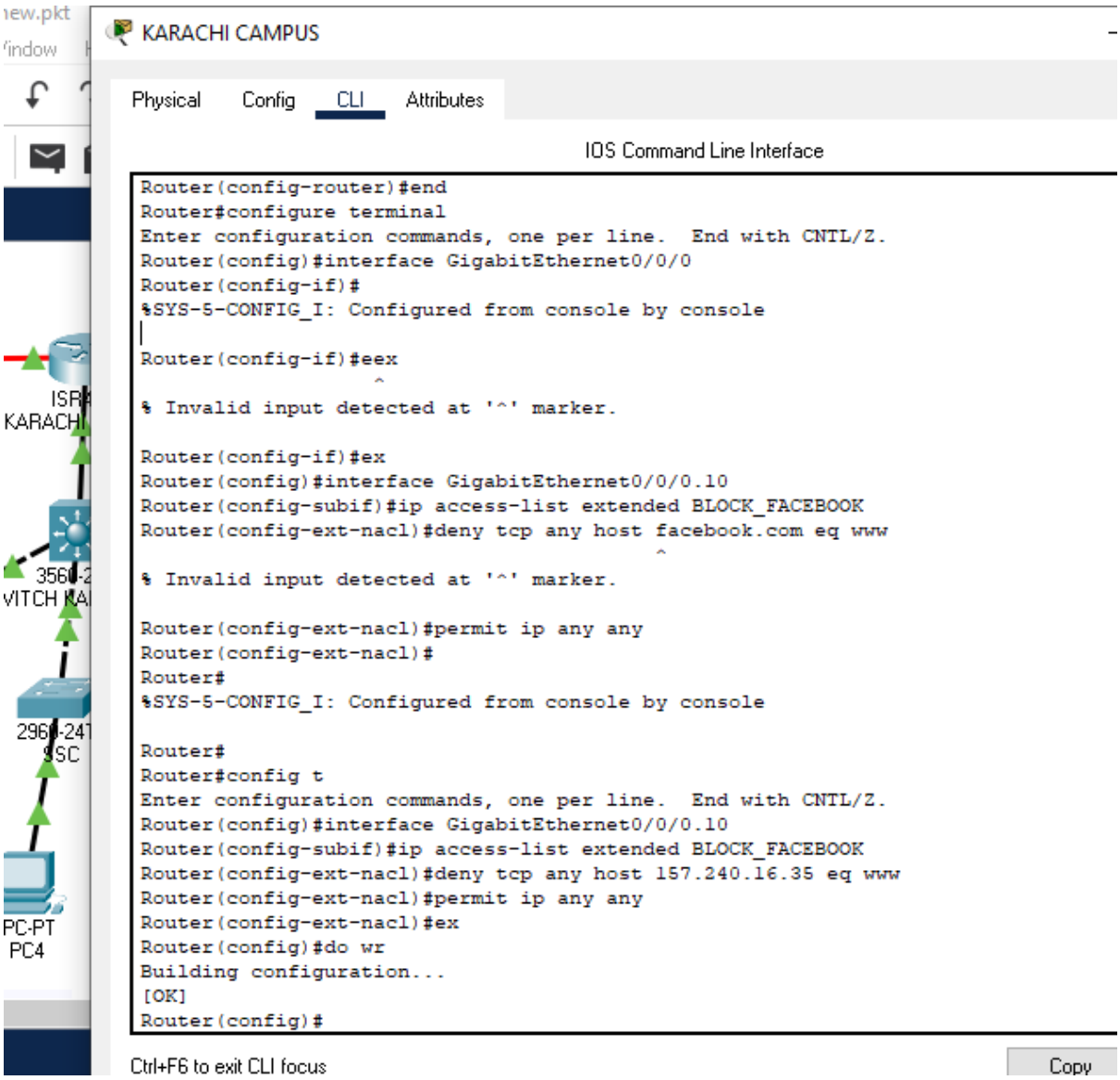




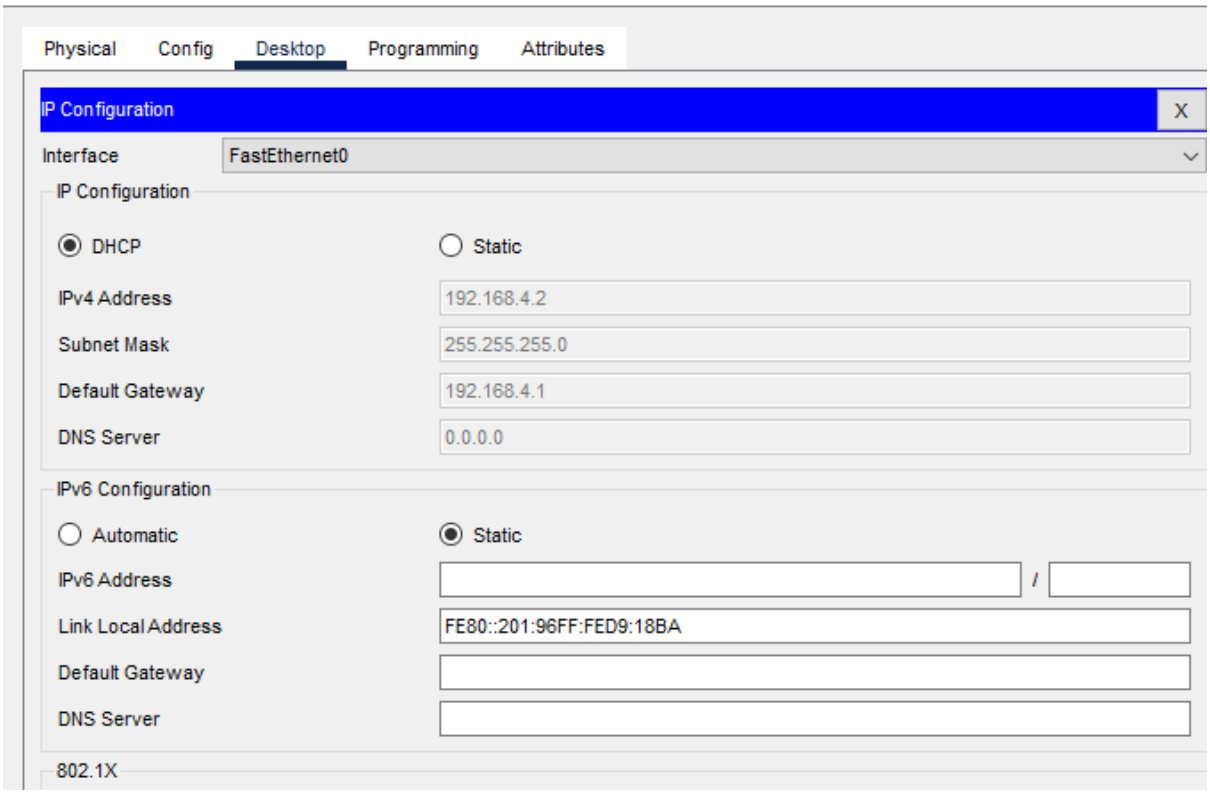


Karachi Student's PC:

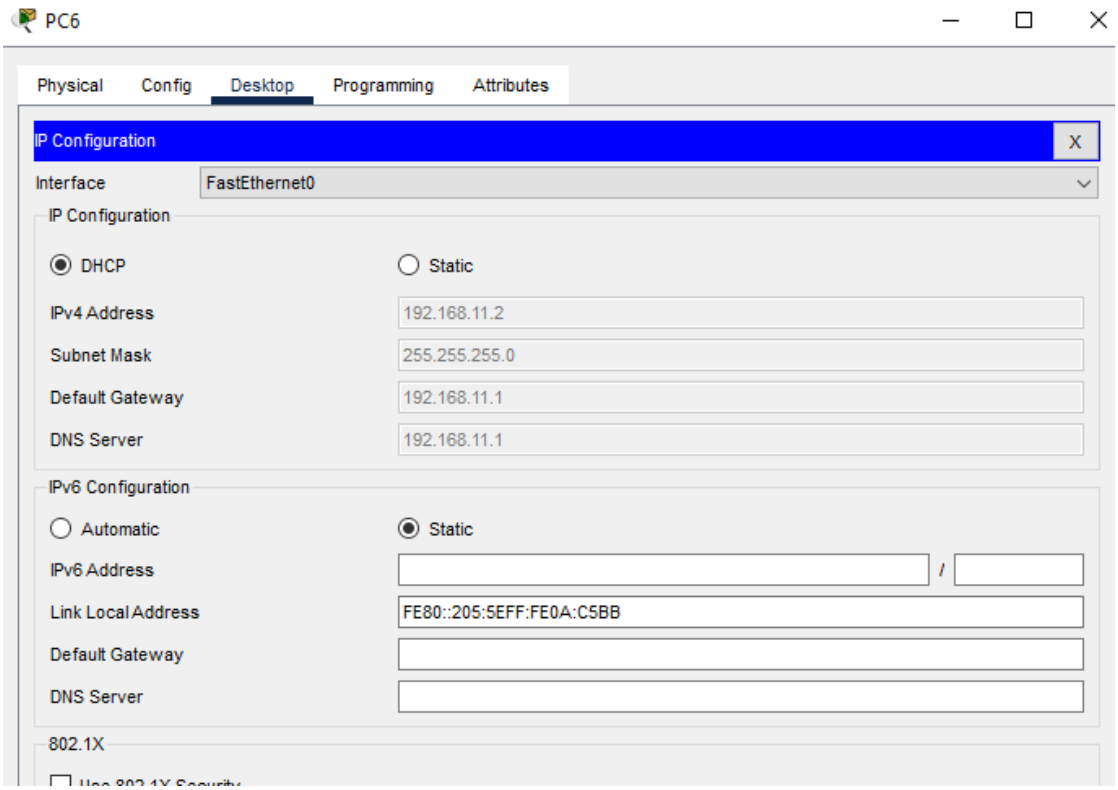

PC0
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
192.168.1.2
Subnet Mask
255.255.255.0
Default Gateway
192.168.1.1
DNS Server
192.168.1.1
IPv6 Configuration
Automatic
Static
IPv6 Address
/
Link Local Address
FE80::207:ECFF:FE01:6B64
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5



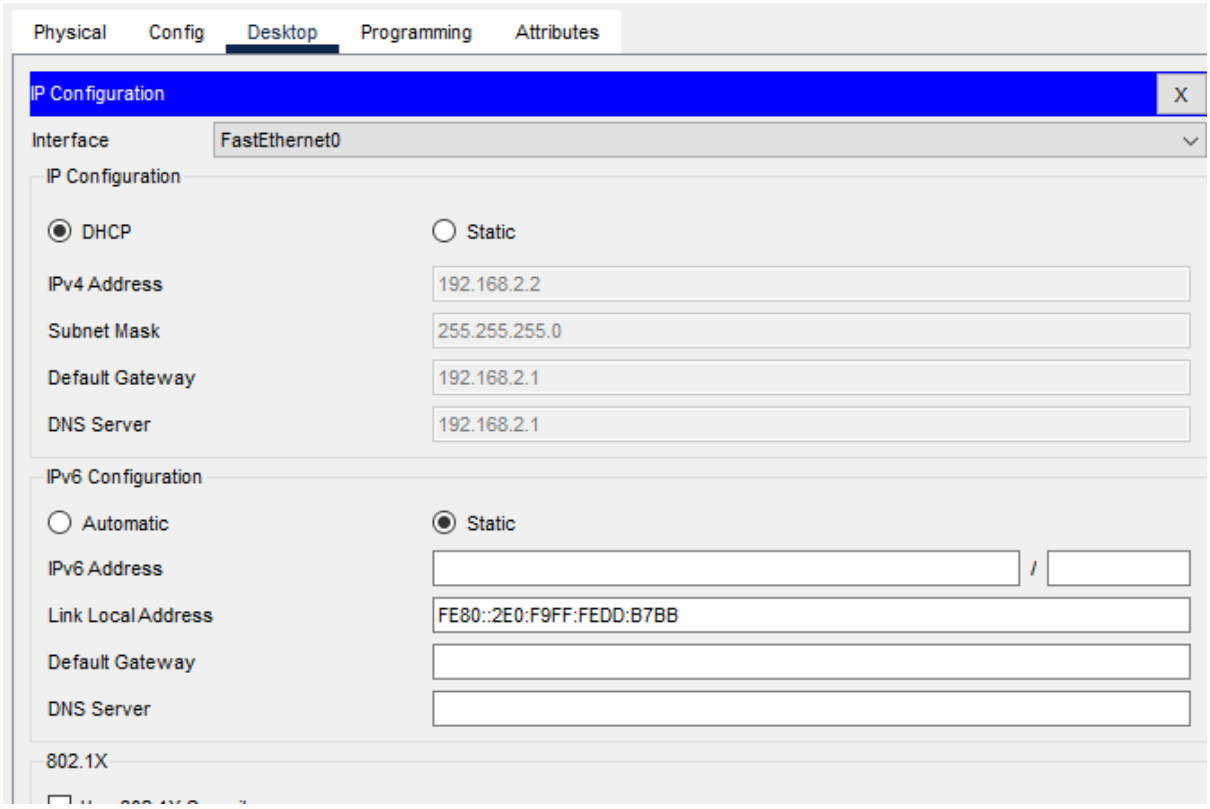
Islamabad Student's PC:



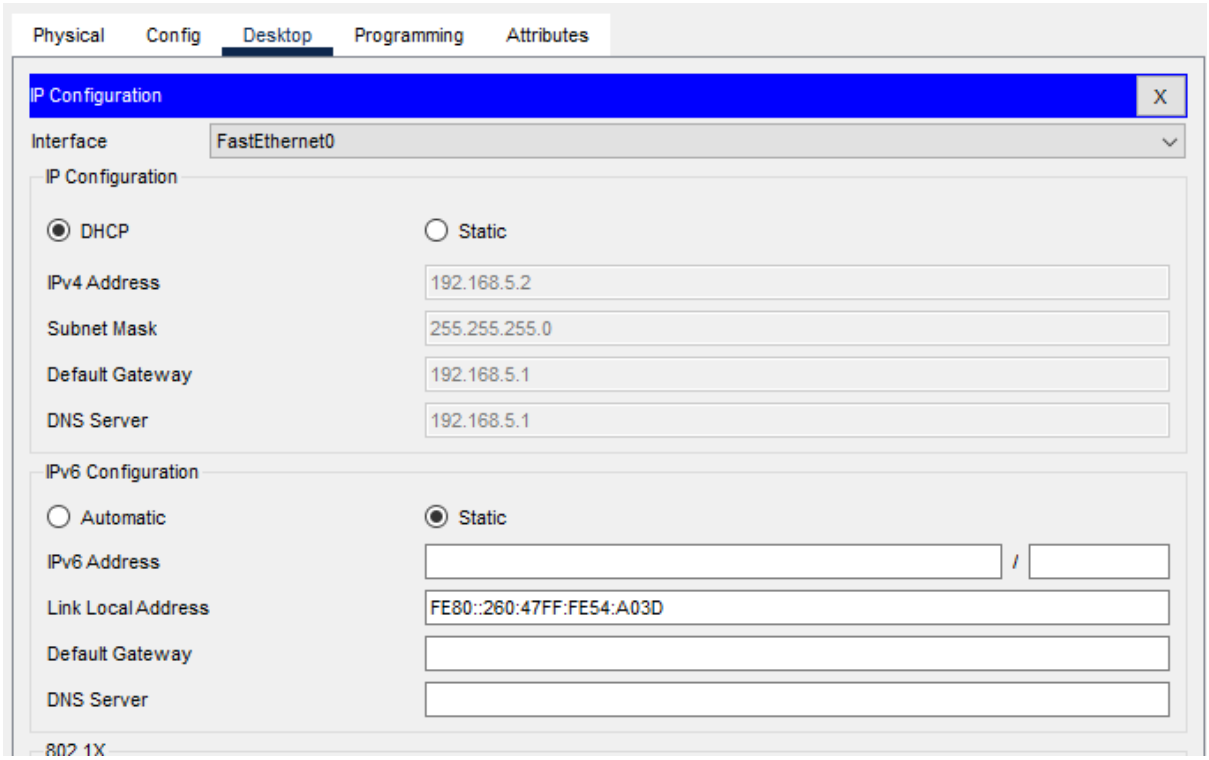
Lahore Student's PC:



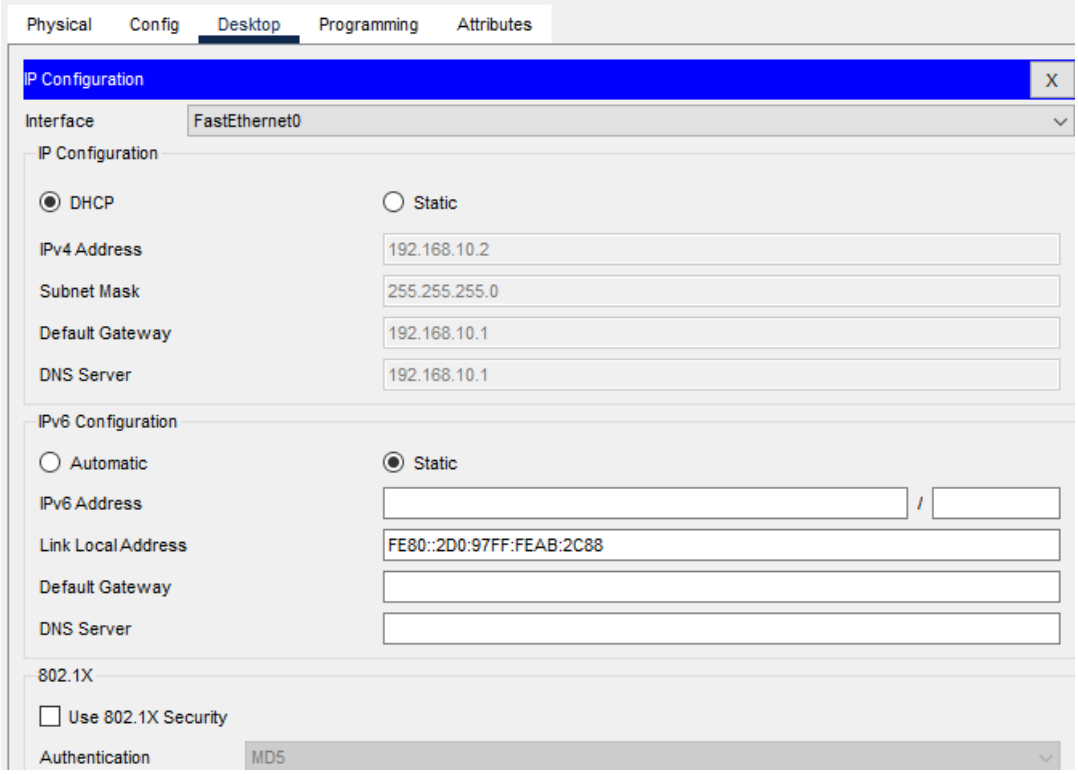
Karachi SSC PC:



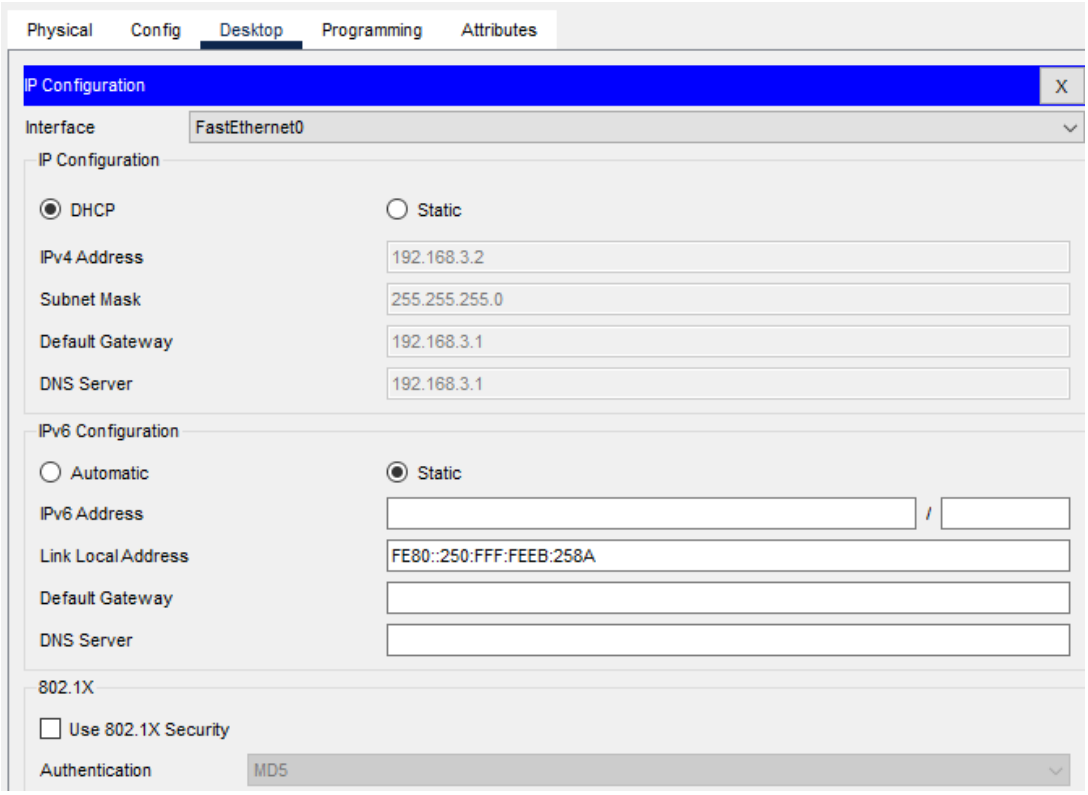
Islamabad SSC PC:



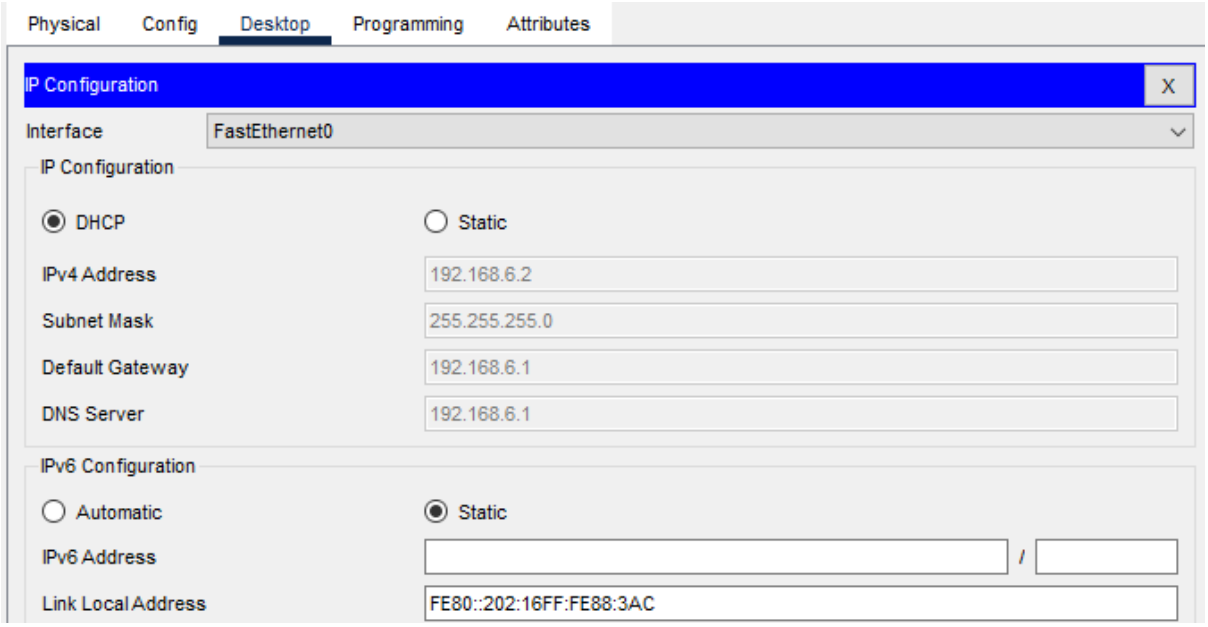
Lahore SSC PC:



Karachi Marketing PC:



Islamabad Marketing PC:



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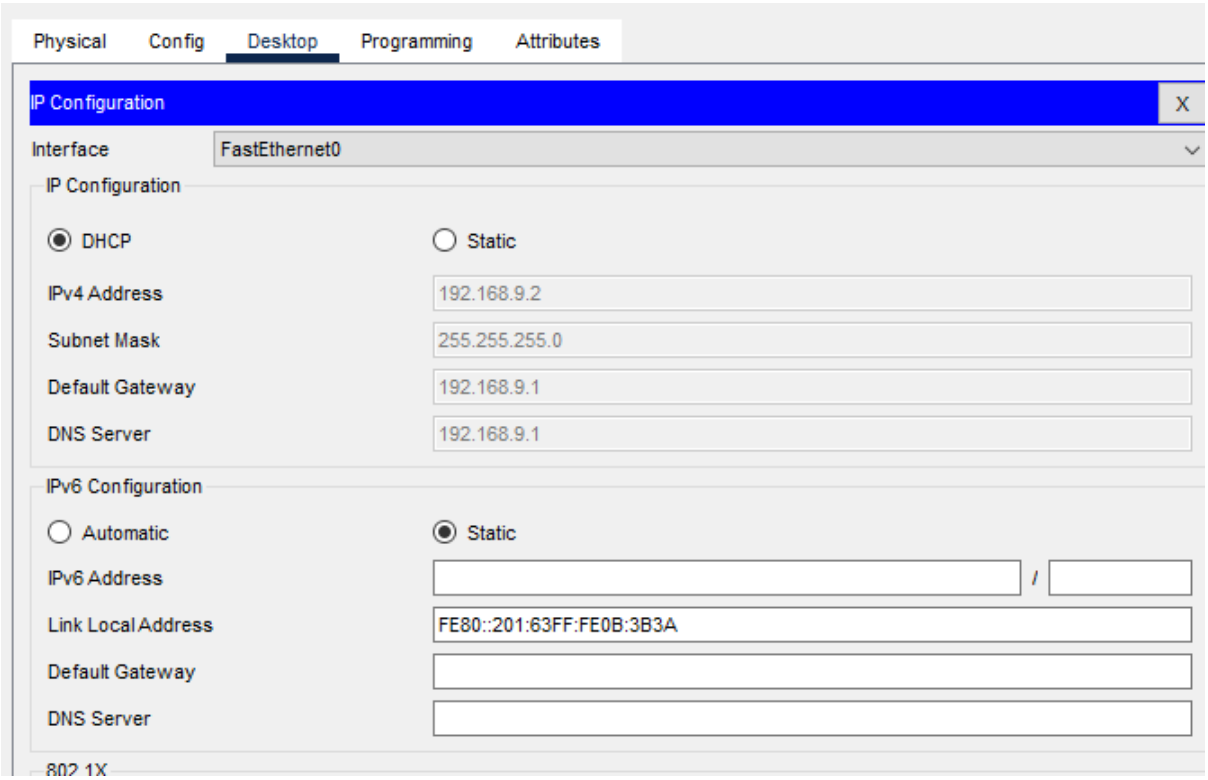

SSC and Marketing departments can communicate to each other but Student department can't communicate to any other departments.

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num
	Successful	PC2	PC5	ICMP		0.000	N	0
	Successful	PC2	PC8	ICMP		0.000	N	1
	Successful	PC1	PC4	ICMP		0.000	N	2
	Successful	PC1	PC7	ICMP		0.000	N	3
	Failed	PC0	PC4	ICMP		0.000	N	4
	Failed	PC6	PC0	ICMP		0.000	N	5

Student can't access facebook: