Computer Networks Lab – Fall 2020

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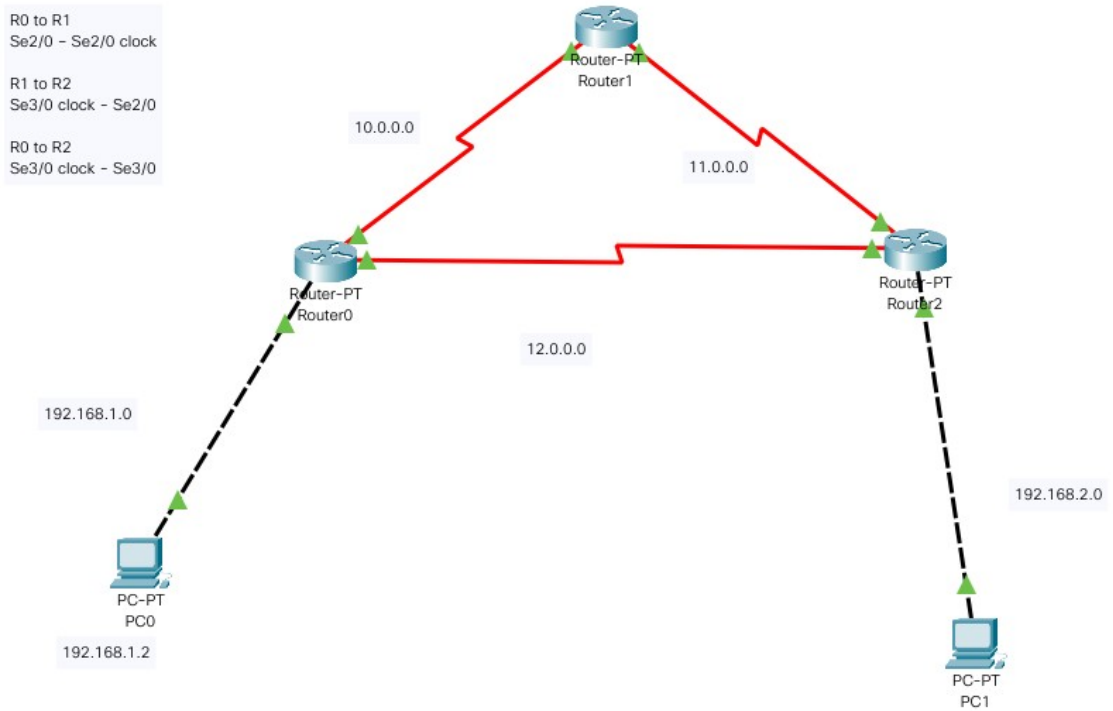
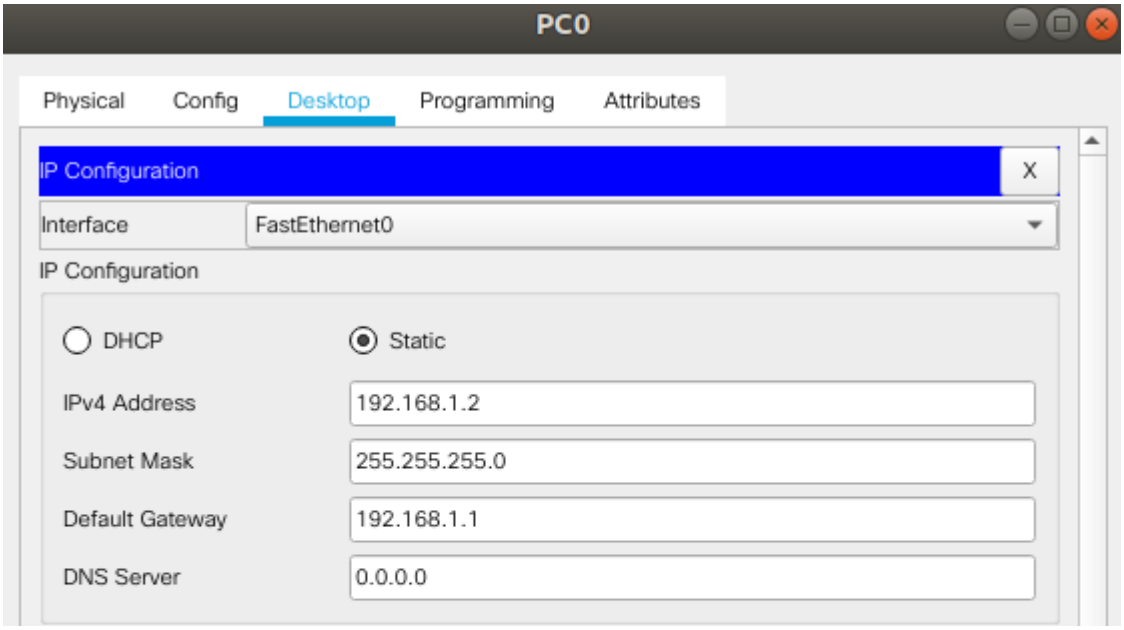
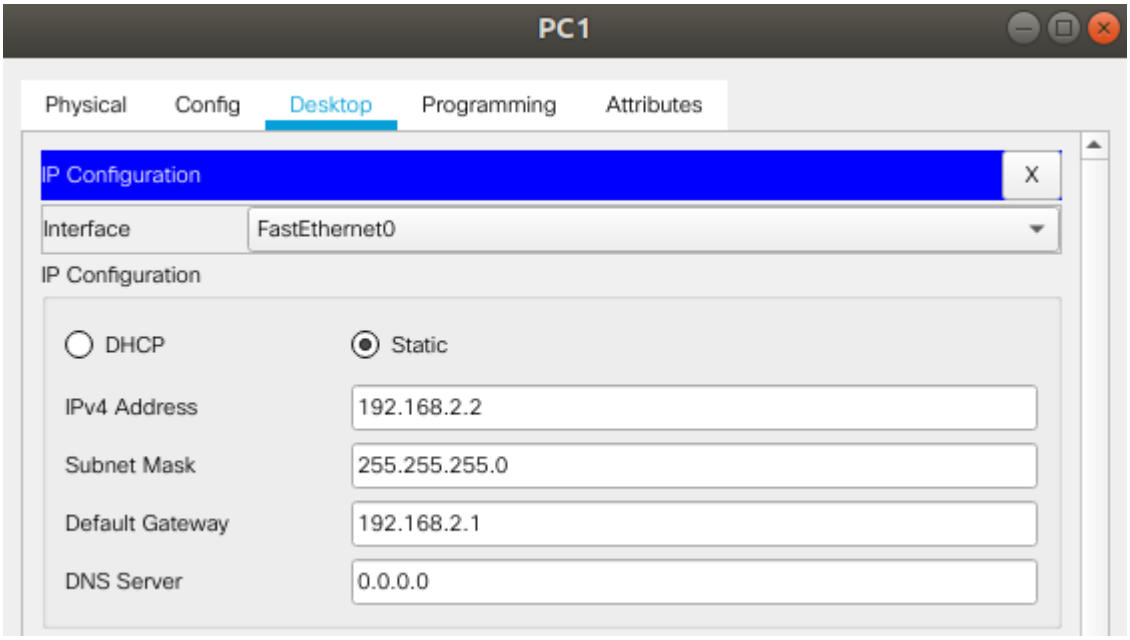
P18-0030
Section B

~ QUESTION 1

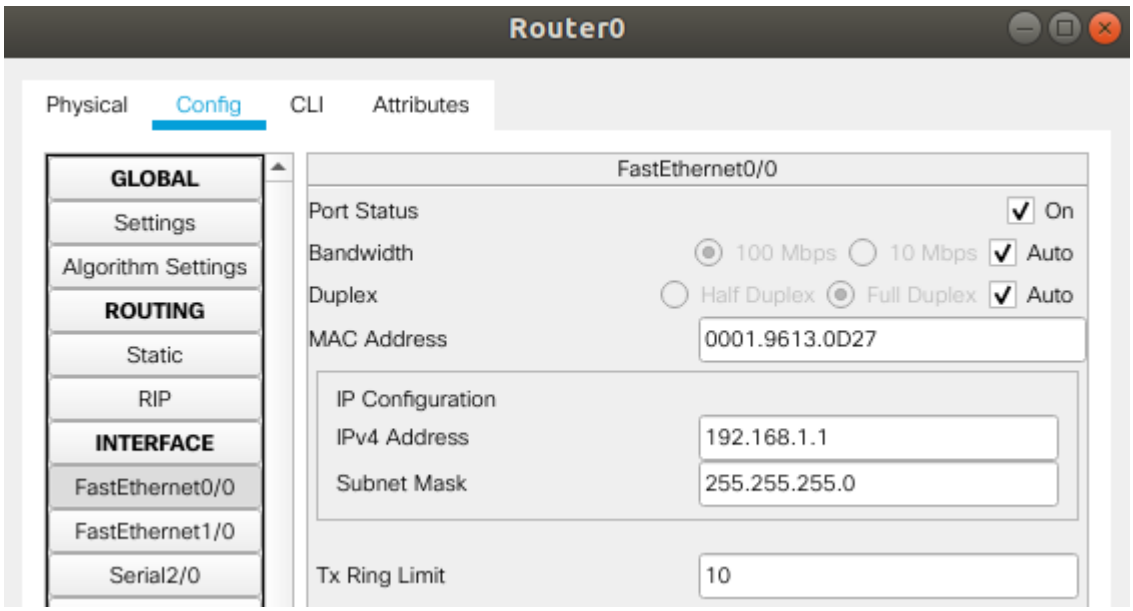
OSPF: Open Shortest Path First is an interior gateway routing protocol that is used to find the shortest path between routers on IP level. OSPF is used for providers in the internet structure. It uses link-state-advertisements to communicate about the state of routers. These advertisements contain information regarding subnet, router ID. Link-state database is maintained by every router in a network. One router updates its LSDB and circulates this info to its neighbors and so on.
First, the neighbors of routers are established and then communication takes place. Let's say there are two routers R1 and R2. R1 sends a Hello message to R2. They don't know each others' IP address. R2 checks requirements like Area ID, subnet, unique Router ID, authentication and sub Area flag. R2 goes in Init state. It sends Hello message to R1. After receiving it, R1 goes in 2-way state and sends a Hello message again – now R1 knows its neighbor and its address. Then R2 goes in 2-way state. Now the neighbors are set.
Now R1 and R2 want to exchange information. R1 has addresses 192.168.1.0 and 192.168.2.0 in its LSDB and R2 had 192.168.2.0 and 192.168.3.0 in its LSDB. R1 and R2 communicate with each other using address 192.168.2.0. R1 wants address 192.168.3.0 from R2 so R1 will send a Link-State Request (LSR) to R2 for 192.168.3.0. R2 will send back 192.168.3.0 as Link-State Update (LSU) as a response to R1. After receiving the information, R1 will send Link-State Acknowledgment (LSAck) to R2.

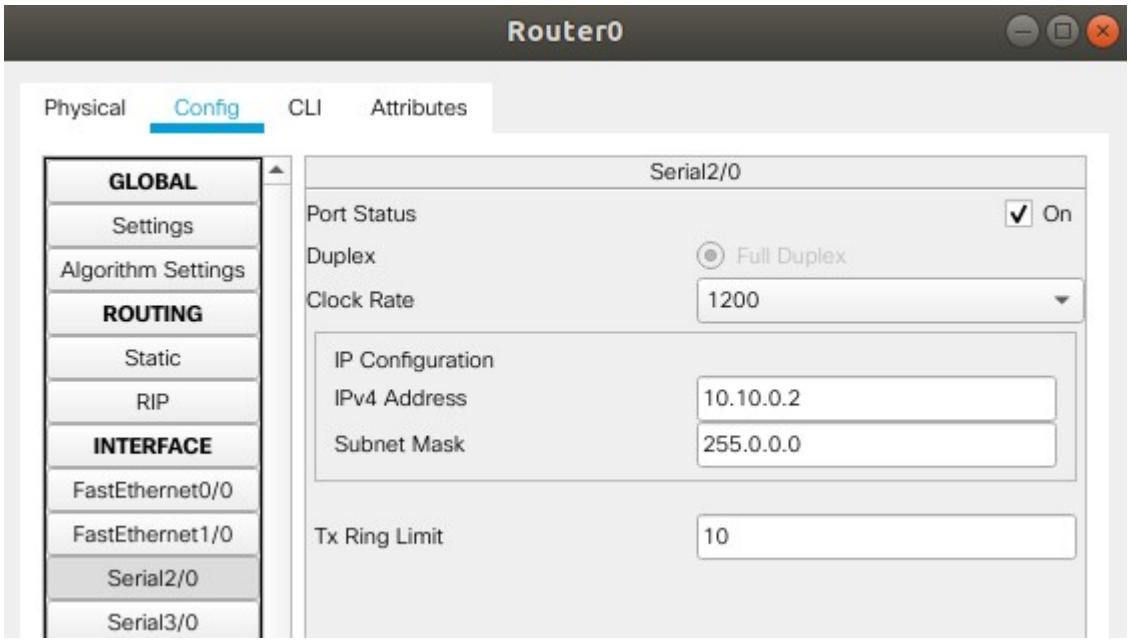


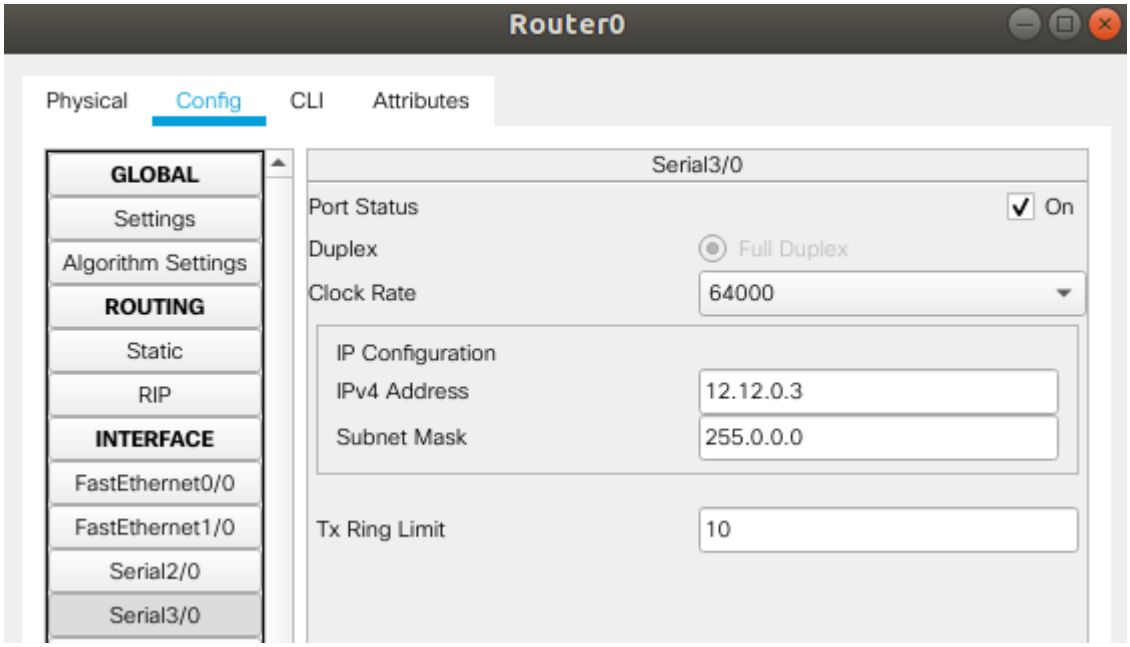

PC0
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
192.168.1.2
Subnet Mask
255.255.255.0
Default Gateway
192.168.1.1
DNS Server
0.0.0.0


PC1
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
192.168.2.2
Subnet Mask
255.255.255.0
Default Gateway
192.168.2.1
DNS Server
0.0.0.0

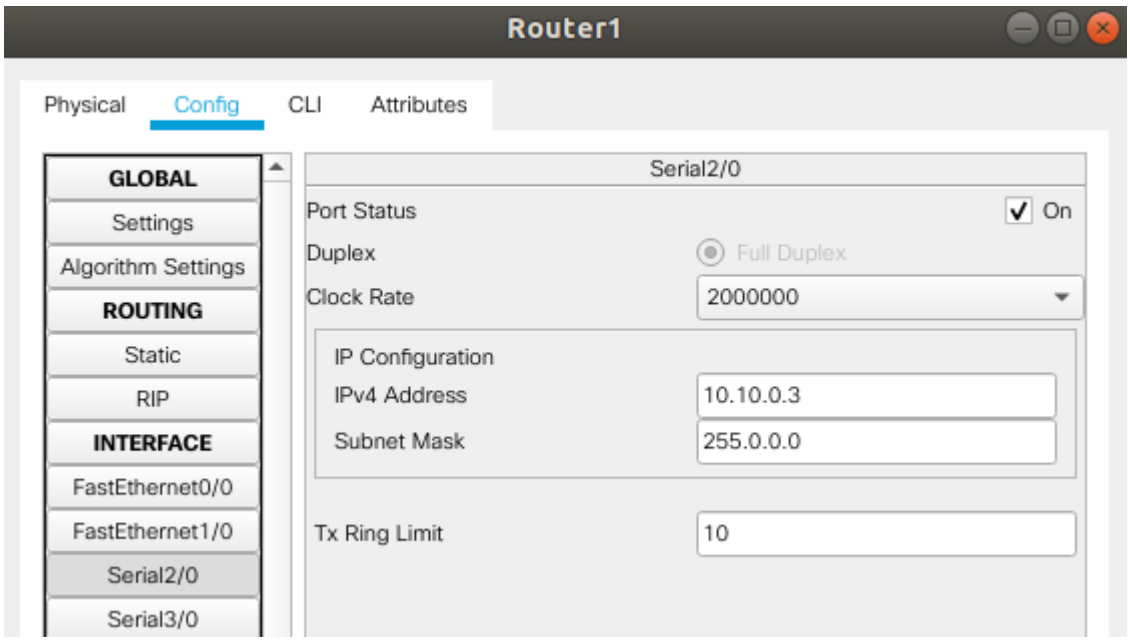
Router 0:

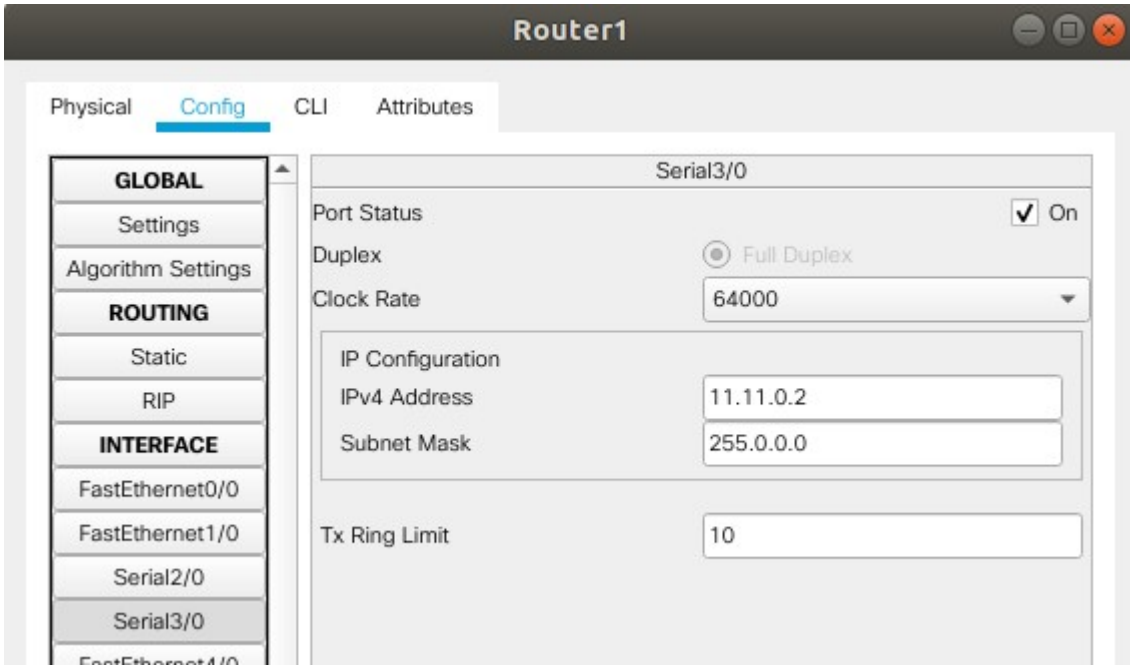

Router0
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
INTERFACE
FastEthernet0/0
FastEthernet1/0
Serial2/0
FastEthernet0/0
Port Status
On
Bandwidth
100 Mbps
10 Mbps
Auto
Duplex
Half Duplex
Full Duplex
Auto
MAC Address
0001.9613.0D27
IP Configuration
IPv4 Address
192.168.1.1
Subnet Mask
255.255.255.0
Tx Ring Limit
10


Router0
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
INTERFACE
FastEthernet0/0
FastEthernet1/0
Serial2/0
Serial3/0
Serial2/0
Port Status
On
Duplex
Full Duplex
Clock Rate
1200
IP Configuration
IPv4 Address
10.10.0.2
Subnet Mask
255.0.0.0
Tx Ring Limit
10

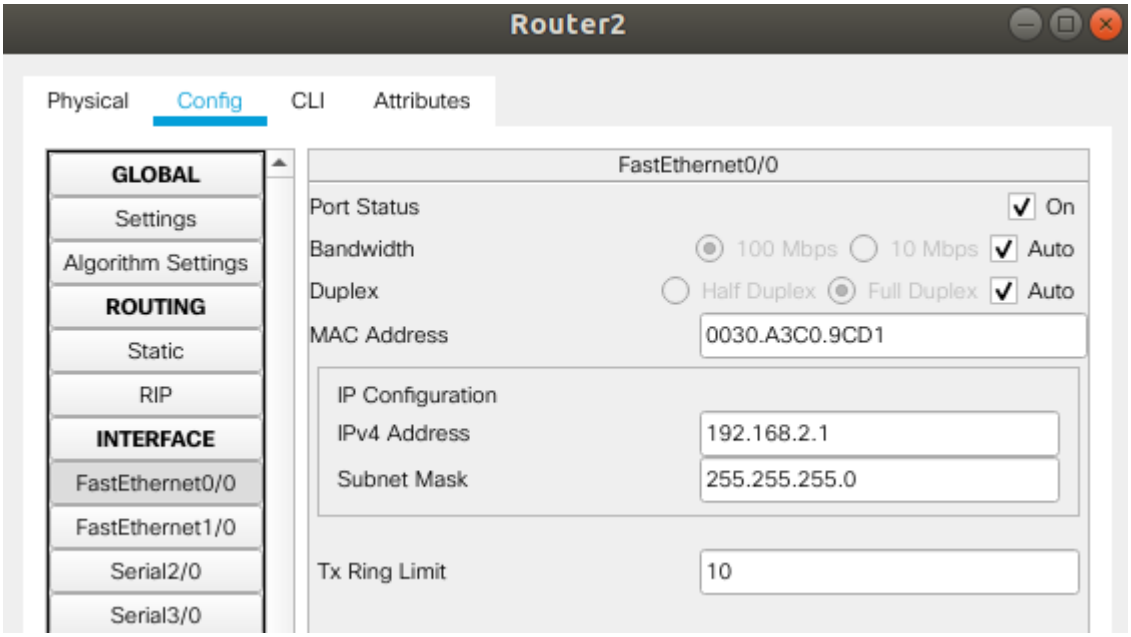

Router0
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
INTERFACE
FastEthernet0/0
FastEthernet1/0
Serial2/0
Serial3/0
Serial3/0
Port Status
On
Duplex
Full Duplex
Clock Rate
64000
IP Configuration
IPv4 Address
12.12.0.3
Subnet Mask
255.0.0.0
Tx Ring Limit
10

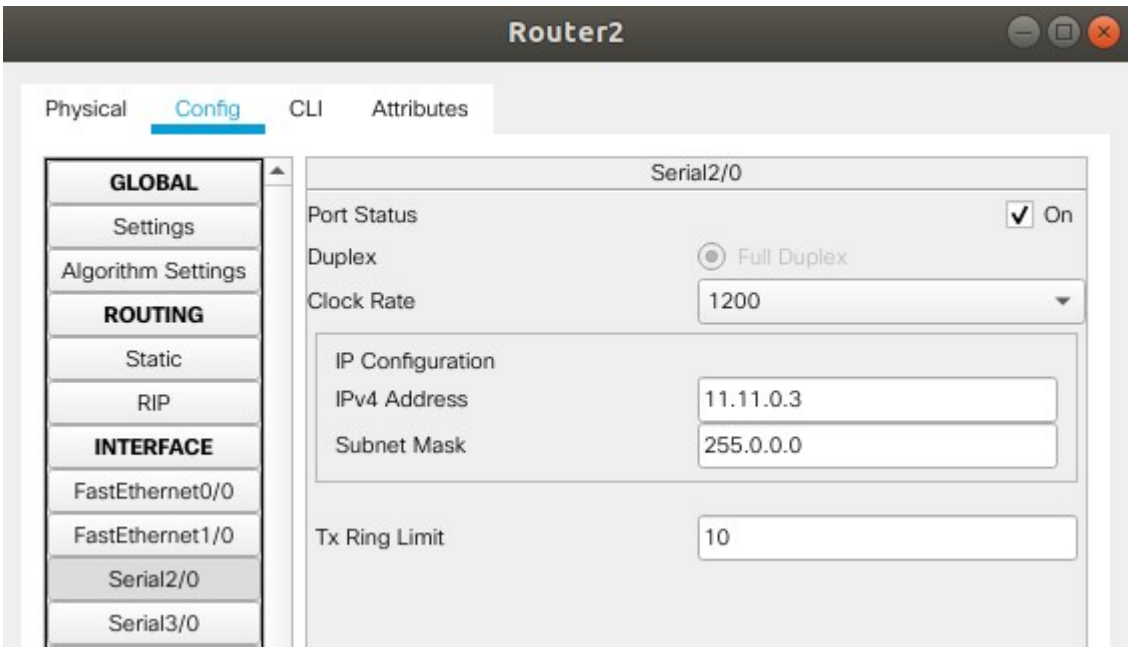
Router 1:

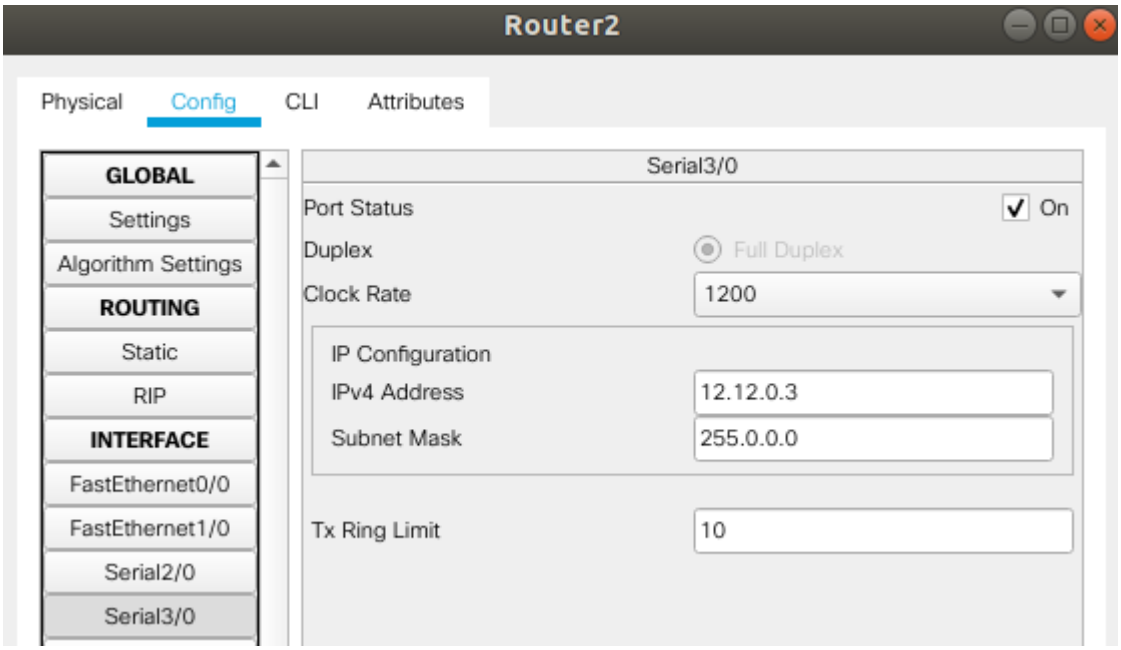

Router1
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
INTERFACE
FastEthernet0/0
FastEthernet1/0
Serial2/0
Serial3/0
Serial2/0
Port Status
On
Duplex
Full Duplex
Clock Rate
2000000
IP Configuration
IPv4 Address
10.10.0.3
Subnet Mask
255.0.0.0
Tx Ring Limit
10


Router1
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
INTERFACE
FastEthernet0/0
FastEthernet1/0
Serial2/0
Serial3/0
Serial3/0
Port Status
On
Duplex
Full Duplex
Clock Rate
64000
IP Configuration
IPv4 Address
11.11.0.2
Subnet Mask
255.0.0.0
Tx Ring Limit
10

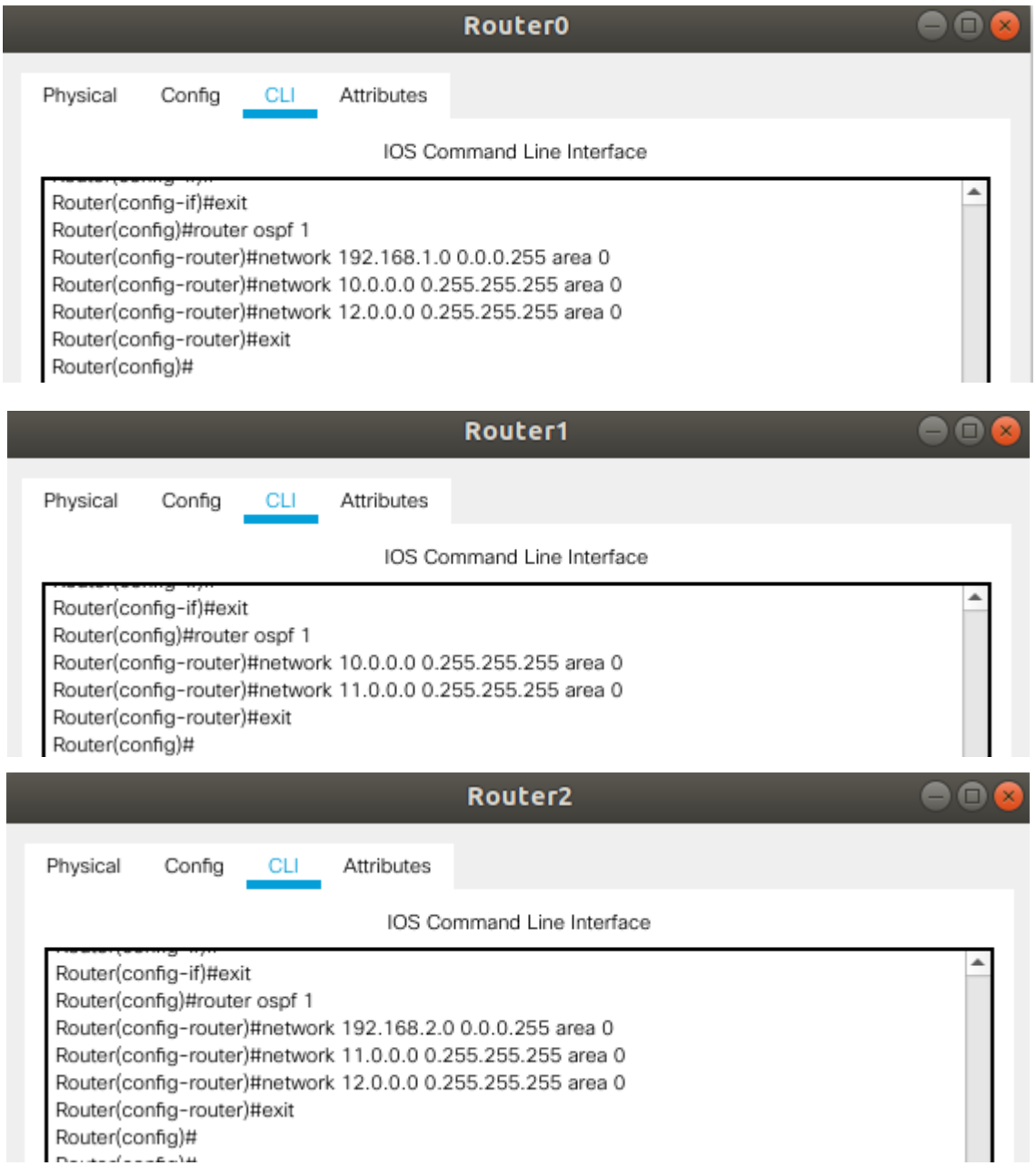
Router 2:


Router2
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
INTERFACE
FastEthernet0/0
FastEthernet1/0
Serial2/0
Serial3/0
FastEthernet0/0
Port Status
On
Bandwidth
100 Mbps
10 Mbps
Auto
Duplex
Half Duplex
Full Duplex
Auto
MAC Address
0030.A3C0.9CD1
IP Configuration
IPv4 Address
192.168.2.1
Subnet Mask
255.255.255.0
Tx Ring Limit
10

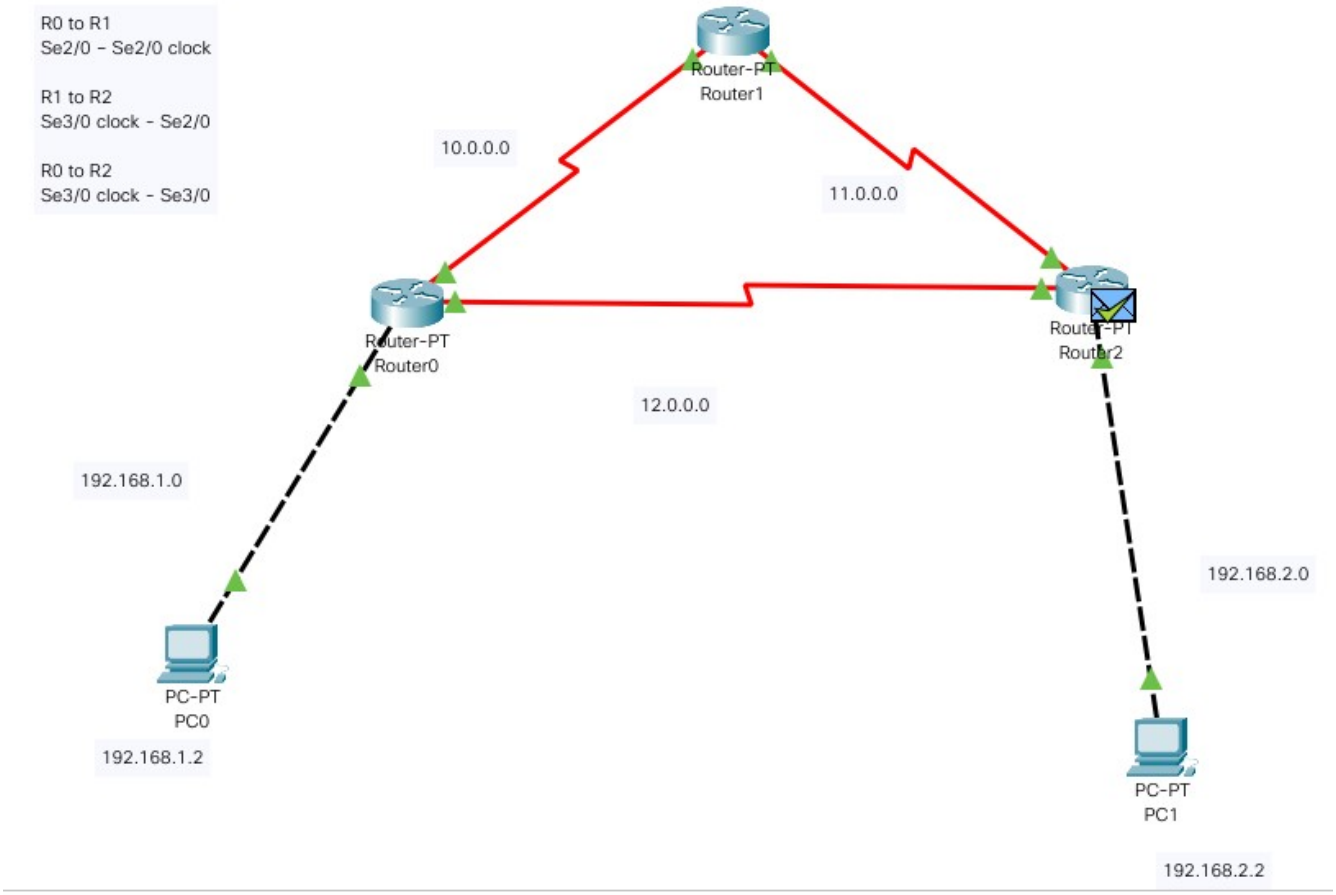




OSPF Configuration:



Successful OSPF configuration:

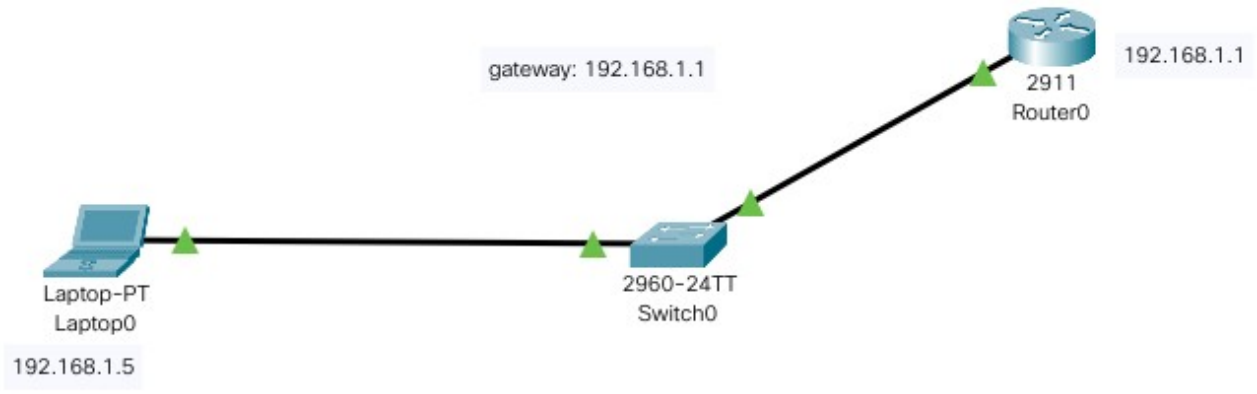


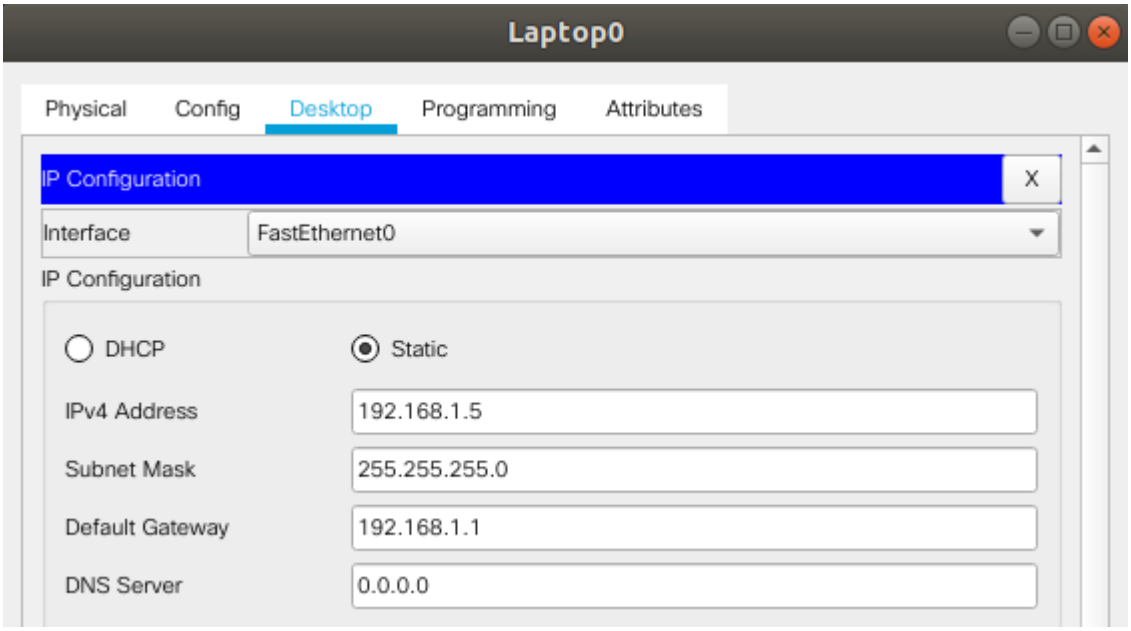
Window

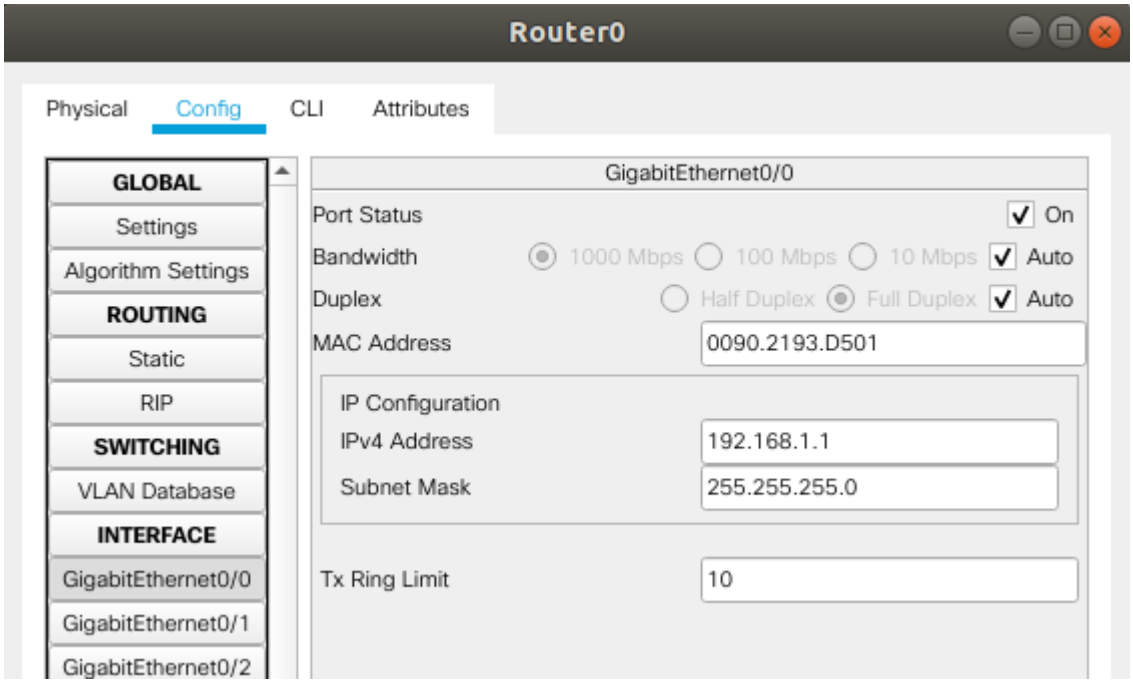
Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
Successful	PC0	Router1	ICMP		0.000	N	0	(edit)	
Successful	PC1	Router1	ICMP		9.992	N	1	(edit)	

TelNet:

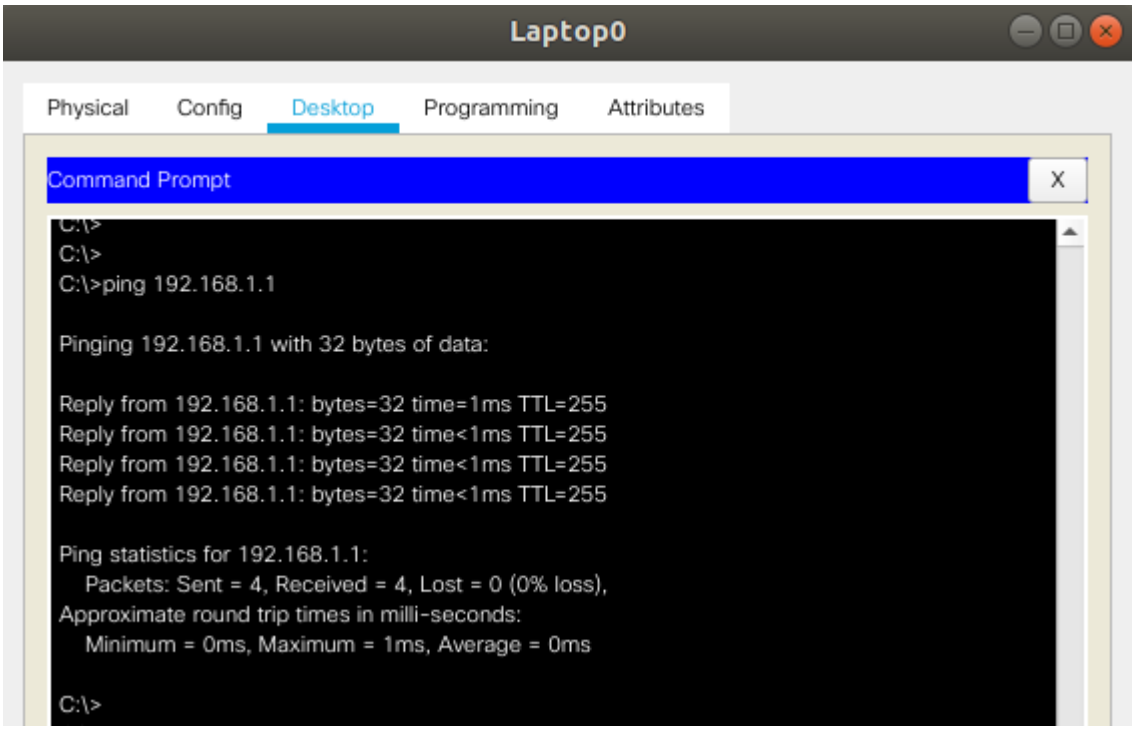
Telnet is a terminal emulator that is used to access files found on a remote computer via a command line interface. But it is not secure as the data being retrieved or transmitted is done in plain text which an attacker can easily access and exploit – for this issue there is SSH (secure shell). It provides a virtual terminal to the user with which it can access the remote files. But first user needs to login to the remote system or they can do it without having an account on the remote system. TelNet uses TCP protocol.


gateway: 192.168.1.1
2911
Router0
192.168.1.1
Laptop-PT
Laptop0
192.168.1.5
2960-24TT
Switch0

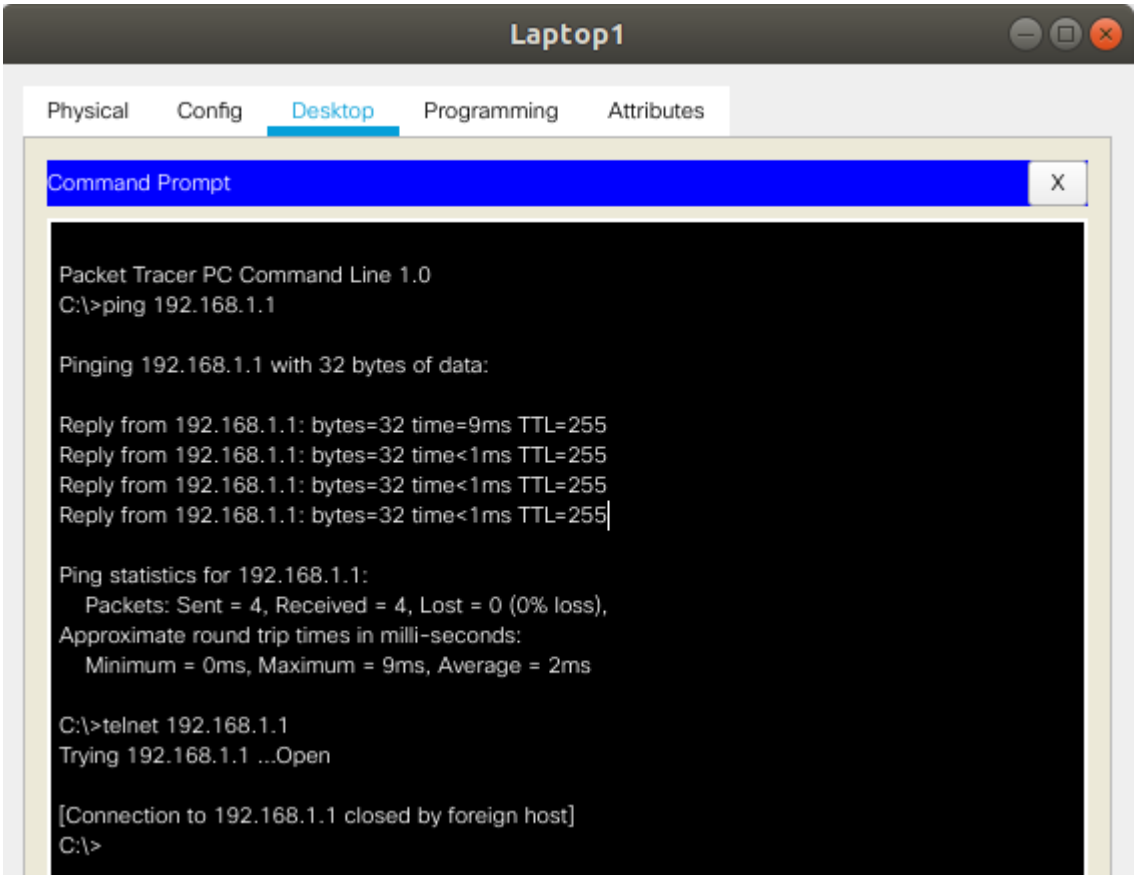

Laptop0
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
192.168.1.5
Subnet Mask
255.255.255.0
Default Gateway
192.168.1.1
DNS Server
0.0.0.0



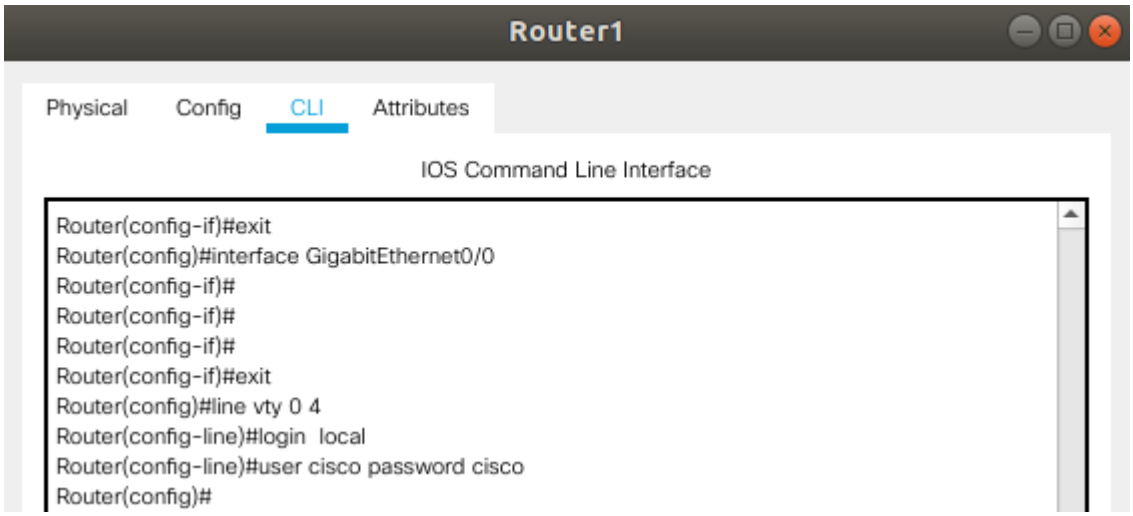
Connection established:

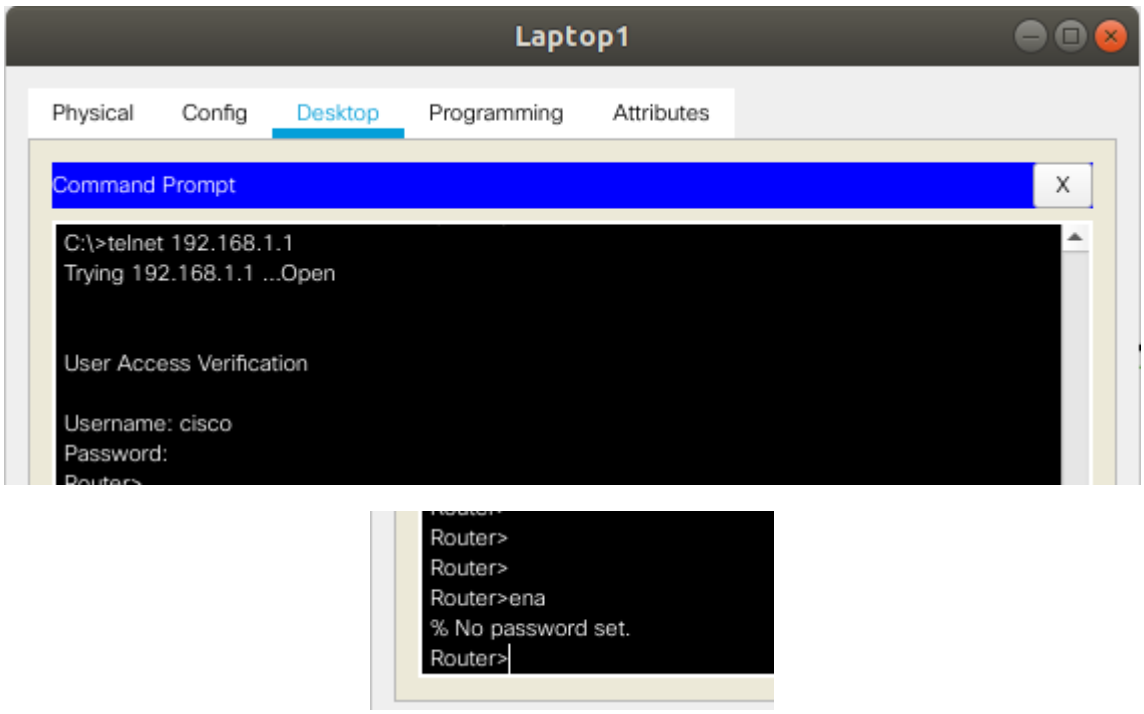


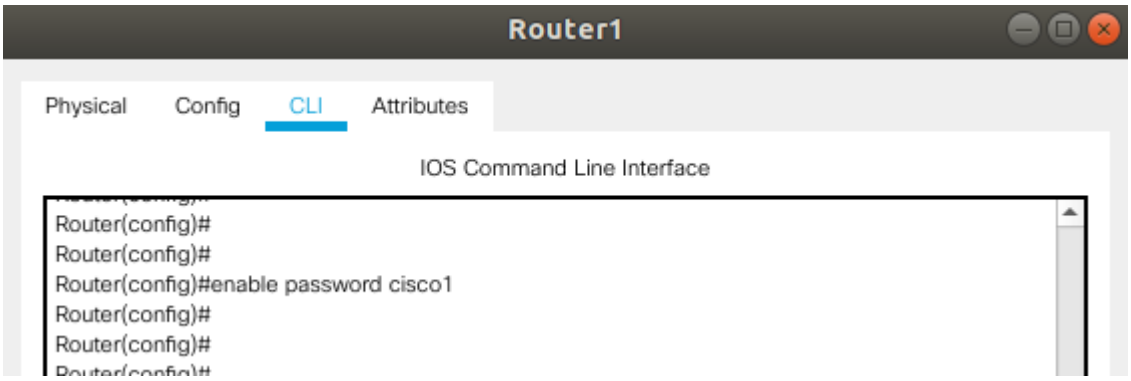
TelNet not working:

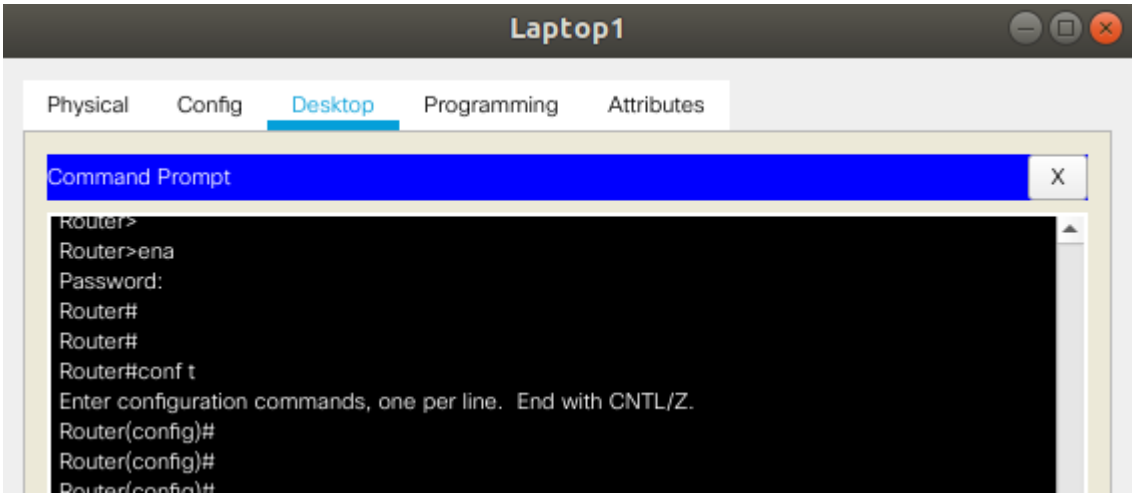


Configuring TelNet in router:



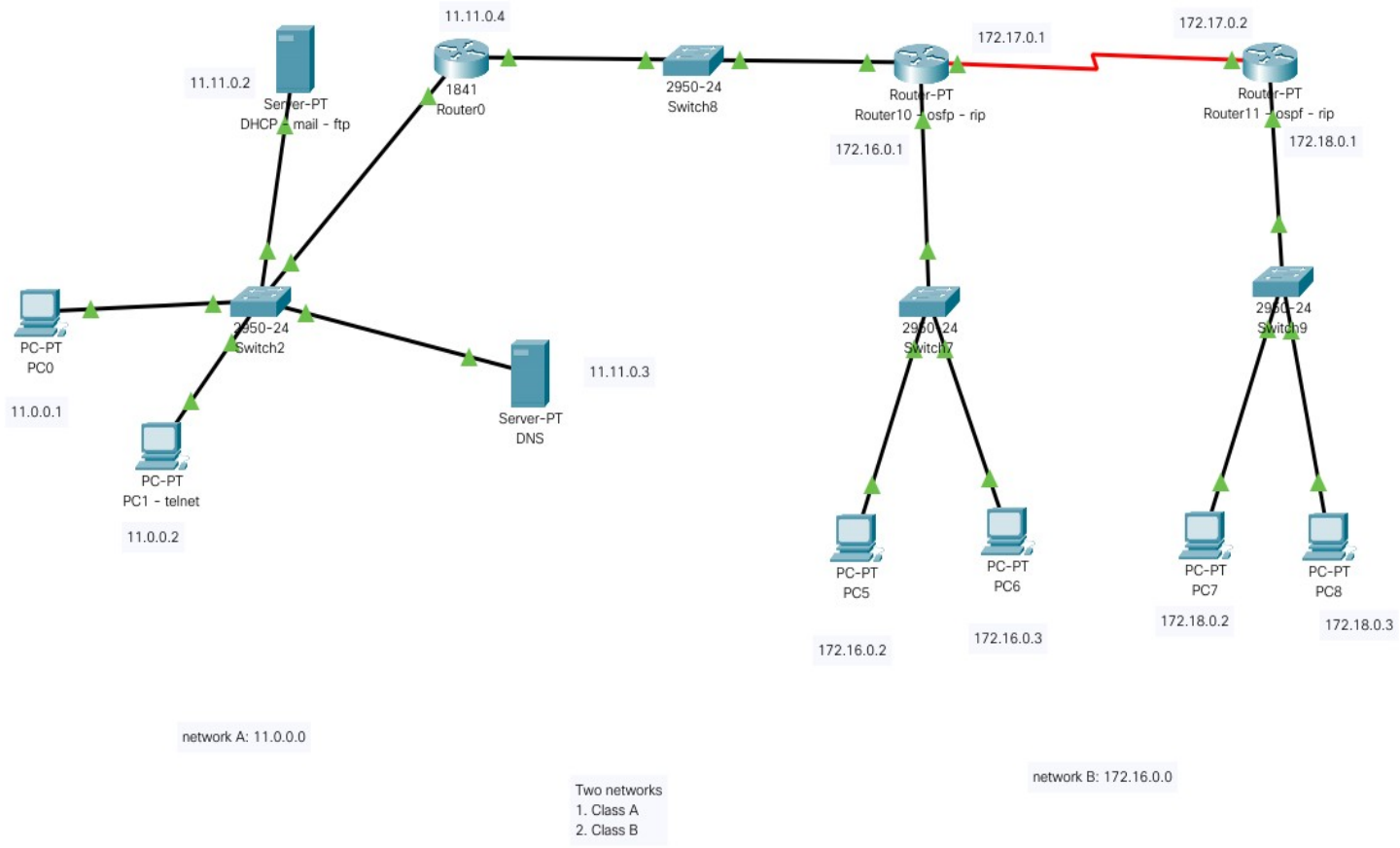




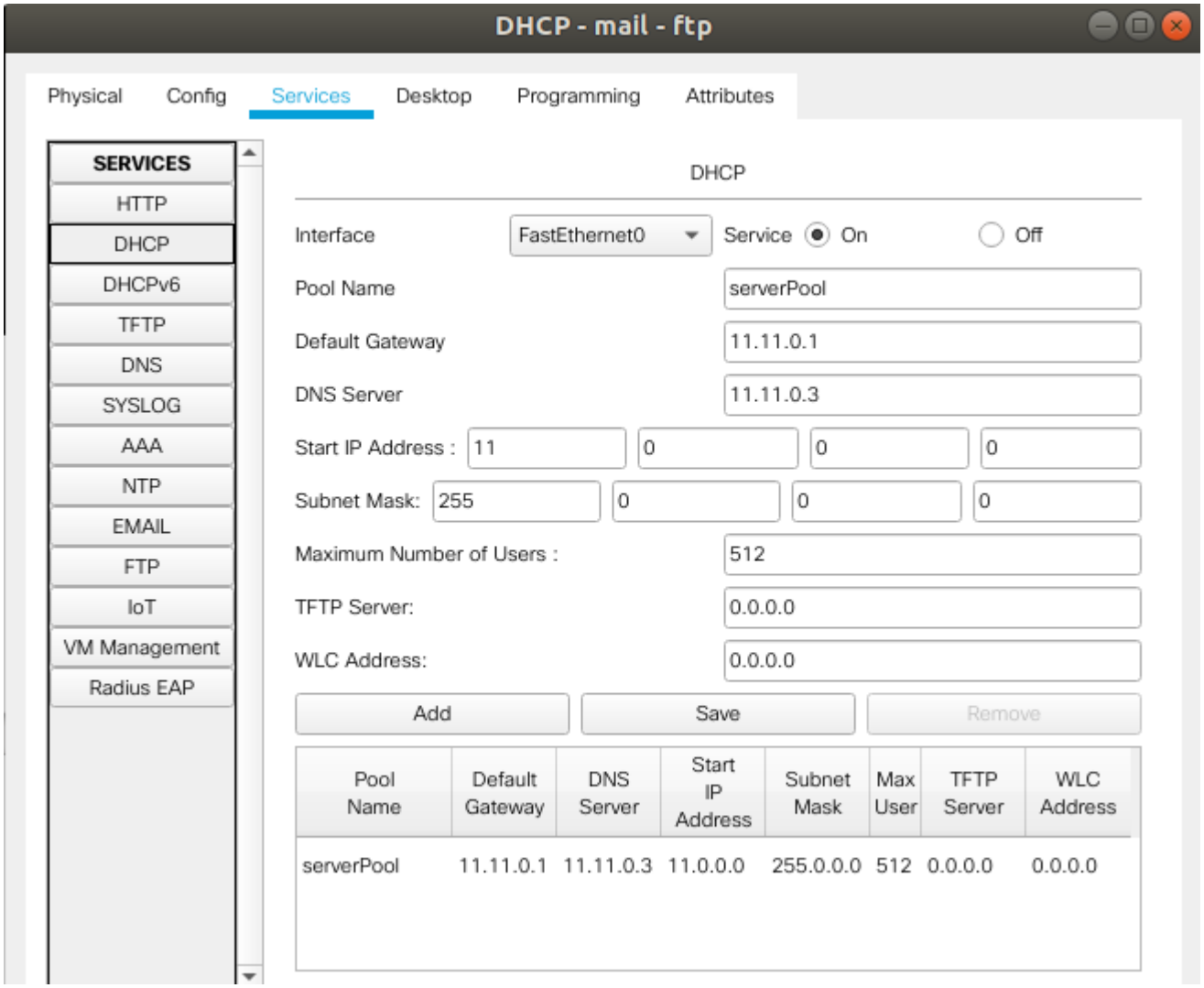


Now TelNet is configured and using user's Laptop, remote device i.e. router can be accessed.

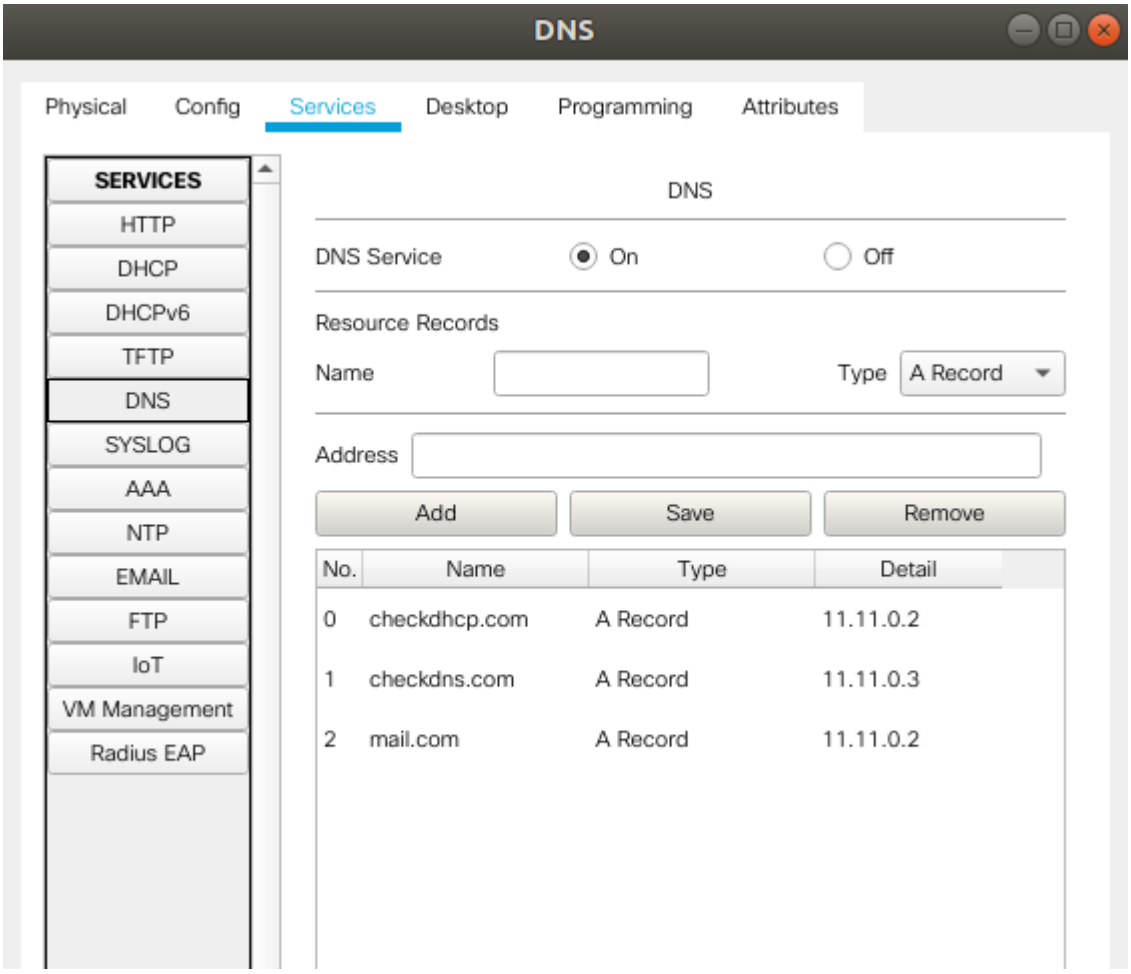
~ QUESTION 2


11.11.0.4
11.11.0.2
Server-PT
DHCP - mail - ftp
1841
Router0
2950-24
Switch8
172.17.0.1
Router-PT
Router10 - ospfp - rip
172.17.0.2
Router-PT
Router11 - ospf - rip
172.16.0.1
172.18.0.1
PC-PT
PC0
11.0.0.1
2950-24
Switch2
Server-PT
DNS
11.11.0.3
PC-PT
PC1 - telnet
11.0.0.2
2950-24
Switch7
2950-24
Switch9
PC-PT
PC5
PC-PT
PC6
PC-PT
PC7
PC-PT
PC8
172.16.0.2
172.16.0.3
172.18.0.2
172.18.0.3
network A: 11.0.0.0
network B: 172.16.0.0
Two networks
1. Class A
2. Class B

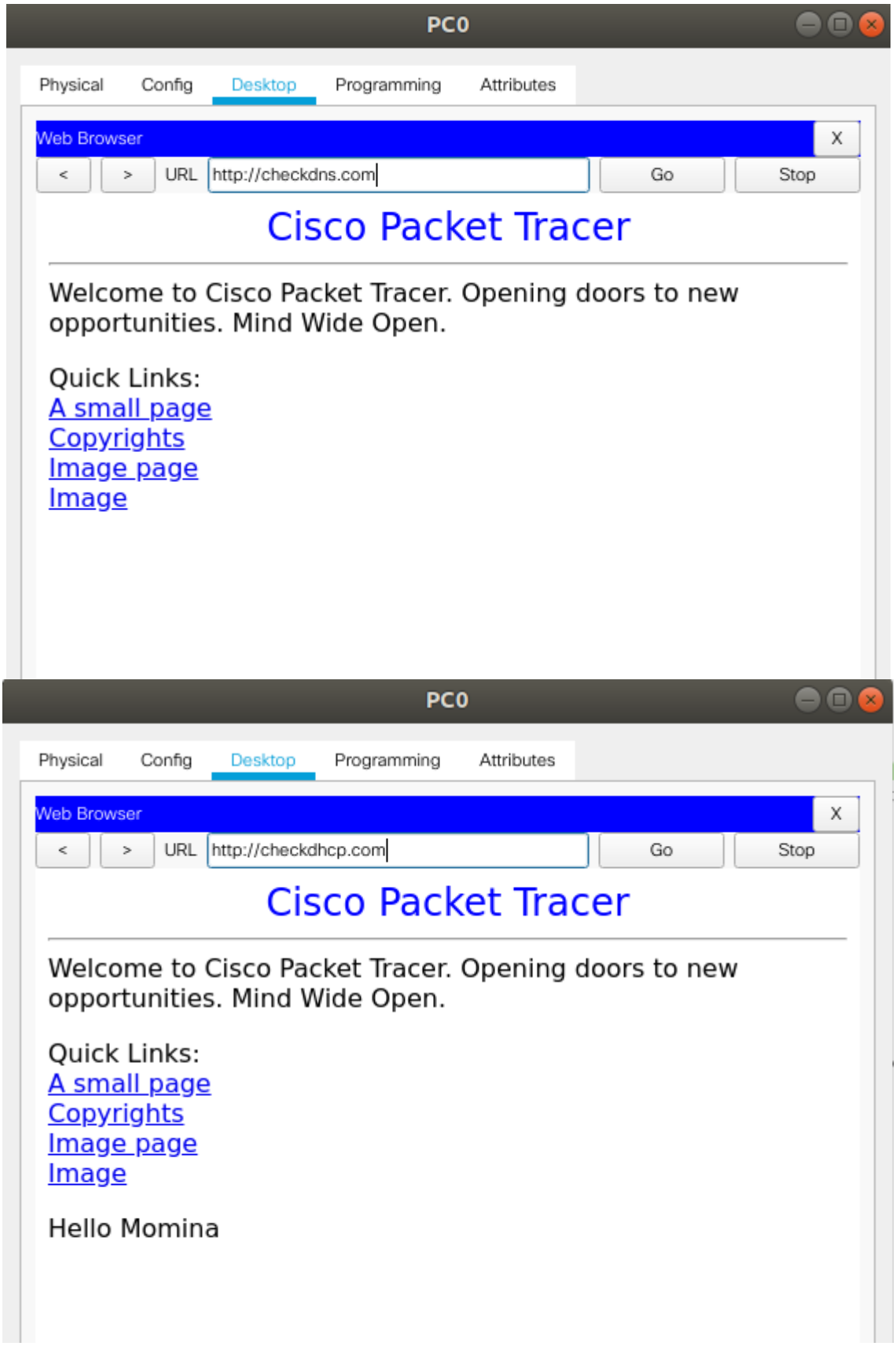
DHCP:


DHCP - mail - ftp
Physical
Config
Services
Desktop
Programming
Attributes
SERVICES
HTTP
DHCP
DHCPv6
TFTP
DNS
SYSLOG
AAA
NTP
EMAIL
FTP
IoT
VM Management
Radius EAP
DHCP
Interface
FastEthernet0
Service
On
Off
Pool Name
serverPool
Default Gateway
11.11.0.1
DNS Server
11.11.0.3
Start IP Address :
11
0
0
0
Subnet Mask:
255
0
0
0
Maximum Number of Users :
512
TFTP Server:
0.0.0.0
WLC Address:
0.0.0.0
Add
Save
Remove
Pool Name
Default Gateway
DNS Server
Start IP Address
Subnet Mask
Max User
TFTP Server
WLC Address
serverPool
11.11.0.1
11.11.0.3
11.0.0.0
255.0.0.0
512
0.0.0.0
0.0.0.0

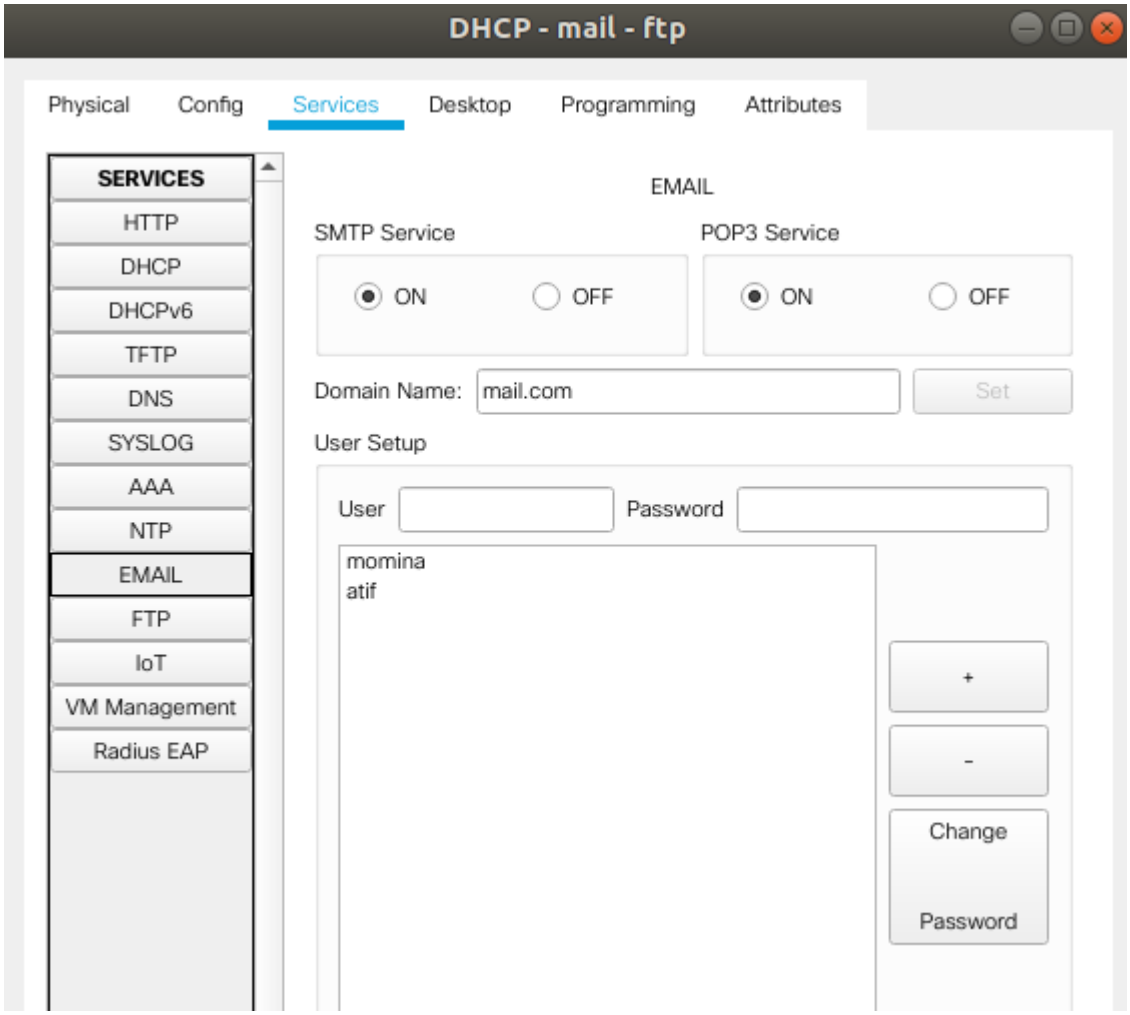
DNS:


DNS
Physical
Config
Services
Desktop
Programming
Attributes
SERVICES
HTTP
DHCP
DHCPv6
TFTP
DNS
SYSLOG
AAA
NTP
EMAIL
FTP
IoT
VM Management
Radius EAP
DNS
DNS Service
On
Off
Resource Records
Name
Type
A Record
Address
Add
Save
Remove
No.
Name
Type
Detail
0
checkdhcp.com
A Record
11.11.0.2
1
checkdns.com
A Record
11.11.0.3
2
mail.com
A Record
11.11.0.2

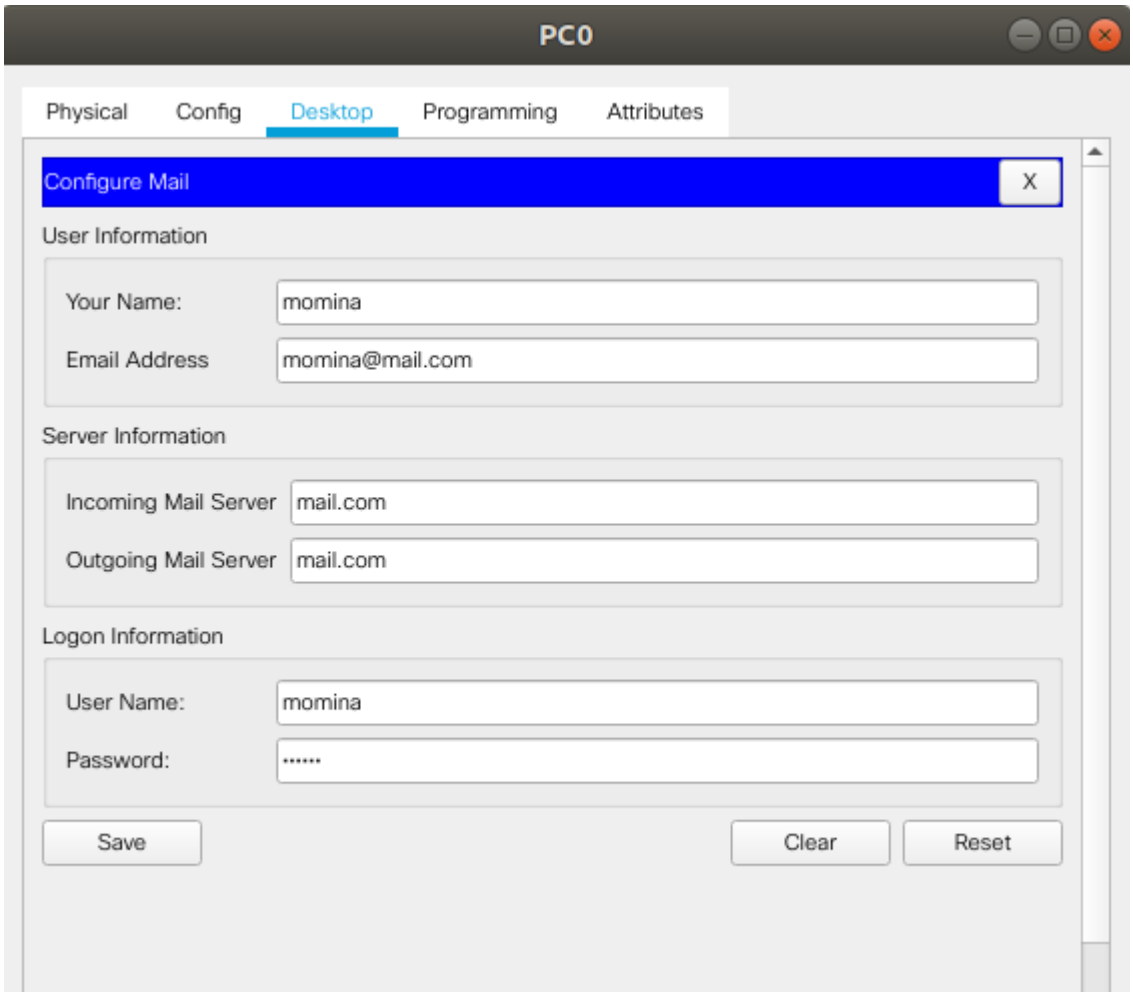
Check DHCP and DNS working:



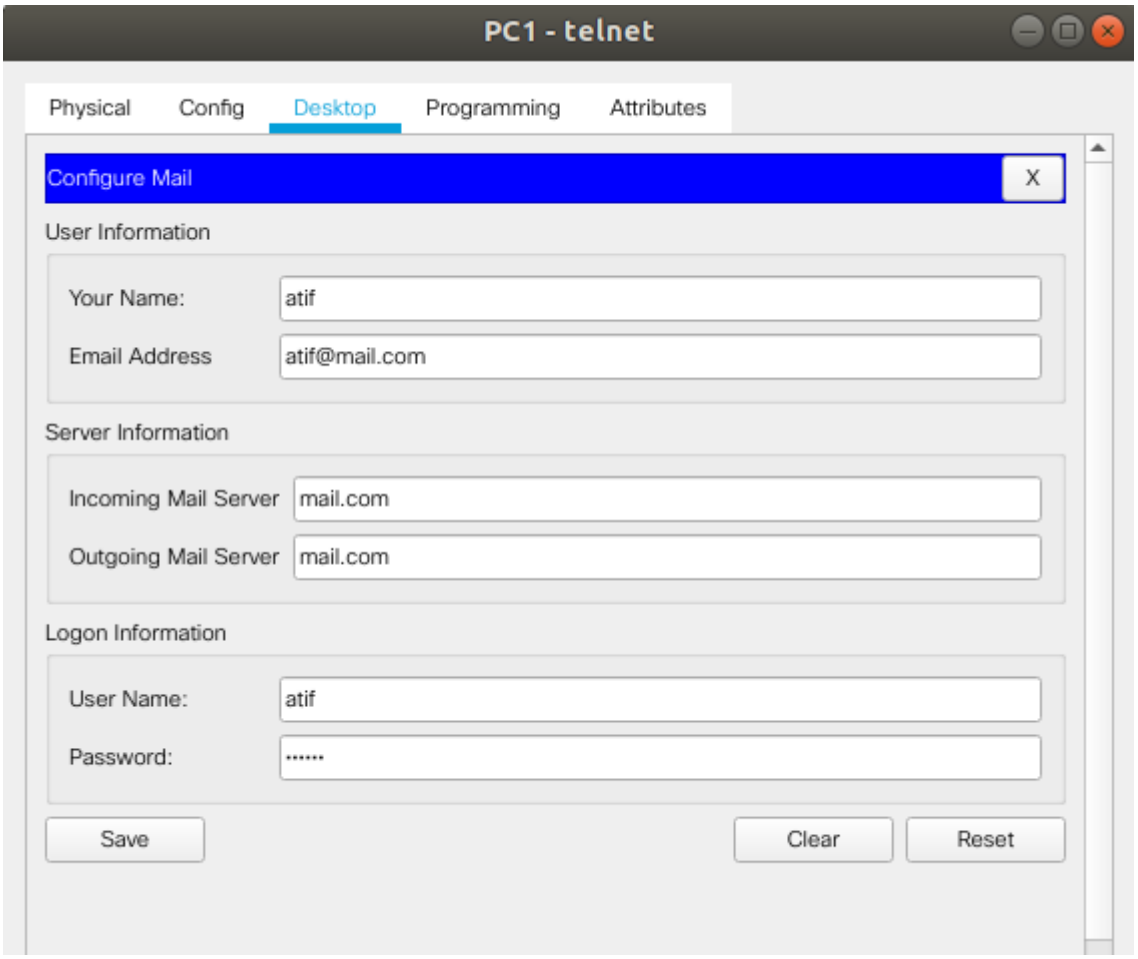
Mail Server:


DHCP - mail - ftp
Physical
Config
Services
Desktop
Programming
Attributes
SERVICES
HTTP
DHCP
DHCPv6
TFTP
DNS
SYSLOG
AAA
NTP
EMAIL
FTP
IoT
VM Management
Radius EAP
EMAIL
SMTP Service
POP3 Service
ON
OFF
ON
OFF
Domain Name:
mail.com
Set
User Setup
User
Password
momina
atif
+
-
Change
Password

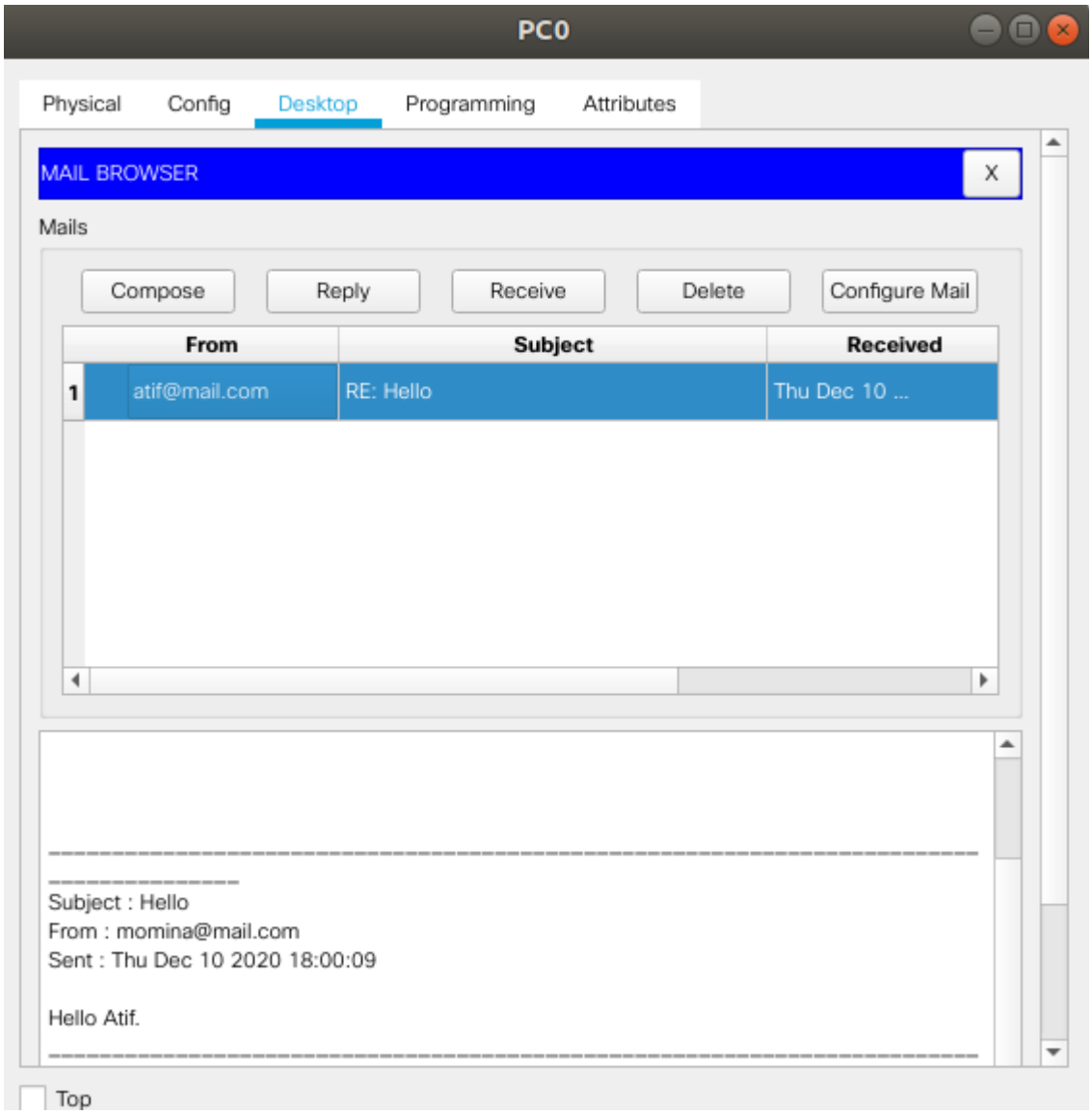
Mail Client 1:



Mail Client 2:

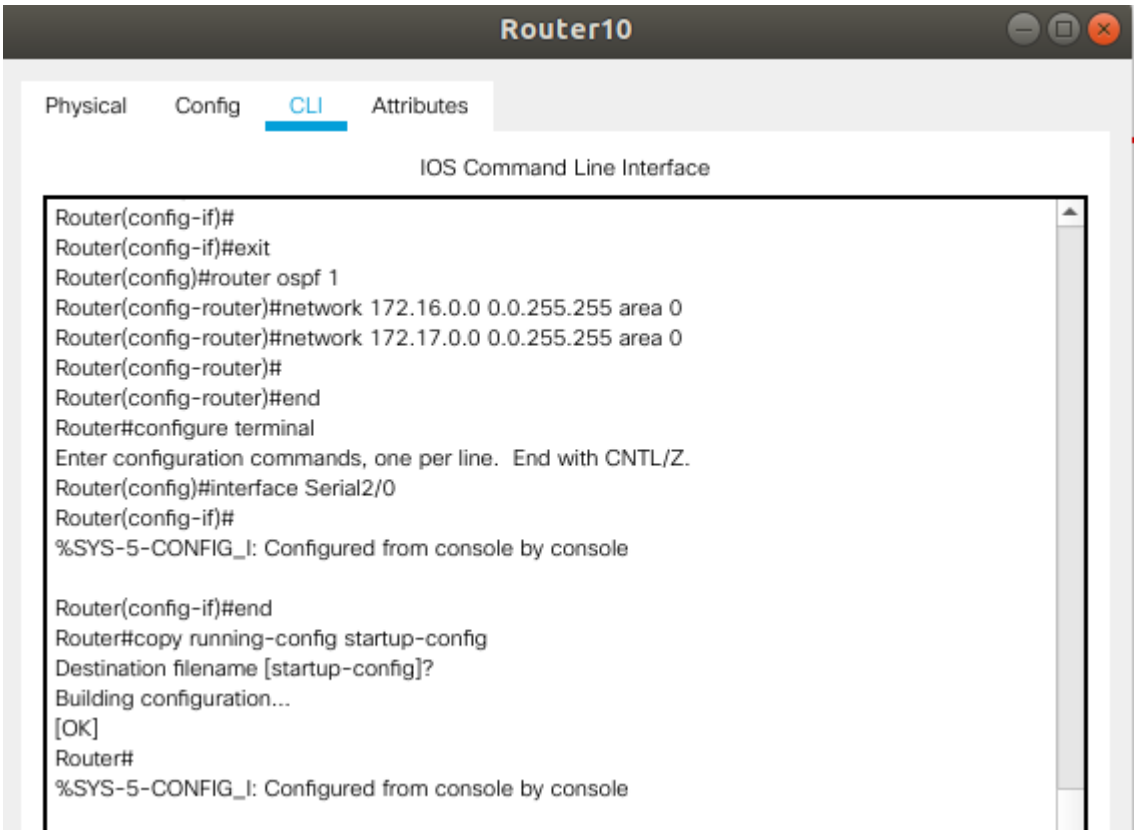


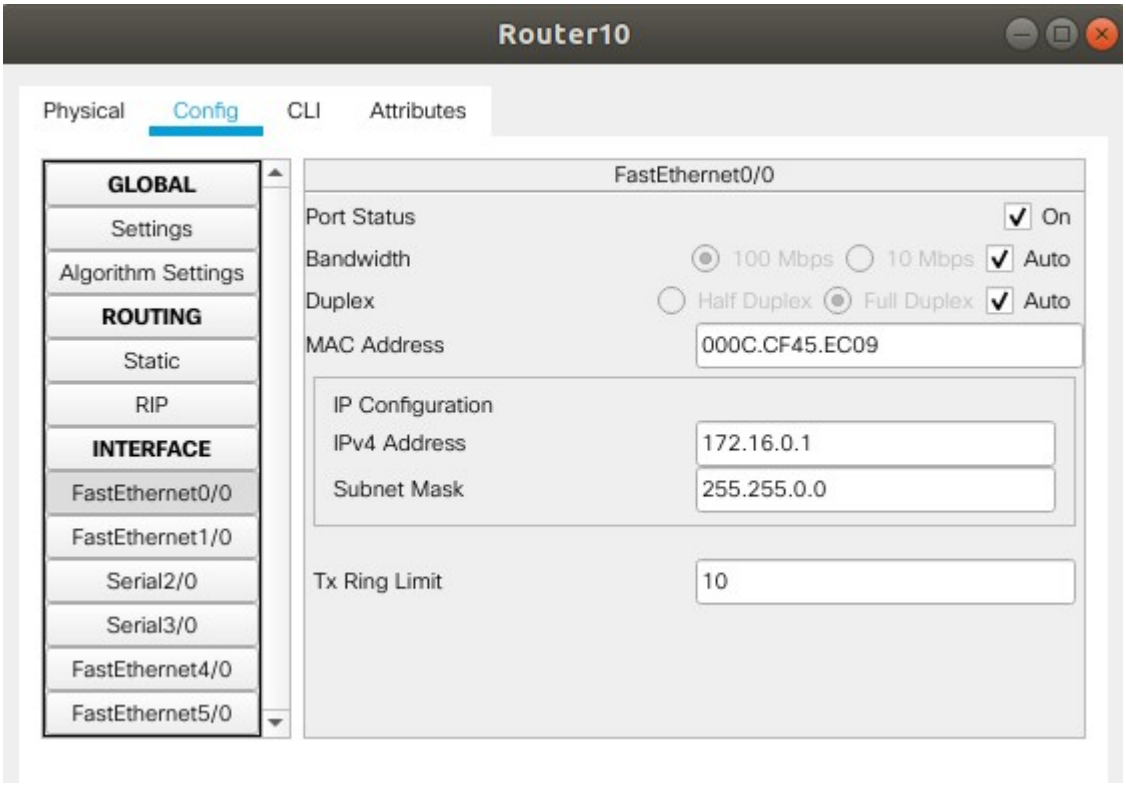
Mail Sending:

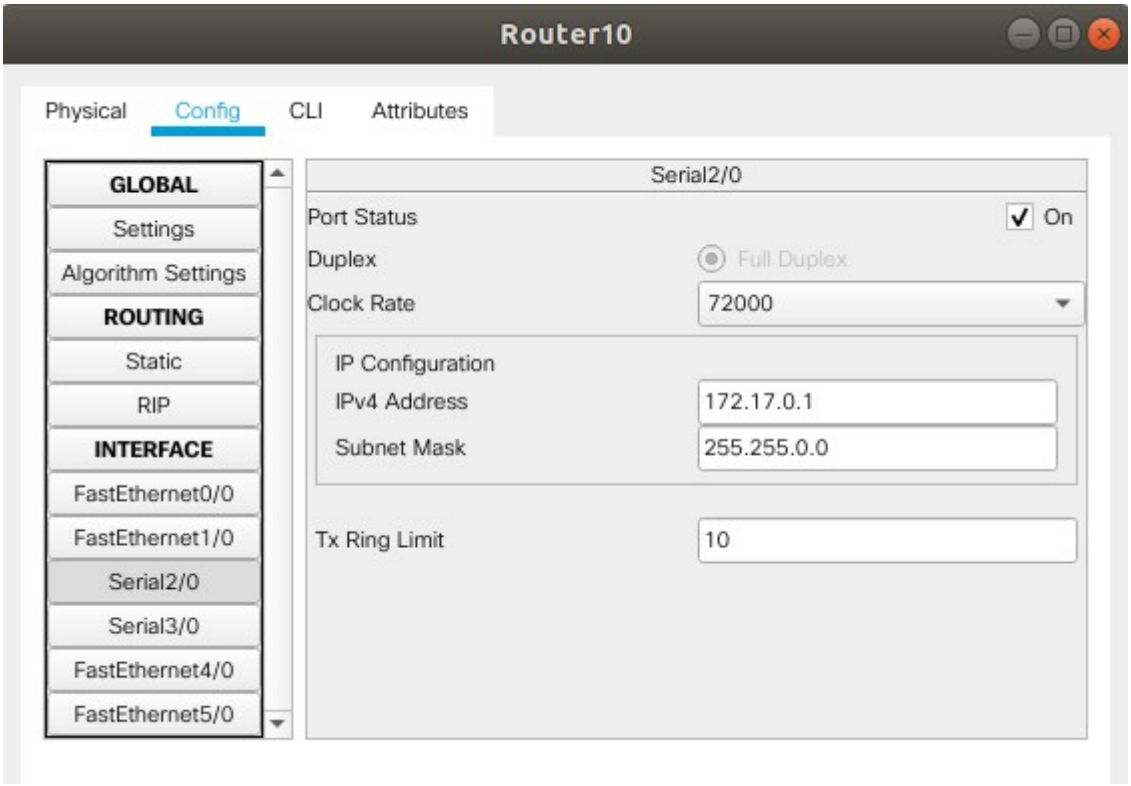


OSPF:

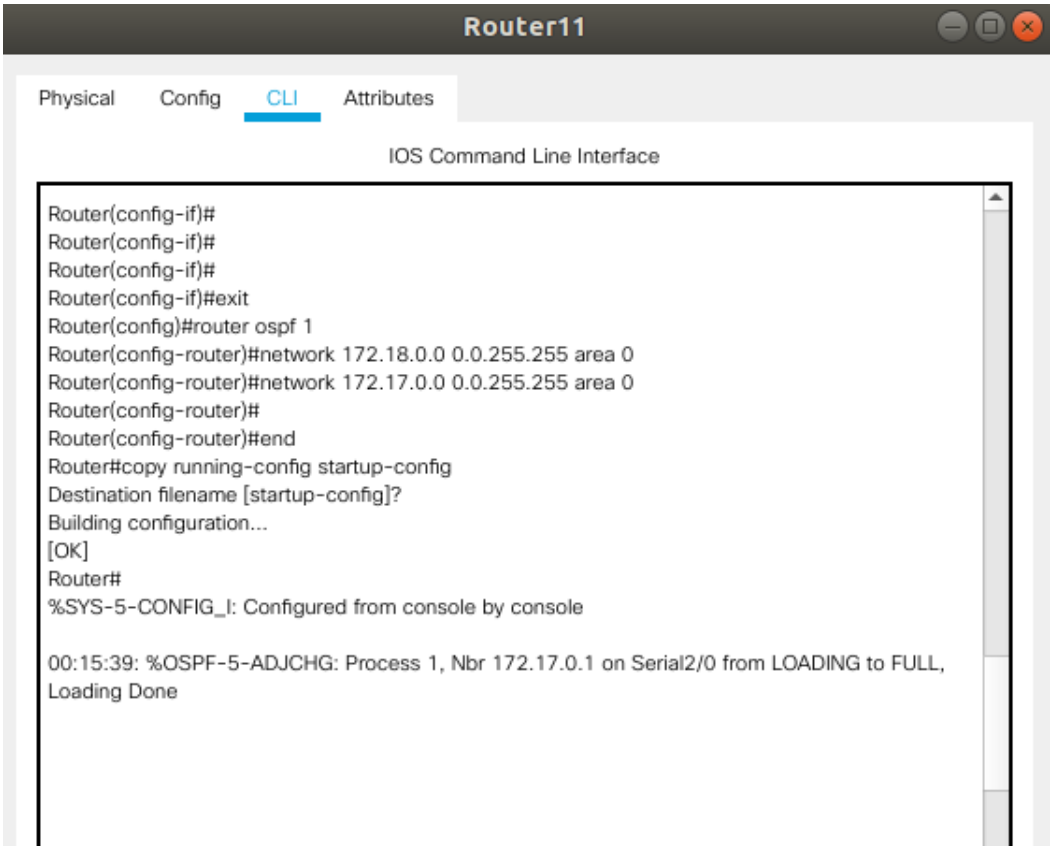
Router 1:

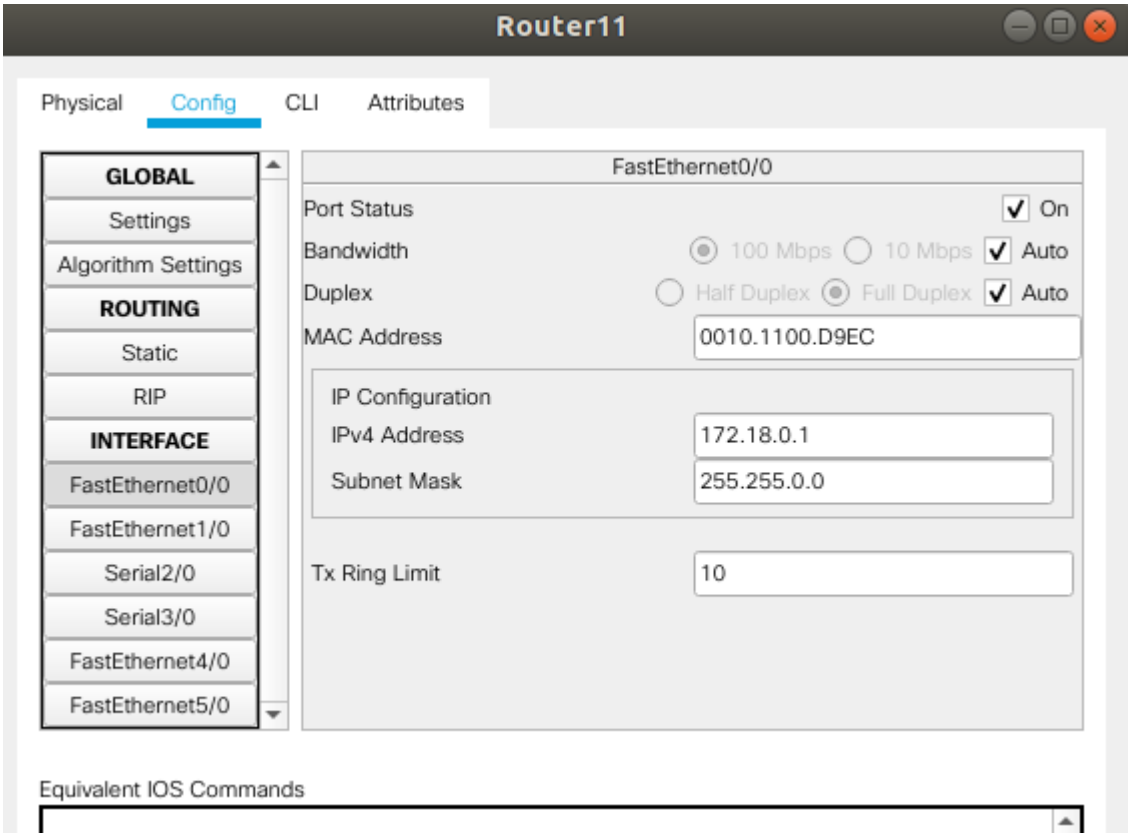


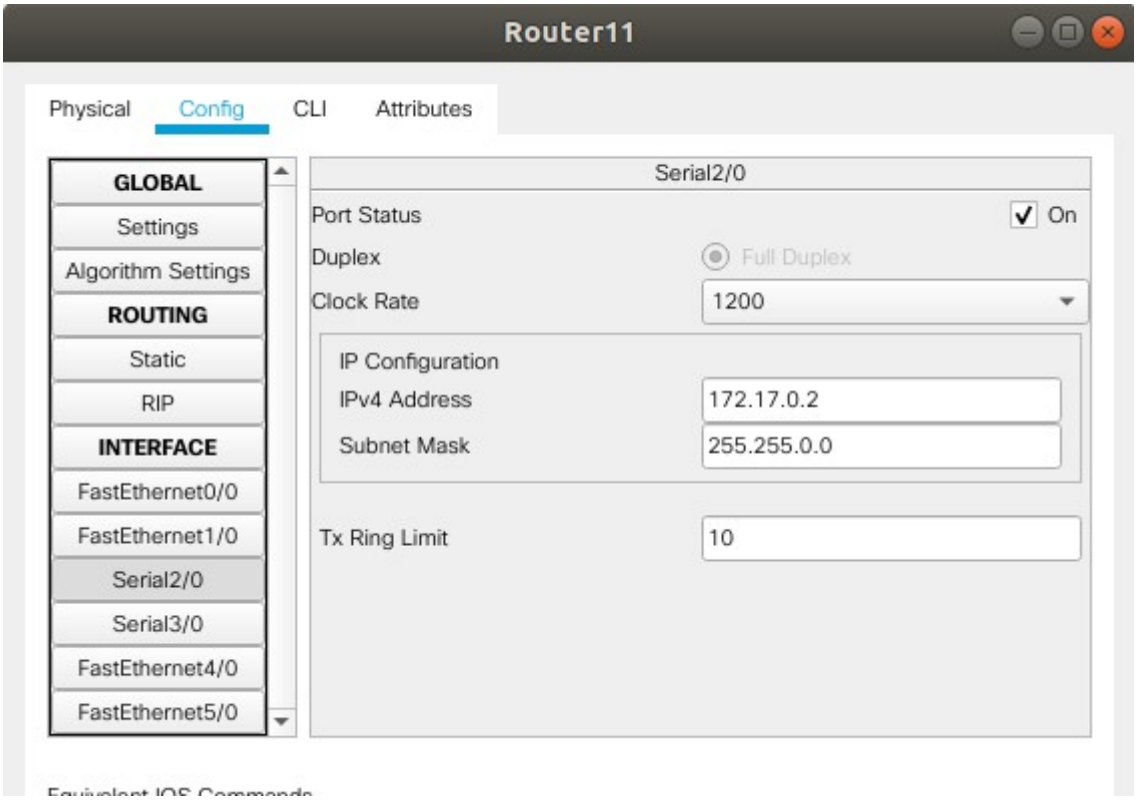



Router10
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
INTERFACE
FastEthernet0/0
FastEthernet1/0
Serial2/0
Serial3/0
FastEthernet4/0
FastEthernet5/0
Serial2/0
Port Status
On
Duplex
Full Duplex
Clock Rate
72000
IP Configuration
IPv4 Address
172.17.0.1
Subnet Mask
255.255.0.0
Tx Ring Limit
10

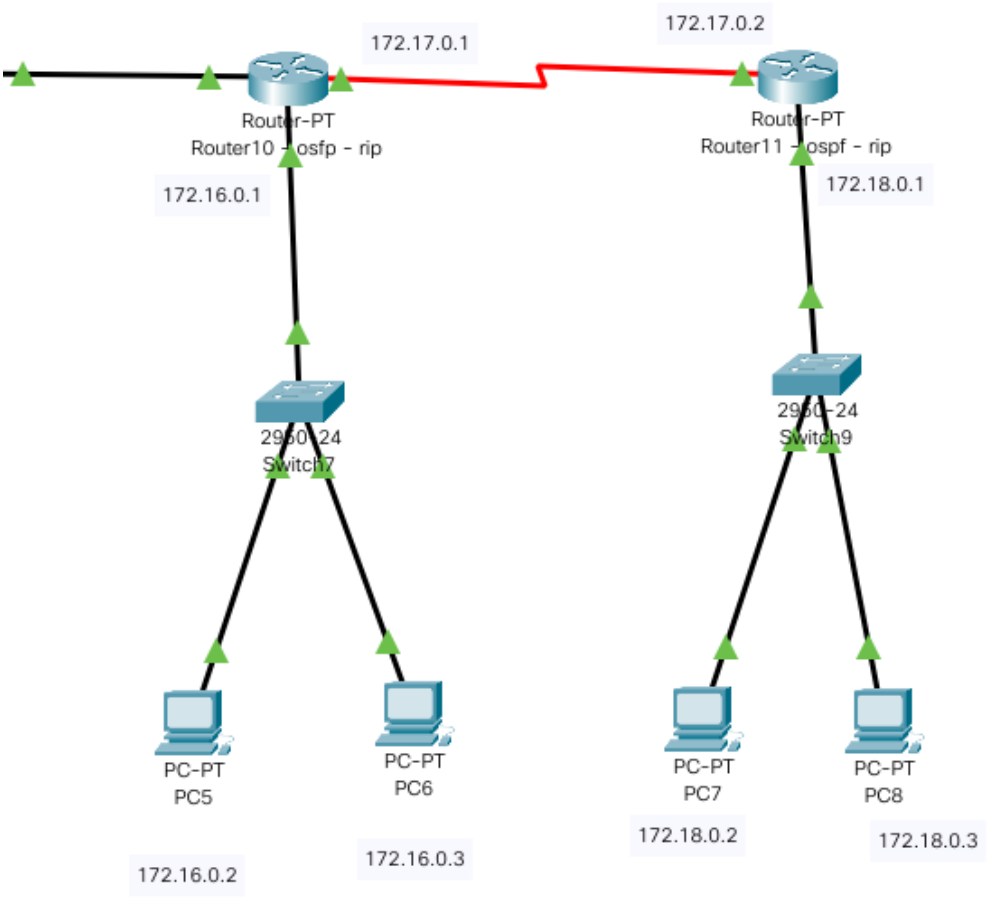
Router 2:


Router11
Physical
Config
CLI
Attributes
IOS Command Line Interface
Router(config-if)#
Router(config-if)#
Router(config-if)#
Router(config-if)#exit
Router(config)#router ospf 1
Router(config-router)#network 172.18.0.0 0.0.255.255 area 0
Router(config-router)#network 172.17.0.0 0.0.255.255 area 0
Router(config-router)#
Router(config-router)#end
Router#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
Router#
%SYS-5-CONFIG_I: Configured from console by console
00:15:39: %OSPF-5-ADJCHG: Process 1, Nbr 172.17.0.1 on Serial2/0 from LOADING to FULL, Loading Done


Router11
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
INTERFACE
FastEthernet0/0
FastEthernet1/0
Serial2/0
Serial3/0
FastEthernet4/0
FastEthernet5/0
FastEthernet0/0
Port Status
On
Bandwidth
100 Mbps
10 Mbps
Auto
Duplex
Half Duplex
Full Duplex
Auto
MAC Address
0010.1100.D9EC
IP Configuration
IPv4 Address
172.18.0.1
Subnet Mask
255.255.0.0
Tx Ring Limit
10
Equivalent IOS Commands


Router11
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
INTERFACE
FastEthernet0/0
FastEthernet1/0
Serial2/0
Serial3/0
FastEthernet4/0
FastEthernet5/0
Serial2/0
Port Status
On
Duplex
Full Duplex
Clock Rate
1200
IP Configuration
IPv4 Address
172.17.0.2
Subnet Mask
255.255.0.0
Tx Ring Limit
10

OSPF Successful:

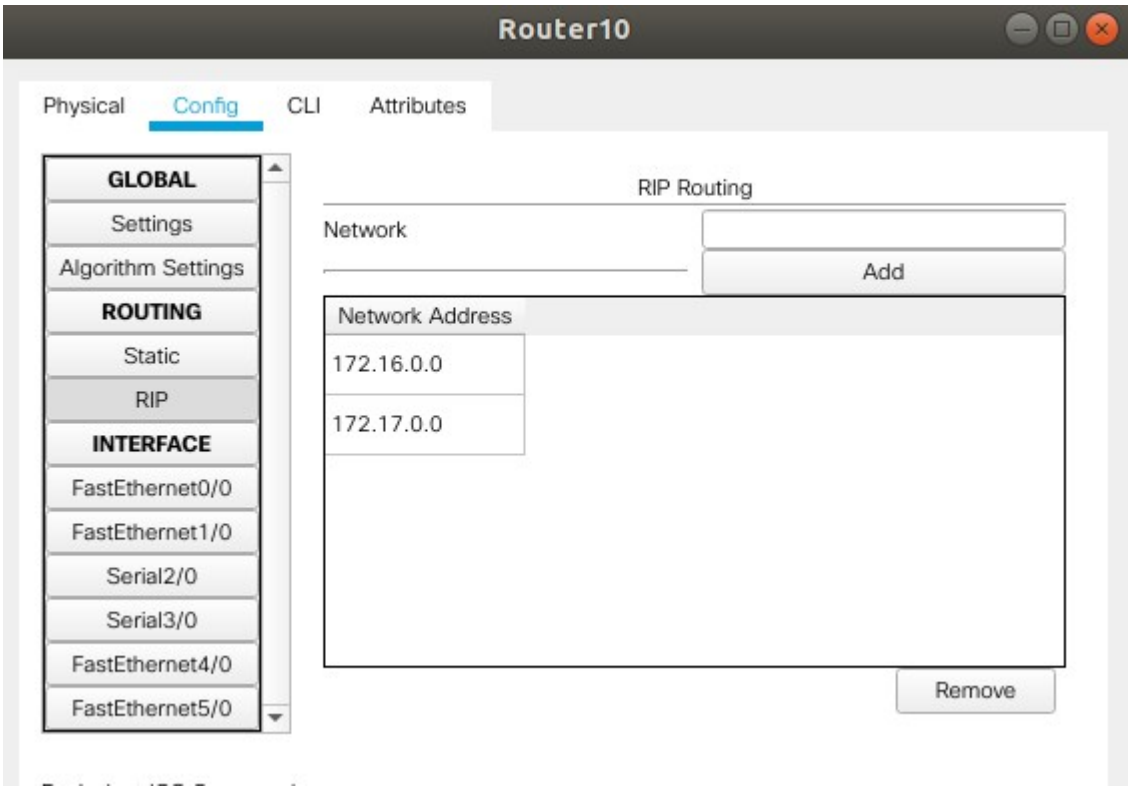


Window

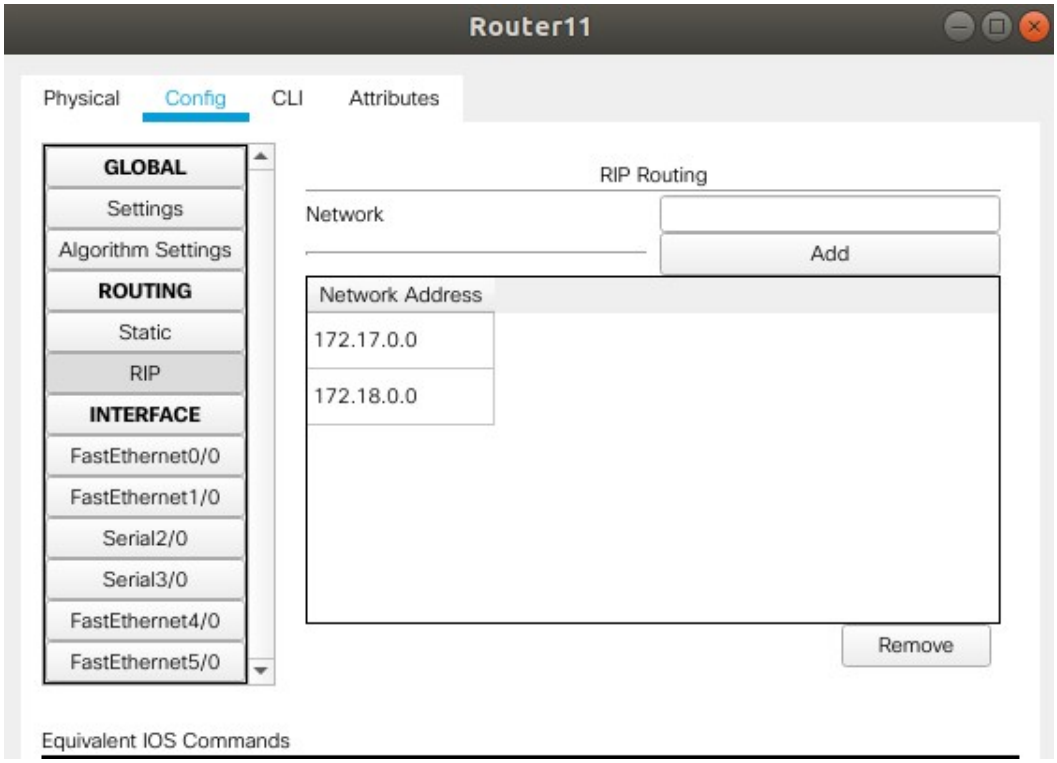
Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
Successful	PC5	Router11	ICMP		0.000	N	0	(edit)	
Successful	PC8	Router10	ICMP		0.000	N	1	(edit)	
Successful	PC5	PC7	ICMP		0.000	N	2	(edit)	
Successful	Router10	Router11	ICMP		0.000	N	3	(edit)	
Successful	PC7	PC8	ICMP		0.000	N	4	(edit)	
Successful	Router10	PC8	ICMP		0.000	N	5	(edit)	

RIP:

Router 1:

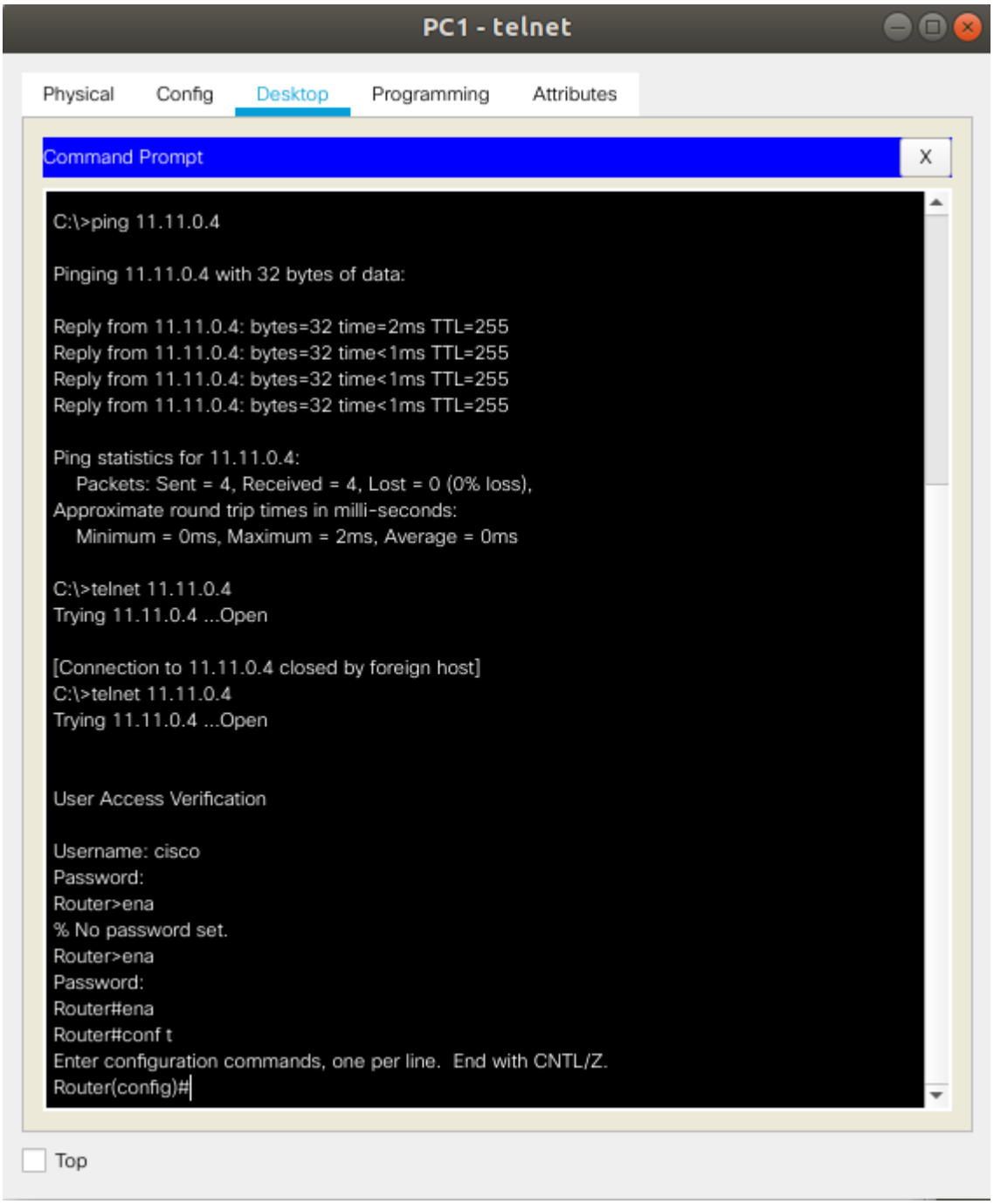


Router 2:

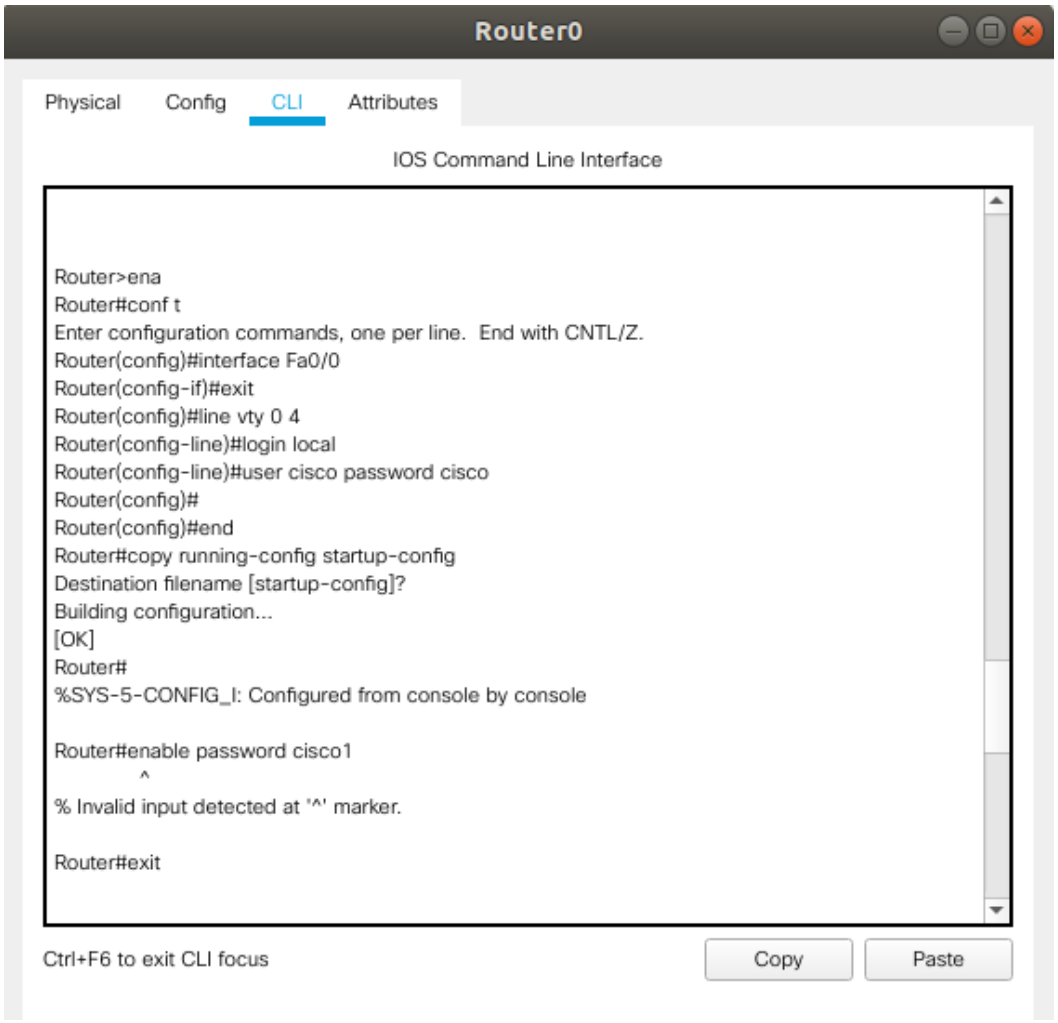


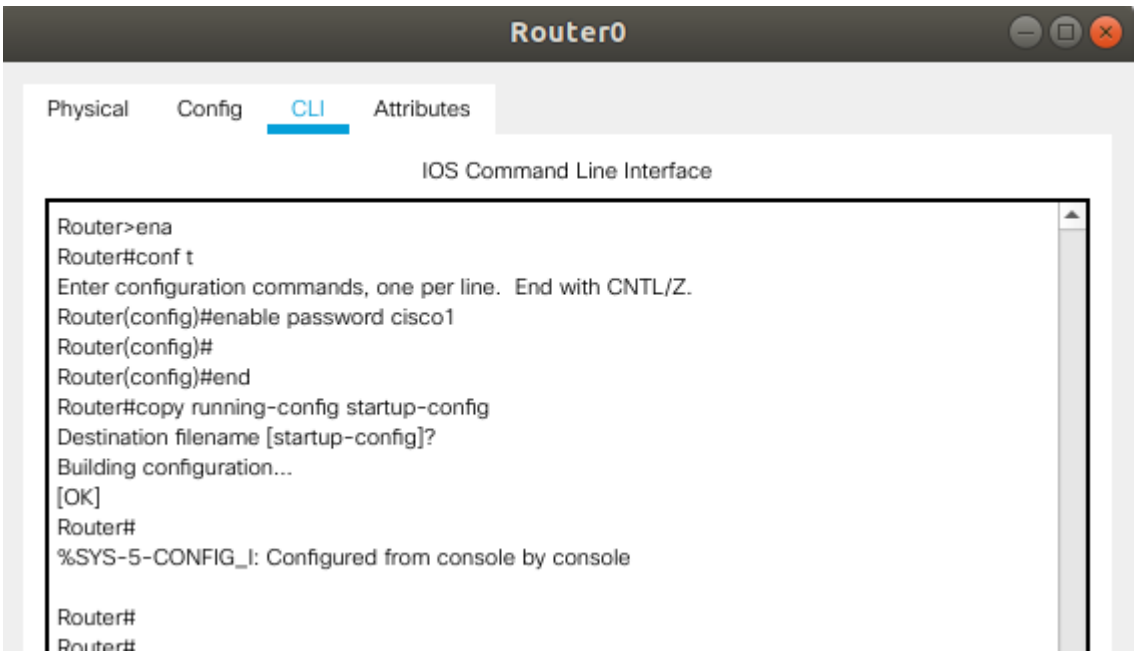
TelNet:

PC Side:



Router Side:

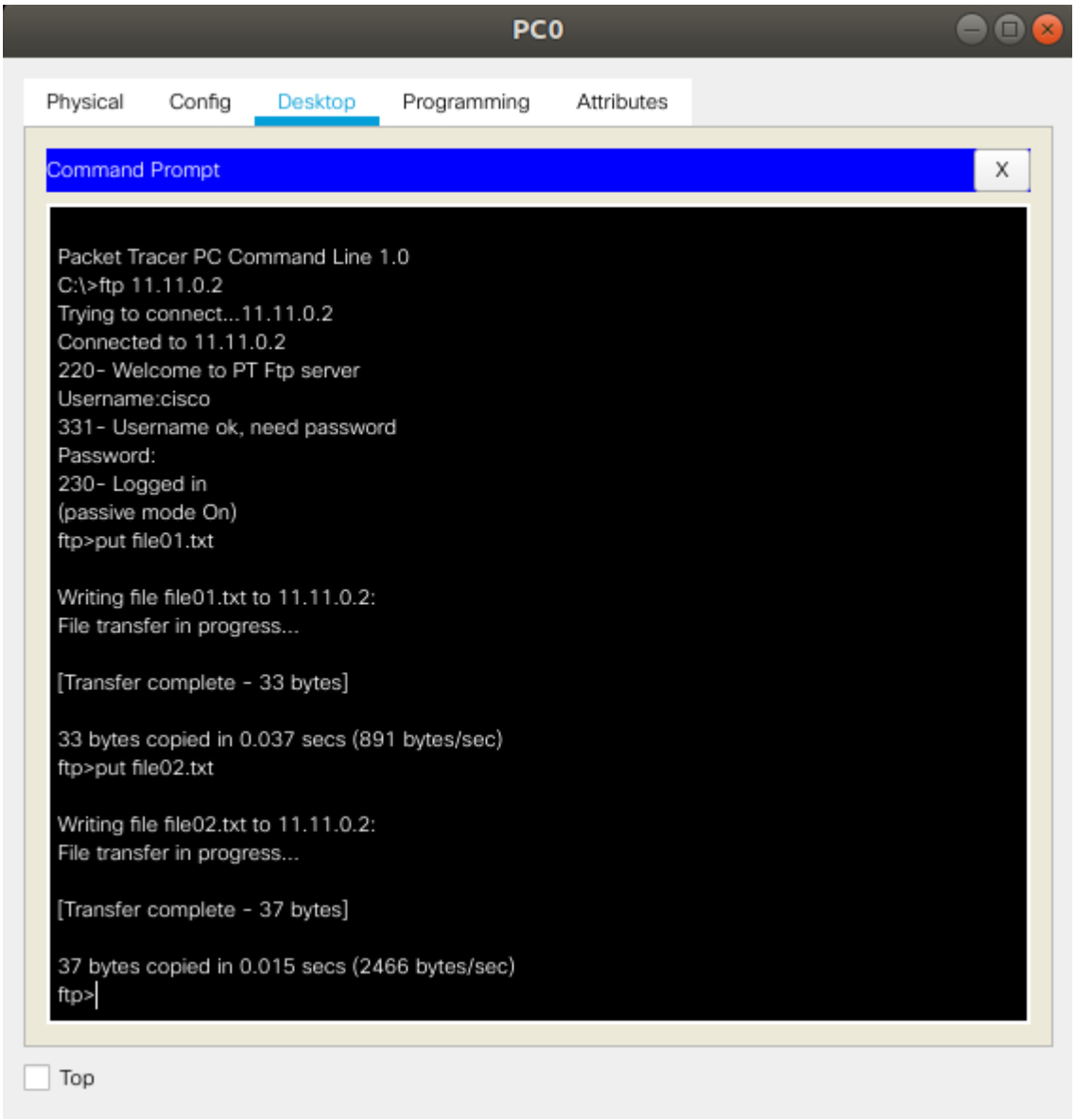

Router0
Physical
Config
CLI
Attributes
IOS Command Line Interface
Router>ena
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface Fa0/0
Router(config-if)#exit
Router(config)#line vty 0 4
Router(config-line)#login local
Router(config-line)#user cisco password cisco
Router(config)#
Router(config)#end
Router#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#enable password cisco1
^
% Invalid input detected at '^' marker.
Router#exit
Ctrl+F6 to exit CLI focus
Copy
Paste


Router0
Physical
Config
CLI
Attributes
IOS Command Line Interface
Router>ena
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#enable password cisco1
Router(config)#
Router(config)#end
Router#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#

FTP:

File creation:

Sending File to Server:



Checking file on server: