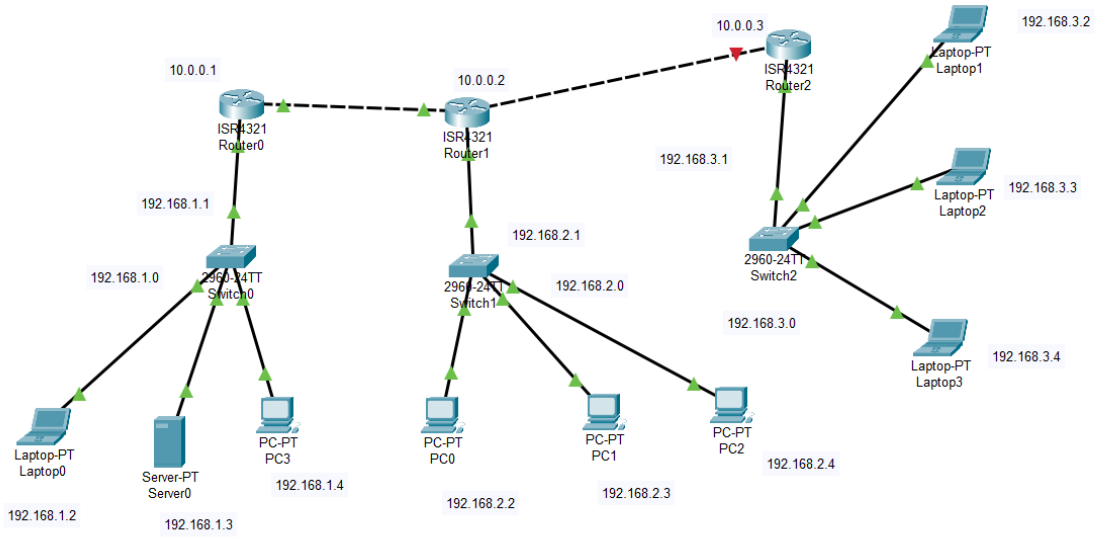
**Aryaman Mishra**

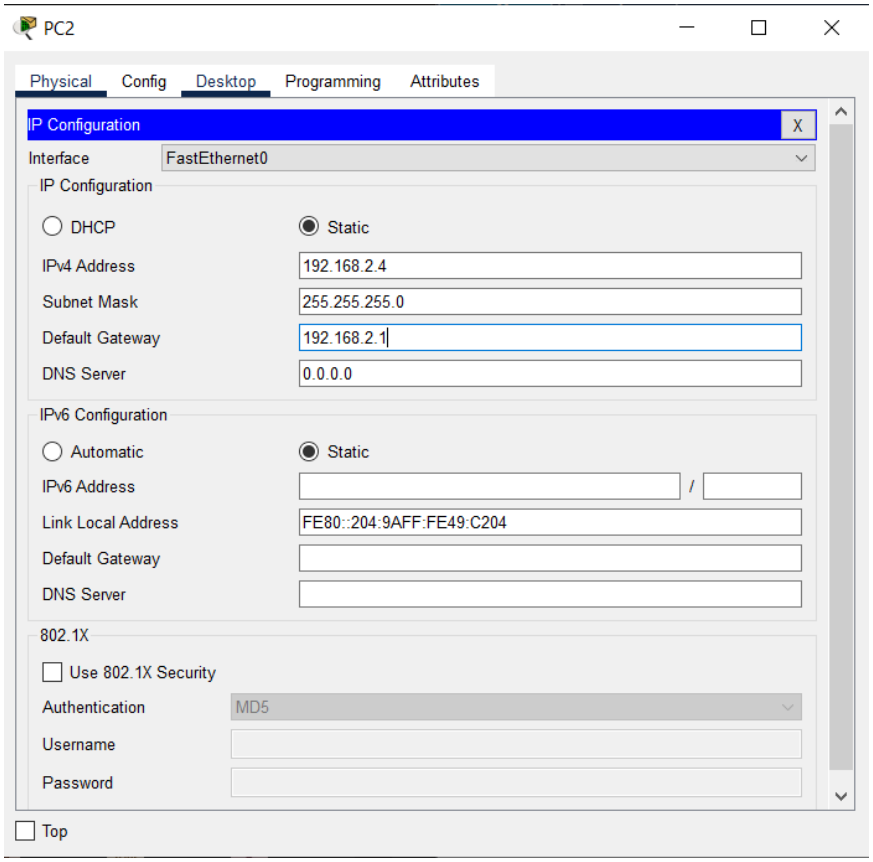
**19BCE1027**

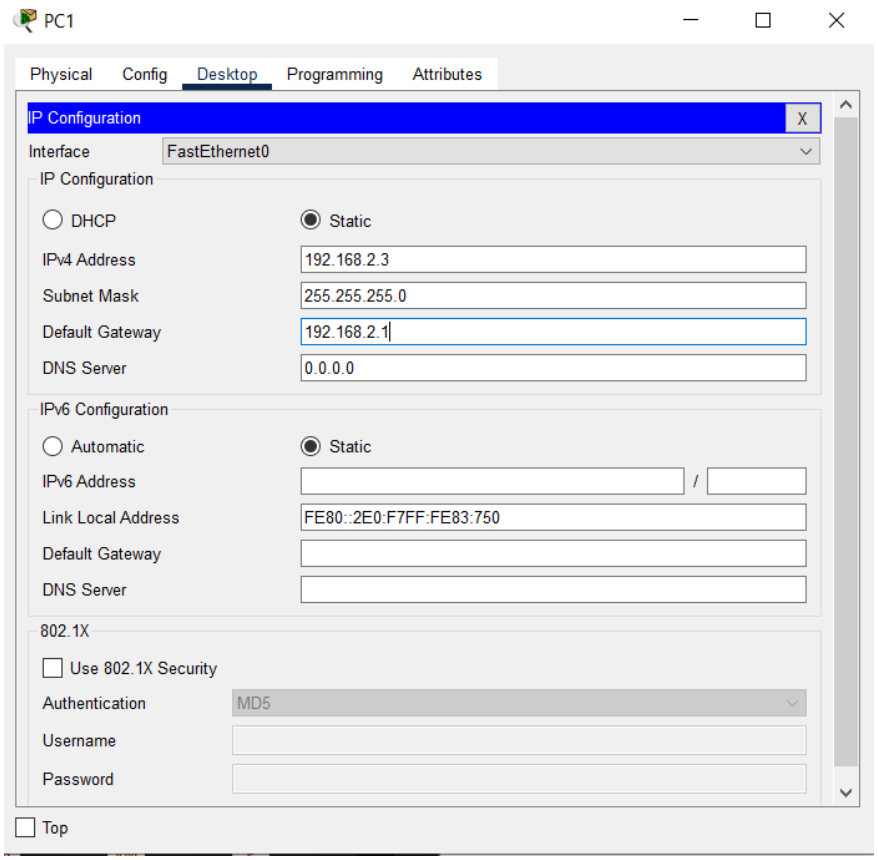
**EXPERIMENT 3:ACCESS CONTROL LISTS**

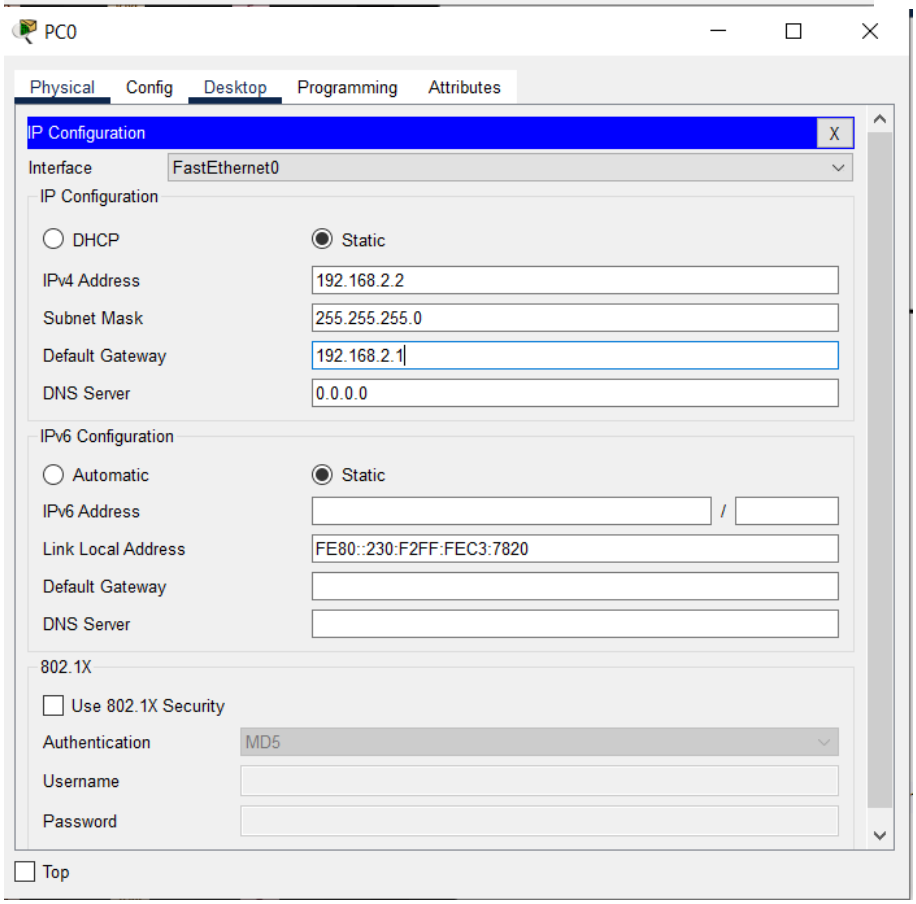
**Topology**

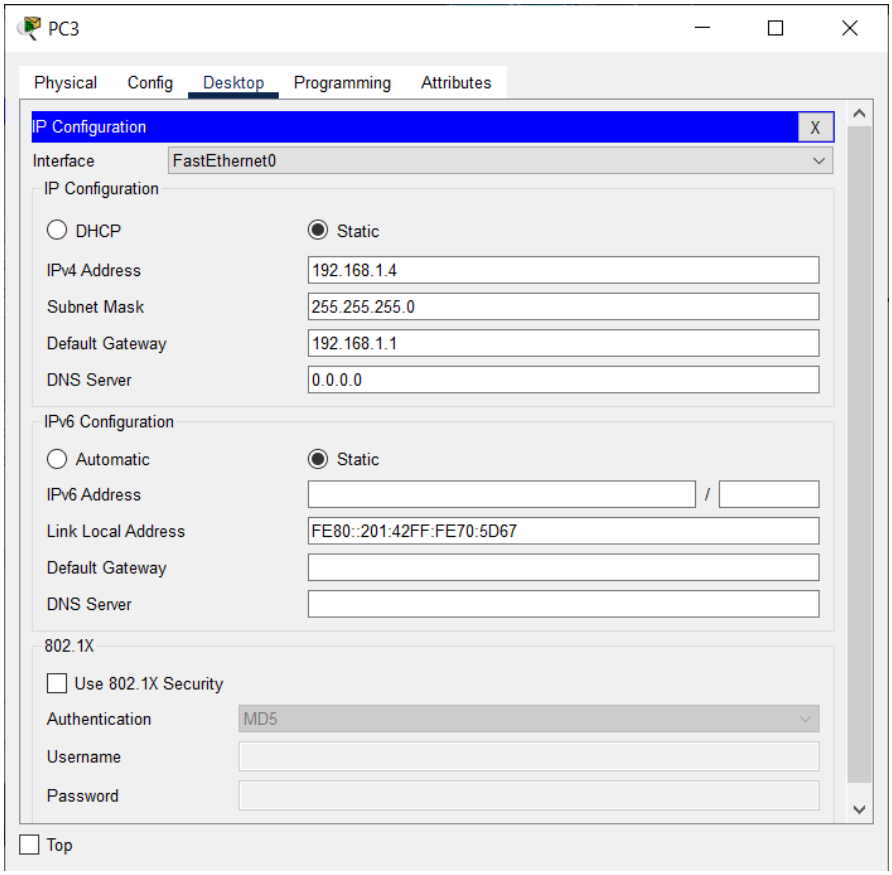


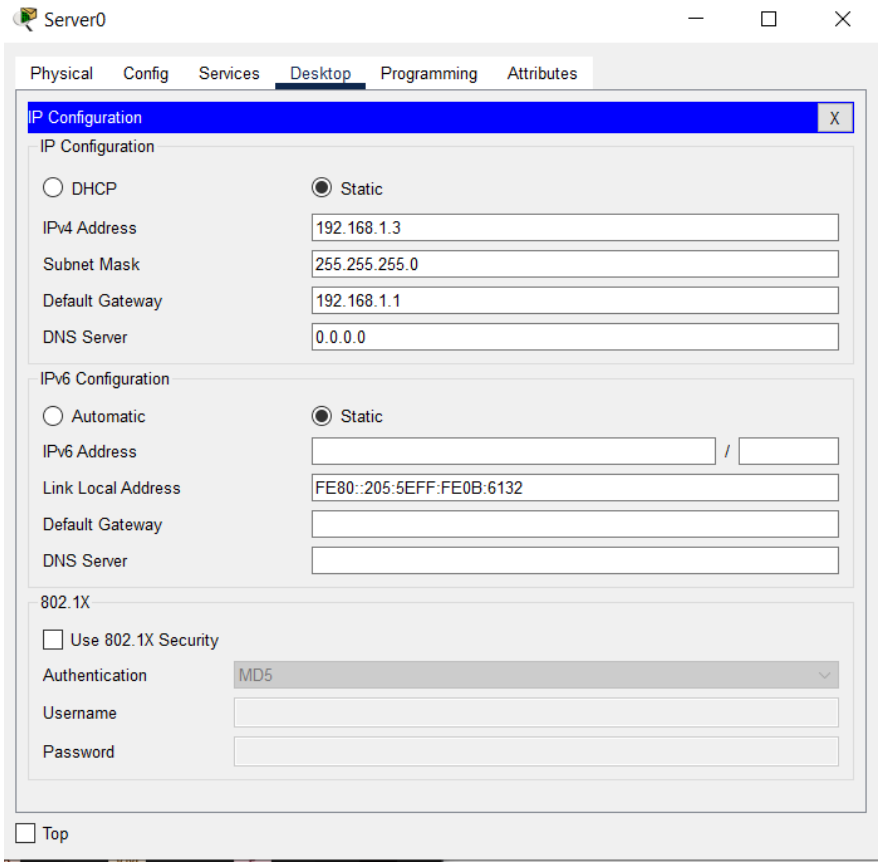

**System Configurations**

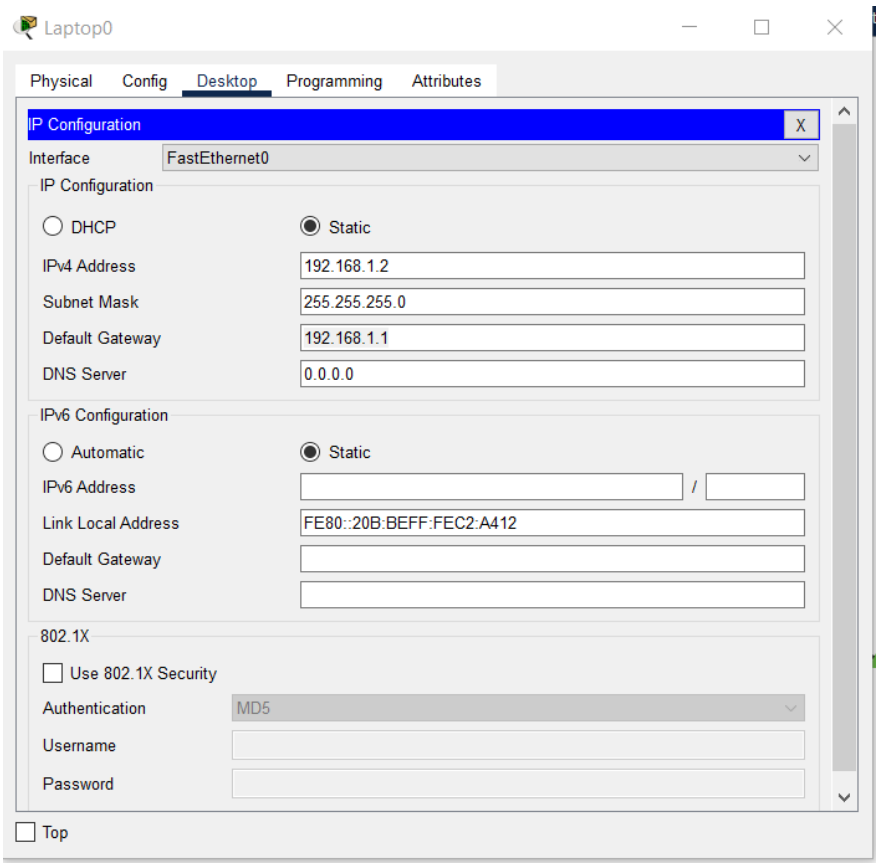


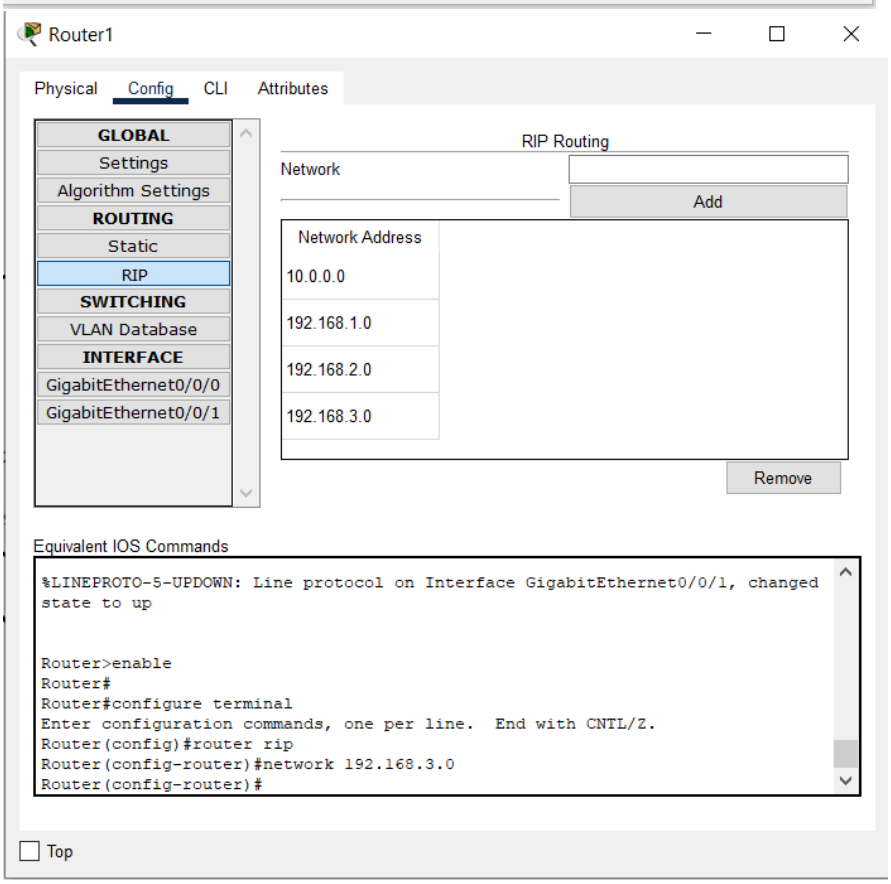

PC1
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
192.168.2.3
Subnet Mask
255.255.255.0
Default Gateway
192.168.2.1
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address
FE80::2E0:F7FF:FE83:750
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Username
Password
Top

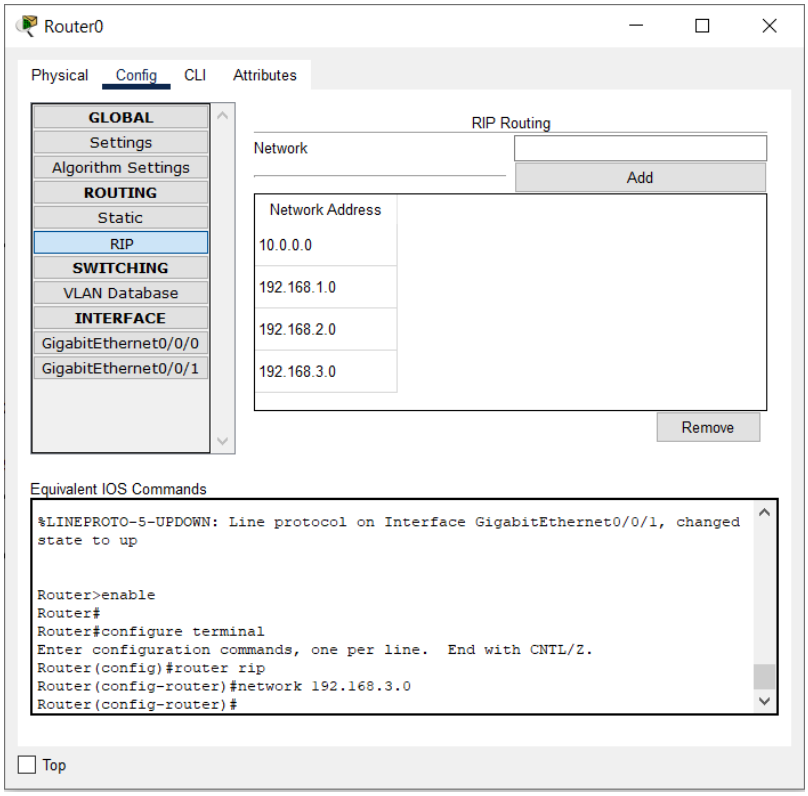

PC0
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
192.168.2.2
Subnet Mask
255.255.255.0
Default Gateway
192.168.2.1
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address
FE80::230:F2FF:FEC3:7820
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Username
Password
Top

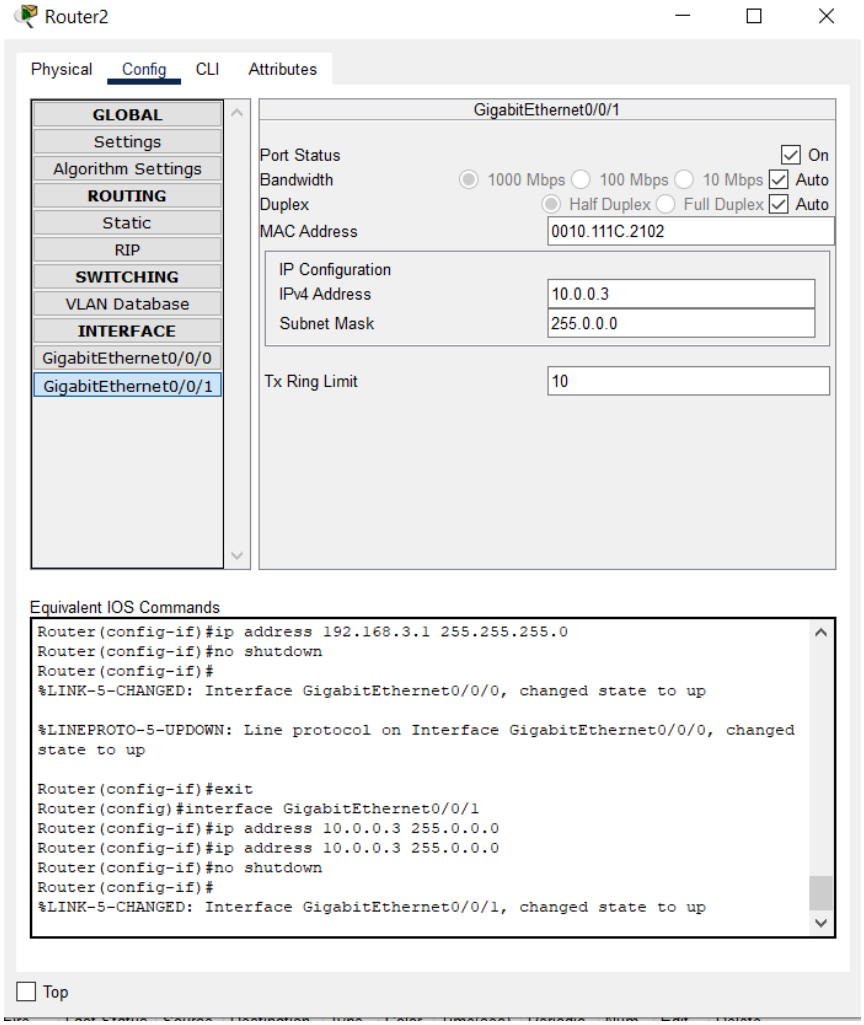

PC3
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
192.168.1.4
Subnet Mask
255.255.255.0
Default Gateway
192.168.1.1
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
/
Link Local Address
FE80::201:42FF:FE70:5D67
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Username
Password
Top

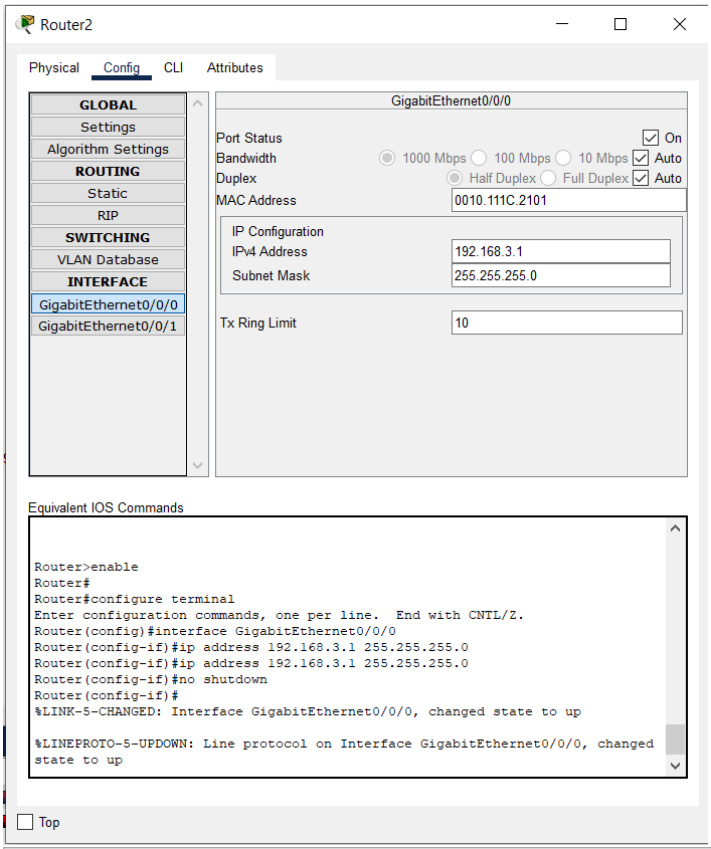

Server0
Physical
Config
Services
Desktop
Programming
Attributes
IP Configuration
X
IP Configuration
DHCP
Static
IPv4 Address
192.168.1.3
Subnet Mask
255.255.255.0
Default Gateway
192.168.1.1
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
/
Link Local Address
FE80::205:5EFF:FE0B:6132
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Username
Password
Top

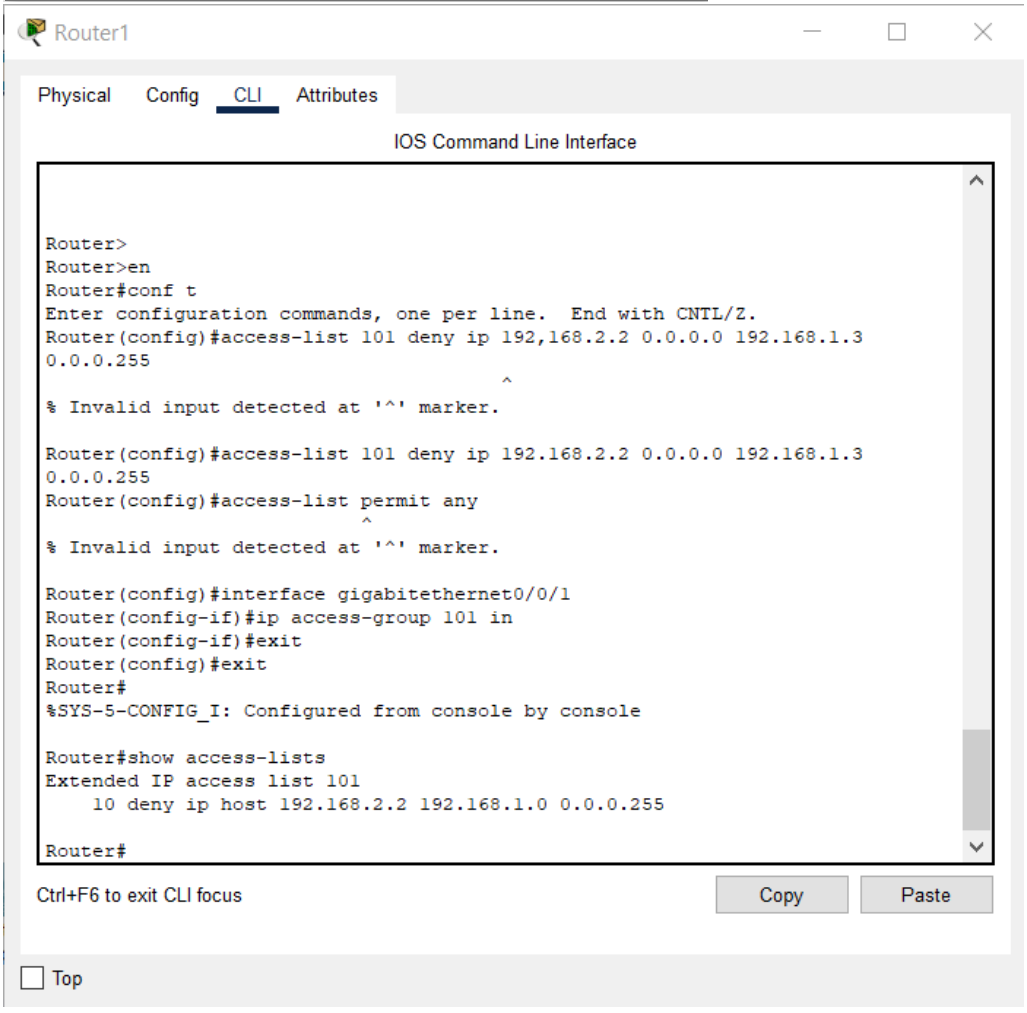

Laptop0
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
192.168.1.2
Subnet Mask
255.255.255.0
Default Gateway
192.168.1.1
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address
FE80::20B:BEFF:FEC2:A412
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Username
Password
Top

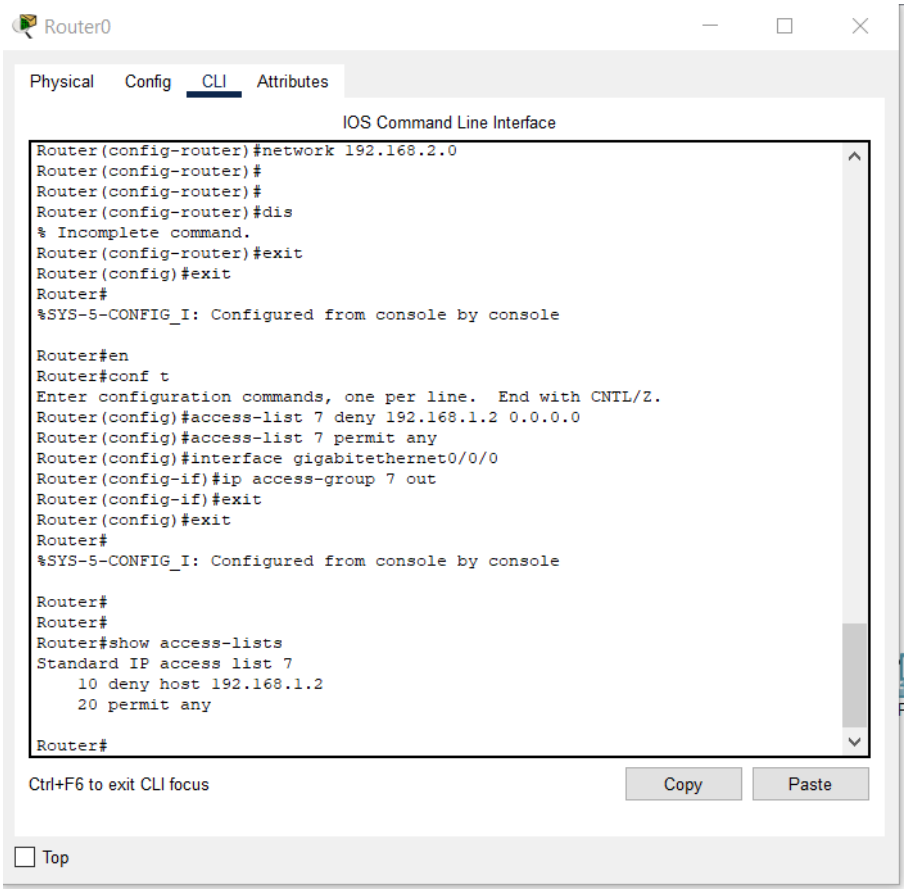

Router1
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
GigabitEthernet0/0/0
GigabitEthernet0/0/1
RIP Routing
Network
Add
Network Address
10.0.0.0
192.168.1.0
192.168.2.0
192.168.3.0
Remove
Equivalent IOS Commands
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/1, changed state to up
Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 192.168.3.0
Router(config-router)#
Top

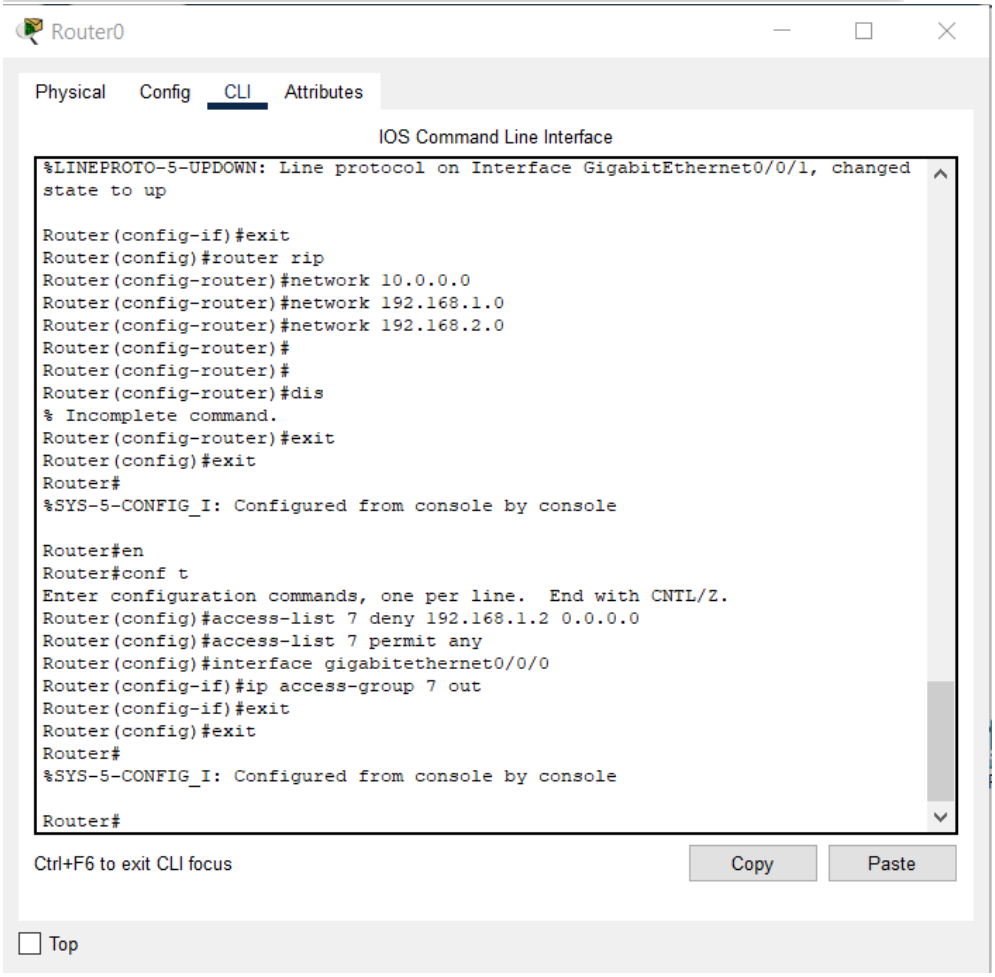

Router0
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
GigabitEthernet0/0/0
GigabitEthernet0/0/1
RIP Routing
Network
Add
Network Address
10.0.0.0
192.168.1.0
192.168.2.0
192.168.3.0
Remove
Equivalent IOS Commands
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/1, changed state to up
Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 192.168.3.0
Router(config-router)#
Top

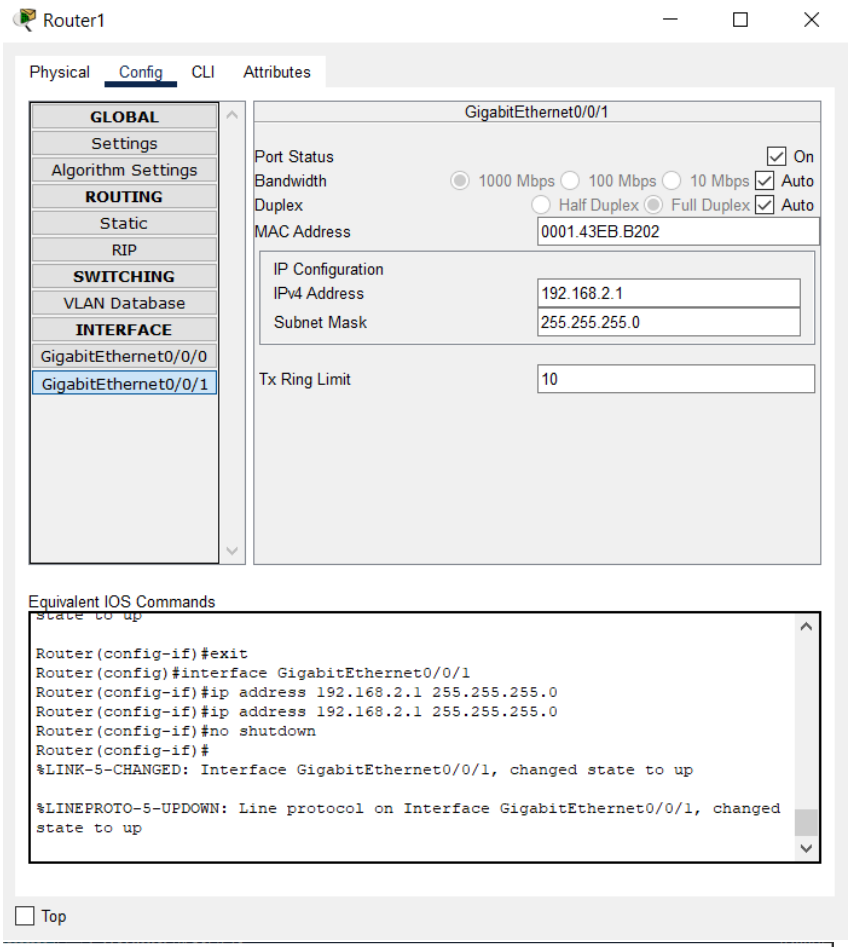

Router2
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
GigabitEthernet0/0/0
GigabitEthernet0/0/1
GigabitEthernet0/0/1
Port Status
On
Bandwidth
1000 Mbps
100 Mbps
10 Mbps
Auto
Duplex
Half Duplex
Full Duplex
Auto
MAC Address
0010.111C.2102
IP Configuration
IPv4 Address
10.0.0.3
Subnet Mask
255.0.0.0
Tx Ring Limit
10
Equivalent IOS Commands
Router(config-if)#ip address 192.168.3.1 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/0, changed state to up
Router(config-if)#exit
Router(config)#interface GigabitEthernet0/0/1
Router(config-if)#ip address 10.0.0.3 255.0.0.0
Router(config-if)#ip address 10.0.0.3 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/1, changed state to up
Top

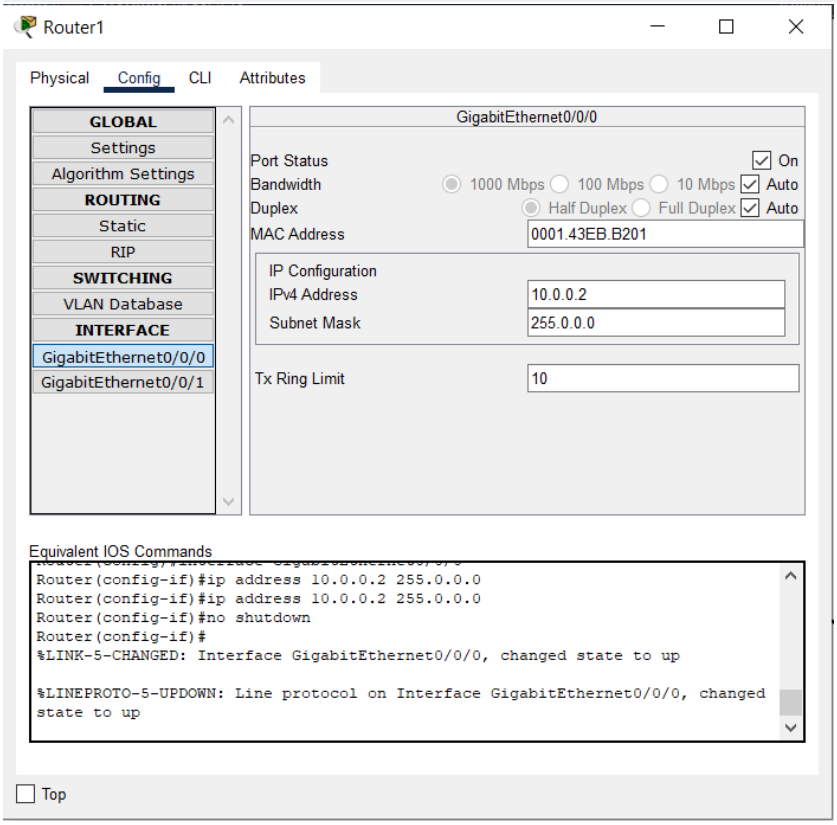

Router2
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
GigabitEthernet0/0/0
GigabitEthernet0/0/1
GigabitEthernet0/0/0
Port Status
On
Bandwidth
1000 Mbps
100 Mbps
10 Mbps
Auto
Duplex
Half Duplex
Full Duplex
Auto
MAC Address
0010.111C.2101
IP Configuration
IPv4 Address
192.168.3.1
Subnet Mask
255.255.255.0
Tx Ring Limit
10
Equivalent IOS Commands
Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface GigabitEthernet0/0/0
Router(config-if)#ip address 192.168.3.1 255.255.255.0
Router(config-if)#ip address 192.168.3.1 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/0, changed state to up
Top

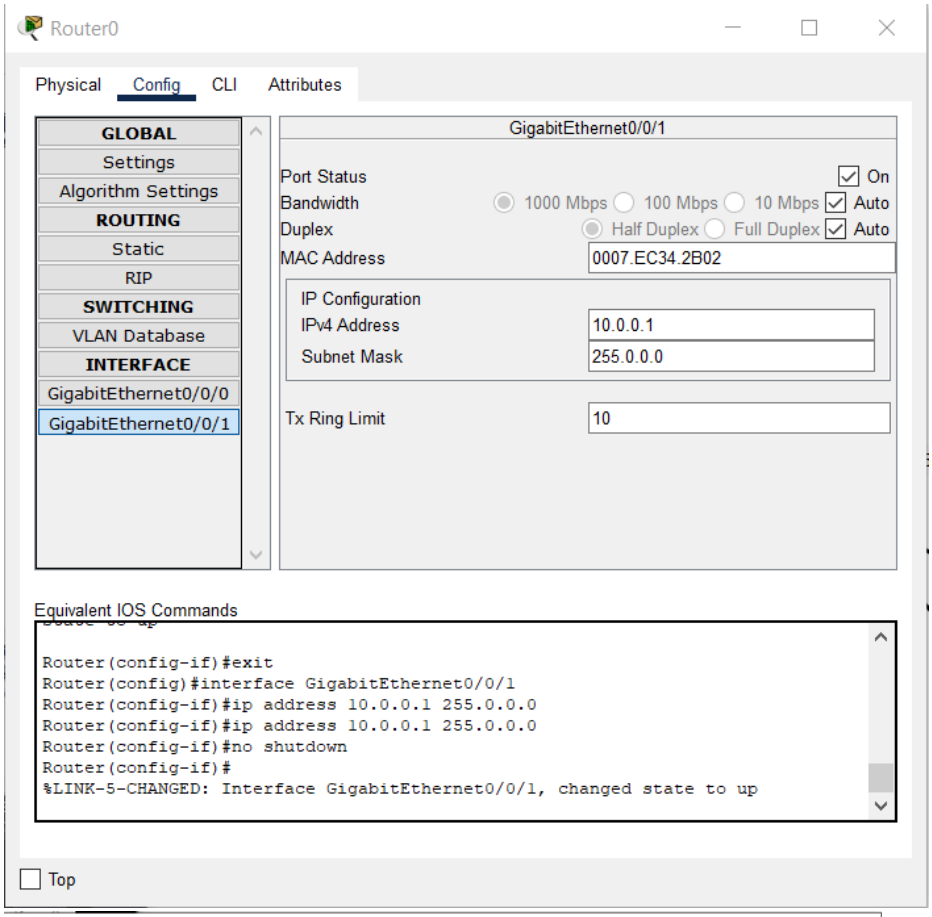

Router1
Physical
Config
CLI
Attributes
IOS Command Line Interface
Router>
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#access-list 101 deny ip 192,168.2.2 0.0.0.0 192.168.1.3
0.0.0.255
^
% Invalid input detected at '^' marker.
Router(config)#access-list 101 deny ip 192.168.2.2 0.0.0.0 192.168.1.3
0.0.0.255
Router(config)#access-list permit any
^
% Invalid input detected at '^' marker.
Router(config)#interface gigabitethernet0/0/1
Router(config-if)#ip access-group 101 in
Router(config-if)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#show access-lists
Extended IP access list 101
10 deny ip host 192.168.2.2 192.168.1.0 0.0.0.255
Router#
Ctrl+F6 to exit CLI focus
Copy
Paste
Top

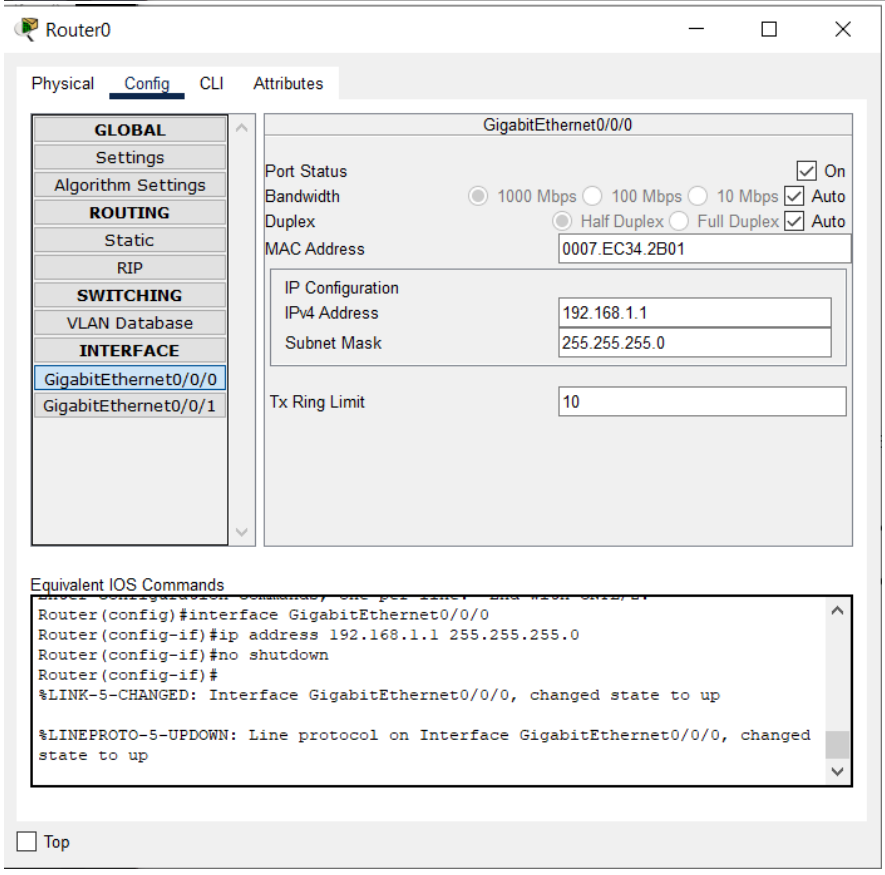

Router0
Physical
Config
CLI
Attributes
IOS Command Line Interface
Router(config-router)#network 192.168.2.0
Router(config-router)#
Router(config-router)#
Router(config-router)#dis
% Incomplete command.
Router(config-router)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#access-list 7 deny 192.168.1.2 0.0.0.0
Router(config)#access-list 7 permit any
Router(config)#interface gigabitethernet0/0/0
Router(config-if)#ip access-group 7 out
Router(config-if)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#
Router#
Router#show access-lists
Standard IP access list 7
10 deny host 192.168.1.2
20 permit any
Router#
Ctrl+F6 to exit CLI focus
Copy
Paste
Top

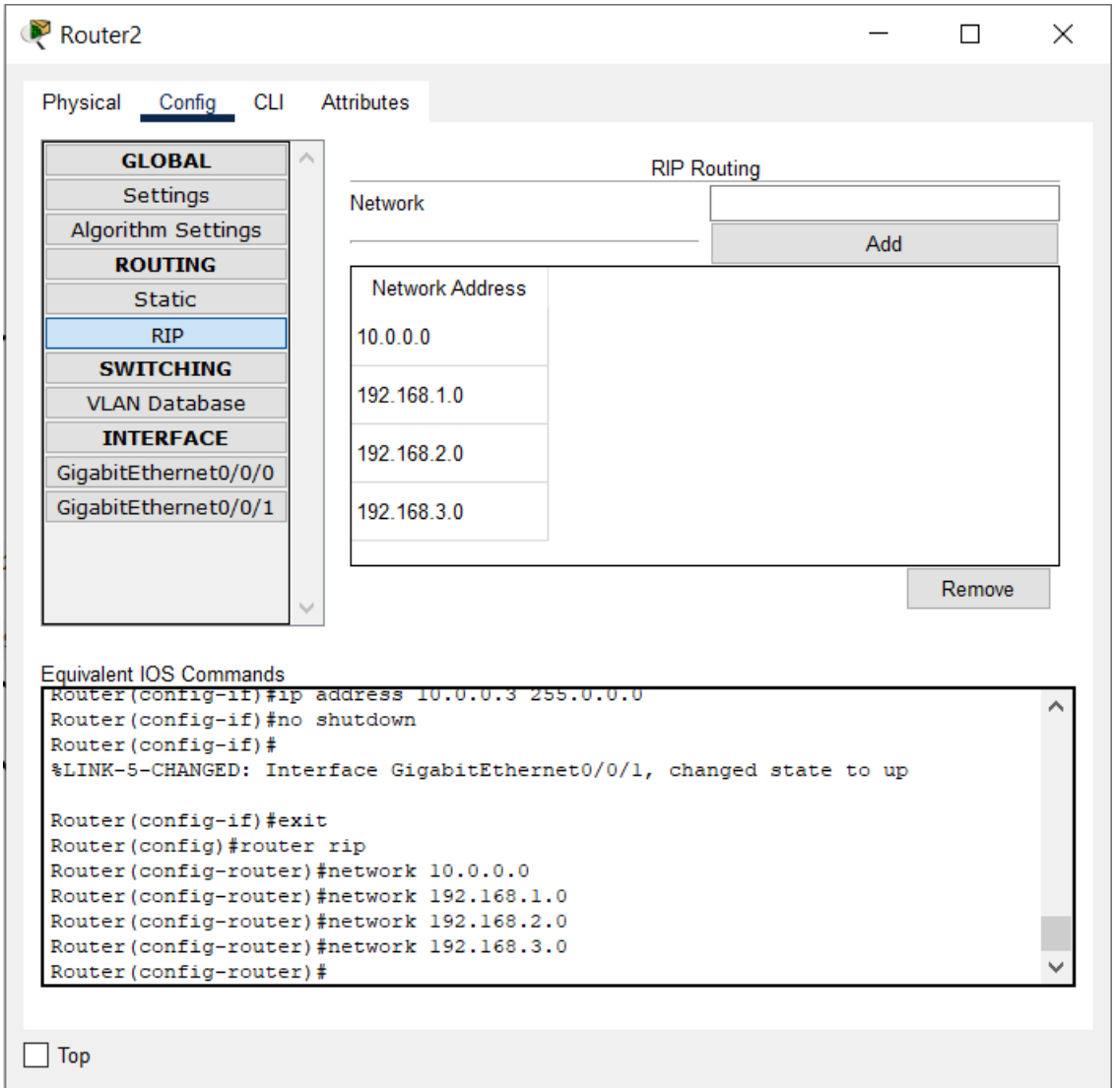

Router0
Physical
Config
CLI
Attributes
IOS Command Line Interface
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/1, changed state to up
Router(config-if)#exit
Router(config)#router rip
Router(config-router)#network 10.0.0.0
Router(config-router)#network 192.168.1.0
Router(config-router)#network 192.168.2.0
Router(config-router)#
Router(config-router)#
Router(config-router)#dis
% Incomplete command.
Router(config-router)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#access-list 7 deny 192.168.1.2 0.0.0.0
Router(config)#access-list 7 permit any
Router(config)#interface gigabitethernet0/0/0
Router(config-if)#ip access-group 7 out
Router(config-if)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#
Ctrl+F6 to exit CLI focus
Copy
Paste
Top


Router1
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
GigabitEthernet0/0/0
GigabitEthernet0/0/1
GigabitEthernet0/0/1
Port Status
On
Bandwidth
1000 Mbps
100 Mbps
10 Mbps
Auto
Duplex
Half Duplex
Full Duplex
Auto
MAC Address
0001.43EB.B202
IP Configuration
IPv4 Address
192.168.2.1
Subnet Mask
255.255.255.0
Tx Ring Limit
10
Equivalent IOS Commands
Router(config-if)#exit
Router(config)#interface GigabitEthernet0/0/1
Router(config-if)#ip address 192.168.2.1 255.255.255.0
Router(config-if)#ip address 192.168.2.1 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/1, changed state to up
Top


Router1
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
GigabitEthernet0/0/0
GigabitEthernet0/0/1
GigabitEthernet0/0/0
Port Status
On
Bandwidth
1000 Mbps
100 Mbps
10 Mbps
Auto
Duplex
Half Duplex
Full Duplex
Auto
MAC Address
0001.43EB.B201
IP Configuration
IPv4 Address
10.0.0.2
Subnet Mask
255.0.0.0
Tx Ring Limit
10
Equivalent IOS Commands
Router(config-if)#ip address 10.0.0.2 255.0.0.0
Router(config-if)#ip address 10.0.0.2 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/0, changed state to up
Top


Router0
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
GigabitEthernet0/0/0
GigabitEthernet0/0/1
GigabitEthernet0/0/1
Port Status
On
Bandwidth
1000 Mbps
100 Mbps
10 Mbps
Auto
Duplex
Half Duplex
Full Duplex
Auto
MAC Address
0007.EC34.2B02
IP Configuration
IPv4 Address
10.0.0.1
Subnet Mask
255.0.0.0
Tx Ring Limit
10
Equivalent IOS Commands
Router(config-if)#exit
Router(config)#interface GigabitEthernet0/0/1
Router(config-if)#ip address 10.0.0.1 255.0.0.0
Router(config-if)#ip address 10.0.0.1 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/1, changed state to up
Top


Router0
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
GigabitEthernet0/0/0
GigabitEthernet0/0/1
GigabitEthernet0/0/0
Port Status
On
Bandwidth
1000 Mbps
100 Mbps
10 Mbps
Auto
Duplex
Half Duplex
Full Duplex
Auto
MAC Address
0007.EC34.2B01
IP Configuration
IPv4 Address
192.168.1.1
Subnet Mask
255.255.255.0
Tx Ring Limit
10
Equivalent IOS Commands
Router(config)#interface GigabitEthernet0/0/0
Router(config-if)#ip address 192.168.1.1 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/0, changed state to up
Top




**Results:**

| Fire | Last Status | Source | Destination | Type | Color | Time(sec) | Periodic | Num | Edit | Delete |
|---|---|---|---|---|---|---|---|---|---|---|
| | Successful | Laptop0 | PC3 | ICMP | | 0.000 | N | 8 | (edit) | (delete) |
| | Successful | Server0 | Laptop0 | ICMP | | 0.000 | N | 9 | (edit) | (delete) |
| | Successful | PC3 | Laptop0 | ICMP | | 0.000 | N | 10 | (edit) | (delete) |

| Fire | Last Status | Source | Destination | Type | Color | Time(sec) | Periodic | Num | Edit | Delete |
|---|---|---|---|---|---|---|---|---|---|---|
| | Failed | PC1 | Laptop0 | ICMP | | 0.000 | N | 6 | (edit) | (delete) |
| | Successful | PC3 | Laptop0 | ICMP | | 0.000 | N | 7 | (edit) | (delete) |
| | Successful | Laptop0 | PC3 | ICMP | | 0.000 | N | 8 | (edit) | (delete) |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Failed | PC0 | Laptop0 | ICMP | | 0.000 | N | 5 | (edit) | (delete) |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Successful | Server0 | Router0 | ICMP | | 0.000 | N | 3 | (edit) | (delete) |
| | Successful | Laptop0 | Router0 | ICMP | | 0.000 | N | 4 | (edit) | (delete) |

| Fire | Last Status | Source | Destination | Type | Color | Time(sec) | Periodic | Num | Edit | Delete |
|---|---|---|---|---|---|---|---|---|---|---|
| | Successful | Laptop0 | Router0 | ICMP | | 0.000 | N | 0 | (edit) | (delete) |
| | Successful | PC3 | Laptop0 | ICMP | | 0.000 | N | 1 | (edit) | (delete) |
| | Successful | PC0 | PC2 | ICMP | | 0.000 | N | 2 | (edit) | (delete) |

| Fire | Last Status | Source | Destination | Type | Color | Time(sec) | Periodic | Num | Edit | Delete |
|---|---|---|---|---|---|---|---|---|---|---|
| | Failed | Server0 | PC0 | ICMP | | 0.000 | N | 0 | (edit) | (delete) |
| | Failed | PC0 | Server0 | ICMP | | 0.000 | N | 1 | (edit) | (delete) |

**Inference:**

Access Control Lists (ACL) are used to filter network traffic on Cisco routers. In order to filter network traffic, ACLs control if routed packets have to be forwarded or blocked at the ingress or egress router interface. The router checks each packet to determine whether to forward or drop the packet based on the criteria specified in the ACL applied to the interface.

# IP ACL types

Two types of IP ACL can be configured in Cisco Packet Tracer 7.2 :

- Standard ACLs : This is the oldest ACL type which can be configured on Cisco routers. Traffic is filtered based on the source IP address of IP packets. The access-list number can be any number from 1 to 99. This kind of ACL has to be placed near the destination to avoid blocking legitimate trafic from the source.

```
access-list 1 permit 10.2.25.0 0.0.0.255
access-list 1 deny any
```

- Extended ACLs : Introduced in IOS version 8.3, the extended ACLs are more complex and allow filtering of the IP traffic based on a combination of multiple criterias : source IP address, destination IP address, TCP or UDP port, protocol, .... In numbered ACLs, the access-list number can be any number from 100 to 199 or 2000 to 2699 (available in IOS versions >12.0.1). Such ACLs can also be named access lists in which the ACL number is replaced by a keyword. This kind of ACL has to be placed near the source as it allows fine grained control to ressources accessed. Placing the ACL near the destination will make the trafic travel through the network before beeing blocked, resulting in bandwidth waste.

```
access-list 1 permit ip 10.2.25.0 0.0.0.255 10.1.0.0 0.0.255.255
access-list 101 permit icmp any 10.1.0.0 0.0.255.255 echo
access-list 1 deny ip any any
```

A wildcard mask is a mask of bits that indicates which parts of an IP address are available for examination. In the Cisco IOS, they are used in several places, for example:

- To indicate the size of a network or subnet for some routing protocols, such as OSPF.
- To indicate what IP addresses should be permitted or denied in access control lists (ACLs).

A wildcard mask can be thought of as an inverted subnet mask. For example, a subnet mask of 255.255.255.0 (binary equivalent = 11111111.11111111.11111111.00000000) inverts to a wildcard mask of 0.0.0.255 (binary equivalent = 00000000.00000000.00000000.11111111).

A wild card mask is a matching rule.[2] The rule for a wildcard mask is:

- 0 means that the equivalent bit must match
- 1 means that the equivalent bit does not matter

Any wildcard bit-pattern can be masked for examination. For example, a wildcard mask of 0.0.0.254 (binary equivalent = 00000000.00000000.00000000.11111110) applied to IP address 10.10.10.2 (00001010.00001010.00001010.00000010) will match even-numbered IP addresses 10.10.10.0, 10.10.10.2, 10.10.10.4, 10.10.10.6 etc. Same mask applied to 10.10.10.1 (00001010.00001010.00001010.00000001) will match odd-numbered IP addresses 10.10.10.1, 10.10.10.3, 10.10.10.5 etc.

A network and wildcard mask combination of 1.1.1.1 0.0.0.0 would match an interface configured exactly with 1.1.1.1 only, and nothing else.

Wildcard masks are used in situations where subnet masks may not apply. For example, when two affected hosts fall in different subnets, the use of a wildcard mask will group them together.

**CONCLUSION:**

**ACCESS CONTROL LOSTS HAVE BEEN SUCCESFULLY IMPLEMENTED IN CISCO PACKET TRACER.**