Jayathilaka H.A.D.T.T.

E/16/156

CO513 - Lab 03

Dynamic Routing - RIP

A. Specify the differences between RIPv1 and RIPv2

RIPv1	RIPv2
RIPv1 is a Distance-Vector Routing protocol.	RIPv2 is also Distance-Vector Routing Protocol.
It does not support for authentications.	It support for authentications.
It does not support for VLSM and discontinuous networks.	It supports for VLSM and discontinuous networks.
RIPv1 use Broadcast traffic for updates.	RIPv2 use Multicast traffic for updates.
RIPV1 not send subnet mask to routing table.	RIPv2 send subnet mask to routing table.
It can supports class full network only.	It can support class full and classless networks.
It is less secure.	It is more secure.
RIPV1 does not provide trigger updates.	RIPv2 provides trigger updates.

B.

01. (Note: As you can see here, we have used the concept of VLSM to configure networks A, B and C) .

Network A

P 0	192.168.1.1/26
PC1	192.168.1.2/26
PC2	192.168.1.3/26

Network B

PC3	192.168.1.66/26
PC4	192.168.1.67/26
PC5	192.168.1.68/26

Network C		Network D	
PC6	192.168.1.129/26	PC9	20.1.1.1/16
PC7	192.168.1.130/26	PC10	20.1.1.2/16
PC8	192.168.1.131/26	PC11	20.1.1.3/16

02. Draw similar network topology given in Figure 01, using packet tracer and do the IP configurations for each of the devices (PCs, router ports) considering Table 01.

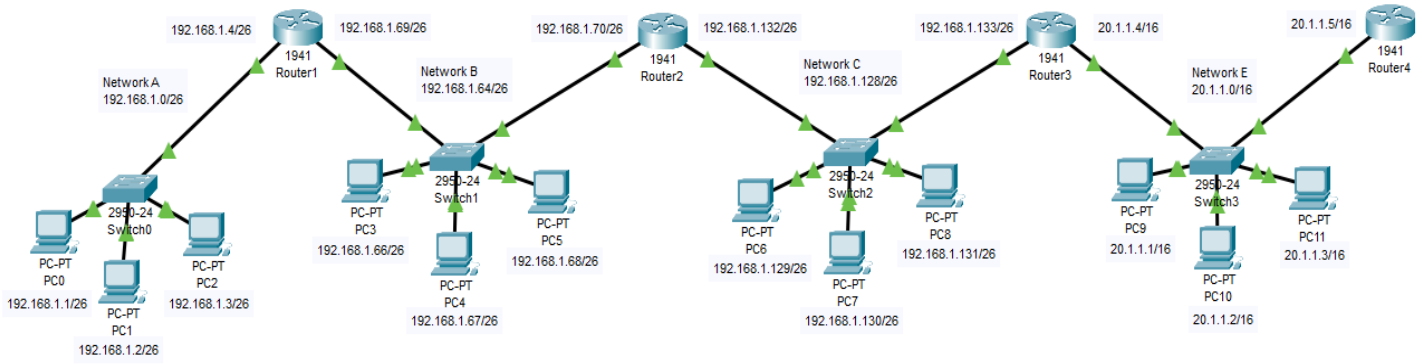


Figure 2.1.1.

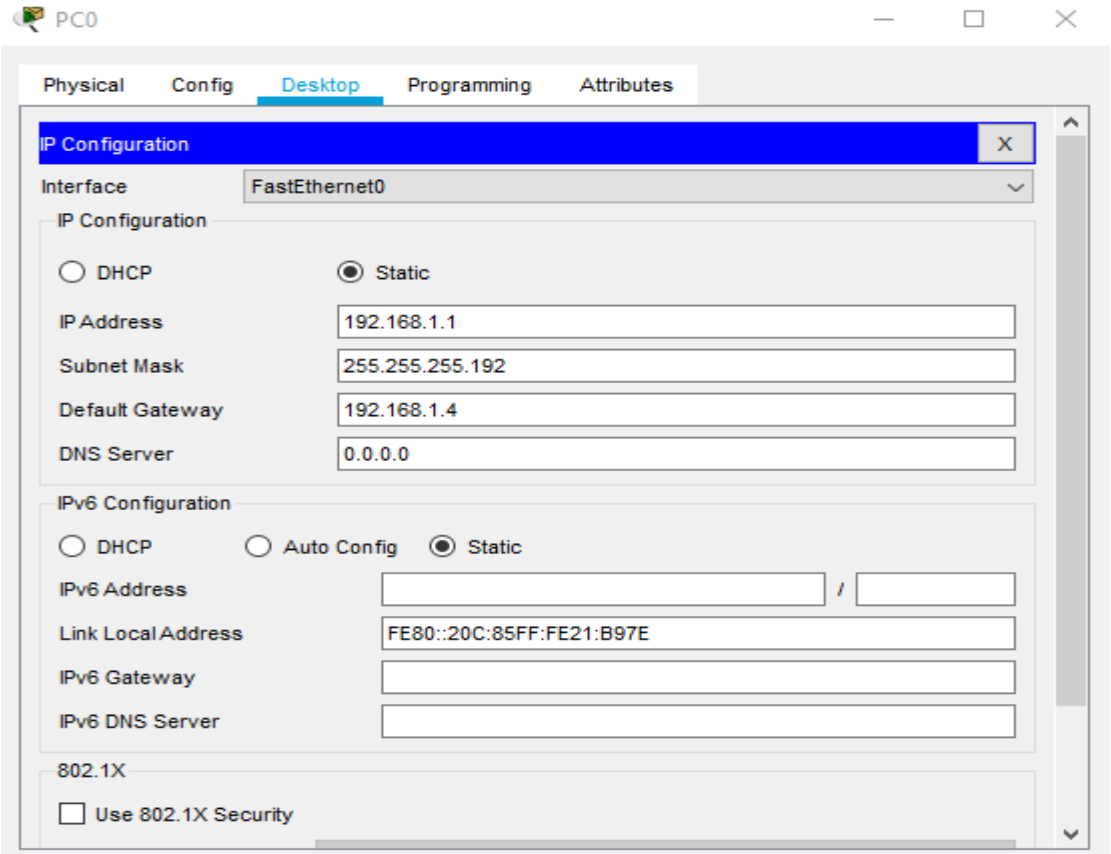


Figure 2.2.1.

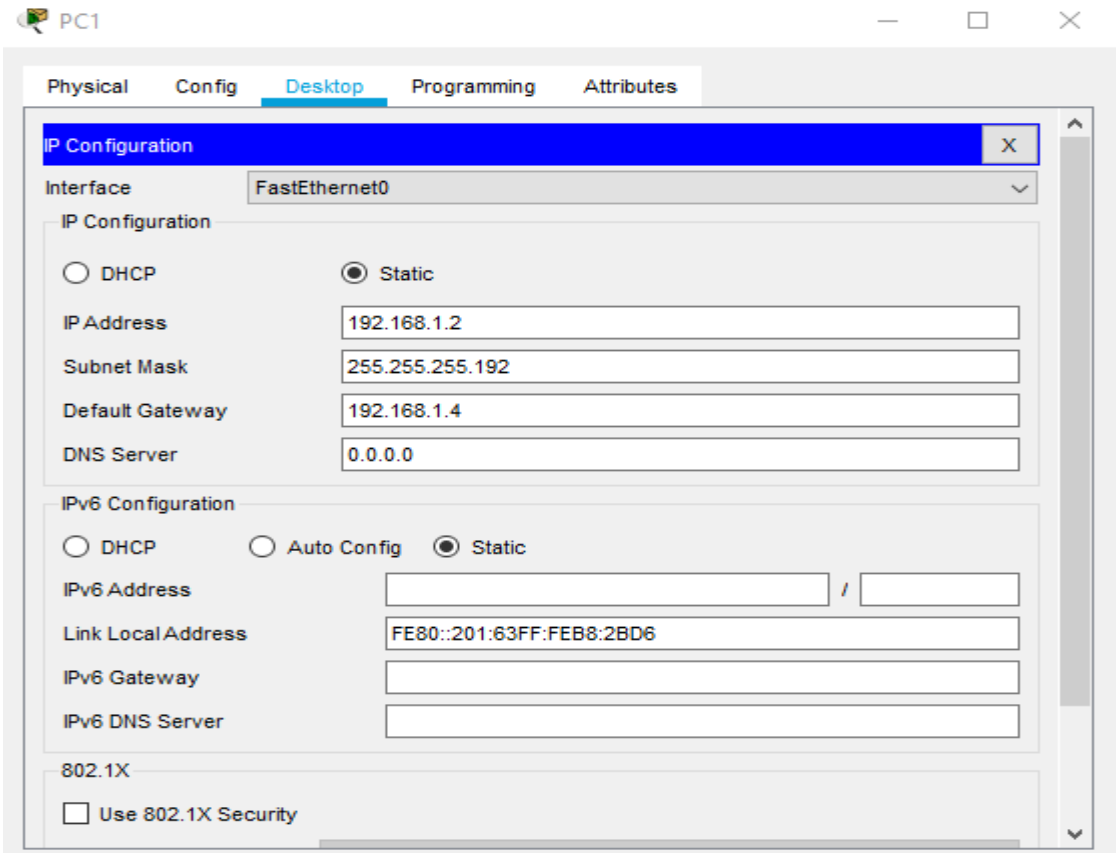


Figure 2.2.2.

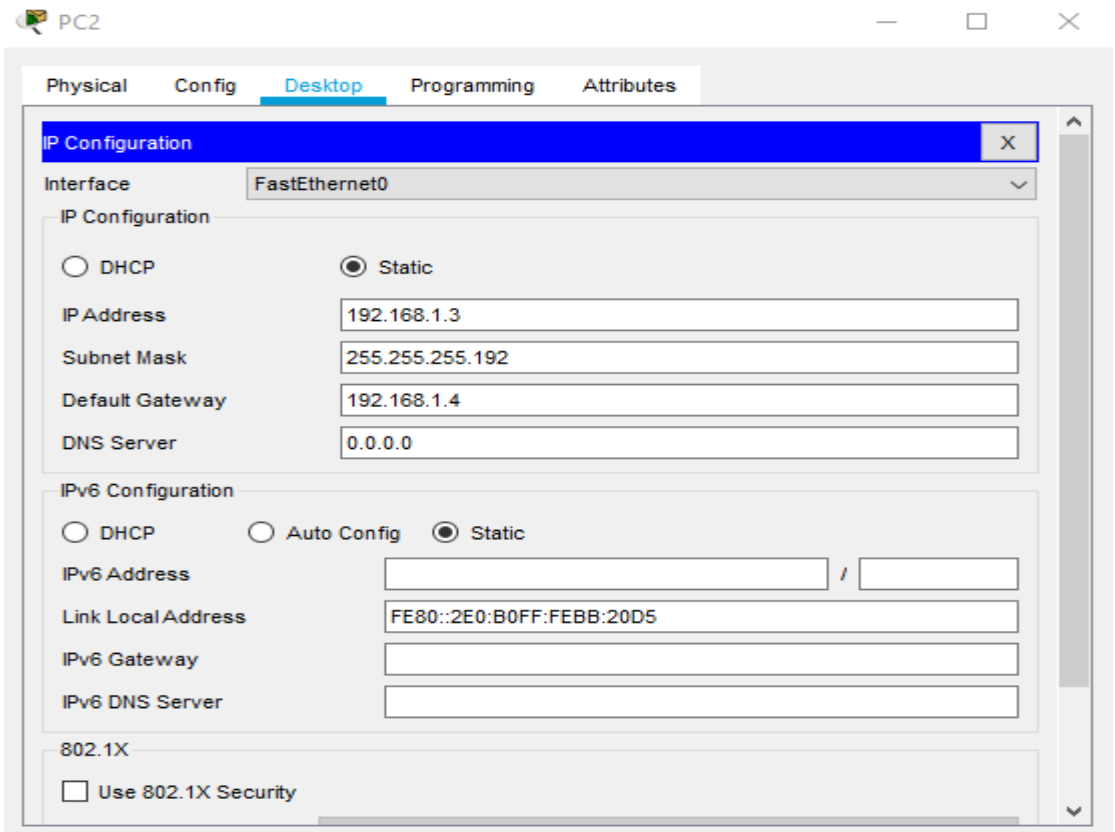


Figure 2.2.3.

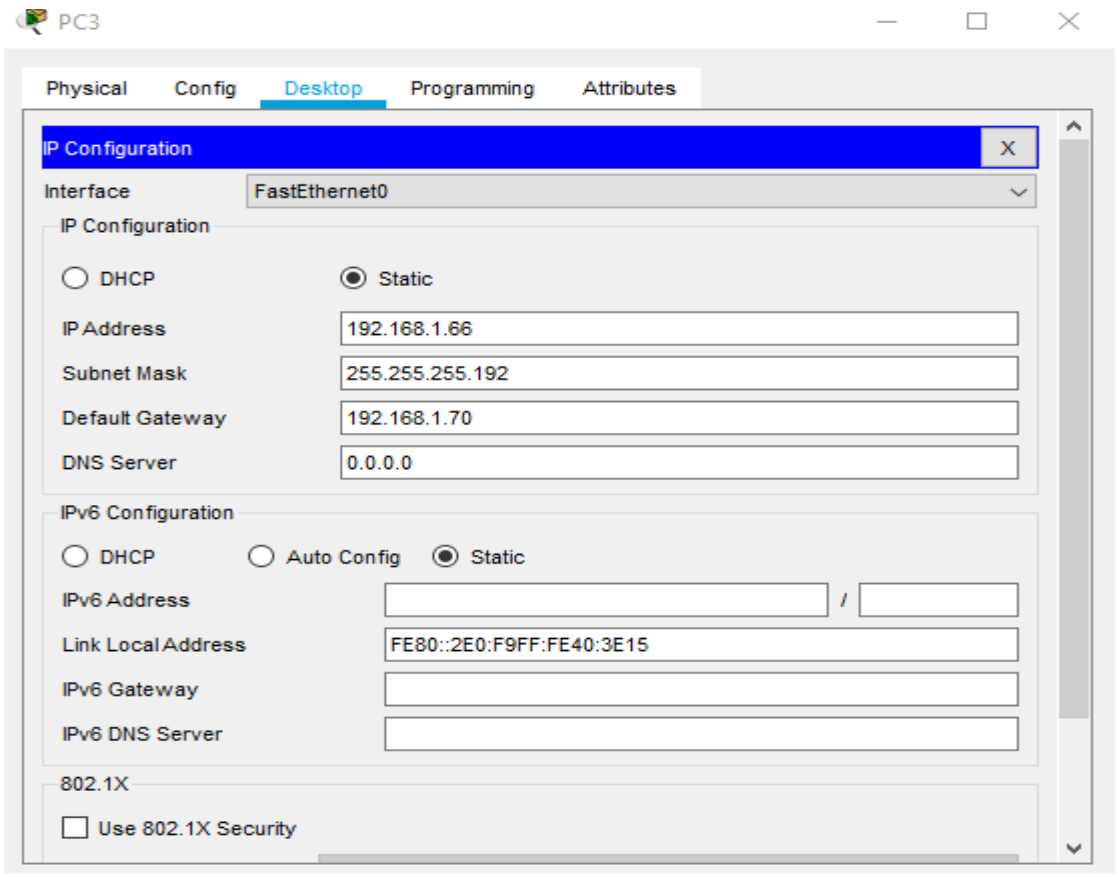


Figure 2.2.4.

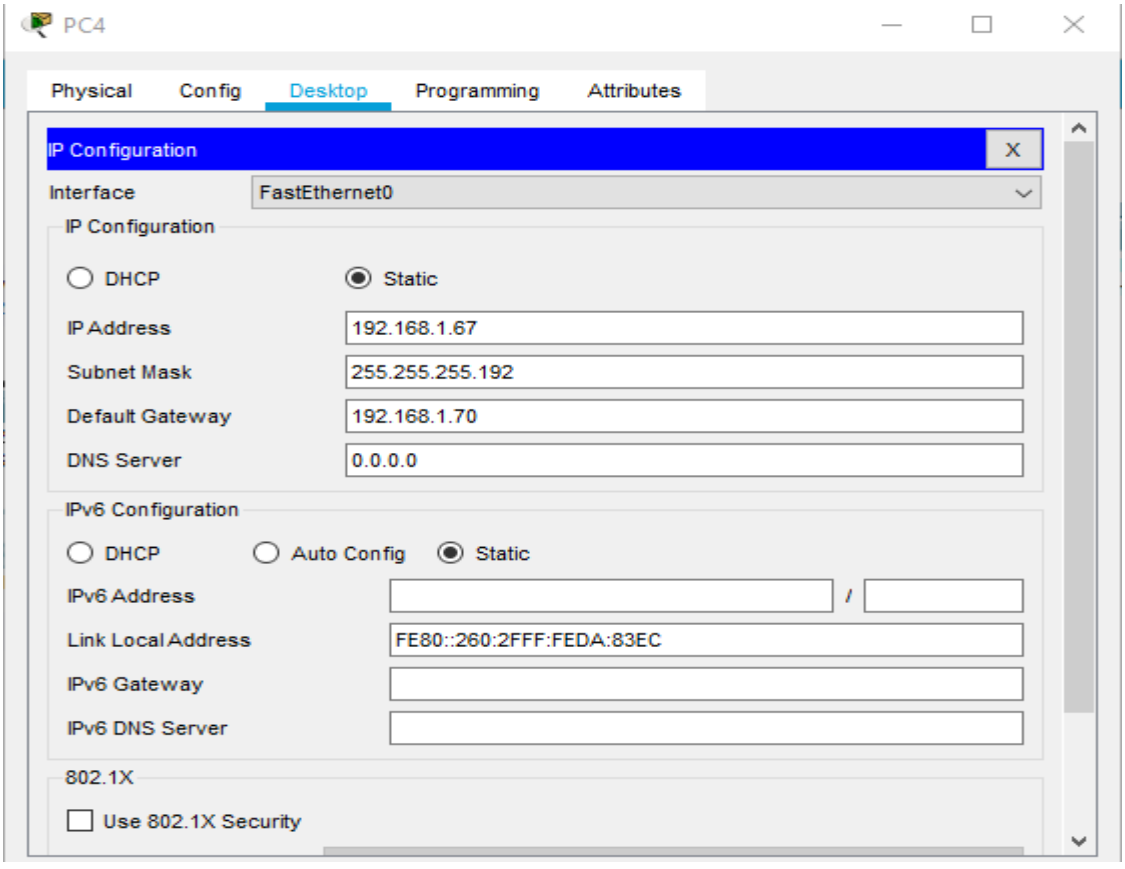


Figure 2.2.5.

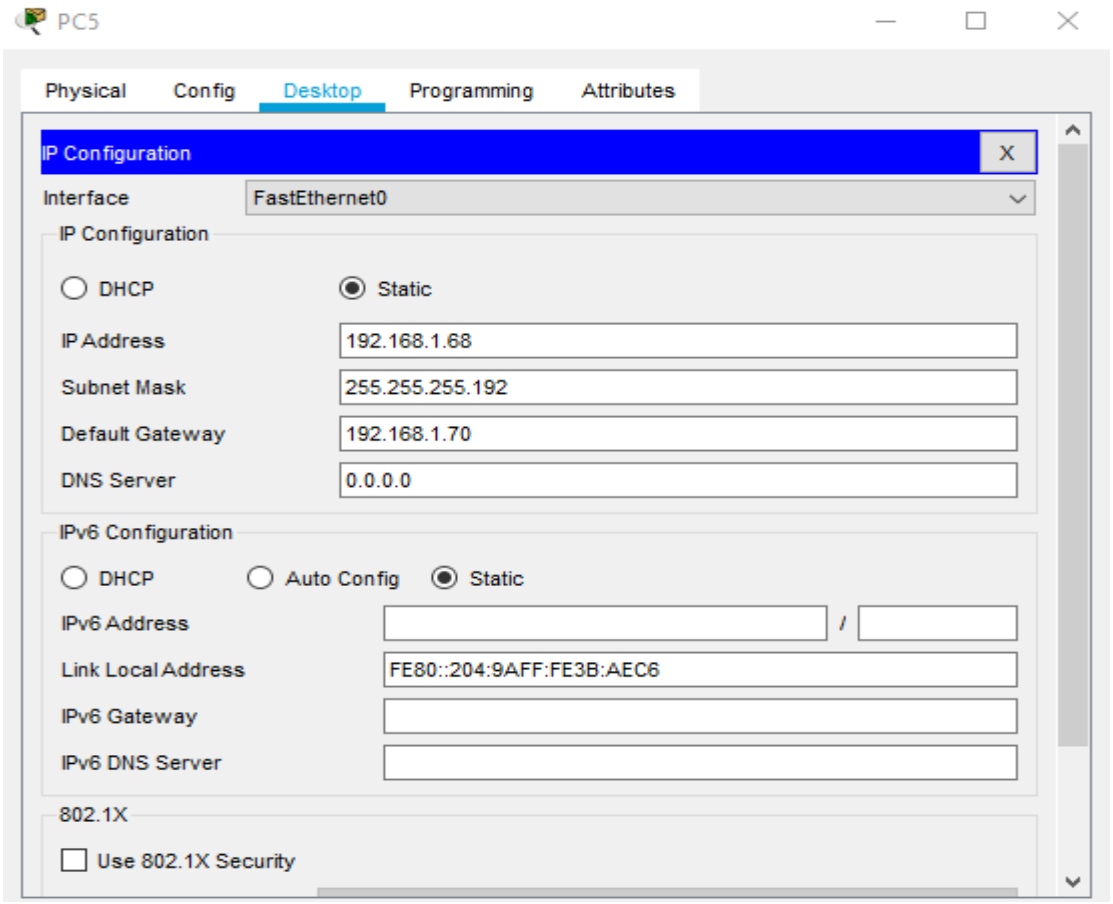


Figure 2.2.6.

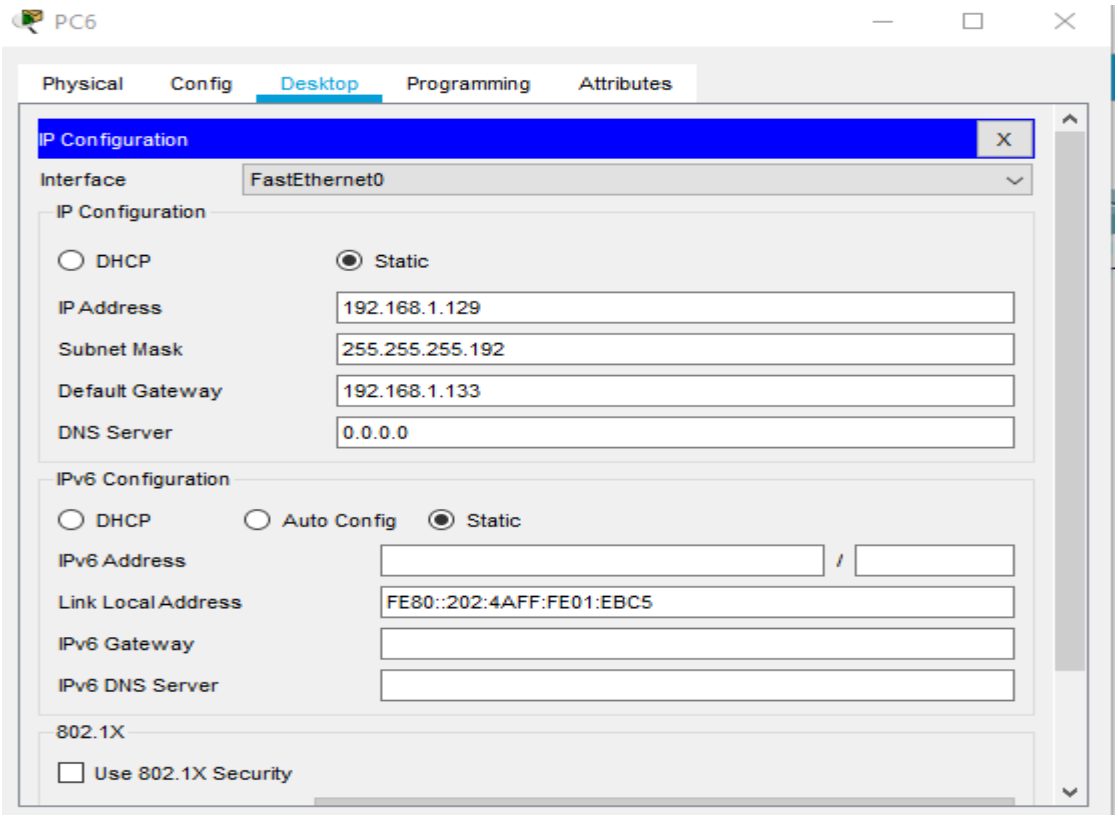


Figure 2.2.7.

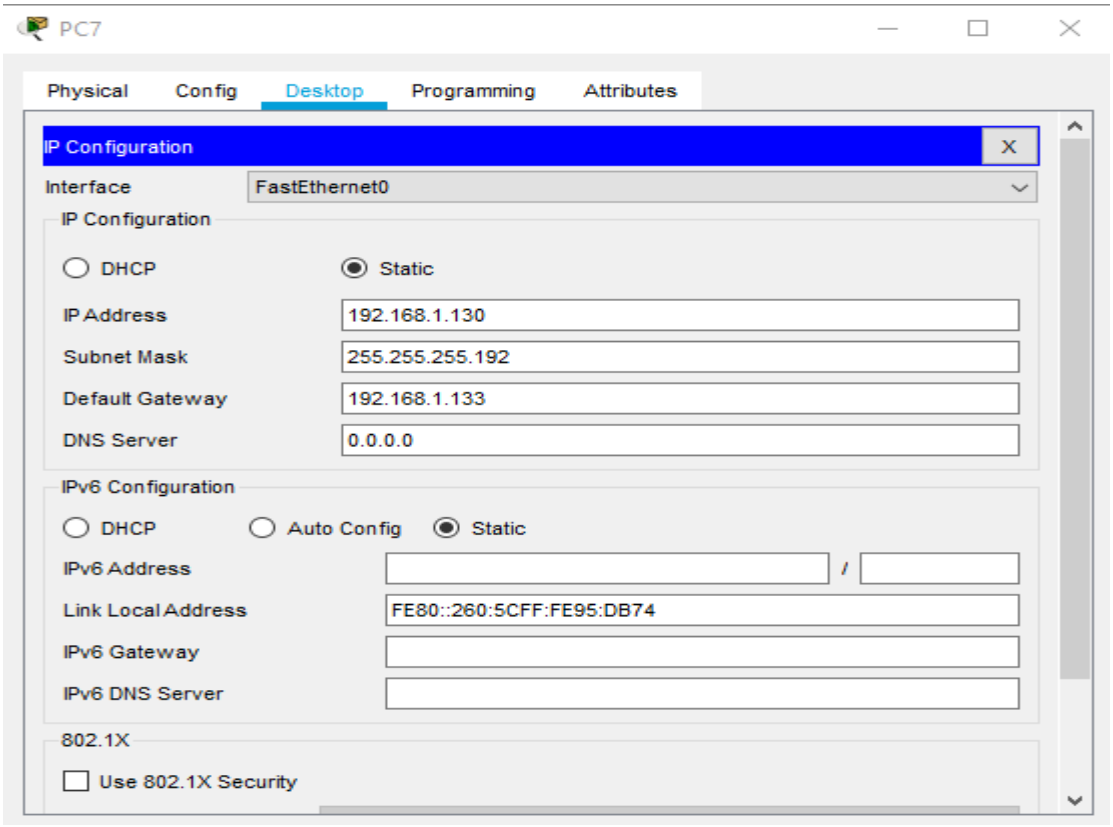


Figure 2.2.8.

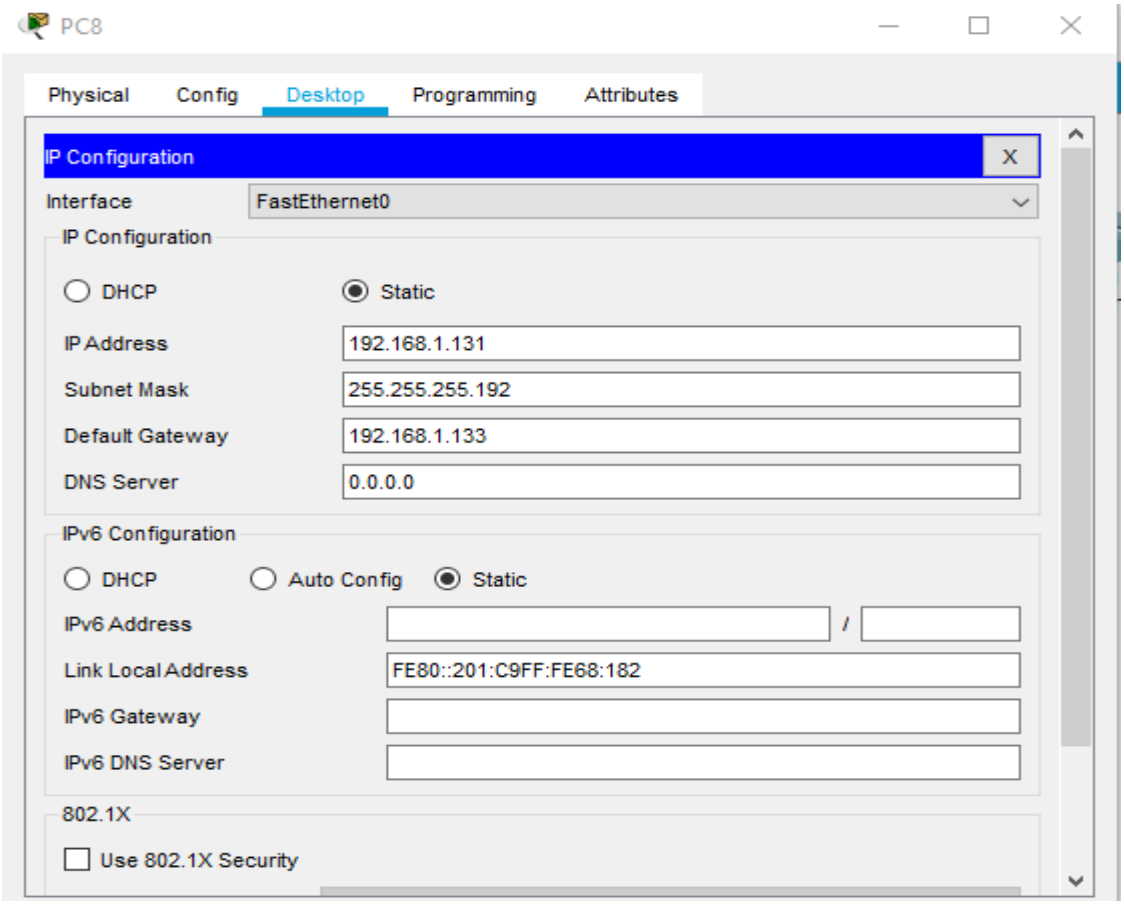


Figure 2.2.9.

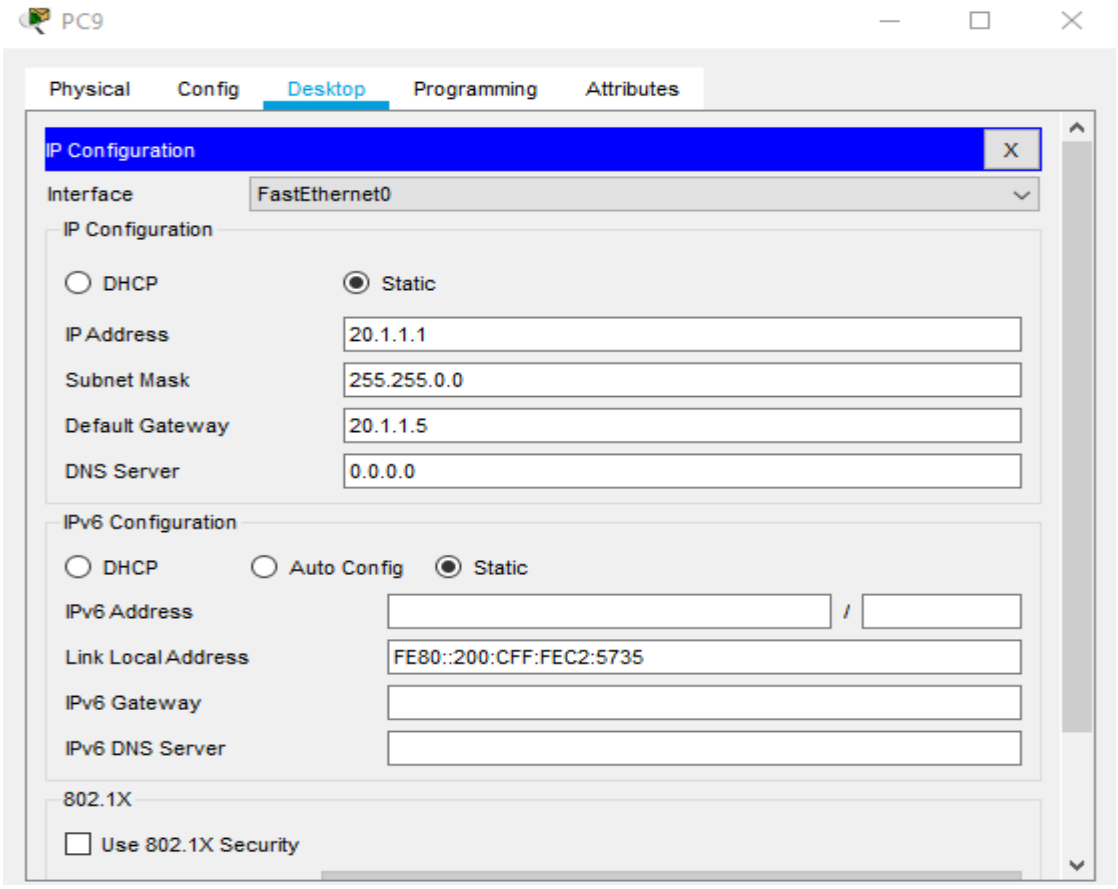


Figure 2.2.10.

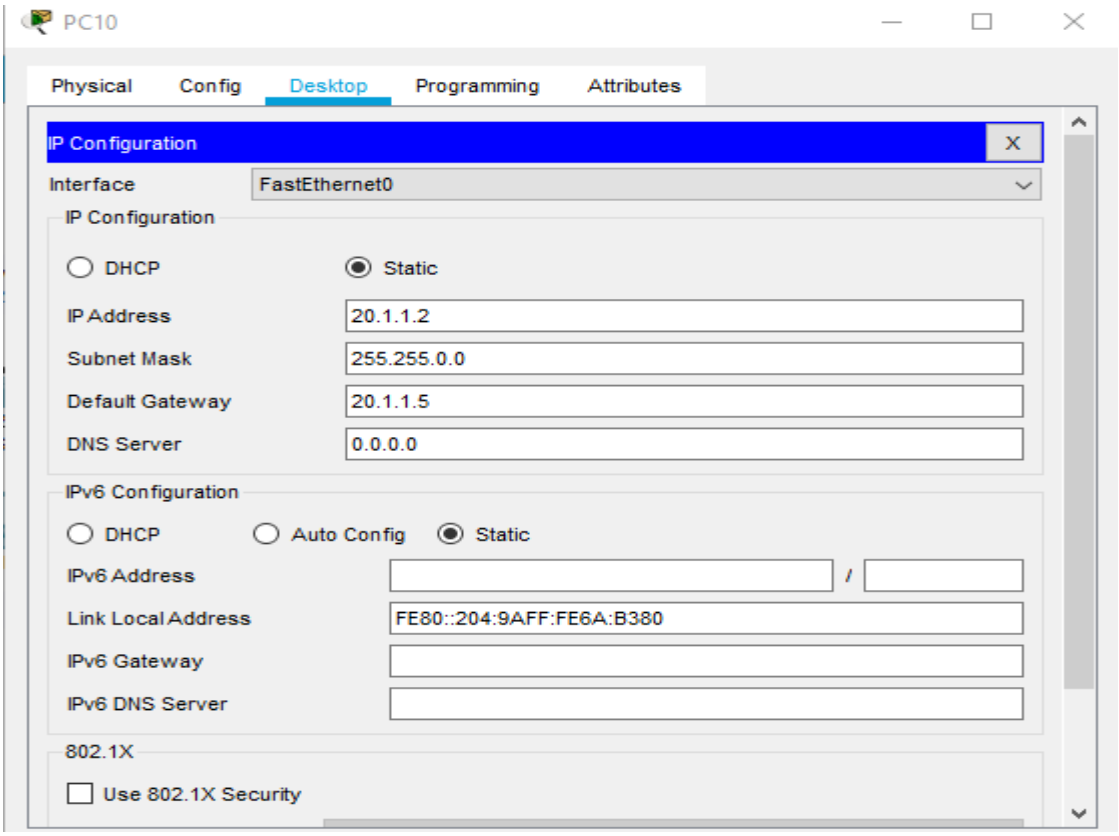


Figure 2.2.11.

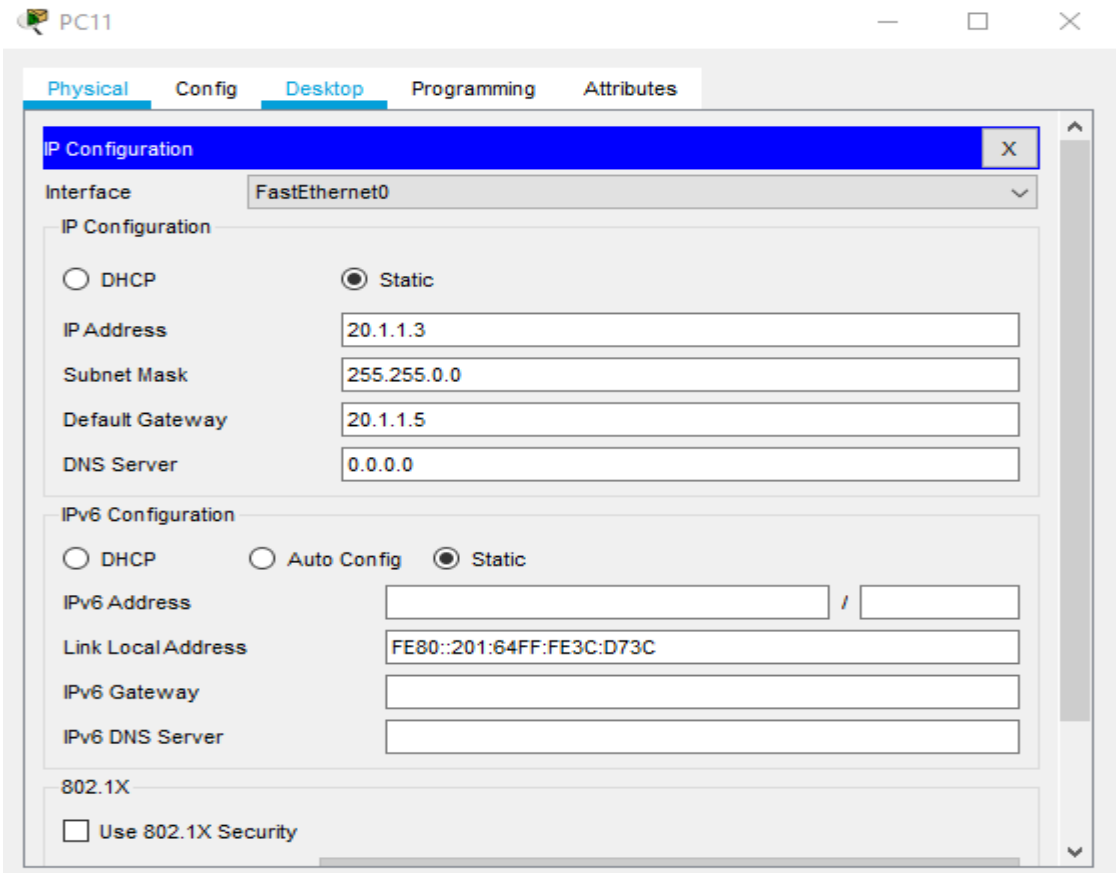


Figure 2.2.12.

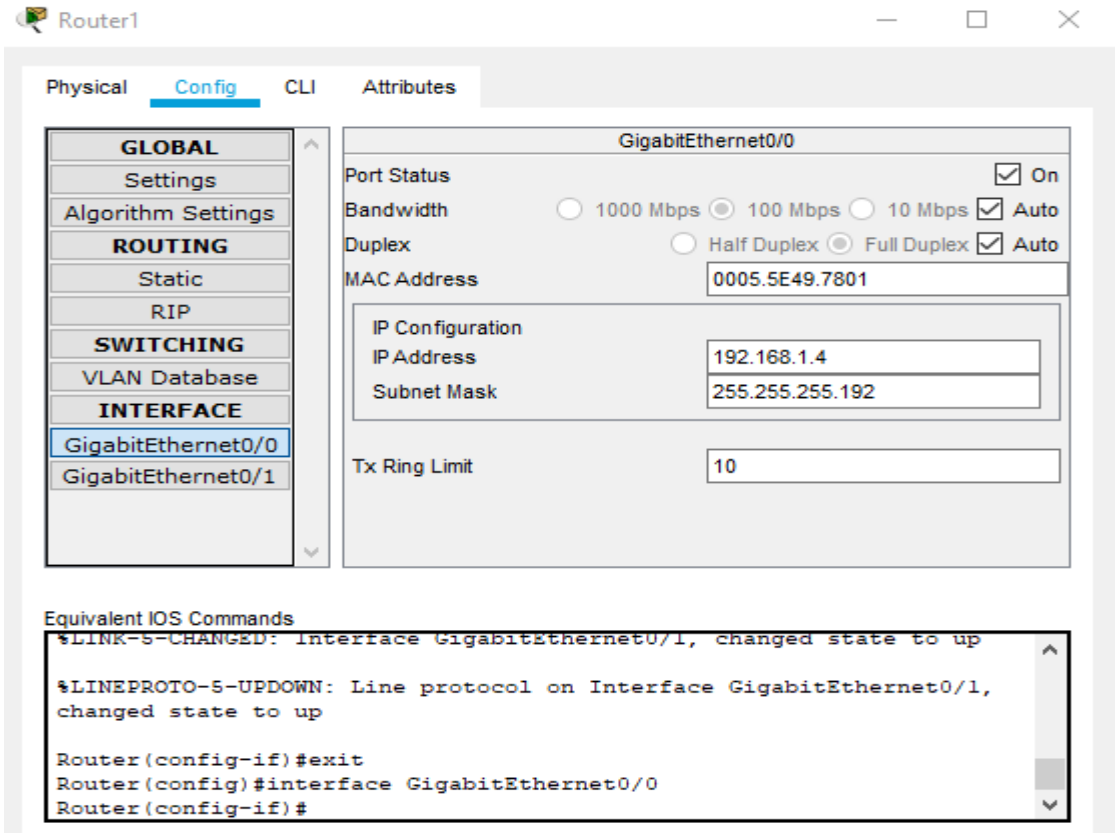


Figure 2.2.13.

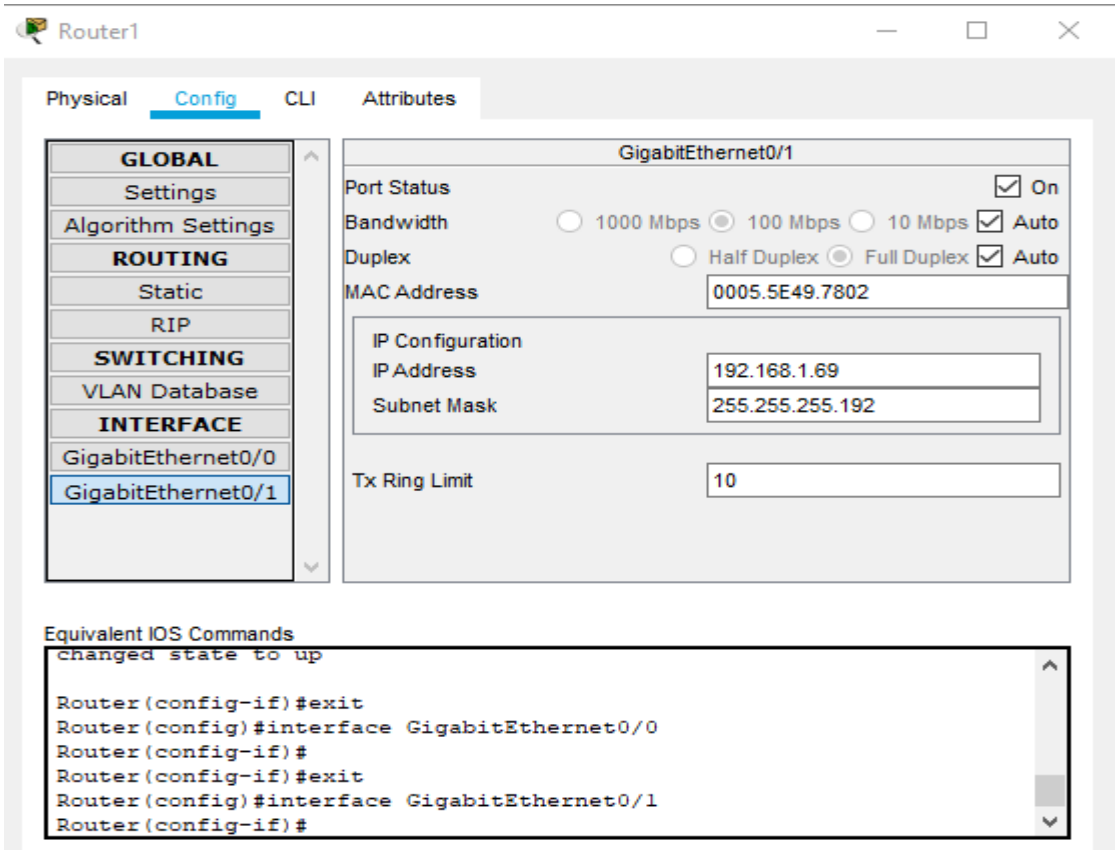


Figure 2.2.14.

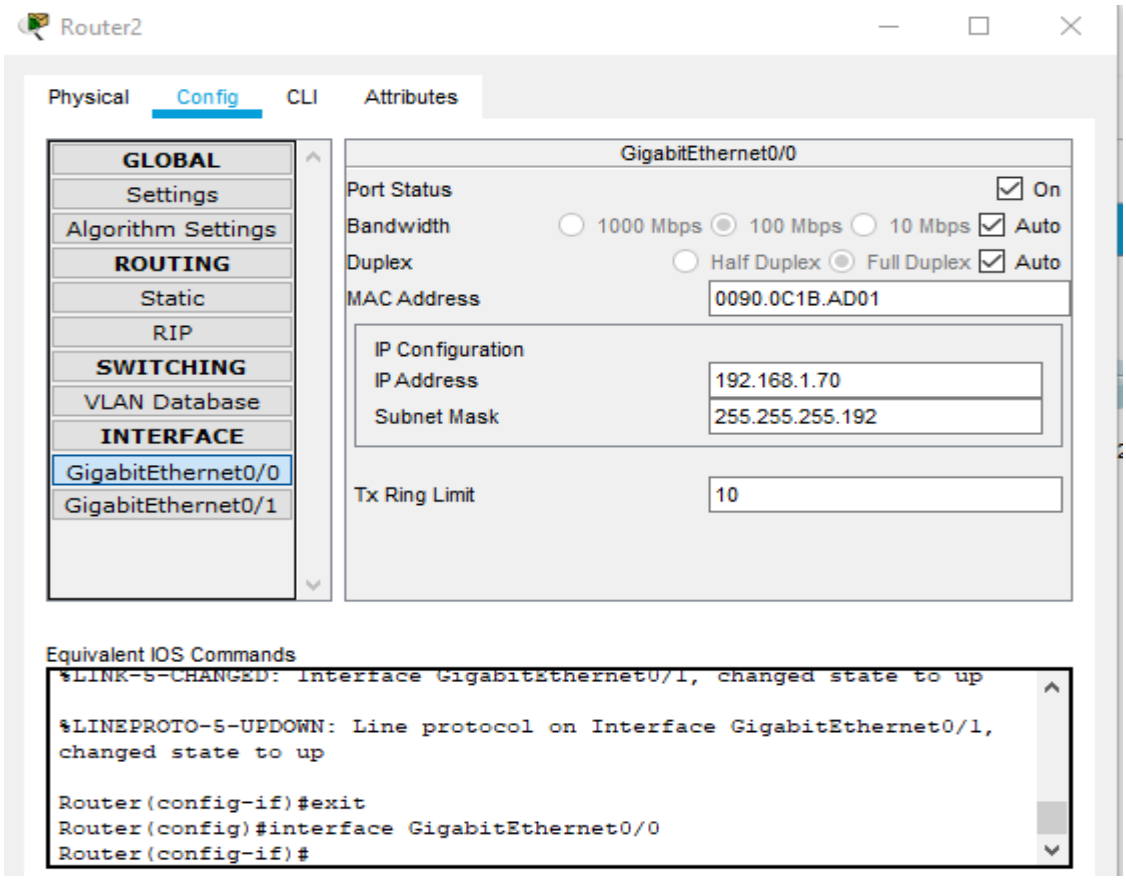


Figure 2.2.15.

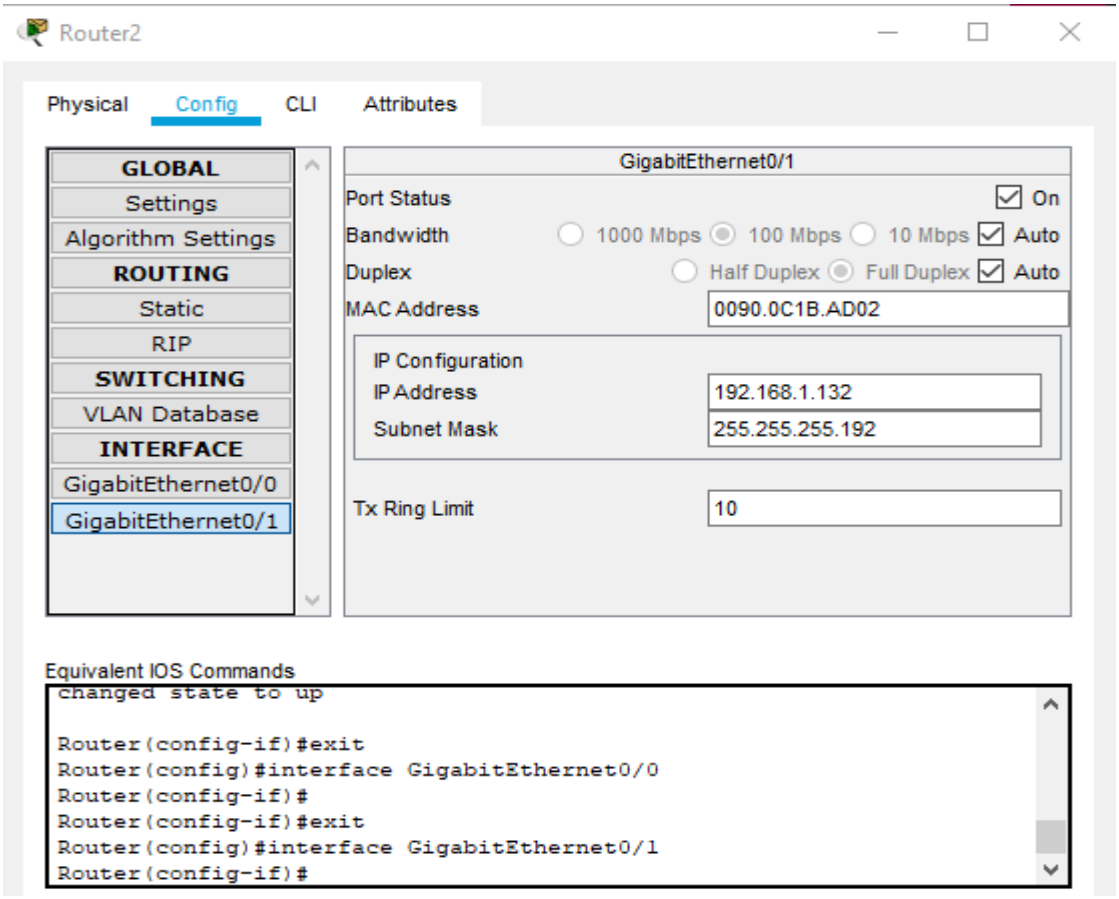


Figure 2.2.16.

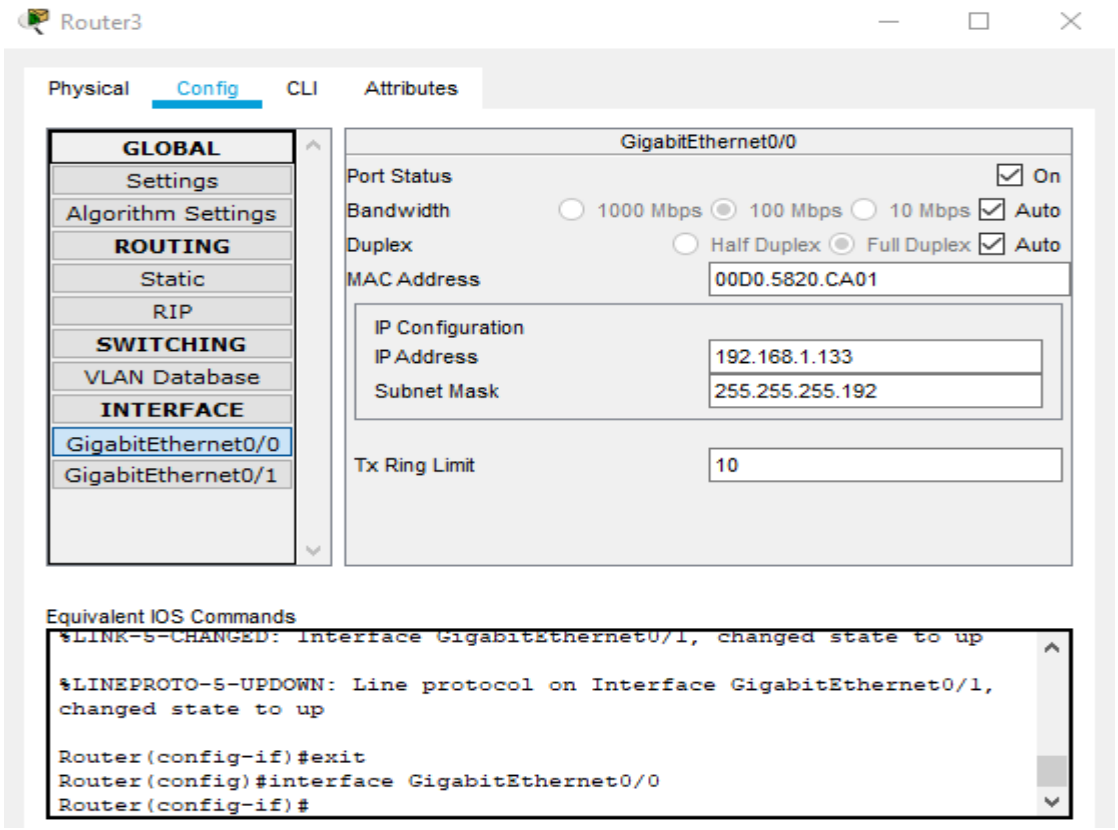


Figure 2.2.17.

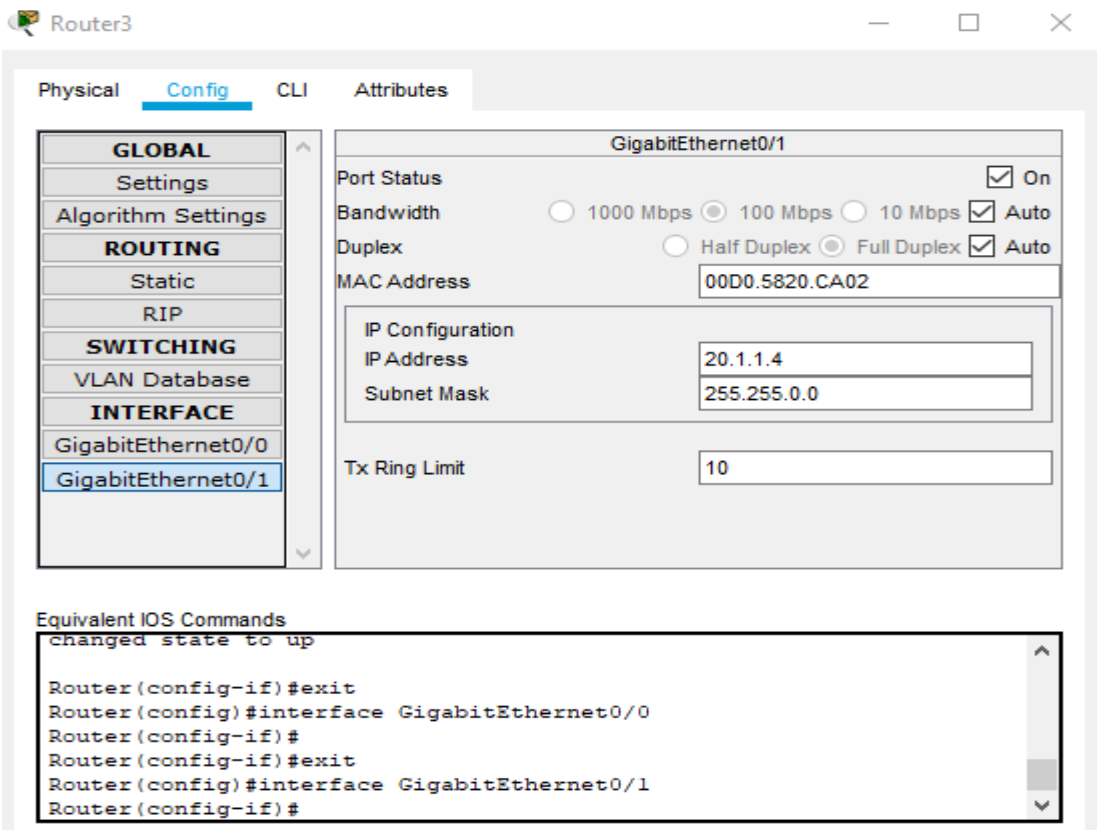


Figure 2.2.18.

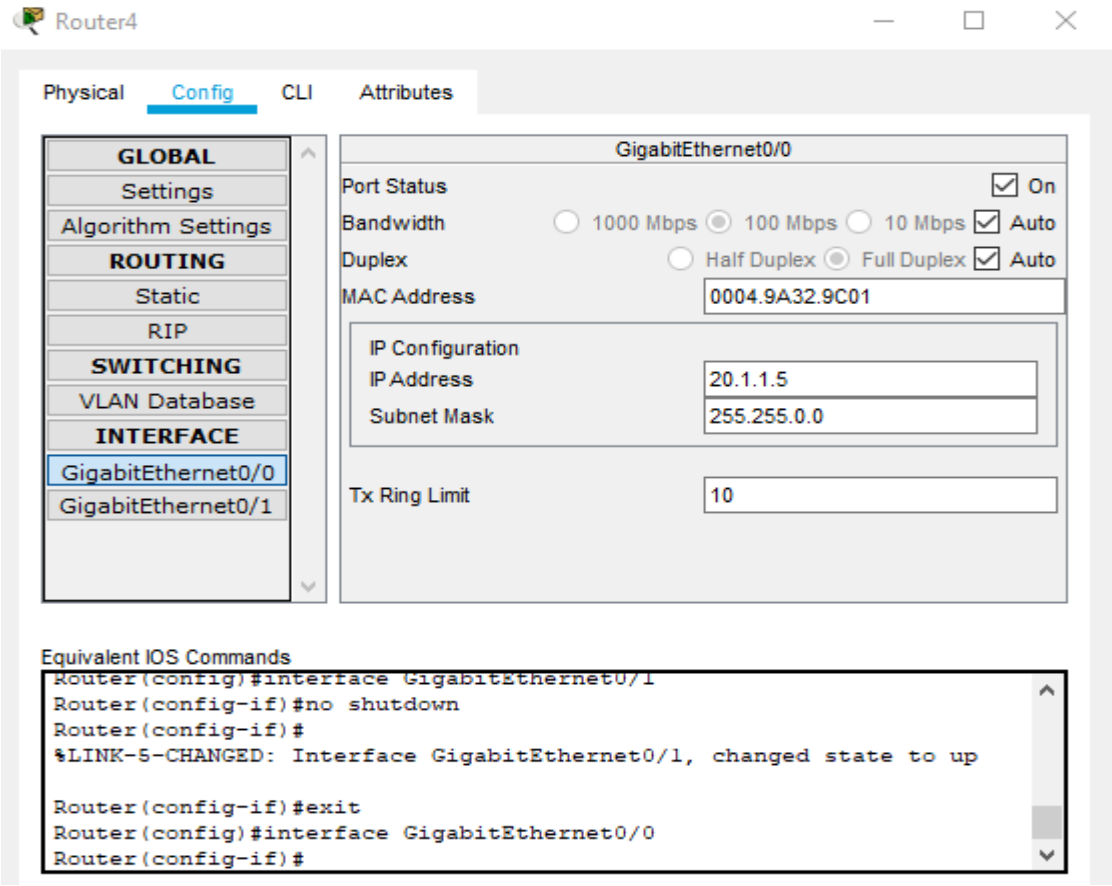
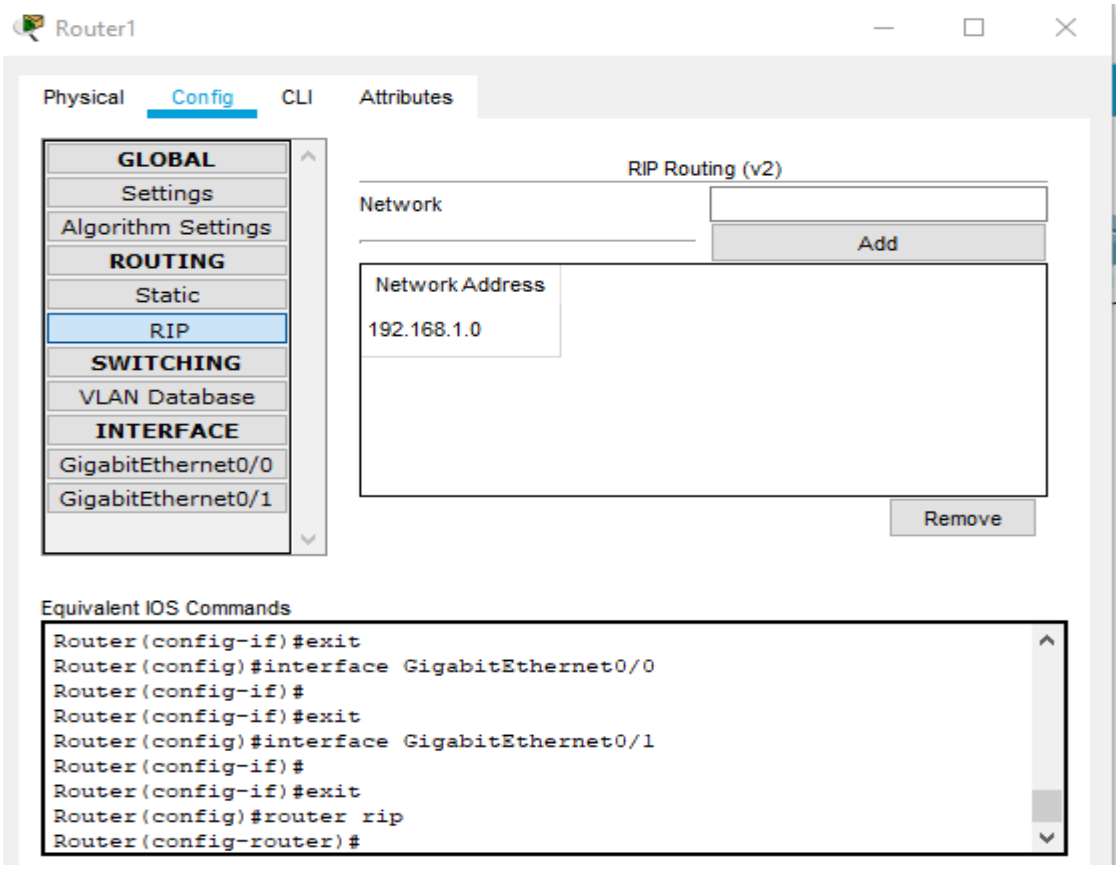
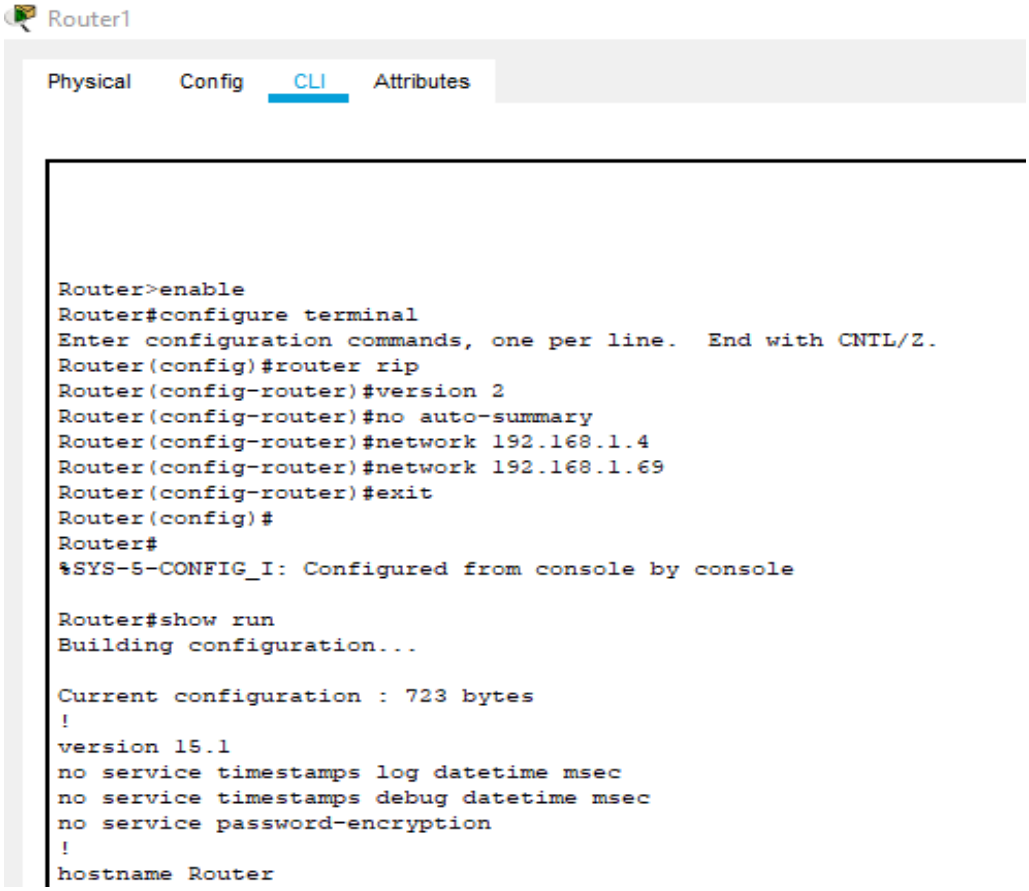


Figure 2.2.19.

03.Configure RIP for each of the routers. Include screenshots of your CLI windows into the report (clearly indicate the network configurations).





Router1

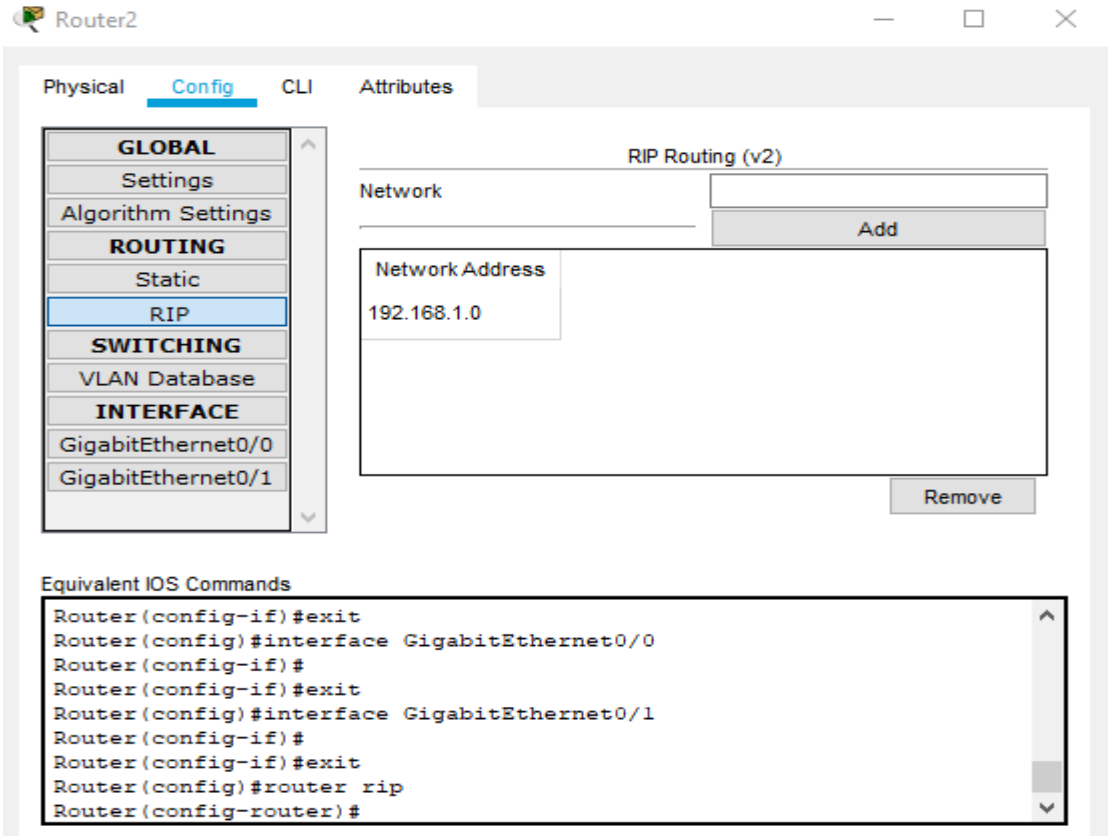
Physical Config CLI Attributes

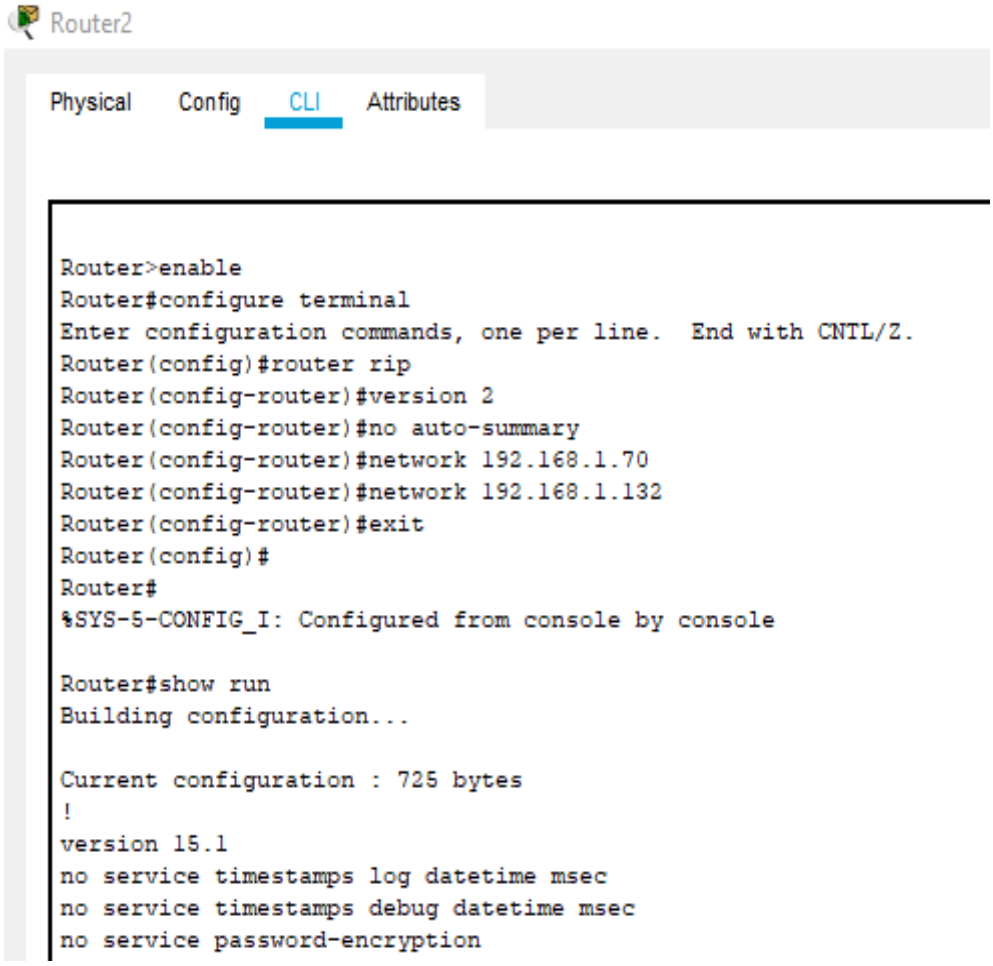
```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#auto-summary
Router(config-router)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#show run
```

Router1

Physical Config CLI Attributes

```
!
!
!
!
interface GigabitEthernet0/0
 ip address 192.168.1.4 255.255.255.192
 duplex auto
 speed auto
!
interface GigabitEthernet0/1
 ip address 192.168.1.69 255.255.255.192
 duplex auto
 speed auto
!
interface Vlan1
 no ip address
 shutdown
!
router rip
 version 2
 network 192.168.1.0
!
ip classless
!
ip flow-export version 9
!
!
!
!
!
!
!
!
line con 0
!
line aux 0
!
line vty 0 4
 --More--
```


Router2
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
GigabitEthernet0/0
GigabitEthernet0/1
RIP Routing (v2)
Network
Add
Network Address
192.168.1.0
Remove
Equivalent IOS Commands
Router(config-if)#exit
Router(config)#interface GigabitEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface GigabitEthernet0/1
Router(config-if)#
Router(config-if)#exit
Router(config)#router rip
Router(config-router)#


Router2
Physical
Config
CLI
Attributes
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router rip
Router(config-router)#version 2
Router(config-router)#no auto-summary
Router(config-router)#network 192.168.1.70
Router(config-router)#network 192.168.1.132
Router(config-router)#exit
Router(config)#
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#show run
Building configuration...
Current configuration : 725 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption

Router2

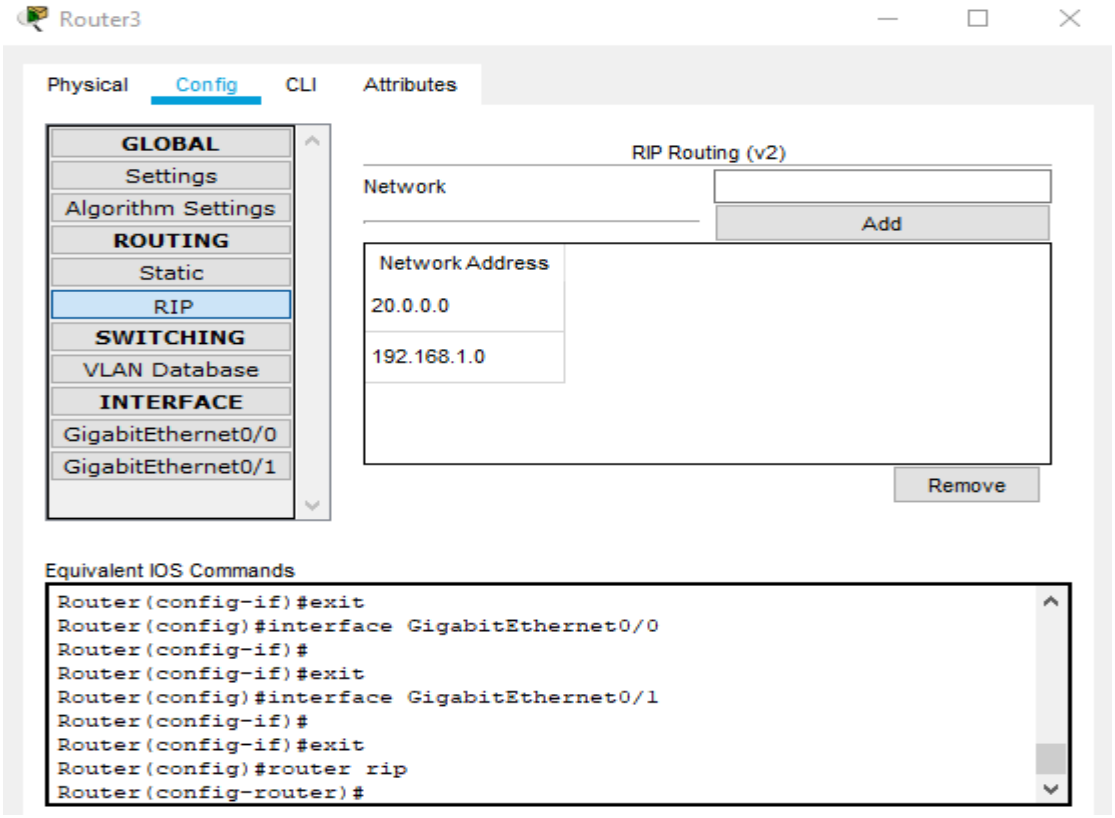
Physical Config CLI Attributes

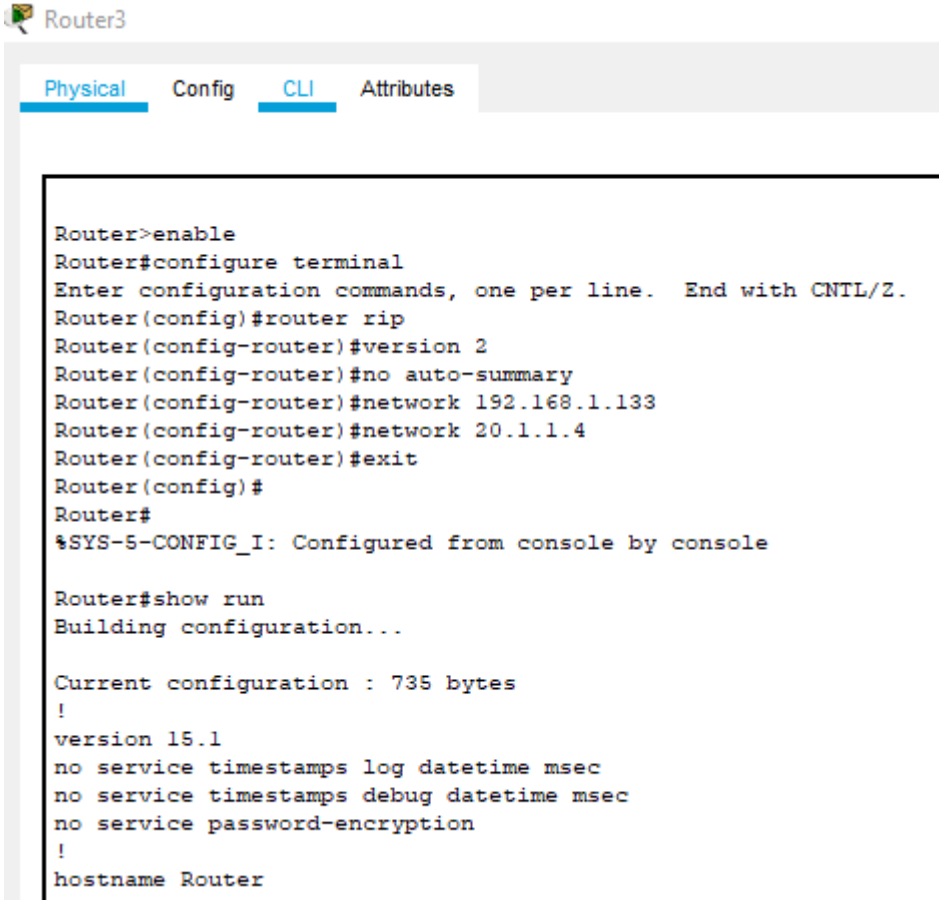
```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#auto-summary
Router(config-router)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#show run
Building configuration...
```

Router2

Physical Config CLI Attributes

```
!
!
!
!
!
!
interface GigabitEthernet0/0
 ip address 192.168.1.70 255.255.255.192
 duplex auto
 speed auto
!
interface GigabitEthernet0/1
 ip address 192.168.1.132 255.255.255.192
 duplex auto
 speed auto
!
interface Vlan1
 no ip address
 shutdown
!
router rip
 version 2
 network 192.168.1.0
!
ip classless
!
ip flow-export version 9
!
!
!
!
!
!
!
!
line con 0
!
line aux 0
 --More--
```


Router3
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
GigabitEthernet0/0
GigabitEthernet0/1
RIP Routing (v2)
Network
Add
Network Address
20.0.0.0
192.168.1.0
Remove
Equivalent IOS Commands
Router(config-if)#exit
Router(config)#interface GigabitEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface GigabitEthernet0/1
Router(config-if)#
Router(config-if)#exit
Router(config)#router rip
Router(config-router)#


Router3
Physical
Config
CLI
Attributes
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router rip
Router(config-router)#version 2
Router(config-router)#no auto-summary
Router(config-router)#network 192.168.1.133
Router(config-router)#network 20.1.1.4
Router(config-router)#exit
Router(config)#
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#show run
Building configuration...
Current configuration : 735 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Router

Router3

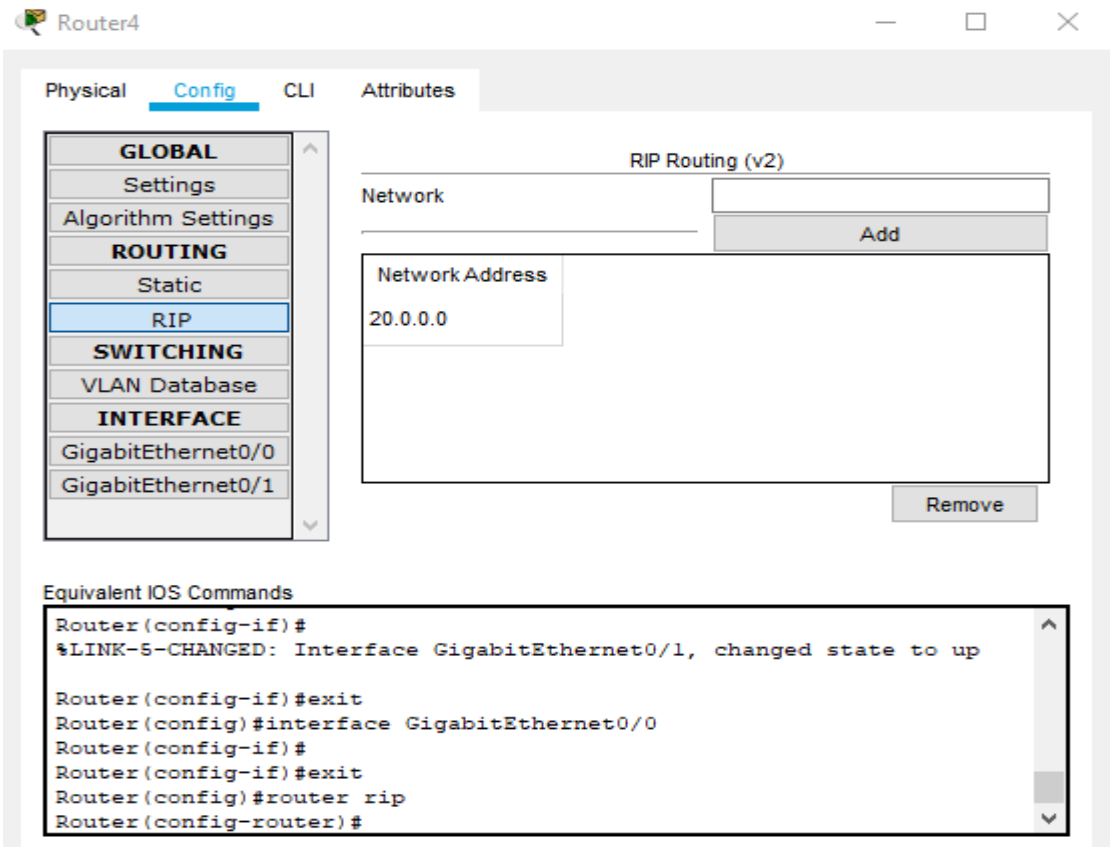
Physical Config CLI Attributes

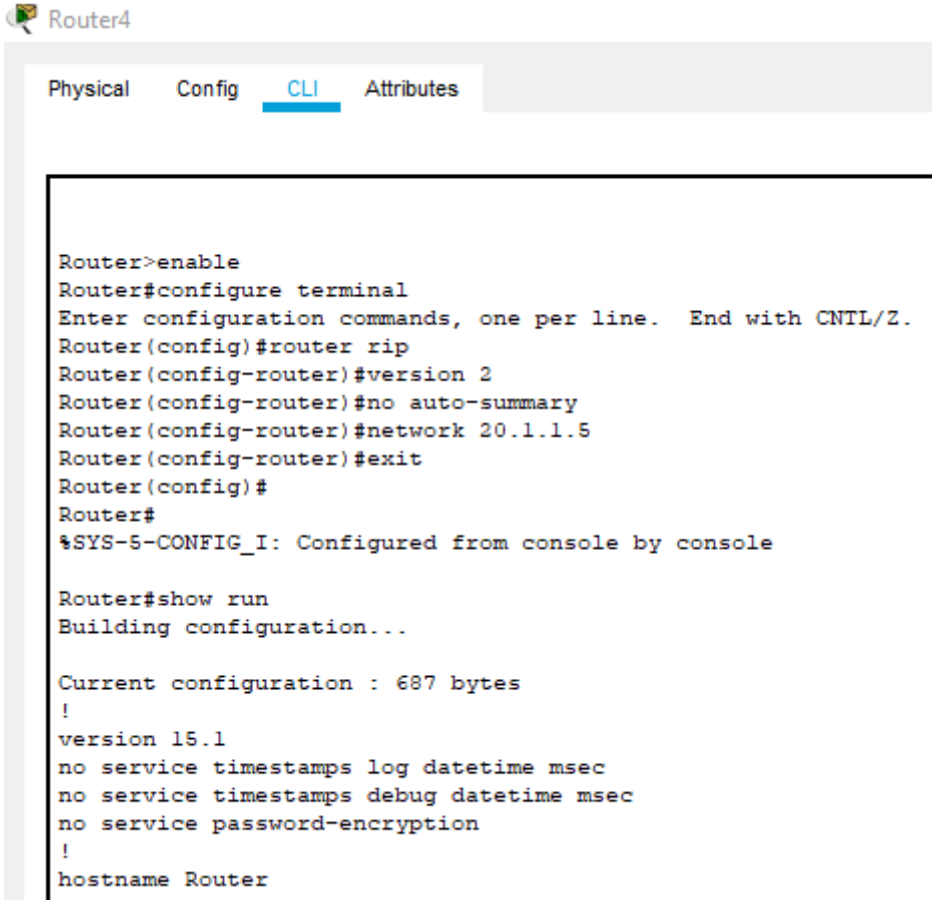
```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#auto-summary
Router(config-router)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#show run
Building configuration...
```

Router3

Physical Config CLI Attributes

```
!
!
!
interface GigabitEthernet0/0
 ip address 192.168.1.133 255.255.255.192
 duplex auto
 speed auto
!
interface GigabitEthernet0/1
 ip address 20.1.1.4 255.255.0.0
 duplex auto
 speed auto
!
interface Vlan1
 no ip address
 shutdown
!
router rip
 version 2
 network 20.0.0.0
 network 192.168.1.0
!
ip classless
!
ip flow-export version 9
!
!
!
!
!
!
!
!
line con 0
!
line aux 0
!
line vty 0 4
 --More--
```


Router4
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
GigabitEthernet0/0
GigabitEthernet0/1
RIP Routing (v2)
Network
Add
Network Address
20.0.0.0
Remove
Equivalent IOS Commands
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up
Router(config-if)#exit
Router(config)#interface GigabitEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#router rip
Router(config-router)#


Router4
Physical
Config
CLI
Attributes
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router rip
Router(config-router)#version 2
Router(config-router)#no auto-summary
Router(config-router)#network 20.1.1.5
Router(config-router)#exit
Router(config)#
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#show run
Building configuration...
Current configuration : 687 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Router

Router4

Physical Config CLI Attributes

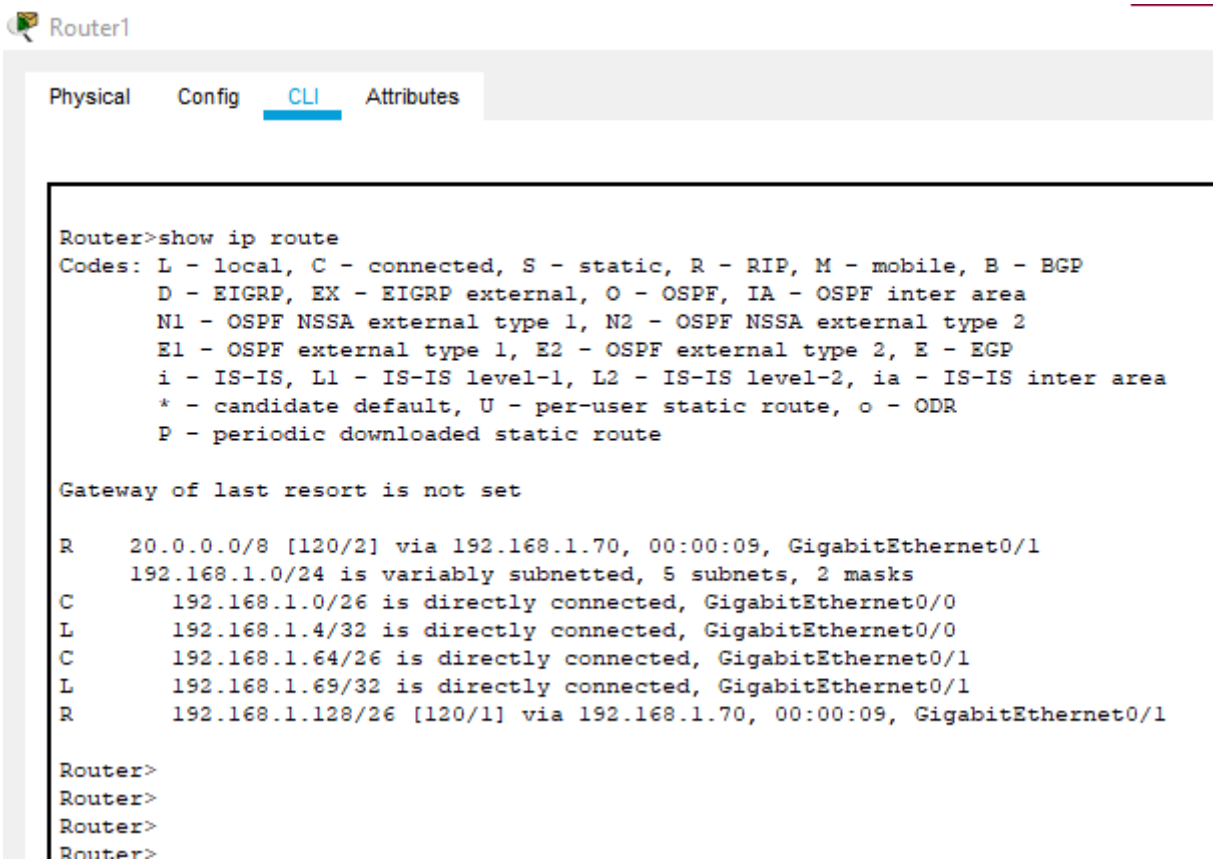
```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#auto-summary
Router(config-router)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#show run
Building configuration...
```

Router4

Physical Config CLI Attributes

```
!
!
interface GigabitEthernet0/0
 ip address 20.1.1.5 255.255.0.0
 duplex auto
 speed auto
!
interface GigabitEthernet0/1
 no ip address
 duplex auto
 speed auto
!
interface Vlan1
 no ip address
 shutdown
!
router rip
 version 2
 network 20.0.0.0
!
ip classless
!
ip flow-export version 9
!
!
!
!
!
!
!
!
line con 0
!
line aux 0
!
line vty 0 4
 login
!
 --More--
```

04. Print the routing table in the router R1. Explain each parameter indicated in the routing table for the routes that it has learnt through RIP.



RIPv2 has all the functions of RIPv1 plus some improvements. RIPv2 provides a mechanism for authentication of other routers. It provides the ability to multicast, which can reduce network traffic when compared to network broadcasting. RIPv2 supports variable length network masks.

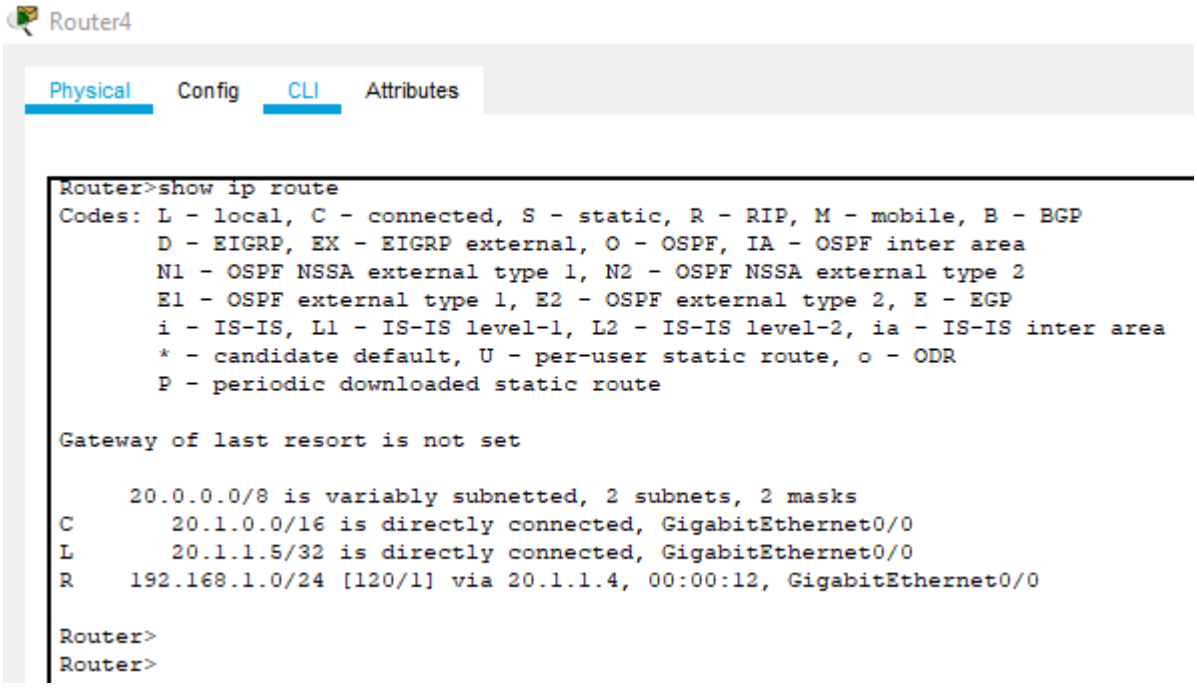
In the above figure C stands for connected, L stands for local and it identify the local route and R stands for RIP. Each directly connected network is automatically added to the routing table.

- R 20.0.0.0/8 [120/2] via 192.168.1.70, 00:00:09, GigabitEthernet0/1
  192.168.1.0/24 is variably subnetted, 5 subnets, 2 masks
  R-route source, **20.0.0.0/8**-Destination network, **[120/2]**-120 is the administrative distance, 2 is the metric, **192.168.1.70**-next hop, **00:00:09**- route timestamp, **GigabitEthernet0/1**- outgoing interface

- **192.168.1.0/26** – indicates the range of the IP addresses for which the route will be used, in this case, all IP addresses from the following range: 192.168.1.0 – 192.168.1.63
  GigabitEthernet0/0 – indicates the interface the packet will be sent out, in order to reach the destination network.
- **192.168.1.4/32** – indicates the local IP addresses which the route will be used.
  GigabitEthernet0/0 – indicates the interface the packet will be sent out, in order to reach the destination network.

- **192.168.1.64/26** – indicates the range of the IP addresses for which the route will be used, in this case, all IP addresses from the following range: 192.168.1.64 – 192.168.1.127
  GigabitEthernet0/1 – indicates the interface the packet will be sent out, in order to reach the destination network.
- **192.168.1.69/32** – indicates the local IP addresses which the route will be used.
  GigabitEthernet0/0 – indicates the interface the packet will be sent out, in order to reach the destination network.

05. Explain the "Auto Summarization" issue of RIP using the routing table of R4 router. Mention under what kind of situations this occurs and suggest a solution to resolve this issue in RIP. Reconfigure R3 with your suggested solution. Observe the new routing table at R4.



The "Auto Summarization" issue of RIP using the routing table of R4 router.

Auto summarization is a feature which allows Routing Information Protocol to summarize its routes to their classful networks automatically.

Now we can see from the Routing Table of the router3 that router1, router2and router3 are summarizing its subnets to default unsubnetted network 192.168.1.0/24. This will create confusion in network, because the routers router1, router2and router3 are advertising the network 192.168.1.0/24. Each router is advertising each other about same network.

A router will drop traffic when it doesn't have a matching destination in its routing table. When we use summarization, it's possible that the summary route covers networks that are not in use. The router that has a summary route will forward them to the router that has advertised the summary route.

Routers prefer the path with the longest prefix match. When you use summaries, it's possible that your router prefers another path where it has learned a more specific network from. The summary route also has a single metric.

Under what kind of situations this occurs

If a routing protocol automatically creates a summary route, it is known as the auto-summarization. In simple words, auto summarization is a state in which, under certain conditions, a routing protocol automatically uses the route summarization feature.

One such a condition is when the router sits between classful networks with some interface in one Class A, B, or C network and other interfaces in another Class A, B, or C network. In such a situation, the router automatically summarizes contiguous routes as a single classful network address.

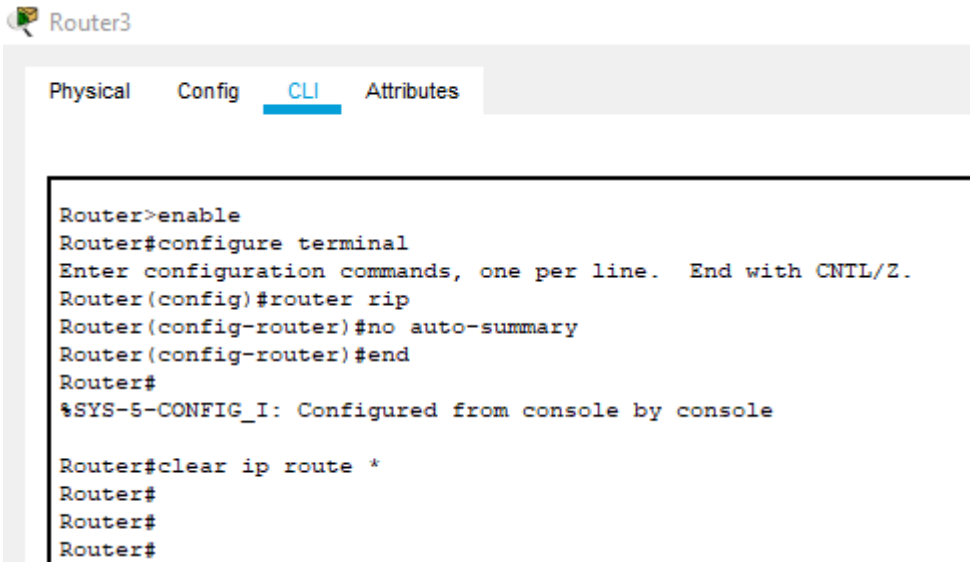
Suggest a solution to resolve this issue in RIP

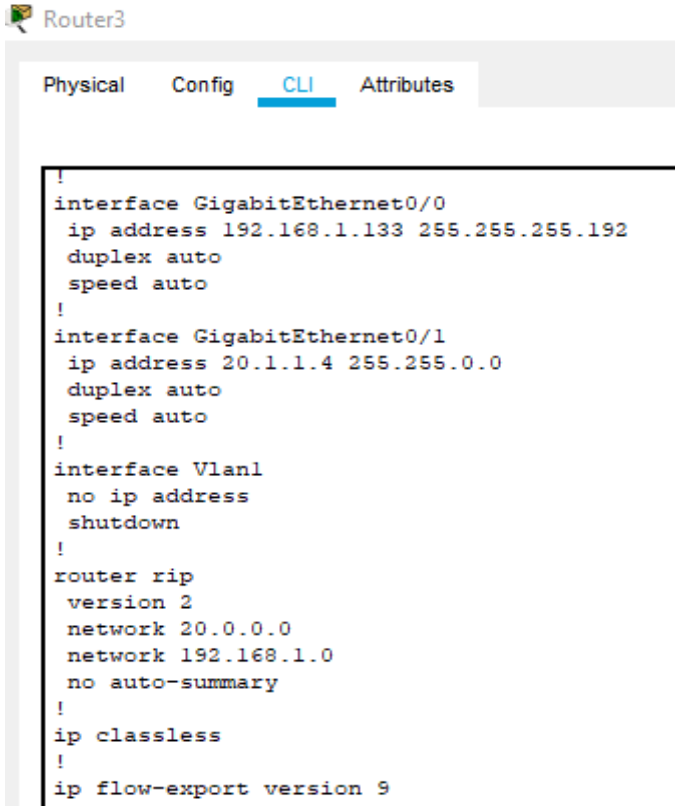
a. The no auto-summary command is used to turn off automatic summarization in RIPv2. Disable auto summarization on all routers. The routers will no longer summarize routes at major classful network boundaries. R3 is shown here as an example.

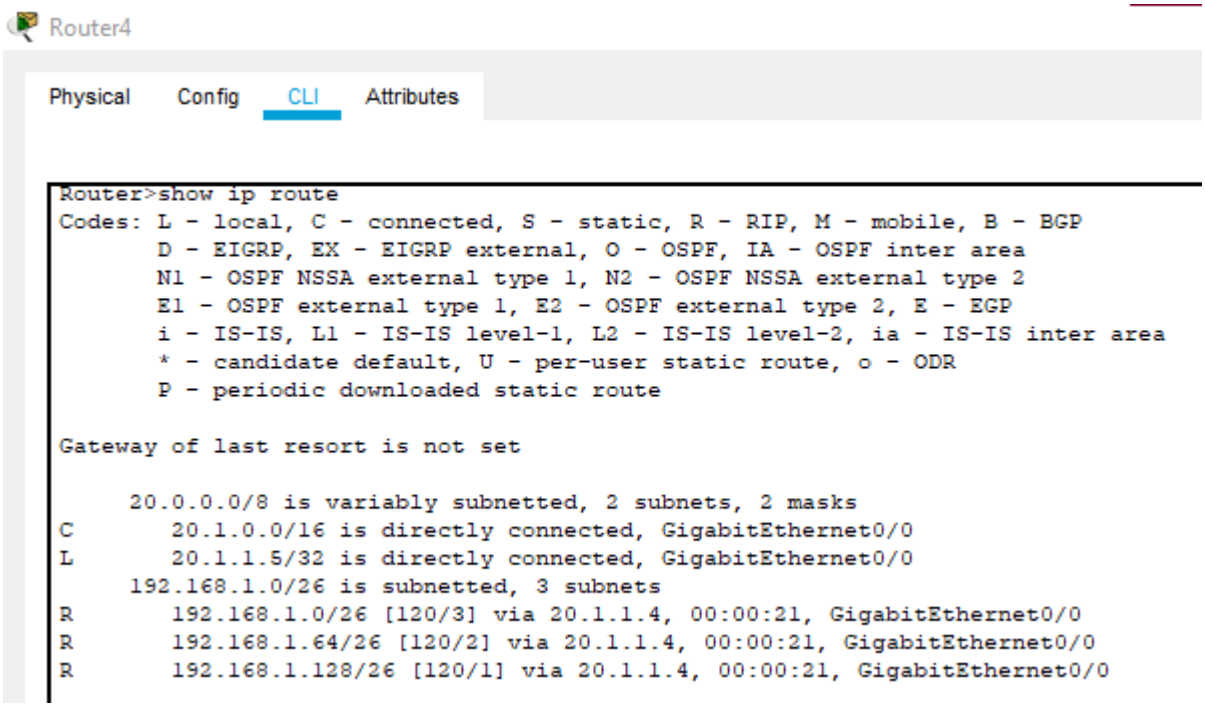
R3(config)# **router rip**
R3(config-router)# **no auto-summary**

b. Issue the clear ip route * command to clear the routing table.
R3(config-router)# **end**
R3# **clear ip route * c.**

c. Examine the routing tables. Remember that it will take some time to converge the routing tables after clearing them.







06.Mention two other limitations of RIP (Except Auto Summarization).

Some of RIP's greatest limitations are its

- Inability to support paths longer than 15 hops (router counts the hops a packet makes as it crosses other routers on the way to its destination.)
- Reliance on fixed metrics to calculate routes (Routing decisions are only made by metrics hop counts. The path with the lowest hop count is the most efficient, which may not be the best method because this does not take into account the speed of some of these network links.)
- Network intensity of table updates
- Relatively slow convergence (The distance-vector algorithm is designed so that all routers share all their routing information regularly. Over time then, all routers eventually end up with the same information about the location of networks and which are the best routes to use to reach them. This is called *convergence*. Unfortunately, the basic RIP algorithm is rather slow to achieve convergence. It takes a long time for all routers to get the same information, and in particular, it takes a long time for information about topology changes to propagate.)
- Lack of support for dynamic load balancing