EXPERIMENT 10 – Dynamic Routing

Objective:

To understand the concept of dynamic routing using Routing Information Protocol (RIP)

Dynamic Routing:

Dynamic routing is a mechanism through which routing information is exchanged between routers to determine the optimal path between network devices. Dynamic routing involves the use of routing protocols that exchange routing information between routing devices. Dynamic routing protocols were designed to address the shortcomings of static routing such as the need for human involvement to route traffic around failures, the human mistakes made when typing route information, and the scaling limit of the few routes one person can track in a text file. These benefits come at the expense of requiring significant computing power in the routers, and the need for training network administrators who specialize in taming routing algorithms.

Routing protocols perform these functions:

- Discovery of remote networks
- Best path calculation to remote networks
- Updating the routing table
- Recalculating a best new path in the case of failure of the current best path

Routing Information Protocol (RIP):

Routing Information Protocol (RIP) is a distance-vector routing protocol. Routers running the distance-vector protocol send all or a portion of their routing tables in routing-update messages to their neighbours. Routing Information Protocol (RIP) is a dynamic routing protocol that uses hop count as a routing metric to find the best path between the source and the destination network. Hop count is the number of routers occurring in between the source and destination network. The path with the lowest hop count is considered as the best route to reach a network and therefore placed in the routing table. RIP prevents routing loops by limiting the number of hops allowed in a path from source and destination. The maximum hop count allowed for RIP is 15 and a hop count of 16 is considered as network unreachable.

Features of RIP:

- Updates of the network are exchanged periodically
- Full routing tables are sent in updates
- Routers always trust routing information received from neighbor routers. This is also known as Routing on rumors.

Downsides of RIP:

- RIP sends the entire routing table every 30 seconds, which can consume a lot of network bandwidth.
- It lacks some more advanced of features of the newer routing protocols like OSPF or EIGRP and is not widely used in modern networks. For example, RIP doesn't support route summarization.

RIP Versions:

There are two versions of Routing Information Protocol – **RIP Version1**, and **RIP Version2**.

RIP v1 is known as Classful Routing Protocol because it doesn't send information of subnet mask in its routing update while **RIP v2** is known as Classless Routing Protocol because it sends information of subnet mask in its routing update.

Command Syntax:

Following is the command syntax for RIP configuration on Cisco router:

Router(config)# router rip
Router(config-router)# version 2
Router(config-router)# network 192.168.10.0
Router(config-router)# network 192.168.20.0

Where 192.168.10.0 and 192.168.20.0 are the network addresses of directly connected networks to this router.

Topology:

RIP routing topology consists of three LAN segments. Network 1 consists of a Cisco 2960 switch and one endpoint with IP address in 192.168.10.0/24 IP address range. Network 3 consists of a Cisco 2960 switch and one endpoint with IP address in 192.168.30.0/24 IP address range. Network 2 is used for the interconnection of two routers (Router1 and Router2).

Router1 is directly connected to two networks (Network 1 and Network 2), and it is indirectly connected (via Router2) to Network 3. Router2 is directly connected to two networks (Network 2 and Network 3), and it is indirectly connected (via Router1) to Network 1.

Once we enable RIP protocol, Router1 will advertise the networks (192.168.10.0/24 and 192.168.20.0/24) directly connected to it and Router2 will advertise the networks (192.168.20.0/24 and 192.168.30.0/24) directly connected to it. Both routers will build their own routing tables after receiving the routing updates advertised from other router.

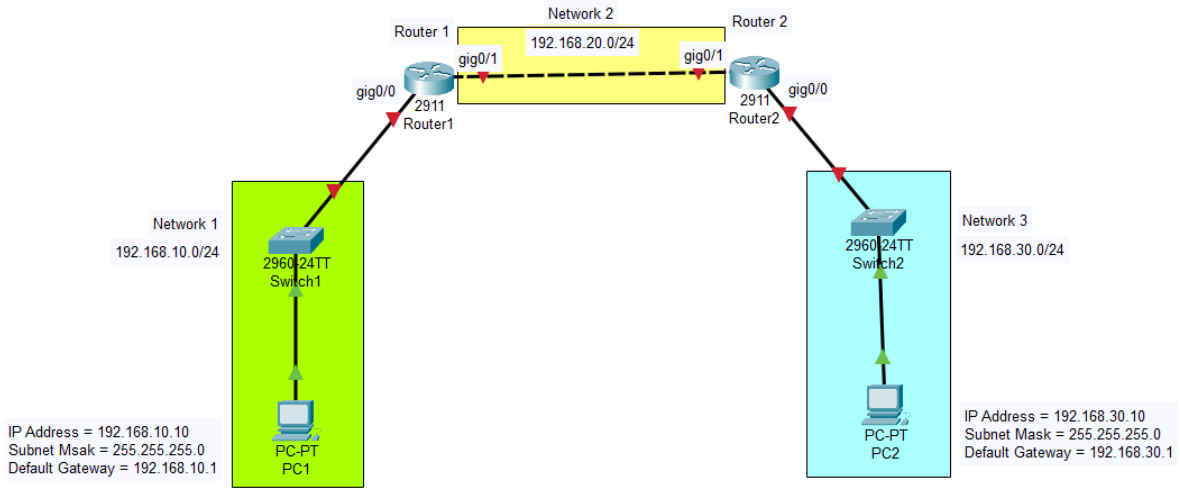
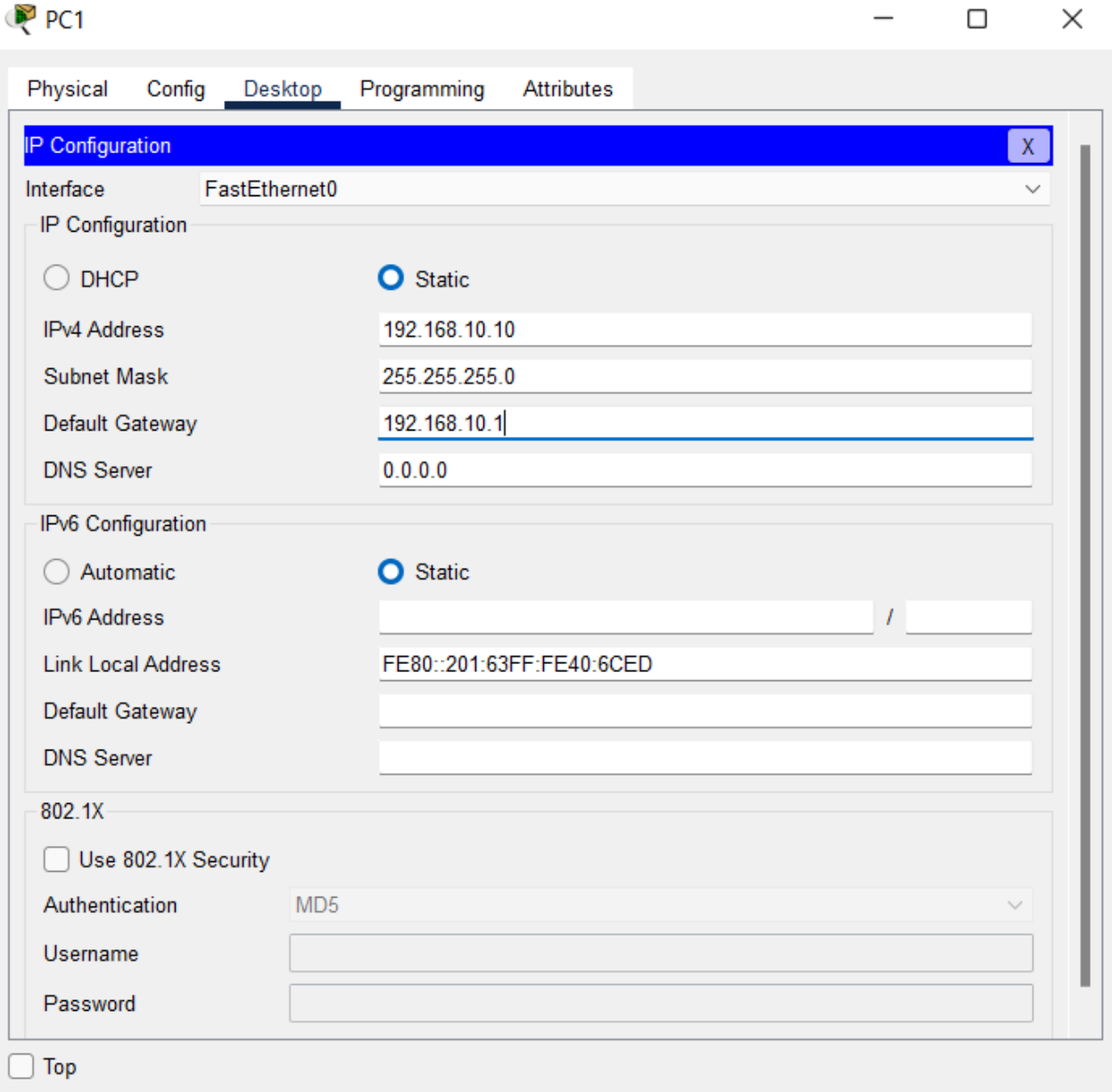


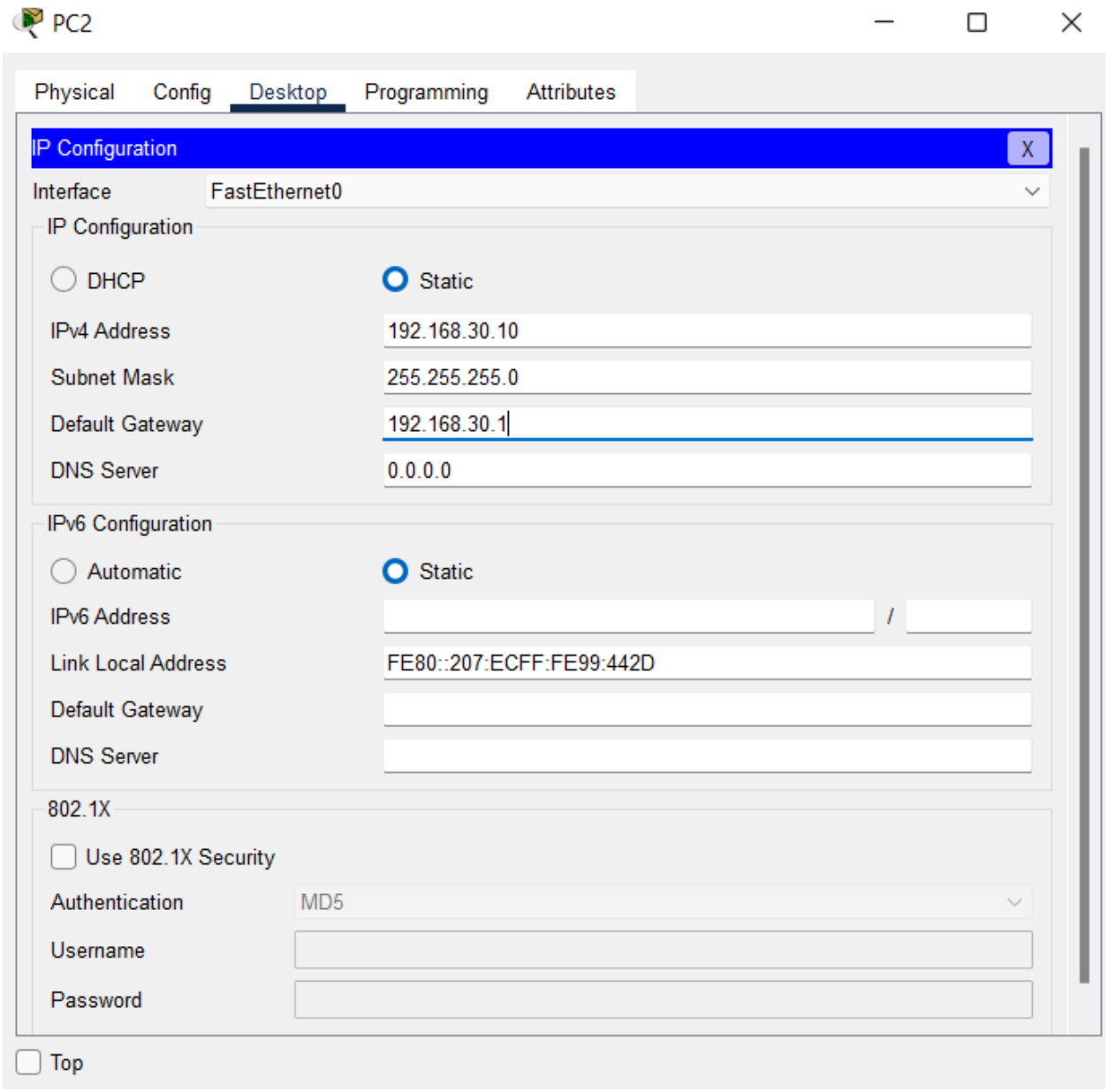
Figure 1 - RIP Routing Topology

Steps:

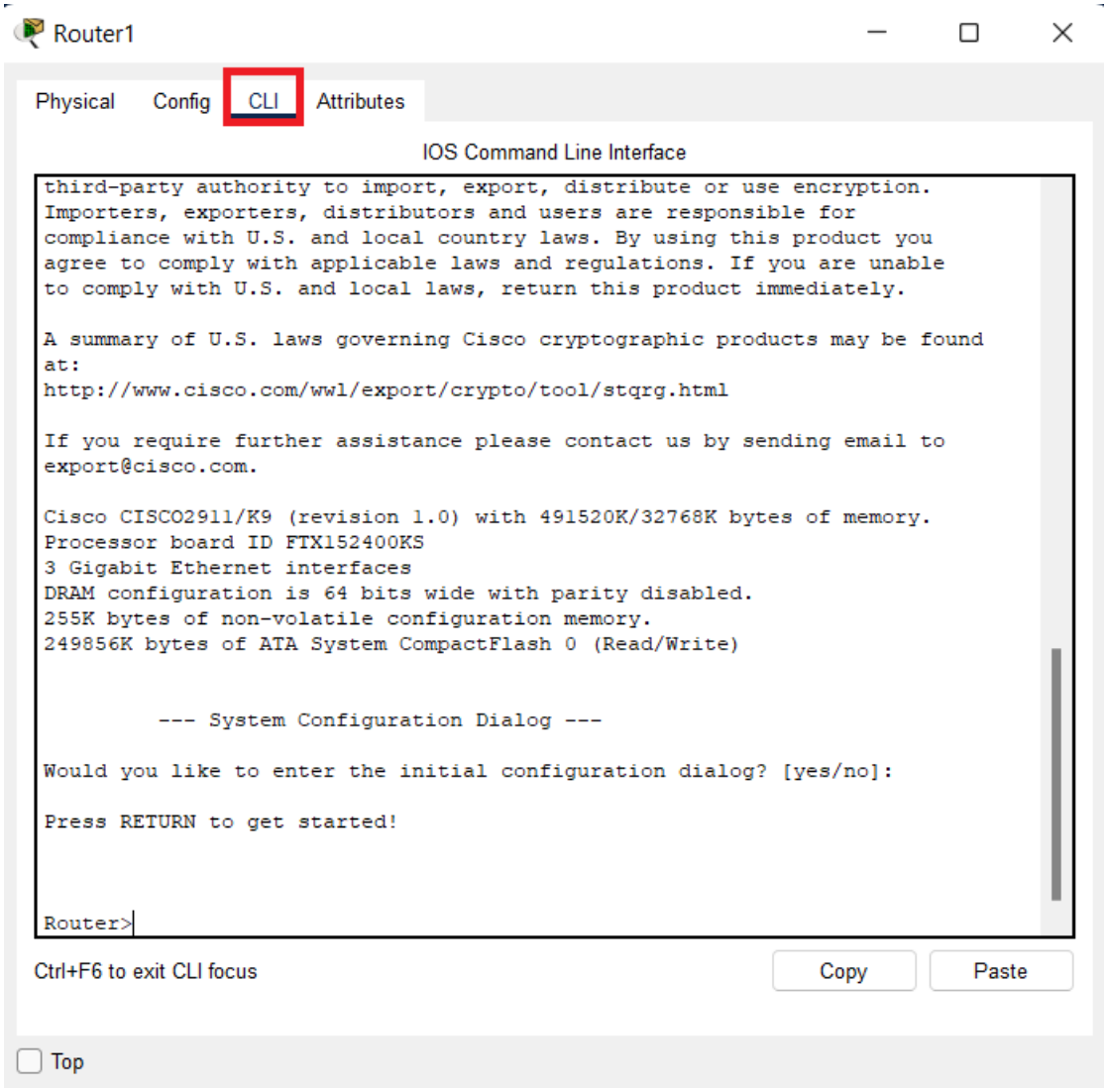
Assign the static IP address, subnet mask and default gateway on first PC as shown below:



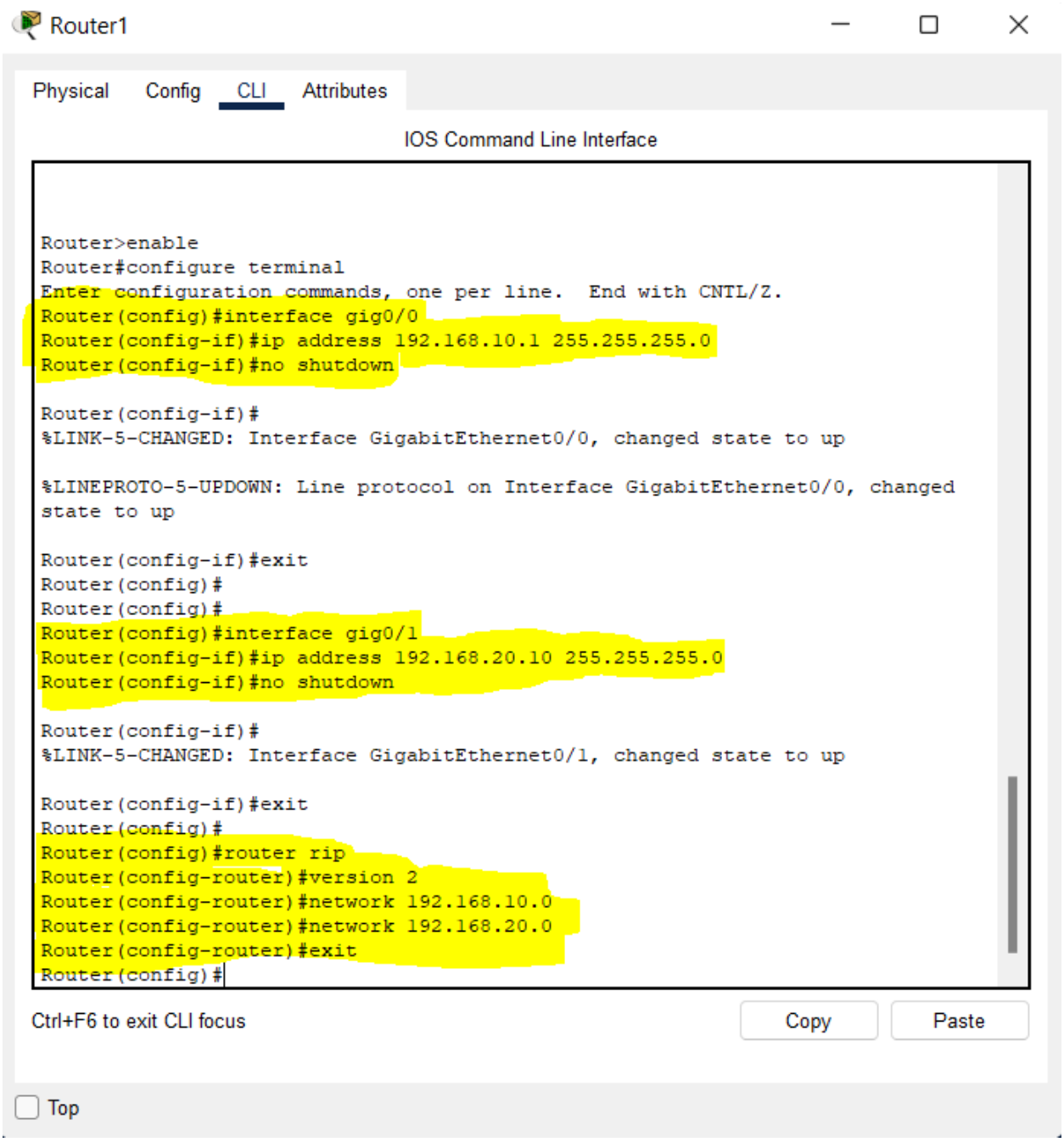
Assign the static IP address, subnet mask and default gateway on second PC shown below:



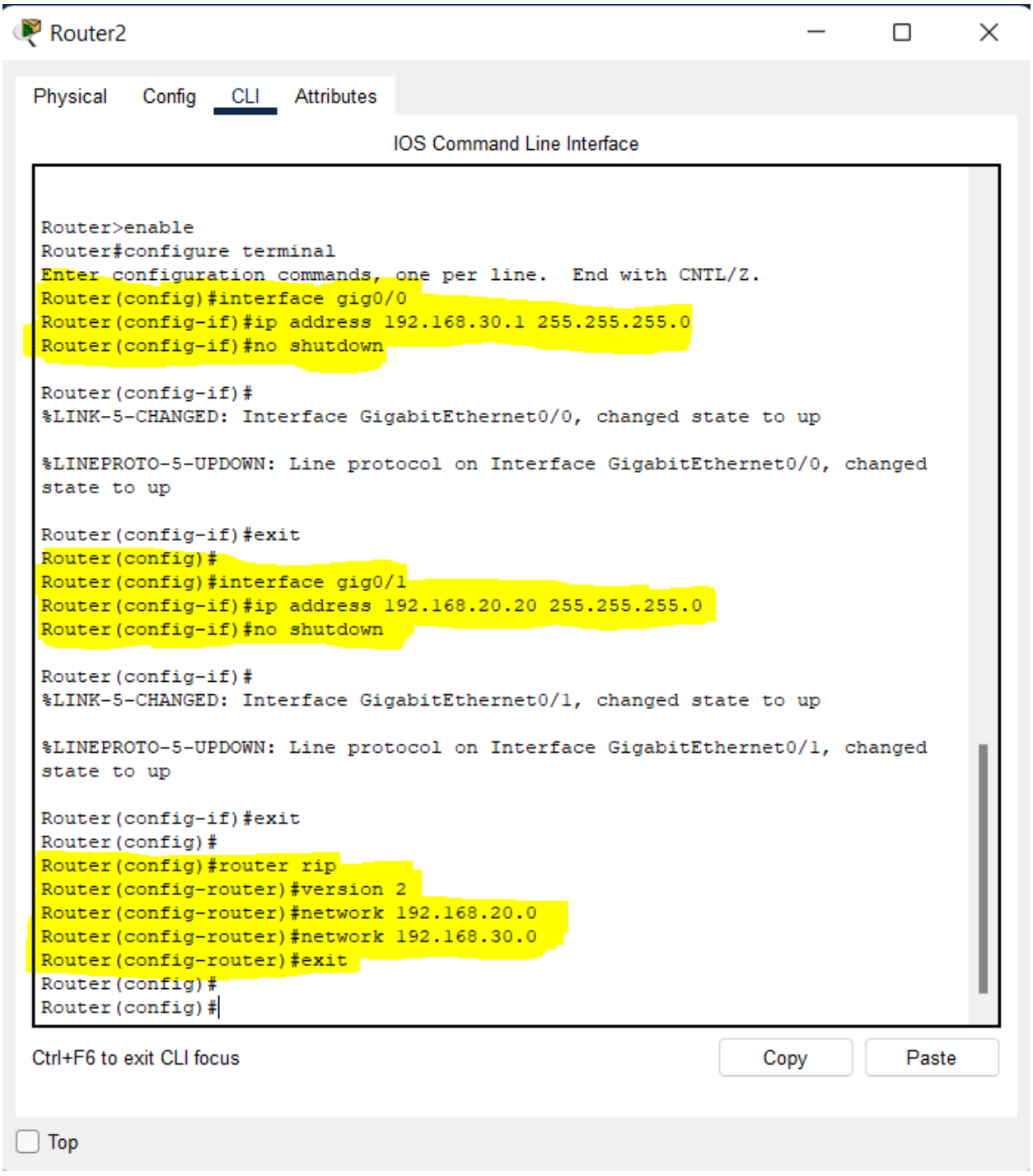
Select the Router1 and click on CLI tab. Do not enter the initial configuration dialog as shown below:



As shown in the topology diagram, we need to configure two router interfaces gig0/0 and gig0/1 with respective gateway IP addresses. We will configure the gateway IP addresses on both router interfaces followed by “no shutdown” command. After configuring the interfaces, we will advertise directly connected networks to Router1 through RIP.

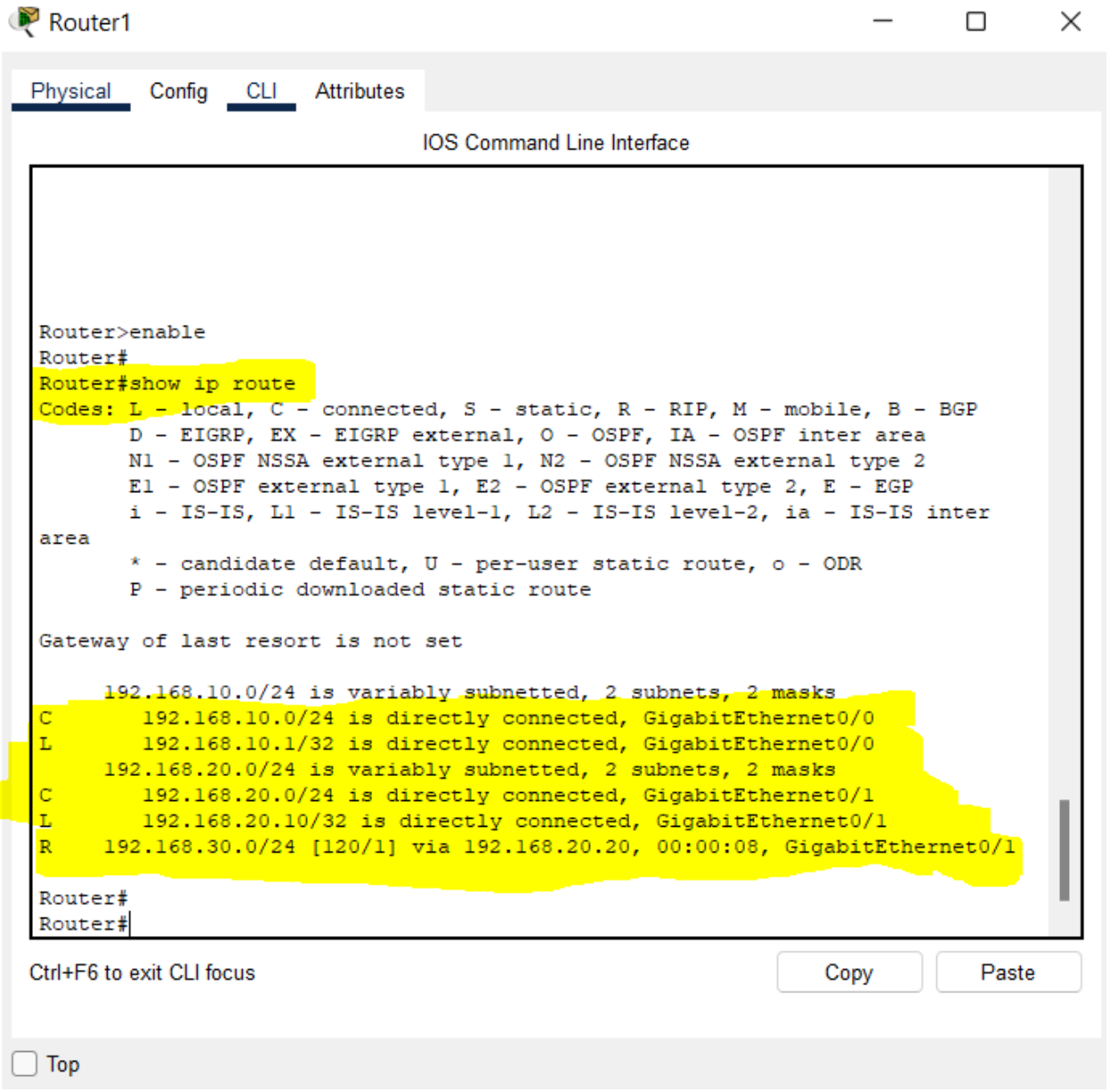


We will repeat the similar configuration on Router2 by configuring the gateway IP addresses on both gig0/0 and gig0/1. After configuring the interfaces, we will advertise directly connected networks to Router2 through RIP.

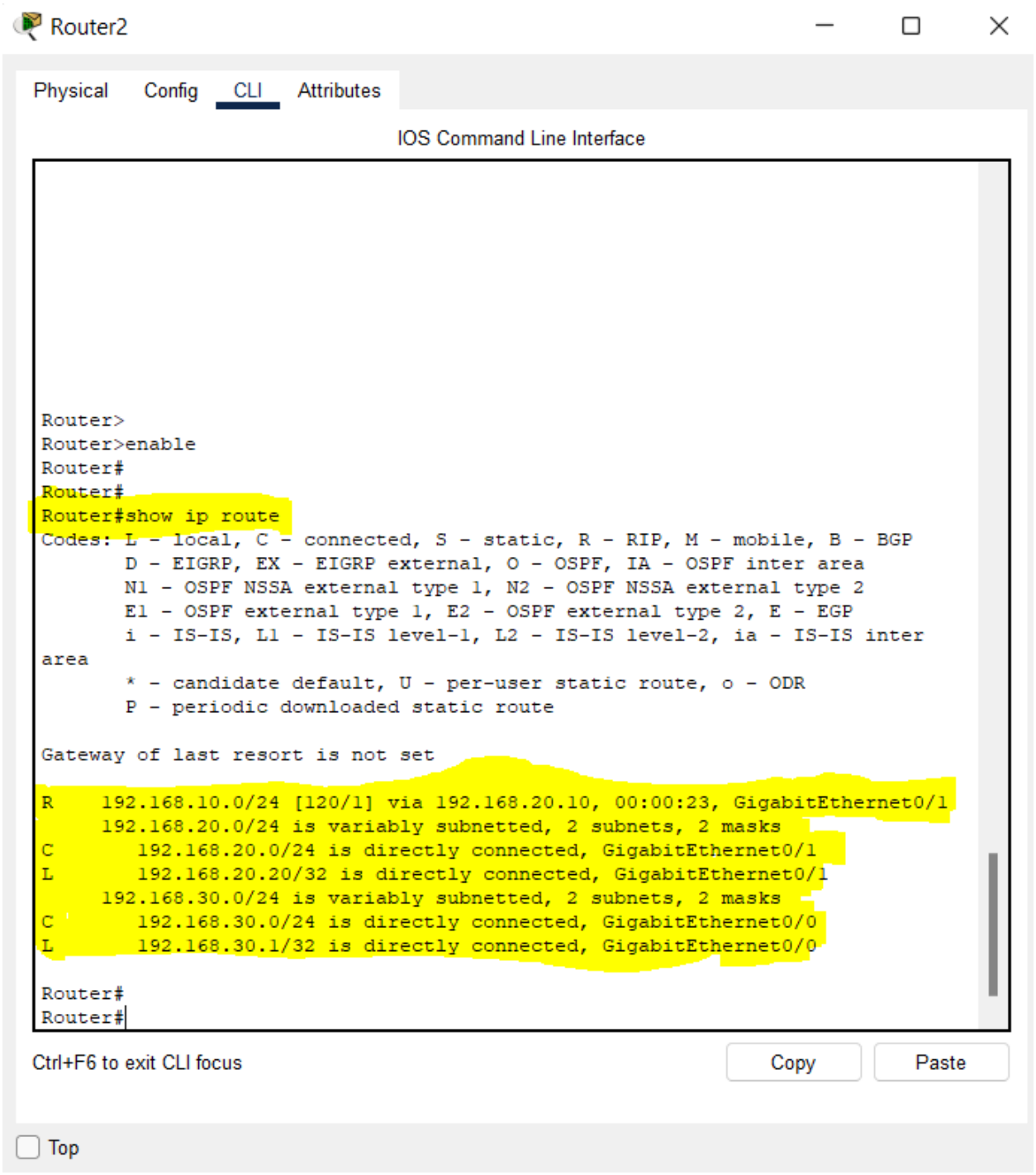


Routing Table:

We can check the routing table of Router1 using "***show ip route***" command from the privileged exec mode. Entries in routing table that start with C represent directly connected networks, these are the network segments that are directly connected with the router, for example, in our topology network 1 (192.168.10.0/24) and network 2 (192.168.20.0/24) are directly connected networks for Router1. Routes learned through RIP protocol appear in the routing table starting with **R** as shown in the below snippet (192.168.30.0/24 network is learned by Router1 using RIP protocol)



We can check the routing table of Router2 using "***show ip route***" command from the privileged exec mode. Entries in routing table that start with C represent directly connected networks, these are the network segments that are directly connected with the router, for example, in our topology network 2 (192.168.20.0/24) and network 3 (192.168.30.0/24) are directly connected networks for Router2. Routes learned through RIP protocol appear in the routing table starting with **R** as shown in the below snippet (192.168.10.0/24 network is learned by Router2 using RIP protocol)



Connectivity check:

Navigate to the command prompt on first PC (connected in network 1) to second PC (connected in network 3) and verify the network connectivity using ***ping*** and ***tracert*** commands as show below: