EXPERIMENT 9 – Static Routing

Objective:

To understand the process of adding static routes on Cisco routers.

Static Routing:

Static routing is a type of network routing technique. Static routing is not a routing protocol; instead, it is the manual configuration and selection of a network route, usually managed by the network administrator. It is employed in scenarios where the network parameters and environment are expected to remain constant.

Static routing performs routing decisions with preconfigured routes in the routing table, which can be changed manually only by administrators. Static routes are normally implemented in those situations where the choices in route selection are limited, or there is only a single default route available. Also, static routing can be used if you have only few devices for route configuration and there is no need for route change in the future.

Advantages:

- Static routing causes very little load on the CPU of the router
- Static routing leaves the network administrator with full control over the routing behavior of the network
- Static Routing is very easy to configure on small networks.

Disadvantages:

- **Human error:** In many cases, static routes are manually configured. This increases the potential for input mistakes. Administrators can make mistakes and mistype in network information or configure incorrect routing paths by mistake.
- **Fault tolerance:** Static routing is not fault tolerant. This means that when there is a change in the network or a failure occurs between two statically defined devices, traffic will not be re-routed. As a result, the network is unusable until the failure is repaired or the static route is manually reconfigured by an administrator.
- **Administrative overhead:** Static routes must be configured on each router in the network(s). This configuration can take a long time if there are many routers. It also means that reconfiguration can be slow and inefficient. Dynamic routing on the other hand automatically propagates routing changes, reducing the need for manual reconfiguration.

Command Syntax:

Following is the command syntax for defining a static route on Cisco router:

Router(config)# ip route 192.168.10.0 255.255.255.0 192.168.20.1

Where 192.168.10.0 and 255.255.255.0 is the network address and subnet mask respectively for the remote network and 192.168.20.1 is the next hop IP address.

Topology:

Static 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.

From the basic routing lab, we know that routers learn about directly connected networks automatically. So in this lab, we will have to add static route in Router1 for Network 3 since it is indirectly connected to Router1 and another static route in Router2 for Network 1 since it is indirectly connected to Router2.

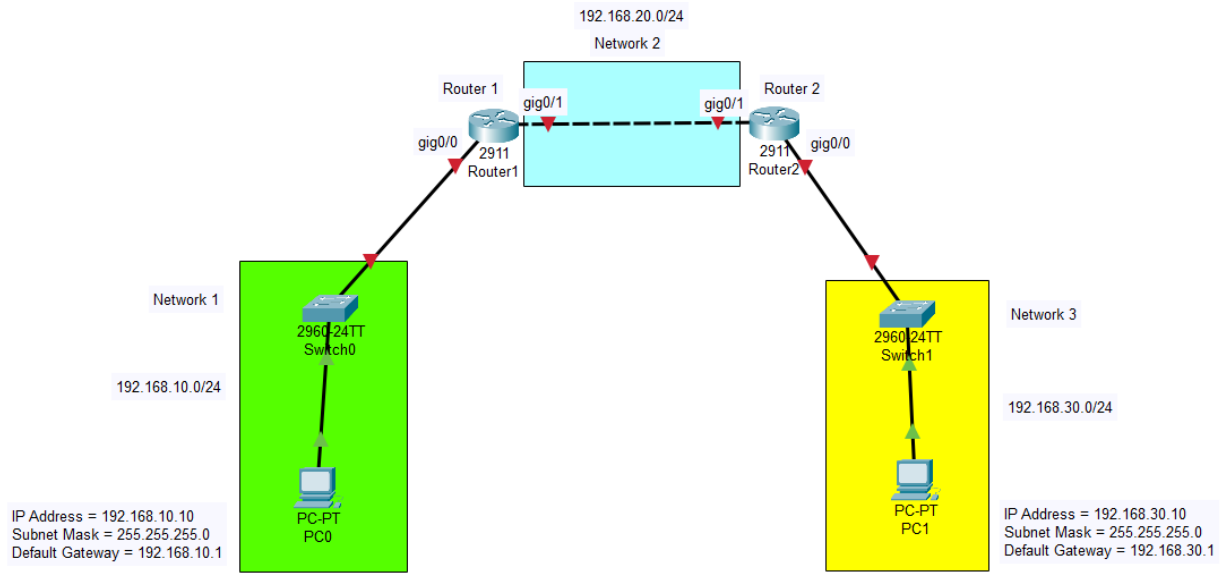
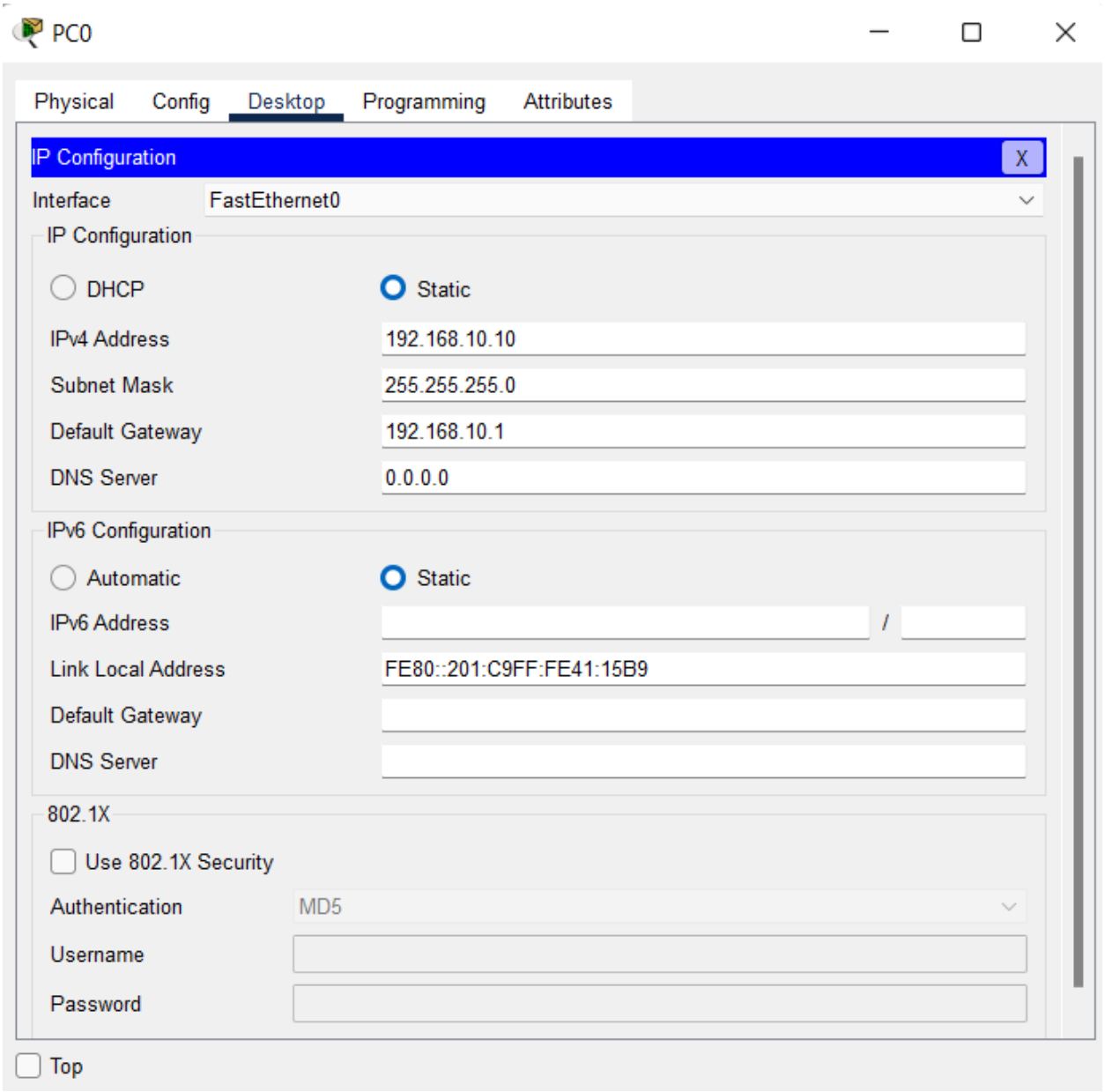


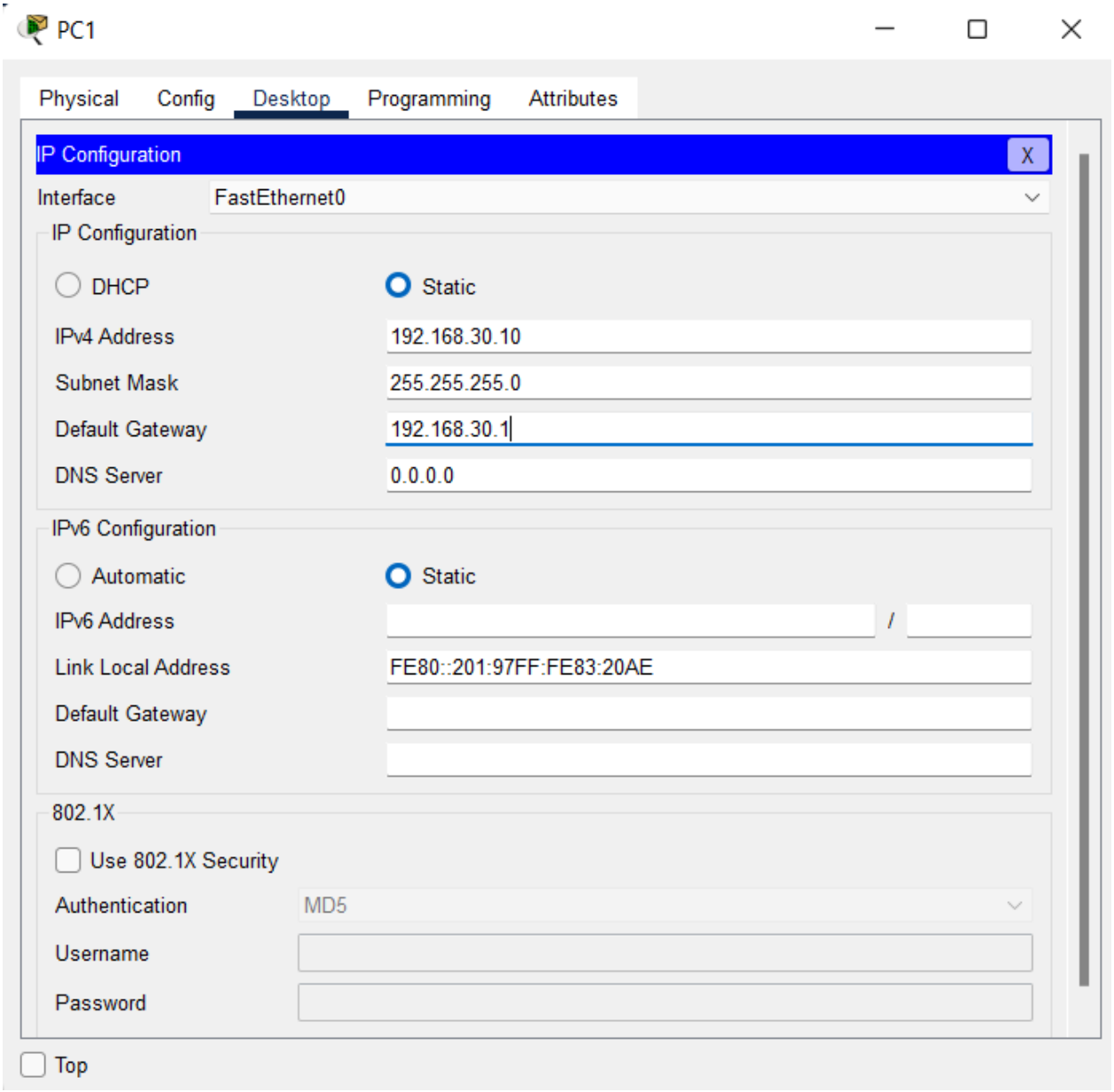
Figure 1 - Static Routing Topology

Steps:

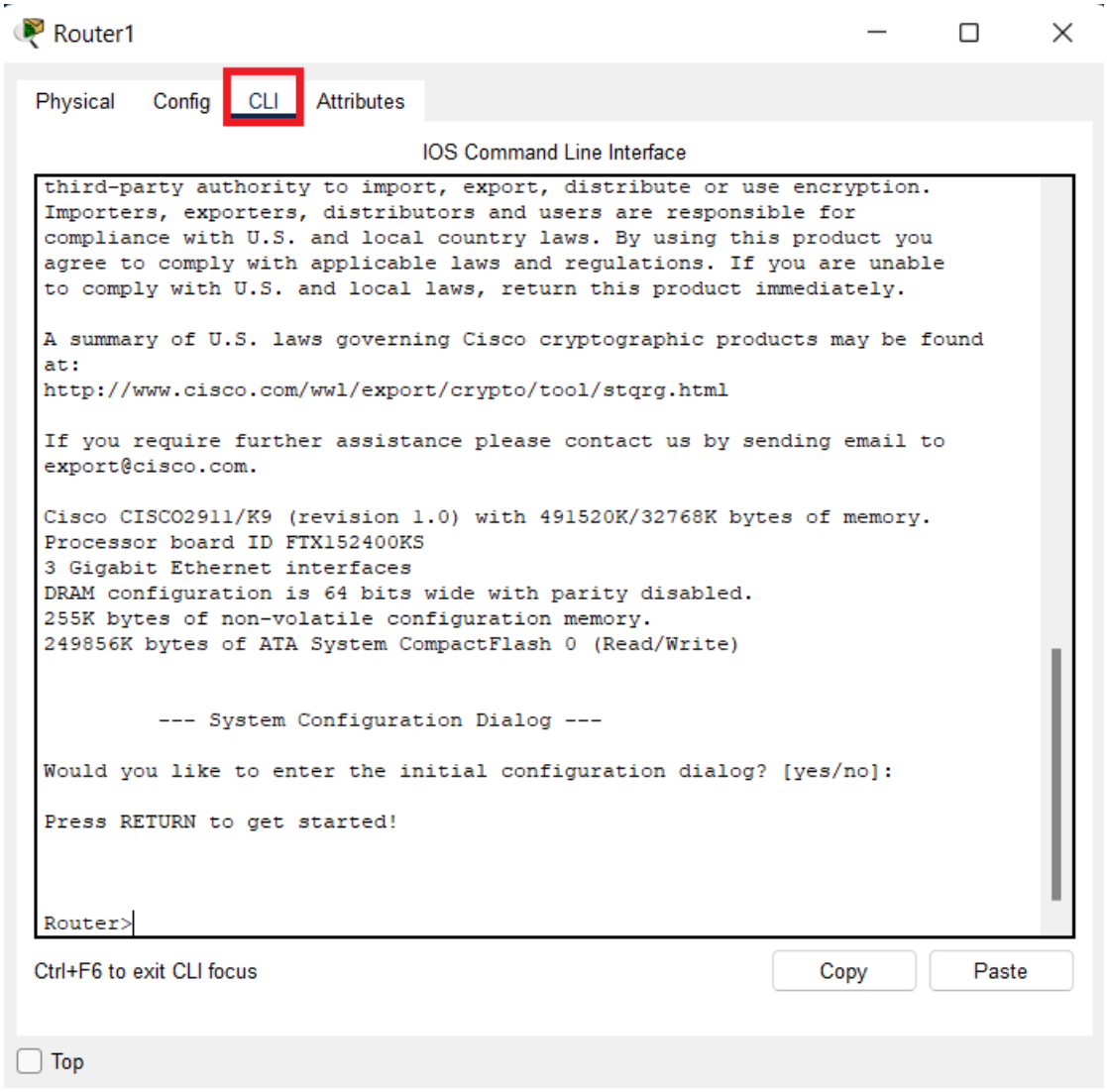
Assign the static IP address, subnet mask and default gateway on first PC as shown below:



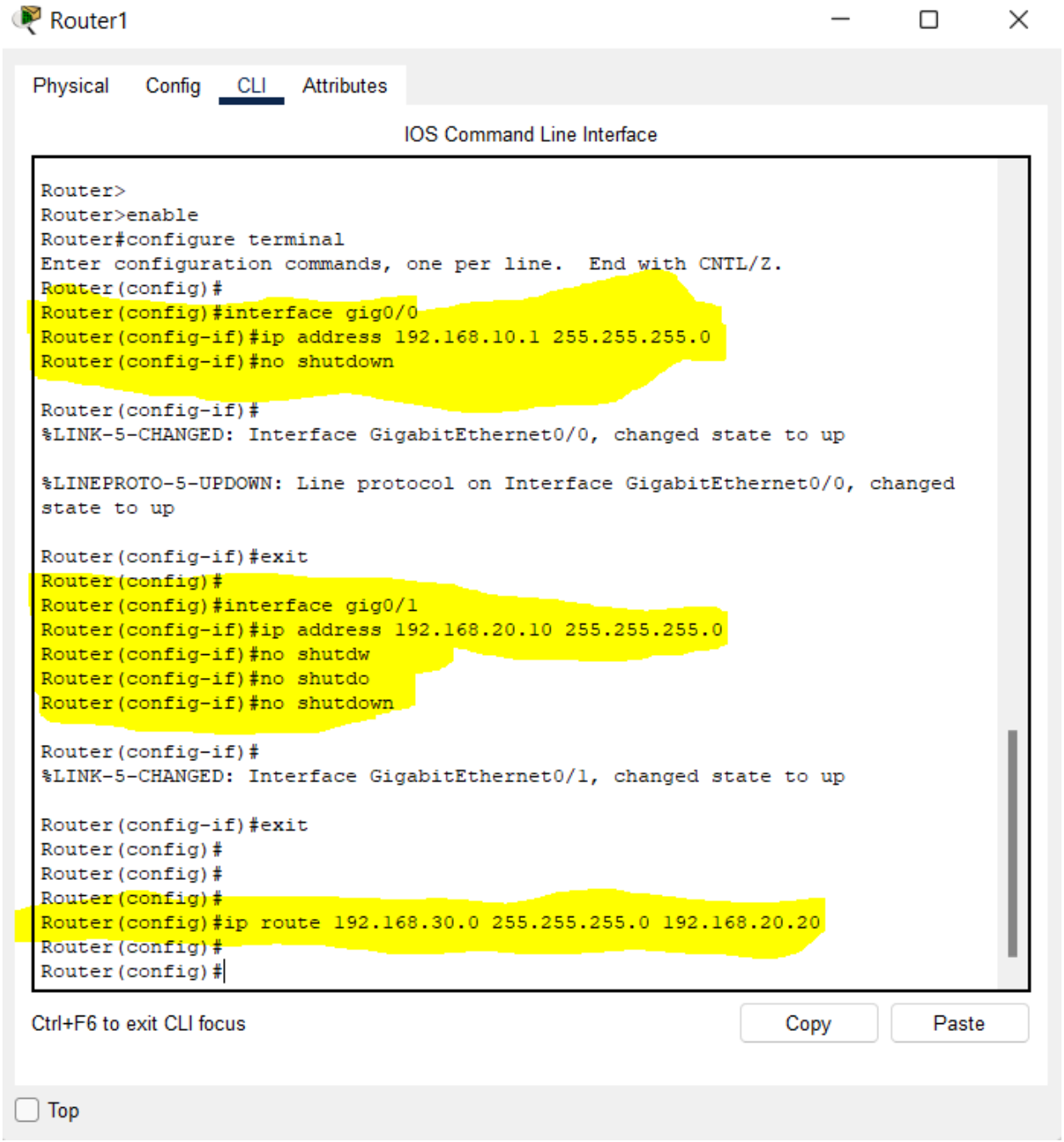
Assign the static IP address, subnet mask and default gateway on second PC shown below:



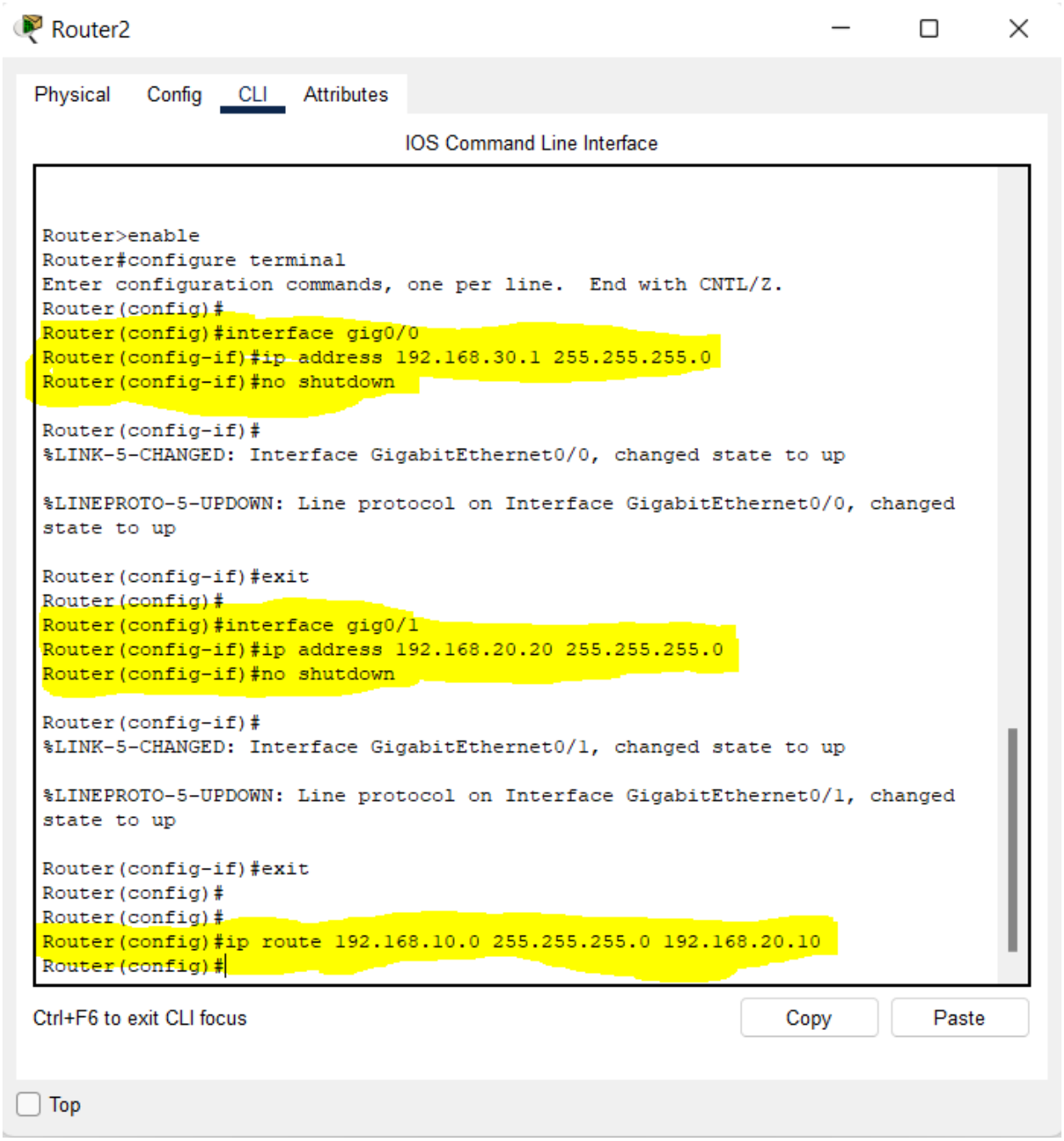
Select the Router1 and click on CLI tab. Do not enter the initial configuration dialog as shown below:



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 add static route for Network 3 (since it is indirectly connected to Router1).

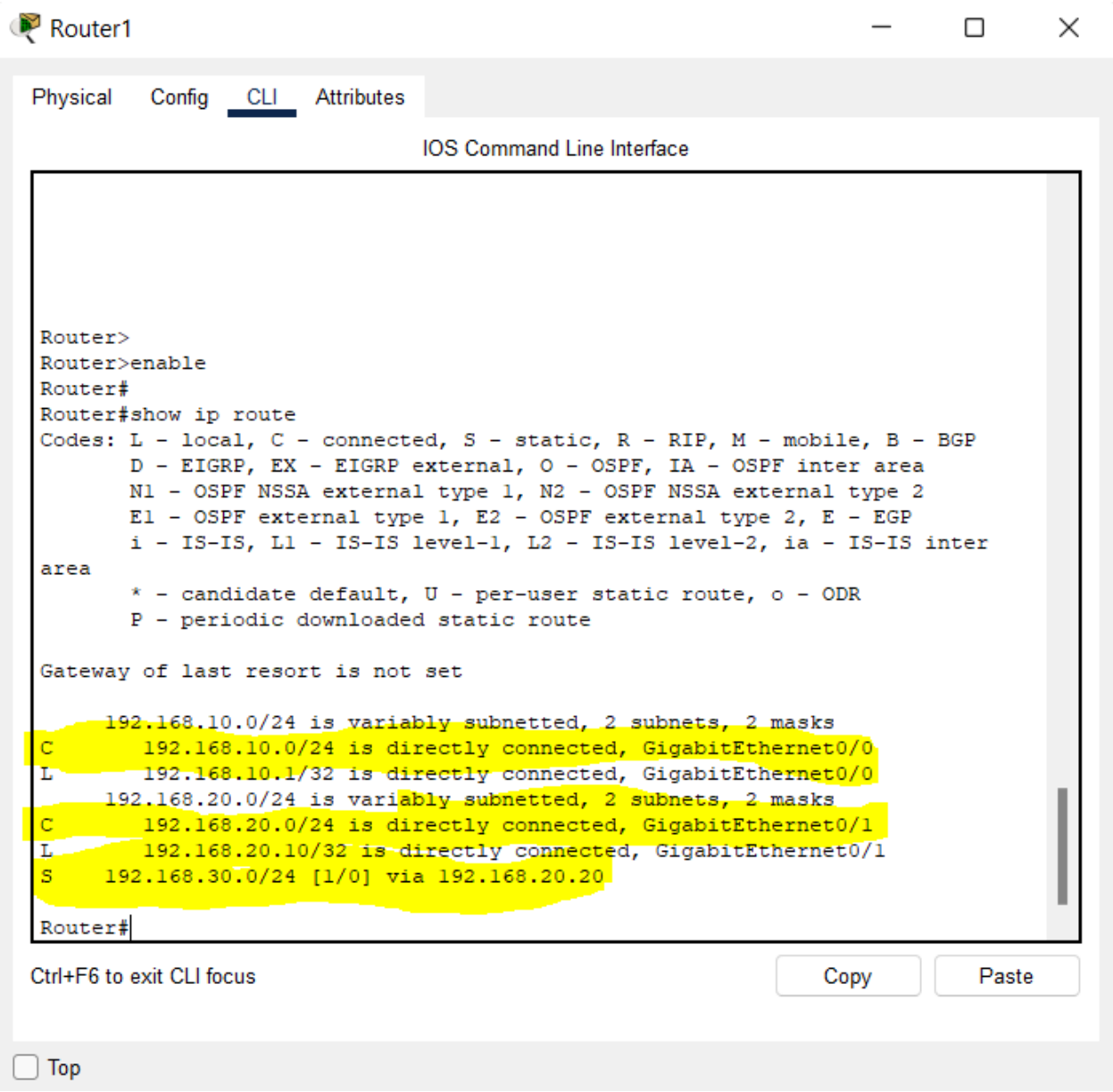


We will repeat the similar configuration on Router2 by configuring the gateway IP addresses on both gig0/0 and gig0/1. After configuring the interfaces, we will add static route for Network 1 (since it is indirectly connected to Router2).

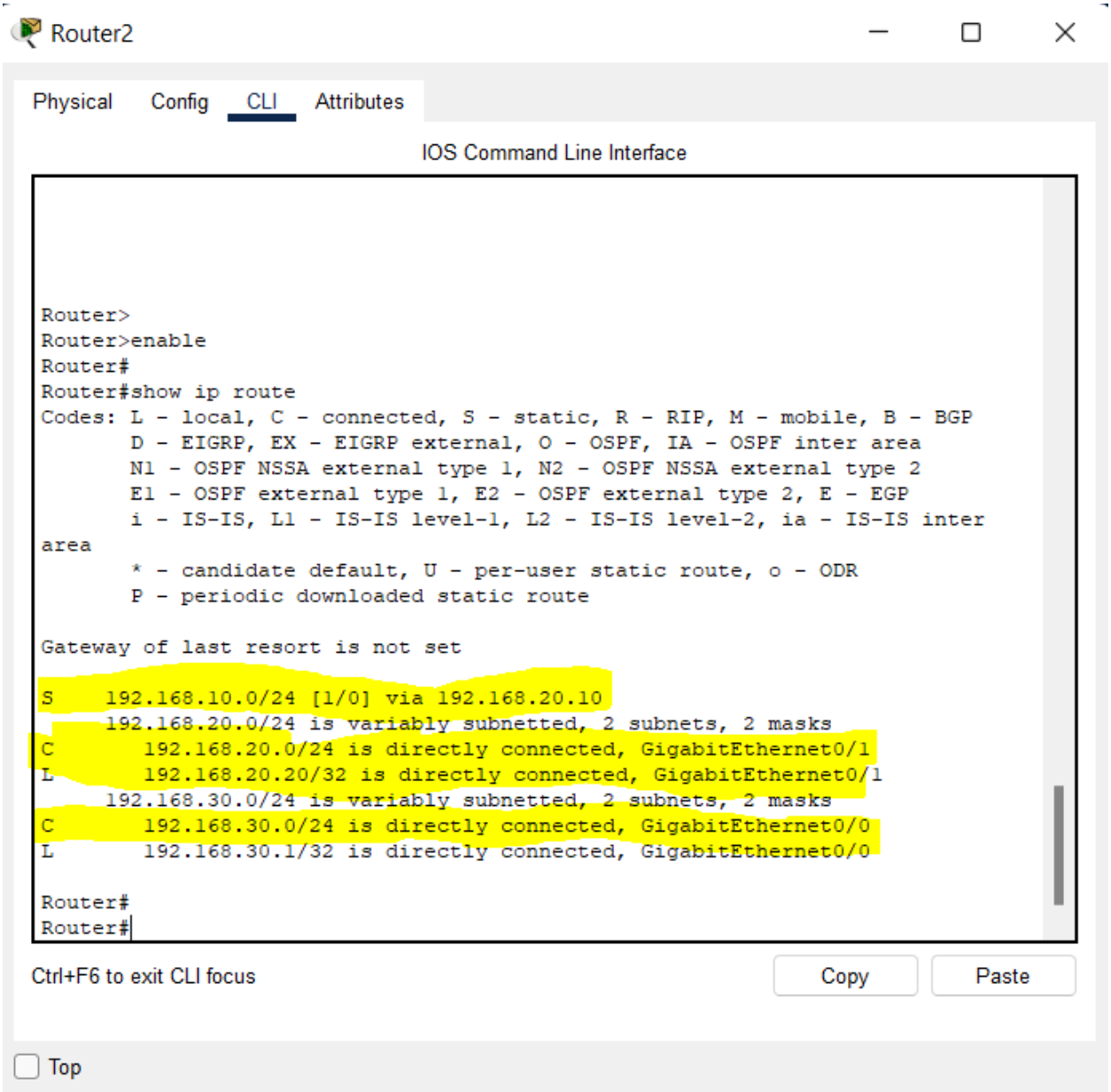


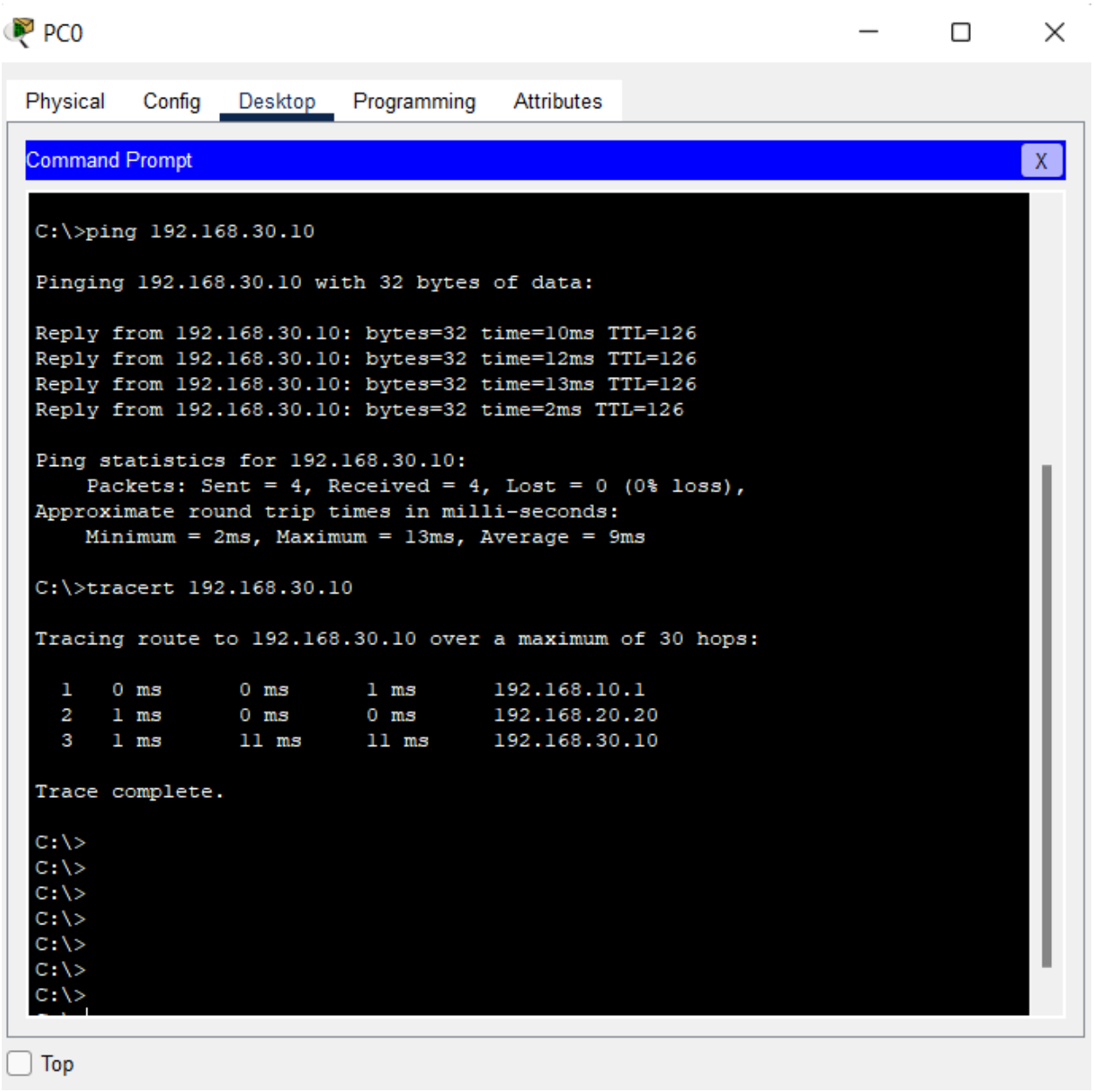
Routing Table:

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. Static route entries in a routing table start with S as shown in the below snippet (192.168.30.0/24 network is learned by Router1 using static route)



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. Static route entries in a routing table start with S as shown in the below snippet (192.168.10.0/24 network is learned by Router2 using static route)



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: