



Computer Communications and Networks

Static Routing

Reach Remote Networks:

A router can learn about remote networks in one of two ways:

- **Manually** - Remote networks are manually entered into the routing table using static routes.
- **Dynamically** - Remote routes are automatically learned using a dynamic routing protocol.
- **What is Static Routing?**
 - A manual method of routing where network paths **are manually configured** by the administrator.
 - Unlike dynamic routing, it does **not use routing protocols** to update routes automatically.
- **Key Characteristics:**
 - Routes are manually added using the `ip route` command.
 - Does not change unless modified by the administrator.
 - Requires less CPU and memory compared to dynamic routing.



♦ **Advantages:**

- ✓ Simple to configure in small networks.
- ✓ No additional bandwidth usage for route updates.
- ✓ More secure as it does not share routing information dynamically.
- ✓ The path a static route uses to send data is known.

♦ **Disadvantages:**

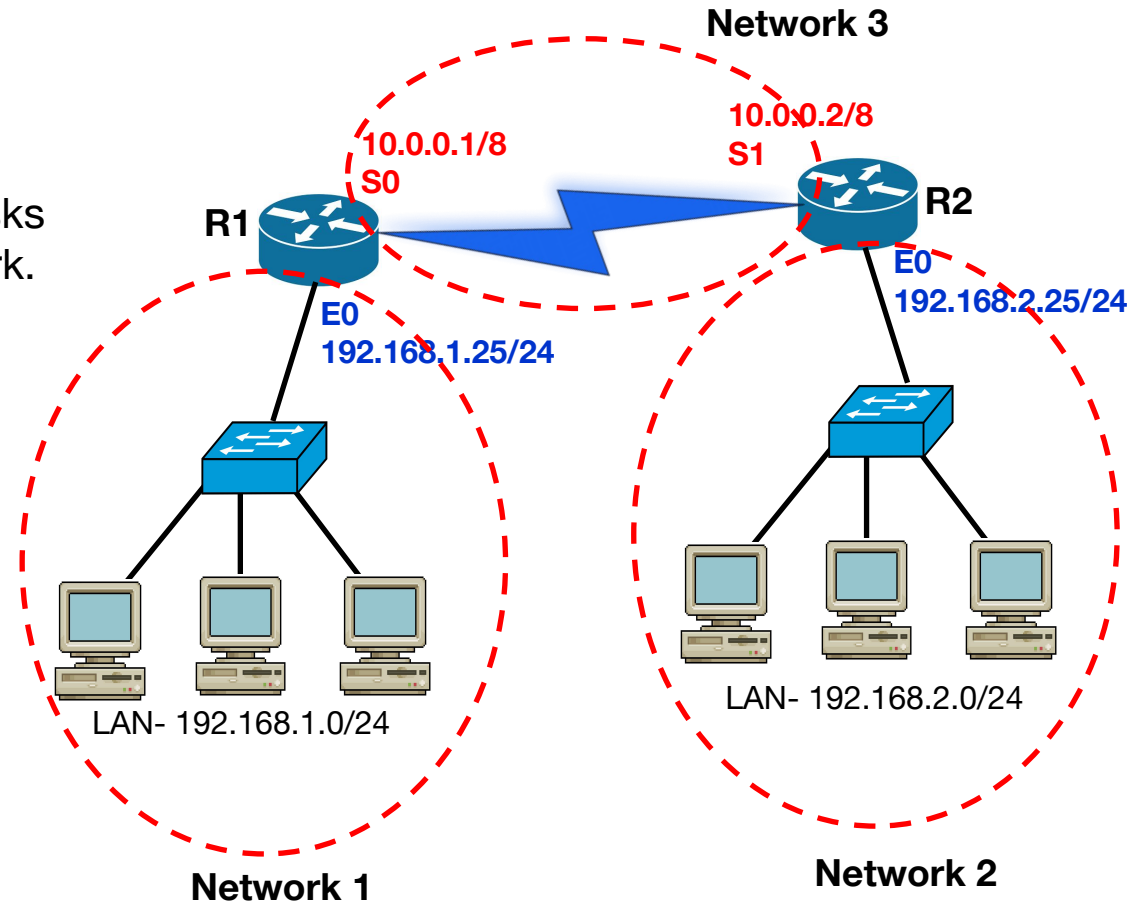
- ✗ Not scalable for large networks.
- ✗ Initial configuration and maintenance is time consuming.
- ✗ Requires manual updates when topology changes.
- ✗ Misconfiguration can lead to network issues.

Before You Start Configuring Static Routes,
Ensure That:

1. **IP Addressing is Complete** – Assign appropriate IP addresses and subnet masks to all active router interfaces in the network.
2. **Interfaces are Activated** – Verify that all required router interfaces are enabled and operational.

Now:

1. Identify all subnetworks within the entire network.
2. On each router, define static routes for all subnetworks that are not directly connected.

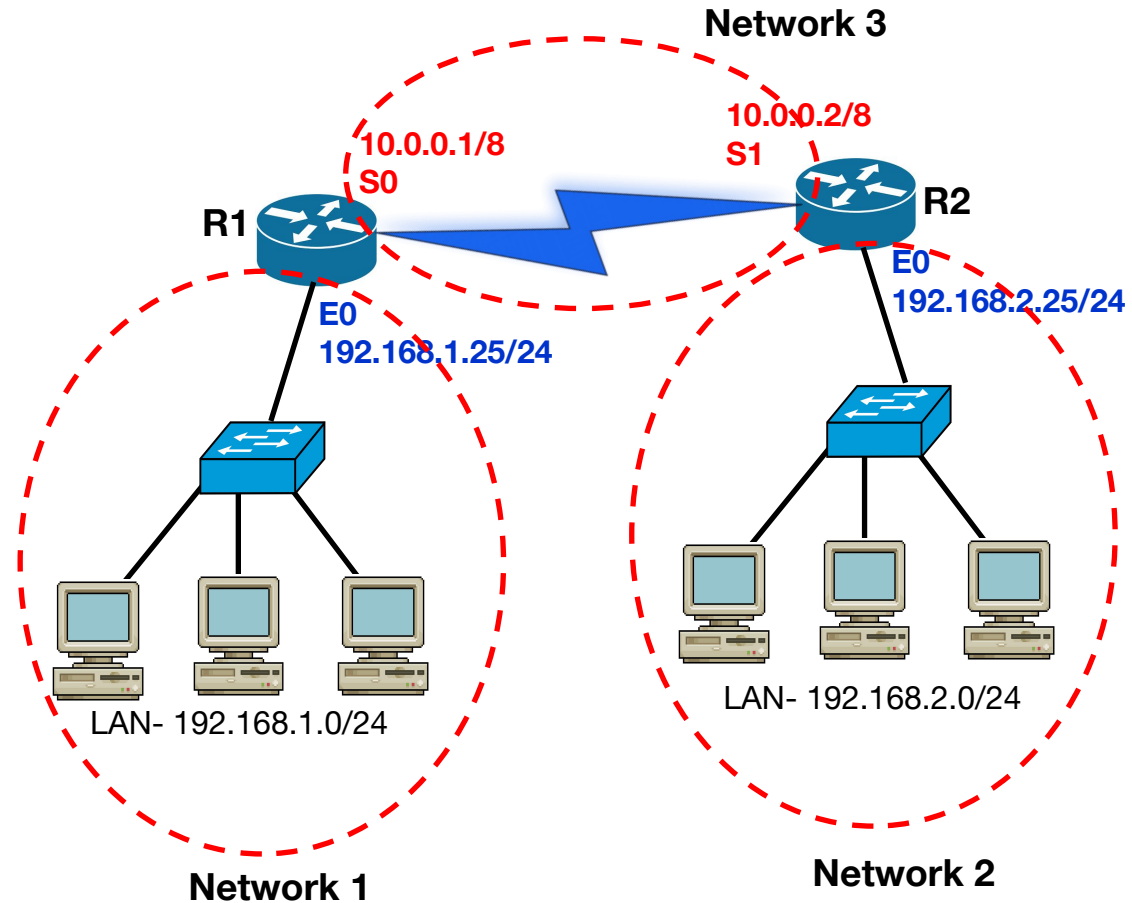




Static Routes: Next-Hop Options

When configuring a static route, the **next hop** can be identified by an **IP address**, **exit interface**, or **both**. How the destination is specified creates one of the three following types of static route:

1. **Next-hop route** - Only the next-hop IP address is specified.
2. **Directly connected static route** - Only the router exit interface is specified.
3. **Fully specified static route** - The next-hop IP address and exit interface are specified.



CLI Commands: we use `ip route` command to define static route

1. **Next-hop route** - Only the next-hop IP address is specified.

```
Router(config)# ip route <Destination Network ID> <Destination  
Subnet Mask> <Next-hop IP address>
```

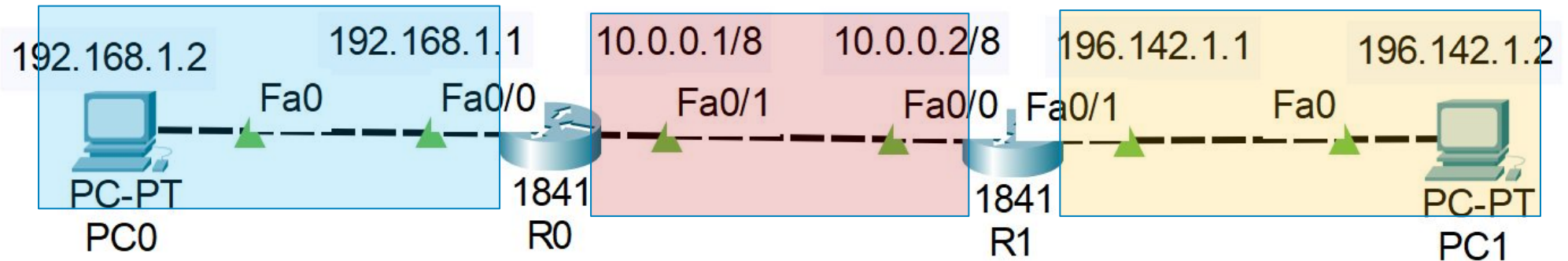
2. **Directly connected static route** - Only the router exit interface is specified.

```
Router(config)# ip route <Destination Network ID> <Destination  
Subnet Mask> <Exit Interface Name>
```

3. **Fully specified static route** - The next-hop IP address and exit interface are specified.

```
Router(config)# ip route <Destination Network ID> <Destination  
Subnet Mask> <Exit Interface Name> <Next-hop IP address>
```

Static Routes: Next-Hop Options



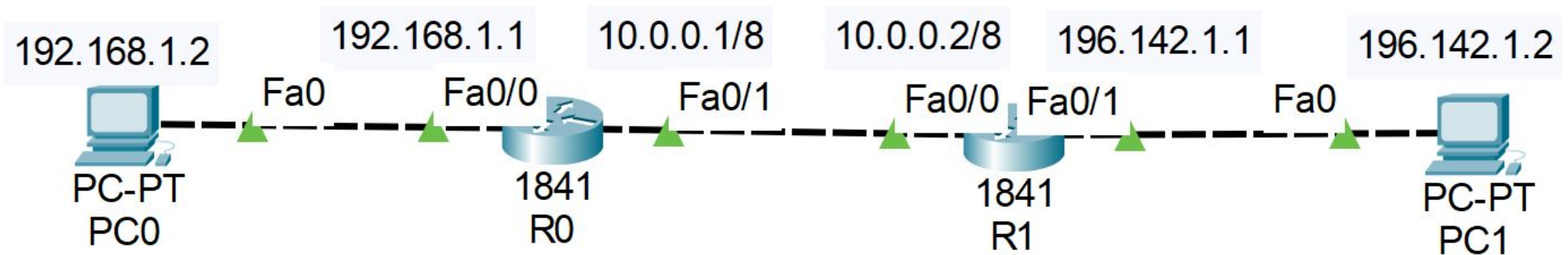
How many distinct subnetworks are present in this network?

Three: **192.168.1.0/24**; **196.142.1.0/24**; and **10.0.0.0/8**

- **Router R0** has direct connections to **192.168.1.0/24** and **10.0.0.0/8**
- We need to define a static route to **196.142.1.0/24**
- **Router R1** has direct connections to **196.142.1.0/24** and **10.0.0.0/8**
- We need to define a static route to **192.168.1.0/24**



Static Routes: Next-Hop Options



On Router R0, route to **196.142.1.0/24** can be defined as:

Next-hop route: `ip route 196.142.1.0 255.255.255.0 10.0.0.2`

Directly connected static route: `ip route 196.142.1.0 255.255.255.0 Fa0/1`

On Router R1, route to **192.168.1.0/24** can be defined as:

Next-hop route: `ip route 192.168.1.0 255.255.255.0 10.0.0.1`

Directly connected static route: `ip route 192.168.1.0 255.255.255.0 Fa0/0`



Static Routes: Manual Configuration

1. Click on Config Tab.

2. Click on Static.

3. Destination Network ID.

4. Destination Subnet Mask.

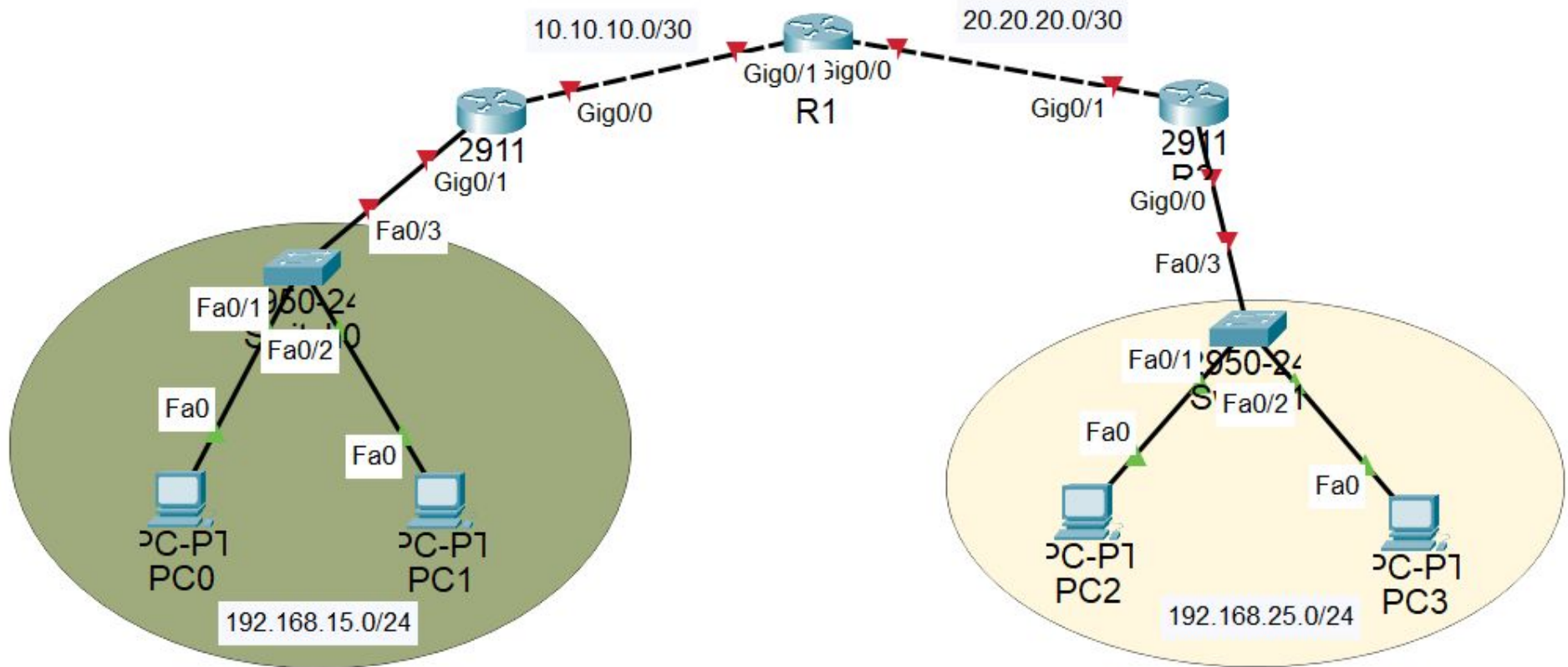
5. Next-hop IP address.

6. Click Add.



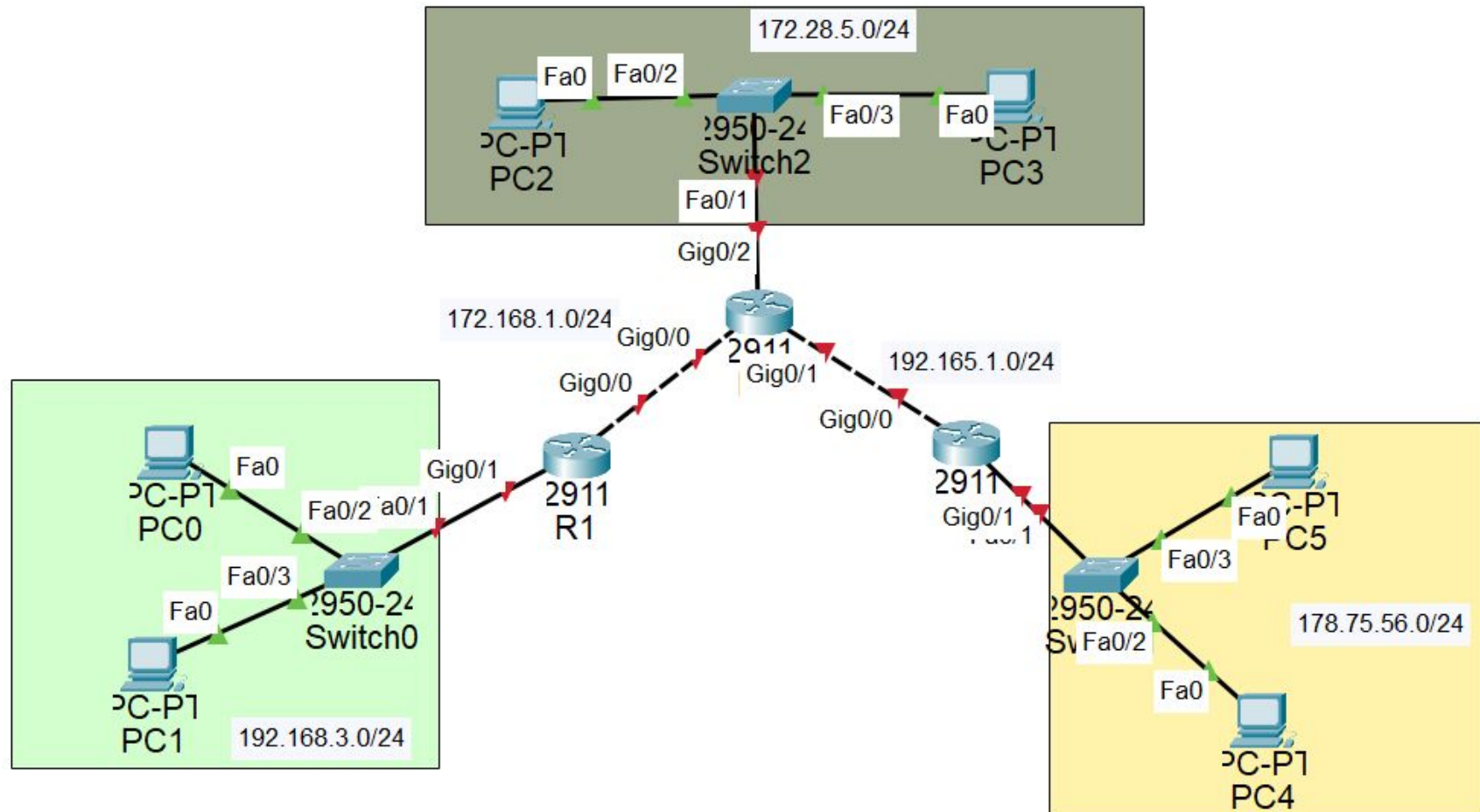
Exercise 1

Create the following network topology and configure the routers with static routing information so that all PCs can communicate with each other.



Exercise 2

Create the following network topology and configure the routers with static routing information so that all PCs can communicate with each other.





Exercise 3

Create the following network topology and configure the routers with static routing information so that all PCs can communicate with each other.

