

ECCS-3631

Networks and Data Communications

Module 2-3

Static and Default Routing

Dr. Ajmal Khan

Router's Serial Interface

- There are two types of devices that can communicate over a serial interface: Data Communication Equipment (DCE), and Data Terminal Equipment (DTE). A DCE provides a physical connection to a network and forwards traffic. A DTE connects to a network through a DCE device. Typically, a DTE device is connected to a DCE device (or vice versa) rather than another DTE device.
- One side of the link (DCE), has to transmit the clock signal, which controls the data rate, and the other side (DTE) receives the clock signal.
- By default, Cisco routers are all data terminal equipment (DTE) devices, so you must tell an interface to provide clocking if you need it to act like a DCE device.

Router's Serial Interface – Configure First

```
Router1# config t
```

```
Router1(config)#interface serial 0/1/0
```

```
Router1(config-if)#ip address 192.168.200.1 255.255.255.252
```

```
Router1(config-if)#no shutdown
```

```
Router1(config-if)#clock rate 250000
```

Notice that the clock rate command is in bits per second.

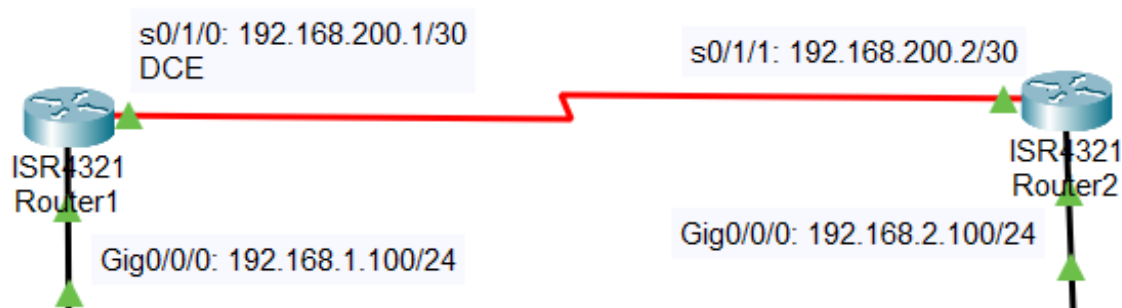
```
Router2#config t
```

```
Router2(config)#interface serial 0/1/1
```

```
Router2(config-if)#ip address 192.168.200.2 255.255.255.252
```

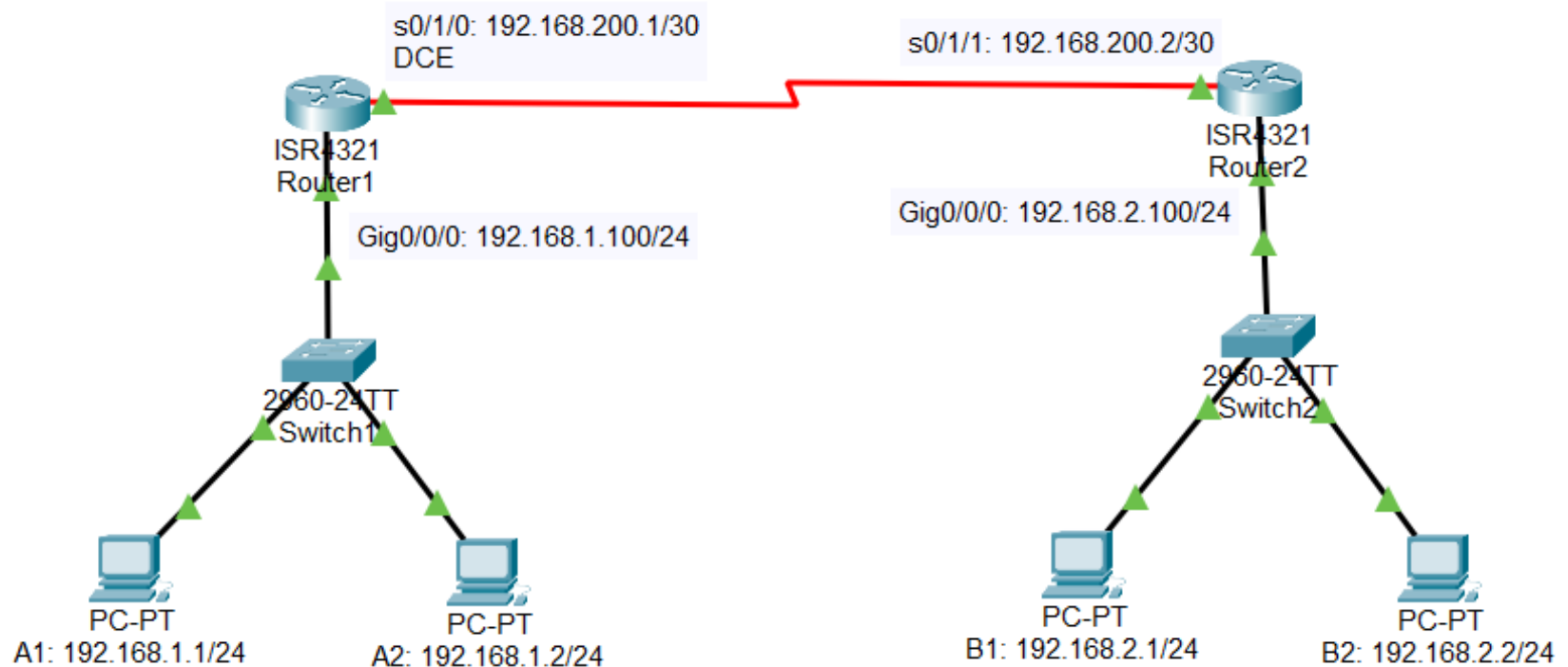
```
Router2(config-if)#no shutdown
```

```
Router2(config-if)#exit
```



Router's Serial Interface – Connect Cable

- The difference between the two cables in the packet tracer is just which side you click first:
- With the **DCE cable**, (red zigzag with clock) the side you click first will be the DCE, the second will be DTE
- With the **DTE cable** (red zigzag no clock) the side you click first will be DTE, the second will be DCE



Router's Serial Interface – Checking

- To see if a router's serial interface has a DCE cable connected with the show controllers interface command.

```
Router1> show controllers serial 0/1/0
```

```
Interface Serial0/1/0
```

```
Hardware is PowerQUICC MPC860
```

```
DCE V.35, clock rate 250000
```

- This output verifies that Router1 serial 1/0 port is configured as DCE with a clock rate of 250000.
- Now go to Router2 CLI mode and use show controllers:

```
Router2> show controllers serial 0/1/1
```

```
Interface Serial0/1/1
```

```
Hardware is PowerQUICC MPC860
```

```
DTE V.35 TX and RX clocks detected
```

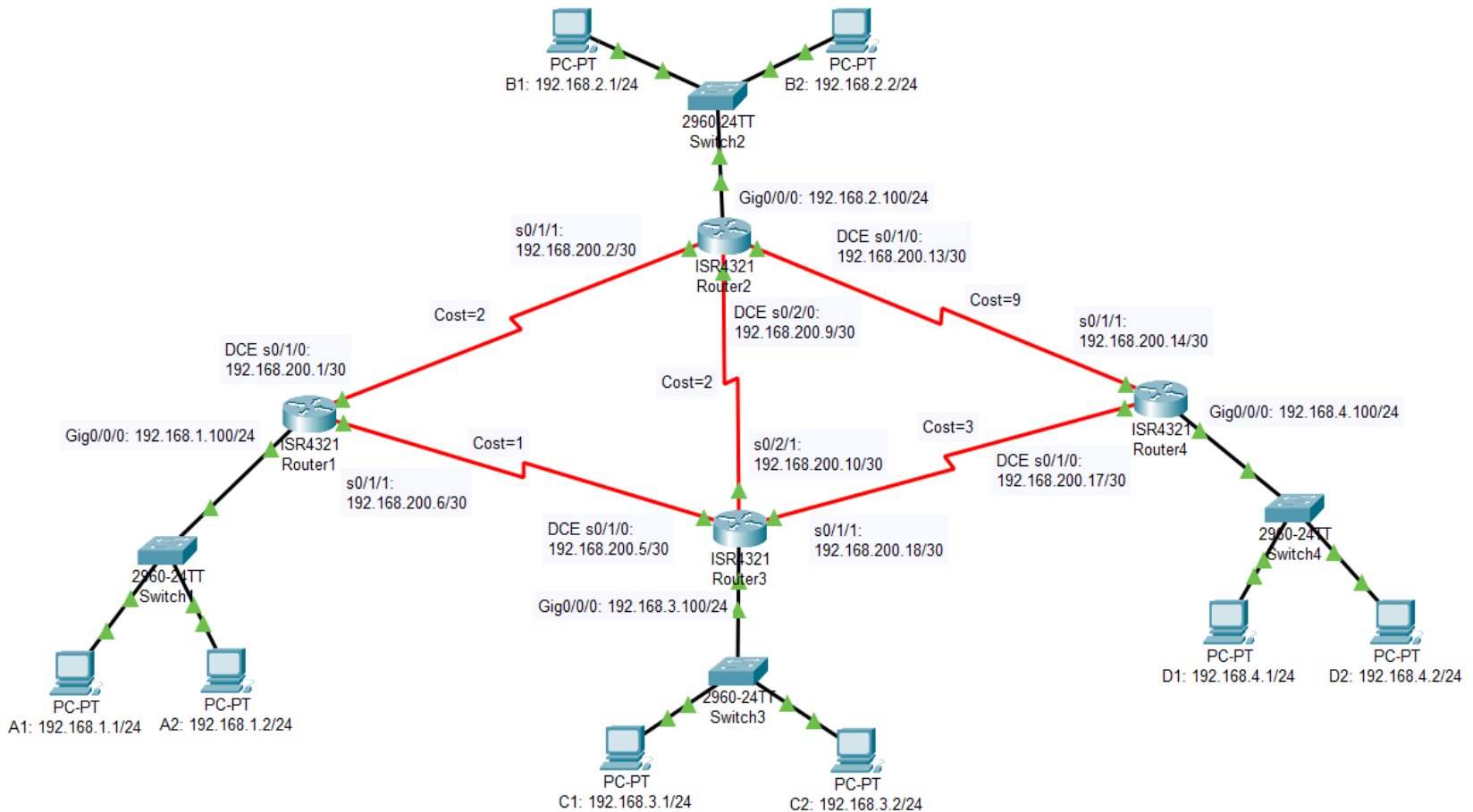
- The output verifies that Router2 serial 0/1/1 is configured as DTE.
- You can also verify using show running-config

Routing Table

- What is a Routing Table?
- A routing table is a set of rules, often viewed in table format, that is used to determine where data packets traveling over an Internet Protocol (IP) network will be directed.

Routing Table

- How the Router1 knows where is Network D?
- We will have to set up a routing table in Router1 that will be used to determine the path to each network in the system

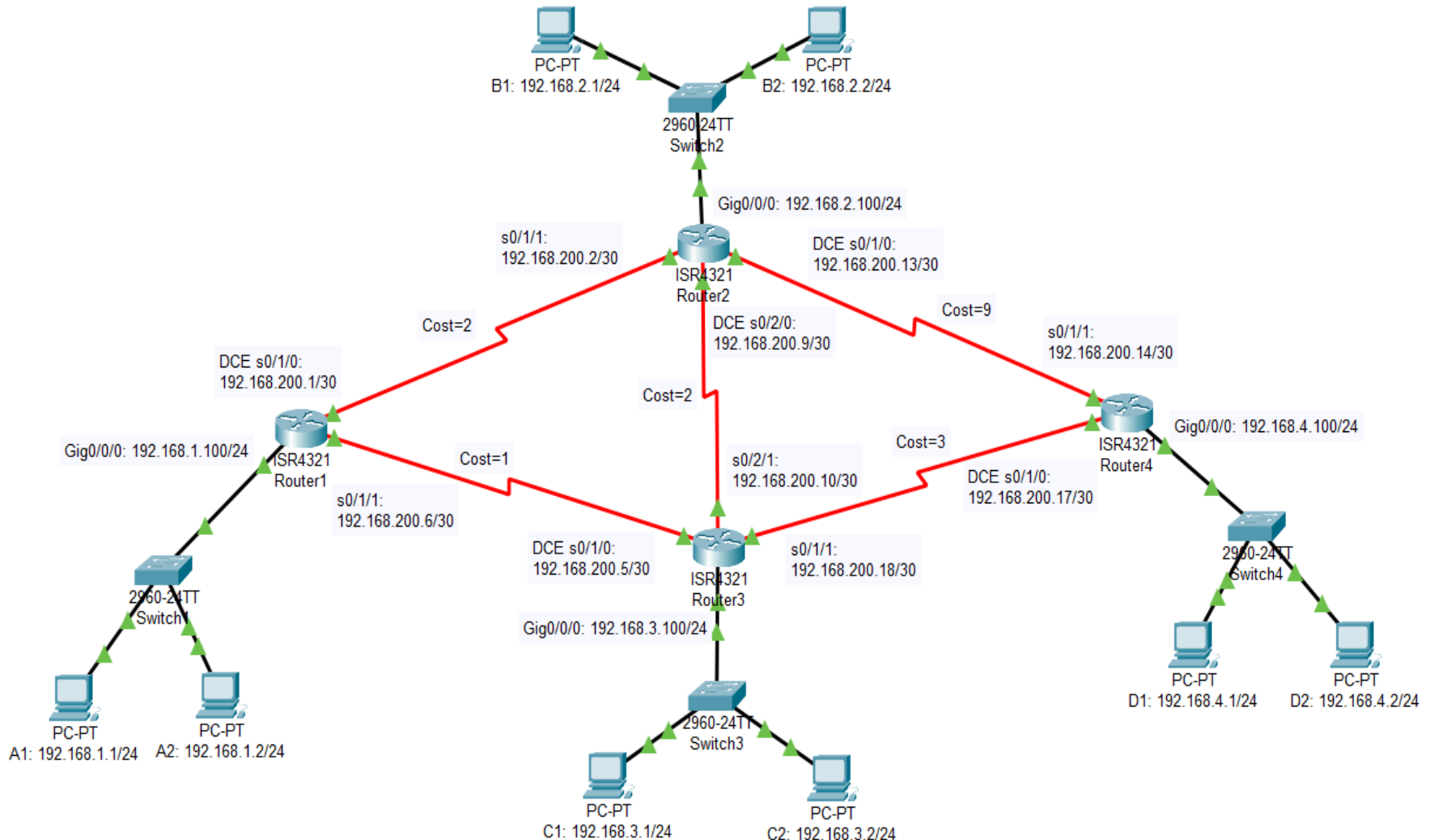


Elements of a Routing Table

- **Destination Network:** The IP address of the packet's final destination
- **Next hop:** The IP address to which the packet is forwarded
- **Interface:** The outgoing network interface the device should use when forwarding the packet to the next hop or final destination
- **Metric:** Assigns a cost to each available route so that the most cost-effective path can be chosen

Routing Table of Router1

- First, identify all networks; who are the networks in this system?
- Then, look at the links costs and find the best route to each network



Prepare the Routing Table

Write the routing table of Router1

Network Address	Subnet Mask	Next-hop or Exit-interface

Prepare the Routing Table

Write the routing table of Router1

Network Address	Subnet Mask	Next-hop or Exit-interface
192.168.1.0	255.255.255.0	Gig 0/0/0
192.168.2.0	255.255.255.0	192.168.200.2
192.168.3.0	255.255.255.0	192.168.200.5
192.168.4.0	255.255.255.0	192.168.200.5
192.168.200.0	255.255.255.252	s 0/1/0
192.168.200.4	255.255.255.252	s 0/1/1
192.168.200.8	255.255.255.252	192.168.200.5
192.168.200.12	255.255.255.252	192.168.200.2
192.168.200.16	255.255.255.252	192.168.200.5

Prepare the Routing Table

Write the routing table of Router2

Network Address	Subnet Mask	Next-hop or Exit-interface

IP Routing

- Three types of Routing
 1. Static Routing
 2. Default Routing
 3. Dynamic Routing

Static Routing

- Static routing occurs when you manually add routes in each router's routing table.
- Here is the command syntax use to add a static route to a routing table:
Router(config)#**ip route** [destination_network] [mask] [next-hop_address or exitinterface]

This list describes each command in the string:

ip route The command used to create the static route.

destination_network The network you are placing in the routing table.

mask The subnet mask being used on the network.

next-hop_address The address of the next-hop router that will receive the packet and forward it to the remote network.

exitinterface You can use it in place of the next-hop address if you want, but it is got to be on a point-to-point link, such as a WAN. This command will not work on a LAN such as Ethernet.

Configuring Static Routing on R1

Configuring Static Routing on Router1:

Router1(config)#ip route 192.168.2.0 255.255.255.0 gig 0/0/0

Router1(config)#ip route 192.168.2.0 255.255.255.0 192.168.200.2

Router1(config)#ip route 192.168.3.0 255.255.255.0 192.168.200.5

Router1(config)#ip route 192.168.4.0 255.255.255.0 192.168.200.5

Router1(config)#ip route 192.168.200.0 255.255.255.252 serial 0/1/0

Router1(config)#ip route 192.168.200.4 255.255.255.252 serial 0/1/1

Router1(config)#ip route 192.168.200.8 255.255.255.252 192.168.200.5

Router1(config)#ip route 192.168.200.12 255.255.255.252 192.168.200.2

Router1(config)#ip route 192.168.200.16 255.255.255.252 192.168.200.5

Configuring Static Routing on R2

Configuring Static Routing on Router2:

Router2(config)# _____

Router2(config)# _____

Router2(config)# _____

Router2(config)# _____

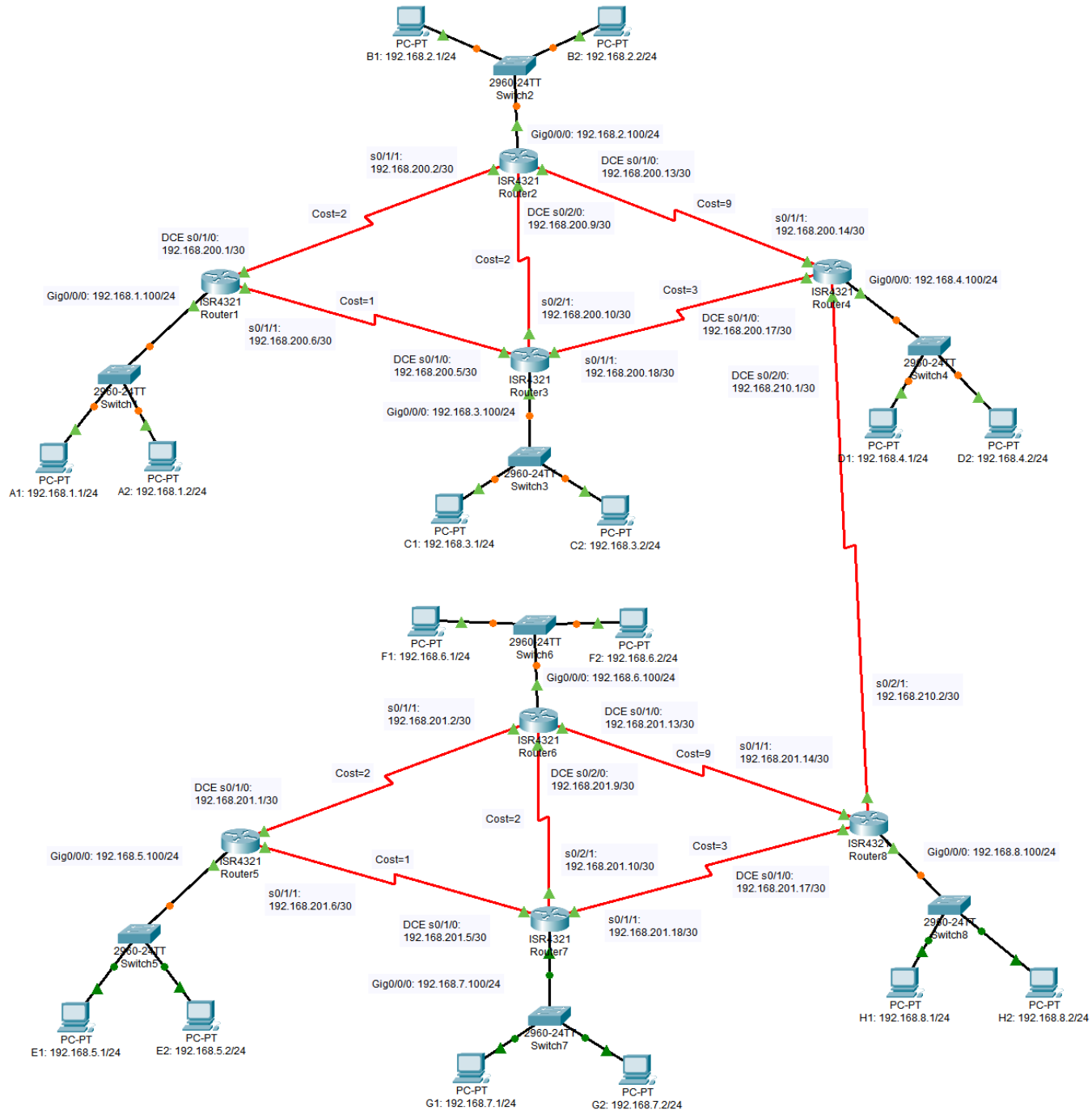
Router2(config)# _____

Router2(config)# _____

Router2(config)# _____

Router2(config)# _____

Router2(config)# _____



Default Routing

We use default routing to send packets with a remote destination network not in the routing table to the next-hop router. You can only use default routing on stub networks, those with only one exit path out of the network.

By using a default route, you can just create one static route entry instead.

```
Router1 (config) #ip route 0.0.0.0 0.0.0.0 serial 0/1/0
```

This above default route is also known as Gateway of Last Resort.

Default Routing for R2, R3, R4

Router2 (config) # _____

Router3 (config) # _____

Router4 (config) # _____