Lab #5 IP Routing I :   Static Routing & Default routing

Routing protocol and Routed protocol

You must understand the difference between a routing protocol and a routed protocol. A routing protocol is used by routers to dynamically find all the networks in the internetwork and to ensure that all routers have the same routing table. Basically, **a routing protocol determines the path of a packet through an internetwork.**

Examples of routing protocols are *RIP*, *RIPv2*, *EIGRP*, and *OSPF*.

Once all routers know about all networks, **a routed protocol can be used to send user data (packets) through the established enterprise**. Routed protocols are assigned to an interface and determine the method of packet delivery.

Examples of routed protocols are *IP* and *IPv6*.

Routing basis

The term *routing* is used for taking a packet from one device and sending it through the network to another device on a different network. Routers do not really care about hosts - they only care about networks and the best path to each network.

The logical network address of the destination host is used to get packets to a network through a routed network, and then the hardware address of the host is used to deliver the packet from a router to the correct destination host.

If a network is not directly connected to the router, then the router must use one of two ways to learn how to get to the remote network: **static routing**, meaning that someone must hand-type all network locations into the routing table, or something called **dynamic routing** (next lab ☺).

Static Routing

Static routing occurs when you manually add routes in each router's routing table. There are pros and cons to static routing, but that is true for all routing processes.

Static routing has the following benefits:

- There is no overhead on the router CPU, which means that you could possibly buy a cheaper router than you would use if you were using dynamic routing.
- There is no bandwidth usage between routers, which means you could possibly save money on WAN links.
- It adds security because the administrator can choose to allow routing access to certain networks only.

Static routing has the following disadvantages:

- The administrator must really understand the internetwork and how each router is connected in order to configure routes correctly.
- If a network is added to the internetwork, the administrator has to add a route to it on all routers—by hand.
- It's not feasible in large networks because maintaining it would be a full-time job in itself.

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 should only use default routing on stub networks—those with only one exit path out of the network.

Configuring Routes on Cisco Router

Using Cisco Packet Tracer software, we simulate the following network which has 4 networks and 10 subnetworks (VLSM).

And assign each host an IP. Also we have to assign an IP for each interface on the router. We assign an IP for the Router interface and start it up using the following commands:

```
Router(config)#interface fa0/0
Router(config-if)#ip address 192.168.1.129 255.255.255.192
Router(config-if)#no shutdown
```
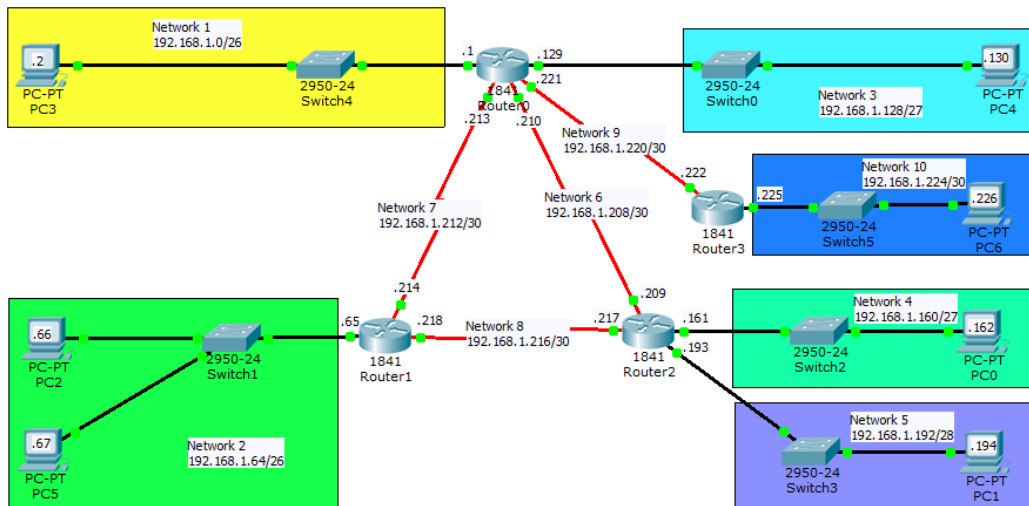
Where:

       fa0/0 is the name of the interface.

       192.168.1.129 is the IP address for interface fa0/0.

       255.255.255.192 is the subnet mask being used on the network that connected directly to the interface.

       no shutdown to start up the interface.

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Run the same commands for all routers interfaces and assign each interface an appropriate IP/mask pair.

Now we start routing …

Network 10 is connected directly to **Router 3** and no other subnets is connected to **Router 3**, so we can configure default route on it using the following command:

Router(config)#ip route **0.0.0.0** **0.0.0.0** **192.168.1.221**

Where:

0.0.0.0 is the destination network IP [0.0.0.0 in case of default routing]

0.0.0.0 is the subnet mask being used on the destination network.

192.168.1.221 is the address of the next-hop router that will receive the packet and forward it to the destination network.

For the other routers, we cannot implement default routing since each of them is connected to more than one network. In this case, we use static routing.

We can configure static route on **router0** as follow:

Router(config)#ip route **192.168.1.64** **255.255.255.192** **192.168.1.214**

Where:

192.168.1.64 is the destination network we wants to send packets to it.

255.255.255.192 is the subnet mask being used on the destination network.

192.168.1.214 is the address of the next-hop router that will receive the packet and forward it to the destination network.

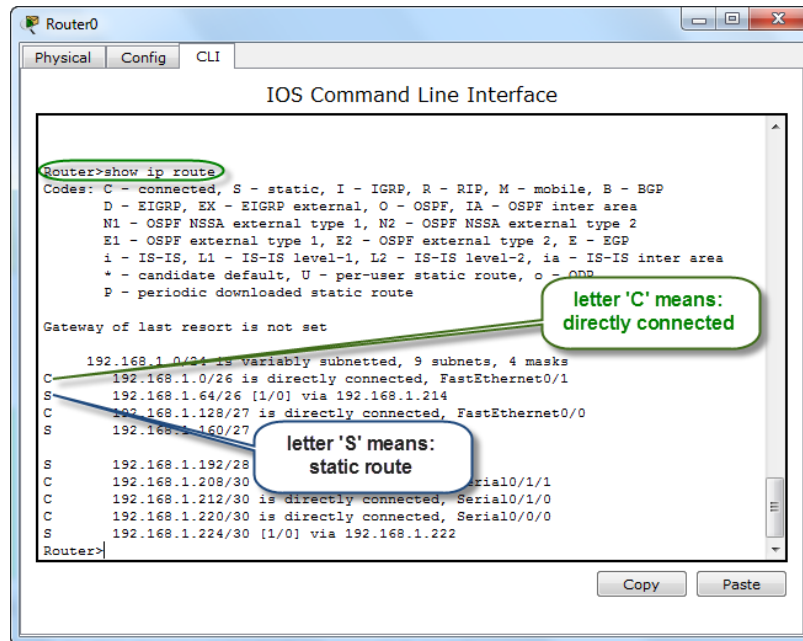Configuring all other static routes on router0:

Router(config)#ip route 192.168.1.160 255.255.255.224 192.168.1.209
Router(config)#ip route 192.168.1.192 255.255.255.240 192.168.1.209
Router(config)#ip route 192.168.1.224 255.255.255.252 192.168.1.222
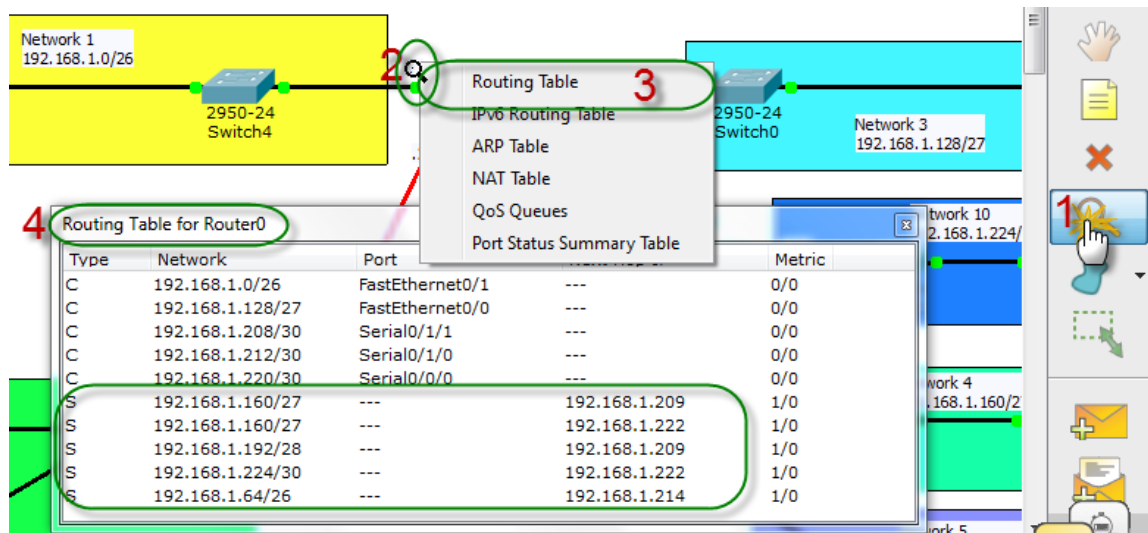
And do the same thing for the other routers.

To review routing table on a router, use command "***show ip route***":

Router>show ip route

Alternatively, by using the Inspect tool from the right panel, and select "*Routing Table*" from the menu:

Now check the connectivity of the network using "*ping*" command, or "*tracert*" command.
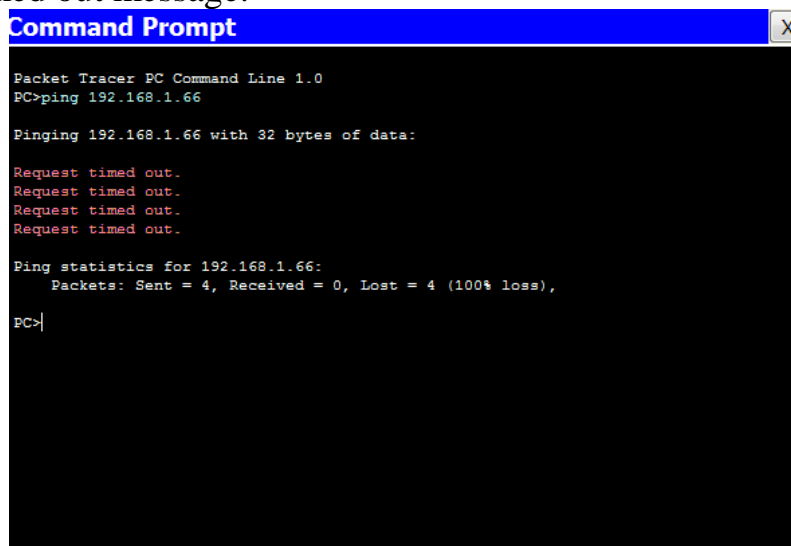

Note: to tell the cisco router to Stops looking for meaning for wrong written words while configuring Cisco router type:
 "Corp(config)#no ip domain-lookup"

Another quick note: to mention that when (if) the packet is lost on the way back to the originating host, you will typically see a "Request timed out" message because it is an unknown error.
If the error occurs because of a known issue, such as if a route is not in the routing table on the way to the destination device, you will see a "Destination host unreachable" message. This should help you determine if the problem occurred on the way to the destination or on the way.

Request timed out message:

```
Command Prompt                                              X

Packet Tracer PC Command Line 1.0
PC>ping 192.168.1.66

Pinging 192.168.1.66 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.1.66:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

PC>
```
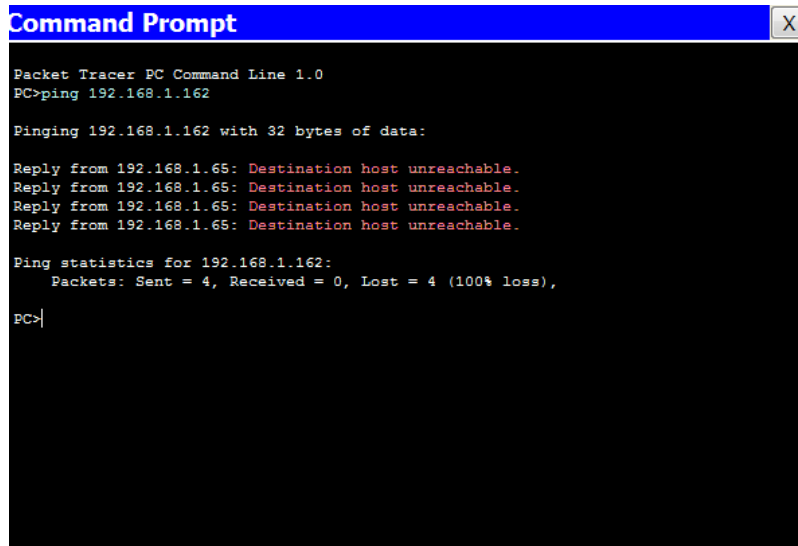
Destination host unreachable message:

```
Command Prompt                                              X

Packet Tracer PC Command Line 1.0
PC>ping 192.168.1.162

Pinging 192.168.1.162 with 32 bytes of data:

Reply from 192.168.1.65: Destination host unreachable.
Reply from 192.168.1.65: Destination host unreachable.
Reply from 192.168.1.65: Destination host unreachable.
Reply from 192.168.1.65: Destination host unreachable.

Ping statistics for 192.168.1.162:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

PC>
```

Exercise:

For the network shown below, assign an appropriate IP address for each host and router interface. Then configure all routers and implement all necessary static/default routes. Try to review routing tables on all routers and test the connectivity of your network using "ping" command before send the exercise file to AT's email.