Static Routes and Default Routes

Overview

It is important to know how to configure static routes on a router. Many networks are small enough that all of the routing can be handled by a few static routes and a default route out of the network.

If you want to know a router's routes you need to look at its routing table. The routing table will show you connected routes, static routes, if there is a default route, and it will also show you if there are any dynamically learned routes too. In this tutorial we will look at connected routes, static routes and default routes

Connected Routes

Connected routes are routes to networks directly connected to the router. To establish connected routes all you have to do is bring up your router's interfaces. This means configuring the router's interfaces with IP addresses and subnet masks and making sure they are not in an administratively shutdown state.

Static Routes

IP route command is used to configure the static route.

In this article we will explain IP route command and its parameters in details. Static routing is useful in small network where numbers of routes are limited. In static routing we need to add route manually with IP route command. Like other routing methods static routing also has its pros and cons.

Advantage of static routing

1. It is easy to implement.
2. It is most secure way of routing, since no information is shared with other routers.
3. It puts no overhead on resources such as CPU or memory.

Disadvantage of static routing

1. It is suitable only for small network.
2. If a link fails static route cannot reroute the traffic.

Static Route Example

Device	Connected from	Connected to	IP Address	Subnet Mask
Router Melaka	FastEthernet0/0	Swtich 1's FastEthernet 0/1	192.168.2.1	255.255.255.0
PC0	FastEthernet0	Swtich 1's FastEthernet 0/2	192.168.2.7	255.255.255.0
PC1	FastEthernet0	Swtich 1's FastEthernet 0/3	192.168.2.9	255.255.255.0
Router Melaka	Serial 0/1/0	Router Seremban's serial0/1/0	192.168.1.2	255.255.255.0
Router Seremban	Serial 0/1/0	Router Melaka's Serial 0/1/0	192.168.1.3	255.255.255.0
Router Seremban	FastEthernet0/0	Swtich 2's FastEthernet 0/1	192.168.3.1	255.255.255.0
PC2	FastEthernet 0	Swtich 2's FastEthernet 0/2	192.168.3.2	255.255.255.0
PC3	FastEthernet 0	Swtich 0's FastEthernet 0/3	192.168.3.5	255.255.255.0

Task 1

Step 1: Assign IP address to devices

Step 2:

Select Router 1841 model, add addition serial module interfaces:

– (**The HWIC-2T** is a Cisco 2-Port Serial High-Speed WAN Interface Card, providing 2 serial ports.)

Step 3: Assign IP address to interfaces of router

Step 4: Following commands are used to access global configuration mode.

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#
```

Step 5: From global configuration mode we can enter in interface mode. From there we can configure the interface. Following commands will assign IP address on FastEthernet0/0

```
Router(config)#hostname Router_Melaka
Router_Melaka(config)#interface fastEthernet 0/0
Router_Melaka(config-if)#ip address 192.168.2.1 255.255.255.0
Router_Melaka(config-if)#no shutdown
Router_Melaka(config-if)#exit
Router_Melaka(config)#
```

- ***interface fastEthernet 0/0*** command is used to enter in interface mode.
- ***ip address 192.168.2.1 255.255.255.0*** command will assign IP address to interface.
- ***no shutdown*** command will bring the interface up.
- ***exit*** command is used to return in global configuration mode.
- Serial interface needs two additional parameters **clock rate and bandwidth**. Every serial cable has two ends DTE and DCE. These parameters are always configured at DCE end. We can use ***show controllers interface*** command from privilege mode to check the cable's end.

```
Router#show controllers serial 0/0/0
Interface Serial0/0/0
Hardware is PowerQUICC MPC860
DCE V.35, clock rate 2000000
[Output omitted]
```

Fourth line of output confirms that DCE end of serial cable is attached. If you see DTE here instead of DCE skip these parameters.

Step 6: Now we have necessary information let's assign IP address to serial interface.

```
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface serial 0/1/0
Router(config-if)#ip address 192.168.1.2 255.255.255.0
Router(config-if)#clock rate 64000
Router(config-if)#bandwidth 64
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#
```

- ***Router#configure terminal*** : Command is used to enter in global configuration mode.
- ***Router(config)#interface serial 0/1/0:*** Command is used to enter in interface mode.
- ***Router(config-if)#ip address 192.168.1.2 255.255.255.0*** Command assigns IP address to interface. For serial link we usually use IP address from /30 subnet.
- ***Router(config-if)#clock rate 64000*** And ***Router(config-if)#bandwidth 64*** In real life environment these parameters control the data flow between serial links and need to be set at service providers end. In lab environment we need not to worry about these values. We can use these values.
- ***Router(config-if)#no shutdown*** Command brings interface up.
- ***Router(config-if)#exit*** Command is used to return in global configuration mode.

We will use same commands to assign IP addresses on interfaces of **Router_Seremban**. Since we have provided clock rate and bandwidth on serial interface of Router_Melaka we need not to assign them on serial interface of **Router_Seremban** side.

Step 7: Following command will assign IP addresses on interface of Router_Seremban.

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface serial 0/1/0
Router(config-if)#ip address 192.168.1.3 255.255.255.0
Router(config-if)#clock rate 64000
Router(config-if)#bandwidth 64
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#interface fastEthernet 0/0
Router(config-if)#ip address 192.168.3.1 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#exit
```

Task 2

Static route command explained

- ***IP route*** command is used to configure the static route. In this section we will explain static route command in detail. Command to configure the static route:

We have two commands to configure the static route.

```
Router(config)# ip route destination_network_# [subnet_mask]
IP_address_of_next_hop_neighbor
```

OR

```
Router(config)# ip route destination_network_# [subnet_mask]
interface_to_exit
```

Configure Static Route

Now we know that how IP route command is used to configure the static route. Let's implement it in our example topology. Run following command from global configuration mode in routers.

Step 1: Configure Static Router_Melaka

```
Router_Melaka(config)# ip route 192.168.3.0 255.255.255.0 192.168.1.3
```

Step 2: Configure Static Router_Seremban

```
Router_Seremban(config)# ip route 192.168.2.0  255.255.255.0  192.168.1.2
```

- **ip route**
  It is the command that add new route in routing table.
- **destination_network_#[subnet_mask]**
  This is the first parameter. It specifies the destination network address. We need to provide subnet mask if we are using sub-network. Sub-networks are the smaller network created from one large network in subnetting. If we are not using sub-network then we can omit the subnet mask value. It will parse automatically.
- **IP_address_of_next_hop_neighbor / interface_to_exit**
  This parameter provides a way to reach the destination network. Both commands use separate way to assign this value. First command provides the IP address of next hop neighbor. It tells router that if it receives a packet for destination [that we set in previous parameter], forward that packet to this next hop neighbor IP address.
  Second command also do the same job but in different way. It specifies exit interface instead of next hop IP address. It tells router that if it receives a packet for the destination specified by previous parameter then exits that packet from this interface. Device attached on other end of this interface will take care of the packet.

TASK 3

Configure Default Route (only for stub network)

By default when a packet arrives in interface, router checks destination filed in packet and compare it with routing table. If it finds a match for destination network then it will forward that packet from related interface. If it does not find a match in routing table then it will discard that packet. This is the default behavior of router. Default route command allows us to override this behavior. Default route is a way to deal with all unmatched packets. If no match for destination network found in routing table then it would be forwarded to the default route.

Following command will set default route

Router(config)# ip route 0.0.0.0 0.0.0.0 *IP_address_of_next_hop_neighbor*
Or
Router(config)# ip route 0.0.0.0 0.0.0.0 *interface_to_exit*

Above command sets destination network to **0.0.0.0/0** that represents all networks.

Step 1: Configure Default Router_Melaka

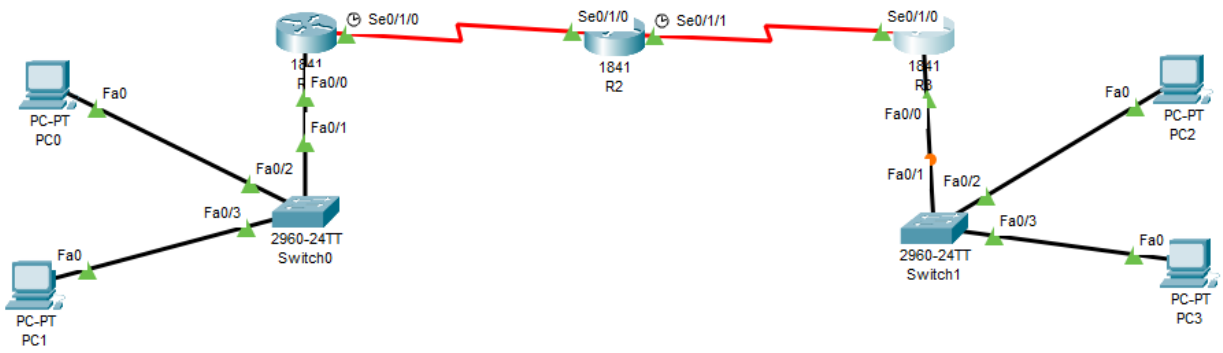
```
Router_Melaka(config)# ip route 0.0.0.0 0.0.0.0 192.168.1.3
```

Step 2: Configure Default Router_Seremban

```
Router_Seremban(config)# ip route 0.0.0.0 0.0.0.0 192.168.1.2
```

Lab Submission [10m]

1. Create the network based on the diagram below and assign the IP address according to the table provided. **[1m]**



Device	Connected from	Connected to	IP Address	Subnet Mask
R1	FastEthernet0/0	Swtich 0's FastEthernet 0/1	10.0.1.1	255.255.255.0
PC0	FastEthernet0	Swtich 0's FastEthernet 0/2	10.0.1.2	255.255.255.0

PC1	FastEthernet0	Swtich 0's FastEthernet 0/3	10.0.1.3	255.255.255.0
R1	Serial 0/1/0	R2's serial0/1/0	192.168.0.253	255.255.255.252
R2	Serial 0/1/0	R1's Serial 0/1/0	192.168.0.254	255.255.255.252
R2	Serial 0/1/1	R3's Serial 0/1/0	192.168..0.249	255.255.255.252
R3	Serial 0/1/0	R2's serial0/1/1	192.168..0.250	255.255.255.252
R3	FastEthernet0/0	Swtich 1's FastEthernet 0/1	10.0.2.1	255.255.255.0
PC2	FastEthernet 0	Swtich 0's FastEthernet 0/2	10.0.2.5	255.255.255.0
PC3	FastEthernet 0	Swtich 0's FastEthernet 0/3	10.0.2.6	255.255.255.0

2. Identify the static route for R1, R2 and R3 and assign to the network above accordingly. **[6m]**

Device	Destination network	Subnet Mask	Next hop/ interface to exit
R1			
R2			
R3			

3. Test all the connectivity to ensure the network is working. **[3m]**
4. Save your file name as Lab Group_StudentID_StudentName_Lab2.pkt.