**EXP-11 Simulate Static Routing Configuration using CISCO Packet Tracer**

**Static routing:**

* Static routing is a method in networking where routes are manually set up and managed by a network administrator.
* static routing requires manual updates whenever there’s a network change.
* It is smaller or simpler networks where changes are infrequent and reliability is critical, as it doesn’t consume network resources for route discovery or updates.

**Routing table:**

A routing table is like a map inside a router that helps it decide where to send data. Each entry in the table tells the router which direction (or "path") to take to reach specific groups of devices (or "networks") on the internet or a private network.

* **Destination**: It lists where the data needs to go, like an address.
* **Next Hop**: Shows the next router or device along the path to send the data to.
* **Metric**: This is like a "cost" or "distance" measurement that helps the router choose the best path if there are multiple options.

**To view the routing table for the specific router follow the below steps:**

In Cisco Packet Tracer, the Inspect tool can help you visually examine device configurations, including the routing table, in a more graphical way.

1. **Activate the Inspect Tool:**

* In the top toolbar, click on Inspect (it looks like a magnifying glass icon).

1. **Click on the Router:**

* With Inspect selected, click on the specific router you want to inspect in the workspace.

1. **View the Router Details:**

* A detailed view of the router’s configuration will appear. Look for the **Routing Table** section in the displayed information.
* Here, you should see a list of networks the router knows about, including their next hop and subnet information.

1. **Check the Routing Information:**

* he table will display directly connected networks and any static or dynamic routes that have been added, giving you a quick overview of how this router is configured to route packets.

**Steps to followed:**

**Step 1: Open Cisco Packet Tracer**

1. Launch the Cisco Packet Tracer application**.**

**Step 2: Set Up Network Components**

1. **Drag and Drop Components onto the workspace:**
   * 8 PCs (named PC0, PC1, ..., PC7)
   * 4 switches (Switch0, Switch1, Switch2, Switch3)
   * 4 routers (Router0, Router1, Router2, Router3)
2. **Connect the Devices:**

***For each pair of PCs, connect them to a switch:***

* PC0 and PC1 to Switch0
* PC2 and PC3 to Switch1
* PC4 and PC5 to Switch2
* PC6 and PC7 to Switch3

**Connect each switch to a router:**

* Switch0 to Router0
* Switch1 to Router1
* Switch2 to Router2
* Switch3 to Router3

1. **Establish Serial Port Connections between the routers:**

 Since routers by default have only two FastEthernet ports, add a **serial interface**.

 To do this, go to the **Physical** tab of each router, turn off the switch of the router, add the **WIC-2T** module, and turn the switch of the router back on.

1. **Now, connect the routers with Serial Connections based on your network design.**

**Step 3: Assign IP Addresses to PCs**

1. **Click on each PC, go to the Desktop tab, and select IP Configuration.**
2. **Assign IP addresses to each PC. The subnet mask will auto-fill based on IP class. Set the Default Gateway as the IP address of the router connected to each respective switch.**

* **PC0**: IP: 192.168.1.2 / Subnet Mask: 255.255.255.0 / Default Gateway: 192.168.1.1
* **PC1**: IP: 192.168.1.3 / Subnet Mask: 255.255.255.0 / Default Gateway: 192.168.1.1
* **PC2**: IP: 192.168.2.2 / Subnet Mask: 255.255.255.0 / Default Gateway: 192.168.2.1
* **PC3**: IP: 192.168.2.3 / Subnet Mask: 255.255.255.0 / Default Gateway: 192.168.2.1
* **PC4**: IP: 192.168.3.2 / Subnet Mask: 255.255.255.0 / Default Gateway: 192.168.3.1
* **PC5**: IP: 192.168.3.3 / Subnet Mask: 255.255.255.0 / Default Gateway: 192.168.3.1
* **PC6**: IP: 192.168.4.2 / Subnet Mask: 255.255.255.0 / Default Gateway: 192.168.4.1
* **PC7**: IP: 192.168.4.3 / Subnet Mask: 255.255.255.0 / Default Gateway: 192.168.4.1

**Step 4: Configure IP Addresses for Routers**

1. **Click on Router0 to open the configuration window.**
2. **Go to the Config tab at the top of the window.**
3. **Identify the correct interface:**

* Look at the **connections** to determine which port (e.g., FastEthernet 0/0 or Serial 0/0/0) is connected to the devices like Switch0 or other routers.
* You can also **hover your cursor** over the arrows connected to each port on the router to see the port name.

1. **Assign IP Address to the Ethernet Interface (e.g., the one connected to Switch0):**

* In the Config tab, click on the appropriate interface (e.g., FastEthernet 0/0).
* Under IP Configuration, set the IP Address and Subnet Mask for this interface.

**Example for Router0 FastEthernet 0/0:**

* + **IP Address: 192.168.1.1**
  + **Subnet Mask: 255.255.255.0**

1. **Assign IP Address to the Serial Interface (e.g., Serial 0/0/0 for Router0):**

* Still in the **Config tab**, select **Serial 0/0/0**.
* Enter the IP Address and Subnet Mask.

Example for **Router0** Serial 0/0/0:

* 1. **IP Address**: 11.0.0.2
  2. **Subnet Mask**: 255.0.0.0

Example for **Router1**Serial 0/0/1:

1. **IP Address**: 12.0.0.2
2. **Subnet Mask**: 255.0.0.0

* Set the **Status** to **On** and make sure **Clock Rate** is enabled if this router is initiating the connection.

1. **Repeat for Remaining Routers:**

* Follow the same steps for **Router1**, **Router2**, and **Router3**.
* Assign the IP addresses to each router’s FastEthernet and Serial interfaces according to your design.

**7.Verify Configuration:**

* + After configuring each router, you can check connectivity between devices using the ping command from any PC.

**Step 5: Manually Configure Static Routes on Routers**

1. **Click on Router0 to open its configuration window.**
2. **Go to the Config tab.**
3. **Under the Routing section on the left menu, select Static.**
4. **Add the static routes:**

***For Router0, enter each route as follows:***

* Network: 192.168.2.0 (ending in .0 to represent the entire network)
* Mask: 255.255.255.0 (subnet mask for a Class C network)
* Next Hop: 11.0.0.3 (the IP address of the next router to route the traffic to this network)

***Click Add to save the route.***

1. **Add Additional Routes for Router0 by repeating the process:**

* **Network**: 192.168.3.0, **Mask**: 255.255.255.0, **Next Hop**: 11.0.0.3
* **Network**: 192.168.4.0, **Mask**: 255.255.255.0, **Next Hop**: 11.0.0.3
* **Network**: 12.0.0.0, **Mask**: 255.0.0.0, **Next Hop**: 11.0.0.3
* **Network**: 13.0.0.0, **Mask**: 255.0.0.0, **Next Hop**: 12.0.0.3
* After each entry, click **Add**. You should see the entries appear as

**192.168.2.0/24 via 11.0.0.3**

**192.168.3.0/24 via 11.0.0.3**

**192.168.4.0/24 via 11.0.0.3**

**12.0.0.0/8 via 11.0.0.3**

**13.0.0.0/8 via 12.0.0.3**

1. **Repeat for Router1:**

***Follow the same steps in Router1's Config tab > Routing > Static.***

***For each destination network, enter:***

* Network (target network address ending in .0)
* Mask (based on network class or subnetting)
* Next Hop (IP address of the next router interface toward that network)

***Add each route, ensuring that the entries correspond to Router1’s connectivity requirements.***

1. **Repeat for Remaining Routers (Router2, Router3, etc.):**

***Follow the same process for each remaining router, making sure to:***

* Enter the Network and Mask correctly.
* Set the Next Hop as the IP address of the adjacent router interface that leads to the desired network.

***After each route entry, click Add to save it.***

**Step 6: Test Connectivity Using the Message Tool**

1. **Click on the Message Tool:**

* At the top toolbar of Cisco Packet Tracer, find and select the envelope icon (Message tool) or look for Add Simple PDU in some versions.

1. **Select the Source PC:**

* After selecting the Message tool, click on the PC where you want to start the message (e.g., PC0).

1. **Select the Destination PC:**

* Next, click on the destination PC (e.g., **PC7** or another PC in a different network).
* This will initiate a data packet from the source to the destination, and you'll see a message indicating **success** or **failure** at the bottom right.

1. **Check the Result in Real Time:**

* If the message is successfully sent, the bottom panel will display Success. If it shows In Progress or Failed, the message was not successfully delivered, indicating an issue with static routing.

1. **Switch to Simulation Mode:**

* At the bottom of the screen, click on the **Simulation** tab to observe how packets are routed between devices.
* This view will show each hop as the data packet moves across routers and switches.
* If the packet stops at a router or shows errors, you may need to check your static route configurations on that router.

1. **Analyze Packet Flow:**
   * In Simulation mode, you can track each step the packet takes. Watch for issues like **timeouts** or **unreachable networks**, which indicate a need to review static routes.
   * Successful message delivery across all routers and networks verifies that static routing is set up correctly.