Configure Static IPv4 Routing

Introduction

In this lab, you will build this network as shown in the following topology. Configure IP settings, IP host table, passwords and Telnet services on each router. You will then configure static routing on all routers to reach each LAN not directly connected to the specific router you are configuring. Finally, you will verify your static routing configuration using a variety of show commands and testing end-to-end connectivity.

Objective(s)

In this lab the student will:

- Implement routing protocols for correct data forwarding across a communication network environment
- Configure and test static routes

Equipment/Supplies Needed

If working in a physical environment:
- 3 Cisco 2911 Routers
- 3 Cisco Switches
- 3 Lab workstations (may be VPCs)

- Your Computer workstation
- Cisco Packet Tracer
- Configure Static IPv4 Routing.pkt

Topology
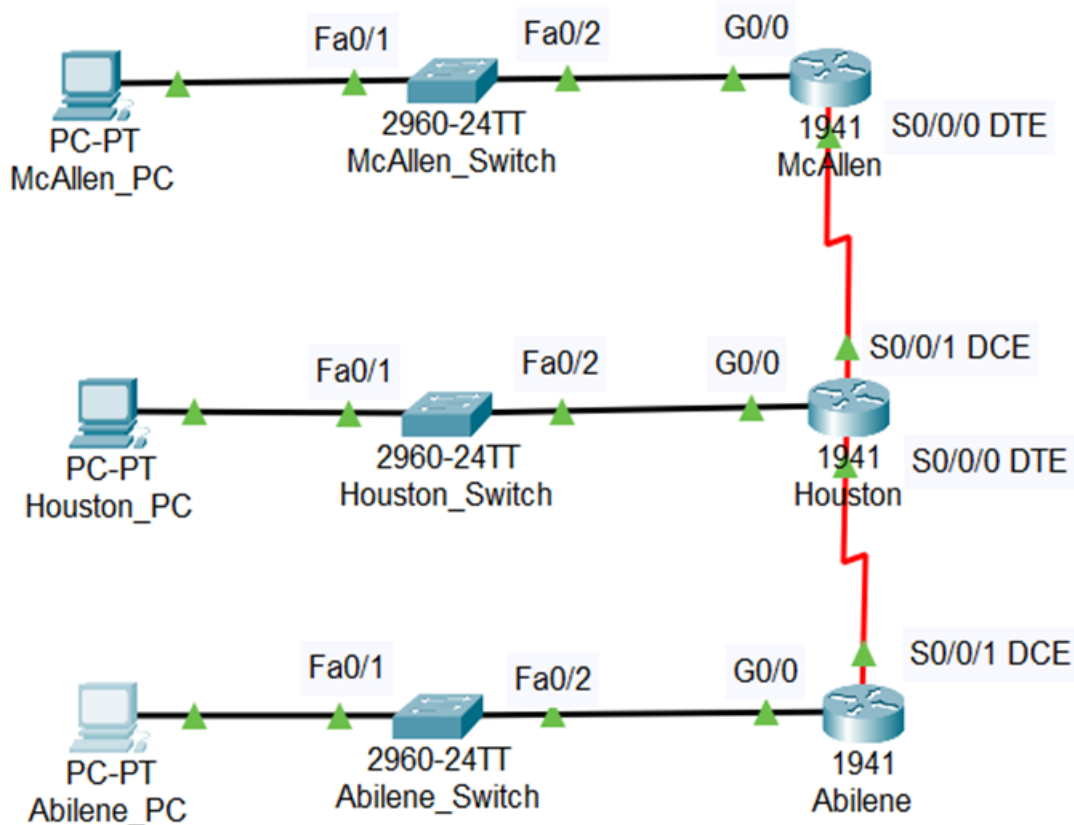
Procedure

Perform the steps in this lab in the order they are presented to you. Answer all questions and record the requested information in a file.

Part 1: Set up Network Configuration

1. Open the corresponding Packet Tracer file and using the CLI, set up initial configuration on the city's routers as shown in the figure.
2. Set your enable secret password to **security**
3. Configure the router console line and set the console password to **cyber**.
4. All of the addresses needed for the router and PC configurations are listed in the table below.

5. You need to **document what the network addresses** are for each interface listed in the table.

128I 64I32I16I 8I 4I2I1   Should be
256I128I64I32I16I8I4I2   201.15.1.6

Device	Interface	IP Address	Subnet Mask	Default Gateway	Network IP Address
McAllen	G0/0	201.15.1.9 ✓	255.255.255.248	N/A	201.15.1.*8*
	S0/0/0	192.168.16.1 ✓	255.255.255.252	N/A	192.168.16.*0*
Houston	G0/0	201.15.1.17 ✓	255.255.255.248	N/A	201.1.1.*16*
	S0/0/1 (DCE)	192.168.16.2 ✓	255.255.255.252	N/A	192.168.16.*0*
	S0/0/0	192.168.16.5 ✓	255.255.255.252	N/A	192.168.16.*4*
Abilene	G0/0	201.15.1.25 ✓	255.255.255.248	N/A	201.15.1.*24*
	S0/0/1 (DCE)	192.168.16.6 ✓	255.255.255.252	N/A	192.168.16.*4*
McAllen - PC	NIC	201.15.1.10 ✓	255.255.255.248	201.15.1.9	201.15.1.*8*
Houston - PC	NIC	201.15.1.18 ✓	255.255.255.248	201.15.1.17	201.15.1.*16*
Abilene - PC	NIC	201.15.1.26 ✓	255.255.255.248	201.15.1.25	201.15.1.*24*

Part 2: Configure Static Routing

There are two ways to configure a static route. The first way is configuring a
Recursive Route. With a recursive route, the next-hop IP address is specified.
Because only the next-hop IP address is specified, the router must perform multiple
lookups in the routing table prior to forwarding packets. The syntax to configure a
recursive static route is:

Router(config)# **ip route network-address subnet-mask next-hop ip-address**

Router(config)# **ip route 192.168.1.0 255.255.255.0 10.1.1.2**

The second way to configure a static route is called a <u>Directly Connected Route</u>. With a directly connected route, the exit-interface parameter is specified, which allows the router to resolve a forwarding decision in one lookup routine. The syntax to configure a directly connected route is:

Router(config)# **ip route network-address subnet-mask exit-interface**

Router(config)# **ip route 192.168.1.0 255.255.255.0 S0/0/0**

Finally, another specialized type of static route is used to forward Internet-bound traffic out of a router. This type of route is called a <u>Default Route</u>, and identifies the gateway to which the router forwards all Internet traffic for which it does not have a learned, or static route. The Default Route always uses the quad-zero as its destination address and subnet mask. In a Default Route, either the next-hop IP address or exit interface can be specified. Default Route configuration examples are listed below:

Router(config)#**ip route 0.0.0.0 0.0.0.0 10.1.1.2**

Router(config)#**ip route 0.0.0.0 0.0.0.0 S0/0/0**

Example: Route on Router B to reach Network 172.16.10.0 on other side of Router C

Example: Route on Router B to reach Network 172.16.10.0 on other side of Router C

RouterB(config)#
ip route **172.16.10.0 255.255.255.0 172.16.20.2**
               Destination   *Subnet Mask*   *next hop*
               Network

172.16.40.1   172.16.20.1   172.16.20.2   172.16.10.2
172.16.40.2   172.16.10.1
RouterA   RouterB   RouterC   RouterD
172.16.30.1

Note: Routes must be unidirectional – going both ways. So a route on Router D is required.

RouterD(config)#
ip route **172.16.20.0 255.255.255.0 172.16.10.2**
               Destination   *Subnet Mask*   *next hop*
               Network

Step 1: Create static routes on all 3 routers to all other networks shown in the diagram above, so that all cities are reachable from your city. There is no need to enter a route to a directly-connected interface because your router has an interface in that network.

The McAllen router is directly connected to two networks. And there 3 remote networks McAllen needs connectivity to. Routes are needed on the McAllen router so that packets can reach the Houston and Abilene routers. Since this is the first time any of you have configured static routes on a router, I will configure the static routes on the McAllen router for you.

McAllen#config t

McAllen(config)# **ip route 201.15.1.16 255.255.255.248 192.168.16.2**
(next-hop IP Address) *OR*

McAllen(config)# **ip route 201.15.1.16 255.255.255.248 S0/0/0** (exit interface)

Notice that you can use either variation of the ip route command. These commands will allow the McAllen router to reach the Houston G0/0 Network.

McAllen(config)# **ip route 201.15.1.24 255.255.255.248 192.168.16.2**
(next-hop IP Address) *OR*

McAllen(config)# **ip route 201.15.1.24 255.255.255.248 S0/0/0** (exit interface)

Notice that you can use either variation of the ip route command. These commands will allow the McAllen router to reach the Abilene G0/0 Network.

McAllen(config)# **ip route 192.168.16.4 255.255.255.252 192.168.16.2**
(next-hop IP Address) *OR*

McAllen(config)# **ip route 192.168.16.4 255.255.255.252 S0/0/0**

Notice that you can use either variation of the ip route command. These commands will allow the McAllen router to reach the WAN Link between Houston and Abilene.

Step 2: Complete the static routing configurations needed for both Houston and Abilene routers.

Part 3:Troubleshoot and Verify Network Routes

1. Enter show ip route to confirm the routes you have entered.

2. Test connectivity to all other cities in the internetwork using ping and traceroute to the host name.
3. If necessary, troubleshoot any connectivity issues with neighboring cities. Use the **show ip route** command to verify routed networks.

Submit Your Work:

Submit all text files, screenshots, or answers to questions to your instructor.

Packet Tracer:

Submit Packet Tracer file as well as your text file with your findings and notes.

Lab Environment:

● Once all routers can reach all networks, record the routing table using the show ip route command.

● Save the running-config to a text file (Notepad or Word) as Your_full_name_STATIC.

● Enter write erase to clear NVRAM and then power off the router. (If working on real equipment in a physical lab)

● Submit all text files, screenshots, or answers to questions to your instructor.

Commands to Note:

ip route
show ip route
show ip interfaces brief
show ip protocols
Ping
Traceroute
show controllers <interface>
clock rate 64000
write terminal
ip host <hostname> <ip addr>
Ctrl + Shift + 6 (release) x
show sessions

Concerns Working Towards Proficiency	Criteria Standards for This Competency	Accomplished Evidence of Mastering Competency
	Criteria #1: Document network addresses for each interface in the addressing table (20 pts)	Document network addresses for each interface in the addressing table. (20 pts)
	Criteria #2: Basic router configs (20 pts)	Configure basic router configs needed for all 3 routers. Passwords and ip addressing (20 pts)
	Criteria #3: Configure static routes needed for all 3 routers to have full connectivity between all networks. (50 pts)	Configure static routes needed for all 3 routers to have full connectivity between all remote networks. (50 pts)
	Criteria #4: Test connectivity between all remote networks using ping. (10 pts)	Test connectivity between all remote networks using ping. (10 pts)