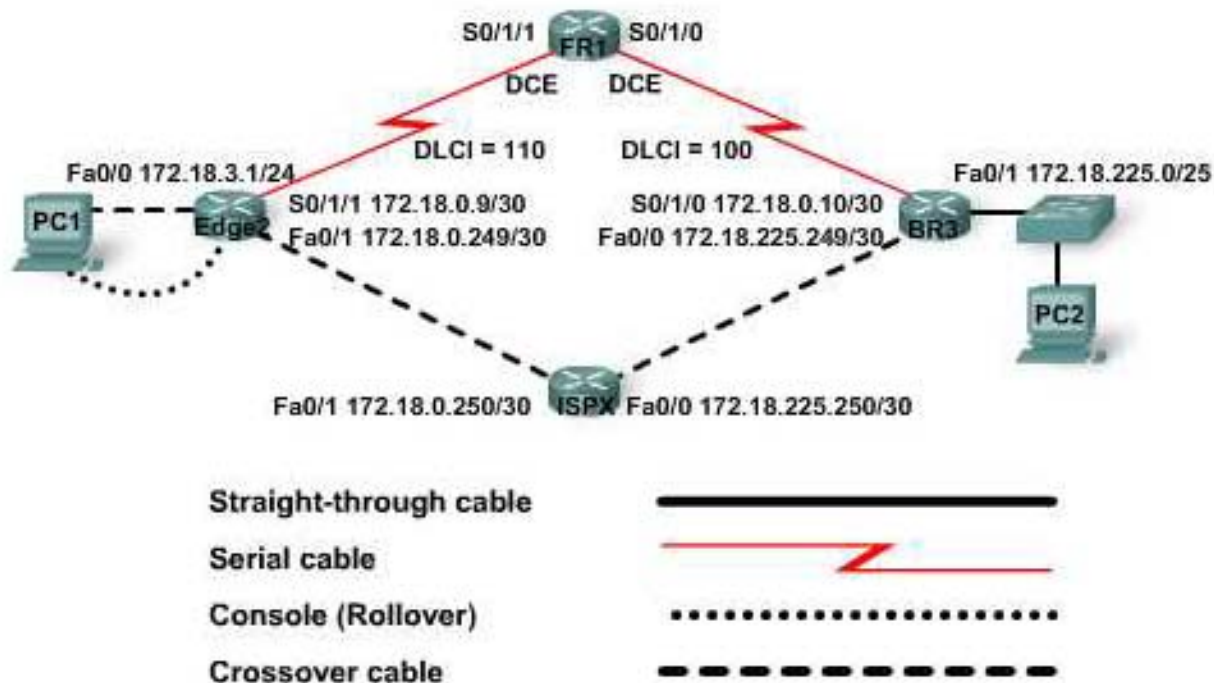Cisco | Networking Academy®
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Lab 8.2.5 Configuring and Verifying WAN Backup Links

Objectives

- Use a test plan to test the functionality of a Frame Relay WAN.
- Verify that the backup route is installed and connectivity is restored if the primary Frame Relay link goes down

640-802 CCNA Exam Objectives

This lab contains skills that relate to the following CCNA exam objectives:

- Interpret network diagrams.
- Determine the path between two hosts across a network.
- Select the components required to meet a network specification.
- Select the appropriate media, cables, ports, and connectors to connect switches to other network devices and hosts.
- Access and use the router to set basic parameters, including CLI/SDM.
- Connect, configure, and verify operation status of a device interface.
- Verify device configuration and network connectivity using ping, traceroute, Telnet, SSH, or other utilities.
- Perform and verify routing configuration tasks for a static or default route given specific routing requirements.

- Configure, verify, and troubleshoot EIGRP.

- Troubleshoot routing issues.

- Verify router hardware and software operation using `show` and `debug` commands.

- Implement basic router security.

- Describe different methods for connecting to a WAN.

- Configure and verify a basic WAN serial connection.

- Configure and verify Frame Relay on Cisco routers.

- Troubleshoot WAN implementation issues.

Expected Results and Success Criteria

Before starting this lab, read through the tasks that you are expected to perform. What do you expect the result of performing these tasks will be?

_____
_____
_____

How is an understanding WAN technologies and Frame Relay important in network design?

_____
_____
_____

What methods can be used to provide backup communications links?

_____
_____
_____

Background / Preparation

This lab simulates the use of a Frame Relay circuit to interconnect the stadium site to the FilmCompany site. The focus of the lab is the simulation of a backup VPN link to be used if the primary link goes down. Use the Test Plan in Lab 8.2.2 to determine the testing to be performed, the methods and tools to be used, and the potential results.

The configuration output used in this lab matches that of 1841 series and 2600 series router. The same or similar commands can be used with other Cisco routers but may produce slightly different output. Any router that meets the interface requirements displayed on the topology diagram may be used. Refer to the Test Plan in Lab 8.2.2 for equipment required. Check off each task as you complete it.

Perform Test1: Frame Relay Configuration Test

Task 1: Build the Network. Task Complete _____

Step 1 Connect devices

NOTE: If the PC used in this lab is also connected to your Academy LAN or to the Internet, ensure that you record the cable connections and TCP/IP settings so that these can be restored at the conclusion of the lab.

a. Connect the routers as shown in the topology diagram. Refer to the Test Plan in Lab 8.2.2 for cabling required.

b. For each of the routers to be configured, use the **erase startup-config** and the **reload** commands from the privileged EXEC prompt, to ensure that you are starting with a clean configuration.

Task 2: Configure Router ISPX as a Backup. Task Complete _____

Step 1: Perform basic configuration of the ISPX router

a. Connect a PC to the console port of the router to perform configurations using a terminal emulation program.

b. Configure the router with hostname, passwords, message-of-the–day, and **no ip domain lookup**.

```
Router(config)#hostname ISPX
ISPX(config)#line console 0
ISPX(config-line)#password cisco
ISPX(config-line)#login
ISPX(config-line)#exit
ISPX(config)#line vty 0 4
ISPX(config-line)#password cisco
ISPX(config-line)#login
ISPX(config-line)#exit
ISPX(config)#enable password cisco
ISPX(config)#enable secret class
ISPX(config)#no ip domain-lookup
ISPX(config)#banner motd #Unauthorized use prohibited#
```

Step 2: Configure ISPX router FastEthernet interfaces

Configure the FastEthernet interfaces for the backup links to the Edge2 and BR3 routers. Configure a description and the IP address, and activate each interface.

Step 3: Configure a static route on the ISPX router to the FilmCompany local network

On the ISPX router, configure a normal static route to the BR3 network 172.18.225.0/25 via the Fa0/0 interface on BR3.

Step 4: Configure a static route on the ISPX router to the stadium local network

On the ISPX router, configure a normal static route to the Edge2 network 172.18.3.0/24 via the Fa0/1 interface on Edge2.

Task 3: Configure the Stadium Edge2 Router. Task Complete: _____

Step 1: Perform basic configuration of the router

a. Connect a PC to the console port of the router to perform configurations using a terminal emulation program. Erase and reload the router before starting.

b. Configure the router with a hostname, passwords, message-of-the–day, and **no ip domain lookup**.

Step 2: Configure stadium router Edge2 interfaces

a. Configure the Serial 0/1/1 interface with Frame Relay encapsulation. Configure a point-to-point subinterface for DLCI 110.

```
Edge2(config)#interface serial0/1/1
Edge2(config-if)#description primary link to BR3
Edge2(config-if)#encapsulation frame-relay
Edge2(config-if)#no shutdown
Edge2(config-if)#interface serial0/1/1.110 point-to-point
Edge2(config-subif)#ip address 172.18.0.9 255.255.255.252
Edge2(config-subif)#frame-relay interface-dlci 110
Edge2(config-fr-dlci)#end
```

b. Configure FastEthernet 0/0 interface for the stadium LAN network 172.18.3.0/24.

c. Configure FastEthernet 0/1 interface for the backup link to the ISPX router per the topology diagram.

Step 3: Configure a dynamic routing protocol on stadium router Edge2

a. On Edge2, configure the EIGRP routing protocol to advertise the 172.18.3.0/24 network and the 172.18.0.8/30 network. Use EIGRP process ID 10. Disable auto-summary.

b. Configure EIGRP MD5 authentication to accept updates from the FilmCompany router BR3 on the Frame Relay subinterface.

Sample steps to configure EIGRP authentication are:

```
Edge2#configure terminal
Edge2(config)#key chain MYCHAIN
Edge2(config-keychain)#key 1
Edge2(config-keychain-key)#key-string securetraffic
Edge2(config-keychain-key)#exit
Edge2(config)#interface serial 0/1/1.110
Edge2(config-subif)#ip authentication mode eigrp 10 md5
Edge2(config-subif)#ip authentication key-chain eigrp 10 MYCHAIN
Edge2(config-subif)#end
Edge2#
```

Until EIGRP and MD5 configuration are complete on router BR3, no EIGRP updates will be received. The **debug eigrp packet** command can be used to view the EIGRP exchange as it is occurring between the routers.

Task 4: Configure the FilmCompany BR3 Router. Task Complete: _____

Step 1: Perform basic configuration of the router

a. Connect a PC to the console port of the router to perform configurations using a terminal emulation program. Erase and reload the router before starting.

b. Configure the router with a hostname, passwords, message-of-the–day, and **no ip domain lookup**.

Step 2: Configure router BR3 interfaces

a. Configure Serial 0/1/0 interface with Frame Relay encapsulation. Configure a point-to-point subinterface for DLCI 100.

```
BR3(config)#interface serial0/1/0
BR3(config-if)#description primary link to Edge2
BR3(config-if)#encapsulation frame-relay
BR3(config-if)#no shutdown
BR3(config-if)#interface serial0/1/0.100 point-to-point
BR3(config-subif)#ip address 172.18.0.10 255.255.255.252
BR3(config-subif)#frame-relay interface-dlci 100
BR3(config-fr-dlci)#end
```

b. Configure FastEthernet 0/1 interface for the FilmCompany LAN network 172.18.225.0/25.

c. Configure FastEthernet 0/0 interface for the backup link to the ISPX router per the topology diagram.

Step 3: Configure the dynamic routing protocol on router BR3

a. On BR3, configure the EIGRP routing protocol to advertise the 172.18.225.0/25 network and the 172.18.0.8/30 network. Use EIGRP process ID 10. Disable auto-summary.

b. Configure EIGRP MD5 authentication to accept routing updates from the Edge2 router on interface serial0/1/0.100.

```
BR3#configure terminal
BR3(config)#key chain MYCHAIN
BR3(config-keychain)#key 1
BR3(config-keychain-key)#key-string securetraffic
BR3(config-keychain-key)#exit
BR3(config)#interface serial 0/1/0.100
BR3(config-subif)#ip authentication mode eigrp 10 md5
BR3(config-subif)#ip authentication key-chain eigrp 10 MYCHAIN
BR3(config-subif)#end
```

c. When authentication is configured, both Edge2 and BR3 should begin accepting EIGRP updates. Use the `show ip route command` to verify that the routes to the LAN devices have been learned.

Until EIGRP and MD5 configuration are complete on router BR3, no EIGRP updates will be received successfully. The command `debug eigrp packet` shows when EIGRP authentication is successful. Example output of the `debug eigrp packet` command once BR3 is correctly configured is shown below:

```
BR3#debug eigrp packet
00:47:04: EIGRP: received packet with MD5 authentication, key id = 1
00:47:04: EIGRP: Received HELLO on Serial0/1/0.100 nbr 172.18.0.9
```

Task 5: Conduct Primary Frame Relay Link Testing Based on the Test Plan. Task Complete: _____

Execute the procedures outlined in Test 1 to test the simulated Frame relay network. Record the results of the tests in the Test 1: Results and Conclusions section.

Step 1: Console into routers Edge2 and BR3 and verify the basic configuration, IP addressing, Frame Relay

Issue the `show running-config` command for each of the routers to verify passwords, IP addressing, and Frame Relay configuration.

Step 2: Verify the Frame Relay configuration on Edge2, BR3, and FR1

Use `show frame-relay` commands to verify the Frame Relay configurations. See Lab 8.2.4 for command output.

   `show frame-relay map` – Status of point-to-point links

   `show frame-relay pvc` – Permanent Virtual Circuit (PVC) status and statistics

   `show frame-relay lmi` – Local Management Interface (LMI) statistics

   `show frame-relay route` – DLCI/interface routing (FR1 switch only)

Step 3: Verify routing table contents on router Edge2

Display the routing table for Edge2 using the **show ip route** command.

Is there an EIGRP route to the FilmCompany LAN 172.18.225.0/25? _____

What is the AD of this route? _____

What is the next hop IP address to get to this network? _____

Does the primary route take the Frame Relay link? _____

Step 4: Verify routing table contents on router BR3

Display the routing table for BR3 using the **show ip route** command.

Is there an EIGRP route to the Edge2 network 172.18.3.1/24? _____

What is the AD of this route? _____

Step 5: Verify routing table contents on router ISPX

Display the routing table for ISPX using the **show ip route** command.

Are there any EIGRP routes? _____

Why or why not?

_____

Are there any static routes and if so, to what network?

_____

What is the purpose of these static routes?

_____

_____

Step 6: Test IP connectivity between routers Edge2 and BR3 via the primary Frame Relay link

a. Ping from Edge2 to the IP address of host PC2. Was the ping successful? _____ If not, troubleshoot until successful.

b. Ping from BR3 to the IP address of host PC1.

Was the ping successful? _____ If not, troubleshoot until successful.

c. Verify that traffic is taking the correct path by using the **traceroute** command.

d. Turn off all debugging using the **undebug all** command.

e. Record all results in the WAN Design Test Plan document in the Test 1: Results and Conclusions section.

Perform Test 2: Backup Link Configuration Test

Task 6: Configure floating static routes. Task Complete: _____

Step 1: Configure a floating static route on Edge2 and BR3 via the primary Frame Relay link.

a. On Edge2, configure a static route to the FilmCompany LAN (172.18.225.0/25) using the next hop address of the interface Fa0/1 on router ISPX. Configure the administrative distance on the floating static routes to be 130, greater than the administrative distance of the EIGRP learned route.

b. On BR3, configure a static route to the stadium LAN (172.18.3.0/24) using the next hop address of the interface Fa0/0 on router ISPX. Configure the administrative distance on the floating static route to be 130, greater than the administrative distance of the EIGRP learned route.

Task 7: Conduct Backup Link Test. Task Complete: _____

Step 1: Test the backup link though the ISPX router by taking down the primary Frame Relay link

Cause the Frame Relay link from Edge2 to FR1 to fail by shutting down the Serial 0/1/1 interface.

Step 2: Verify routing table contents on router Edge2

Display the routing table for Edge2 using the `show ip route` command.

Is there an EIGRP route to the FilmCompany network 172.18.225.0/25 now? _____

Is the floating static backup route to the FilmCompany network 172.18.225.0/25 that you defined earlier now present? _____

What is the AD of this route? _____

What is the next hop IP address to get to the 172.18.225.0/25 network?

_____

Does the backup route take the ISPX link? _____

Step 3: Verify routing table contents on router BR3

a. Display the routing table for BR3 using the `show ip route` command.

NOTE: It will take BR3 some time to declare the EIGRP route to the Edge2 172.18.3.1 network via the Frame Relay link as being down. The link from BR3 to the Frame Relay switch appears to be good from the BR3 side. BR3 will have to wait until the timers expire after receiving no EIGRP updates from Edge2.

b. Continue to issue the `show ip route` command until the EIGRP route is gone and the floating static route is installed, otherwise ping responses (echo reply) cannot be sent back to Edge2.

Is there an EIGRP route to the Edge2 network 172.18.3.0/24? _____

Is there a floating static route? _____

What is the AD of this route? _____

What is the next hop IP address to get to the 172.18.3.0/24 network?

_____

Step 4: Test IP connectivity between routers Edge2 and BR3 via the backup Ethernet link

   a. Ping from PC1 on Edge2 to the IP address of host PC2.

   Was the ping successful? _____ If not, troubleshoot until successful.

   Note: While the backup link route is active, if you ping from router Edge2 to the IP address of host PC2 it will not be successful. The source of the ping will the IP address of the Fa0/1 interface (172.18.0.249) instead of the PC1 IP address and router BR3 does not have a route back to that network when static routing is in effect.

   b. Verify that traffic is taking the backup link by using the **tracert** command from PC1 to PC2. Record the results in the WAN Design Test Plan section Test 2: Results and Conclusions.

   c. Turn off any debugging using the **undebug all** command.

Step 5: Clean up

Erase the configurations and reload the routers. Disconnect and store the cabling. For PC hosts that are normally connected to other networks (such as the school LAN or to the Internet), reconnect the appropriate cabling and restore the TCP/IP settings.

Task 8: Reflection / Challenge

When is it most important to have a backup link? How does a backup link compare to a redundant link?

_____

_____

_____

This lab uses the RIP dynamic routing protocol and floating static routes to demonstrate primary and backup routes. Would it be possible to use all static routes and no dynamic routing protocol?

_____

_____

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_____