Lab – Troubleshooting Advanced EIGRP

1. Topology



1. Addressing Table

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| --- | --- | --- | --- | --- |
| Device | Interface | IP Address | Subnet Mask | Default Gateway |
| R1 | G0/0 | 192.168.1.1 | 255.255.255.0 | N/A |
|  | Lo1 | 172.16.11.1 | 255.255.255.0 | N/A |
|  | Lo2 | 172.16.12.1 | 255.255.255.0 | N/A |
|  | Lo3 | 172.16.13.1 | 255.255.255.0 | N/A |
|  | Lo4 | 172.16.14.1 | 255.255.255.0 | N/A |
|  | S0/0/0 (DCE) | 192.168.12.1 | 255.255.255.252 | N/A |
|  | S0/0/1 | 192.168.13.1 | 255.255.255.252 | N/A |
| R2 | G0/0 | 192.168.2.1 | 255.255.255.0 | N/A |
|  | Lo0 | 209.165.200.225 | 255.255.255.252 | N/A |
|  | S0/0/0 | 192.168.12.2 | 255.255.255.252 | N/A |
|  | S0/0/1 (DCE) | 192.168.23.1 | 255.255.255.252 | N/A |
| R3 | G0/0 | 192.168.3.1 | 255.255.255.0 | N/A |
|  | Lo3 | 172.16.33.1 | 255.255.255.0 | N/A |
|  | Lo4 | 172.16.34.1 | 255.255.255.0 | N/A |
|  | Lo5 | 172.16.35.1 | 255.255.255.0 | N/A |
|  | Lo6 | 172.16.36.1 | 255.255.255.0 | N/A |
|  | S0/0/0 (DCE) | 192.168.13.2 | 255.255.255.252 | N/A |
|  | S0/0/1 | 192.168.23.2 | 255.255.255.252 | N/A |
| PC-A | NIC | 192.168.1.3 | 255.255.255.0 | 192.168.1.1 |
| PC-B | NIC | 192.168.2.3 | 255.255.255.0 | 192.168.2.1 |
| PC-C | NIC | 192.168.3.3 | 255.255.255.0 | 192.168.3.1 |

1. Objectives

Part 1: Build the Network and Load Device Configurations

Part 2: Troubleshoot EIGRP

1. Background / Scenario

The Enhanced Interior Gateway Routing Protocol (EIGRP) has advanced features to allow changes related to summarization, default route propagation, bandwidth utilization, metrics, and security.

In this lab, you will troubleshoot a network that is running EIGRP. Advanced EIGRP features have been implemented, but the network is now experiencing problems. You are tasked with finding and correcting the network issues.

**Note**: The routers used with CCNA hands-on labs are Cisco 1941 Integrated Services Routers (ISRs) with Cisco IOS, Release 15.2(4)M3 (universalk9 image). Other routers and Cisco IOS versions can be used. Depending on the model and Cisco IOS version, the commands available and output produced might vary from what is shown in the labs. Refer to the Router Interface Summary Table at the end of this lab for the correct interface identifiers.

**Note**: Ensure that the routers have been erased and have no startup configurations. If you are unsure, contact your instructor.

1. Required Resources
* 3 Routers (Cisco 1941 with Cisco IOS Release 15.2(4)M3 universal image or comparable)
* 3 PCs (Windows 7, Vista, or XP with terminal emulation program, such as Tera Term)
* Console cables to configure the Cisco IOS devices via the console ports
* Ethernet cables as shown in the topology
1. Build the Network and Load Device Configurations
	1. Cable the network as shown in the topology.
	2. Configure PC hosts.
	3. Load router configurations.

Load the following configurations into the appropriate router. All routers have the same passwords. The privileged EXEC password is **class**, and **cisco** is the console and vty password.

Router R1 Configuration:

conf t

hostname R1

enable secret class

no ip domain lookup

key chain EIGRP-KEYS

 key 1

 key-string cisco123

line con 0

 password cisco

 login

 logging synchronous

line vty 0 4

 password cisco

 login

banner motd @

 Unauthorized Access is Prohibited! @

interface lo1

 description Connection to Branch 11

 ip add 172.16.11.1 255.255.255.0

interface lo2

 description Connection to Branch 12

 ip add 172.16.12.1 255.255.255.0

interface lo3

 description Connection to Branch 13

 ip add 172.16.13.1 255.255.255.0

interface lo4

 description Connection to Branch 14

 ip add 172.16.14.1 255.255.255.0

interface g0/0

 description R1 LAN Connection

 ip add 192.168.1.1 255.255.255.0

 no shutdown

interface s0/0/0

 description Serial Link to R2

 clock rate 128000

 ip add 192.168.12.1 255.255.255.252

 ip authentication mode eigrp 1 md5

 ip authentication key-chain eigrp 1 EIGRP-KEYS

 ip hello-interval eigrp 1 30

 ip hold-time eigrp 1 90

 ip bandwidth-percent eigrp 1 40

 no shutdown

interface s0/0/1

 description Serial Link to R3

 bandwidth 128

 ip add 192.168.13.1 255.255.255.252

 ip authentication mode eigrp 1 md5

 ip authentication key-chain eigrp 1 EIGRP-KEYS

 ip bandwidth-percent eigrp 1 40

 no shutdown

router eigrp 1

 router-id 1.1.1.1

 network 192.168.1.0 0.0.0.255

 network 192.168.12.0 0.0.0.3

 network 192.168.13.0 0.0.0.3

 network 172.16.0.0 0.0.255.255

 passive-interface g0/0

 auto-summary

end

Router R2 Configuration:

conf t

hostname R2

enable secret class

no ip domain lookup

key chain EIGRP-KEYS

 key 1

 key-string Cisco123

line con 0

 password cisco

 login

 logging synchronous

line vty 0 4

 password cisco

 login

banner motd @

 Unauthorized Access is Prohibited! @

interface g0/0

 description R2 LAN Connection

 ip add 192.168.2.1 255.255.255.0

 no shutdown

interface s0/0/0

 description Serial Link to R1

 bandwidth 128

 ip add 192.168.12.2 255.255.255.252

 ip authentication mode eigrp 1 md5

 ip authentication key-chain eigrp 1 EIGRP-KEYS

 ip bandwidth-percent eigrp 1 40

 ip hello-interval eigrp 1 30

 ip hold-time eigrp 1 90

 no shutdown

interface s0/0/1

 description Serial Link to R3

 bandwidth 128

 ip add 192.168.23.1 255.255.255.252

 ip authentication mode eigrp 1 md5

 ip bandwidth-percent eigrp 1 40

 ip hello-interval eigrp 1 30

 ip hold-time eigrp 1 90

 no shutdown

interface lo0

 ip add 209.165.200.225 255.255.255.252

 description Connection to ISP

router eigrp 1

 router-id 2.2.2.2

 network 192.168.2.0 0.0.0.255

 network 192.168.12.0 0.0.0.3

 network 192.168.23.0 0.0.0.3

 passive-interface g0/0

ip route 0.0.0.0 0.0.0.0 lo0

end

Router R3 Configuration:

conf t

hostname R3

enable secret class

no ip domain lookup

key chain EIGRP-KEYS

 key 1

 key-string Cisco123

line con 0

 password cisco

 login

 logging synchronous

line vty 0 4

 password cisco

 login

banner motd @

 Unauthorized Access is Prohibited! @

interface lo3

 description Connection to Branch 33

 ip add 172.16.33.1 255.255.255.0

interface lo4

 description Connection to Branch 34

 ip add 172.16.34.1 255.255.255.0

interface lo5

 description Connection to Branch 35

 ip add 172.16.35.1 255.255.255.0

interface lo6

 description Connection to Branch 36

 ip add 172.16.36.1 255.255.255.0

interface g0/0

 description R3 LAN Connection

 ip add 192.168.3.1 255.255.255.0

 no shutdown

interface s0/0/0

 description Serial Link to R1

 ip add 192.168.13.2 255.255.255.252

 ip authentication mode eigrp 1 md5

 ip authentication key-chain eigrp 1 EIGRP-KEYS

 ip hello-interval eigrp 1 30

 ip hold-time eigrp 1 90

 clock rate 128000

 bandwidth 128

 no shutdown

interface s0/0/1

 description Serial Link to R2

 bandwidth 128

 ip add 192.168.23.2 255.255.255.252

 ip authentication mode eigrp 1 md5

 ip authentication key-chain eigrp 1 eigrp-keys

! ip bandwidth-percent eigrp 1 40

 ip hello-interval eigrp 1 30

 ip hold-time eigrp 1 90

 no shutdown

router eigrp 1

 router-id 3.3.3.3

 network 192.168.3.0 0.0.0.255

 network 192.168.13.0 0.0.0.3

 network 192.168.23.0 0.0.0.3

 network 172.16.0.0 0.0.255.255

 passive-interface g0/0

 auto-summary

end

* 1. Verify end-to-end connectivity.

**Note**: It may be necessary to disable the PC firewall to ping between PCs.

* 1. Save the configuration on all routers.
1. Troubleshoot EIGRP

In Part 2, verify that all routers have established neighbor adjacencies, and that all network routes are available.

Additional EIGRP Requirements:

* All serial interface clock rates should be set at 128 Kb/s and a matching bandwidth setting should be available to allow EIGRP cost metrics to be calculated correctly.
* Manual route summarization of the branch networks, simulated by using Loopback interfaces on R1 and R3, should be utilized. The automatic summarization feature of EIGRP should not be used.
* EIGRP should redistribute the static default route to the Internet. This is simulated by using Loopback interface 0 on R2.
* EIGRP should be configured to use no more than **40** percent of the available bandwidth on the serial interfaces.
* EIGRP Hello/Hold timer intervals should be set to **30/90** on all serial interfaces.
* All serial interfaces should be configured with MD5 authentication, using key chain **EIGRP-KEYS**, with a key-string of **Cisco123**.

List the commands used during your EIGRP troubleshooting process:

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List the changes made to resolve the EIGRP issues. If no problems were found on the device, then respond with “no problems were found”.

R1 Router:

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R2 Router:

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R3 Router:

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1. Reflection
	1. How can the **auto-summary** command create routing issues in EIGRP?

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* 1. What advantages are provided by manually summarizing the branch routes (loopback interfaces on R1 and R3) in this network?

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* 1. Why would you want to change the EIGRP Hello and Hold time intervals on an interface?

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1. Router Interface Summary Table

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| --- |
| Router Interface Summary |
| Router Model | Ethernet Interface #1 | Ethernet Interface #2 | Serial Interface #1 | Serial Interface #2 |
| 1800 | Fast Ethernet 0/0 (F0/0) | Fast Ethernet 0/1 (F0/1) | Serial 0/0/0 (S0/0/0) | Serial 0/0/1 (S0/0/1) |
| 1900 | Gigabit Ethernet 0/0 (G0/0) | Gigabit Ethernet 0/1 (G0/1) | Serial 0/0/0 (S0/0/0) | Serial 0/0/1 (S0/0/1) |
| 2801 | Fast Ethernet 0/0 (F0/0) | Fast Ethernet 0/1 (F0/1) | Serial 0/1/0 (S0/1/0) | Serial 0/1/1 (S0/1/1) |
| 2811 | Fast Ethernet 0/0 (F0/0) | Fast Ethernet 0/1 (F0/1) | Serial 0/0/0 (S0/0/0) | Serial 0/0/1 (S0/0/1) |
| 2900 | Gigabit Ethernet 0/0 (G0/0) | Gigabit Ethernet 0/1 (G0/1) | Serial 0/0/0 (S0/0/0) | Serial 0/0/1 (S0/0/1) |
| **Note**: To find out how the router is configured, look at the interfaces to identify the type of router and how many interfaces the router has. There is no way to effectively list all the combinations of configurations for each router class. This table includes identifiers for the possible combinations of Ethernet and Serial interfaces in the device. The table does not include any other type of interface, even though a specific router may contain one. An example of this might be an ISDN BRI interface. The string in parenthesis is the legal abbreviation that can be used in Cisco IOS commands to represent the interface. |