

Powerful Protocols (Instructor Version)

Instructor Note: Red font color or Gray highlights indicate text that appears in the instructor copy only.

Objective

A review of EIGRP and OSPF routing protocol configuration and verification commands.

Students will review EIGRP and OSPF commands to complete the end-of-course Capstone Projects.

Scenario

At the end of this course, you are asked to complete two Capstone Projects where you will create, configure, and verify two network topologies using the two main routing protocols taught in this course, EIGRP and OSPF.

To make things easier, you decide to create a chart of configuration and verification commands to use for these two design projects. To help devise the protocol charts, ask another student in the class to help you.

Refer to the PDF for this chapter for directions on how to create a design for this modeling project. When complete, share your work with another group or with the class. You may also want to save the files created for this project in a network portfolio for future reference.

Resources

- Previous curriculum chapter content for EIGRP and OSPF
- Word processing software

Directions

Step 1: Create a matrix for each routing protocol (EIGRP and OSPF).

- Within each routing protocol matrix, design two sections.
 - one section for configuration commands
 - one section for verification or **show** commands
- Use a word processing program to save your matrix designs, one for EIGRP and one for OSPF.

Step 2: Review the chapters in this curriculum.

- Refer to the different sections and activities presented in the curriculum.
 - Content
 - Labs
 - Packet Tracer Activities
- Record configuration commands for each protocol on their respective matrix. **Note:** Some commands are universal, and some are used only for IPv4 or IPv6.
- Record verification commands used for each protocol on their respective matrix. **Note:** Some of these commands are universal, and some are used only with IPv4 or IPv6.
- Leave extra, blank rows for the group or classroom portion of this activity.

Step 3: Meet as a class or with another group.

- Compare configuration commands.
- Compare verification commands.

- c. Add any commands to each matrix mentioned in the full- or group-setting that you did not record in your own group.
- d. Save your work for use with the two Capstone projects which summarize this entire course.

Instructor Resource Example

The information listed in this section is only one depiction of what students could see as a result of this activity. Other designs may vary per student groups.

EIGRP Configuration and Verification Commands (summary)

Configuration Command	Purpose
<code>R1(config)# router eigrp 1</code>	Enables the EIGRP routing process on R1 using a process ID of 1
<code>R1(config-router)# network 172.16.1.0 0.0.0.255</code> <code>R1(config-router)# network 172.16.3.0 0.0.0.3</code> <code>R1(config-router)# network 192.168.10.4 0.0.0.3</code>	Configures EIGRP to advertise the specific directly connected subnets
<code>R1(config)# ipv6 unicast-routing</code>	*Enables IPv6 routing on each router
<code>R1(config)# ipv6 router eigrp 1</code> <code>R1(config-rtr)# no shutdown</code>	*Configures EIGRP for IPv6 routing on each router
<code>R1(config-rtr)# router-id 1.1.1.1</code>	Manual assignment of a router ID to that particular router
<code>R1(config)# int g0/0</code> <code>R1(config-if)# ipv6 eigrp 1</code> <code>R1(config)# int s0/0/0</code> <code>R1(config-if)# ipv6 eigrp 1</code> <code>R1(config)# int s0/0/1</code> <code>R1(config-if)# ipv6 eigrp 1</code>	*Interface configuration directions for assigning IPv6 EIGRP to an interface – must be done on each interface using the IPv6 EIGRP routing protocol
<code>R1(config)# interface Serial0/0/0</code> <code>R1(config-if)# ip summary-address eigrp 1 172.31.8.0 255.255.252.0</code>	Allows R1 to send a manually computed summary route network address and prefix through S0/0/0
<code>R1(config)# interface Serial0/0/0</code> <code>R1(config-if)# ipv6 summary-address eigrp 1 2001:DB8:ACAD:8::/62</code>	Allows R1 to advertise a manually computed IPv6 summary route network address and prefix through S0/0/0
<code>R1(config)# ip route 0.0.0.0 0.0.0.0 Serial0/1/0</code>	Configures an IPv4 default route
<code>R1(config)# router eigrp 1</code> <code>R1(config-router)# redistribute static</code>	Allows the EIGRP IPv4 default route to be propagated

R1(config)# ipv6 route ::/0 Serial0/1/0	Configures an IPv6 default route
R1(config)# ipv6 router eigrp 1 R1(config-rtr)# redistribute static	Allows the IPv6 default route to be propagated
R1(config)# interface s0/0/0 R1(config-if)# ip hello-interval eigrp 1 10	Changes the EIGRP hello time period to 10 seconds as advertised out of s0/0/0
R1(config)# router eigrp 1 R1(config-router)# passive-interface gigabitethernet 0/0	Changes Gi0/0 to not send hello packet for the EIGRP process to its neighbors
R1(config)# interface s 0/0/0 R1(config-if)# bandwidth 64	Sets a particular bandwidth value for a particular interface for EIGRP DUAL calculations
R1(config)# interface s 0/0/1 R1(config-if)# ipv6 address fe80::1 link-local R1(config-if)# exit	Sets a link-local address for a router's interface – in this case, s0/0/1
R1(config)# router eigrp 1 R1(config-router)# auto-summary	Allows the EIGRP process to use auto-summarization for the routing table output
R1 (config)# key chain name-of-chain R1 (config-keychain)# key key-id R1 (config-keychain-key)# key-string key-string-text R1(config)# interface type number R1(config-if)# ip authentication mode eigrp as-number md5 R1(config-if)# ip authentication key-chain eigrp as-number name-of-chain	Creates security parameters to use for authentication with EIGRP Configures actual authentication using the keychain parameters configured above
Verification Command	Purpose
R1# show ip route	Displays the known networks on each router
R1# show ip eigrp neighbors	Displays the neighbors discovered by EIGRP – neighbor adjacencies
R1# show ip protocols	Shows parameters and other information about the current state of any active IPv4 routing protocol processes

R1# show ip eigrp topology	Displays successor paths and the networks recorded in the topology table
R1# show ipv6 eigrp neighbors	Verifies adjacencies with directly-connected neighbors – link local addresses
R1# show ipv6 route	Displays IPv6 EIGRP routes
R1# show ipv6 protocols	Verifies parameters and current state of the active IPv6 routing protocol processes
R1# show ip eigrp topology all-links	Shows entries in the routing table for EIGRP only – also shows successors and feasible successors and FD
R1# show ip int brief	Shows link status on a particular router using IPv4
R1# show ipv6 interface brief	Shows link status on a particular router using IPv6
R1# show running-configuration	Displays configuration information currently operating on the router

OSPF Configuration and Verification Commands (summary)

Configuration Command	Purpose
R1(config)# router ospf 10	Enters OSPF for the router using 10 as the process id
R1(config)# router ospf 10 R1(config-router)# router-id 1.1.1.1 R1(config-router)# end	Assigns a router identification address for use with OSPF 10
R1(config)# router ospf 10 R1(config-router)# network 172.16.1.0 0.0.0.255 area 0 R1(config-router)# network 172.16.3.0 0.0.0.3 area 0 R1(config-router)# network 192.168.10.4 0.0.0.3 area 0	Configures OSPF 10 with network addresses and prefixes – area # indicates to which OSPF group the networks will belong
R1# clear ip ospf process	Allows old OSPF information to be cleared and new processes to take effect – places old neighbors in down state and allows new adjacencies to be created
R1(config)# interface serial 0/0/1 R1(config-if)# bandwidth 1024 R1(config-if)# end	Adjusts the bandwidth for a particular interface on a router – used for IPv4 and IPv6
R1(config)# ipv6 unicast-routing R1(config)# interface GigabitEthernet 0/0 R1(config-if)# description R1 LAN R1(config-if)# ipv6 address 2001:DB8:CAFE:1::1/64 R1(config-if)# no shut	Allows IPv6 OSPF to be used for OSPFv3 for one interface (Gi0/0) – must be configured for each interface on the router
R1(config)# interface GigabitEthernet 0/0 R1(config-if)# ipv6 ospf 10 area 0 R1(config-if)# nd	Assigns OSPFv3 for IPv6 for processes and areas on specific interfaces – must be configured per interface on the router
R1(config)# interface GigabitEthernet 0/0 R1(config-if)# ipv6 address fe80::1 link-local R1(config-if)# exit	IPv6 command which assigns a Link Local network address to an interface – configured per interface
R1(config)# ipv6 router ospf 10 R1(config-rtr)# router-id 1.1.1.1 R1(config-rtr)# auto-cost reference-bandwidth 1000 % OSPFv3-1-IPv6: Reference bandwidth is changed. Please ensure reference bandwidth is consistent across all routers.	IPv6 commands which assign a router ID and bandwidth to a particular OSPF process and router – configured separately per router

R1(config-rtr)# end	
R1# clear ipv6 ospf process	Allows a reset of the IPv6 OSPF processes so that new information can be propagated on the router for OSPF
R1(config)# interface GigabitEthernet 0/0 R1(config-if)# ip ospf priority 255 R1(config-if)# end	Changes the interface/link priority to a higher or lower number for DR/BDR election – changing to 0, leaves that router's interface out of the election process. Changing the priority to 255 makes it the highest priority available to the election process
R1(config)# ip route 0.0.0.0 0.0.0.0 loopback 0 209.165.200.226 R1(config)# router ospf 10 R1(config-router)# default-information originate R1(config-router)# end	Sets an IPv4 OSPF default route for a router, assigns that route to the OSPF 10 process and propagates the route
R1(config)# ipv6 route 0::/0 loopback0 2001:DB8:FEED:1::2 R1(config)# ipv6 router ospf 10 R1(config-rtr)# default-information originate R1(config-rtr)# end	Enables OSPFv3 for IPv6 on an interface for the router – propagates the information
R1(config)# interface Serial 0/0/0 R1(config-if)# ipv6 ospf hello-interval 5 R1(config-if)# ipv6 ospf dead-interval 20 R1(config-if)# end	Changes IPv6 Hello and Dead timer intervals to lower or higher values for link reporting and neighbor adjacencies using OSPFv3
R1(config)# router ospf 10 R1(config-router)# area 0 authentication message-digest R1(config-router)# exit R1(config)# interface GigabitEthernet 0/0 R1(config-if)# ip ospf message-digest-key 1 md5 CISCO-123 R1(config-if)# exit	Enables area authentication Sets values per interface for authentication type and password or key
R1(config)# router ospf 10 R1(config-router)# area 1 range 10.1.0.0 255.255.252.0 R1(config-router)# exit	Summarizes OSPF routes into a range for OSPF inter-area configurations – used to create Null routes for packets processing and discard

Verification Command	Purpose
R1# show ip ospf neighbor command.	Shows the Adjacency database and Neighbor table Lists all neighbor routers to which a router has established bidirectional communication. This table is unique for each router.
R1# show ip ospf database	Shows the Link-state database and topology table - Lists information about all other routers in the network and shows the network topology. Also shows area numbers and link IDs within the areas
R1# show ip protocols	Displays the router ID, networks recognized for routing, the gateway, distance and last update information for the router and its protocols
R1# show ip ospf interface serial 0/0/0	Displays status of the interface (or link), bandwidth, the internet address of the interface, status of the protocol (up or down), router ID, network type (for example, point-to-point), cost of the interface/link, hello, dead, wait and transmit intervals in seconds, and neighbors adjacencies Shows priority setting Also shows the interface's DR or BDR with their accompanying addresses and router IDs
R1# show ip ospf	Verifies the router's OSPF process in its entirety

R1# show ip ospf interface brief	Verifies the interfaces/links a particular router, the network assigned to the interfaces, cost, state and number of neighbors on that interface
R1# show ipv6 interface brief	IPv6 command which lists the interfaces participating with OSPF, their Link Local address and their IPv6 address – also lists the status of the interfaces (up or down)
R1# show ipv6 protocols	IPv6 command which shows the process number, router ID, number of areas, etc.
R1# show ipv6 route ospf	Shows IPv6 routing table information – includes type of route (OSPF), IPv6 address/prefix of network being reported, and which interface reported the information
R2# show ipv6 route static	Displays only static routes for IPv6 as reported through the routing table

Identify elements of the model that map to IT-related content:

- EIGRP IPv4 configuration commands
- EIGRP IPv4 verification commands
- OSPF IPv6 configuration commands
- OSPF IPv6 verification commands