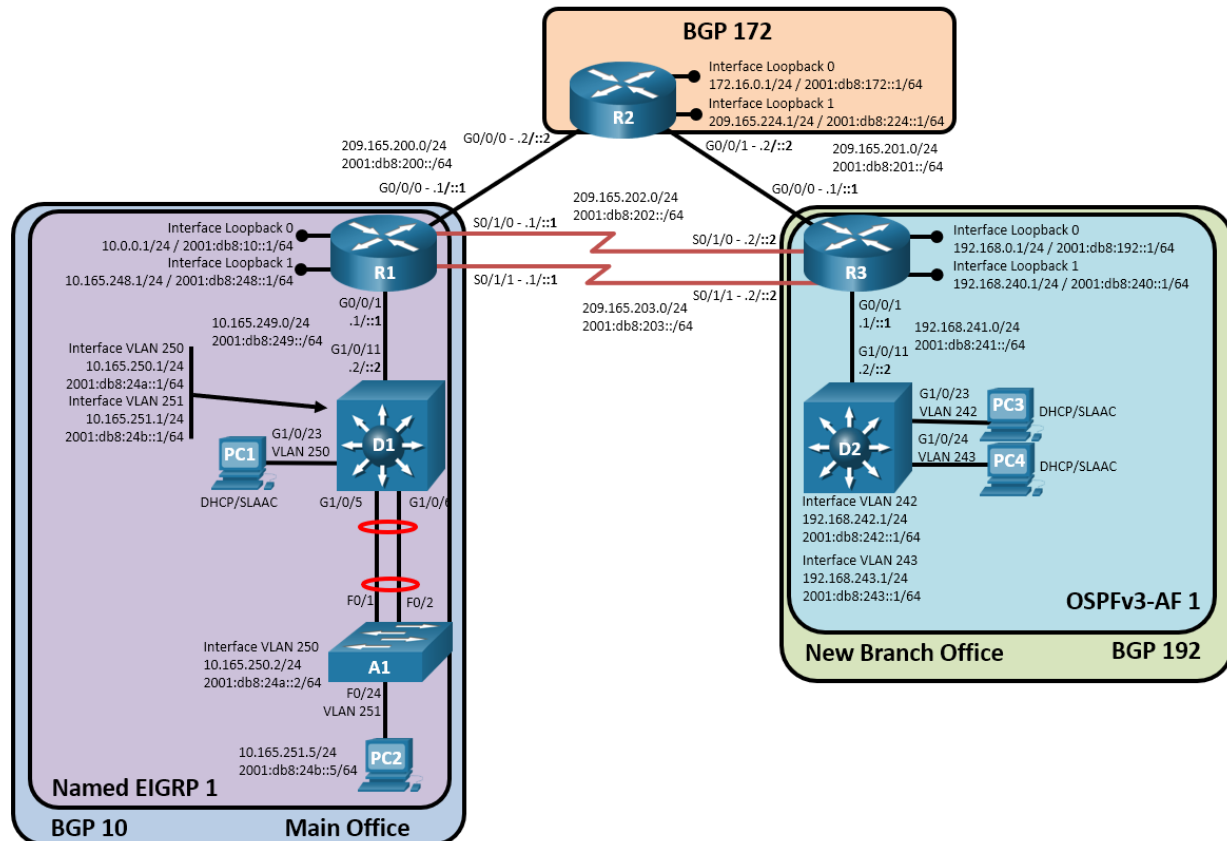


ENARSI Skills Assessment - Configuration

Topology



Addressing Table

Device	Interface	IPv4 Address/Mask	IPv6 Address/Prefix Length	Link-Local Address
R1	G0/0/0	209.165.200.1/24	2001:db8:200::1/64	fe80::1:1
	G0/0/1	10.165.249.1/24	2001:db8:249::1/64	fe80::1:2
	Loopback 0	10.0.0.1/24	2001:db8:10::1/64	fe80::1:3
	Loopback 1	10.165.248.1/24	2001:db8:248::1/64	fe80::1:4
R2	G0/0/0	209.165.200.2/24	2001:db8:200::2/64	fe80::2:1
	G0/0/1	209.165.201.2/24	2001:db8:201::2/64	fe80::2:2
	Loopback 0	172.16.0.1/24	2001:db8:172::1/64	fe80::2:3
	Loopback 1	209.165.224.1/24	2001:db8:224::1/64	fe80::2:4
R3	G0/0/0	209.165.201.1/24	2001:db8:201::1/64	fe80::3:1

Device	Interface	IPv4 Address/Mask	IPv6 Address/Prefix Length	Link-Local Address
	G0/0/1	192.168.241.1/24	2001:db8:241::1/64	fe80::3:2
	Loopback 0	192.168.0.1/24	2001:db8:192::1/64	fe80::3:3
	Loopback 1	192.168.240.1/24	2001:db8:240::1/64	fe80::3:4
D1	G1/0/11	10.165.249.2/25	2001:db8:249::2/64	fe80::d1:1
	VLAN 250	10.165.250.1/24	2001:db8:24a::1/64	fe80::d1:2
	VLAN 251	10.165.251.1/24	2001:db8:24b::1/64	fe80::d1:3
D2	G1/0/11	192.168.241.2/24	2001:db8:241::2/64	fe80::d2:1
	VLAN 242	192.168.242.1/24	2001:db8:242::1/64	fe80::d2:2
	VLAN 243	192.168.243.1/24	2001:db8:243::1/64	fe80::d2:3
A1	VLAN 250	10.165.250.2/24	2001:db8:24a::2/64	fe80::a1:1
PC1	NIC	DHCP	SLAAC	EUI-64/CGA
PC2	NIC	10.165.251.5/24	2001:db8:24b::5/64	EUI-64/CGA
PC3	NIC	DHCP	SLAAC	EUI-64/CGA
PC4	NIC	DHCP	SLAAC	EUI-64/CGA

Objectives

Part 1: Build the Network and Configure Basic Device Settings and Interface Addressing

Part 2: Configure Routing to Specifications

Background / Scenario

You have been tasked with configuring routing for the network according to a set of specifications. You must be precise and configure routing to adhere to the requirements provided.

Note: This lab is an exercise in configuring routing options and does not necessarily reflect networking best practices.

Note: The routers used with CCNP hands-on labs are Cisco 4221 with Cisco IOS XE Release 16.9.4 (universalk9 image). The switches used in the labs are Cisco Catalyst 3650 with Cisco IOS XE Release 16.9.4 (universalk9 image) and Cisco Catalyst 2960 with Cisco IOS Release 15.2(2) (lanbasek9 image). Other routers, switches, and Cisco IOS versions can be used. Depending on the model and Cisco IOS version, the commands available and the output produced might vary from what is shown in the labs. Refer to the Router Interface Summary Table at the end of the lab for the correct interface identifiers.

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

Note: The default Switch Database Manager (SDM) template on a Catalyst 2960 does not support IPv6. You must change the default SDM template to the dual-ipv4-and-ipv6 default template using the **sdm prefer dual-ipv4-and-ipv6 default** global configuration command. Changing the template will require a reboot.

Required Resources

- 3 Routers (Cisco 4221 with Cisco IOS XE Release 16.9.4 universal image or comparable)
- 2 Switches (Cisco 3650 with Cisco IOS XE Release 16.9.4 universal image or comparable)

- 1 Switch (Cisco 2960 with Cisco IOS Release 15.2(2) lanbasek9 image or comparable)
- 4 PCs (Choice of Operating System with terminal emulation program installed)
- Console cables to configure the Cisco IOS devices via the console ports
- Ethernet and serial cables as shown in the topology

Instructions

Part 1: Build the Network and Configure Basic Device Settings and Interface Addressing

In Part 1, you will set up the network topology and configure basic settings and interface addressing on routers.

Step 1: Cable the network as shown in the topology.

Attach the devices as shown in the topology diagram, and cable as necessary.

Step 2: Configure basic settings for each device.

- a. Console into each device, enter global configuration mode, and apply the basic settings. The startup configurations for each device are provided below.

Router R1

```
hostname R1
no ip domain lookup
ipv6 unicast-routing
banner motd # This is R1, ENARSI SA Part 1 #
enable secret cisco12345
username admin privilege 15 algorithm-type scrypt secret cisco12345
interface g0/0/0
  ip address 209.165.200.1 255.255.255.0
  ipv6 address fe80::1:1 link-local
  ipv6 address 2001:db8:200::1/64
  no shutdown
exit
interface g0/0/1
  ip address 10.165.249.1 255.255.255.0
  ipv6 address fe80::1:2 link-local
  ipv6 address 2001:db8:249::1/64
  no shutdown
exit
interface s0/1/0
  ip address 209.165.202.1 255.255.255.0
  ipv6 address fe80::1:3 link-local
  ipv6 address 2001:db8:202::1/64
  no shutdown
exit
interface s0/1/1
  ip address 209.165.203.1 255.255.255.0
```

```
ipv6 address fe80::1:4 link-local
ipv6 address 2001:db8:203::1/64
no shutdown
exit
interface loopback 0
ip address 10.0.0.1 255.255.255.0
ipv6 address fe80::1:5 link-local
ipv6 address 2001:db8:10::1/64
no shutdown
exit
interface loopback 1
ip address 10.165.248.1 255.255.255.0
ipv6 address fe80::1:6 link-local
ipv6 address 2001:db8:248::1/64
no shutdown
exit
line con 0
logging synchronous
exec-timeout 0 0
exit
line vty 0 4
login local
transport input telnet
exec-timeout 5 0
exit
alias exec reset.now tclsh flash:/enarsi/reset.tcl
end
```

Router R2

```
hostname R2
no ip domain lookup
ipv6 unicast-routing
banner motd # This is R2, ENARSI SA Part 1 #
enable secret cisco12345
username admin privilege 15 algorithm-type scrypt secret cisco12345
interface g0/0/0
ip address 209.165.200.2 255.255.255.0
ipv6 address fe80::2:1 link-local
ipv6 address 2001:db8:200::2/64
no shutdown
exit
interface g0/0/1
ip address 209.165.201.2 255.255.255.0
ipv6 address fe80::2:2 link-local
ipv6 address 2001:db8:201::2/64
no shutdown
```

```
exit
interface loopback 0
ip address 172.16.0.1 255.255.255.0
ipv6 address fe80::2:3 link-local
ipv6 address 2001:db8:172::1/64
no shutdown
exit
interface loopback 1
ip address 209.165.224.1 255.255.255.0
ipv6 address fe80::2:4 link-local
ipv6 address 2001:db8:224::1/64
no shutdown
exit
line con 0
logging synchronous
exec-timeout 0 0
exit
line vty 0 4
login local
transport input telnet
exec-timeout 5 0
exit
alias exec reset.now tclsh flash:/enarsi/reset.tcl
end
```

Router R3

```
hostname R3
no ip domain lookup
ipv6 unicast-routing
banner motd # This is R3, ENARSI SA Part 1 #
enable secret cisco12345
username admin privilege 15 algorithm-type scrypt secret cisco12345
interface g0/0/0
ip address 209.165.201.1 255.255.255.0
ipv6 address fe80::3:1 link-local
ipv6 address 2001:db8:201::1/64
no shutdown
exit
interface g0/0/1
ip address 192.168.241.1 255.255.255.0
ipv6 address fe80::3:2 link-local
ipv6 address 2001:db8:241::1/64
no shutdown
exit
interface s0/1/0
ip address 209.165.202.2 255.255.255.0
```

```
    ipv6 address fe80::3:3 link-local
    ipv6 address 2001:db8:202::2/64
    no shutdown
    exit
interface s0/1/1
    ip address 209.165.203.2 255.255.255.0
    ipv6 address fe80::3:4 link-local
    ipv6 address 2001:db8:203::2/64
    no shutdown
    exit
interface loopback 0
    ip address 192.168.0.1 255.255.255.0
    ipv6 address fe80::3:5 link-local
    ipv6 address 2001:db8:192::1/64
    no shutdown
    exit
interface loopback 1
    ip address 192.168.240.1 255.255.255.0
    ipv6 address fe80::3:6 link-local
    ipv6 address 2001:db8:240::1/64
    no shutdown
    exit
line con 0
    logging synchronous
    exec-timeout 0 0
    exit
line vty 0 4
    login local
    transport input telnet
    exec-timeout 5 0
    exit
alias exec reset.now tclsh flash:/enarsi/reset.tcl
end
```

Switch D1

```
hostname D1
no ip domain lookup
ip routing
ipv6 unicast-routing
banner motd # This is D1, ENARSI SA Part 1 #
enable secret cisco12345
username admin privilege 15 algorithm-type scrypt secret cisco12345
vlan 250
    name Users
    exit
vlan 251
```

```
name Servers
exit
interface range g1/0/1-24
    switchport mode access
    shutdown
interface g1/0/11
    no switchport
    ip address 10.165.249.2 255.255.255.0
    ipv6 address fe80::d1:1 link-local
    ipv6 address 2001:db8:249::2/64
    no shutdown
    exit
interface g1/0/23
    switchport mode access
    spanning-tree portfast
    switchport access vlan 250
    no shutdown
    exit
interface vlan 250
    ip address 10.165.250.1 255.255.255.0
    ipv6 address fe80::d1:2 link-local
    ipv6 address 2001:db8:24A::1/64
    no shutdown
    exit
interface vlan 251
    ip address 10.165.251.1 255.255.255.0
    ipv6 address fe80::d1:3 link-local
    ipv6 address 2001:db8:24B::1/64
    no shutdown
    exit
interface range g1/0/5-6
    switchport mode trunk
    channel-group 1 mode active
    no shutdown
    exit
ip dhcp excluded-address 10.165.250.1 10.165.250.5
ip dhcp pool VLAN250DHCP
    network 10.165.250.0 255.255.255.0
    default-router 10.165.250.1
    exit
line con 0
    logging synchronous
    exec-timeout 0 0
    exit
line vty 0 4
    login local
```

```
transport input telnet
exec-timeout 5 0
exit
alias exec reset.now tclsh flash:/enarsi/reset.tcl
end
```

Switch D2

```
hostname D2
no ip domain lookup
ip routing
ipv6 unicast-routing
banner motd # This is D2, ENARSI SA Part 1 #
enable secret cisco12345
username admin privilege 15 algorithm-type scrypt secret cisco12345
vlan 242
  name Users
  exit
interface range g1/0/1-24
  switchport mode access
  shutdown
interface g1/0/11
  no switchport
  ip address 209.165.241.2 255.255.255.0
  ipv6 address fe80::d2:1 link-local
  ipv6 address 2001:db8:241::2/64
  no shutdown
  exit
interface g1/0/23
  switchport mode access
  spanning-tree portfast
  switchport access vlan 242
  no shutdown
  exit
interface g1/0/24
  switchport mode access
  spanning-tree portfast
  switchport access vlan 243
  no shutdown
  exit
interface vlan 242
  ip address 192.168.242.1 255.255.255.0
  ipv6 address fe80::d2:2 link-local
  ipv6 address 2001:db8:242::1/64
  no shutdown
  exit
interface vlan 243
```



```
ip address 192.168.243.1 255.255.255.0
ipv6 address fe80::d1:3 link-local
ipv6 address 2001:db8:243::1/64
no shutdown
exit
ip dhcp excluded-address 192.168.242.1 192.168.242.5
ip dhcp pool VLAN242DHCP
network 192.168.242.0 255.255.255.0
default-router 192.168.242.1
exit
ip dhcp excluded-address 192.168.243.1 192.168.243.5
ip dhcp pool VLAN243DHCP
network 192.168.243.0 255.255.255.0
default-router 192.168.243.1
exit
line con 0
logging synchronous
exec-timeout 0 0
exit
line vty 0 4
login local
transport input telnet
exec-timeout 5 0
exit
alias exec reset.now tclsh flash:/enarsi/reset.tcl
end
```

Switch A1

```
hostname A1
no ip domain lookup
banner motd # This is A1, ENARSI SA Part 1 #
enable secret cisco12345
username admin privilege 15 algorithm-type scrypt secret cisco12345
vlan 251
name Servers
exit
interface range f0/1-24
switchport mode access
shutdown
exit
interface f0/23
switchport mode access
switchport access vlan 250
spanning-tree portfast
no shutdown
exit
```

```
interface f0/24
  switchport mode access
  switchport access vlan 251
  spanning-tree portfast
  no shutdown
  exit
interface vlan 250
  ip address 10.165.250.2 255.255.255.0
  ipv6 address fe80::a1:1 link-local
  ipv6 address 2001:db8:24A::2/64
  no shutdown
  exit
ip default-gateway 10.165.250.1
interface f0/23
  shutdown
  exit
interface range f0/1-3
  switchport mode trunk
  channel-group 1 mode active
  no shutdown
  exit
line con 0
  logging synchronous
  exec-timeout 0 0
  exit
line vty 0 4
  login local
  transport input telnet
  exec-timeout 5 0
  exit
alias exec reset.now tclsh flash:/enarsi/reset.tcl
end
```

- b. Set the clock on each device to UTC time.
- c. Save the running configuration to startup-config.
- d. Verify the IPv4 and IPv6 configuration on hosts as shown in the Addressing Table. PC2 should be manually configured.

Part 2: Configure Routing to Specifications

Implement routing in the network using the following specifications.

Note: The enable secret is **cisco12345**. If you must provide a username, the configured username is **admin**.

Step 1: Configure R1 and D1 to communicate using Named EIGRP.

- a. Name the process ENARSI-SA and use autonomous system number 1 for both IPv4 and IPv6.
- b. Use the router id 0.4.10.1 for R1 and 0.4.10.2 for D1 with address family IPv4.

- c. Use the router id 0.6.10.1 for R1 and 0.6.10.2 for D1 with address family IPv6.
- d. Advertise individual IPv4 and IPv6 networks attached to R1 and D1. Do not summarize.
- e. Ensure R1 interface G0/0/0 does not send or receive EIGRP updates in either address family.
- f. Ensure D1 will not form an EIGRP adjacency on interface VLAN 250 or interface VLAN 251 in either address family.

Step 2: Configure R1 to speak BGP for AS 10 using Multi-Protocol BGP.

- a. Configure MP-BGP for AS 10 and disable the default IPv4 behavior.
- b. Use the BGP router-id 4.6.10.1.
- c. Configure neighbor statements as follows:
 - 1) Establish adjacency with R2 in AS 172 via G0/0/0 using IPv4 and IPv6.
 - 2) Establish adjacency with R3 in AS 192 via S0/1/0 using IPv4 and IPv6.
 - 3) Establish adjacency with R3 in AS 192 via S0/1/1 using IPv4 and IPv6.
- d. Activate the neighbors under the appropriate unicast address family.
- e. Advertise all of the individual networks in AS 10. Do not summarize.

Step 3: Configure R1 to redistribute BGP into EIGRP.

Configure R1 to redistribute BGP 10 into both EIGRP address families with an appropriate metric.

Step 4: Configure R2 to speak BGP for AS 172 using Multi-Protocol BGP.

- a. Configure static default routes for IPv4 and IPv6 pointed to null0.
- b. Configure MP-BGP for AS 172 and disable the default IPv4 behavior.
- c. Use the BGP router-id 4.6.172.2.
- d. Configure neighbor statements as follows:
 - 1) Establish adjacency with R1 in AS 10 via G0/0/0 using IPv4 and IPv6.
 - 2) Establish adjacency with R3 in AS 192 via G0/0/1 using IPv4 and IPv6.
- e. Activate the neighbors under the appropriate unicast address family.
- f. Advertise all of the individual networks in AS 10. Do not summarize.
 - 1) For the default routes, use the **network** 0.0.0.0 **mask** 0.0.0.0 and **network** ::/0 commands.

Step 5: Configure R3 to speak BGP for AS 192 using Multi-Protocol BGP.

- a. Configure MP-BGP for AS 10 and disable the default IPv4 behavior.
- b. Use the BGP router-id 4.6.192.3.
- c. Configure neighbor statements as follows:
 - 1) Establish adjacency with R2 in AS 172 via G0/0/0 using IPv4 and IPv6.
 - 2) Establish adjacency with R1 in AS 10 via S0/1/0 using IPv4 and IPv6.
 - 3) Establish adjacency with R1 in AS 10 via S0/1/1 using IPv4 and IPv6.
- d. Activate the neighbors under the appropriate unicast address family.
- e. Advertise all of the individual networks in AS 192. Do not summarize.

Step 6: Configure R3 and D2 to communicate using OSPFv3-Address Families.

- a. Use OSPFv3 process-id number 1 on both R3 and D2.
- b. Use the router id 0.0.192.3 for R3 and 0.0.192.2 for D2.
- c. Configure R3 interfaces Loopback 0 and Loopback 1 as OSPF point-to-point networks for both IPv4 and IPv6.
- d. Advertise individual IPv4 and IPv6 networks attached to R3 and D2. Do not summarize.
- e. Ensure R3 will not form an OSPFv3 adjacency on interface G0/0/0 in either address family.
- f. Ensure D2 will not form an OSPFv3 adjacency on interface VLAN 250 or interface VLAN 251 in either address family.
- g. Redistribute BGP 192 into OSPFv3 in both address families. Do not specify a custom metric or metric-type.

Step 7: Verify Operation.

- a. BGP path selection should follow the shortest AS path in all cases.
 - 1) Traffic moving from R1 to R3 networks should cross a serial interface.
 - 2) Traffic moving from R1 to R2 or R3 to R2 should cross the GigabitEthernet interfaces.
- b. Because there is no security in place, each host should be able to ping every other host and device on the network.

Router Interface Summary Table

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)
4221	Gigabit Ethernet 0/0/0 (G0/0/0)	Gigabit Ethernet 0/0/1 (G0/0/1)	Serial 0/1/0 (S0/1/0)	Serial 0/1/1 (S0/1/1)
4300	Gigabit Ethernet 0/0/0 (G0/0/0)	Gigabit Ethernet 0/0/1 (G0/0/1)	Serial 0/1/0 (S0/1/0)	Serial 0/1/1 (S0/1/1)

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.