

DIPLOMADO DE PROFUNDIZACION CISCO
PRUEBA DE HABILIDADES PRÁCTICAS CCNP

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UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA - UNAD
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INGENIERÍA DE TELECOMUNICACIONES
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Diplomado de opción de grado presentado para optar el título de
INGENIERO DE TELECOMUNICACIONES

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NOTA DE ACEPTACIÓN

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GLOSARIO

CCNP: Traducción del inglés-Un Cisco Certified Network Professional es una persona en la industria de TI que ha alcanzado el nivel profesional de Certificación de Carrera de Cisco

DHCP: Siglas del inglés "Dynamic Host Configuration Protocol." Protocolo Dinámico de Configuración del Host. Un servidor de red usa este protocolo para asignar de forma dinámica las direcciones IP a las diferentes computadoras de la red.

GNS3: Simulador gráfico de red lanzado en 2008, que te permite diseñar topologías de red complejas y poner en marcha simulaciones sobre ellos, permitiendo la combinación de dispositivos tanto reales como virtuales. Para permitir completar simulaciones

OSPF: Open Shortest Path First, Abrir el camino más corto primero en español, es un protocolo de red para encaminamiento jerárquico de pasarela interior o Interior Gateway Protocol, que usa el algoritmo Dijkstra, para calcular la ruta más corta entre dos nodos.

VLAN: Acrónimo de virtual LAN (red de área local virtual), es un método para crear redes lógicas independientes dentro de una misma red física.

RESUMEN

En el desarrollo de esta prueba de habilidades práctica del Diplomado de profundización Cisco CCNP, se realizan actividades de estructuración de una red empresarial, utilizando como software principal GNS3, el cual funciona en adjunto al software VirtualBox, se hacen las configuraciones adecuadas en cada uno de los 3 routers, los 3 switch y los equipos de cómputo virtuales, utilizando las imágenes de cada dispositivo recomendadas para el desarrollo adecuado de esta prueba de habilidades. Al hacer un correcto enrutamiento, todas las pruebas de verificación desde cada uno de los dispositivos pasarán correctamente, teniendo como finalidad la red empresarial requerida y con las condiciones adecuadas para su total funcionalidad.

PALABRAS CLAVE: CISCO, CCNP, Conmutación, Enrutamiento, Redes, Electrónica.

ABSTRACT

In the development of this practical skills test of the Cisco CCNP Deepening Diploma, structuring activities of a business network are carried out, using GNS3 as the main software, which works together with the VirtualBox software, the appropriate configurations are made in each of the 3 routers, the 3 switches and the virtual computing equipment, using the images of each device recommended for the proper development of this skills test. By making a correct routing, all the verification tests from each of the devices will pass correctly, with the purpose of the required business network and with the appropriate conditions for its full functionality.

KEYWORDS: CISCO, CCNP, Routing, Swicthing, Networking, Electronics.

INTRODUCCIÓN

En el desarrollo de este Diplomado de profundización de Cisco CCNP, se podrá estructurar redes conmutadas mediante el uso del protocolo STP y la configuración de VLANs, para comprender las características de una infraestructura de red jerárquica convergente. Será posible diseñar soluciones de red escalables mediante la configuración básica y avanzada de protocolos de enrutamiento para la implementación de servicios IP con calidad de servicio en ambientes de red empresariales LAN y WAN.

En la continuación del desarrollo de los resultados de aprendizaje del diplomado se planificarán las redes inalámbricas, de acceso remoto y sitio a sitio seguras mediante el análisis de escenarios simulados de infraestructuras de red empresariales para la aplicación de servicios de autenticación, roaming y localización. Por último, se implementarán redes empresariales con acceso seguro a través de la automatización y virtualización de la red para aplicar metodologías de solución de problemas en ambientes de red corporativos LAN y WAN.

Finalizando las diferentes configuraciones de cada uno de los dispositivos, se podrá comprobar y evidenciar por medio de comandos adecuados, la correcta configuración de la red empresarial, dando lugar a una conectividad funcional, tal cual como era requerida desde el inicio de la estructuración.

DESARROLLO

ENCOR SKILLS ASSESSMENT (SCENARIO 1)

Topology

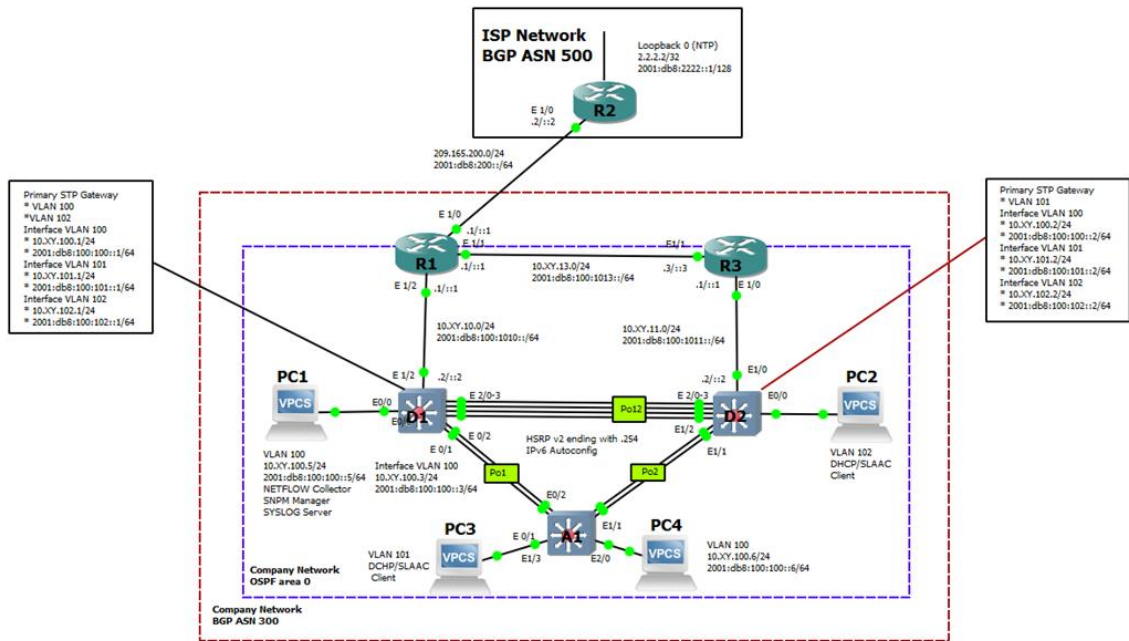


Ilustración 1. Topology

Fuente: Prueba de habilidades CCNP

Tabla 1. Addressing

Device	Interface	IPv4 Address	IPv6 Address	IPv6 Link-Local
R1	E1/0	209.165.200.225/27	2001:db8:200::1/64	fe80::1:1
R1	E1/2	10.17.10.1/24	2001:db8:100:1010::1/64	fe80::1:2
R1	E1/1	10.17.13.1/24	2001:db8:100:1013::1/64	fe80::1:3
R2	E1/0	209.165.200.226/27	2001:db8:200::2/64	fe80::2:1

Device	Interface	IPv4 Address	IPv6 Address	IPv6 Link-Local
R2	Loopback 0	2.2.2.2/32	2001:db8:2222::1/128	fe80::2:3
R3	E1/0	10.17.11.1/24	2001:db8:100:1011::1/64	fe80::3:2
R3	E1/1	10.17.13.3/24	2001:db8:100:1013::3/64	fe80::3:3
D1	E1/2	10.17.10.2/24	2001:db8:100:1010::2/64	fe80::d1:1
D1	VLAN 100	10.17.100.1/24	2001:db8:100:100::1/64	fe80::d1:2
D1	VLAN 101	10.17.101.1/24	2001:db8:100:101::1/64	fe80::d1:3
D1	VLAN 102	10.17.102.1/24	2001:db8:100:102::1/64	fe80::d1:4
D2	E1/0	10.17.11.2/24	2001:db8:100:1011::2/64	fe80::d2:1
D2	VLAN 100	10.17.100.2/24	2001:db8:100:100::2/64	fe80::d2:2
D2	VLAN 101	10.17.101.2/24	2001:db8:100:101::2/64	fe80::d2:3
D2	VLAN 102	10.17.102.2/24	2001:db8:100:102::2/64	fe80::d2:4
A1	VLAN 100	10.17.100.3/23	2001:db8:100:100::3/64	fe80::a1:1
PC1	NIC	10.17.100.5/24	2001:db8:100:100::5/64	EUI-64
PC2	NIC	DHCP	SLAAC	EUI-64
PC3	NIC	DHCP	SLAAC	EUI-64
PC4	NIC	10.17.100.6/24	2001:db8:100:100::6/64	EUI-64

Objectives

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

Part 2: Configure the Layer 2 Network and Host Support

Part 3: Configure Routing Protocols

Part 4: Configure First-Hop Redundancy

Background / Scenario

In this skills assessment, you are responsible for completing the configuration of the network so there is full end-to-end reachability, so the hosts have reliable default gateway support, and so that management protocols are operational within the “Company Network” part of the topology. Be careful to verify that your configurations meet the provided specifications and that the devices perform as required.

Note: The routers used with CCNP hands-on labs are Cisco 7200 routers. The switches used in the labs are Cisco Catalyst L2 switches. 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.

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

Note: The letters "X, Y" represent the last two digits of your ID number (cédula).

Required Resources

3 Routers (Cisco 7200). [Click on the download link of the images for GNS3.](#)

3 Switches (Cisco IOU L2). [Click on the download link of the images for GNS3.](#)

4 PCs (Use the GNS3's VPCS)

After the configuration of devices in GNS3, the Slots of the network adapters of the SW must be configured as follows:

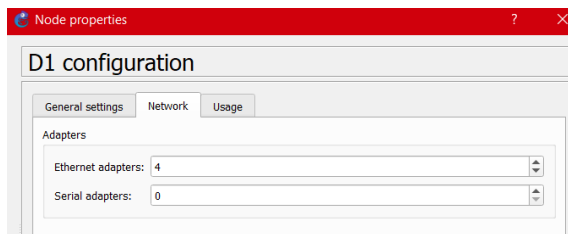


Ilustración 2. D1 Configuration

Fuente: Luis Araque

And of the Routers like this:

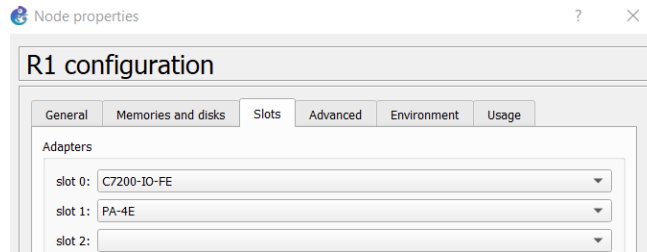


Ilustración 3. R1 Configuration

Fuente: Luis Araque

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.

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

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

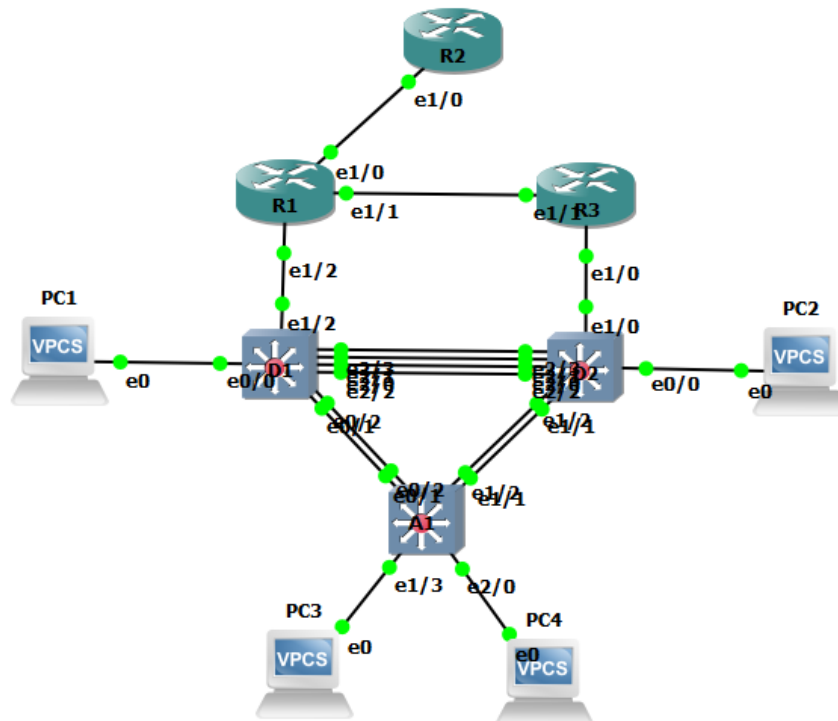


Ilustración 4. Topology in GNS3

Fuente: Luis Araque

Paso 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

```
R1#CONF T
```

Enter configuration commands, one per line. End with CNTL/Z.

```
R1(config)#hostname R1 // Comando para cambiar el nombre del dispositivo
```

```
R1(config)#ipv6 unicast-routing // Habilitamos IPV6 en el dispositivo
```

```
R1(config)#no ip domain lookup // Desactivamos la traducción de nombres
```

```
R1(config)#banner motd # R1, ENCOR Skills Assessment# // Se quema o ubica un mensaje en el inicio
```

```
R1(config)#line con 0
```

```
R1(config-line)# exec-timeout 0 0 // Se establece un tiempo de espera para salir de la sesión
```

```
R1(config-line)# logging synchronous // Se deniegan mensajes inesperados o de alertas en pantalla
```

```
R1(config-line)# exit
```

```
R1(config)#interface e1/0 // Se ingresa a la interfaz seleccionada
```

```
R1(config-if)# ip address 209.165.200.225 255.255.255.224 // Se configura la IP y máscara
```

```
R1(config-if)# ipv6 address fe80::1:1 link-local // Se configura la IPV6 link local
```

```
R1(config-if)# ipv6 address 2001:db8:200::1/64 // // Se configura la IPV6
```

```
R1(config-if)# no shutdown // Se enciende la interfaz
```

```
R1(config-if)# exit
```

```
R1(config)#interface e1/2 // Se ingresa a la interfaz seleccionada
```

```
R1(config-if)# ip address 10.17.10.1 255.255.255.0 // Se configura la IP y máscara
```

```
R1(config-if)# ipv6 address fe80::1:2 link-local // Se configura la IPV6 link local
```

```
R1(config-if)# ipv6 address 2001:db8:100:1010::1/64 // Se configura la IPV6
```

```
R1(config-if)# no shutdown // Se enciende la interfaz
```

```
R1(config-if)# exit
```

```
R1(config)#interface e1/1
```

```
R1(config-if)# ip address 10.17.13.1 255.255.255.0
```

```
R1(config-if)# ipv6 address fe80::1:3 link-local
```

```
R1(config-if)# ipv6 address 2001:db8:100:1013::1/64
R1(config-if)# no shutdown
R1(config-if)# exit
```

Router R2

```
R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#hostname R2
R2(config)#ipv6 unicast-routing // Se habilita el IPV6 en el Router
R2(config)#no ip domain lookup
R2(config)#banner motd # R2, ENCOR Skills Assessment#
R2(config)#line con 0
R2(config-line)# exec-timeout 0 0
R2(config-line)# logging synchronous
R2(config-line)# exit
R2(config)#interface e1/0
R2(config-if)# ip address 209.165.200.226 255.255.255.224
R2(config-if)# ipv6 address fe80::2:1 link-local
R2(config-if)# ipv6 address 2001:db8:200::2/64
R2(config-if)# no shutdown
R2(config-if)# exit
R2(config)#interface Loopback 0
R2(config-if)# ip address 2.2.2.2 255.255.255.255
R2(config-if)# ipv6 address fe80::2:3 link-local
R2(config-if)# ipv6 address 2001:db8:2222::1/128
R2(config-if)# no shutdown
R2(config-if)# exit
```

Router R3

```
R3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#hostname R3
R3(config)#ipv6 unicast-routing
R3(config)#no ip domain lookup
R3(config)#banner motd # R3, ENCOR Skills Assessment#
R3(config)#line con 0
```

```
R3(config-line)# exec-timeout 0 0
R3(config-line)# logging synchronous
R3(config-line)# exit
R3(config)#interface e1/0
R3(config-if)# ip address 10.17.11.1 255.255.255.0
R3(config-if)# ipv6 address fe80::3:2 link-local
R3(config-if)# ipv6 address 2001:db8:100:1011::1/64
R3(config-if)# no shutdown
R3(config-if)# exit
R3(config)#interface e1/1
R3(config-if)# ip address 10.17.13.3 255.255.255.0
R3(config-if)# ipv6 address fe80::3:3 link-local
R3(config-if)# ipv6 address 2001:db8:100:1010::2/64
R3(config-if)# no shutdown
R3(config-if)# exit
```

Switch D1

```
D1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
D1(config)#hostname D1
D1(config)#ip routing
D1(config)#ipv6 unicast-routing
D1(config)#no ip domain lookup
D1(config)#banner motd # D1, ENCOR Skills Assessment#
D1(config)#line con 0
D1(config-line)# exec-timeout 0 0
D1(config-line)# logging synchronous
D1(config-line)# exit
D1(config)#vlan 100 // Se crea la VLAN seleccionada
D1(config-vlan)# name Management // Se configura el nombre de la VLAN
D1(config-vlan)# exit
D1(config)#vlan 101
D1(config-vlan)# name UserGroupA
D1(config-vlan)# exit
D1(config)#vlan 102
D1(config-vlan)# name UserGroupB
```

```
D1(config-vlan)# exit
D1(config)#vlan 999
D1(config-vlan)# name NATIVE
D1(config-vlan)# exit
D1(config)#interface e1/2
D1(config-if)# no switchport
D1(config-if)# ip address 10.17.10.2 255.255.255.0
D1(config-if)# ipv6 address fe80::d1:1 link-local
D1(config-if)# ipv6 address 2001:db8:100:1010::2/64
D1(config-if)# no shutdown
D1(config-if)# exit
D1(config)#interface vlan 100
D1(config-if)# ip address 10.17.100.1 255.255.255.0
D1(config-if)# ipv6 address fe80::d1:2 link-local
D1(config-if)# ipv6 address 2001:db8:100:100::1/64
D1(config-if)# no shutdown
D1(config-if)# exit
D1(config)#interface vlan 101
D1(config-if)# ip address 10.17.101.1 255.255.255.0
D1(config-if)# ipv6 address fe80::d1:3 link-local
D1(config-if)# ipv6 address 2001:db8:100:101::1/64
D1(config-if)# no shutdown
D1(config-if)# exit
D1(config)#interface vlan 102
D1(config-if)# ip address 10.17.102.1 255.255.255.0
D1(config-if)# ipv6 address fe80::d1:4 link-local
D1(config-if)# ipv6 address 2001:db8:100:102::1/64
D1(config-if)# no shutdown
D1(config-if)# exit
D1(config)#ip dhcp excluded-address 10.17.101.1 10.0.101.109
D1(config)#ip dhcp excluded-address 10.17.101.141 10.0.101.254
D1(config)#ip dhcp excluded-address 10.17.102.1 10.0.102.109
D1(config)#ip dhcp excluded-address 10.17.102.141 10.0.102.254 // Se
configuran las exclusiones de los rangos ip indicadas de la propagación del
DHCP
D1(config)#ip dhcp pool VLAN-101 // Creamos un conjunto de IPs para el
DHCP
```

```
D1(dhcp-config)# network 10.17.101.0 255.255.255.0
D1(dhcp-config)# default-router 10.17.101.254
D1(dhcp-config)# exit
D1(config)#ip dhcp pool VLAN-102
D1(dhcp-config)# network 10.17.102.0 255.255.255.0
D1(dhcp-config)# default-router 10.17.102.254
D1(dhcp-config)# exit
D1(config)#interface range e0/0-3,e1/0-1,e1/3,e2/0-3,e3/0-3 // Se selecciona
un rango de interfaces al mismo tiempo para indicar un comando masivo
D1(config-if-range)# shutdown
D1(config-if-range)# exit
```

Switch D2

```
D2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
D2(config)#hostname D2
D2(config)#ip routing
D2(config)#ipv6 unicast-routing
D2(config)#no ip domain lookup
D2(config)#banner motd # D2, ENCOR Skills Assessment#
D2(config)#line con 0
D2(config-line)# exec-timeout 0 0
D2(config-line)# logging synchronous
D2(config-line)# exit
D2(config)#vlan 100
D2(config-vlan)# name Management
D2(config-vlan)# exit
D2(config)#vlan 101
D2(config-vlan)# name UserGroupA
D2(config-vlan)# exit
D2(config)#vlan 102
D2(config-vlan)# name UserGroupB
D2(config-vlan)# exit
D2(config)#vlan 999
D2(config-vlan)# name NATIVE
D2(config-vlan)# exit
```

```
D2(config)#interface e1/0
D2(config-if)# no switchport
D2(config-if)# ip address 10.17.11.2 255.255.255.0
D2(config-if)# ipv6 address fe80::d2:1 link-local
D2(config-if)# ipv6 address 2001:db8:100:1011::2/64
D2(config-if)# no shutdown
D2(config-if)# exit
D2(config)#interface vlan 100
D2(config-if)# ip address 10.17.100.2 255.255.255.0
D2(config-if)# ipv6 address fe80::d2:2 link-local
D2(config-if)# ipv6 address 2001:db8:100:100::2/64
D2(config-if)# no shutdown
D2(config-if)# exit
D2(config)#interface vlan 101
D2(config-if)# ip address 10.17.101.2 255.255.255.0
D2(config-if)# ipv6 address fe80::d2:3 link-local
D2(config-if)# ipv6 address 2001:db8:100:101::2/64
D2(config-if)# no shutdown
D2(config-if)# exit
D2(config)#interface vlan 102
D2(config-if)# ip address 10.17.102.2 255.255.255.0
D2(config-if)# ipv6 address fe80::d2:4 link-local
D2(config-if)# ipv6 address 2001:db8:100:102::2/64
D2(config-if)# no shutdown
D2(config-if)# exit
D2(config)#ip dhcp excluded-address 10.17.101.1 10.0.101.209
D2(config)#ip dhcp excluded-address 10.17.101.241 10.0.101.254
D2(config)#ip dhcp excluded-address 10.17.102.1 10.0.102.209
D2(config)#ip dhcp excluded-address 10.17.102.241 10.0.102.254
D2(config)#ip dhcp pool VLAN-101
D2(dhcp-config)# network 10.17.101.0 255.255.255.0
D2(dhcp-config)# default-router 10.17.101.254
D2(dhcp-config)# exit
D2(config)#ip dhcp pool VLAN-102
D2(dhcp-config)# network 10.17.102.0 255.255.255.0
D2(dhcp-config)# default-router 10.17.102.254
D2(dhcp-config)# exit
```

```
D2(config)#interface range e0/0-3,e1/1-3,e2/0-3,e3/0-3
D2(config-if-range)# shutdown
D2(config-if-range)# exit
```

Switch A1

```
A1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
A1(config)#hostname A1
A1(config)#no ip domain lookup
A1(config)#banner motd # A1, ENCOR Skills Assessment#
A1(config)#line con 0
A1(config-line)# exec-timeout 0 0
A1(config-line)# logging synchronous
A1(config-line)# exit
A1(config)#vlan 100
A1(config-vlan)# name Management
A1(config-vlan)# exit
A1(config)#vlan 101
A1(config-vlan)# name UserGroupA
A1(config-vlan)# exit
A1(config)#vlan 102
A1(config-vlan)# name UserGroupB
A1(config-vlan)# exit
A1(config)#vlan 999
A1(config-vlan)# name NATIVE
A1(config-vlan)# exit
A1(config)#interface vlan 100
A1(config-if)# ip address 10.17.100.3 255.255.255.0
A1(config-if)# ipv6 address fe80::a1:1 link-local
A1(config-if)# ipv6 address 2001:db8:100:100::3/64
A1(config-if)# no shutdown
A1(config-if)# exit
A1(config)#interface range e0/0,e0/3,e1/0,e2/1-3,e3/0-3
A1(config-if-range)# shutdown
A1(config-if-range)# exit
```

- b. Save the running configuration to startup-config on all devices.

copy running-config startup-config

```

: R1 R2 R3 IOU1 D2 A1 x | + - □ x
*Oct 12 21:28:42.262: %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan100, changed state to down
*Oct 12 21:28:43.261: %LINK-3-UPDOWN: Interface Vlan100, changed state to down
*Oct 12 21:28:43.270: %LINK-5-CHANGED: Interface Ethernet0/0, changed state to administratively down
*Oct 12 21:28:43.270: %LINK-5-CHANGED: Interface Ethernet0/3, changed state to administratively down
*Oct 12 21:28:43.270: %LINK-5-CHANGED: Interface Ethernet1/0, changed state to administratively down
*Oct 12 21:28:43.279: %LINK-5-CHANGED: Interface Ethernet2/1, changed state to administratively down
*Oct 12 21:28:43.279: %LINK-5-CHANGED: Interface Ethernet2/2, changed state to administratively down
*Oct 12 21:28:43.279: %LINK-5-CHANGED: Interface Ethernet2/3, changed state to administratively down
A1(config)#
*Oct 12 21:28:43.283: %LINK-5-CHANGED: Interface Ethernet3/0, changed state to administratively down
*Oct 12 21:28:43.283: %LINK-5-CHANGED: Interface Ethernet3/1, changed state to administratively down
*Oct 12 21:28:43.290: %LINK-5-CHANGED: Interface Ethernet3/2, changed state to administratively down
*Oct 12 21:28:43.290: %LINK-5-CHANGED: Interface Ethernet3/3, changed state to administratively down
*Oct 12 21:28:44.271: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/0, changed state to down
*Oct 12 21:28:44.271: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/3, changed state to down
*Oct 12 21:28:44.271: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/0, changed state to down
*Oct 12 21:28:44.280: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet2/1, changed state to down
*Oct 12 21:28:44.280: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet2/2, changed state to down
*Oct 12 21:28:44.280: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet2/3, changed state to down
*Oct 12 21:28:44.285: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet3/0, changed state to down
*Oct 12 21:28:44.285: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet3/1, changed state to down
A1(config)#
*Oct 12 21:28:44.294: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet3/2, changed state to down
*Oct 12 21:28:44.294: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet3/3, changed state to down
A1(config)#exit
A1#c
*Oct 12 21:28:51.833: %SYS-5-CONFIG_I: Configured from console by console
A1#copy running-config startup
Destination filename [startup-config]?
Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
Compressed configuration from 1806 bytes to 1051 bytes[OK]
A1#
solarwinds | Solar-PuTTY free tool © 2019 SolarWinds Worldwide, LLC. All rights reserved.

```

Ilustración 5. Save configuration on all devices

Fuente: Luis Araque

- c. Configure PC 1 and PC 4 host addressing as shown in the addressing table. Assign a default gateway address of 10.17.100.254 which will be the HSRP virtual IP address used in Part 4.

```

PC1> ip 10.17.100.5/24 10.17.100.254
Checking for duplicate address...
PC1 : 10.17.100.5 255.255.255.0 gateway 10.17.100.254

PC4> ip 10.17.100.6/24 10.17.100.254
Checking for duplicate address...
PC4 : 10.17.100.6 255.255.255.0 gateway 10.17.100.254

```

Ilustración 6. Asignación IP estática

Fuente: Luis Araque

PART 2: CONFIGURE THE LAYER 2 NETWORK AND HOST SUPPORT

In this part of the Skills Assessment, you will complete the Layer 2 network configuration and set up basic host support. At the end of this part, all the switches should be able to communicate. PC2 and PC3 should receive addressing from DHCP and SLAAC.

ip dhcp

Your configuration tasks are as follows:

Tabla 2. Configure The Layer 2 Network And Host Support

Task#	Task	Specification	Points
2.1	On all switches, configure IEEE 802.1Q trunk interfaces on interconnecting switch links	Enable 802.1Q trunk links between: <ul style="list-style-type: none"> • D1 and D2 • D1 and A1 • D2 and A1 	6
2.2	On all switches, change the native VLAN on trunk links. switchport trunk native vlan 999	Use VLAN 999 as the native VLAN.	6
2.3	On all switches, enable the Rapid Spanning-Tree Protocol.	Use Rapid Spanning Tree.	3
2.4	On D1 and D2, configure the appropriate RSTP root bridges based on the information in the topology diagram. D1 and D2 must provide backup in case of root bridge failure.	Configure D1 and D2 as root for the appropriate VLANs with mutually supporting priorities in case of switch failure.	2
2.5	On all switches, create LACP EtherChannels as shown in the topology diagram.	Use the following channel numbers: <ul style="list-style-type: none"> • D1 to D2 – Port channel 12 • D1 to A1 – Port channel 1 • D2 to A1 – Port channel 2 	3

Task#	Task	Specification	Points
2.6	On all switches, configure host access ports connecting to PC1, PC2, PC3, and PC4.	Configure access ports with appropriate VLAN settings as shown in the topology diagram. Host ports should transition immediately to forwarding state.	4
2.7	Verify IPv4 DHCP services.	PC2 and PC3 are DHCP clients and should be receiving valid IPv4 addresses.	1
2.8	Verify local LAN connectivity.	<p>PC1 should successfully ping:</p> <ul style="list-style-type: none"> • D1: 10.17.100.1 • D2: 10.17.100.2 • PC4: 10.17.100.6 <p>PC2 should successfully ping:</p> <ul style="list-style-type: none"> • D1: 10.17.102.1 • D2: 10.17.102.2 <p>PC3 should successfully ping:</p> <ul style="list-style-type: none"> • D1: 10.17.101.1 • D2: 10.17.101.2 <p>PC4 should successfully ping:</p> <ul style="list-style-type: none"> • D1: 10.17.100.1 • D2: 10.17.100.2 • PC1: 10.17.100.5 	1

Part 2 Commands (Configure The Layer 2 Network And Host Support)

Switch D1

D1#conf t

Enter configuration commands, one per line. End with CNTL/Z.

D1(config)#int range e2/0-3

```

D1(config-if-range)#switchport trunk encapsulation dot1q // Configuramos el tiempo
de encapsulación
D1(config-if-range)#switchport mode trunk // Configuramos la interfaz(ces) a con
trunk o troncal
D1(config-if-range)#switchport trunk native vlan 999 // Asignamos la VLAN 999
como nativa
D1(config-if-range)#channel-group 12 mode active // Creamos los LACP
etherchannels
D1(config-if-range)#no shutdown
D1(config-if-range)#exit
D1(config)#int range e0/1-2
D1(config-if-range)#switchport trunk encapsulation dot1q
D1(config-if-range)#switchport mode trunk
D1(config-if-range)#switchport trunk native vlan 999
D1(config-if-range)#channel-group 1 mode active
D1(config-if-range)#no shutdown
D1(config-if-range)#exit
D1(config)#spanning-tree mode rapid-pvst // Habilitamos el protocolo STP en modo
rápido
D1(config)#spanning-tree vlan 100,102 root primary // Habilitamos las VLANS como
puente raíz principal
D1(config)#spanning-tree vlan 101 root secondary // Se configura la VLAN puente
raíz secundario
D1(config)#int e0/0
D1(config-if)#switchport mode Access
D1(config-if)#switchport access vlan 100
D1(config-if)#spanning-tree portfast
D1(config-if)#no shutdown
D1(config-if)#exit

```

Switch D2

```

D2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
D2(config)#int range e2/0-3
D2(config-if-range)#switchport trunk encapsulation dot1q
D2(config-if-range)#switchport mode trunk
D2(config-if-range)#switchport trunk native vlan 999
D2(config-if-range)#channel-group 12 mode active
D2(config-if-range)#no shutdown
D2(config-if-range)#exit
D2(config)#int range e1/1-2
D2(config-if-range)#switchport trunk encapsulation dot1q
D2(config-if-range)#switchport mode trunk
D2(config-if-range)#switchport trunk native vlan 999
D2(config-if-range)#channel-group 2 mode active

```

```
D2(config-if-range)#no shutdown
D2(config-if-range)#exit
D2(config)#spanning-tree mode rapid-pvst
D2(config)#spanning-tree vlan 101 root primary
D2(config)#spanning-tree vlan 100,102 root secondary
D2(config)#int e0/0
D2(config-if)#switchport mode Access
D2(config-if)#switchport access vlan 102
D2(config-if)#spanning-tree portfast
D2(config-if)#no shutdown
D2(config-if)#exit
D2(config)#end
```

Switch A1

```
A1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
A1(config)#spanning-tree mode rapid-pvst
A1(config)#int range e0/1-2
A1(config-if-range)#switchport trunk encapsulation dot1q
A1(config-if-range)#switchport mode trunk
A1(config-if-range)#switchport trunk native vlan 999
A1(config-if-range)#channel-group 1 mode active
A1(config-if-range)#no shutdown
A1(config-if-range)#exit
A1(config)#int range e1/1-2
A1(config-if-range)#switchport trunk encapsulation dot1q
A1(config-if-range)#switchport mode trunk
A1(config-if-range)#switchport trunk native vlan 999
A1(config-if-range)#channel-group 2 mode active
A1(config-if-range)#no shutdown
A1(config-if-range)#exit
A1(config)#int e1/3
A1(config-if)#switchport mode access
A1(config-if)#switchport access vlan 101
A1(config-if)#spanning-tree portfast
A1(config-if)#no shutdown
A1(config-if)#exit
A1(config)#int e2/0
A1(config-if)#switchport mode access
A1(config-if)#switchport access vlan 100
A1(config-if)#spanning-tree portfast
A1(config-if)#no shutdown
A1(config-if)#exit
A1(config)#end
```

PC1 should successfully ping:

- D1: 10.17.100.1
- D2: 10.17.100.2
- PC4: 10.17.100.6

```
PC1> ping 10.17.100.1
84 bytes from 10.17.100.1 icmp_seq=1 ttl=255 time=1.581 ms
84 bytes from 10.17.100.1 icmp_seq=2 ttl=255 time=2.548 ms
84 bytes from 10.17.100.1 icmp_seq=3 ttl=255 time=77.025 ms
84 bytes from 10.17.100.1 icmp_seq=4 ttl=255 time=1.874 ms
84 bytes from 10.17.100.1 icmp_seq=5 ttl=255 time=7.168 ms

PC1> ping 10.17.100.2
84 bytes from 10.17.100.2 icmp_seq=1 ttl=255 time=27.008 ms
84 bytes from 10.17.100.2 icmp_seq=2 ttl=255 time=5.794 ms
84 bytes from 10.17.100.2 icmp_seq=3 ttl=255 time=49.021 ms
84 bytes from 10.17.100.2 icmp_seq=4 ttl=255 time=8.363 ms
84 bytes from 10.17.100.2 icmp_seq=5 ttl=255 time=7.808 ms

PC1> ping 10.17.100.6
84 bytes from 10.17.100.6 icmp_seq=1 ttl=64 time=3.046 ms
84 bytes from 10.17.100.6 icmp_seq=2 ttl=64 time=6.358 ms
84 bytes from 10.17.100.6 icmp_seq=3 ttl=64 time=4.852 ms
84 bytes from 10.17.100.6 icmp_seq=4 ttl=64 time=3.766 ms
84 bytes from 10.17.100.6 icmp_seq=5 ttl=64 time=8.513 ms
```

Ilustración 7. PC1 should successfully ping

Fuente: Luis Araque

PC2 should successfully ping:

- D1: 10.17.102.1
- D2: 10.17.102.2

```
PC2> ping 10.17.102.1
84 bytes from 10.17.102.1 icmp_seq=1 ttl=255 time=3.432 ms
84 bytes from 10.17.102.1 icmp_seq=2 ttl=255 time=3.198 ms
84 bytes from 10.17.102.1 icmp_seq=3 ttl=255 time=5.364 ms
84 bytes from 10.17.102.1 icmp_seq=4 ttl=255 time=3.437 ms
84 bytes from 10.17.102.1 icmp_seq=5 ttl=255 time=3.174 ms

PC2> ping 10.17.102.2
84 bytes from 10.17.102.2 icmp_seq=1 ttl=255 time=1.868 ms
84 bytes from 10.17.102.2 icmp_seq=2 ttl=255 time=2.320 ms
84 bytes from 10.17.102.2 icmp_seq=3 ttl=255 time=1.669 ms
84 bytes from 10.17.102.2 icmp_seq=4 ttl=255 time=6.667 ms
84 bytes from 10.17.102.2 icmp_seq=5 ttl=255 time=25.184 ms
```

Ilustración 8. PC2 should successfully ping

Fuente: Luis Araque

PC3 should successfully ping:

- D1: 10.17.101.1
- D2: 10.17.101.2

```

PC3> ping 10.17.101.1
84 bytes from 10.17.101.1 icmp_seq=1 ttl=255 time=10.720 ms
84 bytes from 10.17.101.1 icmp_seq=2 ttl=255 time=6.632 ms
84 bytes from 10.17.101.1 icmp_seq=3 ttl=255 time=10.963 ms
84 bytes from 10.17.101.1 icmp_seq=4 ttl=255 time=5.869 ms
84 bytes from 10.17.101.1 icmp_seq=5 ttl=255 time=9.912 ms

PC3> ping 10.17.101.2
84 bytes from 10.17.101.2 icmp_seq=1 ttl=255 time=4.544 ms
84 bytes from 10.17.101.2 icmp_seq=2 ttl=255 time=4.462 ms
84 bytes from 10.17.101.2 icmp_seq=3 ttl=255 time=3.795 ms
84 bytes from 10.17.101.2 icmp_seq=4 ttl=255 time=7.248 ms
84 bytes from 10.17.101.2 icmp_seq=5 ttl=255 time=6.177 ms

```

Ilustración 9. PC3 should successfully ping

Fuente: Luis Araque

PC4 should successfully ping:

- D1: 10.17.100.1
- D2: 10.17.100.2
- PC1: 10.17.100.5

```

PC4> ping 10.17.100.1
84 bytes from 10.17.100.1 icmp_seq=1 ttl=255 time=11.451 ms
84 bytes from 10.17.100.1 icmp_seq=2 ttl=255 time=4.344 ms
84 bytes from 10.17.100.1 icmp_seq=3 ttl=255 time=6.109 ms
84 bytes from 10.17.100.1 icmp_seq=4 ttl=255 time=2.983 ms
84 bytes from 10.17.100.1 icmp_seq=5 ttl=255 time=12.446 ms

PC4> ping 10.17.100.2
84 bytes from 10.17.100.2 icmp_seq=1 ttl=255 time=5.466 ms
84 bytes from 10.17.100.2 icmp_seq=2 ttl=255 time=8.945 ms
84 bytes from 10.17.100.2 icmp_seq=3 ttl=255 time=4.746 ms
84 bytes from 10.17.100.2 icmp_seq=4 ttl=255 time=8.695 ms
84 bytes from 10.17.100.2 icmp_seq=5 ttl=255 time=7.906 ms

PC4> ping 10.17.100.5
84 bytes from 10.17.100.5 icmp_seq=1 ttl=64 time=9.454 ms
84 bytes from 10.17.100.5 icmp_seq=2 ttl=64 time=8.947 ms
84 bytes from 10.17.100.5 icmp_seq=3 ttl=64 time=4.103 ms
84 bytes from 10.17.100.5 icmp_seq=4 ttl=64 time=11.663 ms
84 bytes from 10.17.100.5 icmp_seq=5 ttl=64 time=5.524 ms

```

Ilustración 10. PC4 should successfully ping

Fuente: Luis Araque

PART 3: CONFIGURE ROUTING PROTOCOLS

In this part, you will configure IPv4 and IPv6 routing protocols. At the end of this part, the network should be fully converged. IPv4 and IPv6 pings to the Loopback 0 interface from D1 and D2 should be successful.

Note: Pings from the hosts will not be successful because their default gateways are pointing to the HSRP address, which will be enabled in Part 4.

Your configuration tasks are as follows:

Tabla 3. Configure Routing Protocols

Task#	Task	Specification	Points
3.1	On the “Company Network” (i.e., R1, R3, D1, and D2), configure single-area OSPFv2 in area 0.	<p>Use OSPF Process ID 4 and assign the following router-IDs:</p> <ul style="list-style-type: none"> • R1: 0.0.4.1 • R3: 0.0.4.3 • D1: 0.0.4.131 • D2: 0.0.4.132 <p>On R1, R3, D1, and D2, advertise all directly connected networks / VLANs in Area 0.</p> <ul style="list-style-type: none"> • On R1, do not advertise the R1 – R2 network. • On R1, propagate a default route. Note that the default route will be provided by BGP. <p>Disable OSPFv2 advertisements on:</p> <ul style="list-style-type: none"> • D1: All interfaces except E1/2 • D2: All interfaces except E1/0 	8
3.2	On the “Company Network” (i.e., R1, R3, D1, and D2), configure classic single-area OSPFv3 in area 0.	<p>Use OSPF Process ID 6 and assign the following router-IDs:</p> <ul style="list-style-type: none"> • R1: 0.0.6.1 • R3: 0.0.6.3 • D1: 0.0.6.131 • D2: 0.0.6.132 <p>On R1, R3, D1, and D2, advertise all directly connected networks / VLANs in Area 0.</p> <ul style="list-style-type: none"> • On R1, do not advertise the R1 – R2 network. • On R1, propagate a default route. Note that the default route will be provided by BGP. <p>Disable OSPFv3 advertisements on:</p> <ul style="list-style-type: none"> • D1: All interfaces except E1/2 • D2: All interfaces except E1/0 	8

Task#	Task	Specification	Points
3.3	On R2 in the “ISP Network”, configure MP-BGP.	<p>Configure two default static routes via interface Loopback 0:</p> <ul style="list-style-type: none"> • An IPv4 default static route. • An IPv6 default static route. <p>Configure R2 in BGP ASN 500 and use the router-id 2.2.2.2.</p> <p>Configure and enable an IPv4 and IPv6 neighbor relationship with R1 in ASN 300.</p> <p>In IPv4 address family, advertise:</p> <ul style="list-style-type: none"> • The Loopback 0 IPv4 network (/32). • The default route (0.0.0.0/0). <p>In IPv6 address family, advertise:</p> <ul style="list-style-type: none"> • The Loopback 0 IPv4 network (/128). • The default route (::/0). 	4
3.4	On R1 in the “ISP Network”, configure MP-BGP.	<p>Configure two static summary routes to interface Null 0:</p> <ul style="list-style-type: none"> • A summary IPv4 route for 10.0.0.0/8. • A summary IPv6 route for 2001:db8:100::/48. <p>Configure R1 in BGP ASN 300 and use the router-id 1.1.1.1.</p> <p>Configure an IPv4 and IPv6 neighbor relationship with R2 in ASN 500.</p> <p>In IPv4 address family:</p> <ul style="list-style-type: none"> • Disable the IPv6 neighbor relationship. • Enable the IPv4 neighbor relationship. • Advertise the 10.0.0.0/8 network. <p>In IPv6 address family:</p> <ul style="list-style-type: none"> • Disable the IPv4 neighbor relationship. • Enable the IPv6 neighbor relationship. • Advertise the 2001:db8:100::/48 network. 	4

Issue show run | section ^router ospf on R1, R3, D1, and D2; output should appear as below. Verification task 3.1 on each device.

```
R1#show run | section ^router ospf
router ospf 4
  router-id 0.0.4.1
  network 10.17.10.0 0.0.0.255 area 0
  network 10.17.13.0 0.0.0.255 area 0
  default-information originate
R1#
```

```
R3#show run | section ^router ospf
router ospf 4
  router-id 0.0.4.3
  network 10.17.11.0 0.0.0.255 area 0
  network 10.17.13.0 0.0.0.255 area 0
R3#
```

```
D1#show run | section ^router ospf
router ospf 4
  router-id 0.0.4.131
  passive-interface default
  no passive-interface Ethernet1/2
  network 10.17.10.0 0.0.0.255 area 0
  network 10.17.100.0 0.0.0.255 area 0
  network 10.17.101.0 0.0.0.255 area 0
  network 10.17.102.0 0.0.0.255 area 0
D1#
```

```
D2#show run | section ^router ospf
router ospf 4
  router-id 0.0.4.132
  passive-interface default
  no passive-interface Ethernet1/0
  network 10.17.11.0 0.0.0.255 area 0
  network 10.17.100.0 0.0.0.255 area 0
  network 10.17.101.0 0.0.0.255 area 0
  network 10.17.102.0 0.0.0.255 area 0
D2#
```

Ilustración 11. Verificación de task 3.1 on each device

Fuente: Luis Araque

Issue show run | section ^ipv6 router and show ipv6 ospf interface brief on R1, R3, D1, and D2; output should appear as below. Verification task 3.2 on each device.

```
R1#show run | section ^ipv6 router
ipv6 router ospf 6
  router-id 0.0.6.1
  default-information originate
R1#show ipv6 ospf interface brief
Interface  PID  Area      Intf ID  Cost  State Nbrs F/C
Et1/1     6    0         4        10   DR    1/1
Et1/2     6    0         5        10   DR    1/1
R1#
```

```

R3#show run | section ^ipv6 router
ipv6 router ospf 6
  router-id 0.0.6.3
R3#show ipv6 ospf interface brief
Interface      PID   Area          Intf ID   Cost   State Nbrs F/C
Et1/1          6     0              4         10    BDR   1/1
Et1/0          6     0              3         10    DR    1/1
R3#

D1#show run | section ^ipv6 router
ipv6 router ospf 6
  router-id 0.0.6.131
  passive-interface default
  no passive-interface Ethernet1/2
D1#show ipv6 ospf interface brief
Interface      PID   Area          Intf ID   Cost   State Nbrs F/C
V1102         6     0              25         1     DR    0/0
V1101         6     0              24         1     DR    0/0
V1100         6     0              23         1     DR    0/0
Et1/2         6     0              21        10    BDR   1/1
D1#

D2#show run | section ^ipv6 router
ipv6 router ospf 6
  router-id 0.0.6.132
  passive-interface default
  no passive-interface Ethernet1/0
D2#show ipv6 ospf interface brief
Interface      PID   Area          Intf ID   Cost   State Nbrs F/C
V1102         6     0              25         1     DR    0/0
V1101         6     0              24         1     DR    0/0
V1100         6     0              23         1     DR    0/0
Et1/0         6     0              21        10    BDR   1/1
D2#

```

Ilustración 12. Verification task 3.2 on each device

Fuente: Luis Araque

Issue show run | section bgp and show run | include route on R2; output should appear as below. Verification task 3.3.

```

R2#show run | section router bgp
router bgp 500
  bgp router-id 2.2.2.2
  bgp log-neighbor-changes
  neighbor 2001:DB8:200::1 remote-as 300
  neighbor 209.165.200.225 remote-as 300
  !
  address-family ipv4
    network 0.0.0.0
    network 2.2.2.2 mask 255.255.255.255
    no neighbor 2001:DB8:200::1 activate
    neighbor 209.165.200.225 activate
  exit-address-family
  !
  address-family ipv6
    network ::/0
    network 2001:DB8:2222::/128
    neighbor 2001:DB8:200::1 activate
  exit-address-family
R2#show run | include route
router bgp 500
  bgp router-id 2.2.2.2
ip route 0.0.0.0 0.0.0.0 Loopback0
ipv6 route ::/0 Loopback0
R2#

```

Ilustración 13. Verification task 3.3, R2

Fuente: Luis Araque

Issue show run | section bgp on R1; output should appear as below. Verification task 3.4.

```

R1#show run | section bgp
router bgp 300
  bgp router-id 1.1.1.1
  bgp log-neighbor-changes
  neighbor 2001:DB8:200::2 remote-as 500
  neighbor 209.165.200.226 remote-as 500
  !
  address-family ipv4
    network 10.0.0.0
    no neighbor 2001:DB8:200::2 activate
    neighbor 209.165.200.226 activate
  exit-address-family
  !
  address-family ipv6
    network 2001:DB8:100::/48
    neighbor 2001:DB8:200::2 activate
  exit-address-family
R1#

```

Ilustración 14. Verification task 3.4, R1

Fuente: Luis Araque

Verify Routing Tables:

Issue show ip route | include O/B on R1; output should appear as below. Verification that OSPF and BGP for IPv4 are working properly.

```

R1#show ip route | include O|B
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
B*    0.0.0.0/0 [20/0] via 209.165.200.226, 00:29:01
B     2.2.2.2 [20/0] via 209.165.200.226, 00:29:01
O     10.17.11.0/24 [110/20] via 10.17.13.3, 00:28:59, Ethernet1/1
O     10.17.100.0/24 [110/11] via 10.17.10.2, 00:28:02, Ethernet1/2
O     10.17.101.0/24 [110/11] via 10.17.10.2, 00:28:02, Ethernet1/2
O     10.17.102.0/24 [110/11] via 10.17.10.2, 00:28:02, Ethernet1/2
R1#

```

Ilustración 15. Verification that OSPF and BGP for IPv4, R1

Fuente: Luis Araque

Issue show ipv6 route command on R1; should appear as below. Verification that OSPFv3 for IPv6 is working properly.

```

R1#show ipv6 route
IPv6 Routing Table - default - 13 entries
Codes: C - Connected, L - Local, S - Static, U - Per-user Static route
       B - BGP, R - RIP, H - NHRP, I1 - ISIS L1
       I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary, D - EIGRP
       EX - EIGRP external, ND - ND Default, NDp - ND Prefix, DCE - Destination
       NDr - Redirect, O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF ext 1
       OE2 - OSPF ext 2, ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2, l - LISP
B    ::/0 [20/0]
     via FE80::2:1, Ethernet1/0
S    2001:DB8:100::/48 [1/0]
     via Null0, directly connected
O    2001:DB8:100:100::/64 [110/11]
     via FE80::D1:1, Ethernet1/2
O    2001:DB8:100:101::/64 [110/11]
     via FE80::D1:1, Ethernet1/2
O    2001:DB8:100:102::/64 [110/11]
     via FE80::D1:1, Ethernet1/2
C    2001:DB8:100:1010::/64 [0/0]
     via Ethernet1/2, directly connected
L    2001:DB8:100:1010::1/128 [0/0]
     via Ethernet1/2, receive
O    2001:DB8:100:1011::/64 [110/20]
     via FE80::3:3, Ethernet1/1
C    2001:DB8:100:1013::/64 [0/0]
     via Ethernet1/1, directly connected
L    2001:DB8:100:1013::1/128 [0/0]
     via Ethernet1/1, receive
C    2001:DB8:200::/64 [0/0]
     via Ethernet1/0, directly connected
L    2001:DB8:200::1/128 [0/0]
     via Ethernet1/0, receive
L    FF00::/8 [0/0]
     via Null0, receive

```

Ilustración 16. Verification that OSPFv3 for IPv6, R1

Fuente: Luis Araque

Issue show ip route ospf | begin Gateway command on R3; output should appear as below. Verification that OSPF for IPv4 is working properly.

```
R3#show ip route ospf | begin Gateway
Gateway of last resort is 10.17.13.1 to network 0.0.0.0

O*E2 0.0.0.0/0 [110/1] via 10.17.13.1, 00:32:46, Ethernet1/1
      10.0.0.0/8 is variably subnetted, 8 subnets, 2 masks
O      10.17.10.0/24 [110/20] via 10.17.13.1, 00:32:46, Ethernet1/1
O      10.17.100.0/24 [110/11] via 10.17.11.2, 00:30:52, Ethernet1/0
O      10.17.101.0/24 [110/11] via 10.17.11.2, 00:30:52, Ethernet1/0
O      10.17.102.0/24 [110/11] via 10.17.11.2, 00:30:52, Ethernet1/0
R3#
```

Ilustración 17. Verification that OSPF for IPv4, R3

Fuente: Luis Araque

Issue the show ipv6 route ospf command on R3; output should appear as below. Verification that OSPFv3 for IPv6 is working properly.

```
R3#show ipv6 route ospf
IPv6 Routing Table - default - 10 entries
Codes: C - Connected, L - Local, S - Static, U - Per-user Static route
       B - BGP, R - RIP, H - NHRP, I1 - ISIS L1
       I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary, D - EIGRP
       EX - EIGRP external, ND - ND Default, NDp - ND Prefix, DCE - Destination
       NDr - Redirect, O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF ext 1
       OE2 - OSPF ext 2, ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2, 1 - LISP
OE2 ::/0 [110/1], tag 6
    via FE80::1:3, Ethernet1/1
O  2001:DB8:100:100::/64 [110/11]
    via FE80::D2:1, Ethernet1/0
O  2001:DB8:100:101::/64 [110/11]
    via FE80::D2:1, Ethernet1/0
O  2001:DB8:100:102::/64 [110/11]
    via FE80::D2:1, Ethernet1/0
O  2001:DB8:100:1013::/64 [110/10]
    via Ethernet1/1, directly connected
R3#
```

Ilustración 18. Verification that OSPFv3 for IPv6, R3

Fuente: Luis Araque

Part 3 Commands (Routing Protocols)

Router R1

```
R1#conf t
```

Enter configuration commands, one per line. End with CNTL/Z.

```
R1(config)#router ospf 4 // Se habilita el OSPF
```

```
R1(config-router)# router-id 0.0.4.1 // Se especifica el id del OSPF
```

```
R1(config-router)# network 10.17.10.0 0.0.0.255 area 0
```

```
R1(config-router)# network 10.17.13.0 0.0.0.255 area 0 // Se configura la red IPV4
```

```

R1(config-router)# default-information originate // Se indica a R1 que sea el origen
de la ruta predeterminadaa OSPF
R1(config-router)# exit
R1(config)#ipv6 router ospf 6 // Se configura OSPF para IPV6
R1(config-rtr)# router-id 0.0.6.1 // Se configura el enrutamiento IPV6 OSPF
R1(config-rtr)# default-information originate
R1(config-rtr)# exit
R1(config)#interface e1/2 // Ingresamos a la configuración de la interfaz
R1(config-if)# ipv6 ospf 6 area 0 // Indicamos el área cero, es la única área presente
R1(config-if)# exit
R1(config)#interface e1/1
R1(config-if)# ipv6 ospf 6 area 0
R1(config-if)# exit
R1(config)#!
R1(config)#ip route 10.0.0.0 255.0.0.0 null0 // Configuración de la ruta estática null
0
R1(config)#ipv6 route 2001:db8:100::/48 null0 // Configuración de la ruta estática
IPV6 null 0
R1(config)#!
R1(config)#router bgp 300
R1(config-router)# bgp router-id 1.1.1.1
R1(config-router)# neighbor 209.165.200.226 remote-as 500 // configuración de
vecinos en BGP AS 500 IPV4
R1(config-router)# neighbor 2001:db8:200::2 remote-as 500
R1(config-router)# address-family ipv4 unicast // Configuración de la familia de
direcciones
R1(config-router-af)# neighbor 209.165.200.226 activate
R1(config-router-af)# no neighbor 2001:db8:200::2 activate
R1(config-router-af)# network 10.0.0.0 mask 255.0.0.0
R1(config-router-af)# exit-address-family
R1(config-router)# address-family ipv6 unicast
R1(config-router-af)# no neighbor 209.165.200.226 activate
R1(config-router-af)# neighbor 2001:db8:200::2 activate // Activamos la
configuración del vecino en IPV6
R1(config-router-af)# network 2001:db8:100::/48
R1(config-router-af)# exit-address-family

```

```

R1(config)#router ospf 4
R1(config-router)#router-id 0.0.4.1
R1(config-router)#network 10.17.10.0 0.0.0.255 area 0
R1(config-router)#network 10.17.13.0 0.0.0.255 area 0
R1(config-router)#default-information originate
R1(config-router)#exit
R1(config)#ipv6 router ospf 6
R1(config-rtr)#router-id 0.0.6.1
R1(config-rtr)#default-information originate
R1(config-rtr)#exit
R1(config)#interface e1/2
R1(config-if)#ipv6 ospf 6 area 0
R1(config-if)#exit
R1(config)#interface e1/1
R1(config-if)#ipv6 ospf 6 area 0
R1(config-if)#exit
R1(config)#!
R1(config)#ip route 10.0.0.0 255.0.0.0 null0
R1(config)#ipv6 route 2001:db8:100::/48 null0
R1(config)#!
R1(config)#router bgp 300
R1(config-router)#bgp router-id 1.1.1.1
R1(config-router)#neighbor 209.165.200.226 remote-as 500
R1(config-router)#neighbor 2001:db8:200::2 remote-as 500
R1(config-router)#address-family ipv4 unicast
R1(config-router-af)#neighbor 209.165.200.226 activate
R1(config-router-af)#no neighbor 2001:db8:200::2 activate
R1(config-router-af)#network 10.0.0.0 mask 255.0.0.0
R1(config-router-af)#exit-address-family
R1(config-router)#address-family ipv6 unicast
R1(config-router-af)#no neighbor 209.165.200.226 activate
R1(config-router-af)#neighbor 2001:db8:200::2 activate
R1(config-router-af)#network 2001:db8:100::/48
R1(config-router-af)#exit-address-family
R1(config-router)#

```

Ilustración 19. Configurarion R1 Part 3

Fuente: *Luis Araque*

Router R2

R2#conf t

Enter configuration commands, one per line. End with CNTL/Z.

R2(config)#ip route 0.0.0.0 0.0.0.0 loopback 0 // *Habilita enrutamiento loopback 0*

R2(config)#ipv6 route ::/0 loopback 0 // *Habilita IPV6 en loopback 0*

R2(config)#router bgp 500

R2(config-router)# bgp router-id 2.2.2.2 // *Se asigna manualmente el id de BGP*

R2(config-router)# neighbor 209.165.200.225 remote-as 300

R2(config-router)# neighbor 2001:db8:200::1 remote-as 300

R2(config-router)# address-family ipv4

R2(config-router-af)# neighbor 209.165.200.225 activate

R2(config-router-af)# no neighbor 2001:db8:200::1 activate

R2(config-router-af)# network 2.2.2.2 mask 255.255.255.255

```

R2(config-router-af)# network 0.0.0.0
R2(config-router-af)# exit-address-family
R2(config-router)# address-family ipv6
R2(config-router-af)# no neighbor 209.165.200.225 activate
R2(config-router-af)# neighbor 2001:db8:200::1 activate
R2(config-router-af)# network 2001:db8:2222::/128
R2(config-router-af)# network ::/0
R2(config-router-af)# exit-address-family

```

```

R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#ip route 0.0.0.0 0.0.0.0 loopback 0
%Default route without gateway, if not a point-to-point interface
R2(config)#ipv6 route ::/0 loopback 0
R2(config)#router bgp 500
R2(config-router)#bgp router-id 2.2.2.2
R2(config-router)#neighbor 209.165.200.225 remote-as 300
R2(config-router)#neighbor 2001:db8:200::1 remote-as 300
R2(config-router)#address-family ipv4
R2(config-router-af)#neighbor 209.165.200.225 activate
R2(config-router-af)#no neighbor 2001:db8:200::1 activate
R2(config-router-af)#network 2.2.2.2 mask 255.255.255.255
R2(config-router-af)#network 0.0.0.0
R2(config-router-af)#exit-address-family
R2(config-router)#address-family ipv6
R2(config-router-af)#no neighbor 209.165.200.225 activate
R2(config-router-af)#neighbor 2001:db8:200::1 activate
R2(config-router-af)#network 2001:db8:2222::/128
R2(config-router-af)#network ::/0
R2(config-router-af)#exit-address-family
R2(config-router)#

```

Ilustración 20. Configuration R2 Part 3

Fuente: Luis Araque

Router R3

```

R3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#router ospf 4
R3(config-router)# router-id 0.0.4.3
R3(config-router)# network 10.17.11.0 0.0.0.255 area 0
R3(config-router)# network 10.17.13.0 0.0.0.255 area 0
R3(config-router)# exit
R3(config)#ipv6 router ospf 6
R3(config-rtr)# router-id 0.0.6.3
R3(config-rtr)# exit

```

```
R3(config)#interface e1/0
R3(config-if)# ipv6 ospf 6 area 0
R3(config-if)# exit
R3(config)#interface e1/1
R3(config-if)# ipv6 ospf 6 area 0
R3(config-if)# exit
```

```
R3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#router ospf 4
R3(config-router)#router-id 0.0.4.3
R3(config-router)#network 10.17.11.0 0.0.0.255 area 0
R3(config-router)#network 10.17.13.0 0.0.0.255 area 0
R3(config-router)#exit
R3(config)#ipv6 router ospf 6
R3(config-rtr)#router-id 0.0.6.3
R3(config-rtr)#exit
R3(config)#interface e1/0
R3(config-if)#ipv6 ospf 6 area 0
R3(config-if)#exit
R3(config)#interface e1/1
R3(config-if)#ipv6 ospf 6 area 0
R3(config-if)#exit
R3(config)#end
```

Ilustración 21. Configuration R3 Part 3

Fuente: Luis Araque

Switch D1

```
D1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
D1(config)#router ospf 4
D1(config-router)# router-id 0.0.4.131
D1(config-router)# network 10.17.100.0 0.0.0.255 area 0
D1(config-router)# network 10.17.101.0 0.0.0.255 area 0
D1(config-router)# network 10.17.102.0 0.0.0.255 area 0
D1(config-router)# network 10.17.10.0 0.0.0.255 area 0
D1(config-router)# passive-interface default
D1(config-router)# no passive-interface e1/2
D1(config-router)# exit
D1(config)#ipv6 router ospf 6
D1(config-rtr)# router-id 0.0.6.131
D1(config-rtr)# passive-interface default
D1(config-rtr)# no passive-interface e1/2
```

```

D1(config-rtr)# exit
D1(config)#interface e1/2
D1(config-if)# ipv6 ospf 6 area 0
D1(config-if)# exit
D1(config)#interface vlan 100
D1(config-if)# ipv6 ospf 6 area 0
D1(config-if)# exit
D1(config)#interface vlan 101
D1(config-if)# ipv6 ospf 6 area 0
D1(config-if)# exit
D1(config)#interface vlan 102
D1(config-if)# ipv6 ospf 6 area 0
D1(config-if)# exit
D1(config)#end

```

```

D1(config)#router ospf 4
D1(config-router)#router-id 0.0.4.3
D1(config-router)#network 10.17.11.0 0.0.0.255 area 0
D1(config-router)#network 10.17.13.0 0.0.0.255 area 0
D1(config-router)#exit
D1(config)#ipv6 router ospf 6
D1(config-rtr)#router-id 0.0.6.3
D1(config-rtr)#exit
D1(config)#interface e1/0
D1(config-if)#ipv6 ospf 6 area 0
D1(config-if)#exit
D1(config)#interface e1/1
D1(config-if)#ipv6 ospf 6 area 0
D1(config-if)#exit
D1(config)#end

```

Ilustración 22. Configuration D1 Part 3

Fuente: Luis Araque

Switch D2

```

D2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
D2(config)#router ospf 4
D2(config-router)# router-id 0.0.4.132
D2(config-router)# network 10.17.100.0 0.0.0.255 area 0
D2(config-router)# network 10.17.101.0 0.0.0.255 area 0
D2(config-router)# network 10.17.102.0 0.0.0.255 area 0

```

```
D2(config-router)# network 10.17.11.0 0.0.0.255 area 0
D2(config-router)# passive-interface default
D2(config-router)# no passive-interface e1/0
D2(config-router)# exit
D2(config)#ipv6 router ospf 6
D2(config-rtr)# router-id 0.0.6.132
D2(config-rtr)# passive-interface default // Se configura todo el OSPF como pasivo
D2(config-rtr)# no passive-interface e1/0 // Se excluye de la configuración pasiva la
interfaz
D2(config-rtr)# exit
D2(config)#interface e1/0
D2(config-if)# ipv6 ospf 6 area 0
D2(config-if)# exit
D2(config)#interface vlan 100
D2(config-if)# ipv6 ospf 6 area 0
D2(config-if)# exit
D2(config)#interface vlan 101
D2(config-if)# ipv6 ospf 6 area 0
D2(config-if)# exit
D2(config)#interface vlan 102
D2(config-if)# ipv6 ospf 6 area 0
D2(config-if)# exit
D2(config)#end
```

```

D2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
D2(config)#router ospf 4
D2(config-router)#router-id 0.0.4.132
D2(config-router)#network 10.17.100.0 0.0.0.255 area 0
D2(config-router)#network 10.17.101.0 0.0.0.255 area 0
D2(config-router)#network 10.17.102.0 0.0.0.255 area 0
D2(config-router)#network 10.17.11.0 0.0.0.255 area 0
D2(config-router)#passive-interface default
D2(config-router)#no passive-interface e1/0
D2(config-router)#exit
D2(config)#ipv6 router ospf 6
D2(config-rtr)#router-id 0.0.6.132
D2(config-rtr)#passive-interface default
D2(config-rtr)#no passive-interface e1/0
D2(config-rtr)#exit
D2(config)#interface e1/0
D2(config-if)#ipv6 ospf 6 area 0
D2(config-if)#exit
D2(config)#interface vlan 100
D2(config-if)#ipv6 ospf 6 area 0
D2(config-if)#exit
D2(config)#interface vlan 101
D2(config-if)#ipv6 ospf 6 area 0
D2(config-if)#exit
D2(config)#interface vlan 102
D2(config-if)#ipv6 ospf 6 area 0
D2(config-if)#exit
D2(config)#end

```

Ilustración 23. Configuration D2 Part 3

Fuente: Luis Araque

PART 4: CONFIGURE FIRST HOP REDUNDANCY

In this part, you will configure HSRP version 2 to provide first-hop redundancy for hosts in the “Company Network”.

Your configuration tasks are as follows:

Tabla 4. Configure First Hop Redundancy

Task#	Task	Specification	Points
4.1	On D1, create IP SLAs that test the reachability of R1 interface E1/2.	<p>Create two IP SLAs.</p> <ul style="list-style-type: none"> • Use SLA number 4 for IPv4. • Use SLA number 6 for IPv6. <p>The IP SLAs will test availability of R1 E1/2 interface every 5 seconds.</p> <p>Schedule the SLA for immediate implementation with no end time.</p> <p>Create an IP SLA object for IP SLA 4 and one for IP SLA 6.</p> <ul style="list-style-type: none"> • Use track number 4 for IP SLA 4. • Use track number 6 for IP SLA 6. <p>The tracked objects should notify D1 if the IP SLA state changes from down to up after 10 seconds, or from up to down after 15 seconds.</p>	2
4.2	On D2, create IP SLAs that test the reachability of R3 interface E1/0.	<p>Create two IP SLAs.</p> <ul style="list-style-type: none"> • Use SLA number 4 for IPv4. • Use SLA number 6 for IPv6. <p>The IP SLAs will test availability of R3 E1/0 interface every 5 seconds.</p> <p>Schedule the SLA for immediate implementation with no end time.</p> <p>Create an IP SLA object for IP SLA 4 and one for IP SLA 6.</p> <ul style="list-style-type: none"> • Use track number 4 for IP SLA 4. • Use track number 6 for IP SLA 6. <p>The tracked objects should notify D1 if the IP SLA state changes from down to up after 10 seconds, or from up to down after 15 seconds.</p>	2

Task#	Task	Specification	Points
4.3	On D1, configure HSRPv2.	<p>D1 is the primary router for VLANs 100 and 102; therefore, their priority will also be changed to 150.</p> <p>Configure HSRP version 2.</p> <p>Configure IPv4 HSRP group 104 for VLAN 100:</p> <ul style="list-style-type: none"> • Assign the virtual IP address 10.17.100.254. • Set the group priority to 150. • Enable preemption. • Track object 4 and decrement by 60. <p>Configure IPv4 HSRP group 114 for VLAN 101:</p> <ul style="list-style-type: none"> • Assign the virtual IP address 10.17.101.254. • Enable preemption. • Track object 4 to decrement by 60. <p>Configure IPv4 HSRP group 124 for VLAN 102:</p> <ul style="list-style-type: none"> • Assign the virtual IP address 10.17.102.254. • Set the group priority to 150. • Enable preemption. • Track object 4 to decrement by 60. <p>Configure IPv6 HSRP group 106 for VLAN 100:</p> <ul style="list-style-type: none"> • Assign the virtual IP address using ipv6 autoconfig. • Set the group priority to 150. • Enable preemption. • Track object 6 and decrement by 60. <p>Configure IPv6 HSRP group 116 for VLAN 101:</p> <ul style="list-style-type: none"> • Assign the virtual IP address using ipv6 autoconfig. • Enable preemption. • Track object 6 and decrement by 60. <p>Configure IPv6 HSRP group 126 for VLAN 102:</p> <ul style="list-style-type: none"> • Assign the virtual IP address using ipv6 autoconfig. • Set the group priority to 150. • Enable preemption. • Track object 6 and decrement by 60. 	8

Task#	Task	Specification	Points
	On D2, configure HSRPv2.	<p>D2 is the primary router for VLAN 101; therefore, the priority will also be changed to 150.</p> <p>Configure HSRP version 2.</p> <p>Configure IPv4 HSRP group 104 for VLAN 100:</p> <ul style="list-style-type: none"> • Assign the virtual IP address 10.17.100.254. • Enable preemption. • Track object 4 and decrement by 60. <p>Configure IPv4 HSRP group 114 for VLAN 101:</p> <ul style="list-style-type: none"> • Assign the virtual IP address 10.17.101.254. • Set the group priority to 150. • Enable preemption. • Track object 4 to decrement by 60. <p>Configure IPv4 HSRP group 124 for VLAN 102:</p> <ul style="list-style-type: none"> • Assign the virtual IP address 10.17.102.254. • Enable preemption. • Track object 4 to decrement by 60. <p>Configure IPv6 HSRP group 106 for VLAN 100:</p> <ul style="list-style-type: none"> • Assign the virtual IP address using ipv6 autoconfig. • Enable preemption. • Track object 6 and decrement by 60. <p>Configure IPv6 HSRP group 116 for VLAN 101:</p> <ul style="list-style-type: none"> • Assign the virtual IP address using ipv6 autoconfig. • Set the group priority to 150. • Enable preemption. • Track object 6 and decrement by 60. <p>Configure IPv6 HSRP group 126 for VLAN 102:</p> <ul style="list-style-type: none"> • Assign the virtual IP address using ipv6 autoconfig. • Enable preemption. • Track object 6 and decrement by 60. 	

Issue the show run | section ip sla command on D1; output should appear as below. Verification task 4.1 and bullet 3 of task 4.3 for Switch D1.

```
D1#show run | section ip sla
track 4 ip sla 4
  delay down 10 up 15
track 6 ip sla 6
  delay down 10 up 15
ip sla 4
  icmp-echo 10.17.10.1
  frequency 5
ip sla schedule 4 life forever start-time now
ip sla 6
  icmp-echo 2001:DB8:100:1010::1
  frequency 5
D1#
```

Ilustración 24. Verification task 4.1 and bullet 3 of task 4.3 for Switch D1

Fuente: Luis Araque

Issue the show standby brief command on D1; output should appear as below. Verification task 4.3.

```
D1#show standby brief
                P indicates configured to preempt.
                |
Interface      Grp  Pri  P State   Active           Standby          Virtual IP
Vl100          104 150  P Active  local           10.17.100.2     10.17.100.254
Vl100          106 90   P Standby FE80::D2:2      local           FE80::5:73FF:FEA0:6A
Vl101          114 100  P Standby 10.17.101.2    local           10.17.101.254
Vl101          116 40   P Standby FE80::D2:3      local           FE80::5:73FF:FEA0:74
Vl102          124 150  P Active  local           10.17.102.2     10.17.102.254
Vl102          126 90   P Standby FE80::D2:4      local           FE80::5:73FF:FEA0:7E
D1#
```

Ilustración 25. Verification task 4.3

Fuente: Luis Araque

Issue the show run | section ip sla command on D2; output should appear as below. Verification task 4.2 and bullet 3 of task 4.3 for Switch D2.

```

D2#show run | section ip sla
track 4 ip sla 4
  delay down 10 up 15
track 6 ip sla 6
  delay down 10 up 15
ip sla 4
  icmp-echo 10.17.11.1
ip sla schedule 4 life forever start-time now
ip sla 6
  icmp-echo 2001:DB8:100:1011::1
ip sla schedule 6 life forever start-time now
D2#

```

Ilustración 26. Verificación task 4.2 and bullet 3 of task 4.3 for Switch D2

Fuente: Luis Araque

Part 4 Commands (FHRP/SLA)

Switch D1

D1#conf t

Enter configuration commands, one per line. End with CNTL/Z.

D1(config)#ip sla 4 // *Se configura número de IP SLA*

D1(config-ip-sla)# icmp-echo 10.17.10.1 // *Se configura la dirección a la que se hará ping*

D1(config-ip-sla-echo)# frequency 5 // *Se configura la frecuencia*

D1(config-ip-sla-echo)# exit

D1(config)#ip sla 6

D1(config-ip-sla)# icmp-echo 2001:db8:100:1010::1

D1(config-ip-sla-echo)# frequency 5

D1(config-ip-sla-echo)# exit

D1(config)#ip sla schedule 4 life forever start-time now // *Configuramos cuándo queremos que se ejecute el IP SLA y por cuanto tiempo en IPV4*

D1(config)#ip sla schedule 6 life forever start-time now

D1(config)#track 4 ip sla 4

D1(config-track)# delay down 10 up 15 // *Configuramos el delay*

D1(config-track)# exit

D1(config)#track 6 ip sla 6

D1(config-track)# delay down 10 up 15

D1(config-track)# exit

D1(config)#interface vlan 100

D1(config-if)# standby version 2 // *Configuramos el HSRP version 2*

D1(config-if)# standby 104 ip 10.17.100.254

```

D1(config-if)# standby 104 priority 150 // Se establece la prioridad en 150
D1(config-if)# standby 104 preempt // Se configura la preferencia del grupo
D1(config-if)# standby 104 track 4 decrement 60 // Se configura el rastreo y el
decremento
D1(config-if)# standby 106 ipv6 autoconfig
D1(config-if)# standby 106 priority 150
D1(config-if)# standby 106 preempt
D1(config-if)# standby 106 track 6 decrement 60
D1(config-if)# exit
D1(config)#interface vlan 101
D1(config-if)# standby version 2
D1(config-if)# standby 114 ip 10.17.101.254
D1(config-if)# standby 114 preempt
D1(config-if)# standby 114 track 4 decrement 60
D1(config-if)# standby 116 ipv6 autoconfig
D1(config-if)# standby 116 preempt
D1(config-if)# standby 116 track 6 decrement 60
D1(config-if)# exit
D1(config)#interface vlan 102
D1(config-if)# standby version 2
D1(config-if)# standby 124 ip 10.17.102.254
D1(config-if)# standby 124 priority 150
D1(config-if)# standby 124 preempt
D1(config-if)# standby 124 track 4 decrement 60
D1(config-if)# standby 126 ipv6 autoconfig
D1(config-if)# standby 126 priority 150
D1(config-if)# standby 126 preempt
D1(config-if)# standby 126 track 6 decrement 60
D1(config-if)# exit
D1(config)#end

```

```

D1#
D1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
D1(config)#ip sla 4
D1(config-ip-sla)#icmp-echo 10.17.10.1
D1(config-ip-sla-echo)#frequency 5
D1(config-ip-sla-echo)#exit
D1(config)#ip sla 6
D1(config-ip-sla)#icmp-echo 2001:db8:100:1010::1
D1(config-ip-sla-echo)#frequency 5
D1(config-ip-sla-echo)#exit
D1(config)#ip sla schedule 4 life forever start-time now
D1(config)#ip sla schedule 6 life-forever start-time now

```

```

D1(config)#track 4 ip sla 4
D1(config-track)#delay down 10 up 15
D1(config-track)#exit
D1(config)#track 6 ip sla 6
D1(config-track)#delay down 10 up 15
D1(config-track)#exit
D1(config)#interface vlan 100
D1(config-if)#standby version 2
D1(config-if)#standby 104 ip 10.17.100.254
D1(config-if)#standby 104 priority 150
D1(config-if)#standby 104 preempt
D1(config-if)#standby 104 track 4 decrement 60
D1(config-if)#standby 106 ipv6 autoconfig
D1(config-if)#standby 106 priority 150
D1(config-if)#standby 106 preempt
D1(config-if)#standby 106 track 6 decrement 60
D1(config-if)#exit
D1(config)#interface vlan 101
D1(config-if)#standby version 2
D1(config-if)#standby 114 ip 10.17.101.254
D1(config-if)#standby 114 preempt
D1(config-if)#standby 114 track 4 decrement 60
D1(config-if)#standby 116 ipv6 autoconfig
D1(config-if)#standby 116 preempt
D1(config-if)#standby 116 track 6 decrement 60
D1(config-if)#exit
D1(config)#interface vlan 102
D1(config-if)#standby version 2
D1(config-if)#standby 124 ip 10.17.102.254
D1(config-if)#standby 124 priority 150
D1(config-if)#standby 124 preempt
D1(config-if)#standby 124 track 4 decrement 60
D1(config-if)#standby 126 ipv6 autoconfig
D1(config-if)#standby 126 priority 150
D1(config-if)#standby 126 preempt
D1(config-if)#standby 126 track 6 decrement 60
D1(config-if)#exit
D1(config)#end

```

Ilustración 27. Configuration D1 Part 4

Fuente: Luis Araque

Switch D2

D2#conf t

Enter configuration commands, one per line. End with CNTL/Z.

D2(config)#ip sla 4

D2(config-ip-sla)# icmp-echo 10.17.11.1

D2(config-ip-sla-echo)# frequency 5

D2(config-ip-sla-echo)#exit

D2(config)#ip sla 6

D2(config-ip-sla)# icmp-echo 2001:db8:100:1011::1

D2(config-ip-sla-echo)# frequency 5

D2(config-ip-sla-echo)#exit

D2(config)#ip sla schedule 4 life forever start-time now

D2(config)#ip sla schedule 6 life forever start-time now

D2(config)#track 4 ip sla 4

```
D2(config-track)# delay down 10 up 15
D2(config-track)# exit
D2(config)#track 6 ip sla 6
D2(config-track)# delay down 10 up 15
D2(config-track)# exit
D2(config)#interface vlan 100
D2(config-if)# standby version 2
D2(config-if)# standby 104 ip 10.17.100.254
D2(config-if)# standby 104 preempt
D2(config-if)# standby 104 track 4 decrement 60
D2(config-if)# standby 106 ipv6 autoconfig
D2(config-if)# standby 106 preempt
D2(config-if)# standby 106 track 6 decrement 60
D2(config-if)# exit
D2(config)#interface vlan 101
D2(config-if)# standby version 2
D2(config-if)# standby 114 ip 10.17.101.254
D2(config-if)# standby 114 priority 150
D2(config-if)# standby 114 preempt
D2(config-if)# standby 114 track 4 decrement 60
D2(config-if)# standby 116 ipv6 autoconfig
D2(config-if)# standby 116 priority 150
D2(config-if)# standby 116 preempt
D2(config-if)# standby 116 track 6 decrement 60
D2(config-if)# exit
D2(config)#interface vlan 102
D2(config-if)# standby version 2
D2(config-if)# standby 124 ip 10.17.102.254
D2(config-if)# standby 124 preempt
D2(config-if)# standby 124 track 4 decrement 60
D2(config-if)# standby 126 ipv6 autoconfig
D2(config-if)# standby 126 preempt
D2(config-if)# standby 126 track 6 decrement 60
D2(config-if)# exit
D2(config)#end
```

```

D2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
D2(config)#ip sla 4
D2(config-ip-sla)#icmp-echo 10.17.11.1
D2(config-ip-sla-echo)#frequency 5
D2(config-ip-sla-echo)#exit
D2(config)#ip sla 6
D2(config-ip-sla)#icmp-echo 2001:db8:100:1011::1
D2(config-ip-sla-echo)#frequency 5
D2(config-ip-sla-echo)#exit
D2(config)#ip sla schedule 4 life forever start-time now
D2(config)#ip sla schedule 6 life forever start-time now
D2(config)#track 4 ip sla 4
D2(config-track)#delay down 10 up 15
D2(config-track)#exit
D2(config)#track 6 ip sla 6
D2(config-track)#delay down 10 up 15
D2(config-track)#exit
D2(config)#interface vlan 100
D2(config-if)#standby version 2
D2(config-if)#standby 104 ip 10.17.100.254
D2(config-if)#standby 104 preempt
D2(config-if)#standby 104 track 4 decrement 60
D2(config-if)#standby 106 ipv6 autoconfig
D2(config-if)#standby 106 preempt
D2(config-if)#standby 106 track 6 decrement 60
D2(config-if)#exit
D2(config)#interface vlan 101
D2(config-if)#standby version 2
D2(config-if)#standby 114 ip 10.17.101.254
D2(config-if)#standby 114 priority 150
D2(config-if)#standby 114 preempt
D2(config-if)#standby 114 track 4 decrement 60
D2(config-if)#standby 116 ipv6 autoconfig
D2(config-if)#standby 116 priority 150
D2(config-if)#standby 116 preempt
D2(config-if)#standby 116 track 6 decrement 60
D2(config-if)#exit
D2(config)#interface vlan 102
D2(config-if)#standby version 2
D2(config-if)#standby 124 ip 10.17.102.254
D2(config-if)#standby 124 preempt
D2(config-if)#standby 124 track 4 decrement 60
D2(config-if)#standby 126 ipv6 autoconfig
D2(config-if)#standby 126 preempt
D2(config-if)#standby 126 track 6 decrement 60
D2(config-if)#exit
D2(config)#end

```

Ilustración 28. Configuration D2 Part 4

Fuente: Luis Araque

ENLACE ARCHIVO DE SIMULACIÓN

Link: [1053665417_TrabajoFinal_PruebaHabilidades.gns3project](https://www.gns3project.com/1053665417-TrabajoFinal-PruebaHabilidades-gns3project)

CONCLUSIONES

En el desarrollo de este Diplomado de profundización de Cisco CCNP, se logró hacer la estructuración de redes conmutadas mediante el uso del protocolo STP y la configuración de VLANs, donde se comprendieron las características de una infraestructura de red jerárquica convergente.

Fue posible diseñar soluciones de red escalables mediante la configuración básica y avanzada de protocolos de enrutamiento para la implementación de servicios IP con calidad de servicio en ambientes de red empresariales LAN y WAN.

En la continuación del desarrollo de los resultados de aprendizaje del diplomado se planificaron las redes inalámbricas, de acceso remoto y sitio a sitio seguras mediante el análisis de escenarios simulados de infraestructuras de red empresariales para la aplicación de servicios de autenticación, roaming y localización.

Por último, se implementaron redes empresariales con acceso seguro a través de la automatización y virtualización de la red donde se aplicaron metodologías de solución de problemas en ambientes de red corporativos LAN y WAN.

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