

DIPLOMADO DE PROFUNDIZACIÓN CISCO  
PRUEBA DE HABILIDADES PRÁCTICAS CCNP

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UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA –UNAD  
ESCUELA DE CIENCIAS BÁSICAS, TECNOLOGÍA E INGENIERÍA  
INGENIERÍA ELECTRÓNICA  
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ELECTRÓNICA

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COLOMBIA  
2022

Nota de Aceptación

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Presidente del Jurado

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Jurado

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Jurado

Bucaramanga, 27 de noviembre de 2022

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## GLOSARIO

**BGP:** Protocolo de puerta de enlace fronteriza. Protocolo de enrutamiento entre dominios que reemplaza a EGP. BGP intercambia información de accesibilidad con otros sistemas BGP. Está definido por RFC 1163.

**HSRP:** Protocolo de enrutador Hot Standby. Proporciona una alta disponibilidad de red y cambios transparentes en la topología de la red. HSRP crea un grupo de enrutadores de reserva activa con un enrutador principal que atiende todos los paquetes enviados a la dirección de reserva activa. El enrutador principal es monitoreado por otros enrutadores del grupo. Si falla, uno de los enrutadores en espera hereda tanto la posición principal como la dirección de reserva activa.

**IP SLA:** IP SLA se usa para mantener “monitoreado” un nodo en la red, donde sea, siempre y cuando tengas conectividad, en este caso, ese monitoreo puede ser por medio de pings (ICMP), HTTP, FTP, entre otros. Esto te permite saber el estatus de dicho nodo, ya sea que esté activo o no, te mostrará un estatus según sea el caso.

**OSPF:** Primero, abra el camino más corto. Algoritmo de enrutamiento IGP jerárquico de estado de enlace propuesto como sucesor de RIP en la comunidad de Internet. Las características de OSPF incluyen enrutamiento de menor costo, enrutamiento de múltiples rutas y equilibrio de carga. OSPF se derivó de una versión anterior del protocolo IS-IS.

**PVST +:** Por VLAN Spanning Tree Plus. Soporte para troncos dot1q para mapear múltiples árboles de expansión a un solo árbol de expansión.

**STP:** Par trenzado blindado. Medio de cableado de dos pares utilizado en una variedad de implementaciones de red. El cableado STP tiene una capa de aislamiento blindado para reducir la EMI.

**VLAN:** LAN virtual. Grupo de dispositivos en una o más LAN que están configurados (usando software de administración) para que puedan comunicarse como si estuvieran conectados al mismo cable, cuando en realidad están ubicados en varios segmentos de LAN diferentes.

## RESUMEN

Para esta actividad, se realizan las tareas asignadas en el escenario propuesto, acompañado de los respectivos procesos de documentación de la solución, correspondientes al registro de la configuración de cada uno de los dispositivos, la descripción detallada del paso a paso de cada una de las etapas realizadas durante su desarrollo, el registro de los procesos de verificación de conectividad mediante el uso de comandos ping, traceroute, show ip route, entre otros.

**PALABRAS CLAVE:** CISCO, Conmutación, Enrutamiento, Redes, Sistemas.

## ABSTRACT

For this activity, the tasks assigned in the proposed scenario are carried out, including the selected solution documentation processes, corresponding to the registration of the configuration of each of the devices, the detailed step-by-step description of each of the stages carried out during its development, the registration of the connectivity verification processes through the use of ping, traceroute, and show ip route commands, among others.

KEY WORDS: CISCO, Switching, Routing, Networks, Systems

## 1. INTRODUCCIÓN

La evaluación denominada “DOCUMENTO FINAL”, forma parte de las actividades evaluativas del Diplomado de Profundización CCNP, y busca identificar el grado de desarrollo de competencias y habilidades que fueron adquiridas a lo largo del diplomado. Lo esencial es poner a prueba los niveles de comprensión y solución de problemas relacionados con diversos aspectos de Networking.

Para esta actividad, se implementa primeramente la configuración de los dispositivos que conforman esta topología que van desde la habilitación del direccionamiento ipv6 unicast y verificaciones en la línea de consola. Se realiza la configuración de las interfaces que conforman el direccionamiento, así como la vinculación de interfaces Loopback, aplicación de DHCP y demás configuraciones que permitan la disposición de la capa 2 de la red y el soporte de host, habilitando los enlaces trunk 802.1Q entre los swiches de capa 3 y el switch de capa 2.

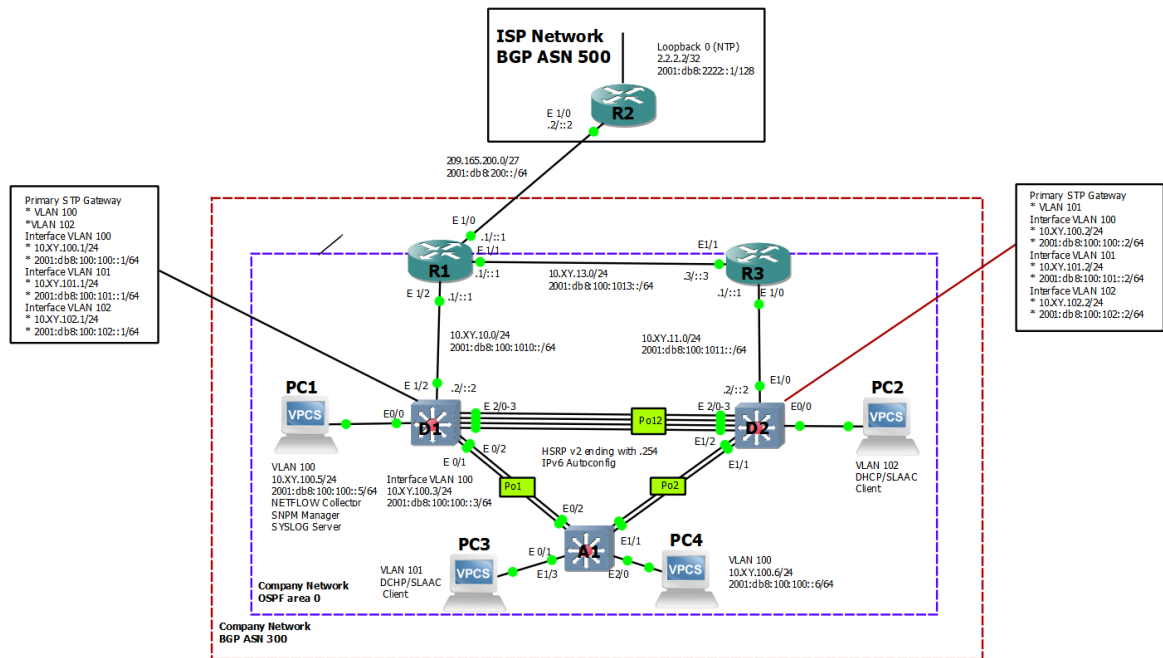
Finalmente se realiza la configuración de los protocolos de enrutamiento en los dispositivos para que la red esté completamente convergente. Para ello se realiza la configuración OSPF tanto para el direccionamiento IPv4 como para el IPv6, Este comando permite configurar MP-BGP en el router R2 y R1.

## 2. DESARROLLO DEL PROYECTO

### 2.1. Escenario 1

#### Topology

Figura 1. Topología del escenario 1



Fuente: Autor del documento.

#### Addressing Table

Tabla 1. Tabla de direcciones

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

Device	Interface	IPv4 Address	IPv6 Address	IPv6 Link-Local
	E1/2	10.67.10.1/24	2001:db8:100:1010::1/64	fe80::1:2
	E1/1	10.67.13.1/24	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
	Loopback 0	2.2.2.2/32	2001:db8:2222::1/128	fe80::2:3
R3	E1/0	10.67.11.1/24	2001:db8:100:1011::1/64	fe80::3:2
	E1/1	10.67.13.3/24	2001:db8:100:1013::3/64	fe80::3:3
D1	E1/2	10.67.10.2/24	2001:db8:100:1010::2/64	fe80::d1:1
	VLAN 100	10.67.100.1/24	2001:db8:100:100::1/64	fe80::d1:2
	VLAN 101	10.67.101.1/24	2001:db8:100:101::1/64	fe80::d1:3
	VLAN 102	10.67.102.1/24	2001:db8:100:102::1/64	fe80::d1:4
D2	E1/0	10.67.11.2/24	2001:db8:100:1011::2/64	fe80::d2:1
	VLAN 100	10.67.100.2/24	2001:db8:100:100::2/64	fe80::d2:2
	VLAN 101	10.67.101.2/24	2001:db8:100:101::2/64	fe80::d2:3
	VLAN 102	10.67.102.2/24	2001:db8:100:102::2/64	fe80::d2:4
A1	VLAN 100	10.67.100.3/23	2001:db8:100:100::3/64	fe80::a1:1
PC1	NIC	10.67.100.5/24	2001:db8:100:100::5/64	EUI-64
PC2	NIC	DHCP	SLAAC	EUI-64

<b>Device</b>	<b>Interface</b>	<b>IPv4 Address</b>	<b>IPv6 Address</b>	<b>IPv6 Link-Local</b>
PC3	NIC	DHCP	SLAAC	EUI-64
PC4	NIC	10.67.100.6/24	2001:db8:100:100::6/64	EUI-64

Fuente: Autor del documento.

## 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).

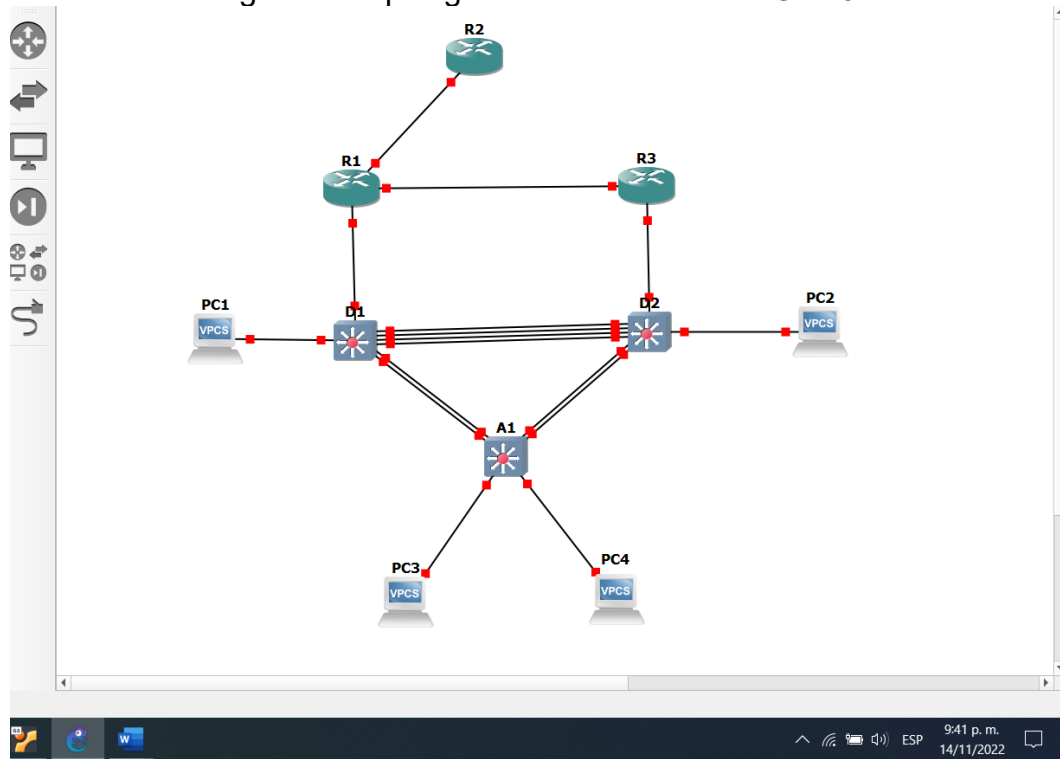
### 2.1.1. Part 1: Build the Network and Configure Basic Device Settings and Interface Addressing

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

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

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

Figura 2. Topología del escenario 1 en GNS3.



Fuente: Autor.

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

```
R1#configure terminal
R1(config)#hostname R1 //Se asigna el nombre del
dispositivo
R1(config)#ipv6 unicast-routing //Se establece el
enrutamiento de direcciones IPv6
R1(config)#no ip domain lookup //Se desactiva la búsqueda
DNS
R1(config)#banner motd # R1, ENCOR Skills Assessment# //Se asigna un banner
R1(config)#line con 0
```

```

R1(config-line)# exec-timeout 0 0 //Se asigna el tiempo de
salida exec
R1(config-line)# logging synchronous //Se establece el inicio de
sesión sincrónico
R1(config-line)# exit
R1(config)#interface e1/0 //Se accede a la interfaz
R1(config-if)# ip address 209.165.200.225 255.255.255.224 //Se asigna el
direccionamiento IPv4
R1(config-if)# ipv6 address fe80::1:1 link-local //Se asigna el
direccionamiento para el enlace local
R1(config-if)# ipv6 address 2001:db8:200::1/64 //Se asigna el
direccionamiento IPv6
R1(config-if)# no shutdown //Se enciende la interfaz
R1(config-if)# exit
R1(config)#interface e1/2 //Se accede a la interfaz
R1(config-if)# ip address 10.67.10.1 255.255.255.0 //Se asigna el
direccionamiento IPv4
R1(config-if)# ipv6 address fe80::1:2 link-local //Se asigna el
direccionamiento para el enlace local
R1(config-if)# ipv6 address 2001:db8:100:1010::1/64 //Se asigna el
direccionamiento IPv6
R1(config-if)# no shutdown //Se enciende la interfaz
R1(config-if)# exit
R1(config)#interface e1/1 //Se accede a la interfaz
R1(config-if)# ip address 10.67.13.1 255.255.255.0 //Se asigna el
direccionamiento IPv4
R1(config-if)# ipv6 address fe80::1:3 link-local //Se asigna el
direccionamiento para el enlace local
R1(config-if)# ipv6 address 2001:db8:100:1013::1/64 //Se asigna el
direccionamiento IPv6
R1(config-if)# no shutdown //Se enciende la interfaz
R1(config-if)# exit
R1(config)#

```

## Router R2

```

R2#configure terminal
R2(config)#hostname R2 //Se asigna el nombre del
dispositivo
R2(config)#ipv6 unicast-routing //Se establece el
enrutamiento de direcciones IPv6
R2(config)#no ip domain lookup //Se desactiva la búsqueda
DNS
R2(config)#banner motd # R2, ENCOR Skills Assessment# //Se asigna un banner
line con 0

```

```

R2(config)#line con 0
R2(config-line)# exec-timeout 0 0 //Se asigna el tiempo de
salida exec
R2(config-line)# logging synchronous //Se establece el inicio de
sesión sincrónico
R2(config-line)# exit
R2(config)#interface e1/0 //Se accede a la interfaz
R2(config-if)# ip address 209.165.200.226 255.255.255.224 //Se asigna el
direccionamiento IPv4
R2(config-if)# ipv6 address fe80::2:1 link-local //Se asigna el
direccionamiento para el enlace local
R2(config-if)# ipv6 address 2001:db8:200::2/64 //Se asigna el
direccionamiento IPv6
R2(config-if)# no shutdown //Se enciende la interfaz
R2(config-if)# exit
R2(config)#interface Loopback 0 //Se accede a la interfaz
R2(config-if)# ip address 2.2.2.2 255.255.255.255 //Se asigna el
direccionamiento IPv4
R2(config-if)# ipv6 address fe80::2:3 link-local //Se asigna el
direccionamiento para el enlace local
R2(config-if)# ipv6 address 2001:db8:2222::1/128 //Se asigna el
direccionamiento IPv6
R2(config-if)# no shutdown //Se enciende la interfaz
R2(config-if)# exit
R2(config)#

```

### Router R3

```

R3#configure terminal
R3(config)#hostname R3 //Se asigna el nombre del
dispositivo
R3(config)#ipv6 unicast-routing //Se establece el
enrutamiento de direcciones IPv6
R3(config)#no ip domain lookup //Se desactiva la búsqueda
DNS
R3(config)#banner motd # R3, ENCOR Skills Assessment# //Se asigna un banner
R3(config)#line con 0
R3(config-line)# exec-timeout 0 0 //Se asigna el tiempo de
salida exec
R3(config-line)# logging synchronous //Se establece el inicio de
sesión sincrónico
R3(config-line)# exit
R3(config)#interface e1/0 //Se accede a la interfaz
R3(config-if)# ip address 10.67.11.1 255.255.255.0 //Se asigna el
direccionamiento IPv4

```

```

R3(config-if)# ipv6 address fe80::3:2 link-local //Se asigna el
direccionamiento para el enlace local
R3(config-if)# ipv6 address 2001:db8:100:1011::1/64 //Se asigna el
direccionamiento IPv6
R3(config-if)# no shutdown //Se enciende la interfaz
R3(config-if)# exit
R3(config)#interface e1/1 //Se accede a la interfaz
R3(config-if)# ip address 10.67.13.3 255.255.255.0 //Se asigna el
direccionamiento IPv4
R3(config-if)# ipv6 address fe80::3:3 link-local //Se asigna el
direccionamiento para el enlace local
R3(config-if)# ipv6 address 2001:db8:100:1010::2/64 //Se asigna el
direccionamiento IPv6
R3(config-if)# no shutdown //Se enciende la interfaz
R3(config-if)# exit
R3(config)#

```

#### Switch D1

```

D1#configure terminal
D1(config)#hostname D1 //Se asigna el nombre del
dispositivo
D1(config)#ip routing //Se asigna el enrutamiento
de direcciones IPv4
D1(config)#ipv6 unicast-routing //Se establece el
enrutamiento de direcciones IPv6
D1(config)#no ip domain lookup //Se desactiva la búsqueda
DNS
D1(config)#banner motd # D1, ENCOR Skills Assessment# //Se asigna un banner
D1(config)#line con 0
D1(config-line)# exec-timeout 0 0 //Se asigna el tiempo de
salida exec
D1(config-line)# logging synchronous //Se establece el inicio de
sesión sincrónico
D1(config-line)# exit
D1(config)#vlan 100 //Se asigna la vlan
D1(config-vlan)# name Management //Se asigna un nombre de
vlan
D1(config-vlan)# exit
D1(config)#vlan 101 //Se asigna la vlan
D1(config-vlan)# name UserGroupA //Se asigna un nombre de
vlan
D1(config-vlan)# exit
D1(config)#vlan 102 //Se asigna la vlan

```

```

D1(config-vlan)# name UserGroupB //Se asigna un nombre de
vlan
D1(config-vlan)# exit
D1(config)#vlan 999 //Se asigna la vlan
D1(config-vlan)# name NATIVE //Se asigna un nombre de
vlan
D1(config-vlan)# exit
D1(config)#interface e1/2 //Se accede a la interfaz
D1(config-if)# no switchport //Se desactiva el switchport
D1(config-if)# ip address 10.67.10.2 255.255.255.0 //Se asigna el
direccionamiento IPv4
D1(config-if)# ipv6 address fe80::d1:1 link-local //Se asigna el
direccionamiento para el enlace local
D1(config-if)# ipv6 address 2001:db8:100:1010::2/64 //Se asigna el
direccionamiento IPv6
D1(config-if)# no shutdown //Se enciende la interfaz
D1(config-if)# exit
D1(config)#interface vlan 100 //Se accede a la interfaz
D1(config-if)# ip address 10.67.100.1 255.255.255.0 //Se asigna el
direccionamiento IPv4
D1(config-if)# ipv6 address fe80::d1:2 link-local //Se asigna el
direccionamiento para el enlace local
D1(config-if)# ipv6 address 2001:db8:100:100::1/64 //Se asigna el
direccionamiento IPv6
D1(config-if)# no shutdown //Se enciende la interfaz
D1(config-if)# exit
D1(config)#interface vlan 101 //Se accede a la interfaz
D1(config-if)# ip address 10.67.101.1 255.255.255.0 //Se asigna el
direccionamiento IPv4
D1(config-if)# ipv6 address fe80::d1:3 link-local //Se asigna el
direccionamiento para el enlace local
D1(config-if)# ipv6 address 2001:db8:100:101::1/64 //Se asigna el
direccionamiento IPv6
D1(config-if)# no shutdown //Se enciende la interfaz
D1(config-if)# exit
D1(config)#interface vlan 102 //Se accede a la interfaz
D1(config-if)# ip address 10.67.102.1 255.255.255.0 //Se asigna el
direccionamiento IPv4
D1(config-if)# ipv6 address fe80::d1:4 link-local //Se asigna el
direccionamiento para el enlace local
D1(config-if)# ipv6 address 2001:db8:100:102::1/64 //Se asigna el
direccionamiento IPv6
D1(config-if)# no shutdown //Se enciende la interfaz
D1(config-if)# exit

```

```

D1(config)#ip dhcp excluded-address 10.67.101.1 10.67.101.109 //Se excluyen
las direcciones para el servidor DHCP
D1(config)#ip dhcp excluded-address 10.67.101.141 10.67.101.254//Se excluyen
las direcciones para el servidor DHCP
D1(config)#ip dhcp excluded-address 10.67.102.1 10.67.102.109 //Se excluyen
las direcciones para el servidor DHCP
D1(config)#ip dhcp excluded-address 10.67.102.141 10.67.102.254//Se excluyen
las direcciones para el servidor DHCP
D1(config)#ip dhcp pool VLAN-101 //Se asigna un pool DHCP
D1(dhcp-config)# network 10.67.101.0 255.255.255.0 //Se define la red del pool de
direcciones DHCP
D1(dhcp-config)# default-router 10.67.101.254 //Se asigna la puerta
predeterminada de enlace para el pool de direcciones DHCP
D1(dhcp-config)# exit
D1(config)#ip dhcp pool VLAN-102 //Se asigna un pool DHCP
D1(dhcp-config)# network 10.67.102.0 255.255.255.0 //Se define la red del pool de
direcciones DHCP
D1(dhcp-config)# default-router 10.67.102.254 //Se asigna la puerta
predeterminada de enlace para el pool de direcciones DHCP
D1(dhcp-config)# exit
D1(config)#interface range e0/0-3,e1/0-1,e1/3,e2/0-3,e3/0-3 //Se accede a un
rango de direcciones
D1(config-if-range)# shutdown //Se apagan las interfaces
D1(config-if-range)# exit
D1(config)#

```

## Switch D2

```

D2#configure terminal
D2(config)#hostname D2 //Se asigna el nombre del
dispositivo
D2(config)#ip routing //Se asigna el enrutamiento
de direcciones IPv4
D2(config)#ipv6 unicast-routing //Se establece el
enrutamiento de direcciones IPv6
D2(config)#no ip domain lookup //Se desactiva la búsqueda
DNS
D2(config)#banner motd # D2, ENCOR Skills Assessment# //Se asigna un banner
D2(config)#line con 0
D2(config-line)# exec-timeout 0 0 //Se asigna el tiempo de
salida exec
D2(config-line)# logging synchronous //Se establece el inicio de
sesión sincrónico
D2(config-line)# exit
D2(config)#vlan 100 //Se asigna la vlan

```

```

D2(config-vlan)# name Management //Se asigna un nombre de
vlan
D2(config-vlan)# exit
D2(config)#vlan 101 //Se asigna la vlan
D2(config-vlan)# name UserGroupA //Se asigna un nombre de
vlan
D2(config-vlan)# exit
D2(config)#vlan 102 //Se asigna la vlan
D2(config-vlan)# name UserGroupB //Se asigna un nombre de
vlan
D2(config-vlan)# exit
D2(config)#vlan 999 //Se asigna la vlan
D2(config-vlan)# name NATIVE //Se asigna un nombre de
vlan
D2(config-vlan)# exit
D2(config)#interface e1/0 //Se accede a la interfaz
D2(config-if)# no switchport //Se desactiva el switchport
D2(config-if)# ip address 10.67.11.2 255.255.255.0 //Se asigna el
direccionamiento IPv4
D2(config-if)# ipv6 address fe80::d1:1 link-local //Se asigna el
direccionamiento para el enlace local
D2(config-if)# ipv6 address 2001:db8:100:1011::2/64 //Se asigna el
direccionamiento IPv6
D2(config-if)# no shutdown //Se enciende la interfaz
D2(config-if)# exit
D2(config)#interface vlan 100 //Se accede a la interfaz
D2(config-if)# ip address 10.67.100.2 255.255.255.0 //Se asigna el
direccionamiento IPv4
D2(config-if)# ipv6 address fe80::d2:2 link-local //Se asigna el
direccionamiento para el enlace local
D2(config-if)# ipv6 address 2001:db8:100:100::2/64 //Se asigna el
direccionamiento IPv6
D2(config-if)# no shutdown //Se enciende la interfaz
D2(config-if)# exit
D2(config)#interface vlan 101 //Se accede a la interfaz
D2(config-if)# ip address 10.67.101.2 255.255.255.0 //Se asigna el
direccionamiento IPv4
D2(config-if)# ipv6 address fe80::d2:3 link-local //Se asigna el
direccionamiento para el enlace local
D2(config-if)# ipv6 address 2001:db8:100:101::2/64 //Se asigna el
direccionamiento IPv6
D2(config-if)# no shutdown //Se enciende la interfaz
D2(config-if)# exit
D2(config)#interface vlan 102 //Se accede a la interfaz

```

```

D2(config-if)# ip address 10.67.102.2 255.255.255.0 //Se asigna el
direccionamiento IPv4
D2(config-if)# ipv6 address fe80::d2:4 link-local //Se asigna el
direccionamiento para el enlace local
D2(config-if)# ipv6 address 2001:db8:100:102::2/64 //Se asigna el
direccionamiento IPv6
D2(config-if)# no shutdown //Se enciende la interfaz
D2(config-if)# exit
D2(config)#ip dhcp excluded-address 10.67.101.1 10.67.101.209 //Se excluyen
las direcciones para el servidor DHCP
D2(config)#ip dhcp excluded-address 10.67.101.241 10.67.101.254//Se excluyen
las direcciones para el servidor DHCP
D2(config)#ip dhcp excluded-address 10.67.102.1 10.67.102.209 //Se excluyen
las direcciones para el servidor DHCP
D2(config)#ip dhcp excluded-address 10.67.102.241 10.67.102.254//Se excluyen
las direcciones para el servidor DHCP
D2(config)#ip dhcp pool VLAN-101 //Se asigna un pool DHCP
D2(dhcp-config)# network 10.67.101.0 255.255.255.0 //Se define la red del pool de
direcciones DHCP
D2(dhcp-config)# default-router 10.67.101.254 //Se asigna la puerta
predeterminada de enlace para el pool de direcciones DHCP
D2(dhcp-config)# exit
D2(config)#ip dhcp pool VLAN-102 //Se asigna un pool DHCP
D2(dhcp-config)# network 10.67.102.0 255.255.255.0 //Se define la red del pool de
direcciones DHCP
D2(dhcp-config)# default-router 10.67.102.254 //Se asigna la puerta
predeterminada de enlace para el pool de direcciones DHCP
D2(dhcp-config)# exit
D2(config)#interface range e0/0-3,e1/1-3,e2/0-3,e3/0-3 //Se accede a un
rango de direcciones
D2(config-if-range)# shutdown //Se apagan las interfaces
D2(config-if-range)# exit
D2(config)#

```

## Switch A1

```

A1#configure terminal
A1(config)#hostname A1 //Se asigna el nombre del
dispositivo
A1(config)#no ip domain lookup //Se desactiva la búsqueda
DNS
A1(config)#banner motd # A1, ENCOR Skills Assessment# //Se asigna un banner
A1(config)#line con 0
A1(config-line)# exec-timeout 0 0 //Se asigna el tiempo de
salida exec

```

```

A1(config-line)# logging synchronous //Se establece el inicio de
sesión sincrónico
A1(config-line)# exit
A1(config)#vlan 100 //Se asigna la vlan
A1(config-vlan)# name Management //Se asigna un nombre de
vlan
A1(config-vlan)# exit
A1(config)#vlan 101 //Se asigna la vlan
A1(config-vlan)# name UserGroupA //Se asigna un nombre de
vlan
A1(config-vlan)# exit
A1(config)#vlan 102 //Se asigna la vlan
A1(config-vlan)# name UserGroupB //Se asigna un nombre de
vlan
A1(config-vlan)# exit
A1(config)#vlan 999 //Se asigna la vlan
A1(config-vlan)# name NATIVE //Se asigna un nombre de
vlan
A1(config-vlan)# exit
A1(config)#interface vlan 100 //Se accede a la interfaz
A1(config-if)# ip address 10.67.100.3 255.255.255.0 //Se asigna el
direccionamiento IPv4
A1(config-if)# ipv6 address fe80::a1:1 link-local //Se asigna el
direccionamiento para el enlace local
A1(config-if)# ipv6 address 2001:db8:100:100::3/64 //Se asigna el
direccionamiento IPv6
A1(config-if)# no shutdown //Se enciende la interfaz
A1(config-if)# exit
A1(config)#interface range e0/0,e0/3,e1/0,e2/1-3,e3/0-3 //Se accede a un
rango de interfaces
A1(config-if-range)# shutdown //Se apagan las interfaces
A1(config-if-range)# exit
A1(config)#

```

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

```

R1#copy running-config startup-config //Se guarda la configuracion
del dispositivo

```

```

R2#copy running-config startup-config //Se guarda la configuracion
del dispositivo

```

```

R3#copy running-config startup-config //Se guarda la configuracion
del dispositivo

```

D1#copy running-config startup-config //Se guarda la configuracion del dispositivo

D2#copy running-config startup-config //Se guarda la configuracion del dispositivo

A1#copy running-config startup-config //Se guarda la configuracion del dispositivo

- c. Configure PC 1 and PC 4 host addressing as shown in the addressing table. Assign a default gateway address of 10.56.100.254 which will be the HSRP virtual IP address used in Part 4.

PC1> ip 10.67.100.5 255.255.255.0 10.67.100.254 //Se asigna el direccionamiento IPv4 del equipo

PC1> ip 2001:db8:100:100::5/64 eui-64 //Se asigna el direccionamiento IPv6 del equipo

PC4> ip 10.67.100.6 255.255.255.0 10.67.100.254 //Se asigna el direccionamiento IPv4 del equipo

PC4> ip 2001:db8:100:100::6/64 eui-64 //Se asigna el direccionamiento IPv6 del equipo

### 2.1.2. 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.

Your configuration tasks are as follows:

Tabla 2. Tabla de tareas a realizar en la parte 2.

<b>Task#</b>	<b>Task</b>	<b>Specification</b>
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"> <li>• D1 and D2</li> <li>• D1 and A1</li> <li>• D2 and A1</li> </ul>
2.2	On all switches, change the native VLAN on trunk links.	Use VLAN 999 as the native VLAN.
2.3	On all switches, enable the Rapid Spanning-Tree Protocol.	Use Rapid Spanning Tree.
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.
2.5	On all switches, create LACP EtherChannels as shown in the topology diagram.	Use the following channel numbers: <ul style="list-style-type: none"> <li>• D1 to D2 – Port channel 12</li> <li>• D1 to A1 – Port channel 1</li> <li>• D2 to A1 – Port channel 2</li> </ul>
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.
2.7	Verify IPv4 DHCP services.	PC2 and PC3 are DHCP clients and should be receiving valid IPv4 addresses.
2.8	Verify local LAN connectivity.	PC1 should successfully ping: <ul style="list-style-type: none"> <li>• D1: 10.67.100.1</li> <li>• D2: 10.67.100.2</li> <li>• PC4: 10.67.100.6</li> </ul> PC2 should successfully ping:

Task#	Task	Specification
		<ul style="list-style-type: none"> <li>• D1: 10.67.102.1</li> <li>• D2: 10.67.102.2</li> </ul> PC3 should successfully ping: <ul style="list-style-type: none"> <li>• D1: 10.67.101.1</li> <li>• D2: 10.67.101.2</li> </ul> PC4 should successfully ping: <ul style="list-style-type: none"> <li>• D1: 10.67.100.1</li> <li>• D2: 10.67.100.2</li> <li>• PC1: 10.67.100.5</li> </ul>

Fuente: Autor del documento.

### Switch D1

```

D1(config)#interface range e2/0-3 //Se accede a las interfaces
D1(config-if-range)#switchport trunk encapsulation dot1q //Se establece la
encapsulación para el enlace troncal
D1(config-if-range)# switchport mode trunk //Se configuran las interfaces
como enlaces troncales
D1(config-if-range)# switchport trunk native vlan 999 //Se asigna la vlan como
nativa
D1(config-if-range)# channel-group 12 mode active //Se establece el LACP de
grupo 12
D1(config-if-range)# no shutdown //Se enciende las interfaces
D1(config-if-range)# exit
D1(config)#interface range e0/1-2 //Se accede a las interfaces
D1(config-if-range)#switchport trunk encapsulation dot1q //Se establece la
encapsulación para el enlace troncal
D1(config-if-range)# switchport mode trunk //Se configuran las interfaces
como enlaces troncales
D1(config-if-range)# switchport trunk native vlan 999 //Se asigna la vlan como
nativa
D1(config-if-range)# channel-group 1 mode active //Se establece el LACP de
grupo 1
D1(config-if-range)# no shutdown //Se enciende las interfaces
D1(config-if-range)# exit
D1(config)#spanning-tree mode rapid-pvst //Se establece el modo rapid-
pvst
D1(config)#spanning-tree vlan 100,102 root primary //Se configuran las vlans
como raices primarias de spanning-tree
D1(config)#spanning-tree vlan 101 root secondary //Se configuran las vlans
como raices secundarias de spanning-tree

```

```

D1(config)#interface e0/0 //Se accede a la interface
D1(config-if)# switchport mode access //Se asigna en modo de
acceso
D1(config-if)# switchport access vlan 100 //Se asigna la vlan en el
puerto de acceso
D1(config-if)# spanning-tree portfast //Se asigna el spanning-tree
en modo portfast
D1(config-if)# no shutdown //Se enciende las interfaces
D1(config-if)# exit
D1(config)#end

```

## Switch D2

```

D2(config)#interface range e2/0-3 //Se accede a las interfaces
D2(config-if-range)#switchport trunk encapsulation dot1q //Se establece la
encapsulación para el enlace troncal
D2(config-if-range)# switchport mode trunk //Se configuran las interfaces
como enlaces troncales
D2(config-if-range)# switchport trunk native vlan 999 //Se asigna la vlan como
nativa
D2(config-if-range)# channel-group 12 mode active //Se establece el LACP de
grupo 12
D2(config-if-range)# no shutdown //Se enciende la interface
D2(config-if-range)# exit
D2(config)#interface range e1/1-2 //Se accede a las interfaces
D2(config-if-range)#switchport trunk encapsulation dot1q //Se establece la
encapsulación para el enlace troncal
D2(config-if-range)# switchport mode trunk //Se configuran las interfaces
como enlaces troncales
D2(config-if-range)# switchport trunk native vlan 999 //Se asigna la vlan como
nativa
D2(config-if-range)# channel-group 2 mode active //Se establece el LACP de
grupo 2
D2(config-if-range)# no shutdown //Se enciende las interfaces
D2(config-if-range)# exit
D2(config)#spanning-tree mode rapid-pvst //Se establece el modo rapid-
pvst
D2(config)#spanning-tree vlan 101 root primary //Se configuran las vlans
como raices primarias de spanning-tree
D2(config)#spanning-tree vlan 100,102 root secondary //Se configuran las
vlans como raices secundarias de spanning-tree
D2(config)#interface e0/0 //Se accede a la interface
D2(config-if)# switchport mode access //Se asigna en modo de
acceso

```

```

D2(config-if)# switchport access vlan 102 //Se asigna la vlan en el
puerto de acceso
D2(config-if)# spanning-tree portfast //Se asigna el spanning-tree
en modo portfast
D2(config-if)# no shutdown //Se enciende las interfaces
D2(config-if)# exit
D2(config)#end

Switch A1

A1(config)#spanning-tree mode rapid-pvst //Se establece el modo rapid-
pvst
A1(config)#interface range e0/1-2 //Se accede a las interfaces
A1(config-if-range)#switchport trunk encapsulation dot1q //Se establece la
encapsulación para el enlace troncal
A1(config-if-range)# switchport mode trunk //Se configuran las interfaces
como enlaces troncales
A1(config-if-range)# switchport trunk native vlan 999 //Se asigna la vlan como
nativa
A1(config-if-range)# channel-group 1 mode active //Se establece el LACP de
grupo 1
A1(config-if-range)# no shutdown //Se enciende las interfaces
A1(config-if-range)# exit
A1(config)#interface range e1/1-2 //Se accede a las interfaces
A1(config-if-range)#switchport trunk encapsulation dot1q //Se establece la
encapsulación para el enlace troncal
A1(config-if-range)# switchport mode trunk //Se configuran las interfaces
como enlaces troncales
A1(config-if-range)# switchport trunk native vlan 999 //Se asigna la vlan como
nativa
A1(config-if-range)# channel-group 2 mode active //Se establece el LACP de
grupo 2
A1(config-if-range)# no shutdown //Se enciende las interfaces
A1(config-if-range)# exit
A1(config)#interface e1/3 //Se accede a las interfaces
A1(config-if)# switchport mode access //Se asigna en modo de
acceso
A1(config-if)# switchport access vlan 101 //Se asigna la vlan en el
puerto de acceso
A1(config-if)# spanning-tree portfast //Se asigna el spanning-tree
en modo portfast
A1(config-if)# no shutdown //Se enciende las interfaces
A1(config-if)# exit
A1(config)#interface e2/0 //Se accede a las interfaces

```

A1(config-if)# switchport mode access	//Se asigna en modo de acceso
A1(config-if)# switchport access vlan 100	//Se asigna la vlan en el puerto de acceso
A1(config-if)# spanning-tree portfast	//Se asigna el spanning-tree en modo portfast
A1(config-if)# no shutdown	//Se enciende las interfaces
A1(config-if)# exit	
A1(config)#end	

Figura 3. Verificación del protocolo DHCP en PC2.



Fuente: Autor.

Figura 4. Verificación del protocolo DHCP en PC3.



```

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Press '?' to get help.

Executing the startup file

PC3> ip dhcp
DDORA IP 10.67.101.210/24 GW 10.67.101.254

PC3> ip auto
GLOBAL SCOPE      : 2001:db8:100:1010:2050:79ff:fe66:6802/64
ROUTER LINK-LAYER : ca:01:00:ea:00:1e

PC3>

```

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Windows taskbar: 9:56 p. m. 14/11/2022

Fuente: Autor.

Figura 5. Prueba de conexión en PC1.



```
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Press '?' to get help.

Executing the startup file

PC1> ip 10.67.100.5 255.255.255.0 10.67.100.254
Checking for duplicate address...
PC1 : 10.67.100.5 255.255.255.0 gateway 10.67.100.254

PC1> ip 2001:db8:100:100::5/64 eui-64
PC1 : 2001:db8:100:100:2050:79ff:fe66:6800/64 eui-64

PC1>
PC1>
PC1> ping 10.67.100.1

84 bytes from 10.67.100.1 icmp_seq=1 ttl=255 time=0.142 ms
84 bytes from 10.67.100.1 icmp_seq=2 ttl=255 time=0.242 ms
84 bytes from 10.67.100.1 icmp_seq=3 ttl=255 time=0.254 ms
84 bytes from 10.67.100.1 icmp_seq=4 ttl=255 time=0.279 ms
84 bytes from 10.67.100.1 icmp_seq=5 ttl=255 time=0.521 ms

PC1> ping 10.67.100.2

84 bytes from 10.67.100.2 icmp_seq=1 ttl=255 time=0.195 ms
84 bytes from 10.67.100.2 icmp_seq=2 ttl=255 time=0.503 ms
84 bytes from 10.67.100.2 icmp_seq=3 ttl=255 time=0.507 ms
84 bytes from 10.67.100.2 icmp_seq=4 ttl=255 time=0.509 ms
84 bytes from 10.67.100.2 icmp_seq=5 ttl=255 time=0.486 ms

PC1> ping 10.67.100.6

84 bytes from 10.67.100.6 icmp_seq=1 ttl=64 time=0.242 ms
84 bytes from 10.67.100.6 icmp_seq=2 ttl=64 time=0.818 ms
84 bytes from 10.67.100.6 icmp_seq=3 ttl=64 time=0.993 ms
84 bytes from 10.67.100.6 icmp_seq=4 ttl=64 time=0.418 ms
84 bytes from 10.67.100.6 icmp_seq=5 ttl=64 time=0.436 ms

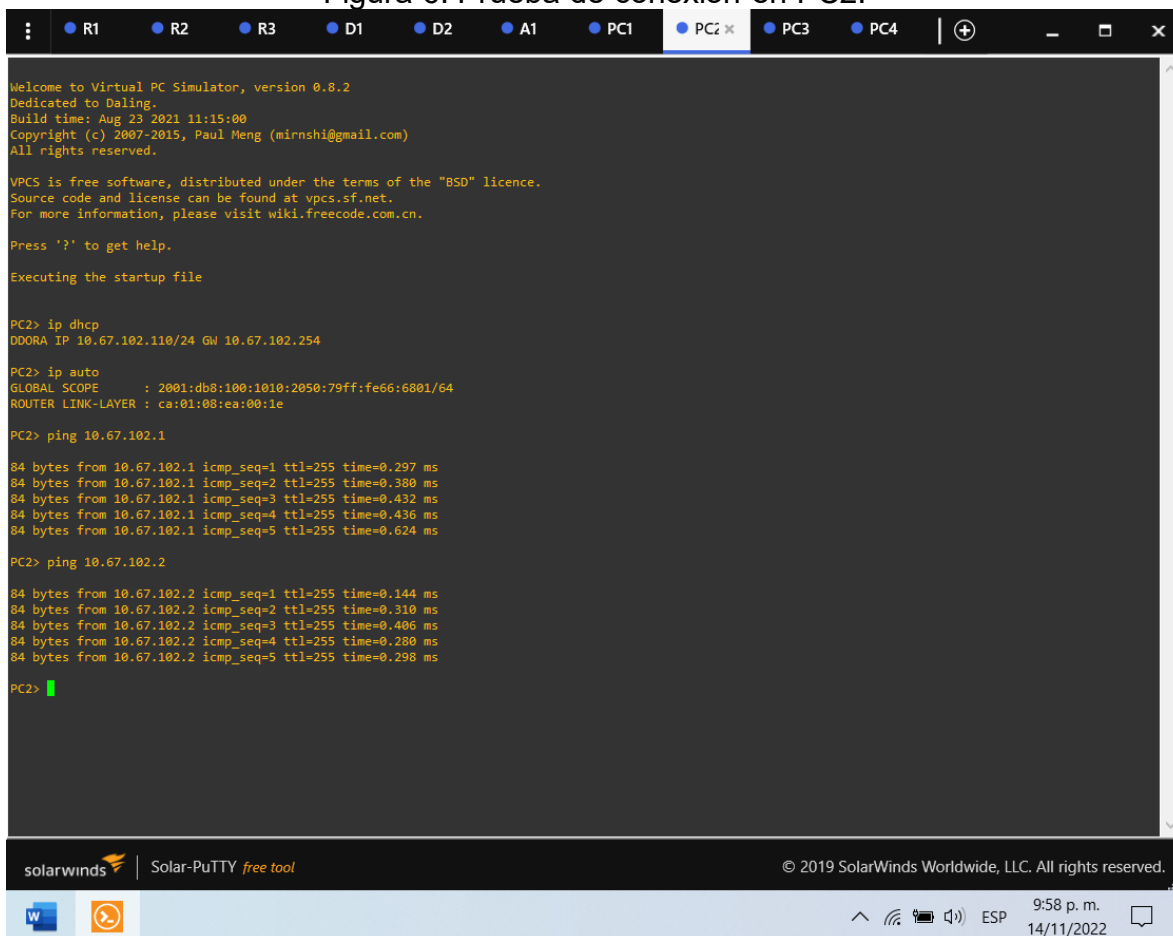
PC1> █
```

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Windows taskbar: 9:58 p. m., 14/11/2022

Fuente: Autor.

Figura 6. Prueba de conexión en PC2.



```
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Press '?' to get help.

Executing the startup file

PC2> ip dhcp
DDORA IP 10.67.102.110/24 GN 10.67.102.254

PC2> ip auto
GLOBAL SCOPE      : 2001:db8:100:1010:2050:79ff:fe66:6801/64
ROUTER LINK-LAYER : ca:01:00:ea:00:1e

PC2> ping 10.67.102.1

84 bytes from 10.67.102.1 icmp_seq=1 ttl=255 time=0.297 ms
84 bytes from 10.67.102.1 icmp_seq=2 ttl=255 time=0.380 ms
84 bytes from 10.67.102.1 icmp_seq=3 ttl=255 time=0.432 ms
84 bytes from 10.67.102.1 icmp_seq=4 ttl=255 time=0.436 ms
84 bytes from 10.67.102.1 icmp_seq=5 ttl=255 time=0.624 ms

PC2> ping 10.67.102.2

84 bytes from 10.67.102.2 icmp_seq=1 ttl=255 time=0.144 ms
84 bytes from 10.67.102.2 icmp_seq=2 ttl=255 time=0.310 ms
84 bytes from 10.67.102.2 icmp_seq=3 ttl=255 time=0.406 ms
84 bytes from 10.67.102.2 icmp_seq=4 ttl=255 time=0.280 ms
84 bytes from 10.67.102.2 icmp_seq=5 ttl=255 time=0.298 ms

PC2> █
```

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Fuente: Autor.

Figura 7. Prueba de conexión en PC3.



```
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Press '?' to get help.

Executing the startup file

PC3> ip dhcp
DDORA IP 10.67.101.210/24 GW 10.67.101.254

PC3> ip auto
GLOBAL SCOPE      : 2001:db8:100:1010:2050:79ff:fe66:6802/64
ROUTER LINK-LAYER : ca:01:08:ea:00:1e

PC3> ping 10.67.101.1

84 bytes from 10.67.101.1 icmp_seq=1 ttl=255 time=0.276 ms
84 bytes from 10.67.101.1 icmp_seq=2 ttl=255 time=0.528 ms
84 bytes from 10.67.101.1 icmp_seq=3 ttl=255 time=0.567 ms
84 bytes from 10.67.101.1 icmp_seq=4 ttl=255 time=0.516 ms
84 bytes from 10.67.101.1 icmp_seq=5 ttl=255 time=0.576 ms

PC3> ping 10.67.101.2

84 bytes from 10.67.101.2 icmp_seq=1 ttl=255 time=0.216 ms
84 bytes from 10.67.101.2 icmp_seq=2 ttl=255 time=0.496 ms
84 bytes from 10.67.101.2 icmp_seq=3 ttl=255 time=0.354 ms
84 bytes from 10.67.101.2 icmp_seq=4 ttl=255 time=0.466 ms
84 bytes from 10.67.101.2 icmp_seq=5 ttl=255 time=0.464 ms

PC3> █
```

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W | [Taskbar icons] | 9:59 p. m. 14/11/2022

Fuente: Autor.

Figura 8. Prueba de conexión en PC4.



```
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For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

PC4> ip 10.67.100.6 255.255.255.0 10.67.100.254
Checking for duplicate address...
PC4 : 10.67.100.6 255.255.255.0 gateway 10.67.100.254

PC4> ip 2001:db8:100:100::6/64 eui-64
PC1 : 2001:db8:100:100:2050:79ff:fe66:6803/64 eui-64

PC4> ping 10.67.100.1

84 bytes from 10.67.100.1 icmp_seq=1 ttl=255 time=0.255 ms
84 bytes from 10.67.100.1 icmp_seq=2 ttl=255 time=0.406 ms
84 bytes from 10.67.100.1 icmp_seq=3 ttl=255 time=0.374 ms
84 bytes from 10.67.100.1 icmp_seq=4 ttl=255 time=0.428 ms
84 bytes from 10.67.100.1 icmp_seq=5 ttl=255 time=0.385 ms
^C
PC4> ping 10.67.100.2

84 bytes from 10.67.100.2 icmp_seq=1 ttl=255 time=0.319 ms
84 bytes from 10.67.100.2 icmp_seq=2 ttl=255 time=0.645 ms
84 bytes from 10.67.100.2 icmp_seq=3 ttl=255 time=0.570 ms
84 bytes from 10.67.100.2 icmp_seq=4 ttl=255 time=0.476 ms
84 bytes from 10.67.100.2 icmp_seq=5 ttl=255 time=0.541 ms

PC4> ping 10.67.100.5

84 bytes from 10.67.100.5 icmp_seq=1 ttl=64 time=0.528 ms
84 bytes from 10.67.100.5 icmp_seq=2 ttl=64 time=0.392 ms
84 bytes from 10.67.100.5 icmp_seq=3 ttl=64 time=0.715 ms
84 bytes from 10.67.100.5 icmp_seq=4 ttl=64 time=0.562 ms
84 bytes from 10.67.100.5 icmp_seq=5 ttl=64 time=0.380 ms

PC4> █
```

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Windows taskbar: 9:59 p. m., 14/11/2022

Fuente: Autor.

### 2.1.3. 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. Tabla de tareas a realizar en la parte 3.

Task#	Task	Specification
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 <b>4</b> and assign the following router-IDs:</p> <ul style="list-style-type: none"> <li>• R1: 0.0.4.1</li> <li>• R3: 0.0.4.3</li> <li>• D1: 0.0.4.131</li> <li>• D2: 0.0.4.132</li> </ul> <p>On R1, R3, D1, and D2, advertise all directly connected networks / VLANs in Area 0.</p> <ul style="list-style-type: none"> <li>• On R1, do not advertise the R1 – R2 network.</li> <li>• On R1, propagate a default route. Note that the default route will be provided by BGP.</li> </ul> <p>Disable OSPFv2 advertisements on:</p> <ul style="list-style-type: none"> <li>• D1: All interfaces except E1/2</li> <li>• D2: All interfaces except E1/0</li> </ul>
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 <b>6</b> and assign the following router-IDs:</p> <ul style="list-style-type: none"> <li>• R1: 0.0.6.1</li> <li>• R3: 0.0.6.3</li> <li>• D1: 0.0.6.131</li> <li>• D2: 0.0.6.132</li> </ul> <p>On R1, R3, D1, and D2, advertise all directly connected networks / VLANs in Area 0.</p> <ul style="list-style-type: none"> <li>• On R1, do not advertise the R1 – R2 network.</li> <li>• On R1, propagate a default route. Note that the default route will be provided by BGP.</li> </ul> <p>Disable OSPFv3 advertisements on:</p> <ul style="list-style-type: none"> <li>• D1: All interfaces except E1/2</li> </ul>

Task#	Task	Specification
		<ul style="list-style-type: none"> <li>• D2: All interfaces except E1/0</li> </ul>
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"> <li>• An IPv4 default static route.</li> <li>• An IPv6 default static route.</li> </ul> <p>Configure R2 in BGP ASN <b>500</b> 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"> <li>• The Loopback 0 IPv4 network (/32).</li> <li>• The default route (0.0.0.0/0).</li> </ul> <p>In IPv6 address family, advertise:</p> <ul style="list-style-type: none"> <li>• The Loopback 0 IPv4 network (/128).</li> <li>• The default route (::/0).</li> </ul>
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"> <li>• A summary IPv4 route for 10.67.0.0/8.</li> <li>• A summary IPv6 route for 2001:db8:100::/48.</li> </ul> <p>Configure R1 in BGP ASN <b>300</b> 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"> <li>• Disable the IPv6 neighbor relationship.</li> <li>• Enable the IPv4 neighbor relationship.</li> <li>• Advertise the 10.67.0.0/8 network.</li> </ul> <p>In IPv6 address family:</p> <ul style="list-style-type: none"> <li>• Disable the IPv4 neighbor relationship.</li> <li>• Enable the IPv6 neighbor relationship.</li> <li>• Advertise the 2001:db8:100::/48 network.</li> </ul>

Fuente: Autor del documento.

## Router R1

```
R1#configure terminal
R1(config)#router ospf 4 //Se asigna OSPF IPv4
R1(config-router)# router-id 0.0.4.1 //Se asigna el id OSPF
R1(config-router)# network 10.67.10.0 0.0.0.255 area 0 //Se asigna la red
conectada directamente en el área 0
R1(config-router)# network 10.67.13.0 0.0.0.255 area 0 //Se asigna la red
conectada directamente en el área 0
R1(config-router)# default-information originate //Se desactiva el anuncio en
R1
R1(config-router)# exit
R1(config)#ipv6 router ospf 6 //Se asigna OSPF IPv6
R1(config-rtr)# router-id 0.0.6.1 //Se asigna el id OSPF
R1(config-rtr)# default-information originate //Se desactiva la
propagación en R1
R1(config-rtr)# exit
R1(config)#interface e1/2 //Se accede a la interfaz
R1(config-if)# ipv6 ospf 6 area 0 //Se asigna el enrutamiento
ospf ipv6 en el área 0
R1(config-if)# exit
R1(config)#interface e1/1 //Se accede a la interfaz
R1(config-if)# ipv6 ospf 6 area 0 //Se asigna el enrutamiento
ospf ipv6 en el área 0
R1(config-if)# exit
R1(config)#ip route 10.0.0.0 255.0.0.0 null0 //Se propaga una ruta
estatica por defecto
R1(config)#ipv6 route 2001:db8:100::/48 null0 //Se propaga una ruta
estatica IPv6 por defecto
R1(config)#router bgp 300 //Se asigna BGP con ASN
300
R1(config-router)# bgp router-id 1.1.1.1 //Se asigna el id BGP
R1(config-router)# neighbor 209.165.200.226 remote-as 500 //Se asigna la relación
IPv4 con R2 con ASN 500
R1(config-router)# neighbor 2001:db8:200::2 remote-as 500 //Se asigna la relación
IPv4 con R2 con ASN 500
R1(config-router)# address-family ipv4 unicast //Se asigna la familia de
direcciones IPv4
R1(config-router-af)# neighbor 209.165.200.226 activate //Se activa la relación
IPv4
R1(config-router-af)# no neighbor 2001:db8:200::2 activate //Se desactiva la
relación IPv6
R1(config-router-af)# network 10.0.0.0 mask 255.0.0.0 //Se asigna la
dirección y la máscara de red
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 //Se desactiva la
relación IPv4
R1(config-router-af)# neighbor 2001:db8:200::2 activate //Se activa la relación
IPv6
R1(config-router-af)# network 2001:db8:100::/48 //Se asigna la
dirección
R1(config-router-af)# exit-address-family
R1(config-router)#

```

## Router R2

```

R2(config)#ip route 0.0.0.0 0.0.0.0 loopback 0 //Se asigna una ruta
estatica por defecto IPv4 vía Loopback 0
R2(config)#ipv6 route ::/0 loopback 0 //Se asigna una ruta
estatica por defecto IPv6 vía Loopback 0
R2(config)#router bgp 500 //Se asigna BGP con
ASN 500
R2(config-router)# bgp router-id 2.2.2.2 //Se asigna el id BGP
R2(config-router)# neighbor 209.165.200.225 remote-as 300 //Se asigna la relación
IPv4 con R1 con ASN 300
R2(config-router)# neighbor 2001:db8:200::1 remote-as 300 //Se asigna la relación
IPv6 con R1 con ASN 300
R2(config-router)# address-family ipv4
R2(config-router-af)# neighbor 209.165.200.225 activate //Se anuncia la red
IPv4 de R1
R2(config-router-af)# no neighbor 2001:db8:200::1 activate //No se anuncia la red
IPv6 de R1
R2(config-router-af)# network 2.2.2.2 mask 255.255.255.255 //Se anuncia la
red IPv4 de la Loopback 0
R2(config-router-af)# network 0.0.0.0 //Se anuncia la ruta
por defecto
R2(config-router-af)# exit-address-family
R2(config-router)# address-family ipv6
R2(config-router-af)# no neighbor 209.165.200.225 activate //No se anuncia la red
IPv4 de R1
R2(config-router-af)# neighbor 2001:db8:200::1 activate //Se anuncia la red
IPv6 de R1
R2(config-router-af)# network 2001:db8:2222::/128 //Se anuncia la red
IPv4 de la Loopback 0 /128
R2(config-router-af)# network ::/0 //Se anuncia la ruta
por defecto
R2(config-router-af)# exit-address-family
R2(config-router)#
Router R3

```

```

R3(config)#router ospf 4 //Se asigna OSPF IPv4
R3(config-router)# router-id 0.0.4.3 //Se asigna el id OSPF
R3(config-router)# network 10.67.11.0 0.0.0.255 area 0 //Se asigna la red
conectada directamente en el área 0
R3(config-router)# network 10.67.13.0 0.0.0.255 area 0 //Se asigna la red
conectada directamente en el área 0
R3(config-router)# exit
R3(config)#ipv6 router ospf 6 //Se asigna OSPF IPv6
R3(config-rtr)# router-id 0.0.6.3 //Se asigna el id OSPF
R3(config-rtr)# exit
R3(config)#interface e1/0 //Se accede a la interface
R3(config-if)# ipv6 ospf 6 area 0 //Se asigna el enrutamiento
ospf ipv6 en el área 0
R3(config-if)# exit
R3(config)#interface e1/1 //Se accede a la interface
R3(config-if)# ipv6 ospf 6 area 0 //Se asigna el enrutamiento
ospf ipv6 en el área 0
R3(config-if)# exit
R3(config)#end

```

#### Switch D1

```

D1(config)#router ospf 4 //Se asigna OSPF IPv4
D1(config-router)# router-id 0.0.4.131 //Se asigna el id OSPF
D1(config-router)# network 10.67.100.0 0.0.0.255 area 0 //Se asigna la red
conectada directamente en el área 0
D1(config-router)# network 10.67.101.0 0.0.0.255 area 0 //Se asigna la red
conectada directamente en el área 0
D1(config-router)# network 10.67.102.0 0.0.0.255 area 0 //Se asigna la red
conectada directamente en el área 0
D1(config-router)# network 10.67.10.0 0.0.0.255 area 0 //Se asigna la red
conectada directamente en el área 0
D1(config-router)# passive-interface default //Se desactiva los anuncios
en todas las interfaces
D1(config-router)# no passive-interface e1/2 //Se activa el anuncio en la
interface
D1(config-router)# exit
D1(config)#ipv6 router ospf 6 //Se asigna OSPF IPv6
D1(config-rtr)# router-id 0.0.6.131 //Se asigna el id OSPF
D1(config-rtr)# passive-interface default //Se desactiva los anuncios
en todas las interfaces
D1(config-rtr)# no passive-interface e1/2 //Se activa el anuncio en la
interface
D1(config-rtr)# exit

```

```

D1(config)#interface e1/2 //Se accede a la interface
D1(config-if)# ipv6 ospf 6 area 0 //Se asigna el enrutamiento
ospf ipv6 en el área 0
D1(config-if)# exit
D1(config)#interface vlan 100 //Se accede a la interface
D1(config-if)# ipv6 ospf 6 area 0 //Se asigna el enrutamiento
ospf ipv6 en el área 0
D1(config-if)# exit
D1(config)#interface vlan 101 //Se accede a la interface
D1(config-if)# ipv6 ospf 6 area 0 //Se asigna el enrutamiento
ospf ipv6 en el área 0
D1(config-if)# exit
D1(config)#interface vlan 102 //Se accede a la interface
D1(config-if)# ipv6 ospf 6 area 0 //Se asigna el enrutamiento
ospf ipv6 en el área 0
D1(config-if)# exit
D1(config)#end
D1#

```

#### Switch D2

```

D2#configure terminal
D2(config)#router ospf 4 //Se asigna OSPF IPv4
D2(config-router)# router-id 0.0.4.132 //Se asigna el id OSPF
D2(config-router)# network 10.67.100.0 0.0.0.255 area 0 //Se asigna la red
conectada directamente en el área 0
D2(config-router)# network 10.67.101.0 0.0.0.255 area 0 //Se asigna la red
conectada directamente en el área 0
D2(config-router)# network 10.67.102.0 0.0.0.255 area 0 //Se asigna la red
conectada directamente en el área 0
D2(config-router)# network 10.67.11.0 0.0.0.255 area 0 //Se asigna la red
conectada directamente en el área 0
D2(config-router)# passive-interface default //Se desactiva los anuncios
en todas las interfaces
D2(config-router)# no passive-interface e1/0 //Se activa el anuncio en la
interface
D2(config-router)# exit
D2(config)#ipv6 router ospf 6 //Se asigna OSPF IPv6
D2(config-rtr)# router-id 0.0.6.132 //Se asigna el id OSPF
D2(config-rtr)# passive-interface default //Se desactiva los anuncios
en todas las interfaces
D2(config-rtr)# no passive-interface e1/0 //Se activa el anuncio en la
interface
D2(config-rtr)# exit
D2(config)#interface e1/0 //Se accede a la interface

```

D2(config-if)# ipv6 ospf 6 area 0 ospf ipv6 en el área 0	//Se asigna el enrutamiento
D2(config-if)# exit	
D2(config)#interface vlan 100	//Se accede a la interface
D2(config-if)# ipv6 ospf 6 area 0 ospf ipv6 en el área 0	//Se asigna el enrutamiento
D2(config-if)# exit	
D2(config)#interface vlan 101	//Se accede a la interface
D2(config-if)# ipv6 ospf 6 area 0 ospf ipv6 en el área 0	//Se asigna el enrutamiento
D2(config-if)# exit	
D2(config)#interface vlan 102	//Se accede a la interface
D2(config-if)# ipv6 ospf 6 area 0 ospf ipv6 en el área 0	//Se asigna el enrutamiento
D2(config-if)# exit	

Figura 9. Validación de OSPF en R1.

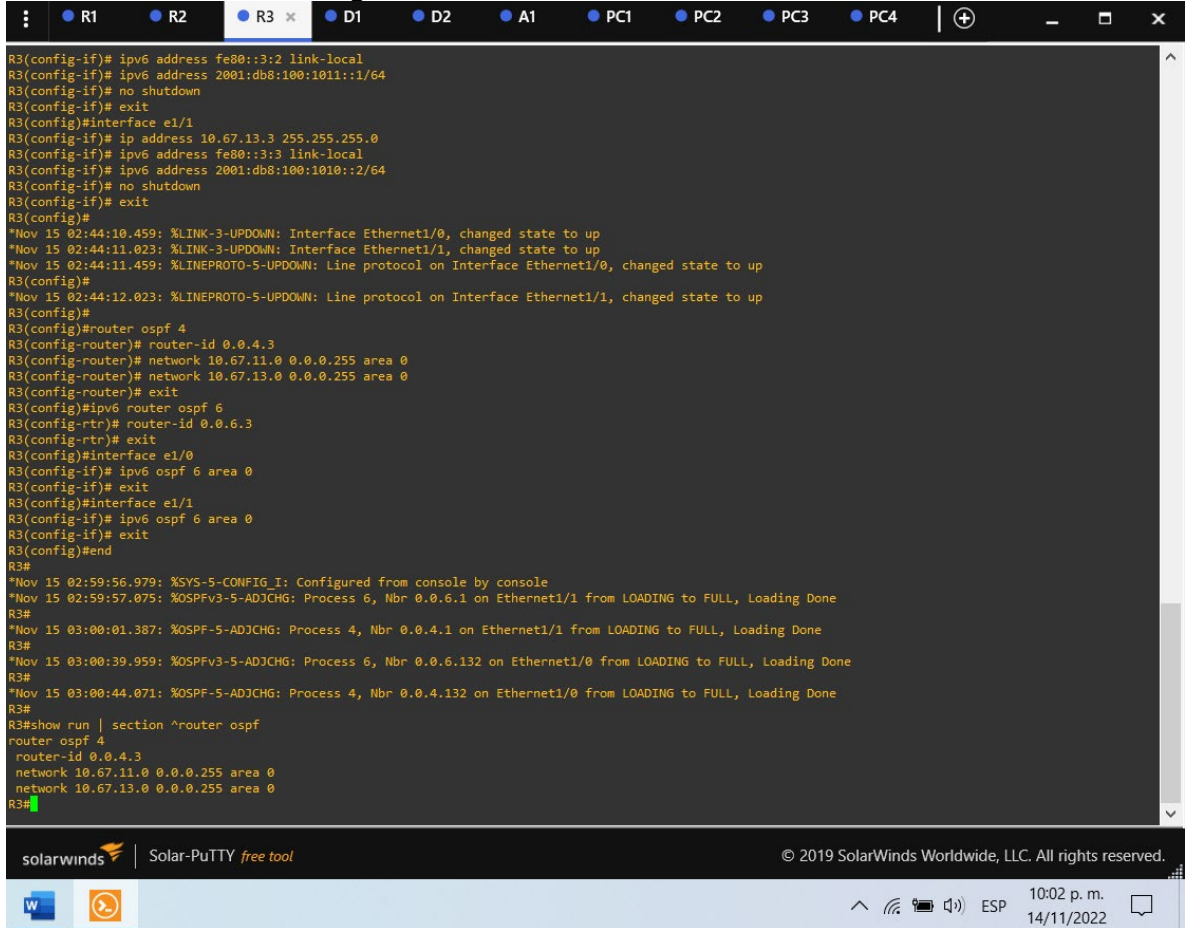
```

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)#ip route 10.0.0.0 255.0.0.0 null0
R1(config)#ipv6 route 2001:db8:100::/48 null0
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)#exit
R1(config)#
*Nov 15 03:00:29.715: %BGP-5-ADJCHANGE: neighbor 209.165.200.226 Up
R1(config)#
*Nov 15 03:00:31.415: %BGP-5-ADJCHANGE: neighbor 2001:DB8:200::2 Up
R1(config)#
*Nov 15 03:00:47.167: %OSPFv3-5-ADJCHG: Process 6, Nbr 0.0.6.3 on Ethernet1/1 from LOADING to FULL, Loading Done
R1(config)#
*Nov 15 03:00:51.471: %OSPF-5-ADJCHG: Process 4, Nbr 0.0.4.3 on Ethernet1/1 from LOADING to FULL, Loading Done
R1(config)#
*Nov 15 03:01:03.683: %OSPFv3-5-ADJCHG: Process 6, Nbr 0.0.6.131 on Ethernet1/2 from LOADING to FULL, Loading Done
R1(config)#
*Nov 15 03:01:09.875: %OSPF-5-ADJCHG: Process 4, Nbr 0.0.4.131 on Ethernet1/2 from LOADING to FULL, Loading Done
R1(config)#end
R1#
*Nov 15 03:01:49.399: %SYS-5-CONFIG_I: Configured from console by console
R1#show run | section ^router ospf
router ospf 4
router-id 0.0.4.1
network 10.67.10.0 0.0.0.255 area 0
network 10.67.13.0 0.0.0.255 area 0
default-information originate
R1#

```

Fuente: Autor.

Figura 10. Validación de OSPF en R3.



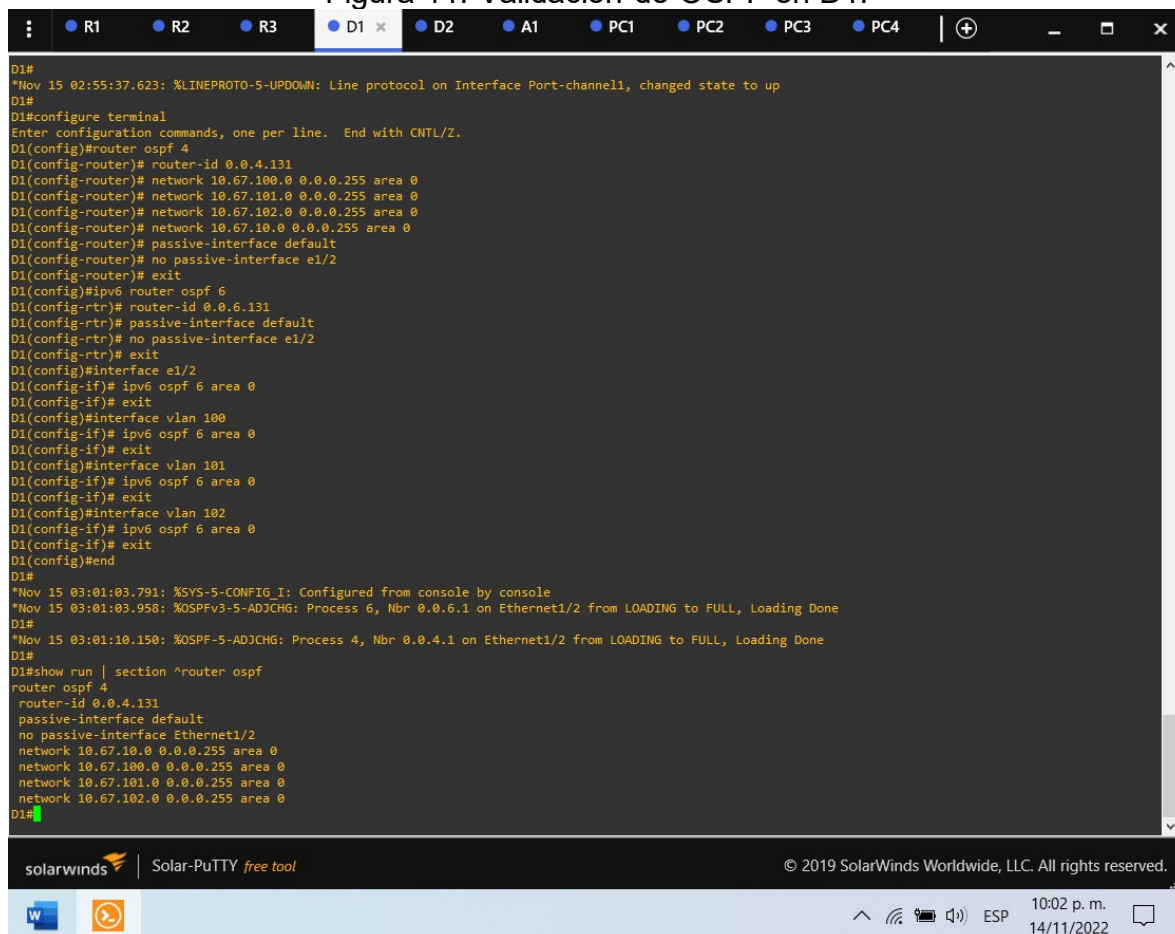
```
R3(config-if)# ipv6 address fe80::3:2 link-local
R3(config-if)# ipv6 address 2001:db8:100:1011::1/64
R3(config-if)# no shutdown
R3(config-if)# exit
R3(config)#interface e1/1
R3(config-if)# ip address 10.67.13.3 255.255.255.0
R3(config-if)# ipv6 address fe80::3:3 link-local
R3(config-if)# ipv6 address 2001:db8:100:1010::2/64
R3(config-if)# no shutdown
R3(config-if)# exit
R3(config)#
*Nov 15 02:44:10.459: %LINK-3-UPDOWN: Interface Ethernet1/0, changed state to up
*Nov 15 02:44:11.023: %LINK-3-UPDOWN: Interface Ethernet1/1, changed state to up
*Nov 15 02:44:11.459: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/0, changed state to up
R3(config)#
*Nov 15 02:44:12.023: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/1, changed state to up
R3(config)#
R3(config)#router ospf 4
R3(config-router)# router-id 0.0.4.3
R3(config-router)# network 10.67.11.0 0.0.0.255 area 0
R3(config-router)# network 10.67.13.0 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
R3#
*Nov 15 02:59:56.979: %SYS-5-CONFIG_I: Configured from console by console
*Nov 15 02:59:57.075: %OSPFv3-5-ADJCHG: Process 6, Nbr 0.0.6.1 on Ethernet1/1 from LOADING to FULL, Loading Done
R3#
*Nov 15 03:00:01.387: %OSPF-5-ADJCHG: Process 4, Nbr 0.0.4.1 on Ethernet1/1 from LOADING to FULL, Loading Done
R3#
*Nov 15 03:00:39.959: %OSPFv3-5-ADJCHG: Process 6, Nbr 0.0.6.132 on Ethernet1/0 from LOADING to FULL, Loading Done
R3#
*Nov 15 03:00:44.071: %OSPF-5-ADJCHG: Process 4, Nbr 0.0.4.132 on Ethernet1/0 from LOADING to FULL, Loading Done
R3#
R3#show run | section ^router ospf
router ospf 4
router-id 0.0.4.3
network 10.67.11.0 0.0.0.255 area 0
network 10.67.13.0 0.0.0.255 area 0
R3#
```

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10:02 p. m. 14/11/2022

Fuente: Autor.

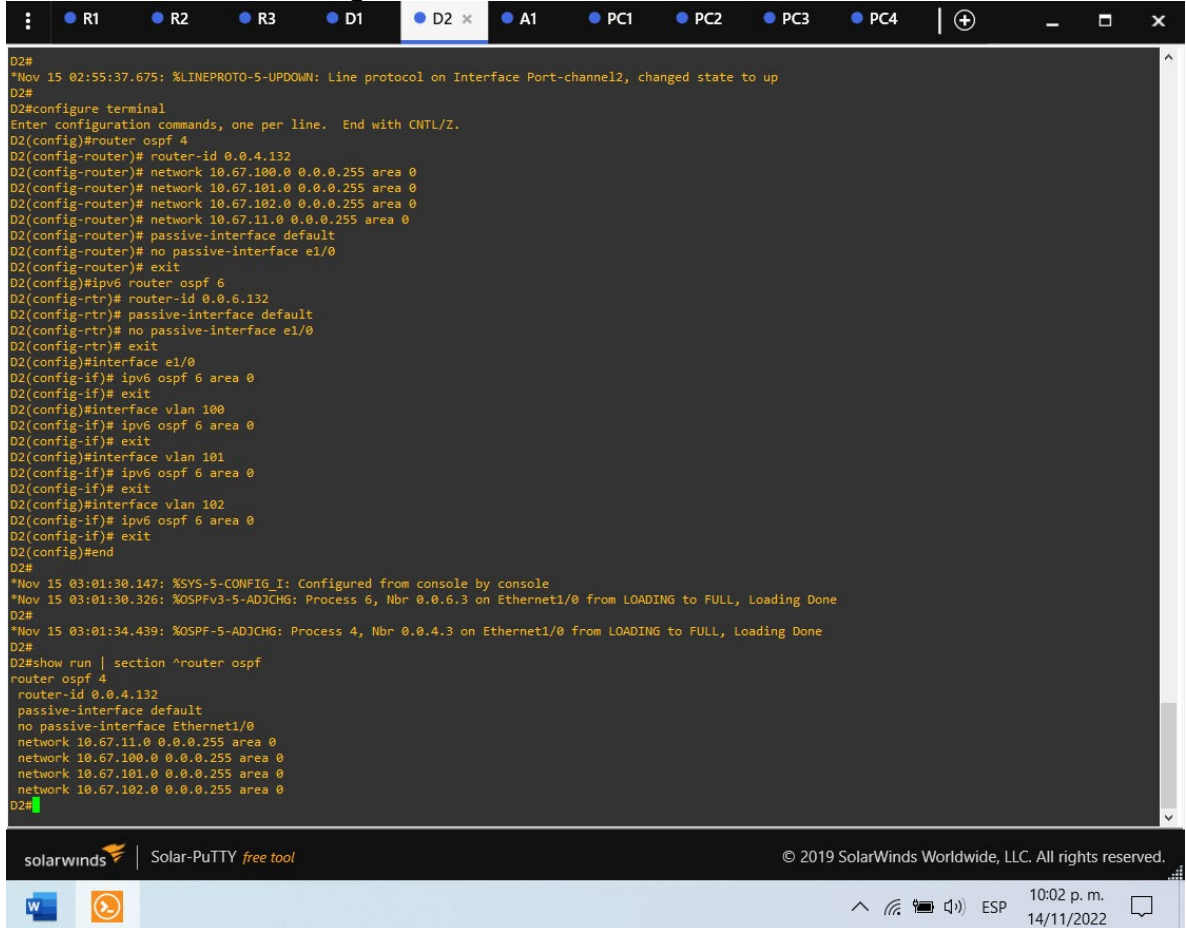
Figura 11. Validación de OSPF en D1.



```
D1#
*Nov 15 02:55:37.623: %LINEPROTO-5-UPDOWN: Line protocol on Interface Port-channel1, changed state to up
D1#
D1#configure terminal
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 10.67.100.0 0.0.0.255 area 0
D1(config-router)# network 10.67.101.0 0.0.0.255 area 0
D1(config-router)# network 10.67.102.0 0.0.0.255 area 0
D1(config-router)# network 10.67.10.0 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#
*Nov 15 03:01:03.791: %SYS-5-CONFIG_I: Configured from console by console
*Nov 15 03:01:03.958: %OSPFv3-5-ADJCHG: Process 6, Nbr 0.0.6.1 on Ethernet1/2 from LOADING to FULL, Loading Done
D1#
*Nov 15 03:01:10.150: %OSPF-5-ADJCHG: Process 4, Nbr 0.0.4.1 on Ethernet1/2 from LOADING to FULL, Loading Done
D1#
D1#show run | section ^router ospf
router ospf 4
router-id 0.0.4.131
passive-interface default
no passive-interface Ethernet1/2
network 10.67.10.0 0.0.0.255 area 0
network 10.67.100.0 0.0.0.255 area 0
network 10.67.101.0 0.0.0.255 area 0
network 10.67.102.0 0.0.0.255 area 0
D1#
```

Fuente: Autor.

Figura 12. Validación de OSPF en D2.



```
D2#
*Nov 15 02:55:37.675: %LINEPROTO-5-UPDOWN: Line protocol on Interface Port-channel2, changed state to up
D2#
D2#configure terminal
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 10.67.100.0 0.0.0.255 area 0
D2(config-router)# network 10.67.101.0 0.0.0.255 area 0
D2(config-router)# network 10.67.102.0 0.0.0.255 area 0
D2(config-router)# network 10.67.11.0 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
D2#
*Nov 15 03:01:30.147: %SYS-5-CONFIG I: Configured from console by console
*Nov 15 03:01:30.326: %OSPFv3-5-ADJCHG: Process 6, Nbr 0.0.6.3 on Ethernet1/0 from LOADING to FULL, Loading Done
D2#
*Nov 15 03:01:34.439: %OSPF-5-ADJCHG: Process 4, Nbr 0.0.4.3 on Ethernet1/0 from LOADING to FULL, Loading Done
D2#
D2#show run | section ^router ospf
router ospf 4
 router-id 0.0.4.132
 passive-interface default
 no passive-interface Ethernet1/0
 network 10.67.11.0 0.0.0.255 area 0
 network 10.67.100.0 0.0.0.255 area 0
 network 10.67.101.0 0.0.0.255 area 0
 network 10.67.102.0 0.0.0.255 area 0
D2#
```

Fuente: Autor.

Figura 13. Validación de OSPF IPv6 en R1.

```

R1(config)#ip route 10.0.0.0 255.0.0.0 null0
R1(config)#ipv6 route 2001:db8:100::/48 null0
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)#exit
R1(config)#
*Nov 15 03:00:29.715: %BGP-5-ADJCHANGE: neighbor 209.165.200.226 Up
R1(config)#
*Nov 15 03:00:31.415: %BGP-5-ADJCHANGE: neighbor 2001:DB8:200::2 Up
R1(config)#
*Nov 15 03:00:47.167: %OSPFv3-5-ADJCHG: Process 6, Nbr 0.0.6.3 on Ethernet1/1 from LOADING to FULL, Loading Done
R1(config)#
*Nov 15 03:00:51.471: %OSPF-5-ADJCHG: Process 4, Nbr 0.0.4.3 on Ethernet1/1 from LOADING to FULL, Loading Done
R1(config)#
*Nov 15 03:01:03.683: %OSPFv3-5-ADJCHG: Process 6, Nbr 0.0.6.131 on Ethernet1/2 from LOADING to FULL, Loading Done
R1(config)#
*Nov 15 03:01:09.875: %OSPF-5-ADJCHG: Process 4, Nbr 0.0.4.131 on Ethernet1/2 from LOADING to FULL, Loading Done
R1(config)#end
R1#
*Nov 15 03:01:49.399: %SYS-5-CONFIG_I: Configured from console by console
R1#show run | section ^router ospf
router ospf 4
  router-id 0.0.4.1
  network 10.67.10.0 0.0.0.255 area 0
  network 10.67.13.0 0.0.0.255 area 0
  default-information originate
R1#show run | section ^ipv6 route
ipv6 route 2001:DB8:100::/48 Null0
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
E1/1	6	0	6	10	DR	1/1	
E1/2	6	0	7	10	DR	1/1	

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Fuente: Autor.

Figura 14. Validación de OSPF IPv6 en R3.



```
R3(config-if)# ipv6 address 2001:db8:100:1010::2/64
R3(config-if)# no shutdown
R3(config-if)# exit
R3(config)#
*Nov 15 02:44:10.459: %LINK-3-UPDOWN: Interface Ethernet1/0, changed state to up
*Nov 15 02:44:11.023: %LINK-3-UPDOWN: Interface Ethernet1/1, changed state to up
*Nov 15 02:44:11.459: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/0, changed state to up
R3(config)#
*Nov 15 02:44:12.023: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/1, changed state to up
R3(config)#
R3(config)#router ospf 4
R3(config-router)# router-id 0.0.4.3
R3(config-router)# network 10.67.11.0 0.0.0.255 area 0
R3(config-router)# network 10.67.13.0 0.0.0.255 area 0
R3(config-router)# exit
R3(config)#ipv6 router ospf 6
R3(config-mtr)# router-id 0.0.6.3
R3(config-mtr)# 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
R3#
*Nov 15 02:59:56.979: %SYS-5-CONFIG I: Configured from console by console
*Nov 15 02:59:57.075: %OSPFv3-5-ADJCHG: Process 6, Nbr 0.0.6.1 on Ethernet1/1 from LOADING to FULL, Loading Done
R3#
*Nov 15 03:00:01.387: %OSPF-5-ADJCHG: Process 4, Nbr 0.0.4.1 on Ethernet1/1 from LOADING to FULL, Loading Done
R3#
*Nov 15 03:00:39.959: %OSPFv3-5-ADJCHG: Process 6, Nbr 0.0.6.132 on Ethernet1/0 from LOADING to FULL, Loading Done
R3#
*Nov 15 03:00:44.071: %OSPF-5-ADJCHG: Process 4, Nbr 0.0.4.132 on Ethernet1/0 from LOADING to FULL, Loading Done
R3#
R3#show run | section ^router ospf
router ospf 4
  router-id 0.0.4.3
  network 10.67.11.0 0.0.0.255 area 0
  network 10.67.13.0 0.0.0.255 area 0
R3#show run | section ^ipv6 route
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     6        10  BDR   1/1
Et1/0    6   0     5        10  DR    1/1
R3#
```

Fuente: Autor.

Figura 15. Validación de OSPF IPv6 en D1.



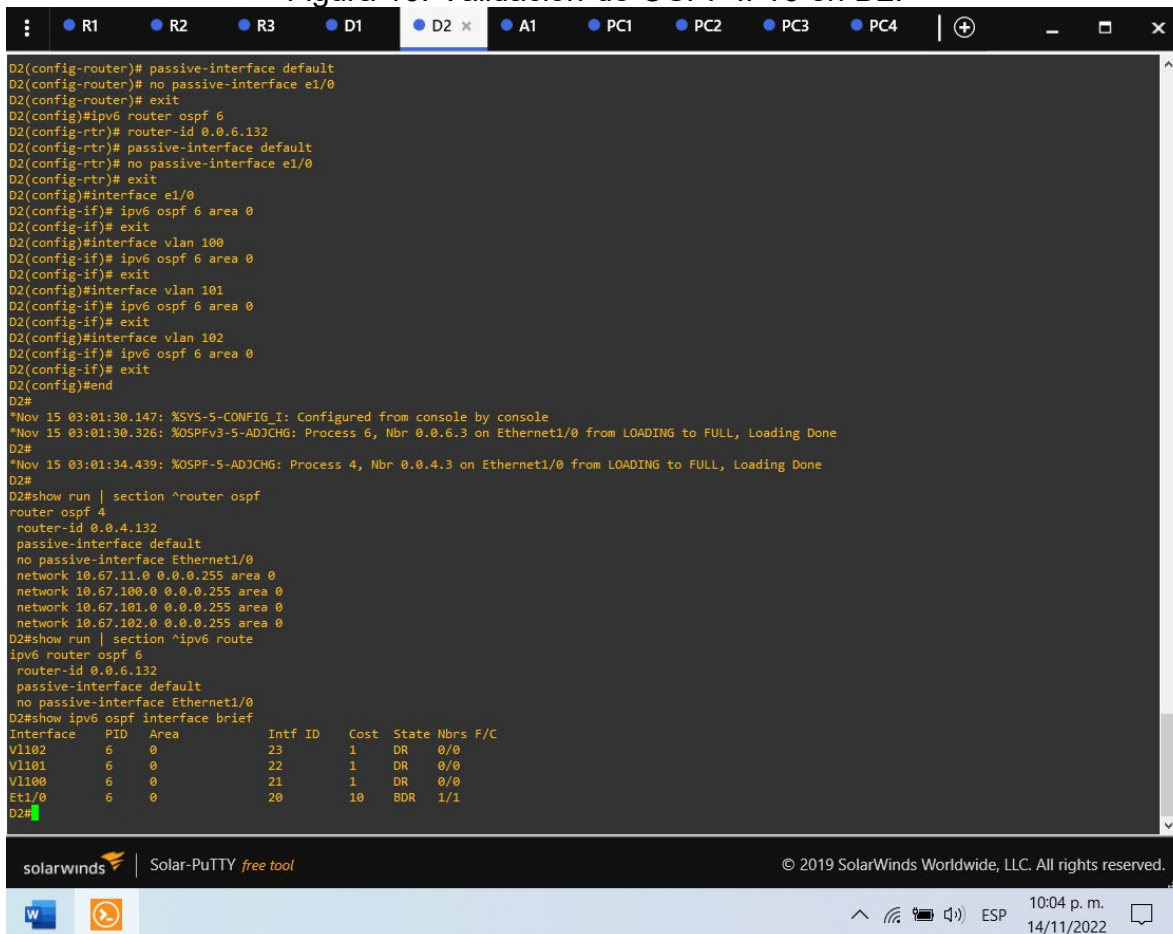
```
D1(config-router)# passive-interface default
D1(config-router)# no passive-interface e1/2
D1(config-router)# exit
D1(config)#ipv6 router ospf 6
D1(config-rtr)# router-id 0.0.6.131
D1(config-rtr)# passive-interface default
D1(config-rtr)# no passive-interface e1/2
D1(config-rtr)# exit
D1(config)#interface 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#
*Nov 15 03:01:03.791: %SYS-5-CONFIG I: Configured from console by console
*Nov 15 03:01:03.958: %OSPFv3-5-ADJCHG: Process 6, Nbr 0.0.6.1 on Ethernet1/2 from LOADING to FULL, Loading Done
D1#
*Nov 15 03:01:10.150: %OSPF-5-ADJCHG: Process 4, Nbr 0.0.4.1 on Ethernet1/2 from LOADING to FULL, Loading Done
D1#
D1#show run | section ^router ospf
router ospf 4
router-id 0.0.4.131
passive-interface default
no passive-interface Ethernet1/2
network 10.67.10.0 0.0.0.255 area 0
network 10.67.100.0 0.0.0.255 area 0
network 10.67.101.0 0.0.0.255 area 0
network 10.67.102.0 0.0.0.255 area 0
D1#show run | section ^ipv6 route
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  PTID  Area  Intf ID  Cost  State  Nbrs F/C
Vl102     6     0     23      1     DR     0/0
Vl101     6     0     22      1     DR     0/0
Vl100     6     0     21      1     DR     0/0
Et1/2     6     0     20     10     BDR    1/1
D1#
```

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Fuente: Autor.

Figura 16. Validación de OSPF IPv6 en D2.



```
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
D2#
*Nov 15 03:01:30.147: %SYS-5-CONFIG_I: Configured from console by console
*Nov 15 03:01:30.326: %OSPFv3-5-ADJCHG: Process 6, Nbr 0.0.6.3 on Ethernet1/0 from LOADING to FULL, Loading Done
D2#
*Nov 15 03:01:34.439: %OSPF-5-ADJCHG: Process 4, Nbr 0.0.4.3 on Ethernet1/0 from LOADING to FULL, Loading Done
D2#
D2#show run | section ^router ospf
router ospf 4
router-id 0.0.4.132
passive-interface default
no passive-interface Ethernet1/0
network 10.67.11.0 0.0.0.255 area 0
network 10.67.100.0 0.0.0.255 area 0
network 10.67.101.0 0.0.0.255 area 0
network 10.67.102.0 0.0.0.255 area 0
D2#show run | section ^ipv6 route
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 23 1 DR 0/0
V1101 6 0 22 1 DR 0/0
V1100 6 0 21 1 DR 0/0
Et1/0 6 0 20 10 BDR 1/1
D2#
```

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Fuente: Autor.

Figura 17. Validación de BGP y rutas estáticas en R2.



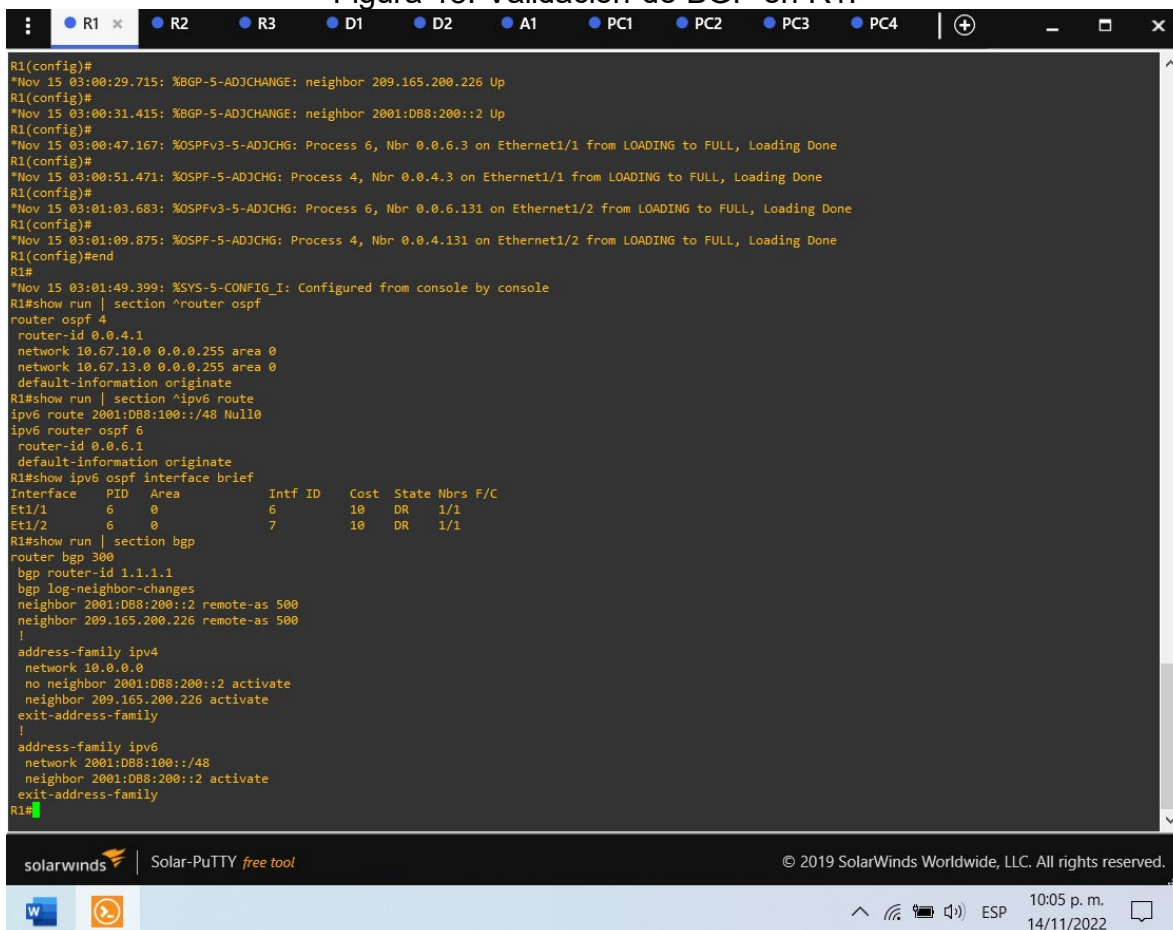
```
R2(config-router)# bgp router-id 2.2.2.2
R2(config-router)# neighbor 209.165.200.225 remote-as 300
R2(config-router)# neighbor 2001:db8:200::1 remote-as 300
R2(config-router)# address-family ipv4
R2(config-router-af)# neighbor 209.165.200.225 activate
R2(config-router-af)# no neighbor 2001:db8:200::1 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)#
*Nov 15 02:59:59.711: %BGP-5-ADJCHANGE: neighbor 209.165.200.225 Up
R2(config-router)#
*Nov 15 03:00:01.387: %BGP-5-ADJCHANGE: neighbor 2001:DB8:200::1 Up
R2(config-router)#end
R2#
R2#
*Nov 15 03:04:40.351: %SYS-5-CONFIG_I: Configured from console by console
R2#show run | section 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
  !
  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#
```

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Fuente: Autor.

Figura 18. Validación de BGP en R1.



```
R1 x R2 R3 D1 D2 A1 PC1 PC2 PC3 PC4
R1(config)#
Nov 15 03:00:29.715: %BGP-5-ADJCHANGE: neighbor 209.165.200.226 Up
R1(config)#
Nov 15 03:00:31.415: %BGP-5-ADJCHANGE: neighbor 2001:DB8:200::2 Up
R1(config)#
Nov 15 03:00:47.167: %OSPFv3-5-ADJCHG: Process 6, Nbr 0.0.6.3 on Ethernet1/1 from LOADING to FULL, Loading Done
R1(config)#
Nov 15 03:00:51.471: %OSPF-5-ADJCHG: Process 4, Nbr 0.0.4.3 on Ethernet1/1 from LOADING to FULL, Loading Done
R1(config)#
Nov 15 03:01:03.683: %OSPFv3-5-ADJCHG: Process 6, Nbr 0.0.6.131 on Ethernet1/2 from LOADING to FULL, Loading Done
R1(config)#
Nov 15 03:01:09.875: %OSPF-5-ADJCHG: Process 4, Nbr 0.0.4.131 on Ethernet1/2 from LOADING to FULL, Loading Done
R1(config)#end
R1#
Nov 15 03:01:49.399: %SYS-5-CONFIG_I: Configured from console by console
R1#show run | section ^router ospf
router ospf 4
router-id 0.0.4.1
network 10.67.10.0 0.0.0.255 area 0
network 10.67.13.0 0.0.0.255 area 0
default-information originate
R1#show run | section ^ipv6 route
ipv6 route 2001:DB8:100::/48 Null0
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 6 10 DR 1/1
Et1/2 6 0 7 10 DR 1/1
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#
```

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Fuente: Autor.

Figura 19. Validación de BGP y tabla de enrutamiento en R1.

```

R1 (config)#end
R1#
*Nov 15 03:01:49.399: %SYS-5-CONFIG_I: Configured from console by console
R1#show run | section ^router ospf
router ospf 4
  router-id 0.0.4.1
  network 10.67.10.0 0.0.0.255 area 0
  network 10.67.13.0 0.0.0.255 area 0
  default-information originate
R1#show run | section ^ipv6 route
ipv6 route 2001:DB8:100::/48 Null0
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
E1/1	6	0	6	10	DR	1/1	
E1/2	6	0	7	10	DR	1/1	

```

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#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, I - LISP
B* 0.0.0.0/0 [20/0] via 209.165.200.226, 00:04:16
B 2.2.2.2 [20/0] via 209.165.200.226, 00:04:16
O 10.67.11.0/24 [110/20] via 10.67.13.3, 00:04:44, Ethernet1/1
O 10.67.100.0/24 [110/11] via 10.67.10.2, 00:04:25, Ethernet1/2
O 10.67.101.0/24 [110/11] via 10.67.10.2, 00:04:25, Ethernet1/2
O 10.67.102.0/24 [110/11] via 10.67.10.2, 00:04:25, Ethernet1/2
R1#

```

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Fuente: Autor.

Figura 20. Validación de la tabla de enrutamiento IPv6 en R1.

```
R1#show ip route | include 0|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, I - LISP
B*    0.0.0.0 [20/0] via 209.165.200.226, 00:04:16
B     2.2.2.2 [20/0] via 209.165.200.226, 00:04:16
O     10.67.11.0/24 [110/20] via 10.67.13.3, 00:04:44, Ethernet1/1
O     10.67.100.0/24 [110/11] via 10.67.10.2, 00:04:25, Ethernet1/2
O     10.67.101.0/24 [110/11] via 10.67.10.2, 00:04:25, Ethernet1/2
O     10.67.102.0/24 [110/11] via 10.67.10.2, 00:04:25, Ethernet1/2
R1#show ipv6 route
IPv6 Routing Table - default - 13 entries
Codes: C - Connected, L - Local, S - Static, U - Per-user Static route
       B - BGP, HA - Home Agent, MR - Mobile Router, R - RIP
       H - NHRP, I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea
       IS - ISIS summary, D - EIGRP, EX - EIGRP external, NM - NEMO
       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, I - 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::13:3, 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
R1#
```

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W 10:05 p. m. 14/11/2022

Fuente: Autor.

Figura 21. Validación de la tabla de enrutamiento IPv4 en OSPF en R3.

```
R3(config)#
R3(config)#router ospf 4
R3(config-router)# router-id 0.0.4.3
R3(config-router)# network 10.67.11.0 0.0.0.255 area 0
R3(config-router)# network 10.67.13.0 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
R3#
*Nov 15 02:59:56.979: %SYS-5-CONFIG_I: Configured from console by console
*Nov 15 02:59:57.075: %OSPFv3-5-ADJCHG: Process 6, Nbr 0.0.6.1 on Ethernet1/1 from LOADING to FULL, Loading Done
R3#
*Nov 15 03:00:01.387: %OSPF-5-ADJCHG: Process 4, Nbr 0.0.4.1 on Ethernet1/1 from LOADING to FULL, Loading Done
R3#
*Nov 15 03:00:39.959: %OSPFv3-5-ADJCHG: Process 6, Nbr 0.0.6.132 on Ethernet1/0 from LOADING to FULL, Loading Done
R3#
*Nov 15 03:00:44.071: %OSPF-5-ADJCHG: Process 4, Nbr 0.0.4.132 on Ethernet1/0 from LOADING to FULL, Loading Done
R3#
R3#show run | section ^router ospf
router ospf 4
  router-id 0.0.4.3
  network 10.67.11.0 0.0.0.255 area 0
  network 10.67.13.0 0.0.0.255 area 0
R3#show run | section ^ipv6 route
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             6        10  BDR   1/1
Et1/0     6   0             5        10  DR    1/1
R3#show ip route ospf | begin Gateway
Gateway of last resort is 10.67.13.1 to network 0.0.0.0

O*E2  0.0.0.0/0 [110/1] via 10.67.13.1, 00:04:42, Ethernet1/1
      10.0.0.0/8 is variably subnetted, 8 subnets, 2 masks
O      10.67.10.0/24 [110/20] via 10.67.13.1, 00:05:15, Ethernet1/1
O      10.67.100.0/24 [110/11] via 10.67.11.2, 00:04:28, Ethernet1/0
O      10.67.101.0/24 [110/11] via 10.67.11.2, 00:04:28, Ethernet1/0
O      10.67.102.0/24 [110/11] via 10.67.11.2, 00:04:28, Ethernet1/0
R3#
```

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10:06 p. m. 14/11/2022

Fuente: Autor.

Figura 22. Validación de la tabla de enrutamiento IPv6 en OSPF en R3.

```

R3#
*Nov 15 03:00:01.387: %OSPF-5-ADJCHG: Process 4, Nbr 0.0.4.1 on Ethernet1/1 from LOADING to FULL, Loading Done
R3#
*Nov 15 03:00:39.959: %OSPFv3-5-ADJCHG: Process 6, Nbr 0.0.6.132 on Ethernet1/0 from LOADING to FULL, Loading Done
R3#
*Nov 15 03:00:44.071: %OSPF-5-ADJCHG: Process 4, Nbr 0.0.4.132 on Ethernet1/0 from LOADING to FULL, Loading Done
R3#
R3#show run | section ^router ospf
router ospf 4
  router-id 0.0.4.3
  network 10.67.11.0 0.0.0.255 area 0
  network 10.67.13.0 0.0.0.255 area 0
R3#show run | section ^ipv6 route
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     6        10  BDR   1/1
Et1/0     6   0     5        10  DR    1/1
R3#show ip route ospf | begin Gateway
Gateway of last resort is 10.67.13.1 to network 0.0.0.0

O'E2  0.0.0.0/0 [110/1] via 10.67.13.1, 00:04:42, Ethernet1/1
      10.0.0.0/8 is variably subnetted, 8 subnets, 2 masks
O      10.67.10.0/24 [110/20] via 10.67.13.1, 00:05:15, Ethernet1/1
O      10.67.100.0/24 [110/11] via 10.67.11.2, 00:04:28, Ethernet1/0
O      10.67.101.0/24 [110/11] via 10.67.11.2, 00:04:28, Ethernet1/0
O      10.67.102.0/24 [110/11] via 10.67.11.2, 00:04:28, Ethernet1/0
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, HA - Home Agent, MR - Mobile Router, R - RIP
        H - NHRP, I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea
        IS - ISIS summary, D - EIGRP, EX - EIGRP external, NM - NEMO
        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, I - IISP
OE2 ::/0 [110/1], tag 6
      via FE80::1:3, Ethernet1/1
O 2001:DB8:100:100::/64 [110/11]
      via FE80::D1:1, Ethernet1/0
O 2001:DB8:100:101::/64 [110/11]
      via FE80::D1:1, Ethernet1/0
O 2001:DB8:100:102::/64 [110/11]
      via FE80::D1:1, Ethernet1/0
O 2001:DB8:100:1013::/64 [110/10]
      via Ethernet1/1, directly connected
R3#
  
```

Fuente: Autor.

#### 2.1.4. 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. Tabla de tareas a realizar en la parte 4.

Task#	Task	Specification
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"> <li>• Use SLA number <b>4</b> for IPv4.</li> <li>• Use SLA number <b>6</b> for IPv6.</li> </ul> <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"> <li>• Use track number <b>4</b> for IP SLA 4.</li> <li>• Use track number <b>6</b> for IP SLA 6.</li> </ul> <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>
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"> <li>• Use SLA number <b>4</b> for IPv4.</li> <li>• Use SLA number <b>6</b> for IPv6.</li> </ul> <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"> <li>• Use track number <b>4</b> for IP SLA 4.</li> <li>• Use track number <b>6</b> for IP SLA 6.</li> </ul>

Task#	Task	Specification
		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.
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.  Configure HSRP version 2.</p> <p>Configure IPv4 HSRP group <b>104</b> for VLAN 100:</p> <ul style="list-style-type: none"> <li>• Assign the virtual IP address <b>10.67.100.254</b>.</li> <li>• Set the group priority to <b>150</b>.</li> <li>• Enable preemption.</li> <li>• Track object 4 and decrement by 60.</li> </ul> <p>Configure IPv4 HSRP group <b>114</b> for VLAN 101:</p> <ul style="list-style-type: none"> <li>• Assign the virtual IP address <b>10.67.101.254</b>.</li> <li>• Enable preemption.</li> <li>• Track object 4 to decrement by 60.</li> </ul> <p>Configure IPv4 HSRP group <b>124</b> for VLAN 102:</p> <ul style="list-style-type: none"> <li>• Assign the virtual IP address <b>10.67.102.254</b>.</li> <li>• Set the group priority to <b>150</b>.</li> <li>• Enable preemption.</li> <li>• Track object 4 to decrement by 60.</li> </ul> <p>Configure IPv6 HSRP group <b>106</b> for VLAN 100:</p> <ul style="list-style-type: none"> <li>• Assign the virtual IP address using <b>ipv6 autoconfig</b>.</li> <li>• Set the group priority to <b>150</b>.</li> <li>• Enable preemption.</li> <li>• Track object 6 and decrement by 60.</li> </ul> <p>Configure IPv6 HSRP group <b>116</b> for VLAN 101:</p> <ul style="list-style-type: none"> <li>• Assign the virtual IP address using <b>ipv6 autoconfig</b>.</li> <li>• Enable preemption.</li> <li>• Track object 6 and decrement by 60.</li> </ul> <p>Configure IPv6 HSRP group <b>126</b> for VLAN 102:</p> <ul style="list-style-type: none"> <li>• Assign the virtual IP address using <b>ipv6 autoconfig</b>.</li> <li>• Set the group priority to <b>150</b>.</li> <li>• Enable preemption.</li> <li>• Track object 6 and decrement by 60.</li> </ul>
	On D2, configure HSRPv2.	<p>D2 is the primary router for VLAN 101; therefore, the priority will also be changed to 150.  Configure HSRP version 2.  Configure IPv4 HSRP group <b>104</b> for VLAN 100:</p>

Task#	Task	Specification
		<ul style="list-style-type: none"> <li>• Assign the virtual IP address <b>10.67.100.254</b>.</li> <li>• Enable preemption.</li> <li>• Track object 4 and decrement by 60.</li> </ul> Configure IPv4 HSRP group <b>114</b> for VLAN 101: <ul style="list-style-type: none"> <li>• Assign the virtual IP address <b>10.67.101.254</b>.</li> <li>• Set the group priority to <b>150</b>.</li> <li>• Enable preemption.</li> <li>• Track object 4 to decrement by 60.</li> </ul> Configure IPv4 HSRP group <b>124</b> for VLAN 102: <ul style="list-style-type: none"> <li>• Assign the virtual IP address <b>10.67.102.254</b>.</li> <li>• Enable preemption.</li> <li>• Track object 4 to decrement by 60.</li> </ul> Configure IPv6 HSRP group <b>106</b> for VLAN 100: <ul style="list-style-type: none"> <li>• Assign the virtual IP address using <b>ipv6 autoconfig</b>.</li> <li>• Enable preemption.</li> <li>• Track object 6 and decrement by 60.</li> </ul> Configure IPv6 HSRP group <b>116</b> for VLAN 101: <ul style="list-style-type: none"> <li>• Assign the virtual IP address using <b>ipv6 autoconfig</b>.</li> <li>• Set the group priority to <b>150</b>.</li> <li>• Enable preemption.</li> <li>• Track object 6 and decrement by 60.</li> </ul> Configure IPv6 HSRP group <b>126</b> for VLAN 102: <ul style="list-style-type: none"> <li>• Assign the virtual IP address using <b>ipv6 autoconfig</b>.</li> <li>• Enable preemption.</li> <li>• Track object 6 and decrement by 60.</li> </ul>

Fuente: Autor del documento.

### Switch D1

```

D1#configure terminal
D1(config)#ip sla 4 //Se asigna SLA con numero
4 para IPv4
D1(config-ip-sla)# icmp-echo 10.67.10.1 //Se asigna la interfaz de
prueba
D1(config-ip-sla-echo)# frequency 5 //Se asigna la frecuencia de
la prueba
D1(config-ip-sla-echo)# exit
D1(config)#ip sla 6 //Se asigna SLA con numero
6 para IPv6

```

```

D1(config-ip-sla)# icmp-echo 2001:db8:100:1010::1 //Se asigna la interfaz de
prueba
D1(config-ip-sla-echo)# frequency 5 //Se asigna la frecuencia de
la prueba
D1(config-ip-sla-echo)# exit
D1(config)#ip sla schedule 4 life forever start-time now //Se programa SLA
para implementacion inmediata sin tiempo de finalización
D1(config)#ip sla schedule 6 life forever start-time now //Se programa SLA
para implementacion inmediata sin tiempo de finalización
D1(config)#track 4 ip sla 4 //Se asigna una pista con id 4
D1(config-track)# delay down 10 up 15 //Se configuran los tiempo de
notificación de abajo a arriba después de 10 sg o de arriba abajo después de 15 sg
D1(config-track)# exit
D1(config)#track 6 ip sla 6 //Se asigna una pista con id 6
D1(config-track)# delay down 10 up 15 //Se configuran los tiempo de
notificación de abajo a arriba después de 10 sg o de arriba abajo después de 15 sg
D1(config-track)# exit
D1(config)#interface vlan 100 //Se accede a la interfaz
D1(config-if)# standby version 2 //Se asigna HSRP version 2
D1(config-if)# standby 104 ip 10.67.100.254 //Se asigna una dirección ip
virtual
D1(config-if)# standby 104 priority 150 //Se asigna la prioridad de
grupo
D1(config-if)# standby 104 preempt //Se establece preferencia
D1(config-if)# standby 104 track 4 decrement 60 //Se asigna una pista con
decremento de 60
D1(config-if)# standby 106 ipv6 autoconfig //Se asigna una dirección ip
virtual autoconfigurable
D1(config-if)# standby 106 priority 150 //Se asigna la prioridad de
grupo
D1(config-if)# standby 106 preempt //Se establece preferencia
D1(config-if)# standby 106 track 6 decrement 60 //Se asigna una pista con
decremento de 60
D1(config-if)# exit
D1(config)#interface vlan 101 //Se accede a la interfaz
D1(config-if)# standby version 2 //Se asigna HSRP version 2
D1(config-if)# standby 114 ip 10.67.101.254 //Se asigna una dirección ip
virtual
D1(config-if)# standby 114 preempt //Se establece preferencia
D1(config-if)# standby 114 track 4 decrement 60 //Se asigna una pista con
decremento de 60
D1(config-if)# standby 116 ipv6 autoconfig //Se asigna una dirección ip
virtual autoconfigurable
D1(config-if)# standby 116 preempt //Se establece preferencia

```

```

D1(config-if)# standby 116 track 6 decrement 60 //Se asigna una pista con
decremento de 60
D1(config-if)# exit
D1(config)#interface vlan 102 //Se accede a la interfaz
D1(config-if)# standby version 2 //Se asigna HSRP version 2
D1(config-if)# standby 124 ip 10.67.102.254 //Se asigna una dirección ip
virtual
D1(config-if)# standby 124 priority 150 //Se asigna la prioridad de
grupo
D1(config-if)# standby 124 preempt //Se establece preferencia
D1(config-if)# standby 124 track 4 decrement 60 //Se asigna una pista con
decremento de 60
D1(config-if)# standby 126 ipv6 autoconfig //Se asigna una dirección ip
virtual autoconfigurable
D1(config-if)# standby 126 priority 150 //Se asigna la prioridad de
grupo
D1(config-if)# standby 126 preempt //Se establece preferencia
D1(config-if)# standby 126 track 6 decrement 60
D1(config-if)# exit
D1(config)#end

```

#### Switch D2

```

D2#configure terminal
D2(config)#ip sla 4 //Se asigna SLA con numero
4 para IPv4
D2(config-ip-sla)# icmp-echo 10.67.11.1 //Se asigna la interfaz de
prueba
D2(config-ip-sla-echo)# frequency 5 //Se asigna la frecuencia de
la prueba
D2(config-ip-sla-echo)#exit
D2(config)#ip sla 6 //Se asigna SLA con numero
6 para IPv6
D2(config-ip-sla)# icmp-echo 2001:db8:100:1011::1 //Se asigna la interfaz de
prueba
D2(config-ip-sla-echo)# frequency 5 //Se asigna la frecuencia de
la prueba
D2(config-ip-sla-echo)#exit
D2(config)#ip sla schedule 4 life forever start-time now //Se programa SLA
para implementacion inmediata sin tiempo de finalización
D2(config)#ip sla schedule 6 life forever start-time now //Se programa SLA
para implementacion inmediata sin tiempo de finalización
D2(config)#track 4 ip sla 4 //Se asigna una pista con id
4

```

```

D2(config-track)# delay down 10 up 15 //Se configuran los tiempo
de notificación de abajo a arriba después de 10 sg o de arriba abajo después de
15 sg
D2(config-track)# exit
D2(config)#track 6 ip sla 6 //Se asigna una pista con id
6
D2(config-track)# delay down 10 up 15 //Se configuran los tiempo
de notificación de abajo a arriba después de 10 sg o de arriba abajo después de
15 sg
D2(config-track)# exit
D2(config)#interface vlan 100 //Se accede a la interfaz
D2(config-if)# standby version 2 //Se asigna HSRP version 2
D2(config-if)# standby 104 ip 10.67.100.254 //Se asigna una dirección ip
virtual
D2(config-if)# standby 104 preempt //Se establece preferencia
D2(config-if)# standby 104 track 4 decrement 60 //Se asigna una pista con
decremento de 60
D2(config-if)# standby 106 ipv6 autoconfig //Se asigna una dirección ip
virtual autoconfigurable
D2(config-if)# standby 106 preempt //Se establece preferencia
D2(config-if)# standby 106 track 6 decrement 60 //Se asigna una pista con
decremento de 60
D2(config-if)# exit
D2(config)#interface vlan 101 //Se accede a la interfaz
D2(config-if)# standby version 2 //Se asigna HSRP version 2
D2(config-if)# standby 114 ip 10.67.101.254 //Se asigna una dirección ip
virtual
D2(config-if)# standby 114 priority 150 //Se asigna la prioridad de
grupo
D2(config-if)# standby 114 preempt //Se establece preferencia
D2(config-if)# standby 114 track 4 decrement 60 //Se asigna una pista con
decremento de 60
D2(config-if)# standby 116 ipv6 autoconfig //Se asigna una dirección ip
virtual autoconfigurable
D2(config-if)# standby 116 priority 150 //Se asigna la prioridad de
grupo
D2(config-if)# standby 116 preempt //Se establece preferencia
D2(config-if)# standby 116 track 6 decrement 60 //Se asigna una pista con
decremento de 60
D2(config-if)# exit
D2(config)#interface vlan 102 //Se accede a la interfaz
D2(config-if)# standby version 2 //Se asigna HSRP version 2
D2(config-if)# standby 124 ip 10.67.102.254 //Se asigna una dirección ip
virtual
D2(config-if)# standby 124 preempt //Se establece preferencia

```

```

D2(config-if)# standby 124 track 4 decrement 60 //Se asigna una pista con
decremento de 60
D2(config-if)# standby 126 ipv6 autoconfig //Se asigna una dirección ip
virtual autoconfigurable
D2(config-if)# standby 126 preempt //Se establece preferencia
D2(config-if)# standby 126 track 6 decrement 60 //Se asigna una pista con
decremento de 60
D2(config-if)# exit
D2(config)#end

```

Figura 23. Validación de los comandos IP SLA aplicados en D1.

```

D1(config-if)# standby version 2
D1(config-if)# standby 114 ip 10.67.101.254
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 10.67.102.254
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#
*Nov 15 03:06:44.778: %SYS-5-CONFIG_I: Configured from console by console
D1#
*Nov 15 03:07:06.843: %HSRP-5-STATECHANGE: Vlan102 Grp 124 state Standby -> Active
*Nov 15 03:07:06.843: %HSRP-5-STATECHANGE: Vlan101 Grp 116 state Standby -> Active
*Nov 15 03:07:06.879: %HSRP-5-STATECHANGE: Vlan101 Grp 114 state Standby -> Active
*Nov 15 03:07:07.067: %HSRP-5-STATECHANGE: Vlan100 Grp 104 state Standby -> Active
*Nov 15 03:07:07.320: %HSRP-5-STATECHANGE: Vlan100 Grp 106 state Standby -> Active
D1#
*Nov 15 03:07:08.751: %HSRP-5-STATECHANGE: Vlan102 Grp 126 state Standby -> Active
D1#
*Nov 15 03:07:25.709: %HSRP-5-STATECHANGE: Vlan101 Grp 114 state Active -> Speak
*Nov 15 03:07:26.286: %HSRP-5-STATECHANGE: Vlan101 Grp 116 state Active -> Speak
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 10.67.10.1
 frequency 5
ip sla schedule 4 life forever start-time now
ip sla 6
 icmp-echo 2001:DB8:100:1010::1
 frequency 5
ip sla schedule 6 life forever start-time now
D1#

```

Fuente: Autor.

Figura 24. Validación de los comandos standby aplicados en D1.

```

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#
*Nov 15 03:06:44.778: %SYS-5-CONFIG_I: Configured from console by console
D1#
*Nov 15 03:07:06.843: %HSRP-5-STATECHANGE: Vlan102 Grp 124 state Standby -> Active
*Nov 15 03:07:06.843: %HSRP-5-STATECHANGE: Vlan101 Grp 116 state Standby -> Active
*Nov 15 03:07:06.879: %HSRP-5-STATECHANGE: Vlan101 Grp 114 state Standby -> Active
*Nov 15 03:07:07.067: %HSRP-5-STATECHANGE: Vlan100 Grp 104 state Standby -> Active
*Nov 15 03:07:07.320: %HSRP-5-STATECHANGE: Vlan100 Grp 106 state Standby -> Active
D1#
*Nov 15 03:07:08.751: %HSRP-5-STATECHANGE: Vlan102 Grp 126 state Standby -> Active
D1#
*Nov 15 03:07:25.709: %HSRP-5-STATECHANGE: Vlan101 Grp 114 state Active -> Speak
*Nov 15 03:07:26.286: %HSRP-5-STATECHANGE: Vlan101 Grp 116 state Active -> Speak
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 10.67.10.1
frequency 5
ip sla schedule 4 life forever start-time now
ip sla 6
icmp-echo 2001:DB8:100:1010::1
frequency 5
ip sla schedule 6 life forever start-time now
D1#
*Nov 15 03:07:36.593: %HSRP-5-STATECHANGE: Vlan101 Grp 116 state Speak -> Standby
*Nov 15 03:07:37.559: %HSRP-5-STATECHANGE: Vlan101 Grp 114 state Speak -> Standby
D1#show standby brief
P indicates configured to preempt.
|
Interface Grp Pri P State Active Standby Virtual IP
V1100 104 150 P Active local 10.67.100.2 10.67.100.254
V1100 106 150 P Active local FE80::D2:2 FE80::5:73FF:FEA0:6A
V1101 114 100 P Standby 10.67.101.2 local 10.67.101.254
V1101 116 100 P Standby FE80::D2:3 local FE80::5:73FF:FEA0:74
V1102 124 150 P Active local 10.67.102.2 10.67.102.254
V1102 126 150 P Active local FE80::D2:4 FE80::5:73FF:FEA0:7E
D1#

```

Fuente: Autor.

Figura 25. Validación de los comandos IP SLA aplicados en D2.

```
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 10.67.101.254
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 10.67.102.254
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#
*Nov 15 03:07:04.784: %SYS-5-CONFIG_I: Configured from console by console
D2#
*Nov 15 03:07:25.708: %HSRP-5-STATECHANGE: Vlan101 Grp 114 state Speak -> Active
*Nov 15 03:07:26.285: %HSRP-5-STATECHANGE: Vlan101 Grp 116 state Speak -> Active
D2#
*Nov 15 03:07:28.122: %HSRP-5-STATECHANGE: Vlan100 Grp 104 state Speak -> Standby
*Nov 15 03:07:28.482: %HSRP-5-STATECHANGE: Vlan102 Grp 124 state Speak -> Standby
*Nov 15 03:07:28.501: %HSRP-5-STATECHANGE: Vlan100 Grp 106 state Speak -> Standby
D2#
*Nov 15 03:07:30.668: %HSRP-5-STATECHANGE: Vlan102 Grp 126 state Speak -> Standby
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 10.67.11.1
 frequency 5
ip sla schedule 4 life forever start-time now
ip sla 6
 icmp-echo 2001:DB8:100:1011::1
 frequency 5
ip sla schedule 6 life forever start-time now
D2#
```

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Windows taskbar: 10:07 p. m. 14/11/2022

Fuente: Autor.

## CONCLUSIONES

Con el desarrollo de esta prueba de habilidades se puede comprender como es el procedimiento para adecuar una topología de red, implementar los respectivos direccionamientos y llevar a cabo cada uno de los procesos que permitan establecer el correcto funcionamiento de la red. Hay temas que son bastantes complejos, pero este diplomado de profundización es un paso para comprender y evidenciar los conceptos elementales e incentivar a en un futuro, llevar a cabo investigaciones sobre el tema y así poder aplicar correctamente a cargos de administrador de redes.

Esta prueba permite comprender como sería la aplicación de varios conceptos de redes, la implementación de técnicas y la verificación de aplicaciones realizadas a los dispositivos, que van desde la implementación de vlans en dispositivos switch capa 3, la habilitación del enrutamiento ipv6 y la ejecución de bgp con un asn designado.

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