

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 - ECBTI
INGENIERÍA ELECTRÓNICA
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Título de INGENIERO ELECTRÓNICO

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NOTA DE ACEPTACIÓN

Firma del Presidente del Jurado

Firma del Jurado

Firma del Jurado

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GLOSARIO

DHCP: “dynamic Host Configuration Protocol”, es un protocolo de red que utiliza una arquitectura cliente-servidor.

HOST: es cualquier computadora o máquina conectada a una red mediante un número de IP definido y un dominio, que ofrece recursos, información y servicios a sus usuarios.

IPV4: protocolo de Internet utilizado actualmente para las direcciones IP de los dominios.

IPV6: obedece a la sexta y más reciente versión del Protocolo de Internet, pretende reemplazar la escasez de direcciones que tiene el actual IPv4.

LAN: red de área local (Local Area Network) son un conjunto de dispositivos electrónicos conectados entre sí que comparten una línea de comunicación común o un enlace inalámbrico con un servidor.

ISP: “Internet Service Provider” se refiere a una empresa o compañía que proporciona acceso a Internet, permitiendo que sus clientes puedan navegar en la web.

ROUTER: se encarga de distribuir la conexión a Internet a distintos ordenadores vinculados a una misma red local. Por tanto, actúa de intermediario entre el conjunto de equipos e Internet.

SWITCH: conectan varios dispositivos, como computadoras, access points inalámbricos, impresoras y servidores; en la misma red dentro de un edificio o campus. Un switch permite a los dispositivos conectados compartir información y comunicarse entre sí.

VLAN: pueden considerarse como dominios de difusión lógica. Una VLAN divide los grupos de usuarios de la red de una red física real en segmentos de redes lógicas.

RESUMEN

Para el desarrollo de las pruebas de habilidades se realiza la construcción de una red basada en la topología planteada en el escenario 1, donde se configura y direcciona los dispositivos empleados en dicha red. De igual manera se configura la capa 2 de la red y la compatibilidad de los host, así mismo se realiza la configuración de los protocolos de enrutamiento y redundancia de primer salto.

Durante el proceso se documenta la configuración de los distintos dispositivos de la red y con ayuda de la herramienta GNS3 se prueba y verifica la configuración de los dispositivos por medio de la simulación.

PALABRAS CLAVE: Electrónica, Redes, Telecomunicaciones, Router, Switch, CCNP, Cisco, Enrutamiento, Diplomado.

ABSTRACT

For the development of the skills tests, the construction of a network based on the topology proposed in scenario 1 is carried out, where the devices used in said network are configured and addressed. In the same way, layer 2 of the network and the compatibility of the hosts are configured, as well as the configuration of the routing protocols and first hop redundancy.

During the process, the configuration of the different network devices is documented and with the help of the GNS3 tool, the configuration of the devices is tested and verified through simulation.

KEYWORDS: Electronics, Networks, Telecommunications, Router, Switch, CCNP, Cisco, Routing, Diplomat.

INTRODUCCIÓN

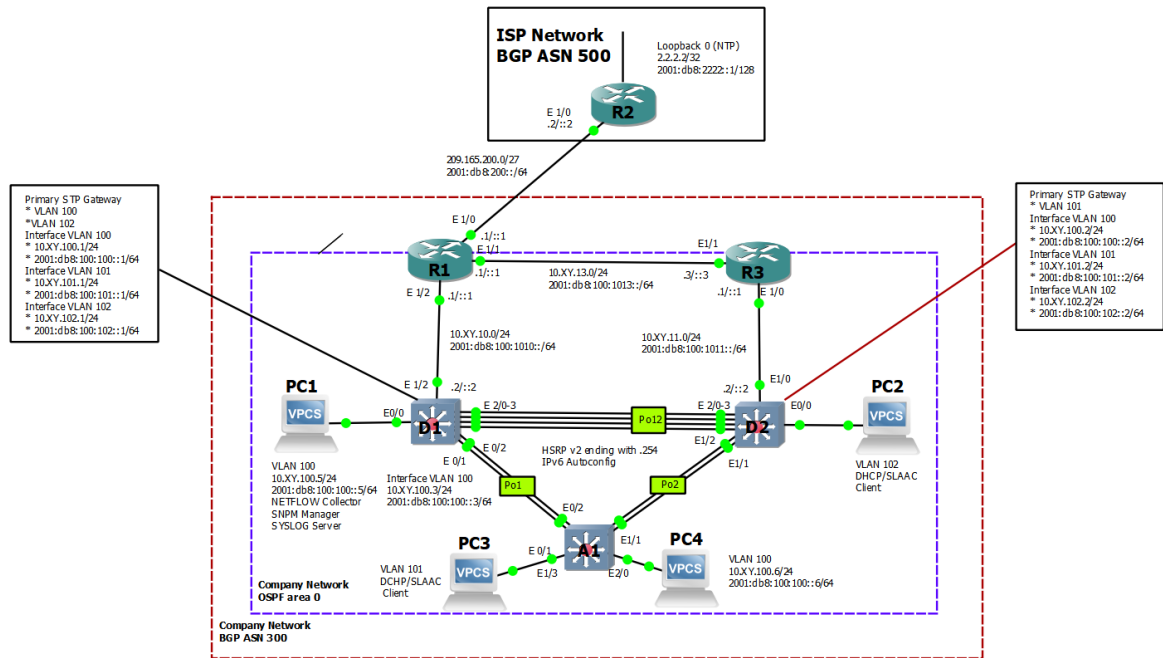
La realización del presente trabajo se basa en el conocimiento adquirido durante el diplomado de profundización Cisco CCNP, el cual se enfoca en el entendimiento de la infraestructura empresarial, incluida la arquitectura de doble pila (IPv4 e IPv6), virtualización, infraestructura, garantía de red, seguridad, y automatización.

Estos conocimientos se ponen en práctica por medio de pruebas de habilidades prácticas CCNP.

DESARROLLO

Escenario 1.

Figura 1. Topología escenario 1



Fuente: Guía escenario 1.

Tabla 1. Table de direccionamiento

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
	E1/2	10.19.10.1/24	2001:db8:100:1010::1/64	fe80::1:2
	E1/1	10.19.13.1/24	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
	Loopback0	2.2.2.2/32	2001:db8:2222::1/128	fe80::2:3
R3	E1/0	10.19.11.1/24	2001:db8:100:1011::1/64	fe80::3:2
	E1/1	10.19.13.3/24	2001:db8:100:1013::3/64	fe80::3:3

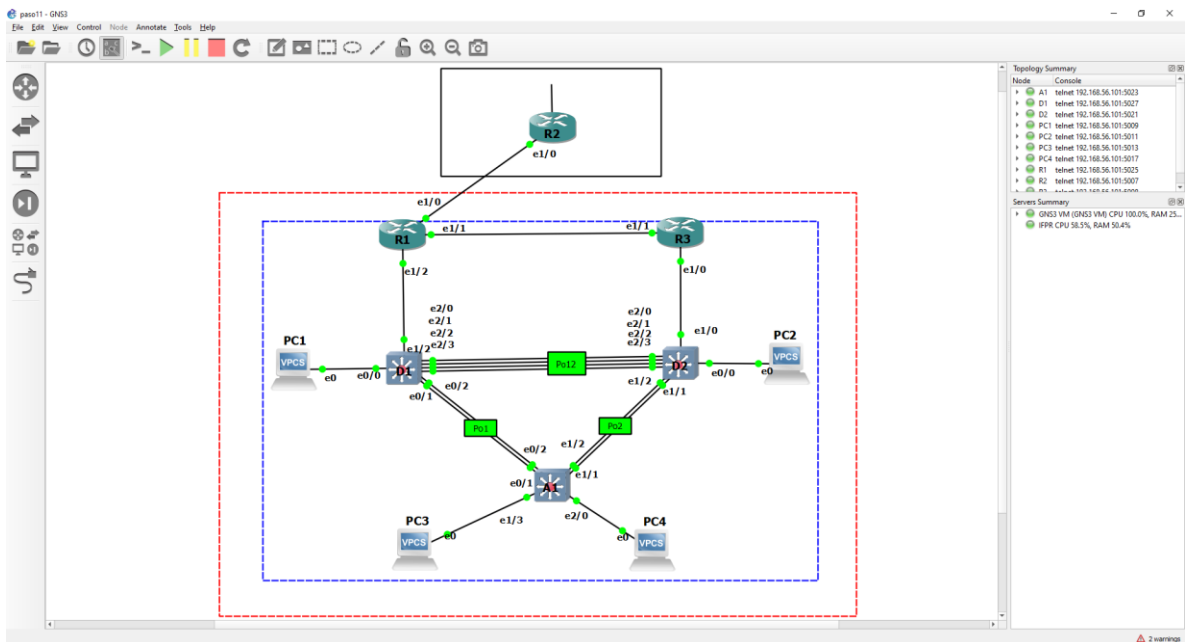
Device	Interface	IPv4 Address	IPv6 Address	IPv6 Link-Local
D1	E1/2	10.19.10.2/24	2001:db8:100:1010::2/64	fe80::d1:1
	VLAN 100	10.19.100.1/24	2001:db8:100:100::1/64	fe80::d1:2
	VLAN 101	10.19.101.1/24	2001:db8:100:101::1/64	fe80::d1:3
	VLAN 102	10.19.102.1/24	2001:db8:100:102::1/64	fe80::d1:4
D2	E1/0	10.19.11.2/24	2001:db8:100:1011::2/64	fe80::d2:1
	VLAN 100	10.19.100.2/24	2001:db8:100:100::2/64	fe80::d2:2
	VLAN 101	10.19.101.2/24	2001:db8:100:101::2/64	fe80::d2:3
	VLAN 102	10.19.102.2/24	2001:db8:100:102::2/64	fe80::d2:4
A1	VLAN 100	10.19.100.3/23	2001:db8:100:100::3/64	fe80::a1:1
PC1	NIC	10.19.100.5/24	2001:db8:100:100::5/64	EUI-64
PC2	NIC	DHCP	SLAAC	EUI-64
PC3	NIC	DHCP	SLAAC	EUI-64
PC4	NIC	10.19.100.6/24	2001:db8:100:100::6/64	EUI-64

Fuente: Guía escenario 1.

Parte 1: Construir la red y configurar los ajustes básicos del dispositivo y el direccionamiento de la interfaz.

Paso 1: Cable la red como se muestra en la topología.

Figura 2. Topología implementada en GNS3



Fuente: Autoría propia

Paso 2: Configure los ajustes básicos para cada dispositivo.

- a. Dentro de cada dispositivo ingrese a la consola, ingrese al modo de configuración global y aplique la configuración básica.

Configuración de Router R1

```
R1#conf t
```

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

```
R1(config)#hostname R1
```

```
R1(config)#ipv6 unicast-routing
```

```
R1(config)#no ip domain lookup
```

```
R1(config)#banner motd # R1, ENCOR Skills Assessment#
```

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

```
R1(config-line)#exec-timeout 0 0
```

```
R1(config-line)#logging synchronous
```

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

```
R1(config)#interface e1/0
```

```
R1(config-if)#ip address 209.165.200.225 255.255.255.224
```

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

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

```
R1(config-if)#no shutdown
```

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

```
R1(config)#interface e1/2
R1(config-if)#ip address 10.19.10.1 255.255.255.0
R1(config-if)#ipv6 address fe80::1:2 link-local
R1(config-if)#ipv6 address 2001:db8:100:1010::1/64
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#interface e1/1
R1(config-if)#ip address 10.19.13.1 255.255.255.0
R1(config-if)#ipv6 address fe80::1:3 link-local
R1(config-if)#ipv6 address 2001:db8:100:1013::1/64
R1(config-if)#no shutdown
R1(config-if)#
R1(config-if)#
R1(config-if)#exit
R1(config)#exit
R1#copy running-config startup-config
```

Configuración de Router R2

```
R2#conf t
R2(config)#hostname R2
R2(config)#ipv6 unicast-routing
R2(config)#no ip domain lookup
R2(config)#banner motd # R2, ENCOR Skills Assessment#
R2(config)#line con 0
R2(config-line)#exec-timeout 0 0
R2(config-line)#logging synchronous
R2(config-line)#exit
R2(config)#interface e1/0
R2(config-if)#ip address 209.165.200.226 255.255.255.224
R2(config-if)#ipv6 address fe80::2:1 link-local
R2(config-if)#ipv6 address 2001:db8:200::2/64
R2(config-if)#no shutdown
R2(config-if)#exit
R2(config)#interface Loopback 0
R2(config-if)#ip address 2.2.2.2 255.255.255.255
R2(config-if)#ipv6 address fe80::2:3 link-local
R2(config-if)#ipv6 address 2001:db8:2222::1/128
```

```
R2(config-if)#no shutdown
R2(config-if)#exit
R2(config)#exit
R2#
R2#copy running-config startup-config
```

Configuración de Router R3

```
R3#conf t
R3(config)#hostname R3
R3(config)#ipv6 unicast-routing
R3(config)#no ip domain lookup
R3(config)#banner motd # R3, ENCOR Skills Assessment#
R3(config)#line con 0
R3(config-line)#exec-timeout 0 0
R3(config-line)#logging synchronous
R3(config-line)#exit
R3(config)#interface e1/0
R3(config-if)#ip address 10.19.11.1 255.255.255.0
R3(config-if)#ipv6 address fe80::3:2 link-local
R3(config-if)#ipv6 address 2001:db8:100:1011::1/64
R3(config-if)#no shutdown
R3(config-if)#exit
R3(config)#
R3(config)#interface e1/1
R3(config-if)#ip address 10.19.13.3 255.255.255.0
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)#exit
R3#
R3#copy running-config startup-config
```

Configuración de Switch D1

```
D1#conf t
```

```
D1(config)#hostname D1
D1(config)#ip routing
D1(config)#ipv6 unicast-routing
D1(config)#no ip domain lookup
D1(config)#banner motd # D1, ENCOR Skills Assessment#
D1(config)#line con 0
D1(config-line)#line con 0
D1(config-line)#exec-timeout 0 0
D1(config-line)#logging synchronous
D1(config-line)#exit
D1(config)#vlan 100
D1(config-vlan)#name Management
D1(config-vlan)#exit
D1(config)#vlan 101
D1(config-vlan)#name UserGro
D1(config-vlan)#exit
D1(config)#vlan 102
D1(config-vlan)#name UserGroupB
D1(config-vlan)#
D1(config-vlan)#exit
D1(config)#vlan 101
D1(config-vlan)#name UserGroupA
D1(config-vlan)#exit
D1(config)#vlan 102
D1(config-vlan)#name UserGroupB
D1(config-vlan)#exit
D1(config)#vlan 999
D1(config-vlan)#name NATIVE
D1(config-vlan)#exit
D1(config)#interface e1/2
D1(config-if)#no switchport
D1(config-if)#ip address 10.19.10.2 255.255.255.0
D1(config-if)#ipv6 address fe80::d1:1 link-local
D1(config-if)#ipv6 address 2001:db8:100:1010::2/64
D1(config-if)#no shutdown
D1(config-if)#exit
D1(config)#interface vlan 100
D1(config-if)#ip address 10.19.100.1 255.255.255.0
D1(config-if)#ipv6 address fe80::d1:2 link-local
```

```

D1(config-if)#ipv6 address 2001:db8:100:100::1/64
D1(config-if)#no shutdown
D1(config-if)#exit
D1(config-if)#exit
D1(config)#interface vlan 101
D1(config-if)#ip address 10.19.101.1 255.255.255.0
D1(config-if)#ipv6 address fe80::d1:3 link-local
D1(config-if)#ipv6 address 2001:db8:100:101::1/64
D1(config-if)#no shutdown
D1(config-if)#exit
D1(config)#interface vlan 102
D1(config-if)#ip address 10.19.102.1 255.255.255.0
D1(config-if)#ipv6 address fe80::d1:4 link-local
D1(config-if)#ipv6 address 2001:db8:100:102::1/64
D1(config-if)#no shutdown
D1(config-if)#exit
D1(config)#interface vlan 100
D1(config-if)#ip address 10.19.100.1 255.255.255.0
D1(config-if)#ipv6 address fe80::d1:2 link-local
D1(config-if)#ipv6 address 2001:db8:100:100::1/64
D1(config-if)#no shutdown
D1(config-if)#exit
D1(config)#ip dhcp excluded-address 10.19.101.1 10.19.101.109
D1(config)#ip dhcp excluded-address 10.19.101.141 10.19.101.254
D1(config)#ip dhcp excluded-address 10.19.102.1 10.19.102.109
D1(config)#ip dhcp excluded-address 10.19.102.141 10.19.102.254
D1(config)#ip dhcp pool VLAN-101
D1(dhcp-config)#network 10.19.101.0 255.255.255.0
D1(dhcp-config)#default-router 10.19.101.254
D1(dhcp-config)#exit
D1(config)#ip dhcp pool VLAN-102
D1(dhcp-config)#network 10.19.102.0 255.255.255.0
D1(dhcp-config)#default-router 10.19.102.254
D1(dhcp-config)#default-router 10.19.102.254
D1(dhcp-config)#exit
D1(config)#interface range e0/0-3,e1/0-1,e1/3,e2/0-3,e3/0-3
D1(config-if-range)#shutdown
D1(config-if-range)#exit
D1(config)#

```

```
D1(config)#exit
D1#copy running-config startup-config
```

Configuración de Switch D2

```
D2#conf t
D2(config)#hostname D2
D2(config)#ip routing
D2(config)#ipv6 unicast-routing
D2(config)#no ip domain lookup
D2(config)#banner motd # D2, ENCOR Skills Assessment#
D2(config)#line con 0
D2(config-line)#exec-timeout 0 0
D2(config-line)#logging synchronous
D2(config-line)#exit
D2(config)#vlan 100
D2(config-vlan)#name Management
D2(config-vlan)#exit
D2(config)#vlan 101
D2(config-vlan)#name UserGroupA
D2(config-vlan)#exit
D2(config)#vlan 102
D2(config-vlan)#name UserGroupB
D2(config-vlan)#exit
D2(config)#vlan 999
D2(config-vlan)#name NATIVE
D2(config-vlan)#exit
D2(config)#interface e1/0
D2(config-if)#no switchport
D2(config-if)#ip address 10.19.11.2 255.255.255.0
D2(config-if)#ipv6 address fe80::d1:1 link-local
D2(config-if)#ipv6 address 2001:db8:100:1011::2/64
D2(config-if)#no shutdown
D2(config-if)#exit
D2(config)#interface vlan 100
D2(config-if)#ip address 10.19.100.2 255.255.255.0
D2(config-if)#ipv6 address fe80::d2:2 link-local
D2(config-if)#ipv6 address 2001:db8:100:100::2/64
```

```

D2(config-if)#no shutdown
D2(config-if)#exit
D2(config)#interface vlan 101
D2(config-if)#ip address 10.19.101.2 255.255.255.0
D2(config-if)#ipv6 address fe80::d2:3 link-local
D2(config-if)#ipv6 address 2001:db8:100:101::2/64
D2(config-if)#no shutdown
D2(config-if)#exit
D2(config)#interface vlan 102
D2(config-if)#ip address 10.19.102.2 255.255.255.0
D2(config-if)#ipv6 address fe80::d2:4 link-local
D2(config-if)#ipv6 address 2001:db8:100:102::2/64
D2(config-if)#no shutdown
D2(config-if)#exit
D2(config)#ip dhcp excluded-address 10.19.101.1 10.19.101.209
D2(config)#ip dhcp excluded-address 10.19.101.241 10.19.101.254
D2(config)#ip dhcp excluded-address 10.19.102.1 10.19.102.209
D2(config)#ip dhcp excluded-address 10.19.102.241 10.19.102.254
D2(config)#ip dhcp pool VLAN-101
D2(dhcp-config)#network 10.19.101.0 255.255.255.0
D2(dhcp-config)#default-router 19.0.101.254
D2(dhcp-config)#exit
D2(config)#ip dhcp pool VLAN-102
D2(dhcp-config)#network 10.19.102.0 255.255.255.0
D2(dhcp-config)#default-router 10.19.102.254
D2(dhcp-config)#exit
D2(config)#interface range e0/0-3,e1/1-3,e2/0-3,e3/0-3
D2(config-if-range)#shutdown
D2(config-if-range)#exit
D2(config)#exit
D2#
D2#copy running-config startup-config

```

Configuración de Switch A1

```

A1#conf t
A1(config)#hostname A1
A1(config)#no ip domain lookup

```

```
A1(config)#banner motd # A1, ENCOR Skills Assessment#
A1(config)#line con 0
A1(config-line)#exec-timeout 0 0
A1(config-line)#logging synchronous
A1(config-line)#exit
A1(config)#vlan 100
A1(config-vlan)#name Management
A1(config-vlan)#exit
A1(config)#
A1(config)#vlan 101
A1(config-vlan)#name UserGroupA
A1(config-vlan)#exit
A1(config)#vlan 102
A1(config-vlan)#name UserGroupB
A1(config-vlan)#exit
A1(config)#vlan 999
A1(config-vlan)#name NATIVE
A1(config-vlan)#exit
A1(config)#
A1(config)#interface vlan 100
A1(config-if)#ip address 10.19.100.3 255.255.255.0
A1(config-if)#ipv6 address fe80::a1:1 link-local
A1(config-if)#ipv6 address 2001:db8:100:100::3/64
A1(config-if)#no shutdown
A1(config-if)#exit
A1(config)#
A1(config)#interface range e0/0,e0/3,e1/0,e2/1-3,e3/0-3
A1(config-if-range)#
A1(config-if-range)#
A1(config-if-range)#exit
A1(config)#exit
A1#
A1#copy running-config startup-config
```

- b.** Guarde la configuración en ejecución con startup-config en todos los dispositivos.

Figura 3. Guardado de configuración en R1.

```

R1
*Nov 13 16:44:10.127: %LINK-3-UPDOWN: Interface Ethernet1/0, changed state to up
*Nov 13 16:44:10.655: %LINK-3-UPDOWN: Interface Ethernet1/2, changed state to up
*Nov 13 16:44:11.059: %LINK-3-UPDOWN: Interface Ethernet1/1, changed state to up
*Nov 13 16:44:11.127: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/0, changed state to up
R1(config-if)#
*Nov 13 16:44:11.655: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/2, changed state to up
*Nov 13 16:44:12.059: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/1, changed state to up
R1(config-if)#exit
R1(config)#exit
R1#copy running-config startup-config
Destination filename [startup-config]?
*Nov 13 16:44:29.899: %SYS-5-CONFIG_I: Configured from console by console

Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
[OK]
R1#
```

Fuente: Autoría propia

Figura 4. Guardado de configuración en R2.

```

R1
R2
R2(config-if)#no shutdown
R2(config-if)#exit
R2(config)#interface Loopback 0
R2(config-if)#ip address 2.2.2.2 255.255.255.255
R2(config-if)#ipv6 address fe80::2:3 link-local
R2(config-if)#ipv6 address 2001:db8:2222::1/128
R2(config-if)#no shutdown
R2(config-if)#exit
R2(config)#
*Nov 13 16:49:48.827: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up
R2(config)#
*Nov 13 16:49:50.595: %LINK-3-UPDOWN: Interface Ethernet1/0, changed state to up
*Nov 13 16:49:51.595: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/0, changed state to up
R2(config)#exit
R2#copy running-config startup-config
Destination filename [startup-config]?
*Nov 13 16:50:29.095: %SYS-5-CONFIG_I: Configured from console by console

Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
[OK]
R2#
```

Fuente: Autoría propia

Figura 5. Guardado de configuración en R3.

```

R3(config-if)#exit
R3(config)#interface e1/1
R3(config-if)#ip address 10.19.13.3 255.255.255.0
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 13 16:53:44.519: %LINK-3-UPDOWN: Interface Ethernet1/0, changed state to up
*Nov 13 16:53:45.003: %LINK-3-UPDOWN: Interface Ethernet1/1, changed state to up
*Nov 13 16:53:45.519: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/0, changed state to up
R3(config)#
*Nov 13 16:53:46.003: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/1, changed state to up
R3(config)#exit
R3#copy running-config startup-config
Destination filename [startup-config]?
Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
*Nov 13 16:54:02.187: %SYS-5-CONFIG_I: Configured from console by console
[confirm]
Building configuration...
[OK]
R3#
```

Fuente: Autoría propia

Figura 6. Guardado de configuración en D1.

```

*Nov 13 17:11:43.968: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/2, changed state to down
*Nov 13 17:11:43.969: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/3, changed state to down
*Nov 13 17:11:43.969: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/0, changed state to down
*Nov 13 17:11:43.969: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/1, changed state to down
*Nov 13 17:11:43.969: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/3, changed state to down
*Nov 13 17:11:43.973: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet2/0, changed state to down
*Nov 13 17:11:43.973: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet2/1, changed state to down
*Nov 13 17:11:43.982: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet2/2, changed state to down
*Nov 13 17:11:43.987: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet2/3, changed state to down
*Nov 13 17:11:43.987: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet3/0, changed state to down
*Nov 13 17:11:43.987: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet3/1, changed state to down
*Nov 13 17:11:43.995: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet3/2, changed state to down
D1(config)#
*Nov 13 17:11:43.995: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet3/3, changed state to down
D1(config)#exit
D1#copy running-config startup-config
Destination filename [startup-config]?
*Nov 13 17:12:24.641: %SYS-5-CONFIG_I: Configured from console by console

Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
Compressed configuration from 2490 bytes to 1371 bytes[OK]
```

Fuente: Autoría propia

Figura 7. Guardado de configuración en D2.

```

D2#
D2#
D2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
Compressed configuration from 2489 bytes to 1392 bytes[OK]
D2#

```

Fuente: Autoría propia

Figura 8. Guardado de configuración en A1.

```

: ● R1 ● R2 ● R3 ● D1 ● D2
*Nov 13 17:23:46.431: %LINK-5-CHANGED: Interface Ethernet3/0, changed state to administratively down
*Nov 13 17:23:46.431: %LINK-5-CHANGED: Interface Ethernet3/1, changed state to administratively down
*Nov 13 17:23:46.431: %LINK-5-CHANGED: Interface Ethernet3/2, changed state to administratively down
*Nov 13 17:23:46.444: %LINK-5-CHANGED: Interface Ethernet3/3, changed state to administratively down
*Nov 13 17:23:47.418: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/0, changed state to down
*Nov 13 17:23:47.423: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/3, changed state to down
*Nov 13 17:23:47.423: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/0, changed state to down
*Nov 13 17:23:47.423: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet2/1, changed state to down
*Nov 13 17:23:47.423: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet2/2, changed state to down
*Nov 13 17:23:47.435: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet2/3, changed state to down
*Nov 13 17:23:47.436: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet3/0, changed state to down
*Nov 13 17:23:47.436: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet3/1, changed state to down
A1(config)#
*Nov 13 17:23:47.436: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet3/2, changed state to down
*Nov 13 17:23:47.444: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet3/3, changed state to down
A1(config)#
A1(config)#exit
A1#copy running-config startup-config
Destination filename [startup-config]?
*Nov 13 17:24:25.192: %SYS-5-CONFIG_I: Configured from console by console

Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
Compressed configuration from 1633 bytes to 988 bytes[OK]
***

```

Fuente: Autoría propia

- c. Configure PC 1 and PC 4 host addressing as shown in the addressing table. Assign a default gateway address of 10.19.100.254 which will be the HSRP virtual IP address used in Part 4.

Figura 9. Configuración de PC1

```
Executing the startup file

PC1> ip 10.19.100.5/24 10.19.100.254
Checking for duplicate address...
PC1 : 10.19.100.5 255.255.255.0 gateway 10.19.100.254

PC1> save
Saving startup configuration to startup.vpc
. done

PC1> show ip

NAME       : PC1[1]
IP/MASK    : 10.19.100.5/24
GATEWAY    : 10.19.100.254
DNS        :
MAC        : 00:50:79:66:68:00
LPORT     : 20044
RHOST:PORT : 127.0.0.1:20045
MTU        : 1500

PC1> █
```

Fuente: Autoría propia

Figura 10. Configuración de PC4

```
Executing the startup file

PC4> ip 10.19.100.6/24 10.19.100.254
Checking for duplicate address...
PC4 : 10.19.100.6 255.255.255.0 gateway 10.19.100.254

PC4> save
Saving startup configuration to startup.vpc
. done

PC4> show ip

NAME       : PC4[1]
IP/MASK    : 10.19.100.6/24
GATEWAY    : 10.19.100.254
DNS        :
MAC        : 00:50:79:66:68:03
LPORT     : 20046
RHOST:PORT : 127.0.0.1:20047
MTU        : 1500

PC4> █
```

Fuente: Autoría propia

Parte 2: Configurar la red de capa 2 y la compatibilidad con el host.

Paso 2.1: En todos los conmutadores, configure las interfaces troncales IEEE 802.1Q en los enlaces de conmutador de interconexión

Paso 2.2: En todos los conmutadores, cambie la VLAN nativa en los enlaces troncales.

Paso 2.3: En todos los conmutadores, habilite el protocolo Rapid Spanning-Tree.

Paso 2.4: En D1 y D2, configure los puentes raíz RSTP apropiados según la información del diagrama de topología.

D1 y D2 deben proporcionar respaldo en caso de falla del puente raíz.

Paso 2.5: En todos los switches, cree LACP EtherChannels como se muestra en el diagrama de topología.

Paso 2.6: En todos los conmutadores, configure los puertos de acceso de host que se conectan a PC1, PC2, PC3 y PC4.

Desarrollo

Configuración de Switch D1

```
D1#conf t
```

```
D1(config)#Interface range e2/0-3
```

```
D1(config-if-range)#switchport trunk encapsulation dot1q
```

```
D1(config-if-range)#switchport mode trunk
```

```
D1(config-if-range)#switchport trunk native vlan 999
```

```
D1(config-if-range)#channel-group 12 mode active
```

```
D1(config-if-range)#no shutdown
```

```
D1(config-if-range)#exit
```

```
D1(config)#Interface range e0/1-2
```

```
D1(config-if-range)#switchport trunk encapsulation dot1q
```

```
D1(config-if-range)#switchport mode trunk
```

```
D1(config-if-range)#switchport trunk native vlan 999
```

```
D1(config-if-range)#channel-group 1 mode active
```

```
Creating a port-channel interface Port-channel 1
```

```
D1(config-if-range)#no shutdown
```

```
D1(config-if-range)#exit
```

```
D1(config)#spanning-tree mode rapid-pvst
```

```
D1(config)#spanning-tree vlan 100,102 root primary
```

```
D1(config)#spanning-tree vlan 101 root secondary
```

```
D1(config)#interface e0/0
```

```
D1(config-if)#switchport mode access
```

```
D1(config-if)#switchport access vlan 100
```

```
D1(config-if)#spanning-tree portfast
```

```
D1(config-if)#no shutdown
```

```
D1(config-if)#exit
```

```
D1(config)#
```

Configuración de Switch D2

```
D2#conf t
```

```
D2(config)#Interface range e2/0-3
```

```
D2(config-if-range)#switchport trunk encapsulation dot1q
```

```
D2(config-if-range)#switchport mode trunk
```

```
D2(config-if-range)#switchport trunk native vlan 999
```

```
D2(config-if-range)#channel-group 12 mode active
```

```
Creating a port-channel interface Port-channel 12
```

```
D2(config-if-range)#no shutdown
```

```
D2(config-if-range)#exit
```

```
D2(config)#Interface range e1/1-2
```

```
D2(config-if-range)#switchport trunk encapsulation dot1q
```

```
D2(config-if-range)#switchport mode trunk
```

```
D2(config-if-range)#switchport trunk native vlan 999
```

```
D2(config-if-range)#channel-group 2 mode active
```

```
Creating a port-channel interface Port-channel 2
```

```
D2(config-if-range)#no shutdown
```

```
D2(config-if-range)#exit
```

```
D2(config)#spanning-tree mode rapid-pvst
```

```
D2(config)#spanning-tree vlan 101 root primary
```

```
D2(config)#spanning-tree vlan 100,102 root secondary
```

```
D2(config)#interface e0/0
```

```
D2(config-if)#switchport mode access
```

```
D2(config-if)#switchport access vlan 102
```

```
D2(config-if)#spanning-tree portfast
```

```
D2(config-if)#no shutdown
```

```
D2(config-if)#exit
```

Configuración de Switch A1

```
A1#conf t
```

```
A1(config)#spanning-tree mode rapid-pvst
```

```
A1(config)#Interface range e0/1-2
```

```
A1(config-if-range)#switchport trunk encapsulation dot1q
```

```
A1(config-if-range)#switchport mode trunk
```

```
A1(config-if-range)#switchport trunk native vlan 999
```

```
A1(config-if-range)#channel-group 1 mode active
```

```
Creating a port-channel interface Port-channel 1
```

```
A1(config-if-range)#no shutdown
```

```
A1(config-if-range)#exit
```

```
A1(config)#Interface range e1/1-2
```

```
A1(config-if-range)#switchport trunk encapsulation dot1q
```

```
A1(config-if-range)#switchport mode trunk
```

```
A1(config-if-range)#switchport trunk native vlan 999
```

```
A1(config-if-range)#channel-group 2 mode active
```

```
Creating a port-channel interface Port-channel 2
```

```
A1(config-if-range)#no shutdown
```

```
A1(config-if-range)#exit
```

```
A1(config)#interface e1/3  
A1(config-if)#switchport mode access  
A1(config-if)#switch access vlan 101  
A1(config-if)#spanning-tree portfast  
A1(config-if)#no shutdown  
A1(config-if)#exit  
A1(config)#interface e2/0  
A1(config-if)#switchport mode access  
A1(config-if)#switch access vlan 100  
A1(config-if)#spanning-tree portfast  
A1(config-if)#no shutdown  
A1(config-if)#exit
```

Paso 2.7: Verifique los servicios DHCP IPv4.

Figura 11. Verificación de DHCP ipv4 en PC2



```
⋮ ● D1 ● D2 ● A1 ● PC1 ● PC2 x  
Welcome to Virtual PC Simulator, version 0.8.2  
Dedicated to Daling.  
Build time: Aug 23 2021 11:15:00  
Copyright (c) 2007-2015, Paul Meng (mirnshi@gmail.com)  
All rights reserved.  
  
VPCS is free software, distributed under the terms of the "BSD" licence.  
Source code and license can be found at vpcs.sf.net.  
For more information, please visit wiki.freecode.com.cn.  
  
Press '?' to get help.  
  
Executing the startup file  
  
PC2> DHCP  
Bad command: "DHCP". Use ? for help.  
  
PC2> dhcp  
DORA IP 10.19.102.210/24 GW 10.19.102.254  
  
PC2> █
```

Fuente: Autoría propia

Figura 12. Verificación de DHCP ipv4 en PC3

```

D1 D2 A1 PC1 PC2
Welcome to Virtual PC Simulator, version 0.8.2
Dedicated to Daling.
Build time: Aug 23 2021 11:15:00
Copyright (c) 2007-2015, Paul Meng (mirnshi@gmail.com)
All rights reserved.

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Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

PC3> dhcp
DORA IP 10.19.101.110/24 GW 10.19.101.254
PC3> █
```

Fuente: Autoría propia

Paso 2.8: Verifique la conectividad LAN local.

Figura 13. Verificación conectividad LAN local en PC1.

```

D1 D2 A1 PC1 PC2 PC3 PC4
All rights reserved.
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Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

Checking for duplicate address...
PC1 : 10.19.100.5 255.255.255.0 gateway 10.19.100.254

PC1> ping 10.19.100.1
84 bytes from 10.19.100.1 icmp_seq=1 ttl=255 time=0.615 ms
84 bytes from 10.19.100.1 icmp_seq=2 ttl=255 time=0.707 ms
84 bytes from 10.19.100.1 icmp_seq=3 ttl=255 time=0.566 ms
84 bytes from 10.19.100.1 icmp_seq=4 ttl=255 time=0.527 ms
84 bytes from 10.19.100.1 icmp_seq=5 ttl=255 time=0.593 ms

PC1> ping 10.19.100.2
84 bytes from 10.19.100.2 icmp_seq=1 ttl=255 time=0.649 ms
84 bytes from 10.19.100.2 icmp_seq=2 ttl=255 time=1.416 ms
84 bytes from 10.19.100.2 icmp_seq=3 ttl=255 time=1.208 ms
84 bytes from 10.19.100.2 icmp_seq=4 ttl=255 time=1.018 ms
84 bytes from 10.19.100.2 icmp_seq=5 ttl=255 time=2.441 ms

PC1> 10.19.100.6
Bad command: "10.19.100.6". Use ? for help.

PC1> ping 10.19.100.6
84 bytes from 10.19.100.6 icmp_seq=1 ttl=64 time=0.935 ms
84 bytes from 10.19.100.6 icmp_seq=2 ttl=64 time=0.879 ms
84 bytes from 10.19.100.6 icmp_seq=3 ttl=64 time=3.325 ms
84 bytes from 10.19.100.6 icmp_seq=4 ttl=64 time=0.752 ms
84 bytes from 10.19.100.6 icmp_seq=5 ttl=64 time=0.774 ms

PC1> █
```

Fuente: Autoría propia

Figura 14. Verificación conectividad LAN local en PC2.

```

Welcome to Virtual PC Simulator, version 0.8.2
Dedicated to Daling.
Build time: Aug 23 2021 11:15:00
Copyright (c) 2007-2015, Paul Meng (mirnshi@gmail.com)
All rights reserved.

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Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

PC2> dhcp
Bad command: "DHCP". Use ? for help.

PC2> dhcp
DORA IP 10.19.102.218/24 GW 10.19.102.254

PC2> ping 10.19.102.1
84 bytes from 10.19.102.1 icmp_seq=1 ttl=255 time=1.610 ms
84 bytes from 10.19.102.1 icmp_seq=2 ttl=255 time=0.886 ms
84 bytes from 10.19.102.1 icmp_seq=3 ttl=255 time=2.500 ms
84 bytes from 10.19.102.1 icmp_seq=4 ttl=255 time=1.104 ms
84 bytes from 10.19.102.1 icmp_seq=5 ttl=255 time=0.977 ms

PC2> ping 10.19.102.2
84 bytes from 10.19.102.2 icmp_seq=1 ttl=255 time=1.524 ms
84 bytes from 10.19.102.2 icmp_seq=2 ttl=255 time=0.699 ms
84 bytes from 10.19.102.2 icmp_seq=3 ttl=255 time=0.595 ms
84 bytes from 10.19.102.2 icmp_seq=4 ttl=255 time=0.593 ms
84 bytes from 10.19.102.2 icmp_seq=5 ttl=255 time=0.477 ms

PC2>

```

Fuente: Autoría propia

Figura 15. Verificación conectividad LAN local en PC3.

```

Welcome to Virtual PC Simulator, version 0.8.2
Dedicated to Daling.
Build time: Aug 23 2021 11:15:00
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All rights reserved.

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

Press '?' to get help.

Executing the startup file

PC3> dhcp
DORA IP 10.19.101.110/24 GW 10.19.101.254

PC3> ping 10.19.101.1
84 bytes from 10.19.101.1 icmp_seq=1 ttl=255 time=2.883 ms
84 bytes from 10.19.101.1 icmp_seq=2 ttl=255 time=3.414 ms
84 bytes from 10.19.101.1 icmp_seq=3 ttl=255 time=1.295 ms
84 bytes from 10.19.101.1 icmp_seq=4 ttl=255 time=1.278 ms
84 bytes from 10.19.101.1 icmp_seq=5 ttl=255 time=1.920 ms

PC3> ping 10.19.101.2
84 bytes from 10.19.101.2 icmp_seq=1 ttl=255 time=1.177 ms
84 bytes from 10.19.101.2 icmp_seq=2 ttl=255 time=0.768 ms
84 bytes from 10.19.101.2 icmp_seq=3 ttl=255 time=0.795 ms
84 bytes from 10.19.101.2 icmp_seq=4 ttl=255 time=1.101 ms
84 bytes from 10.19.101.2 icmp_seq=5 ttl=255 time=0.998 ms

PC3>

```

Fuente: Autoría propia

Figura 16. Verificación conectividad LAN local en PC4.

```
Dedicated to Dellinger.  
Build time: Aug 23 2021 11:15:00  
Copyright (c) 2007-2015, Paul Meng (mirnshi@gmail.com)  
All rights reserved.  
  
VPCS is free software, distributed under the terms of the "BSD" licence.  
Source code and license can be found at vpcs.sf.net.  
For more information, please visit wiki.freecode.com.cn.  
  
Press '?' to get help.  
Executing the startup file  
  
Checking for duplicate address...  
PC4 : 10.19.100.6 255.255.255.0 gateway 10.19.100.254  
  
PC4> ping 10.19.100.1  
84 bytes from 10.19.100.1 icmp_seq=1 ttl=255 time=0.698 ms  
84 bytes from 10.19.100.1 icmp_seq=2 ttl=255 time=1.677 ms  
84 bytes from 10.19.100.1 icmp_seq=3 ttl=255 time=0.680 ms  
84 bytes from 10.19.100.1 icmp_seq=4 ttl=255 time=0.686 ms  
84 bytes from 10.19.100.1 icmp_seq=5 ttl=255 time=0.714 ms  
  
PC4> ping 10.19.100.2  
84 bytes from 10.19.100.2 icmp_seq=1 ttl=255 time=3.253 ms  
84 bytes from 10.19.100.2 icmp_seq=2 ttl=255 time=3.486 ms  
84 bytes from 10.19.100.2 icmp_seq=3 ttl=255 time=1.470 ms  
84 bytes from 10.19.100.2 icmp_seq=4 ttl=255 time=1.943 ms  
84 bytes from 10.19.100.2 icmp_seq=5 ttl=255 time=1.582 ms  
  
PC4> ping 10.19.100.5  
84 bytes from 10.19.100.5 icmp_seq=1 ttl=64 time=1.481 ms  
84 bytes from 10.19.100.5 icmp_seq=2 ttl=64 time=3.996 ms  
84 bytes from 10.19.100.5 icmp_seq=3 ttl=64 time=0.882 ms  
84 bytes from 10.19.100.5 icmp_seq=4 ttl=64 time=0.747 ms  
84 bytes from 10.19.100.5 icmp_seq=5 ttl=64 time=0.791 ms  
  
PC4> █
```

Fuente: Autoría propia

Parte 3: Configurar protocolos de enrutamiento.

Paso 3.1: En la "Red de la empresa" (es decir, R1, R3, D1 y D2), configure OSPFv2 de área única en el área 0.

Configuración en router R1

```
R1#conf t  
Enter configuration commands, one per line. End with CNTL/Z.  
R1(config)#router ospf 4  
R1(config-router)#router-id 0.0.4.1  
R1(config-router)#network 10.19.10.0 0.0.0.255 area 0  
R1(config-router)#network 10.19.13.0 0.0.0.255 area 0  
R1(config-router)#default-information originate  
R1(config-router)#exit  
R1(config)#
```

Configuración de Router R3

```
R3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#router ospf 4
R3(config-router)#router-id 0.0.4.3
R3(config-router)#network 10.19.11.0 0.0.0.255 area 0
R3(config-router)#network 10.19.13.0 0.0.0.255 area 0
R3(config-router)#default-information originate
R3(config-router)#exit
R3(config)#
```

Configuración de Switch D1

```
D1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
D1(config)#router ospf 4
D1(config-router)#router-id 0.0.4.131
D1(config-router)#network 10.19.10.0 0.0.0.255 area 0
D1(config-router)#network 10.19.100.1 0.0.0.255 area 0
D1(config-router)#network 10.19.101.1 0.0.0.255 area 0
D1(config-router)#network 10.19.102.1 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)#
```

Configuración de Switch D2

```
D2#conf t
D2(config)#router ospf 4
D2(config-router)#router-id 0.0.4.132
D2(config-router)#network 10.19.11.0 0.0.0.255 area 0
D2(config-router)#network 10.19.100.2 0.0.0.255 area 0
D2(config-router)#network 10.19.101.2 0.0.0.255 area 0
D2(config-router)#network 10.19.102.2 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)#
```

Paso 3.2: En la "Red de la empresa" (es decir, R1, R3, D1 y D2), configure OSPFv3 clásico de área única en el área 0.

Configuración de router R1

```
R1(config)#router ospf 6
R1(config-router)#router-id 0.0.6.1
R1(config-router)#default-information originate
R1(config-router)#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)#
```

Configuración de Router R3

```
R3(config)#router ospf 6
R3(config-router)#router-id 0.0.6.3
R3(config-router)#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)#exit
R3#copy running-config startup-config
Destination filename [startup-config]?
Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
[OK]
```

Configuración de Switch D1

```
D1(config)#router ospf 6
D1(config-router)#router-id 0.0.6.131
D1(config-router)#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)#
D1(config)#exit
D1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
Compressed configuration from 3959 bytes to 1989 bytes[OK]
```

Configuración de Switch D2

```
D2(config)#router ospf 6
D2(config-router)#router-id 0.0.6.132
D2(config-router)#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)#
D2(config)#exit
D2#copy running-config startup-config
D2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
Compressed configuration from 3958 bytes to 1998 bytes[OK]
```

Paso 3.3: En R2 en la "Red ISP", configure MP-BGP.

Configuración de Router R2

```
R2#conf t
R2(config)#ip route 0.0.0.0 0.0.0.0 loopback 0
R2(config)#ipv6 route ::/0 loopback 0
R2(config)#router bgp 500
R2(config-router)#bgp router-id 2.2.2.2
R2(config-router)#neighbor 209.165.200.225 remote-as 300
R2(config-router)#neighbor 2001:db8:200::1 remote-as 300
R2(config-router)#address-family ipv4
R2(config-router-af)#neighbor 209.165.200.225 activate
R2(config-router-af)#no neighbor 2001:db8:200::1 activate
R2(config-router-af)#network 2.2.2.2 mask 255.255.255.255
R2(config-router-af)#network 0.0.0.0
R2(config-router-af)#exit-address-family
R2(config-router)#address-family ipv6
R2(config-router-af)#no neighbor 209.165.200.225 activate
R2(config-router-af)#neighbor 2001:db8:200::1 activate
R2(config-router-af)#network 2001:db8:2222::/128
R2(config-router-af)#network ::/0
R2(config-router-af)#exit-address-family
R2(config-router)#exit
R2(config)#exit
R2#
R2#copy running-config startup-config
Destination filename [startup-config]?
Warning: Attempting to overwrite an NVRAM configuration previously written
```

by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
[OK]

Paso 3.4: En R1 en la "Red ISP", configure MP-BGP.

Configuración de Router R1

```
R1#conf t
R1(config)#ip route 10.19.0.0 255.255.255.0 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 10.19.0.0 mask 255.255.255.0
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)#
R1(config)#exit
R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
```

Figura 17. Verificación de configuración paso 3.1, 3.2, en R1.

```

Cisco IOS Software, 7200 Software (C7200-ADVIPSERVICESK9-M), Version 15.2(4)5S, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2014 by Cisco Systems, Inc.
Compiled Thu 20-Feb-14 06:51 by prod_rel_team
*Nov 17 16:17:40.743: %OSPF-5-ADJCHG: Process 4, Nbr 0.0.4.131 on Ethernet1/2 from LOADING to FULL, Loading Done
*Nov 17 16:17:40.767: %OSPFV3-5-ADJCHG: Process 6, Nbr 10.19.102.1 on Ethernet1/2 from LOADING to FULL, Loading Done
*Nov 17 16:17:42.799: %BGP-5-ADJCHANGE: neighbor 2001:DB8:200::2 Up
*Nov 17 16:17:53.187: %BGP-5-ADJCHANGE: neighbor 209.165.200.226 Up R1, ENCOR Skills Assessment
R1#
R1#
*Nov 17 16:18:23.563: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/2 (not half duplex), with D1 Ethernet1/2 (half duplex).
R1#
*Nov 17 16:18:33.651: %OSPF-5-ADJCHG: Process 4, Nbr 0.0.4.3 on Ethernet1/1 from LOADING to FULL, Loading Done
*Nov 17 16:18:34.435: %OSPFV3-5-ADJCHG: Process 6, Nbr 10.19.13.3 on Ethernet1/1 from LOADING to FULL, Loading Done
R1#
R1#
R1#show run | section ^router ospf
*Nov 17 16:19:13.303: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/2 (not half duplex), with D1 Ethernet1/2 (half duplex).router ospf 4
router-id 0.0.4.1
network 10.19.10.0 0.0.0.255 area 0
network 10.19.13.0 0.0.0.255 area 0
default-information originate
router ospf 6
router-id 0.0.6.1
default-information originate
R1#
R1#show ipv6 ospf interface brief
Interface PID Area Intf ID Cost State Nbrs F/C
Et1/2 6 0 5 10 BDR 1/1
Et1/1 6 0 4 10 DR 1/1
R1#

```

Fuente: Autoría propia

Figura 18. Verificación de configuración paso 3.1, 3.2, en R3.

```

*Nov 17 16:18:06.123: %LINK-5-CHANGED: Interface FastEthernet0/0, changed state to administratively down
*Nov 17 16:18:06.127: %LINK-5-CHANGED: Interface Ethernet1/2, changed state to administratively down
*Nov 17 16:18:06.131: %LINK-5-CHANGED: Interface Ethernet1/3, changed state to administratively down
*Nov 17 16:18:06.687: %OSPF-5-ADJCHG: Process 4, Nbr 0.0.4.132 on Ethernet1/0 from LOADING to FULL, Loading Done
*Nov 17 16:18:06.707: %OSPFV3-5-ADJCHG: Process 6, Nbr 10.19.102.2 on Ethernet1/0 from LOADING to FULL, Loading Done
*Nov 17 16:18:09.339: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/2, changed state to down
*Nov 17 16:18:09.347: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/3, changed state to down
*Nov 17 16:18:27.971: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/0 (not half duplex), with D2 Ethernet1/0 (half duplex).
*Nov 17 16:18:47.235: %OSPF-5-ADJCHG: Process 4, Nbr 0.0.4.1 on Ethernet1/1 from LOADING to FULL, Loading Done
*Nov 17 16:18:48.243: %OSPFV3-5-ADJCHG: Process 6, Nbr 209.165.200.225 on Ethernet1/1 from LOADING to FULL, Loading Done
*Nov 17 16:19:20.179: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/0 (not half duplex), with D2 Ethernet1/0 (half duplex).
*Nov 17 16:20:18.823: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/0 (not half duplex), with D2 Ethernet1/0 (half duplex).
*Nov 17 16:21:11.415: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/0 (not half duplex), with D2 Ethernet1/0 (half duplex).
*Nov 17 16:22:07.343: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/0 (not half duplex), with D2 Ethernet1/0 (half duplex).
R3#
R3#
R3#show run | section ^router ospf
router ospf 4
router-id 0.0.4.3
network 10.19.11.0 0.0.0.255 area 0
network 10.19.13.0 0.0.0.255 area 0
default-information originate
router ospf 6
router-id 0.0.6.3
R3#
R3#show ipv6 ospf interface brief
Interface PID Area Intf ID Cost State Nbrs F/C
Et1/1 6 0 4 10 BDR 1/1
Et1/0 6 0 3 10 BDR 1/1
R3#

```

Fuente: Autoría propia

Figura 19. Verificación de configuración paso 3.1, 3.2, en D1.

```

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 10.19.10.0 0.0.0.255 area 0
network 10.19.100.0 0.0.0.255 area 0
network 10.19.101.0 0.0.0.255 area 0
network 10.19.102.0 0.0.0.255 area 0
router ospf 6
router-id 0.0.6.131
D1#
Nov 17 16:23:13.271: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#show ipv6 ospf interface brief
Interface PID Area Intf ID Cost State Nbrs F/C
V1102 6 0 25 1 BDR 1/1
V1101 6 0 24 1 BDR 1/1
V1100 6 0 23 1 BDR 1/1
Et1/2 6 0 21 10 DR 1/1
D1#

```

Fuente: Autoría propia

Figura 20. Verificación de configuración paso 3.1, 3.2, en D2.

```

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 10.19.11.0 0.0.0.255 area 0
network 10.19.100.0 0.0.0.255 area 0
network 10.19.101.0 0.0.0.255 area 0
network 10.19.102.0 0.0.0.255 area 0
router ospf 6
router-id 0.0.6.132
D2#show ipv6 ospf interface brief
Interface PID Area Intf ID Cost State Nbrs F/C
V1102 6 0 25 1 DR 1/1
V1101 6 0 24 1 DR 1/1
V1100 6 0 23 1 DR 1/1
Et1/0 6 0 21 10 DR 1/1
D2#

```

Fuente: Autoría propia

Figura 21. Verificación de configuración paso 3.3 en R2.

```

Nov 17 16:17:54.623: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/3, changed state to down
Nov 17 16:18:01.203: %BGPP-5-ADJCHANGE: neighbor 2001:DB8:200::1 Up
Nov 17 16:18:08.815: %BGPP-5-ADJCHANGE: neighbor 209.165.200.225 Up R2, ENCOR Skills Assessment
R2#
R2#
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
  exit-address-family
  !
  address-family ipv6
    network ::0
    network 2001:DB8:2222::/128
    neighbor 2001:DB8:200::1 activate
  exit-address-family
R2#
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#

```

Fuente: Autoría propia

Figura 22. Verificación de configuración paso 3.4 en R1.

```

Nov 17 16:25:29.575: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/2 (not half duplex), with D1 Ethernet1/2 (half duplex)
R1#
Nov 17 16:26:28.783: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/2 (not half duplex), with D1 Ethernet1/2 (half duplex)
R1#
Nov 17 16:27:28.003: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/2 (not half duplex), with D1 Ethernet1/2 (half duplex)
R1#
Nov 17 16:28:18.603: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/2 (not half duplex), with D1 Ethernet1/2 (half duplex)
R1#
Nov 17 16:29:17.803: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/2 (not half duplex), with D1 Ethernet1/2 (half duplex)
R1#
Nov 17 16:30:11.911: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/2 (not half duplex), with D1 Ethernet1/2 (half duplex)
R1#
Nov 17 16:31:02.999: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/2 (not half duplex), with D1 Ethernet1/2 (half duplex)
R1#
Nov 17 16:31:51.211: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/2 (not half duplex), with D1 Ethernet1/2 (half duplex)
R1#
R1#
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 10.19.0.0 mask 255.255.255.0
    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#

```

Fuente: Autoría propia

Parte 4: Configurar la redundancia del primer salto

Paso 4.1: En D1, cree IP SLA que prueben la accesibilidad de la interfaz E1/2 de R1.

Configuración de Switch D1

```
D1#conf t
D1(config)#ip sla 4
D1(config-ip-sla)#icmp-echo 10.19.10.1
D1(config-ip-sla-echo)#frequency 5
D1(config-ip-sla-echo)#exit
D1(config)#ip sla 6
D1(config-ip-sla)#icmp-echo 2001:db8:100:1010::1
D1(config-ip-sla-echo)#frequency 5
D1(config-ip-sla-echo)#exit
D1(config)#
D1(config)#ip sla schedule 4 life forever start-time now
D1(config)#ip sla schedule 6 life forever start-time now
D1(config)#
D1(config)#track 4 ip sla 4
D1(config-track)#delay down 10 up 15
D1(config-track)#exit
D1(config)#track 6 ip sla 6
D1(config-track)#delay down 10 up 15
D1(config-track)#exit
D1(config)#
```

Paso 4.2: En D2, cree IP SLA que prueben la accesibilidad de la interfaz E1/0 de R3.

Configuración de Switch D2

```
D2#conf t
D2(config)#
D2(config)#ip sla 4
D2(config-ip-sla)#icmp-echo 10.19.11.1
```

```

D2(config-ip-sla-echo)#frequency 5
D2(config-ip-sla-echo)#exit
D2(config)#
D2(config)#ip sla 6
D2(config-ip-sla)#icmp-echo 2001:db8:100:1011::1
D2(config-ip-sla-echo)#frequency 5
D2(config-ip-sla-echo)#exit
D2(config)#
D2(config)#ip sla schedule 4 life forever start-time now
D2(config)#ip sla schedule 6 life forever start-time now
D2(config)#
D2(config)#track 4 ip sla 4
D2(config-track)#delay down 10 up 15
D2(config-track)#exit
D2(config)#track 6 ip sla 6
D2(config-track)#delay down 10 up 15
D2(config-track)#exit
D2(config)#

```

Paso 4.3: En D1, configure HSRPv2. En D2, configure HSRPv2.

Configuración de Switch D1

```

D1(config)#interface vlan 100
D1(config-if)#standby version 2
D1(config-if)#standby 104 ip 10.19.100.254
D1(config-if)#standby 104 priority 150
D1(config-if)#standby 104 preemp
D1(config-if)#standby 104 track 4 decrement 60
D1(config-if)#exit
D1(config)#interface vlan 101
D1(config-if)#standby version 2
D1(config-if)#standby 114 ip 10.19.101.254
D1(config-if)#standby 114 preemp
D1(config-if)#standby 114 track 4 decrement 60
D1(config-if)#exit
D1(config)#interface vlan 102

```

```
D1(config-if)#standby version 2
D1(config-if)#standby 124 ip 10.19.102.254
D1(config-if)#standby 124 priority 150
D1(config-if)#standby 124 preemp
D1(config-if)#standby 124 track 4 decrement 60
D1(config-if)#exit
D1(config)#interface vlan 100
D1(config-if)#standby version 2
D1(config-if)#standby 106 ipv6 autoconfig
D1(config-if)#standby 106 priority 150
D1(config-if)#standby 106 preemp
D1(config-if)#standby 106 track 6 decrement 60
D1(config-if)#exit
D1(config)#interface vlan 101
D1(config-if)#standby version 2
D1(config-if)#standby 116 ipv6 autoconfig
D1(config-if)#standby 116 preemp
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 126 ipv6 autoconfig
D1(config-if)#standby 126 priority 150
D1(config-if)#standby 126 preemp
D1(config-if)#standby 126 track 6 decrement 60
D1(config-if)#exit
D1(config)# exit
D1#copy running-config startup-config
```

Configuración de Switch D2

```
D2(config)#interface vlan 100
D2(config-if)#standby version 2
D2(config-if)#standby 104 ip 10.19.100.254
D2(config-if)#standby 104 preemp
D2(config-if)#standby 104 track 4 decrement 60
D2(config-if)#exit
D2(config)#interface vlan 101
```

```
D2(config-if)#standby version 2
D2(config-if)#standby 114 ip 10.19.101.254
D2(config-if)#standby 114 priority 150
D2(config-if)#standby 114 preemp
D2(config-if)#standby 114 track 4 decrement 60
D2(config-if)#exit
D2(config)#interface vlan 102
D2(config-if)#standby version 2
D2(config-if)#standby 124 ip 10.19.102.254
D2(config-if)#standby 124 preemp
D2(config-if)#standby 124 track 4 decrement 60
D2(config-if)#exit
D2(config)#interface vlan 100
D2(config-if)#standby version 2
D2(config-if)#standby 106 ipv6 autoconfig
D2(config-if)#standby 106 preemp
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 116 ipv6 autoconfig
D2(config-if)#standby 116 priority 150
D2(config-if)#standby 116 preemp
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 126 ipv6 autoconfig
D2(config-if)#standby 126 preemp
D2(config-if)#standby 126 track 6 decrement 60
D2(config-if)#exit
D2(config)# exit
D2#copy running-config startup-config
```

Figura 23. Verificación de configuración paso 4.1 y 4.3 en D1.

```

R1 R3 D1 D2 R2
*Nov 17 16:35:32.733: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#
*Nov 17 16:36:22.816: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#
*Nov 17 16:37:11.908: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#
*Nov 17 16:38:04.348: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#
*Nov 17 16:39:02.520: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#
*Nov 17 16:39:54.289: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#
*Nov 17 16:40:48.866: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#
*Nov 17 16:41:41.966: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#
*Nov 17 16:42:31.668: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#
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 10.19.10.1
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: Autoría propia

Figura 24. Verificación de configuración paso 4.2 y 4.3 en D2.

```

R1 R3 D1 D2 R2
*Nov 17 16:35:32.733: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#
*Nov 17 16:36:22.816: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#
*Nov 17 16:37:11.908: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#
*Nov 17 16:38:04.348: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#
*Nov 17 16:39:02.520: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#
*Nov 17 16:39:54.289: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#
*Nov 17 16:40:48.866: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#
*Nov 17 16:41:41.966: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#
*Nov 17 16:42:31.668: %CDP-4-DUPLEX_MISMATCH: duplex mismatch discovered on Ethernet1/2 (not full duplex), with R1 Ethernet1/2 (full duplex).
D1#
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 10.19.10.1
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: Autoría propia

CONCLUSIONES

A través de la herramienta GNS3, se realizó la implementación de la topología indicada y se configuro de cada uno de los dispositivos de las red de acuerdo con los requerimiento manifestados en las guías escenario 1 y se realizó la verificación de conectividad de red, donde se obtuvo éxito en con esta.

Se realizo con éxito la implantación de la de la configuración de los protocolo de enrutamiento OSPFv2 para IPv4, OSPFv3 para IPv6, en R1, R3, D1 y D2. se configuro con éxito en R1 y R2 el protocolo MP-BGP el cual es un multiprotocolo que soporta direcciones unidifusión y multidifusión tanto para IPv4 como para IPv6.

Se implementación con éxito la función IP SLA que permite poder monitorear la accesibilidad del switch D1 al puerto E1/2 del router R1 de acuerdo a la configuración la verificación se realizara cada 5 segundos, de igual formas se monitora la accesibilidad del switch D2 al puerto E1/0 del router R3.

Con el desarrollo de este trabajo se pudo poner en práctica las habilidades y conocimientos que ha sido adquiridos gracias al del diplomado de profundización Cisco CCNP, los cuales son de gran relevancia para un futuro poder ser aplicados en el ámbito laboral, ya que hoy día las redes son parte fundamental ya que facilitan la comunicación e interacción tanto para las personas como las empresas.

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