DIPLOMADO DE PROFUNDIAZACIÓN 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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INFORME – DIPLOMADO DE OPCIÓN DE GRADO

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GLOSARIO

TOPOLOGÍA*:* Se define como la disposición que presenta una red de conexión a internet incluyendo nodos y líneas de conexión. (Rouse, 2022)

ROUTER*:* Son dispositivos que permiten el direccionamiento de datos mediante paquetes que contienen varios tipos de datos que permiten navegación en la web. (CISCO)

SWITHC*:* Los switches son dispositivos que permiten la comunicación entre otros dispositivos en una misma red compartiendo información entre ellos. (CISCO)

DHCP*:* Se define como un protocolo de configuración dinámica de host, es un protocolo que proporciona automáticamente dirección IP, máscara de subred y puerta de enlace predeterminada a un host. (Protocolo de configuración dinámica de host (DHCP), 2022)

VLAN*:* Son dominios de difusión lógica que permite dividir usuarios de la red física en segmentos de redes lógicas. (Redes de área local virtuales (VLAN), 2021)

RSTP*:* Es un protocolo que previene la redundancia en una red de switches proporcionando mejora en los tiempos de convergencia. (Que es RSTP, 2020)

LACP*:* Hace parte de una especificación IEEE que permite formar un único canal lógico de comunicación mediante la agrupación de varios puertos físicos. (Funcionamiento de EtherChannel)

OSPF*:* Es un protocolo de enrutamiento dinámico que recoge información de enrutamiento sobre subredes IP de Router vecinos a la vez que proporciona información de enrutamiento de las subredes vecinas. (Marcelo, 2020)

BGP*:* Es un protocolo usado por un grupo de Router que permite compartir información de enrutamiento. (Acerca del Border Gateway Protocol (BGP), 2022)

IP SLA*:* Es una tecnología de cisco que mide el desempeño en una red mediante el monitoreo activo del tráfico de red. (Monitoreo de acuerdos de nivel de servicio (SLA) de IP, 2022)

RESUMEN

Mediante el presente documento se realizan algunas tareas asignadas en la prueba de habilidades para los escenarios 1 y 2, documentando la configuración de cada uno de los dispositivos utilizados en cada etapa de los escenarios, se realiza un proceso de verificación de conectividad mediante el uso de comandos en cada dispositivo.

En el documento se podrán ver algunas imágenes que muestran el correcto direccionamiento entre los equipos y dispositivos de cada escenario y la verificación de conectividad LAN de cada prueba.

Se presenta además el paso a paso del proceso de estructuración de las redes conmutadas utilizadas mediante la utilización de protocolos STP y la configuración de redes VLAN usadas en una infraestructura de red jerárquica convergente.

ABSTRACT

Through this document, some tasks assigned in the skills test for scenarios 1 and 2 are carried out, documenting the configuration of each of the devices used in each stage of the scenarios, a connectivity verification process is carried out through the use of commands on each device.

In the document you will be able to see some images that show the correct addressing between the equipment and devices of each scenario and the LAN connectivity verification of each test.

The process of structuring the switched networks used through the use of STP protocols and the configuration of VLANs used in a convergent hierarchical network infrastructure is also presented step by step.

INTRODUCCIÓN

Para el desarrollo de esta actividad se construye una red a través de la herramienta GNS3 mediante una máquina virtual con el fin de realizar algunos ajustes básicos de configuración en una red de capa 2 ejecutando el direccionamiento de la interfaz con el *host* virtual.

Se realiza configuración de interfaces troncales IEEE 802.1Q en los enlaces de conmutador, se cambia la *VLAN* nativa en los enlaces troncales, se habilita el protocolo *Rapid Spanning-Tree*, Se configuran los *bridges root RSTP* en los switches D1 y D2, se crean canales *LACP* y finalmente se configuran los puertos de acceso de *host* para los equipos PC1, PC2, PC3 Y PC4.

En el escenario 2 se realiza la configuración de protocolos de enrutamiento IPv4 e IPv6 permitiendo la realización de comandos ping de IPv4 e Ipv6 a la interfaz *Loopback* 0 desde los *Switches* D1 y D2, dando como resultado una red totalmente convergente.

Prueba de Habilidades Escenario 1

ACTIVIDAD

Descripción de escenario propuesto para la prueba de habilidades.

Figura 1 Topología

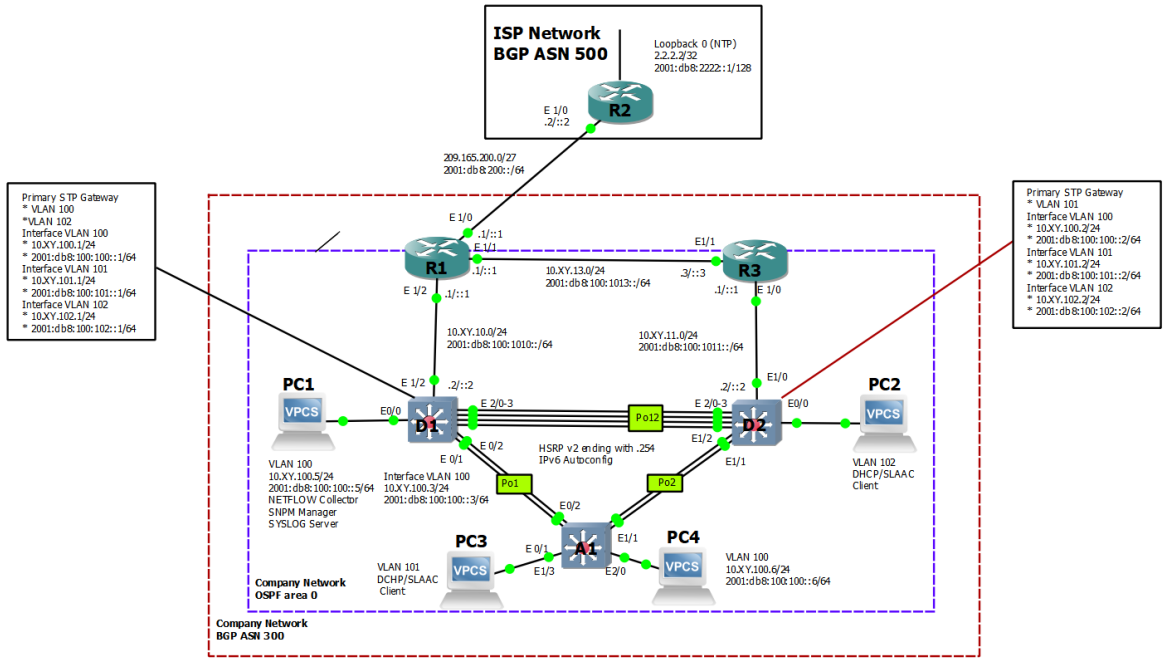


Tabla 1. Tabla de direccionamiento.

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	10.63.10.1/24	2001:db8:100:1010::1/64	fe80::1:2
	E1/1	10.63.13.1/24	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	10.63.11.1/24	2001:db8:100:1011::1/64	fe80::3:2
	E1/1	10.63.13.3/24	2001:db8:100:1013::3/64	fe80::3:3
D1	E1/2	10.63.10.2/24	2001:db8:100:1010::2/64	fe80::d1:1
	VLAN 100	10.63.100.1/24	2001:db8:100:100::1/64	fe80::d1:2
	VLAN 101	10.63.101.1/24	2001:db8:100:101::1/64	fe80::d1:3

Device	Interface	IPv4 Address	IPv6 Address	IPv6 Link-Local
	VLAN 102	10.63.102.1/24	2001:db8:100:102::1/64	fe80::d1:4
D2	E1/0	10.63.11.2/24	2001:db8:100:1011::2/64	fe80::d2:1
	VLAN 100	10.63.100.2/24	2001:db8:100:100::2/64	fe80::d2:2
	VLAN 101	10.63.101.2/24	2001:db8:100:101::2/64	fe80::d2:3
	VLAN 102	10.63.102.2/24	2001:db8:100:102::2/64	fe80::d2:4
A1	VLAN 100	10.63.100.3/23	2001:db8:100:100::3/64	fe80::a1:1
PC1	NIC	10.63.100.5/24	2001:db8:100:100::5/64	EUI-64
PC2	NIC	DHCP	SLAAC	EUI-64
PC3	NIC	DHCP	SLAAC	EUI-64
PC4	NIC	10.63.100.6/24	2001:db8:100:100::6/64	EUI-64

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

Router R1

```
Router(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)#linterface 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 10.63.10.1 255.255.255.0
```

```
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-if)#interface e1/1
R1(Config-if)#ip address 10.63.13.1 255.255.255.0
R1(Config-if)#ipv6 address fe80::1:3 link-local
R1(Config-if)#ipv6 address 2001:db8:100:1013::1/64
R1(Config-if)#no shutdown
R1(Config-if)#exit
```

Router R2

```
Router(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)#line con 0
R2(Config-line)#exec-timeout 0 0
R2(Config-line)#logging synchronous
R2(Config-line)#exit
R2(Config)#interface e1/0
R2(Config-if)#ip address 209.165.200.226 255.255.255.224
R2(Config-if)#ipv6 address fe80::2:1 link-local
R2(Config-if)#ipv6 address 2001:db8:200::2/64
R2(Config-if)#no shutdown
R2(Config-if)#exit
R2(Config)#interface Loopback 0
R2(Config-if)#ip address 2.2.2.2 255.255.255.255
R2(Config-if)#ipv6 address fe80::2:3 link-local
R2(Config-if)#ipv6 address 2001:db8:2222::1/128
R2(Config-if)#no shutdown
R2(Config-if)#exit
```

Router R3

```
Router(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
R2(Config-line)#logging synchronous
R2(Config-line)#exit
R3(Config)#interface e1/0
R3(Config-if)#ip address 10.63.11.1 255.255.255.0
R3(Config-if)#ipv6 address fe80::3:2 link-local
R3(Config-if)#ipv6 address 2001:db8:100:1011::1/64
R3(Config-if)#no shutdown
R3(Config-if)#exit
R3(Config)#interface e1/1
R3(Config-if)#ip address 10.63.13.3 255.255.255.0
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)#xit
```

Switch D1

```
Switch(config)#hostname D1
D1(config)#ip routing
D1(config)#ipv6 unicast-routing
D1(config)#no ip domain lookup
D1(config)#banner motd # D1, ENCOR Skills Assessment#
D1(config)#line con 0
D1(config-line)#exec-timeout 0 0
D1(config-line)#logging synchronous
D1(config-line)#exit
D1(config)#vlan 100
D1(config-vlan)#name Management
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 10.63.10.2 255.255.255.0
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 10.63.100.1 255.255.255.0
D1(config-if)#ipv6 address fe80::d1:2 link-local
D1(config-if)#ipv6 address 2001:db8:100:100::1/64
D1(config-if)#no shutdown
D1(config-if)#exit
D1(config)#interface vlan 101
D1(config-if)#ip address 10.63.101.1 255.255.255.0
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 10.63.102.1 255.255.255.0
D1(config-if)#ipv6 address fe80::d1:4 link-local
D1(config-if)#ipv6 address 2001:db8:100:102::1/64
D1(config-if)# no shutdown
D1(config-if)#exit
D1(config)#ip dhcp excluded-address 10.63.101.1 10.63.101.109
D1(config)#ip dhcp excluded-address 10.63.101.141 10.63.101.254
D1(config)#ip dhcp excluded-address 10.63.102.1 10.63.102.109
```

```
D1(config)#ip dhcp excluded-address 10.63.102.141 10.63.102.254
D1(config)#ip dhcp pool VLAN-101
D1(config-vlan)#network 10.63.101.0 255.255.255.0
D1(config-vlan)#default-router 10.63.101.254
D1(config-vlan)#exit
D1(config)#ip dhcp pool VLAN-102
D1(config-vlan)#network 10.63.102.0 255.255.255.0
D1(config-vlan)#default-router 10.63.102.254
D1(config-vlan)#exit
D1(config-vlan)#interface range e0/0-3,e1/0-1,e1/3,e2/0-3,e3/0-3
D1(config-vlan)#shutdown
D1(config-vlan)#exit
```

Switch D2

```
Switch(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)#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-if)#interface e1/0
```

```
D2(config-if)#no switchport
D2(config-if)#ip address 10.63.11.2 255.255.255.0
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 10.63.100.2 255.255.255.0
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 10.63.101.2 255.255.255.0
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 10.63.102.2 255.255.255.0
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 10.63.101.1 10.63.101.209
D2(config)#ip dhcp excluded-address 10.63.101.241 10.63.101.254
D2(config)#ip dhcp excluded-address 10.63.102.1 10.63.102.209
D2(config)#ip dhcp excluded-address 10.63.102.241 10.63.102.254
D2(config)#ip dhcp pool VLAN-101
D2(config-vlan)#network 10.63.101.0 255.255.255.0
D2(config-vlan)#default-router 63.0.101.254
D2(config-vlan)#exit
D2(config)#ip dhcp pool VLAN-102
D2(config-vlan)#network 10.63.102.0 255.255.255.0
D2(config-vlan)#default-router 10.63.102.254
D2(config-vlan)#exit
D2(config)#interface range e0/0-3,e1/1-3,e2/0-3,e3/0-3
```

```
D2(config-vlan)#shutdown
D2(config-vlan)#exit
```

Switch A1

```
Switch(config)#hostname A1
A1(config)#no ip domain lookup
A1(config)#banner motd # A1, ENCOR Skills Assessment#
A1(config)#line con 0
A1(config-line)#exec-timeout 0 0
A1(config-line)#logging synchronous
A1(config-line)#exit
A1(config)#vlan 100
A1(config-vlan)#name Management
A1(config-vlan)#exit
A1(config)#vlan 101
A1(config-vlan)#name UserGroupA
A1(config-vlan)#exit
A1(config)#vlan 102
A1(config-vlan)#name UserGroupB
A1(config-vlan)#exit
A1(config)#vlan 999
A1(config-vlan)#name NATIVE
A1(config-vlan)#exit
A1(config)#interface vlan 100
A1(config-vlan)#ip address 10.63.100.3 255.255.255.0
A1(config-vlan)#ipv6 address fe80::a1:1 link-local
A1(config-vlan)#ipv6 address 2001:db8:100:100::3/64
A1(config-vlan)#no shutdown
A1(config-vlan)#exit
A1(config)#interface range e0/0,e0/3,e1/0,e2/1-3,e3/0-3
A1(config-if)#shutdown
A1(config-if)#exit
```

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

Tabla 2. Configuración de tareas parte 2

Task#	Task	Specification	Points
2.1	On all switches, configure IEEE 802.1Q trunk interfaces on interconnecting switch links	Enable 802.1Q trunk links between: • D1 and D2 • D1 and A1 • D2 and A1	6
2.2	On all switches, change the native VLAN on trunk links.	Use VLAN 999 as the native VLAN	6
2.3	On all switches, enable the Rapid Spanning-Tree Protocol.	Use Rapid Spanning Tree.	3
2.4	On D1 and D2, configure the appropriate RSTP root bridges based on the information in the topology diagram. D1 and D2 must provide backup in case of root bridge failure.	Configure D1 and D2 as root for the appropriate VLANs with mutually supporting priorities in case of switch failure.	2
2.5	On all switches, create LACP EtherChannels as shown in the topology diagram.	Use the following channel numbers: • D1 to D2 – Port channel 12 • D1 to A1 – Port channel 1 • D2 to A1 – Port channel 2	3
2.6	On all switches, configure host access ports connecting to PC1, PC2, PC3, and PC4.	Configure access ports with appropriate VLAN settings as shown in the topology diagram. Host ports should transition immediately to forwarding state.	4
2.7	Verify IPv4 DHCP services.	PC2 and PC3 are DHCP clients and should be receiving valid IPv4 addresses.	1
2.8	Verify local LAN connectivity.	PC1 should successfully ping: • D1: 10.63.100.1 • D2: 10. 63.100.2 • PC4: 10. 63.100.6 PC2 should successfully ping: • D1: 10. 63.102.1 • D2: 10. 63.102.2 PC3 should successfully ping: • D1: 10. 63.101.1 • D2: 10. 63.101.2 PC4 should successfully ping: • D1: 10. 63.100.1 • D2: 10. 63.100.2 • PC1: 10. 63.100.5	1

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

Switch D1

interface range e2/0-3
switchport mode trunk
interface range e0/1-2
switchport mode trunk

Switch D2

interface range e2/0-3
switchport mode trunk
interface range e1/1-2
switchport mode trunk

Switch A1

interface range e0/1-2
switchport mode trunk
interface range e1/1-2
switchport mode trunk

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

Switch D1

interface range e2/0-3
switchport trunk native vlan 999
interface range e0/1-2
switchport trunk native vlan 999

Switch D2

interface range e2/0-3
switchport trunk native vlan 999
interface range e1/1-2
switchport trunk native vlan 999

Switch A1
interface range e0/1-2
switchport trunk native vlan 999
interface range e1/1-2
switchport trunk native vlan 999

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

Switch D1
spanning-tree mode rapid-pvst

Switch D2
spanning-tree mode rapid-pvst

Switch A1
spanning-tree mode rapid-pvst

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

D1 and D2 must provide backup in case of root bridge failure.

Switch D1
spanning-tree vlan 100,102 root primary
spanning-tree vlan 101 root secondary

Switch D2
spanning-tree vlan 101 root primary
spanning-tree vlan 100,102 root secondary

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

Switch D1
interface range e2/0-3
channel-group 12 mode active
no shutdown

exit
interface range e0/1-2
channel-group 1 mode active
no shutdown
exit

Switch D2
interface range e2/0-3
channel-group 12 mode active
no shutdown
exit
interface range e1/1-2
channel-group 2 mode active
no shutdown
exit

Switch A1
interface range e0/1-2
channel-group 1 mode active
no shutdown
exit
interface range e1/1-2
channel-group 2 mode active
no shutdown
exit

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

Switch D1
interface e0/0
switchport mode access
switchport access vlan 100
spanning-tree portfast
no shutdown

Switch D2

interface e0/0
switchport mode access
switchport access vlan 102
spanning-tree portfast
no shutdown

Switch A1

interface e1/3
switchport mode access
switchport access vlan 101
spanning-tree portfast
no shutdown
exit
interface e2/0
switchport mode access
switchport access vlan 100
spanning-tree portfast
no shutdown
exit

Configuración Switch D1

interface range e2/0-3
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk native vlan 999
channel-group 12 mode active
no shutdown
exit
interface range e0/1-2
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk native vlan 999
channel-group 1 mode active
no shutdown
exit
spanning-tree mode rapid-pvst

spanning-tree vlan 100,102 root primary
spanning-tree vlan 101 root secondary
interface e0/0
switchport mode access
switchport access vlan 100
spanning-tree portfast
no shutdown
exit
end

Configuración Switch D2

interface range e2/0-3
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk native vlan 999
channel-group 12 mode active
no shutdown
exit
interface range e1/1-2
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk native vlan 999
channel-group 2 mode active
no shutdown
exit
spanning-tree mode rapid-pvst
spanning-tree vlan 101 root primary
spanning-tree vlan 100,102 root secondary
interface e0/0
switchport mode access
switchport access vlan 102
spanning-tree portfast
no shutdown
exit
end

Configuración Switch A1

spanning-tree mode rapid-pvst
interface range e0/1-2
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk native vlan 999
channel-group 1 mode active
no shutdown
exit
interface range e1/1-2
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk native vlan 999
channel-group 2 mode active
no shutdown
exit
interface e1/3
switchport mode access
switchport access vlan 101
spanning-tree portfast
no shutdown
exit
interface e2/0
switchport mode access
switchport access vlan 100
spanning-tree portfast
no shutdown
exit
end

2.7 - Verifique los servicios DHCP IPv4.

Figura 2 Configuración DHCP PC2

```
Opcode: 1 (REQUEST)
Client IP Address: 10.63.102.110
Your IP Address: 0.0.0.0
Server IP Address: 0.0.0.0
Gateway IP Address: 0.0.0.0
Client MAC Address: 00:50:79:66:68:01
Option 53: Message Type = Request
Option 54: DHCP Server = 10.63.102.1
Option 50: Requested IP Address = 10.63.102.110
Option 61: Client Identifier = Hardware Type=Ethernet MAC Address = 00:50:79:66:68:01
Option 12: Host Name = PC2

Opcode: 2 (REPLY)
Client IP Address: 10.63.102.110
Your IP Address: 10.63.102.110
Server IP Address: 0.0.0.0
Gateway IP Address: 0.0.0.0
Client MAC Address: 00:50:79:66:68:01
Option 53: Message Type = Ack
Option 54: DHCP Server = 10.63.102.1
Option 51: Lease Time = 86400
Option 58: Renewal Time = 43200
Option 59: Rebinding Time = 75600
Option 1: Subnet Mask = 255.255.255.0
Option 3: Router = 10.63.102.254

 IP 10.63.102.110/24 GW 10.63.102.254
```

Figura 3 Configuración DHCP PC3

```
Opcode: 1 (REQUEST)
Client IP Address: 10.63.101.210
Your IP Address: 0.0.0.0
Server IP Address: 0.0.0.0
Gateway IP Address: 0.0.0.0
Client MAC Address: 00:50:79:66:68:02
Option 53: Message Type = Request
Option 54: DHCP Server = 10.63.101.2
Option 50: Requested IP Address = 10.63.101.210
Option 61: Client Identifier = Hardware Type=Ethernet MAC Address = 00:50:79:66:68:02
Option 12: Host Name = PC3

Opcode: 2 (REPLY)
Client IP Address: 0.0.0.0
Your IP Address: 10.63.101.110
Server IP Address: 0.0.0.0
Gateway IP Address: 0.0.0.0
Client MAC Address: 00:50:79:66:68:02
Option 53: Message Type = Offer
Option 54: DHCP Server = 10.63.101.1
Option 51: Lease Time = 86400
Option 58: Renewal Time = 43200
Option 59: Rebinding Time = 75600
Option 1: Subnet Mask = 255.255.255.0
Option 3: Router = 10.63.101.254

 IP 10.63.101.110/24 GW 10.63.101.254
```

2.8 - Verifique la conectividad LAN local.

PC1 should successfully ping:

- D1: 10.**63**.100.1

Figura 4 Ping de PC1 a D1

```
PC1> ping 10.63.100.1

84 bytes from 10.63.100.1 icmp_seq=1 ttl=255 time=0.870 ms
84 bytes from 10.63.100.1 icmp_seq=2 ttl=255 time=0.782 ms
84 bytes from 10.63.100.1 icmp_seq=3 ttl=255 time=0.807 ms
84 bytes from 10.63.100.1 icmp_seq=4 ttl=255 time=1.276 ms
84 bytes from 10.63.100.1 icmp_seq=5 ttl=255 time=0.952 ms
```

- D2: 10.**63**.100.2

Figura 5 Ping de PC1 a D2

```
PC1> ping 10.63.100.2

84 bytes from 10.63.100.2 icmp_seq=1 ttl=255 time=4.952 ms
84 bytes from 10.63.100.2 icmp_seq=2 ttl=255 time=1.673 ms
84 bytes from 10.63.100.2 icmp_seq=3 ttl=255 time=2.027 ms
84 bytes from 10.63.100.2 icmp_seq=4 ttl=255 time=3.786 ms
84 bytes from 10.63.100.2 icmp_seq=5 ttl=255 time=1.722 ms
```

- PC4: 10.**63**.100.6

Figura 6 Ping de PC1 a PC4

```
PC1> ping 10.63.100.6

84 bytes from 10.63.100.6 icmp_seq=1 ttl=64 time=1.695 ms
84 bytes from 10.63.100.6 icmp_seq=2 ttl=64 time=1.572 ms
84 bytes from 10.63.100.6 icmp_seq=3 ttl=64 time=1.500 ms
84 bytes from 10.63.100.6 icmp_seq=4 ttl=64 time=1.357 ms
84 bytes from 10.63.100.6 icmp_seq=5 ttl=64 time=2.997 ms
```

- D1: 10.**63**.102.1

Figura 7 Ping de PC2 a D1

```
PC2> ping 10.63.102.1

84 bytes from 10.63.102.1 icmp_seq=1 ttl=255 time=3.100 ms
84 bytes from 10.63.102.1 icmp_seq=2 ttl=255 time=1.738 ms
84 bytes from 10.63.102.1 icmp_seq=3 ttl=255 time=1.840 ms
84 bytes from 10.63.102.1 icmp_seq=4 ttl=255 time=1.750 ms
84 bytes from 10.63.102.1 icmp_seq=5 ttl=255 time=2.490 ms
```

- D2: 10.**63**.102.2

Figura 8 Ping de PC2 a D2

```
PC2> ping 10.63.102.2

84 bytes from 10.63.102.2 icmp_seq=1 ttl=255 time=1.421 ms
84 bytes from 10.63.102.2 icmp_seq=2 ttl=255 time=1.006 ms
84 bytes from 10.63.102.2 icmp_seq=3 ttl=255 time=0.775 ms
84 bytes from 10.63.102.2 icmp_seq=4 ttl=255 time=0.881 ms
84 bytes from 10.63.102.2 icmp_seq=5 ttl=255 time=0.806 ms
```

- D1: 10.**63**.101.1

Figura 9 Ping de PC3 a D1

```
PC3> ping 10.63.101.1

84 bytes from 10.63.101.1 icmp_seq=1 ttl=255 time=3.973 ms
84 bytes from 10.63.101.1 icmp_seq=2 ttl=255 time=1.963 ms
84 bytes from 10.63.101.1 icmp_seq=3 ttl=255 time=2.245 ms
84 bytes from 10.63.101.1 icmp_seq=4 ttl=255 time=1.979 ms
84 bytes from 10.63.101.1 icmp_seq=5 ttl=255 time=2.220 ms
```

- D2: 10.**63**.101.2

Figura 10 Ping de PC3 a D2

```
PC3> ping 10.63.101.1

84 bytes from 10.63.101.1 icmp_seq=1 ttl=255 time=5.300 ms
84 bytes from 10.63.101.1 icmp_seq=2 ttl=255 time=2.326 ms
84 bytes from 10.63.101.1 icmp_seq=3 ttl=255 time=1.769 ms
84 bytes from 10.63.101.1 icmp_seq=4 ttl=255 time=3.011 ms
84 bytes from 10.63.101.1 icmp_seq=5 ttl=255 time=2.240 ms
```

- D1: 10.**63**.100.1

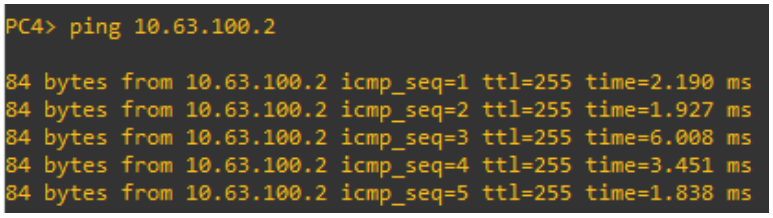
Figura 11 Ping de PC4 a D1

```
PC4> ping 10.63.100.1

84 bytes from 10.63.100.1 icmp_seq=1 ttl=255 time=6.122 ms
84 bytes from 10.63.100.1 icmp_seq=2 ttl=255 time=1.522 ms
84 bytes from 10.63.100.1 icmp_seq=3 ttl=255 time=2.466 ms
84 bytes from 10.63.100.1 icmp_seq=4 ttl=255 time=1.417 ms
84 bytes from 10.63.100.1 icmp_seq=5 ttl=255 time=1.622 ms
```

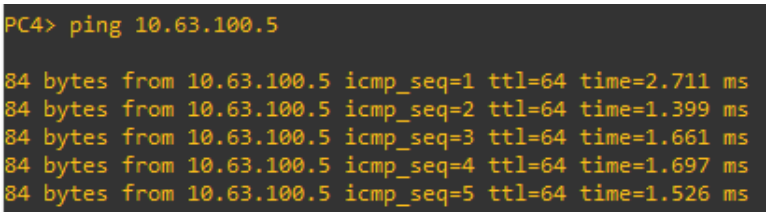
- D2: 10.**63**.100.2

Figura 12 Ping de PC4 a D2



- PC1: 10.**63**.100.5

Figura 13 Ping de PC4 a PC1



Prueba de Habilidades Escenario 2

Parte 3: configurar protocolos de enrutamiento

Tabla 3. Configuración de tareas parte 3

Task#	Task	Specification	Points
3.1	On the "Company Network" (i.e., R1, R3, D1, and D2), configure single-area OSPFv2 in area 0.	Use OSPF Process ID **4** and assign the following router-IDs: • R1: 0.0.4.1 • R3: 0.0.4.3 • D1: 0.0.4.131 • D2: 0.0.4.132 On R1, R3, D1, and D2, advertise all directly connected networks / VLANs in Area 0. • On R1, do not advertise the R1 – R2 network. • On R1, propagate a default route. Note that the default route will be provided by BGP. Disable OSPFv2 advertisements on: • D1: All interfaces except E1/2 • D2: All interfaces except E1/0	8
3.2	On the "Company Network" (i.e., R1, R3, D1, and D2), configure classic single-area OSPFv3 in area 0.	Use OSPF Process ID **6** and assign the following router-IDs: • R1: 0.0.6.1 • R3: 0.0.6.3 • D1: 0.0.6.131 • D2: 0.0.6.132 On R1, R3, D1, and D2, advertise all directly connected networks / VLANs in Area 0. • On R1, do not advertise the R1 – R2 network. • On R1, propagate a default route. Note that the default route will be provided by BGP. Disable OSPFv3 advertisements on: • D1: All interfaces except E1/2 • D2: All interfaces except E1/0	8
3.3	On R2 in the "ISP Network", configure MP-BGP.	Configure two default static routes via interface Loopback 0: • An IPv4 default static route. • An IPv6 default static route. Configure R2 in BGP ASN **500** and use the router-id 2.2.2.2. Configure and enable an IPv4 and IPv6 neighbor relationship with R1 in ASN 300. In IPv4 address family, advertise: • The Loopback 0 IPv4 network (/32). • The default route (0.0.0.0/0). In IPv6 address family, advertise: • The Loopback 0 IPv4 network (/128). The default route (::/0).	4
3.4	On R1 in the "ISP Network", configure MP-BGP.	Configure two static summary routes to interface Null 0: • A summary IPv4 route for 10. 63.0.0/8. • A summary IPv6 route for 2001:db8:100::/48. Configure R1 in BGP ASN **300** and use the router-id 1.1.1.1.	4

		Configure an IPv4 and IPv6 neighbor relationship with R2 in ASN 500. In IPv4 address family: • Disable the IPv6 neighbor relationship. • Enable the IPv4 neighbor relationship. • Advertise the 10. 63.0.0/8 network. In IPv6 address family: • Disable the IPv4 neighbor relationship. • Enable the IPv6 neighbor relationship. • Advertise the 2001:db8:100::/48 network.	

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

Use OSPF Process ID 4 and assign the following router-IDs:

- *R1: 0.0.4.1*

router ospf 4
router-id 0.0.4.1

- *R3: 0.0.4.3*

router ospf 4
router-id 0.0.4.3

- *D1: 0.0.4.131*

router ospf 4
router-id 0.0.4.131

- *D2: 0.0.4.132*

router ospf 4
router-id 0.0.4.132

En R1, R3, D1 y D2, anuncie todas las redes/VLAN conectadas directamente en el Área 0.

R1
network 10.63.10.0 0.0.0.255 area 0
network 10.63.13.0 0.0.0.255 area 0

R3
network 10.63.11.0 0.0.0.255 area 0
network 10.63.13.0 0.0.0.255 area 0

D1
network 10.63.10.0 0.0.0.255 area 0
network 10.63.100.0 0.0.0.255 area 0
network 10.63.101.0 0.0.0.255 area 0
network 10.63.102.0 0.0.0.255 area 0

D2
network 10.63.11.0 0.0.0.255 area 0
network 10.63.100.0 0.0.0.255 area 0
network 10.63.101.0 0.0.0.255 area 0
network 10.63.102.0 0.0.0.255 area 0

- En R1, no anuncie la red R1 – R2*.*

R1
default-information originate

Deshabilitar anuncios OSPFv2 en:
- *D1: Todas las interfaces excepto E1/2*

D1
passive-interface default
no passive-interface e1/2
exit

- *D2: Todas las interfaces excepto E1/0*

D2
passive-interface default
no passive-interface e1/0
exit

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.

Utilice el ID de proceso OSPF 6 y asigne los siguientes ID de enrutador:

- *R1: 0.0.6.1*

ipv6 router ospf 6
router-id 0.0.6.1

- *R3: 0.0.6.3*

ipv6 router ospf 6
router-id 0.0.6.3

- *D1: 0.0.6.131*

ipv6 router ospf 6
router-id 0.0.6.131

- *D2: 0.0.6.132*

ipv6 router ospf 6
router-id 0.0.6.132

En R1, R3, D1 y D2, anuncie todas las redes/VLAN conectadas directamente en el Área 0.

R1
interface e1/2
ipv6 ospf 6 area 0
exit
interface e1/1
ipv6 ospf 6 area 0
exit

R3
interface e1/0
ipv6 ospf 6 area 0
exit
interface e1/1
ipv6 ospf 6 area 0
exit

D1
interface e1/2
ipv6 ospf 6 area 0
exit
interface vlan 100
ipv6 ospf 6 area 0
exit
interface vlan 101
ipv6 ospf 6 area 0
exit
interface vlan 102
ipv6 ospf 6 area 0
exit

D2
interface e1/0
ipv6 ospf 6 area 0
exit
interface vlan 100
ipv6 ospf 6 area 0
exit
interface vlan 101
ipv6 ospf 6 area 0
exit
interface vlan 102
ipv6 ospf 6 area 0
exit

- En R1, no anuncie la red R1 – R2.

default-information originate
exit

Disable OSPFv3 advertisements on:

- D1: Todas las interfaces excepto E1/2

passive-interface default
no passive-interface e1/2
exit

- D2: Todas las interfaces excepto E1/0

passive-interface default
no passive-interface e1/0
exit

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

Configure dos rutas estáticas predeterminadas a través de la interfaz Loopback 0:

- Una ruta estática predeterminada de IPv4.

ip route 0.0.0.0 0.0.0.0 loopback 0

- Una ruta estática predeterminada de IPv6.

ipv6 route ::/0 loopback 0

Configure R2 in BGP ASN 500 and use the router-id 2.2.2.2.
router bgp 500
bgp router-id 2.2.2.2

Configure y habilite una relación de vecino IPv4 e IPv6 con R1 en ASN 300.
neighbor 209.165.200.225 remote-as 300
neighbor 2001:db8:200::1 remote-as 300

En la familia de direcciones IPv4, anuncie:

- La red Loopback 0 IPv4 (/32).
- La ruta predeterminada (0.0.0.0/0).

address-family ipv4
neighbor 209.165.200.225 activate
no neighbor 2001:db8:200::1 activate
network 2.2.2.2 mask 255.255.255.255
network 0.0.0.0

En la familia de direcciones IPv6, anuncie:

- La red Loopback 0 IPv4 (/128).
- La ruta predeterminada (::/0).

address-family ipv6
no neighbor 209.165.200.225 activate
neighbor 2001:db8:200::1 activate
network 2001:db8:2222::/128
network ::/0

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

Configure dos rutas resumidas estáticas a la interfaz Null 0:

- Una ruta IPv4 resumida para 10.63.0.0/8.

ip route 10.63.0.0 255.0.0.0 null0

- Una ruta IPv6 resumida para 2001:db8:100::/48.

ipv6 route 2001:db8:100::/48 null0

Configure R1 en BGP ASN 300 y use la identificación del enrutador 1.1.1.1.
router bgp 300
bgp router-id 1.1.1.1

Configure una relación de vecino IPv4 e IPv6 con R2 en ASN 500.
neighbor 209.165.200.226 remote-as 500
neighbor 2001:db8:200::2 remote-as 500

En la familia de direcciones IPv4:

- Deshabilite la relación de vecino IPv6.
- Habilite la relación de vecino IPv4.
- Anunciar la red 10. 63.0.0/8.

address-family ipv4 unicast
no neighbor 2001:db8:200::2 activate
neighbor 209.165.200.226 activate
network 10.63.0.0 mask 255.0.0.0
exit-address-family

En la familia de direcciones IPv6:

- Deshabilite la relación de vecino IPv4.
- Habilite la relación de vecino IPv6.
- Anuncie la red 2001:db8:100::/48.

address-family ipv6 unicast
no neighbor 209.165.200.226 activate
neighbor 2001:db8:200::2 activate
network 2001:db8:100::/48
exit-address-family

Configuración R1
router ospf 4
router-id 0.0.4.1
network 10.63.10.0 0.0.0.255 area 0
network 10.63.13.0 0.0.0.255 area 0
default-information originate
exit
ipv6 router ospf 6
router-id 0.0.6.1
default-information originate
exit
interface e1/2
ipv6 ospf 6 area 0
exit
interface e1/1
ipv6 ospf 6 area 0
exit
ip route 10.63.0.0 255.0.0.0 null0
ipv6 route 2001:db8:100::/48 null0
router bgp 300

bgp router-id 1.1.1.1
neighbor 209.165.200.226 remote-as 500
neighbor 2001:db8:200::2 remote-as 500
address-family ipv4 unicast
neighbor 209.165.200.226 activate
no neighbor 2001:db8:200::2 activate
network 10.63.0.0 mask 255.0.0.0
exit-address-family
address-family ipv6 unicast
no neighbor 209.165.200.226 activate
neighbor 2001:db8:200::2 activate
network 2001:db8:100::/48
exit-address-family

Configuración R2
ip route 0.0.0.0 0.0.0.0 loopback 0
ipv6 route ::/0 loopback 0
router bgp 500
bgp router-id 2.2.2.2
neighbor 209.165.200.225 remote-as 300
neighbor 2001:db8:200::1 remote-as 300
address-family ipv4
neighbor 209.165.200.225 activate
no neighbor 2001:db8:200::1 activate
network 2.2.2.2 mask 255.255.255.255
network 0.0.0.0
exit-address-family
address-family ipv6
no neighbor 209.165.200.225 activate
neighbor 2001:db8:200::1 activate
network 2001:db8:2222::/128
network ::/0
exit-address-family

Configuración R3
router ospf 4
router-id 0.0.4.3
network 10.63.11.0 0.0.0.255 area 0
network 10.63.13.0 0.0.0.255 area 0
exit
ipv6 router ospf 6
router-id 0.0.6.3
exit
interface e1/0
ipv6 ospf 6 area 0

exit
interface e1/1
ipv6 ospf 6 area 0
exit
end

Configuración D1
router ospf 4
router-id 0.0.4.131
network 10.63.10.0 0.0.0.255 area 0
network 10.63.100.0 0.0.0.255 area 0
network 10.63.101.0 0.0.0.255 area 0
network 10.63.102.0 0.0.0.255 area 0
passive-interface default
no passive-interface e1/2
exit
ipv6 router ospf 6
router-id 0.0.6.131
passive-interface default
no passive-interface e1/2
exit
interface e1/2
ipv6 ospf 6 area 0
exit
interface vlan 100
ipv6 ospf 6 area 0
exit
interface vlan 101
ipv6 ospf 6 area 0
exit
interface vlan 102
ipv6 ospf 6 area 0
exit
end

Configuración D2
router ospf 4
router-id 0.0.4.132
network 10.63.11.0 0.0.0.255 area 0
network 10.63.100.0 0.0.0.255 area 0
network 10.63.101.0 0.0.0.255 area 0
network 10.63.102.0 0.0.0.255 area 0
passive-interface default
no passive-interface e1/2
exit

ipv6 router ospf 6
router-id 0.0.6.132
passive-interface default
no passive-interface e1/0
exit
interface e1/0
ipv6 ospf 6 area 0
exit
interface vlan 100
ipv6 ospf 6 area 0
exit
interface vlan 101
ipv6 ospf 6 area 0
exit
interface vlan 102
ipv6 ospf 6 area 0
exit
end

Figura 14. Show ip route desde R1

```
R1#show ip route
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
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
       + - replicated route, % - next hop override

Gateway of last resort is 209.165.200.226 to network 0.0.0.0

B*    0.0.0.0/0 [20/0] via 209.165.200.226, 00:21:43
      2.0.0.0/32 is subnetted, 1 subnets
B        2.2.2.2 [20/0] via 209.165.200.226, 00:21:43
      10.0.0.0/8 is variably subnetted, 8 subnets, 2 masks
C        10.63.10.0/24 is directly connected, Ethernet1/2
L        10.63.10.1/32 is directly connected, Ethernet1/2
O        10.63.11.0/24 [110/20] via 10.63.13.3, 00:17:26, Ethernet1/1
C        10.63.13.0/24 is directly connected, Ethernet1/1
L        10.63.13.1/32 is directly connected, Ethernet1/1
O        10.63.100.0/24 [110/11] via 10.63.10.2, 00:15:26, Ethernet1/2
O        10.63.101.0/24 [110/11] via 10.63.10.2, 00:15:26, Ethernet1/2
O        10.63.102.0/24 [110/11] via 10.63.10.2, 00:15:26, Ethernet1/2
      209.165.200.0/24 is variably subnetted, 2 subnets, 2 masks
C        209.165.200.224/27 is directly connected, Ethernet1/0
L        209.165.200.225/32 is directly connected, Ethernet1/0
R1#
```

Figura 15. Show ip route desde R3

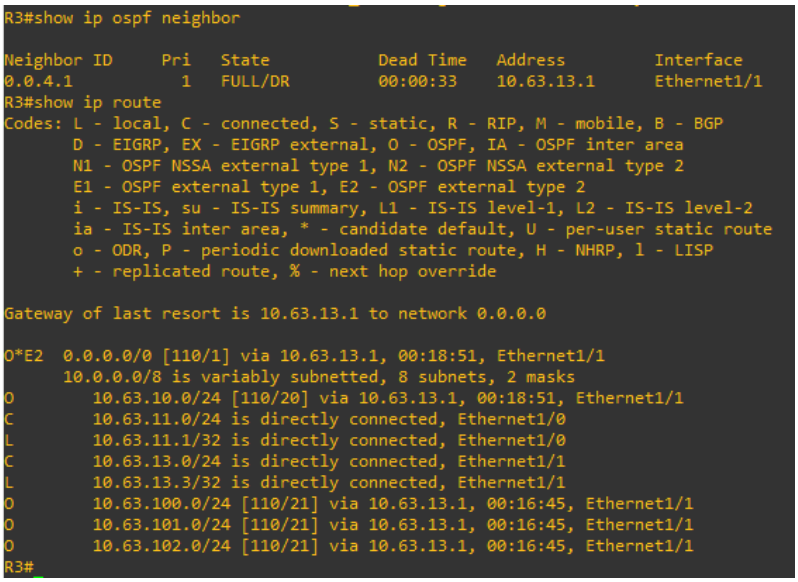


Figura 16. Show ip ospf neighbor desde R1

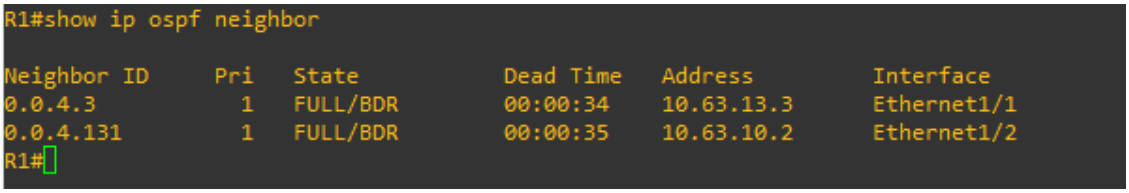
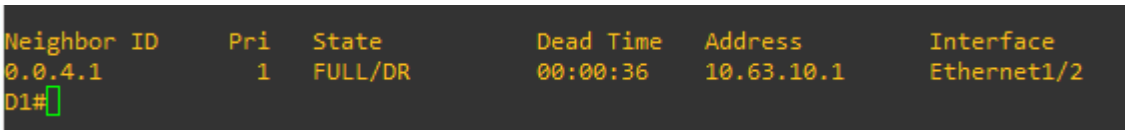


Figura 17. Show ip ospf neighbor desde D1



Parte 4: configurar la redundancia del primer salto

Tabla 4. Configuración de tareas parte 4

Task#	Task	Specification	Points
4.1	On D1, create IP SLAs that test the reachability of R1 interface E1/2.	Create two IP SLAs. • Use SLA number **4** for IPv4. • Use SLA number **6** for IPv6. The IP SLAs will test availability of R1 E1/2 interface every 5 seconds. Schedule the SLA for immediate implementation with no end time. Create an IP SLA object for IP SLA 4 and one for IP SLA 6.	2

		• Use track number **4** for IP SLA 4. • Use track number **6** for IP SLA 6. • 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.	
4.2	On D2, create IP SLAs that test the reachability of R3 interface E1/0.	Create two IP SLAs. • Use SLA number **4** for IPv4. • Use SLA number **6** for IPv6. The IP SLAs will test availability of R3 E1/0 interface every 5 seconds. Schedule the SLA for immediate implementation with no end time. Create an IP SLA object for IP SLA 4 and one for IP SLA 6. • Use track number **4** for IP SLA 4. • Use track number **6** for IP SLA 6. • 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.	2
4.3	On D1, configure HSRPv2.	D1 is the primary router for VLANs 100 and 102; therefore, their priority will also be changed to 150. Configure HSRP version 2. Configure IPv4 HSRP group **104** for VLAN 100: • Assign the virtual IP address **10.63.100.254.** • Set the group priority to **150**. • Enable preemption. • Track object 4 and decrement by 60. Configure IPv4 HSRP group **114** for VLAN 101: • Assign the virtual IP address **10.63.101.254.** • Enable preemption. • Track object 4 to decrement by 60. Configure IPv4 HSRP group **124** for VLAN 102: • Assign the virtual IP address **10. 63.102.254.** • Set the group priority to **150**. • Enable preemption. • Track object 4 to decrement by 60. Configure IPv6 HSRP group **106** for VLAN 100: • Assign the virtual IP address using **ipv6 autoconfig**. • Set the group priority to **150**. • Enable preemption. • Track object 6 and decrement by 60. Configure IPv6 HSRP group **116** for VLAN 101: • Assign the virtual IP address using **ipv6 autoconfig**. • Enable preemption. • Track object 6 and decrement by 60. Configure IPv6 HSRP group **126** for VLAN 102: • Assign the virtual IP address using **ipv6 autoconfig.** • Set the group priority to **150**. • Enable preemption. • Track object 6 and decrement by 60.	4
4.4	On D2, configure HSRPv2.	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 **104** for VLAN 100: • Assign the virtual IP address **10.63.100.254.** • Enable preemption. • Track object 4 and decrement by 60. Configure IPv4 HSRP group **114** for VLAN 101: • Assign the virtual IP address **10.63.101.254.** • Set the group priority to **150.** • Enable preemption. • Track object 4 to decrement by 60. Configure IPv4 HSRP group **124** for VLAN 102: • Assign the virtual IP address **10.63.102.254**. • Enable preemption. • Track object 4 to decrement by 60. Configure IPv6 HSRP group **106** for VLAN 100: • Assign the virtual IP address using **ipv6 autoconfig.** • Enable preemption. • Track object 6 and decrement by 60. Configure IPv6 HSRP group **116** for VLAN 101: • Assign the virtual IP address using **ipv6 autoconfig**. • Set the group priority to **150**. • Enable preemption. • Track object 6 and decrement by 60. Configure IPv6 HSRP group **126** for VLAN 102: • Assign the virtual IP address using **ipv6 autoconfig.** • Enable preemption. • Track object 6 and decrement by 60.	

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

Cree dos IP SLA.

- Utilice el SLA número 4 para IPv4.

ip sla 4

- Utilice el SLA número 6 para IPv6.

ip sla 6

Los IP SLA probarán la disponibilidad de la interfaz R1 E1/2 cada 5 segundos.

icmp-echo 10.63.10.1
frequency 5
exit
ip sla 6
icmp-echo 2001:db8:100:1010::1
frequency 5
exit

Programe el SLA para implementación inmediata sin tiempo de finalización.
ip sla schedule 4 life forever start-time now
ip sla schedule 6 life forever start-time now

Cree un objeto IP SLA para IP SLA 4 y otro para IP SLA 6.

- Utilice el número de pista 4 para IP SLA 4.

track 4 ip sla 4

- Use la pista número 6 para IP SLA 6.

track 6 ip sla 6

Los objetos rastreados deben notificar a D1 si el estado de IP SLA cambia de abajo a arriba después de 10 segundos, o de arriba a abajo después de 15 segundos.
delay down 10 up 15
exit

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

Cree dos IP SLA.
- Utilice el SLA número 4 para IPv4.

ip sla 4

- Utilice el SLA número 6 para IPv6.

ip sla 6

Los IP SLA probarán la disponibilidad de la interfaz R3 E1/0 cada 5 segundos.
icmp-echo 10.63.11.1
frequency 5
exit
icmp-echo 2001:db8:100:1011::1
frequency 5
exit

Programe el SLA para implementación inmediata sin tiempo de finalización.
ip sla schedule 4 life forever start-time now
ip sla schedule 6 life forever start-time now

Cree un objeto IP SLA para IP SLA 4 y otro para IP SLA 6.

- Utilice el número de pista 4 para IP SLA 4.

track 4 ip sla 4

- Use la pista número 6 para IP SLA 6.

track 6 ip sla 6

Los objetos rastreados deben notificar a D1 si el estado de IP SLA cambia de abajo a arriba después de 10 segundos, o de arriba a abajo después de 15 segundos.
delay down 10 up 15
exit

4.3 - *En D1, configure HSRPv2.*

D1 es el enrutador principal para las VLAN 100 y 102; por lo tanto, su prioridad también se cambiará a 150.
interface vlan 100

Configure la versión 2 de HSRP.
standby version 2

Configure el grupo 104 de HSRP de IPv4 para la VLAN 100:

- Asigne la dirección IP virtual 10.63.100.254.
- Establezca la prioridad del grupo en 150.
- Habilitar preferencia.
- Siga el objeto 4 y disminuya en 60.

standby 104 ip 10.63.100.254
standby 104 priority 150
standby 104 preempt
standby 104 track 4 decrement 60

Configure el grupo 114 de HSRP de IPv4 para la VLAN 101:

- Asigne la dirección IP virtual 10.63.101.254.
- Habilitar preferencia.
- Seguimiento del objeto 4 para disminuir en 60.

interface vlan 101
standby version 2
standby 114 ip 10.63.101.254
standby 114 preempt
standby 114 track 4 decrement 60

Configure el grupo 124 de HSRP de IPv4 para la VLAN 102:

- Asigne la dirección IP virtual 10.63.102.254.
- Establezca la prioridad del grupo en 150.
- Habilitar preferencia.
- Seguimiento del objeto 4 para disminuir en 60.

interface vlan 102
standby version 2
standby 124 ip 10.63.102.254
standby 124 priority 150
standby 124 preempt
standby 124 track 4 decrement 60

Configure el grupo 106 de HSRP de IPv6 para la VLAN 100:

- Asigne la dirección IP virtual mediante la configuración automática de ipv6.
- Establezca la prioridad del grupo en 150.
- Habilitar preferencia.
- Siga el objeto 6 y disminuya en 60.

standby 106 ipv6 autoconfig
standby 106 priority 150
standby 106 preempt
standby 106 track 6 decrement 60

Configure el grupo 116 de HSRP de IPv6 para la VLAN 101:

- Asigne la dirección IP virtual mediante la configuración automática de ipv6.
- Habilitar preferencia.
- Siga el objeto 6 y disminuya en 60.

standby 116 ipv6 autoconfig
standby 116 preempt
standby 116 track 6 decrement 60

Configure el grupo 126 de HSRP de IPv6 para la VLAN 102:

- Asigne la dirección IP virtual mediante la configuración automática de ipv6.
- Establezca la prioridad del grupo en 150.
- Habilitar preferencia.
- Siga el objeto 6 y disminuya en 60.

standby 126 ipv6 autoconfig
standby 126 priority 150
standby 126 preempt
standby 126 track 6 decrement 60

4.4 - En D2, configure HSRPv2.

D2 es el enrutador principal para la VLAN 101; por lo tanto, la prioridad también se cambiará a 150.
interface vlan 101

Configure la versión 2 de HSRP.
standby version 2

Configure el grupo 104 de HSRP de IPv4 para la VLAN 100:

- Asigne la dirección IP virtual 10.63.100.254.
- Habilitar preferencia.
- Siga el objeto 4 y disminuya en 60.

standby 104 ip 10.63.100.254
standby 104 preempt
standby 104 track 4 decrement 60

Configure IPv4 HSRP group 114 for VLAN 101:

- Asigne la dirección IP virtual 10.63.101.254.
- Establezca la prioridad del grupo en 150.
- Habilitar preferencia.
- Seguimiento del objeto 4 para disminuir en 60.

standby 114 ip 10.63.101.254
standby 104 priority 150
standby 114 preempt
standby 114 track 4 decrement 60

Configure el grupo 124 de HSRP de IPv4 para la VLAN 102:

- Asigne la dirección IP virtual 10.63.102.254.
- Habilitar preferencia.
- Seguimiento del objeto 4 para disminuir en 60.

standby 124 ip 10.63.102.254
standby 124 preempt
standby 124 track 4 decrement 60

Configure el grupo 106 de HSRP de IPv6 para la VLAN 100:

- Asigne la dirección IP virtual mediante la configuración automática de ipv6.
- Habilitar preferencia.
- Siga el objeto 6 y disminuya en 60.

standby 106 ipv6 autoconfig
standby 106 preempt
standby 106 track 6 decrement 60

Configure el grupo 116 de HSRP de IPv6 para la VLAN 101:

- Asigne la dirección IP virtual mediante la configuración automática de ipv6.
- Establezca la prioridad del grupo en 150.
- Habilitar preferencia.
- Siga el objeto 6 y disminuya en 60.

standby 116 ipv6 autoconfig
standby 116 priority 150
standby 116 preempt
standby 116 track 6 decrement 60

Configure el grupo 126 de HSRP de IPv6 para la VLAN 102:

- Asigne la dirección IP virtual mediante la configuración automática de ipv6.
- Habilitar preferencia.
- Siga el objeto 6 y disminuya en 60.

standby 126 ipv6 autoconfig
standby 126 preempt
standby 126 track 6 decrement 60

Configuración D1
ip sla 4
icmp-echo 10.63.10.1
frequency 5
exit
ip sla 6
icmp-echo 2001:db8:100:1010::1
frequency 5
exit
ip sla schedule 4 life forever start-time now
ip sla schedule 6 life forever start-time now
track 4 ip sla 4
delay down 10 up 15
exit

track 6 ip sla 6
delay down 10 up 15
exit
interface vlan 100
standby version 2
standby 104 ip 10.63.100.254
standby 104 priority 150
standby 104 preempt
standby 104 track 4 decrement 60
standby 106 ipv6 autoconfig
standby 106 priority 150
standby 106 preempt
standby 106 track 6 decrement 60
exit
interface vlan 101
standby version 2
standby 114 ip 10.63.101.254
standby 114 preempt
standby 114 track 4 decrement 60
standby 116 ipv6 autoconfig
standby 116 preempt
standby 116 track 6 decrement 60
exit
interface vlan 102
standby version 2
standby 124 ip 10.63.102.254
standby 124 priority 150
standby 124 preempt
standby 124 track 4 decrement 60
standby 126 ipv6 autoconfig
standby 126 priority 150
standby 126 preempt
standby 126 track 6 decrement 60
exit
end

Configuración D2
ip sla 4
icmp-echo 10.63.11.1
frequency 5
exit
ip sla 6
icmp-echo 2001:db8:100:1011::1
frequency 5

exit
ip sla schedule 4 life forever start-time now
ip sla schedule 6 life forever start-time now
track 4 ip sla 4
delay down 10 up 15
exit
track 6 ip sla 6
delay down 10 up 15
exit
interface vlan 100
standby version 2
standby 104 ip 10.63.100.254
standby 104 preempt
standby 104 track 4 decrement 60
standby 106 ipv6 autoconfig
standby 106 preempt
standby 106 track 6 decrement 60
exit
interface vlan 101
standby version 2
standby 114 ip 10.63.101.254
standby 114 priority 150
standby 114 preempt
standby 114 track 4 decrement 60
standby 116 ipv6 autoconfig
standby 116 priority 150
standby 116 preempt
standby 116 track 6 decrement 60
exit
interface vlan 102
standby version 2
standby 124 ip 10.63.102.254
standby 124 preempt
standby 124 track 4 decrement 60
standby 126 ipv6 autoconfig
standby 126 preempt
standby 126 track 6 decrement 60
exit
end

Figura 18. Configuración interfaces Switches 1 y 2

Switch D1

```
interface Vlan100
 ip address 10.63.100.1 255.255.255.0
 standby version 2
 standby 104 ip 10.63.100.254
 standby 104 priority 150
 standby 104 preempt
 standby 104 track 4 decrement 60
 standby 106 ipv6 autoconfig
 standby 106 priority 150
 standby 106 preempt
 standby 106 track 6 decrement 60
 ipv6 address FE80::D1:2 link-local
 ipv6 address 2001:DB8:100:100::1/64
 ipv6 ospf 6 area 0
!
interface Vlan101
 ip address 10.63.101.1 255.255.255.0
 standby version 2
 standby 114 ip 10.63.101.254
 standby 114 preempt
 standby 114 track 4 decrement 60
 standby 116 ipv6 autoconfig
 standby 116 preempt
 standby 116 track 6 decrement 60
 ipv6 address FE80::D1:3 link-local
 ipv6 address 2001:DB8:100:101::1/64
 ipv6 ospf 6 area 0
!
interface Vlan102
 ip address 10.63.102.1 255.255.255.0
 standby version 2
 standby 124 ip 10.63.102.254
 standby 124 priority 150
 standby 124 preempt
 standby 124 track 4 decrement 60
 standby 126 ipv6 autoconfig
 standby 126 priority 150
 standby 126 preempt
 standby 126 track 6 decrement 60
 ipv6 address FE80::D1:4 link-local
 ipv6 address 2001:DB8:100:102::1/64
 ipv6 ospf 6 area 0
!
router ospf 4
 router-id 0.0.4.131
 passive-interface default
 no passive-interface Ethernet1/2
 network 10.63.10.0 0.0.0.255 area 0
 network 10.63.100.0 0.0.0.255 area 0
 network 10.63.101.0 0.0.0.255 area 0
 network 10.63.102.0 0.0.0.255 area 0
```

Switch D2

```
interface Vlan100
 ip address 10.63.100.2 255.255.255.0
 standby version 2
 standby 104 ip 10.63.100.254
 standby 104 preempt
 standby 104 track 4 decrement 60
 standby 106 ipv6 autoconfig
 standby 106 preempt
 standby 106 track 6 decrement 60
 ipv6 address FE80::D2:2 link-local
 ipv6 address 2001:DB8:100:100::2/64
 ipv6 ospf 6 area 0
!
interface Vlan101
 ip address 10.63.101.2 255.255.255.0
 standby version 2
 standby 114 ip 10.63.101.254
 standby 114 priority 150
 standby 114 preempt
 standby 114 track 4 decrement 60
 standby 116 ipv6 autoconfig
 standby 116 priority 150
 standby 116 preempt
 standby 116 track 6 decrement 60
 ipv6 address FE80::D2:3 link-local
 ipv6 address 2001:DB8:100:101::2/64
 ipv6 ospf 6 area 0
!
interface Vlan102
 ip address 10.63.102.2 255.255.255.0
 standby version 2
 standby 124 ip 10.63.102.254
 standby 124 preempt
 standby 124 track 4 decrement 60
 standby 126 ipv6 autoconfig
 standby 126 preempt
 standby 126 track 6 decrement 60
 ipv6 address FE80::D2:4 link-local
 ipv6 address 2001:DB8:100:102::2/64
 ipv6 ospf 6 area 0
!
router ospf 4
 router-id 0.0.4.132
 passive-interface default
 no passive-interface Ethernet1/2
 network 10.63.11.0 0.0.0.255 area 0
 network 10.63.100.0 0.0.0.255 area 0
 network 10.63.101.0 0.0.0.255 area 0
 network 10.63.102.0 0.0.0.255 area 0
```

CONCLUSIONES

- Mediante IEEE 802.1Q se permiten redes de área local virtual (VLAN) en una red Ethernet, utilizando switches y puentes para el direccionamiento de tramas.
- Los enlaces truncados permiten transportar tramas de datos en varias VLAN mediante la identificación de su etiqueta asignada.
- Gracias al protocolo RSTP se determina mediante algunas reglas la mejor manera de enrutar datos evitando redundancia en dicha red.
- Se realiza la configuración de protocolos IPv4 e IPv6 dando como resultado una red completamente convergente.
- Se realiza con éxito comandos ping de IPv4 e IPv6 a la interfaz Loopback 0 desde los switches D1 y D2.

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