DIPLOMADO DE PROFUNDIZACION 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 TELECOMUNICACIONES
BOGOTA
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DIPLOMADO DE OPCIÓN DE GRADO PRESENTADO
PARA OPTAR ELTÍTULO DE INGENIERO
TELECOMUNICACIONES

DIRECTOR:
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UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA - UNAD ESCUELA DE CIENCIAS BÁSICAS, TECNOLOGÍA E INGENIERÍA - ECBTI
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NOTA DE ACEPTACIÓN

Firma del presidente del Jurado

Firma del Jurado

Firma del Jurado

BOGOTA, 29 de noviembre de 2022

AGRADECIMIENTOS

Agradezco a mi esposa, por ser la guía y motivación para terminar este proyecto, a mis compañeros de trabajo a quienes debo total admiración y a los docentes quienes han compartido su conocimiento.

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GLOSARIO

HSRP: El Hot Standby Router Protocol es un protocolo propiedad de CISCO que permite el despliegue de enrutadores redundantes tolerantes de fallos en una red

VLAN: es una red de área local virtual que consiste en la agrupación o combinación de un conjunto de dispositivos que necesitan comunicarse entre sí.

OSPF: es un protocolo de red para encaminamiento jerárquico de pasarela interior o Interior Gateway Protocol, que usa el algoritmo Dijkstra, para calcular la ruta más corta entre dos nodos.

IPv4: Es un protocolo de internet de cuarta generación, permite la conexión en red con un direccionamiento de 32 bits en 4 bloques o segmentos.

IPv6: Es el protocolo actualizado del IPv4, resuelve los inconvenientes de agotamiento de direcciones, teniendo como principio el internet sin límites.

RESUMEN

Este proyecto está desarrollado con el fin de dar solución al escenario practico propuesto en el Diplomado de Profundización CCNP CISCO, con las habilidades adquiridas en el transcurso del periodo académico y necesarias para resolver situaciones relacionadas a la ingeniería de telecomunicaciones en cuanto al manejo de redes locales y empresariales.

Al momento de crear y configurar la topología de red para dar solución al problema propuesto y obtener un correcto enrutamiento de los dispositivos en capa 2, parámetros de tipo OSPF y redundancia de primer salto para los hosts, así como los mecanismos de seguridad y funciones administrativas.

Esta actividad es desarrollada mediante el software GNS3, manejando una interfaz que permite la emulación y respectiva configuración dispositivos de redes virtuales y reales, al usar 3 Routers, 3 Switches y 4 PC de acuerdo a la guía suministrada en el desarrollo del periodo académico.

Palabras Clave: CISCO, CCNP, Conmutación, Enrutamiento, Redes, Electrónica.

ABSTRACT

This project is developed in order to provide a solution to the practical scenario proposed in the CCNP CISCO Deepening Diploma, with the skills acquired during the academic period and necessary to solve situations related to telecommunications engineering regarding the management of local networks. and business.

When creating and configuring the network topology to solve the proposed problem and obtain a correct routing of the devices in layer 2, OSPF type parameters and first hop

redundancy for the hosts, as well as the security mechanisms and administrative functions.

This activity is developed through the GNS3 software, managing an interface that allows the emulation and respective configuration of virtual and real network devices, using 3 Routers, 3 Switches and 4 PCs according to the guide provided in the development of the academic period.

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

INTRODUCCIÓN

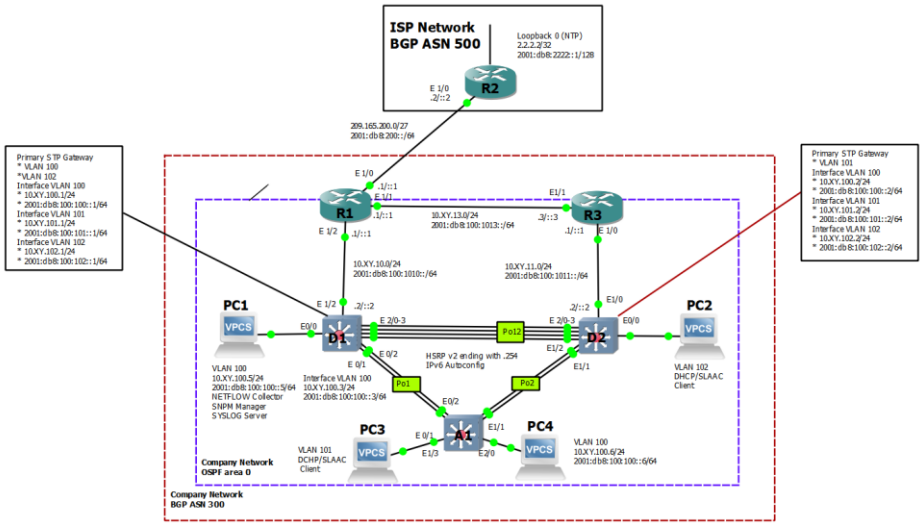
Esta actividad muestra el resultado de aprendizaje referente a estructuras redes conmutadas mediante el uso del protocolo STP y la configuración de VLANs, para comprender las características de una infraestructura de red jerárquica convergente.

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

Demostrando competencias para planificar redes inalámbricas, de acceso remoto seguras mediante el análisis de escenarios simulados de infraestructuras de red empresariales con acceso seguro a través de la automatización y virtualización de la red para aplicar metodologías de solución de problemas en ambientes de red corporativos LAN y WAN

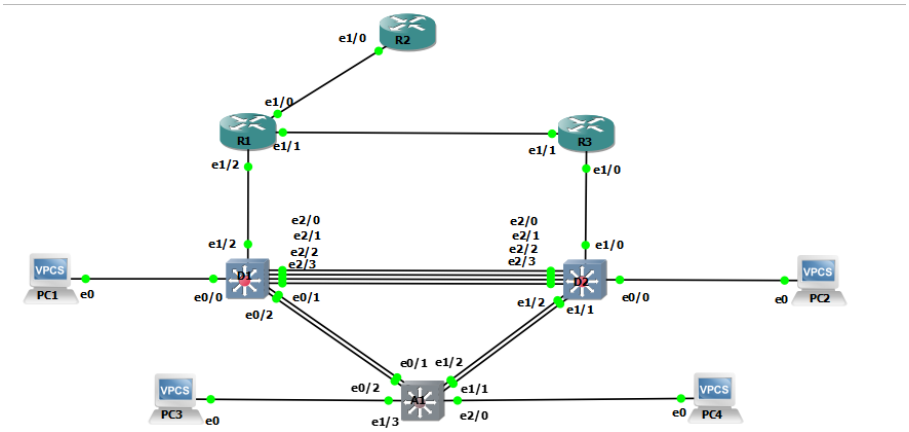
ESCENARIO 1

Figura 1. Escenario 1 1



Fuente: elaboración propia

Figura 2. Topología simulada 1



Fuente: elaboración propia

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	10.74.10.1/24	2001:db8:100:1010::1/64	fe80::1:2
	E1/1	10.74.13.1/24	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. 74.11.1/24	2001:db8:100:1011::1/64	fe80::3:2
	E1/1	10. 74.13.3/24	2001:db8:100:1013::3/64	fe80::3:3
D1	E1/2	10. 74.10.2/24	2001:db8:100:1010::2/64	fe80::d1:1
	VLAN 100	10. 74.100.1/24	2001:db8:100:100::1/64	fe80::d1:2
	VLAN 101	10. 74.101.1/24	2001:db8:100:101::1/64	fe80::d1:3
	VLAN 102	10. 74.102.1/24	2001:db8:100:102::1/64	fe80::d1:4
D2	E1/0	10. 74.11.2/24	2001:db8:100:1011::2/64	fe80::d2:1
	VLAN 100	10. 74.100.2/24	2001:db8:100:100::2/64	fe80::d2:2
	VLAN 101	10. 74.101.2/24	2001:db8:100:101::2/64	fe80::d2:3
	VLAN 102	10. 74.102.2/24	2001:db8:100:102::2/64	fe80::d2:4
A1	VLAN 100	10. 74.100.3/23	2001:db8:100:100::3/64	fe80::a1:1
PC1	NIC	10. 74.100.5/24	2001:db8:100:100::5/64	EUI-64
PC2	NIC	DHCP	SLAAC	EUI-64

Device	Interface	IPv4 Address	IPv6 Address	IPv6 Link-Local
PC3	NIC	DHCP	SLAAC	EUI-64
PC4	NIC	10. 74.100.6/24	2001:db8:100:100::6/64	EUI-64

Tabla 1.Tabla de direccionamiento

ESCENARIO

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

Note: The routers used with CCNP hands-on labs are Cisco 7200 routers. The switches used in the labs are Cisco Catalyst L2 switches Other routers, switches, and Cisco IOS versions can be used. Depending on the model and Cisco IOS version, the commands available and the output produced might vary from what is shown in the labs.

ROUTER R1

```
hostname R1
- Configurar el nombre del dispositivo
ipv6 unicast-routing
no ip domain lookup
banner motd # R1, ENCOR Skills Assessment_Andres_Reina#
line con 0
 exec-timeout 0 0
 logging synchronous
 exit
interface e1/0
 ip address 209.165.200.225 255.255.255.224
 ipv6 address fe80::1:1 link-local
 ipv6 address 2001:db8:200::1/64
 no shutdown
 exit

interface e1/2
 ip address 10.74.10.1 255.255.255.0
 ipv6 address fe80::1:2 link-local
 ipv6 address 2001:db8:100:1010::1/64
 no shutdown
 exit
interface e1/1
 ip address 10.74.13.1 255.255.255.0
 ipv6 address fe80::1:3 link-local
 ipv6 address 2001:db8:100:1013::1/64
 no shutdown
 exit
```

ROUTER R2

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

ROUTER R3

```
hostname R3
ipv6 unicast-routing
no ip domain lookup
banner motd # R3, ENCOR Skills Assessment_Andres_Reina#
line con 0
 exec-timeout 0 0
 logging synchronous
 exit
interface e1/0
 ip address 10.74.11.1 255.255.255.0
 ipv6 address fe80::3:2 link-local
 ipv6 address 2001:db8:100:1011::1/64
 no shutdown
 exit
interface e1/1
 ip address 10.74.13.3 255.255.255.0
 ipv6 address fe80::3:3 link-local
 ipv6 address 2001:db8:100:1010::2/64
 no shutdown
 exit
```

SWITCH 1

```
hostname D1
ip routing
ipv6 unicast-routing
no ip domain lookup
banner motd # D1, ENCOR Skills Assessment_Andres_Reina#
line con 0
 exec-timeout 0 0
 logging synchronous
 exit
vlan 100
 name Management
 exit
vlan 101
 name UserGroupA
 exit
vlan 102
 name UserGroupB
 exit
vlan 999
 name NATIVE
 exit
interface e1/2
 no switchport
 ip address 10.74.10.2 255.255.255.0
 ipv6 address fe80::d1:1 link-local
 ipv6 address 2001:db8:100:1010::2/64
 no shutdown
 exit
interface vlan 100
 ip address 10.74.100.1 255.255.255.0
 ipv6 address fe80::d1:2 link-local
 ipv6 address 2001:db8:100:100::1/64
 no shutdown
 exit
interface vlan 101
 ip address 10.74.101.1 255.255.255.0
 ipv6 address fe80::d1:3 link-local
 ipv6 address 2001:db8:100:101::1/64
 no shutdown
 exit
interface vlan 102
 ip address 10.74.102.1 255.255.255.0
 ipv6 address fe80::d1:4 link-local
 ipv6 address 2001:db8:100:102::1/64
 no shutdown
```

```
 exit
ip dhcp excluded-address 10.74.101.1 10.74.101.109
ip dhcp excluded-address 10.74.101.141 10.74.101.254
ip dhcp excluded-address 10.74.102.1 10.74.102.109
ip dhcp excluded-address 10.74.102.141 10.74.102.254
ip dhcp pool VLAN-101
 network 10.74.101.0 255.255.255.0
 default-router 10.74.101.254
 exit
ip dhcp pool VLAN-102
 network 10.74.102.0 255.255.255.0
 default-router 10.74.102.254
 exit
interface range e0/3,e1/0-1,e1/3,e3/0-3
 shutdown
 exit
```

SWITCH 2

```
hostname D1
ip routing
ipv6 unicast-routing
no ip domain lookup
banner motd # D1, ENCOR Skills Assessment_Andres_Reina#
line con 0
 exec-timeout 0 0
 logging synchronous
 exit
vlan 100
 name Management
 exit
vlan 101
 name UserGroupA
 exit
vlan 102
 name UserGroupB
 exit
vlan 999
 name NATIVE
 exit
interface e1/2
 no switchport
 ip address 10.74.10.2 255.255.255.0
 ipv6 address fe80::d1:1 link-local
 ipv6 address 2001:db8:100:1010::2/64
 no shutdown
 exit
interface vlan 100
 ip address 10.74.100.1 255.255.255.0
 ipv6 address fe80::d1:2 link-local
 ipv6 address 2001:db8:100:100::1/64
 no shutdown
 exit
interface vlan 101
 ip address 10.74.101.1 255.255.255.0
 ipv6 address fe80::d1:3 link-local
 ipv6 address 2001:db8:100:101::1/64
 no shutdown
 exit
interface vlan 102
 ip address 10.74.102.1 255.255.255.0
 ipv6 address fe80::d1:4 link-local
 ipv6 address 2001:db8:100:102::1/64
```

```
 no shutdown
 exit
ip dhcp excluded-address 10.74.101.1 10.74.101.109
ip dhcp excluded-address 10.74.101.141 10.74.101.254
ip dhcp excluded-address 10.74.102.1 10.74.102.109
ip dhcp excluded-address 10.74.102.141 10.74.102.254
ip dhcp pool VLAN-101
 network 10.74.101.0 255.255.255.0
 default-router 10.74.101.254
 exit
ip dhcp pool VLAN-102
 network 10.74.102.0 255.255.255.0
 default-router 10.74.102.254
 exit
interface range e0/3,e1/0-1,e1/3,e3/0-3
 shutdown
 exit
```

SWITCH 3

```
hostname A1
no ip domain lookup
banner motd # A1, ENCOR Skills Assessment_Andres_Reina#
line con 0
 exec-timeout 0 0
 logging synchronous
 exit
vlan 100
 name Management
 exit
vlan 101
 name UserGroupA
 exit
vlan 102
 name UserGroupB
 exit
vlan 999
 name NATIVE
 exit
interface vlan 100
 ip address 10.74.100.3 255.255.255.0
 ipv6 address fe80::a1:1 link-local
 ipv6 address 2001:db8:100:100::3/64
 no shutdown
 exit
interface range e0/0,e0/3,e1/0,e1/3,e2/1-3,e3/0-3
 shutdown
 exit
```

PC1 configurar IP: 10.74.100.5 255.255.255.0 gateway 10.74.100.254
PC2 configurar direccionamiento dinamico (DHCP)
PC3 configurar direccionamiento dinamico (DHCP)
PC4 configurar IP: 10.74.100.6 255.255.255.0 gateway 10.74.100.254

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

Task#	Task	Specification	Points
2.8	Verify local LAN connectivity.	PC1 should successfully ping: • D1: 10.74.100.1 • D2: 10.74.100.2 • PC4: 10.74.100.6 PC2 should successfully ping: • D1: 10.74.102.1 • D2: 10.74.102.2 PC3 should successfully ping: • D1: 10 74.101.1 • D2: 10 74.101.2 PC4 should successfully ping: • D1: 10.74.100.1 • D2: 10 74.100.2 • PC1: 10.74.100.5	1

Tabla 2. Lista de tareas escenario 1

PASO 2.1

Configuracion enlace truncal
Enable 802.1Q trunk links between:

- D1 and D2
- D1 and A1

D2 and A1
Usamos el comando:

switchport trunk encapsulation dot1q
switchport mode trunk

PASO 2.2

Use VLAN 999 as the native VLAN
Usamos el comando

switchport trunk native vlan 999

PASO 2.3

Use Rapid Spanning Tree.
Usamos el comando: spanning-tree mode rapid-pvst

PASO 2.4

Configure D1 and D2 as root for the appropriate VLANs with mutually supporting priorities in case of switch failure.
Usamos el comando: spanning-tree vlan xx root primary y spanning-tree vlan xx root secondary

PASO 2.5

Use the following channel numbers:

- D1 to D2 – Port channel 12
- D1 to A1 – Port channel 1

Usamos el comando: channel-group xx mode active

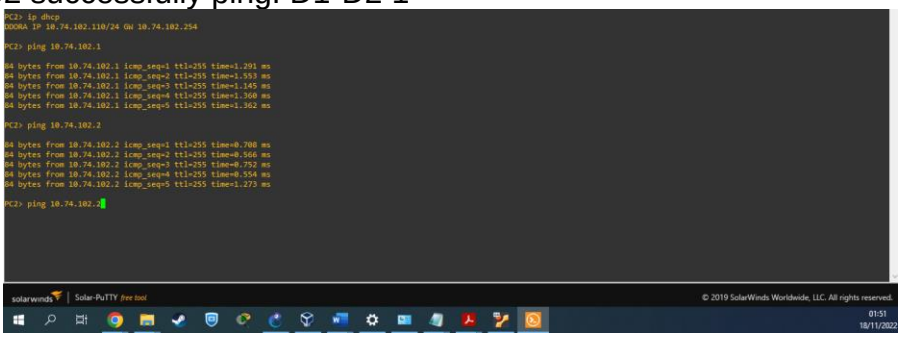
PASO 2.6

Configure access ports with appropriate VLAN settings as shown in the topology diagram.

Host ports should transition immediately to forwarding state
Ingresamos a la interfaz conectada al pc con: interface e0/0
Luego usamos el comando:
switchport mode access
switchport access vlan 100
spanning-tree portfast

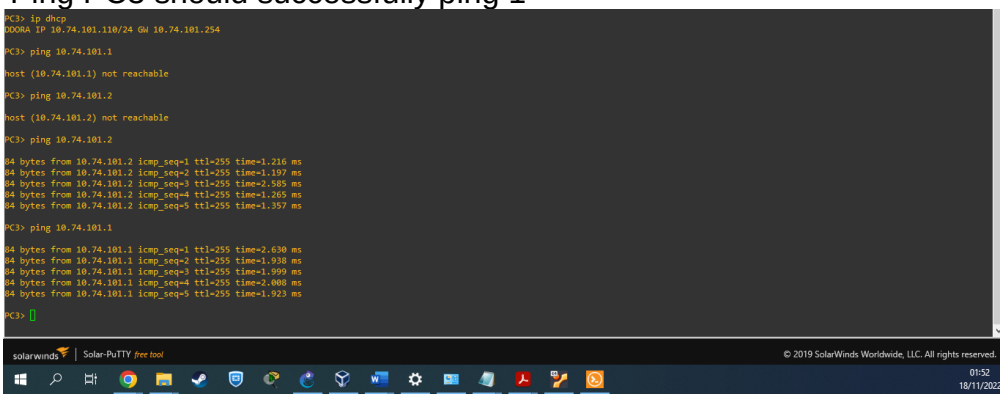
PASO 2.7

Figura 3. PC2 successfully ping: D1-D2 1



Fuente: elaboración propia

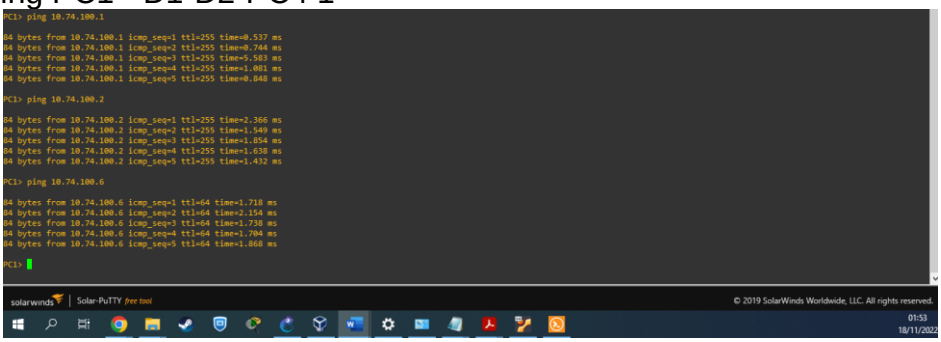
Figura 4. Ping PC3 should successfully ping 1



Fuente: elaboración propia

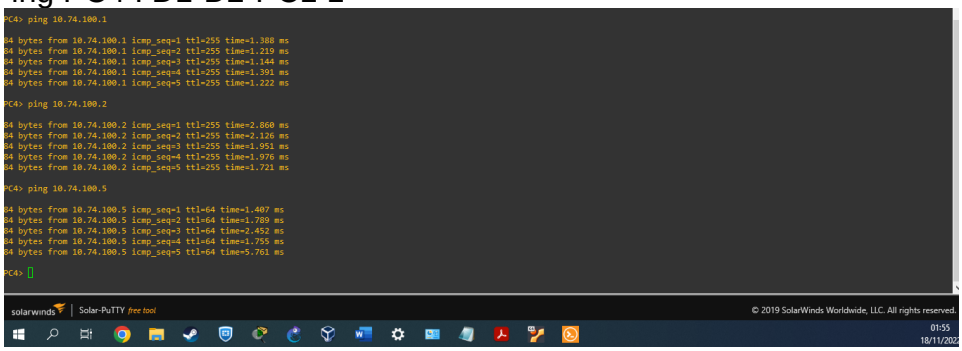
PASO 2.8

Figura 5. Ping PC1 - D1-D2-PC4 1



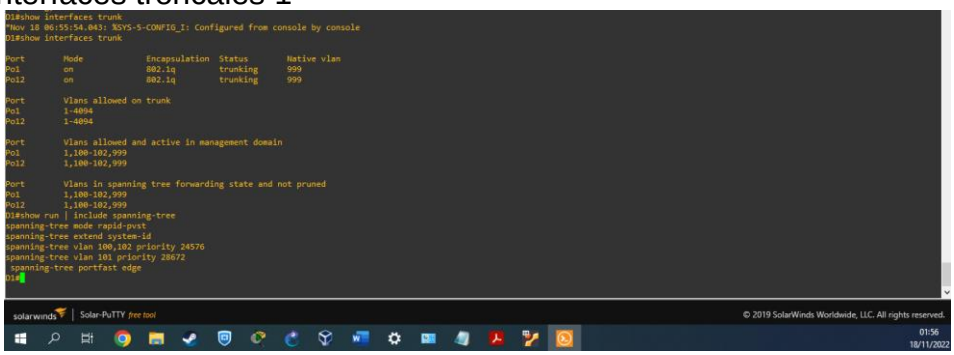
Fuente: elaboración propia

Figura 6. Ping PC4 : D1-D2-PC1 1



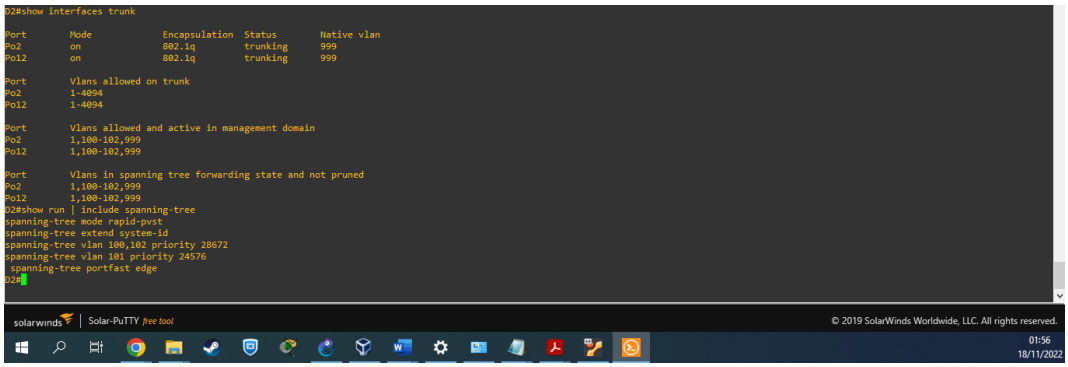
Fuente: elaboración propia

Figura 7. Interfaces troncales 1



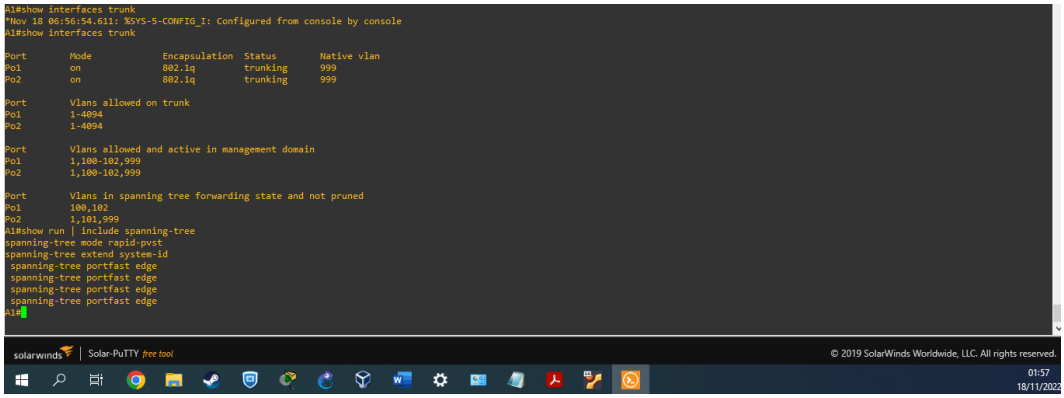
Fuente: elaboración propia

Figura 8. Interfaces troncales 1



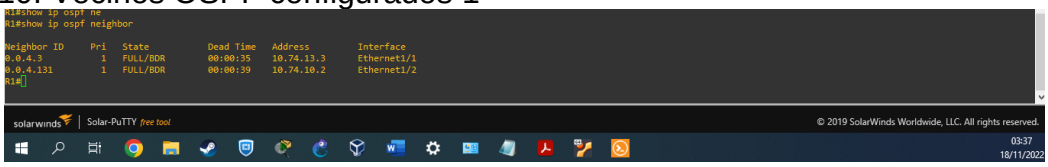
Fuente: elaboración propia

Figura 9. Interfaces troncales 1



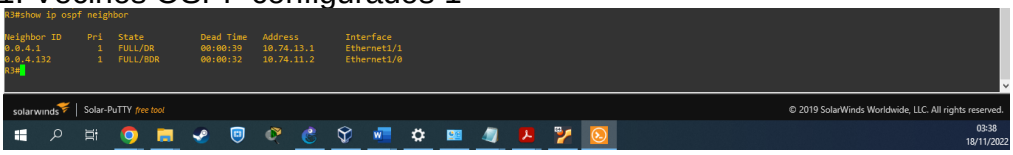
Fuente: elaboración propia

Figura 10. Vecinos OSPF configurados 1



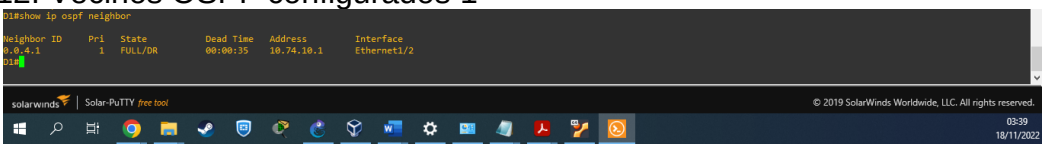
Fuente: elaboración propia

Figura 11. Vecinos OSPF configurados 1



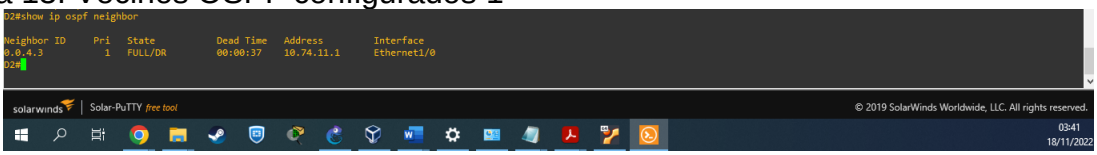
Fuente: elaboración propia

Figura 12. Vecinos OSPF configurados 1



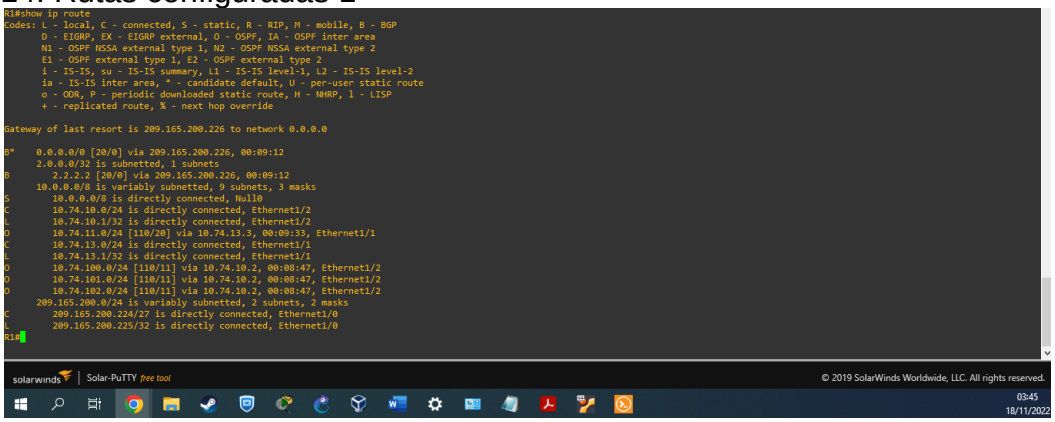
Fuente: elaboración propia

Figura 13. Vecinos OSPF configurados 1



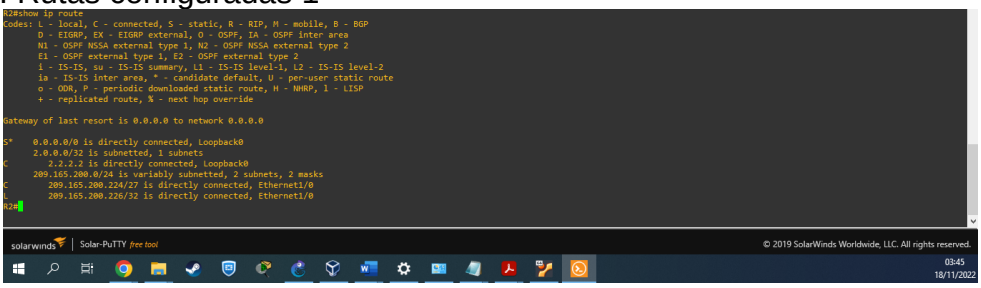
Fuente: elaboración propia

Figura 14. Rutas configuradas 1



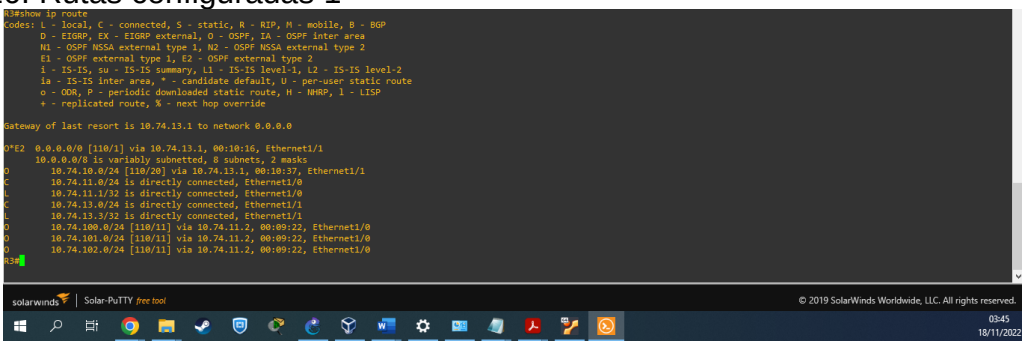
Fuente: elaboración propia

Figura 15. Rutas configuradas 1



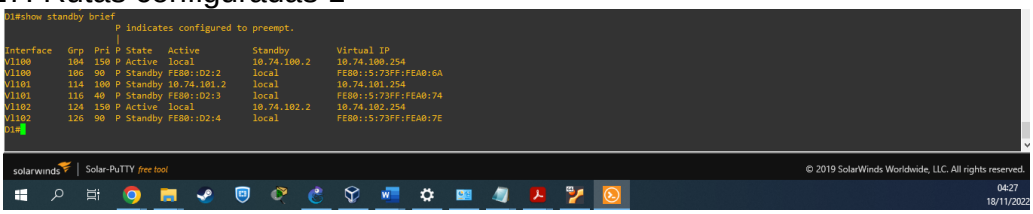
Fuente: elaboración propia

Figura 16. Rutas configuradas 1



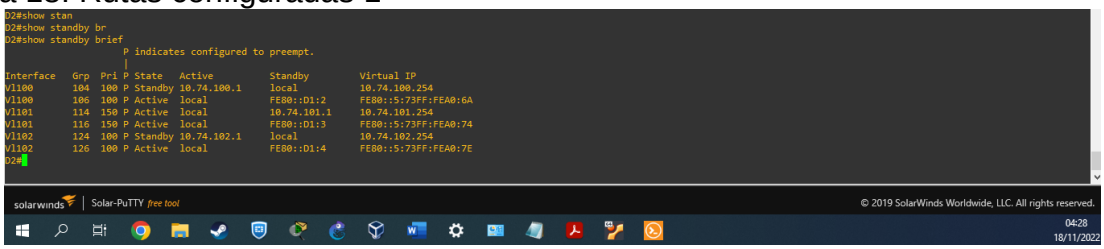
Fuente: elaboración propia

Figura 17. Rutas configuradas 1



Fuente: elaboración propia

Figura 18. Rutas configuradas 1



Fuente: elaboración propia

CONTINUATION OF THE SCENARIO 1

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

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

Your configuration tasks are as follows:

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

Task#	Task	Specification	Points
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

Task#	Task	Specification	Points
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.XY.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. 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.XY.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.	4

Tabla 3. Lista de tareas escenario 2

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. 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

Task#	Task	Specification	Points
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

Task#	Task	Specification	Points
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.XY.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.XY.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.XY.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.	8

Task#	Task	Specification	Points
	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.XY.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.XY.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.XY.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.	

Tabla 4. Lista de tareas escenario 2

R1
router ospf 4
router-id 0.0.4.1
network 10.74.10.0 0.0.0.255 area 0
network 10.74.13.0 0.0.0.255 area 0
default-information originate
exit

-Configuramos ospf con ID 4
-Configuramos router-id 1 para R1
-notificamos las redes conectadas a R1 (descartar la conexion con el ISP)

R3
router ospf 4
router-id 0.0.4.3
network 10.74.11.0 0.0.0.255 area 0
network 10.74.13.0 0.0.0.255 area 0
exit

-Configuramos ospf con ID 4
-Configuramos router-id 3 para R3
-notificamos las redes conectadas a R3

D1
router ospf 4
router-id 0.0.4.131
network 10.74.100.0 0.0.0.255 area 0
network 10.74.101.0 0.0.0.255 area 0
network 10.74.102.0 0.0.0.255 area 0
network 10.74.10.0 0.0.0.255 area 0
passive-interface default
no passive-interface e1/2
exit

-Configuramos ospf con ID 4
-Configuramos router-id 131 para D1
-notificamos las redes conectadas a D1
-desactivar notificaciones OSPF, menos en interfaces e1/2

D2
router ospf 4
router-id 0.0.4.132
network 10.74.100.0 0.0.0.255 area 0
network 10.74.101.0 0.0.0.255 area 0
network 10.74.102.0 0.0.0.255 area 0

network 10.74.11.0 0.0.0.255 area 0
passive-interface default
no passive-interface e1/0
exit

-Configuramos ospf con ID 4
-Configuramos router-id 132 para D2
-notificamos las redes conectadas a D2
-desactivar notificaciones OSPF, menos en interfaces e1/0

3.2
R1
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

R3
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

D1
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
```

D2

```
ipv6 router ospf 6
router-id 0.0.6.132
passive-interface default
no passive-interface e1/2
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
```

3.3

R2

```
ip route 0.0.0.0 0.0.0.0 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
```

-configurar MP-BGP en el ISP a traves de la loopback 0; para IPv4 e IPv6
-configurar BGP en el ISP con sistema autonomo 500 con Id router 2;
-configurar los vecinos para IPv4 e IPv6 con sistema autonomo 300
-notificar la familia de direcciones IPv4 e IPv6 por defecto y loopback
-en IPv4 activar el vecino IPv4, desactivar vecino y en IPv6 activar el vecino IPv6
-salir de familia de direcciones

3.4
R1
ip route 10.0.0.0 255.0.0.0 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 10.74.0.0 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

-configurar en ISP dos rutas sumarizadas estaticas null 0, tanto para IPv4 e IPv6
-configurar en ISP Bgp con sistema autonomo 300 y router id 1
-configurar la relacion de vecinos con sistema autonomo 500
-configurar la familia de direcciones en IPv4, desactivando los vecinos IPv6
-notificar la red 10.74.0.0/8
-configurar la familia de direcciones en IPv6, desactivando los vecinos IPv4
-notificar la red 2001:db8:100::/48
-salir de familia de direcciones
****
4.1
D1
ip sla 4
icmp-echo 10.74.10.1
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

-configurar SLAs IPv4 que prueben la accesibilidad de la interfaz R1 e1/2 cada 5 seg
-configurar SLAs IPv6 que prueben la accesibilidad de la interfaz R1 e1/2 cada 5 seg
-configurar SLAs IPv4 schedule 4 que prueben la accesibilidad de la interfaz R1 sin tiempo y que inicie ahora
-configurar SLAs IPv6 schedule 6 que prueben la accesibilidad de la interfaz R1 sin tiempo y que inicie ahora
-configurar un objeto SLAs IPv4 que notifique que el estado cambia cada determinado tiempo
-configurar un objeto SLAs IPv6 que notifique que el estado cambia cada determinado tiempo

4.2
D2
ip sla 4
icmp-echo 10.74.11.1
frequency 5
exit 34
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

-configurar SLAs IPv4 que prueben la accesibilidad de la interfaz R3 e1/0 cada 5 seg
-configurar SLAs IPv6 que prueben la accesibilidad de la interfaz R3 e1/0 cada 5 seg
-configurar SLAs IPv4 schedule 4 que prueben la accesibilidad de la interfaz R3 sin tiempo y que inicie ahora.
-configurar SLAs IPv6 schedule 6 que prueben la accesibilidad de la interfaz R3 sin tiempo y que inicie ahora.
-configurar un objeto SLAs IPv4 que notifique que el estado cambia cada determinado tiempo.
-configurar un objeto SLAs IPv6 que notifique que el estado cambia cada determinado

tiempo

4.3
D1
```
interface vlan 100
standby version 2
standby 104 ip 10.74.100.254
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 10.74.101.254
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 10.74.102.254
standby 124 priority 150
standby 124 preempt
standby 124 track 4 decrement 60
standby 126 ipv6 autoconfig
standby 126 priority 150
standby 126 priority 150
standby 126 preempt
standby 126 track 6 decrement 60
exit
end
```

-Configurar en D1 como router primerio, configurar HSRPv2 con grupo 104 para vlan 100 con prioridad 150
-asignar ip virtual 10.74.100.254
-configurar objeto 4 con decremento a 60
-Configurar en D1 configurar HSRPv2 con grupo 114 para vlan 101
-asignar ip virtual 10.74.101.254
-configurar objeto 4 con decremento a 60
-Configurar en D1 configurar HSRPv2 con grupo 124 para vlan 102 con prioridad 150
-asignar ip virtual 10.74.102.254

-configurar objeto 4 con decremento a 60
-Configurar en D1 configurar IPv6 HSRP con grupo 106 para vlan 100 con prioridad 150
-asignar autoconfiguracion
-configurar objeto 6 con decremento a 60
-Configurar en D1 configurar IPv6 HSRP con grupo 116 para vlan 101
-asignar autoconfiguracion
-configurar objeto 6 con decremento a 60
-Configurar en D1 configurar IPv6 HSRP con grupo 126 para vlan 102 con prioridad 150
-asignar autoconfiguracion
-configurar objeto 6 con decremento a 60

D2

```
interface vlan 100
standby version 2
standby 104 ip 10.74.100.254
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 10.74.101.254
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 10.74.102.254
standby 124 preempt
standby 124 track 4 decrement 60
standby 126 ipv6 autoconfig
standby 126 preempt
standby 126 track 6 decrement 60
exit
end
```

-Configurar D2 como router primario, configurar HSRPv2 con grupo 104 para vlan 100
-asignar ip virtual 10.74.100.254
-configurar objeto 4 con decremento a 60
-Configurar en D2 configurar HSRPv2 con grupo 114 para vlan 101 con prioridad 150

-asignar ip virtual 10.74.101.254
-configurar objeto 4 con decremento a 60
-Configurar en D2 configurar HSRPv2 con grupo 124 para vlan 102
-asignar ip virtual 10.74.102.254
-configurar objeto 4 con decremento a 60
-Configurar en D2 configurar IPv6 HSRP con grupo 106 para vlan 100
-asignar autoconfiguracion
-configurar objeto 6 con decremento a 60
-Configurar en D2 configurar IPv6 HSRP con grupo 116 para vlan 101 con prioridad 150
-asignar autoconfiguracion
-configurar objeto 6 con decremento a 60
-Configurar en D2 configurar IPv6 HSRP con grupo 126 para vlan 102
-asignar autoconfiguración
-configurar objeto 6 con decremento a 60

CONCLUSIONES

El área de backbone es un área especial que forma la parte central de la red a la que se encuentran conectadas el resto de las áreas de la misma red. Las rutas entre las diferentes áreas circulan siempre por el backbone, por lo tanto, todas las áreas deben conectar con el backbone. Si no es posible hacer una conexión directa con el backbone, se puede hacer un enlace virtual entre redes.

Todo el acceso al Router debe estar asegurado. El modo EXEC privilegiado proporciona al usuario acceso completo al dispositivo y su configuración. Por lo tanto, es el modo más importante para asegurar.

Los siguientes comandos aseguran el modo EXEC privilegiado y el modo EXEC del usuario, habilitan el acceso remoto Telnet y SSH, y cifran todas las contraseñas de texto sin formato (es decir, las líneas EXEC y VTY del usuario).

Si se configuraron los comandos anteriores y el Router accidentalmente perdió energía, todos los comandos configurados se perderían. Por eso es importante guardar la configuración cuando se implementan cambios. El siguiente comando guarda la configuración en NVRAM.

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