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
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Diplomado de opción de grado presentado para optar el título de INGENIERO ELECTRONICO

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UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA - UNAD ESCUELA DE CIENCIAS BÁSICAS, TECNOLOGÍA E INGENIERÍA – ECBTI
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Bucaramanga, 27 de noviembre de 2022

CONTENIDO

LISTA DE FIGURAS

GLOSARIO

DHCP: Servidor de Red que permite la asignación de manera automática los direccionamientos IP que tendrán uno o varios dispositivos dentro de una red y asignando junto con la respectiva puerta de enlace.

VLAN: Del acrónico Virtual Local Área Network, es un método para crear redes lógicas independientes que de manera física se conectan mediante la misma interfaz o puerto, permitiendo sectorizar la información proveniente de diferentes áreas dentro de una red y permitiendo minimizar la cantidad de puertos usados en un dispositivo.

HSRP: Del acrónico Hot Standby Router Protocol, es un protocolo creado por CISCO con el fin de aumentar la disponibilidad de la red al entregar diferentes prioridades a los router de una red, se verifica la disponibilidad de estos elementos de la topología y cambiar sus prioridades en cado caso de la perdida de gestión de ciertos equipos.

BGP: Del acrónico Border Gateway Protocol, es un protocolo donde cada organización tendrá un número diferente asignado de sistema autónomo o AS, permitiendo entregar diferente información entre grupos de enrutadores para estabilizar la comunicación entre los mismos. Este protocolo, puede ser bajo redes externas o EBGP o IBGP en caso de las redes internas.

RESUMEN

Dentro del marco del diplomado de Cisco CCNP, es necesario demostrar las habilidades adquiridas a lo largo de todo el curso, aplicando los diferentes protocolos de redes según lo solicite la topología entregada, por tal motivo, se presenta un paso a paso del escenario propuesto junto con la configuración de cada equipo, que va desde una configuración básica de sus interfaces o nombres de los equipos, pasando con la configuración tanto de IPv4 como de IPv6.

Adicional, todo este proceso lleva un orden según las solicitudes de la prueba de habilidades con registro dentro de cada equipo configurado.

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

ABSTRACT

Within the framework of the Cisco CCNP diploma course, it is necessary to demonstrate the skills acquired throughout the course, applying the different network protocols as requested by the delivered topology, for this reason, a step by step of the proposed scenario is presented together with the configuration of each device, which ranges from a basic configuration of its interfaces or device names, passing through the configuration of both IPv4 and IPv6.

Additionally, this entire process is ordered according to the requests for the skills test with registration within each configured team.

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

INTRODUCCIÓN

En la actualidad y con el auge de la tecnología en prácticamente todos los campos de la vida cotidiana, adquirir un conocimiento a profundidad de las redes de internet se hace una tarea prácticamente obligada para futuros profesionales en el área de la Ingeniería electrónica y las diferencias entre cada protocolo a implementar en ciertas topologías.

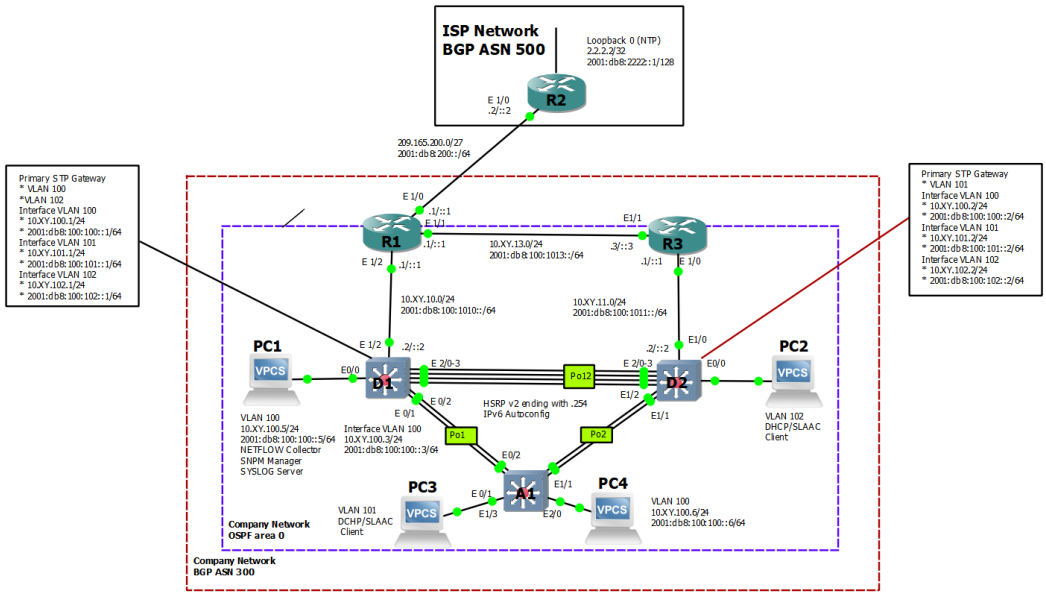
Y estos protocolos, como el protocolo de comunicación dinámica DHCP, Spanning Tree Protocol STP, OSPF, RIP V1 o V2 entre otros, entregan particularidades que mejoran la disponibilidad de una red o la minimización de consumo de energía con el envió de paquetes de una manera más estratégica.

DESARROLLO DEL PROYECTO

ESCENARIO 1

Topología

Figura 1. Topología planteada.



Fuente: Autor.

Tabla de direccionamientos

Tabla 1. Tabla de direccionamientos.

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	10.02.10.1/24	2001:db8:100:1010::1/64	fe80::1:2
	E1/1	10. 02.13.1/24	2001:db8:100:1013::1/64	fe80::1:3
R2	E1/0	209.165.200.226/27	2001:db8:200::2/64	fe80::2:1

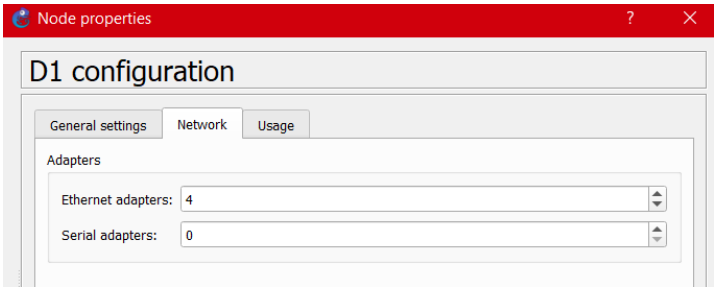
Device	Interface	IPv4 Address	IPv6 Address	IPv6 Link-Local
	Loopback 0	2.2.2.2/32	2001:db8:2222::1/128	fe80::2:3
R3	E1/0	10.02.11.1/24	2001:db8:100:1011::1/64	fe80::3:2
	E1/1	10.02.13.3/24	2001:db8:100:1013::3/64	fe80::3:3
D1	E1/2	10.02.10.2/24	2001:db8:100:1010::2/64	fe80::d1:1
	VLAN 100	10.02.100.1/24	2001:db8:100:100::1/64	fe80::d1:2
	VLAN 101	10.02.101.1/24	2001:db8:100:101::1/64	fe80::d1:3
	VLAN 102	10.02.102.1/24	2001:db8:100:102::1/64	fe80::d1:4
D2	E1/0	10.02.11.2/24	2001:db8:100:1011::2/64	fe80::d2:1
	VLAN 100	10.02.100.2/24	2001:db8:100:100::2/64	fe80::d2:2
	VLAN 101	10.02.101.2/24	2001:db8:100:101::2/64	fe80::d2:3
	VLAN 102	10.02.102.2/24	2001:db8:100:102::2/64	fe80::d2:4
A1	VLAN 100	10.02.100.3/23	2001:db8:100:100::3/64	fe80::a1:1
PC1	NIC	10.02.100.5/24	2001:db8:100:100::5/64	EUI-64
PC2	NIC	DHCP	SLAAC	EUI-64
PC3	NIC	DHCP	SLAAC	EUI-64
PC4	NIC	10.02.100.6/24	2001:db8:100:100::6/64	EUI-64

Fuente: Autor.

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

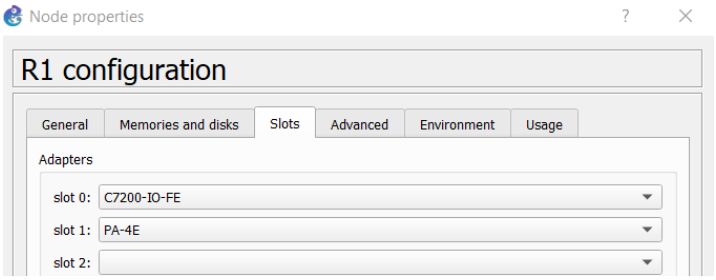
In Part 1, you will set up the network topology and configure basic settings and interface addressing.

Figura 2. Configuración Switch.



Fuente: Autor.

Figura 3. Configuración Router.

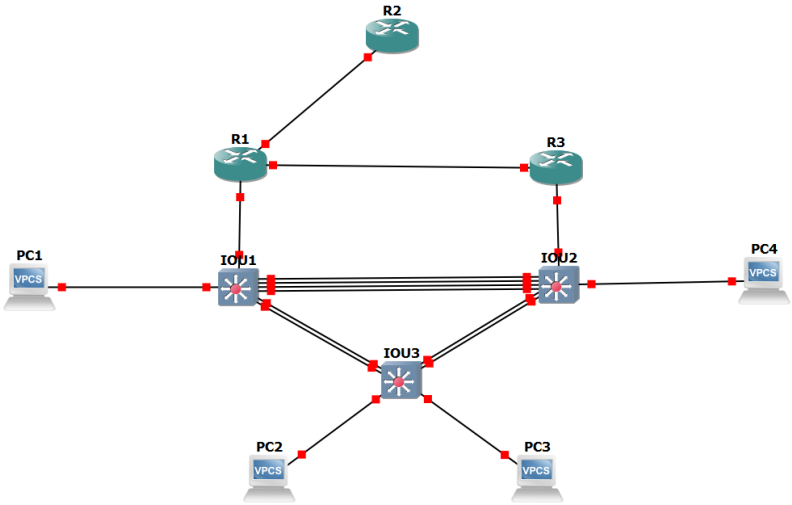


Fuente: Autor.

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

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

Figura 4. Implementación de la topología propuesta.



Fuente: Autor.

Step 2: Configure basic settings for each device.

a. Console into each device, enter global configuration mode, and apply the basic settings. The startup configurations for each device are provided below.

Router R1

```
hostname R1                                  //se cambia el nombre del router
ipv6 unicast-routing                         //config ipv6 en R1
no ip domain lookup                          //Sin IP de dominio
banner motd # R1, ENCOR Skills Assessment#   //mensaje de bienvenida R1
line con 0                                   //configuración de consola
exec-timeout 0 0
logging synchronous                          //configuración de ingreso sincrono
exit
interface e1/0                    //ingreso a la interfaz ethernet 1/0
ip address 209.165.200.225 255.255.255.224      //Dirección IPv4 en E1/0
ipv6 address fe80::1:1 link-local               //Dirección local IPv6
ipv6 address 2001:db8:200::1/64                 //diercción IPv6
no shutdown                                  //Encender interfaz
exit                                         //salida de la interfaz E1/0
interface e1/2                               //ingreso interfaz ethernet 1/2
ip address 10.02.10.1 255.255.255.0          //Config IPv4 en E1/2
ipv6 address fe80::1:2 link-local            //IP local IPv6
ipv6 address 2001:db8:100:1010::1/64         //IP en IPv6
no shutdown                                  //Encender interfaz
exit
```

```
interface e1/1                  //Ingreso interfaz Ethernet 1/1
ip address 10.02.13.1 255.255.255.0     //IP asignada para la interfaz IPv4
ipv6 address fe80::1:3 link-local       //IP local IPv6
ipv6 address 2001:db8:100:1013::1/64    //IPv6 asignada a interfaz
no shutdown                     //encender interfaz
exit            //salida de la interfaz
```

Router R2

```
hostname R2                     //se cambia el nombre del router
ipv6 unicast-routing            //config ipv6 en R2
no ip domain lookup
banner motd # R2, ENCOR Skills Assessment#    //mensaje de bienvenida R1
line con 0              //Configuración consola
exec-timeout 0 0
logging synchronous             //ingreso sincronico
exit
interface e1/0          //ingreso a la interfaz ethernet 1/0
ip address 209.165.200.226 255.255.255.224      //IPv4 asignada a interfaz
ipv6 address fe80::2:1 link-local       //IPv6 local aisgnada
ipv6 address 2001:db8:200::2/64         ///IPv6 asignada a interfaz
no shutdown                     //Encender interfaz
exit
interface Loopback 0            //ingreso interfaz loopback
ip address 2.2.2.2 255.255.255.255      //IPv4 loopback asignada
ipv6 address fe80::2:3 link-local       //IPv6 local asignada
ipv6 address 2001:db8:2222::1/128       //IPv6 loopback solicitada
no shutdown                     //encendiendo interfaz loopback
exit                    //salida interfaz
```

Router R3

```
hostname R3                     //Nombre del equipo
ipv6 unicast-routing            //Habilitación de IPv6 en R3
no ip domain lookup             //deshabilitación busqueda de dominio
banner motd # R3, ENCOR Skills Assessment#    //mensaje bienvenida
line con 0                      //ingreso a config de consola
exec-timeout 0 0                //Configuración desconexión de consola
logging synchronous             //Configuración de ingreso sincronico
exit
interface e1/0                  //ingreso interfaz Ethernet 1/0
ip address 10.02.11.1 255.255.255.0     //config IPv4 en E1/0
ipv6 address fe80::3:2 link-local       //IPv6 local en R3
ipv6 address 2001:db8:100:1011::1/64    //IPv6 configurada en la interfaz
no shutdown                     //encendiendo interfaz
```

```
exit
interface e1/1                          //ingreso a interfaz ethernet 1/1
ip address 10.02.13.3 255.255.255.0     //IPv4 asignada a E1/1
ipv6 address fe80::3:3 link-local       //IPv6 local asignada
ipv6 address 2001:db8:100:1010::2/64    //IPv6 asignada a interfaz
no shutdown                             //encendiendo interfaz
exit
```

Switch D1

```
hostname D1                             //Config del nombre en el switch D1
ip routing                              //habilitación de IPv4
ipv6 unicast-routing                    //habilitación de IPv6
no ip domain lookup                     //Busqueda por dominio desactivada
banner motd # D1, ENCOR Skills Assessment#    //config mensaje bienvenida
line con 0                              //config de consola
exec-timeout 0 0                        //config desconexión de consola
logging synchronous                     //Config ingreso sincrono
exit
vlan 100                                //ingreso VLAN100
name Management                         //config nombre de VLAN100
exit
vlan 101                                //config VLAN101
name UserGroupA                         //config nombre de VLAN101
exit
vlan 102                                //config VLAN 102
name UserGroupB                         //Nombre asignado a VLAN102
exit
vlan 999                                //ingreso a vlan nativa 999
name NATIVE                             //cambio del nombre
exit
interface e1/2                          //ingreso interfaz ethernet 1/2
no switchport                           //encender interfaz
ip address 10.02.10.2 255.255.255.0     //IPv4 asignada
ipv6 address fe80::d1:1 link-local      //IPv6 local asignada
ipv6 address 2001:db8:100:1010::2/64    //IPv6 de interfaz asignada
no shutdown                             //encender interfaz
exit
interface vlan 100                      //ingreso VLAN100
ip address 10.02.100.1 255.255.255.0    //config IP en VLAN100
ipv6 address fe80::d1:2 link-local      //config IPv6 local
ipv6 address 2001:db8:100:100::1/64     //config IPv6 VLAN100
no shutdown                             //encendida
exit
interface vlan 101                      //ingreso VLAN101
```

```
ip address 10.02.101.1 255.255.255.0        //config IP en VLAN101
ipv6 address fe80::d1:3 link-local          //config IPv6 local
ipv6 address 2001:db8:100:101::1/64         //config IPv6 VLAN101
no shutdown
exit                                        //encender interfaz
interface vlan 102                          //ingreso VLAN102
ip address 10.02.102.1 255.255.255.0        //config IP en VLAN102
ipv6 address fe80::d1:4 link-local          //config IPv6 local
ipv6 address 2001:db8:100:102::1/64         //config IPv6 VLAN102
no shutdown                                 //encender interfaz
exit
ip dhcp excluded-address 10.02.101.1 10.02.101.109
ip dhcp excluded-address 10.02.101.141 10.02.101.254
ip dhcp excluded-address 10.02.102.1 10.02.102.109
ip dhcp excluded-address 10.02.102.141 10.02.102.254
ip dhcp pool VLAN-101
network 10.02.101.0 255.255.255.0
default-router 10.02.101.254
exit
//en las 7 línas anteriores se configura el servicio DHCP en los rangos mostrados
de las IP 10.02
ip dhcp pool VLAN-102
network 10.02.102.0 255.255.255.0
default-router 10.02.102.254
exit
interface range e0/0-3,e1/0-1,e1/3,e2/0-3,e3/0-3
shutdown                    //se apagan todas las interfaces no usadas
exit
```

Switch D2

```
hostname D2                 //Config del nombre en el switch D2
ip routing                  //habilitación de IPv4
ipv6 unicast-routing        //habilitación de IPv6
no ip domain lookup         //Busqueda por dominio desactivada
banner motd # D2, ENCOR Skills Assessment#    //config mensaje bienvenida
line con 0                  //config de consola
exec-timeout 0 0            //config desconexión de consola
logging synchronous         //Config ingreso sincrono
exit
vlan 100                    //ingreso VLAN100
name Management             //config nombre de VLAN100
exit
vlan 101                    //config VLAN101
name UserGroupA             //config nombre de VLAN101
```

```
exit
vlan 102                                    //config VLAN 102
name UserGroupB                             //Nombre asignado a VLAN102
exit
vlan 999                                    //ingreso a vlan nativa 999
name NATIVE                                 //cambio del nombre
exit
interface e1/0                              //ingreso interfaz ethernet 1/0
no switchport                               //encender interfaz
ip address 10.02.11.2 255.255.255.0         //IPv4 asignada
ipv6 address fe80::d1:1 link-local          //IPv6 local asignada
ipv6 address 2001:db8:100:1011::2/64        //IPv6 de interfaz asignada
no shutdown                                 //encender interfaz
exit
interface vlan 100                          //ingreso VLAN100
ip address 10.02.100.2 255.255.255.0        //config IP en VLAN100
ipv6 address fe80::d2:2 link-local          //config IPv6 local
ipv6 address 2001:db8:100:100::2/64         //config IPv6 VLAN100
no shutdown                                 //Interfaz encendida
exit
interface vlan 101                          //ingreso VLAN101
ip address 10.02.101.2 255.255.255.0        //config IP en VLAN101
ipv6 address fe80::d2:3 link-local          //config IPv6 local
ipv6 address 2001:db8:100:101::2/64         //config IPv6 VLAN101
no shutdown                                 //encender interfaz
exit
interface vlan 102                          //ingreso VLAN102
ip address 10.02.102.2 255.255.255.0        //config IP en VLAN102
ipv6 address fe80::d2:4 link-local          //config IPv6 local
ipv6 address 2001:db8:100:102::2/64         //config IPv6 VLAN102
no shutdown                                 //encender interfaz
exit
ip dhcp excluded-address 10.02.101.1 10.02.101.209
ip dhcp excluded-address 10.02.101.241 10.02.101.254
ip dhcp excluded-address 10.02.102.1 10.02.102.209
ip dhcp excluded-address 10.02.102.241 10.02.102.254
ip dhcp pool VLAN-101
network 10.02.101.0 255.255.255.0
default-router 02.0.101.254
exit        //en las 7 líneas anteriores se configura el servicio DHCP en los rangos
mostrados de las IP 10.02
ip dhcp pool VLAN-102
network 10.02.102.0 255.255.255.0
default-router 10.02.102.254
exit
```

```
interface range e0/0-3,e1/1-3,e2/0-3,e3/0-3
shutdown                    //se apagan todas las interfaces no usadas
exit
```

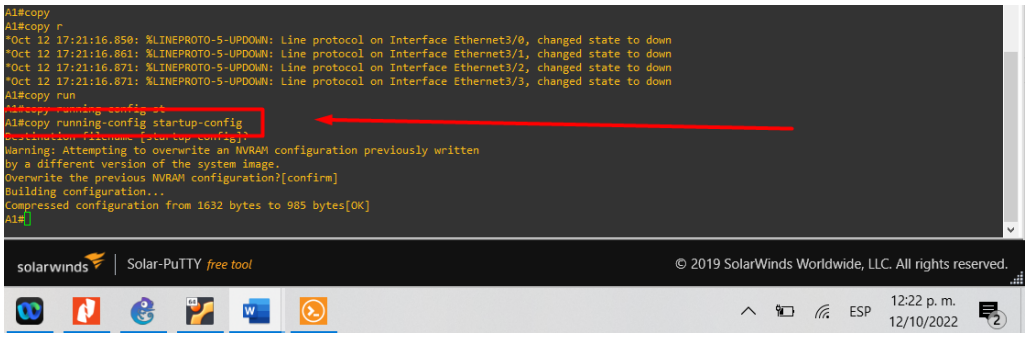
Switch A1

```
hostname A1                         //Config del nombre en el switch A1
no ip domain lookup                 //Busqueda por dominio desactivada
banner motd # A1, ENCOR Skills Assessment#    //config mensaje bienvenida
line con 0                                  //config de consola
exec-timeout 0 0                    //config desconexión de consola
logging synchronous                 //Config ingreso sincrono
exit
vlan 100                            //ingreso VLAN100
name Management                     //config nombre de VLAN100
exit
vlan 101                            //config VLAN101
name UserGroupA                     //config nombre de VLAN101
exit
vlan 102                            //config VLAN 102
name UserGroupB                     //Nombre asignado a VLAN102
exit
vlan 999                            //ingreso a vlan nativa 999
name NATIVE                         //cambio del nombre
exit
interface vlan 100                                  //ingreso VLAN100
ip address 10.02.100.3 255.255.255.0                //config IP en VLAN100
ipv6 address fe80::a1:1 link-local                  //config IPv6 local
ipv6 address 2001:db8:100:100::3/64                 //config IPv6 VLAN100
no shutdown                                         //activación VLAN100
exit
interface range e0/0,e0/3,e1/0,e2/1-3,e3/0-3
shutdown                    //se apagan todas las interfaces no usadas
exit
```

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

Copy running-config startup-config

Figura 5. Guardando configuración sobre A1.



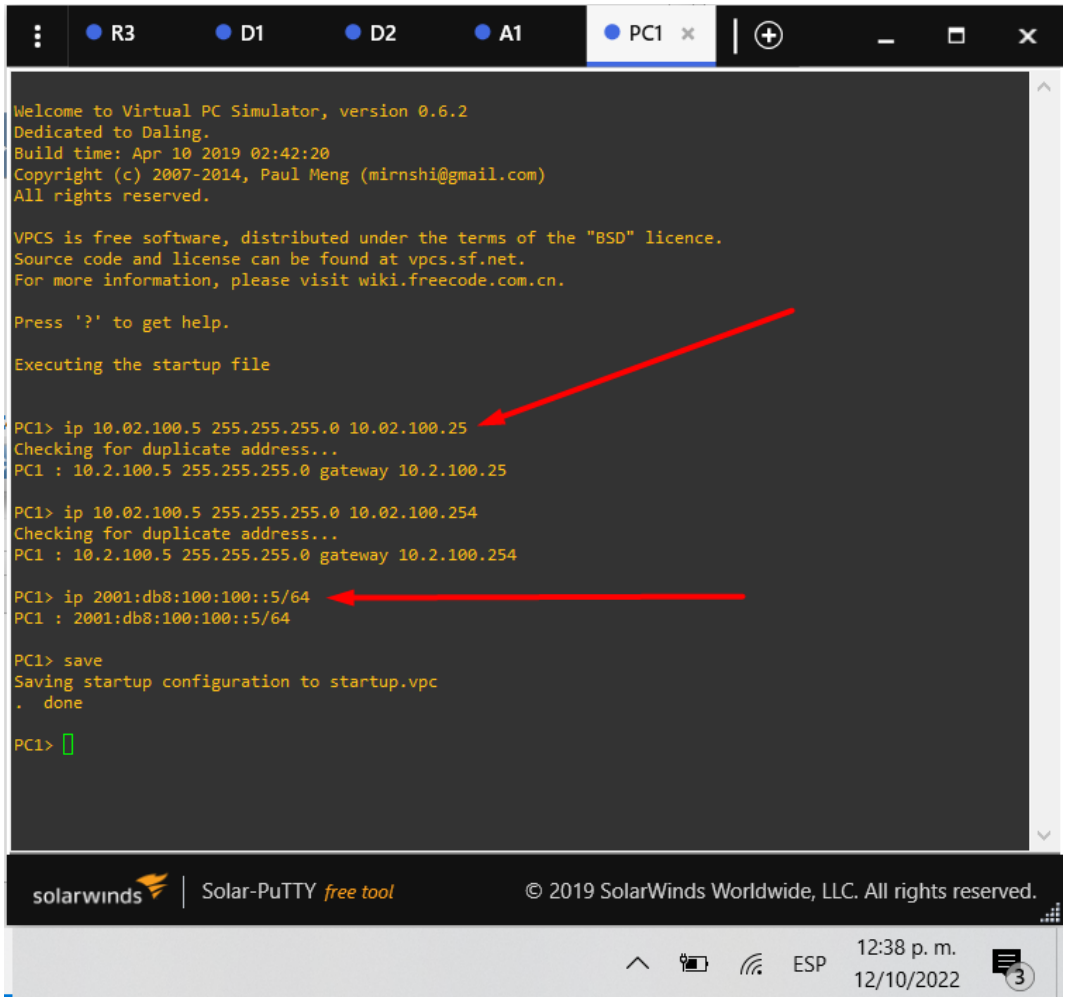
Fuente: Autor.

c. Configure PC 1 and PC 4 host addressing as shown in the addressing table. Assign a default gateway address of 10.02.100.254 which will be the HSRP virtual IP address used in Part 4.

ip 10.02.100.5 255.255.255.0 10.02.100.25

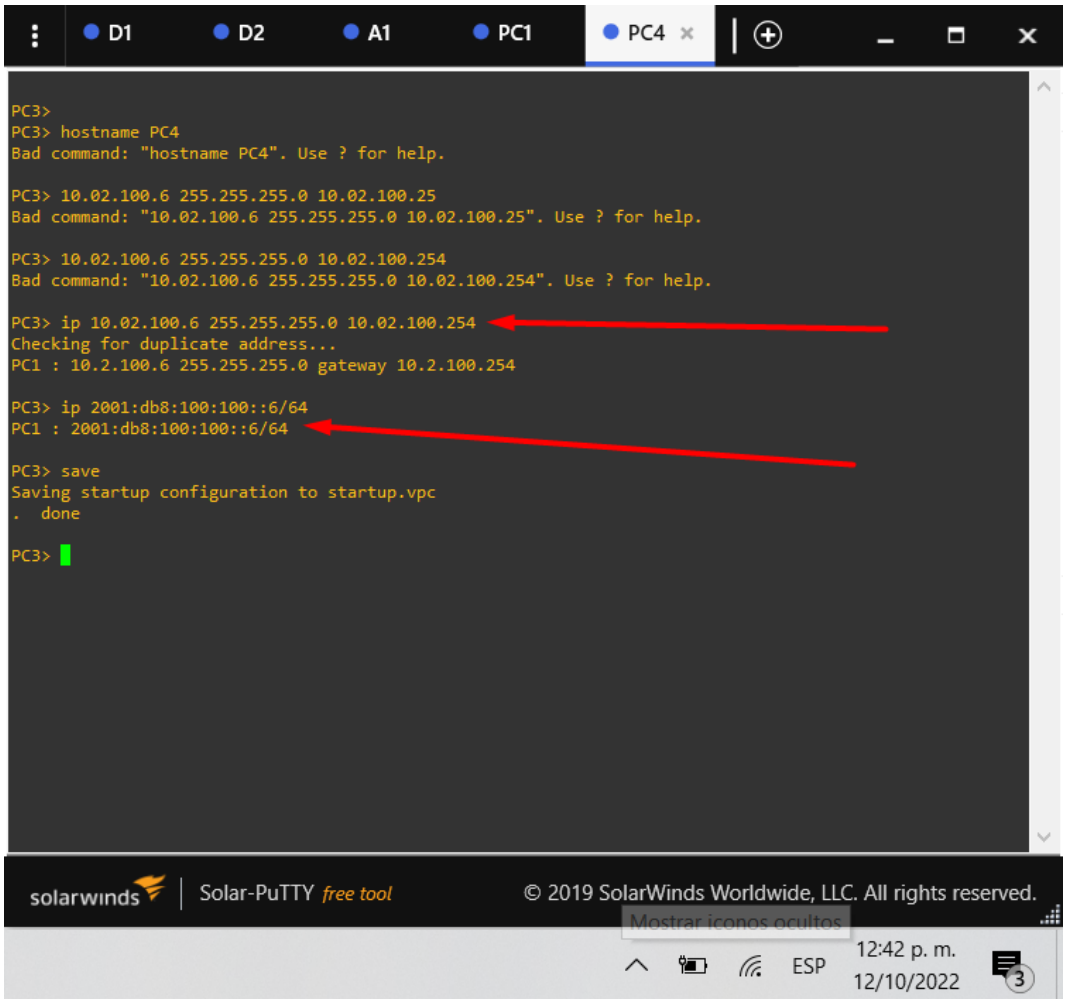
ip 2001:db8:100:100::5/64

Figura 6. Configuración IPv4 e IPv6 sobre PC1.



Fuente: Autor.

Figura 7. Configuración IPv4 e IPv6 sobre PC1.



Fuente: Autor.

Part 2: Configure the Layer 2 Network and Host Support

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

Your configuration tasks are as follows:

Tabla 2, Tareas de configuración.

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

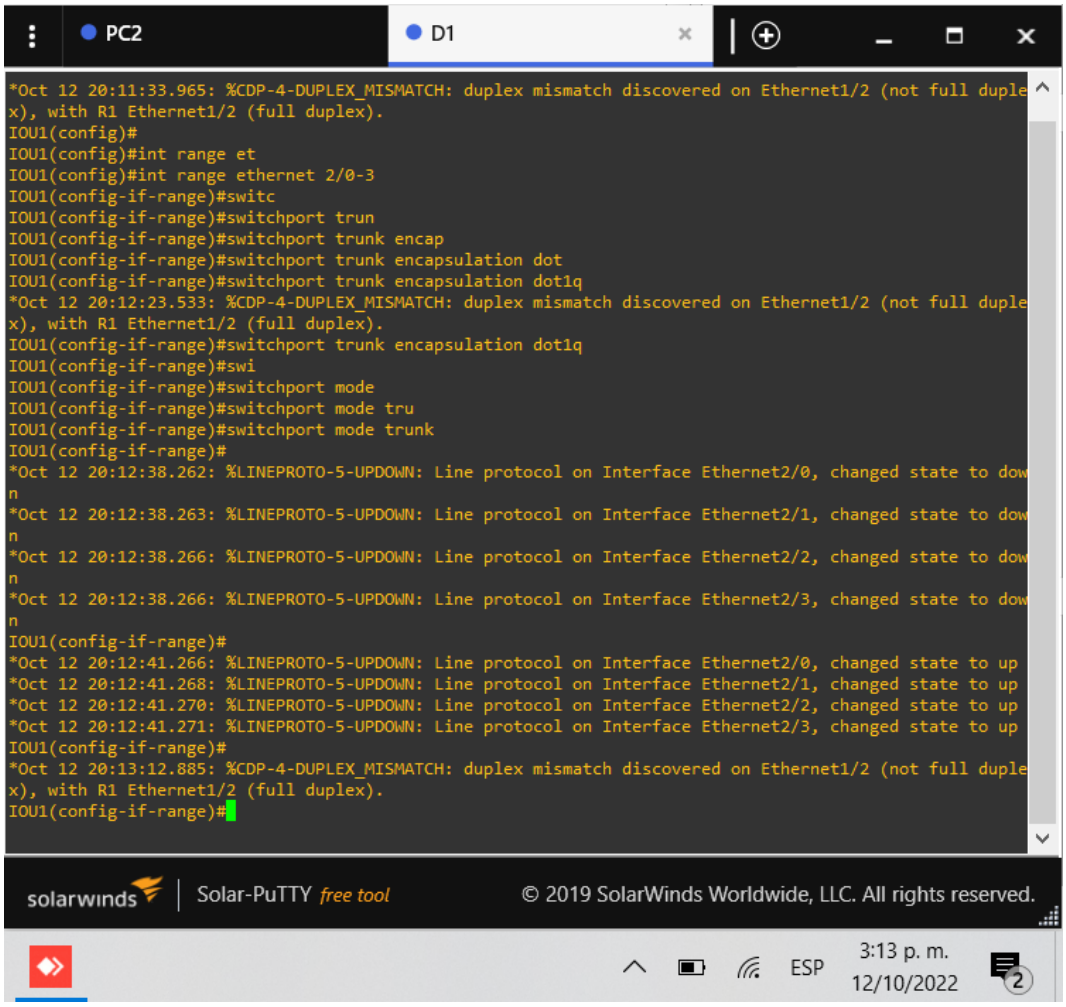
Task#	Task	Specification	Points
2.7	Verify IPv4 DHCP services.	PC2 and PC3 are DHCP clients and should be receiving valid IPv4 addresses.	1
2.8	Verify local LAN connectivity.	PC1 should successfully ping: • D1: 10.02.100.1 • D2: 10.02.100.2 • PC4: 10.02.100.6 PC2 should successfully ping: • D1: 10.02.102.1 • D2: 10.02.102.2 PC3 should successfully ping: • D1: 10.02.101.1 • D2: 10.02.101.2 PC4 should successfully ping: • D1: 10.02.100.1 • D2: 10.02.100.2 • PC1: 10.02.100.5	1

Fuente: Autor.

Task 2.1 On all switches, configure IEEE 802.1Q trunk interfaces on interconnecting switch links

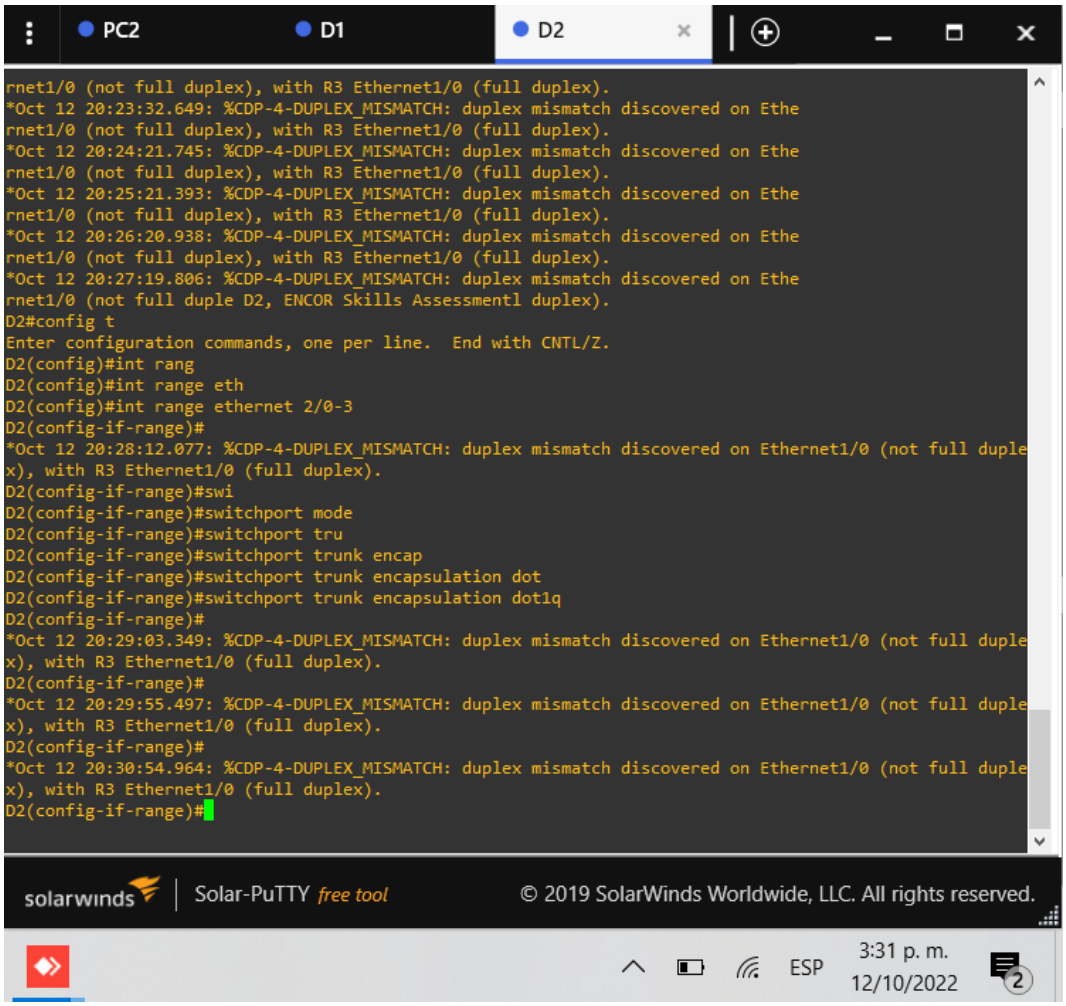
Entre D1 y D2:

Figura 8. Encapsulación Dot1Q sobre D1 a D2.



Fuente: Autor.

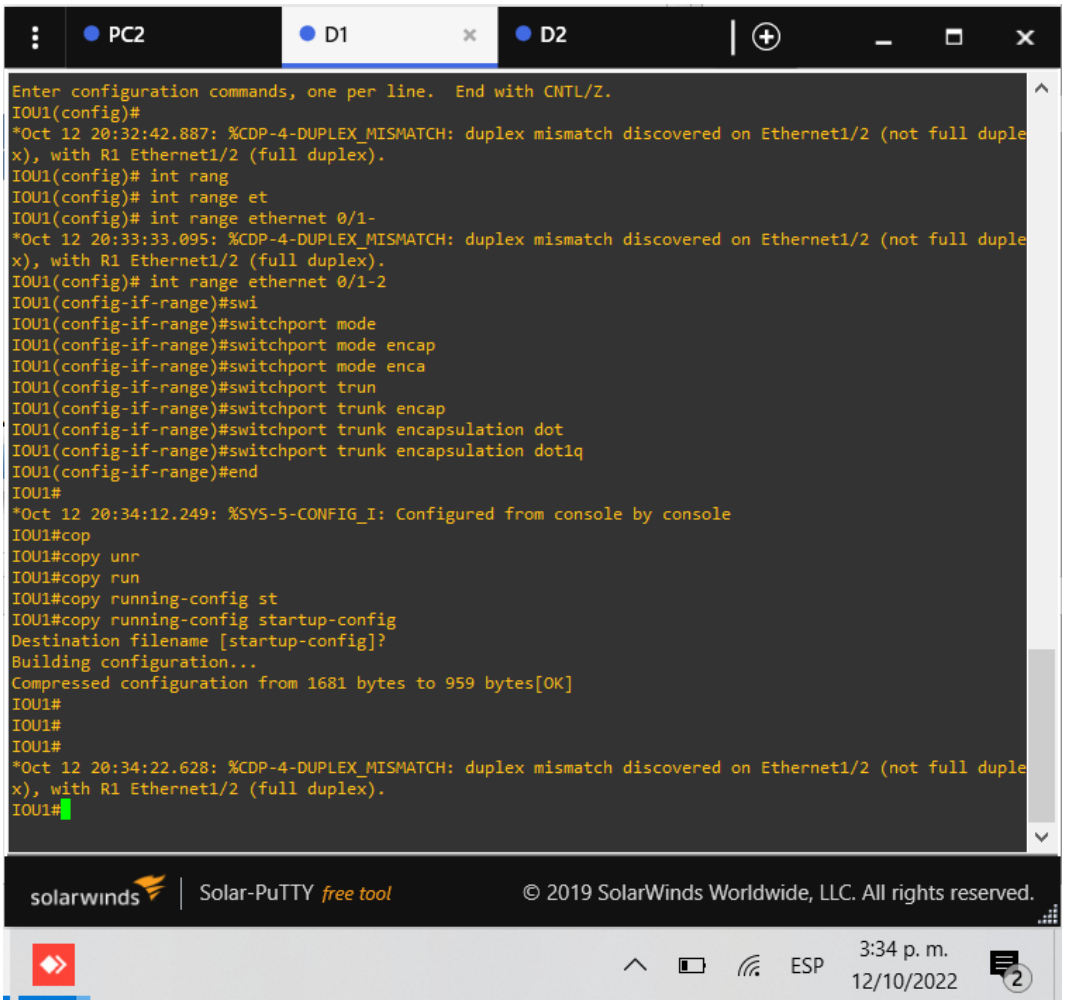
Figura 9. Encapsulación Dot1Q sobre D2 a D1.



Fuente: Autor.

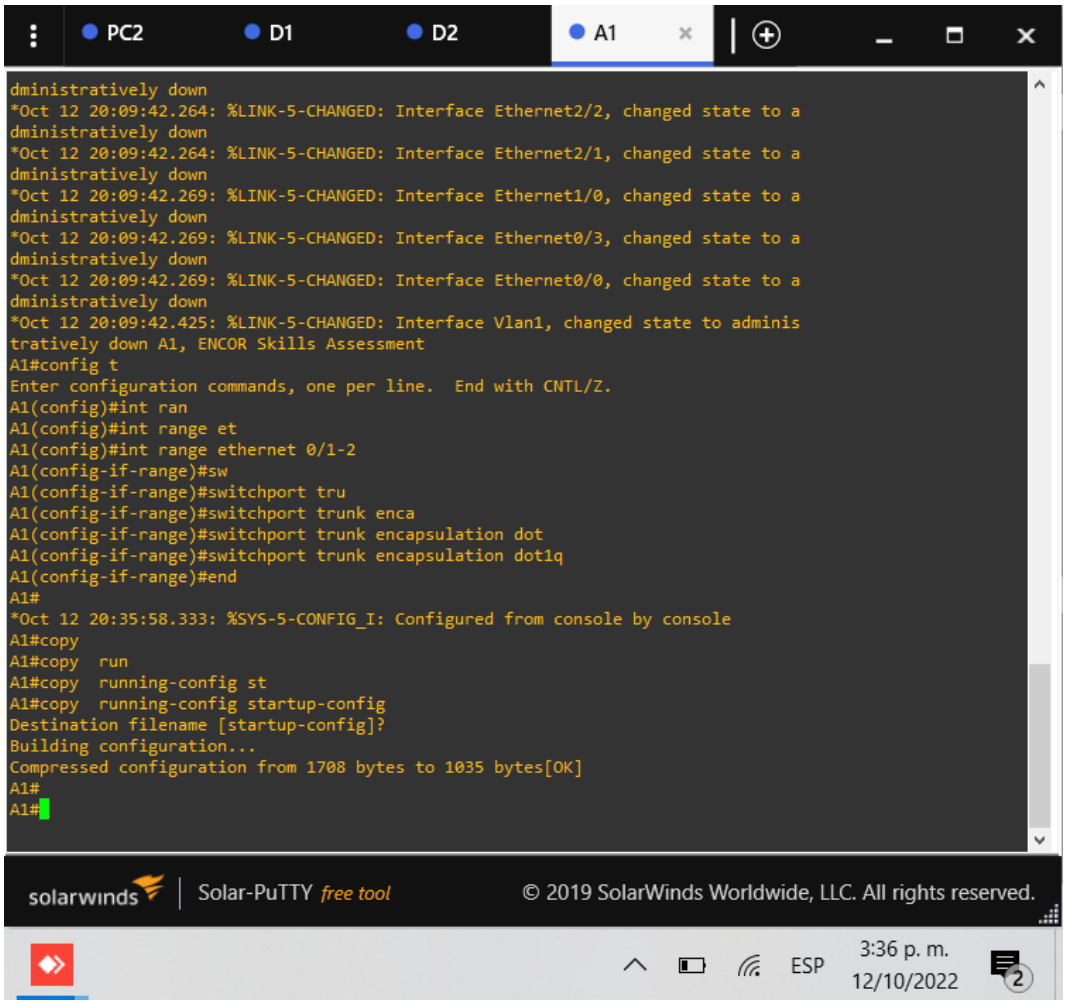
Entre D1 y A1:

Figura 10. Encapsulación Dot1Q sobre D1 a A1.



Fuente: Autor.

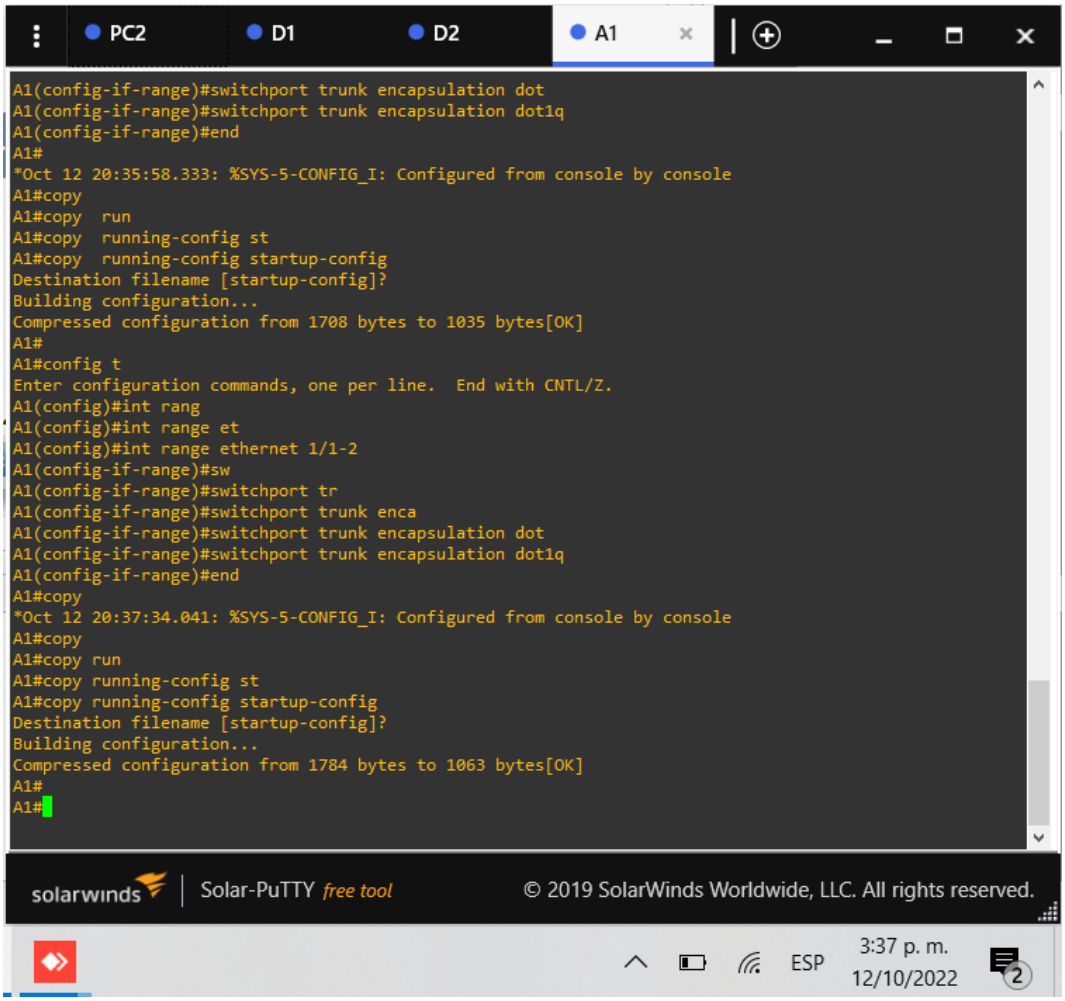
Figura 11. Encapsulación Dot1Q sobre A1 a D1.



Fuente: Autor.

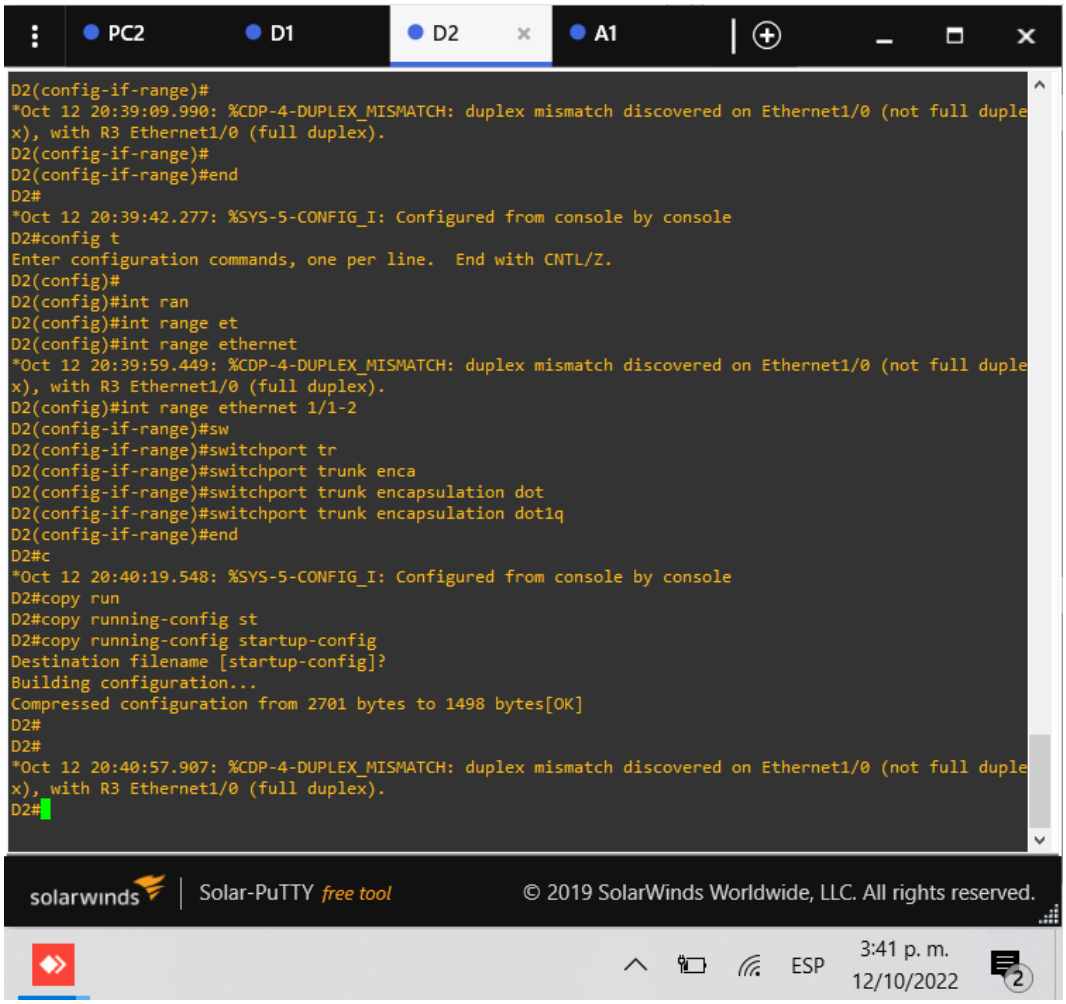
Entre D2 y A1:

Figura 12. Encapsulación Dot1Q sobre A1 a D2.



Fuente: Autor.

Figura 13. Encapsulación Dot1Q sobre D2 a A1.

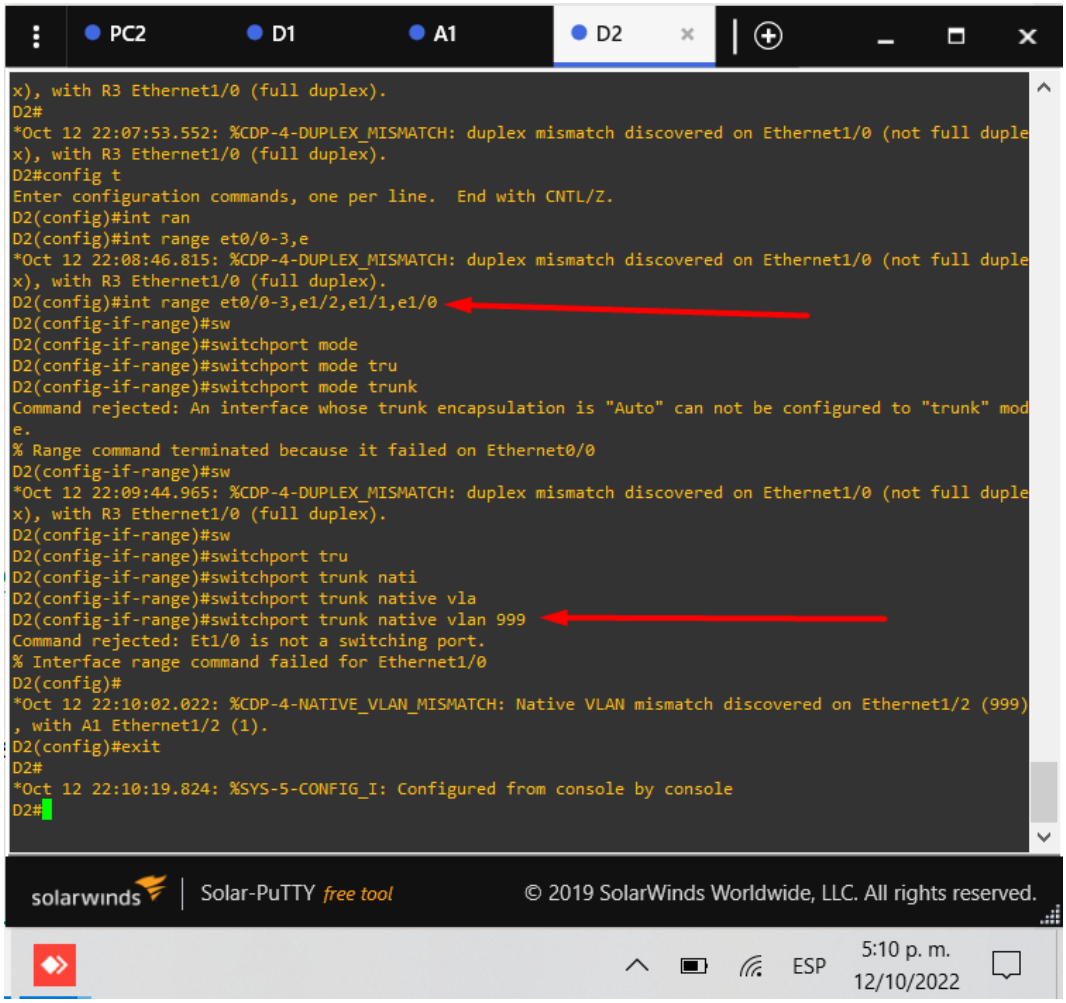


Fuente: Autor.

Task 2.2 On all switches, change the native VLAN on trunk links.

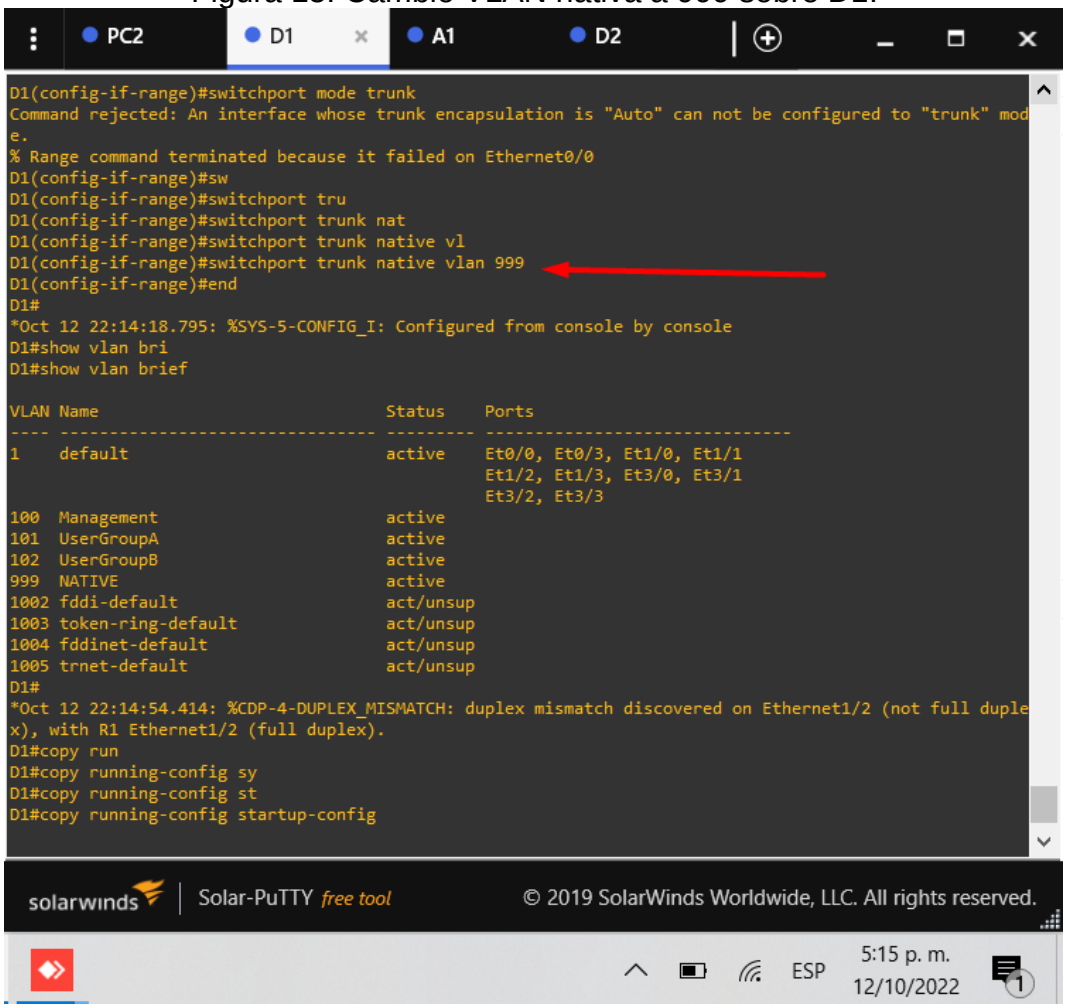
Use VLAN 999 as the native VLAN:

Figura 14. Cambio VLAN nativa a 999 sobre D2.



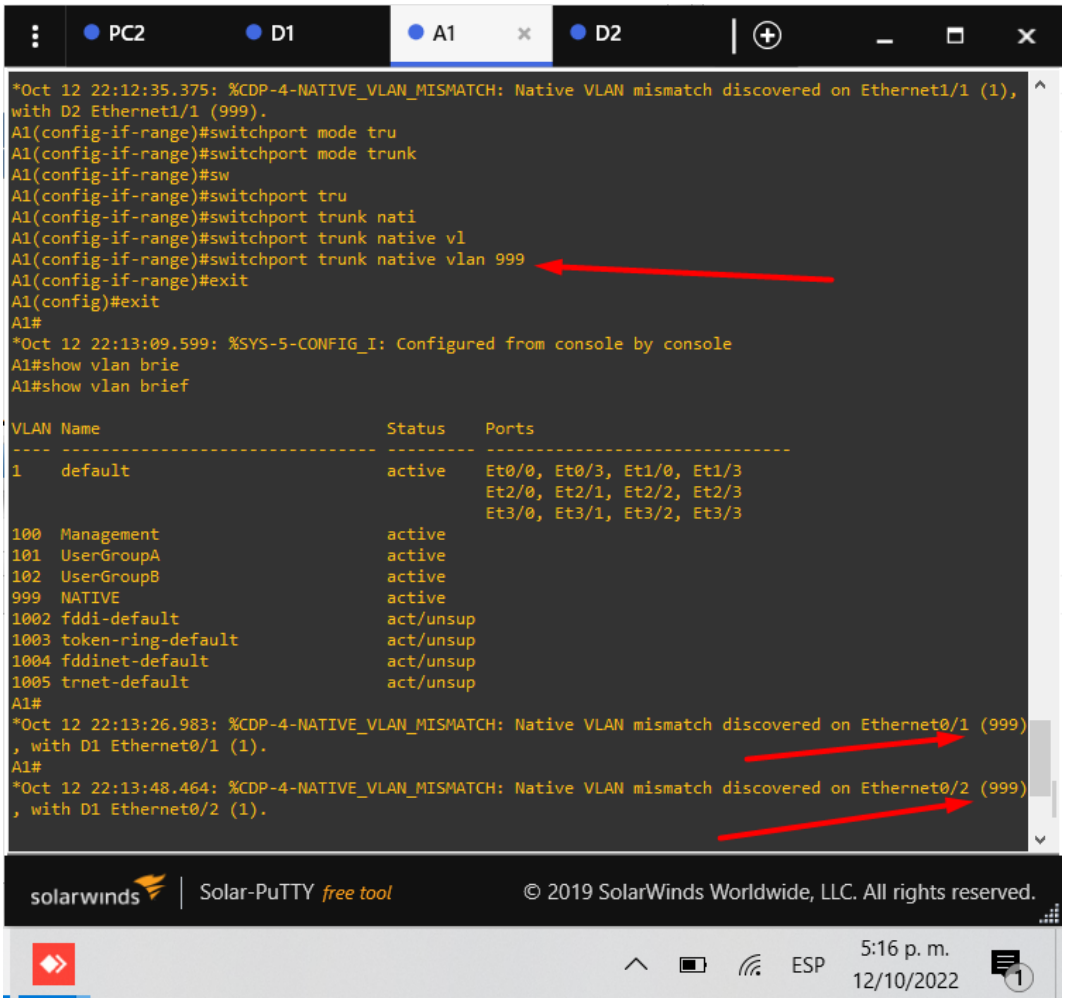
Fuente: Autor.

Figura 15. Cambio VLAN nativa a 999 sobre D1.



Fuente: Autor.

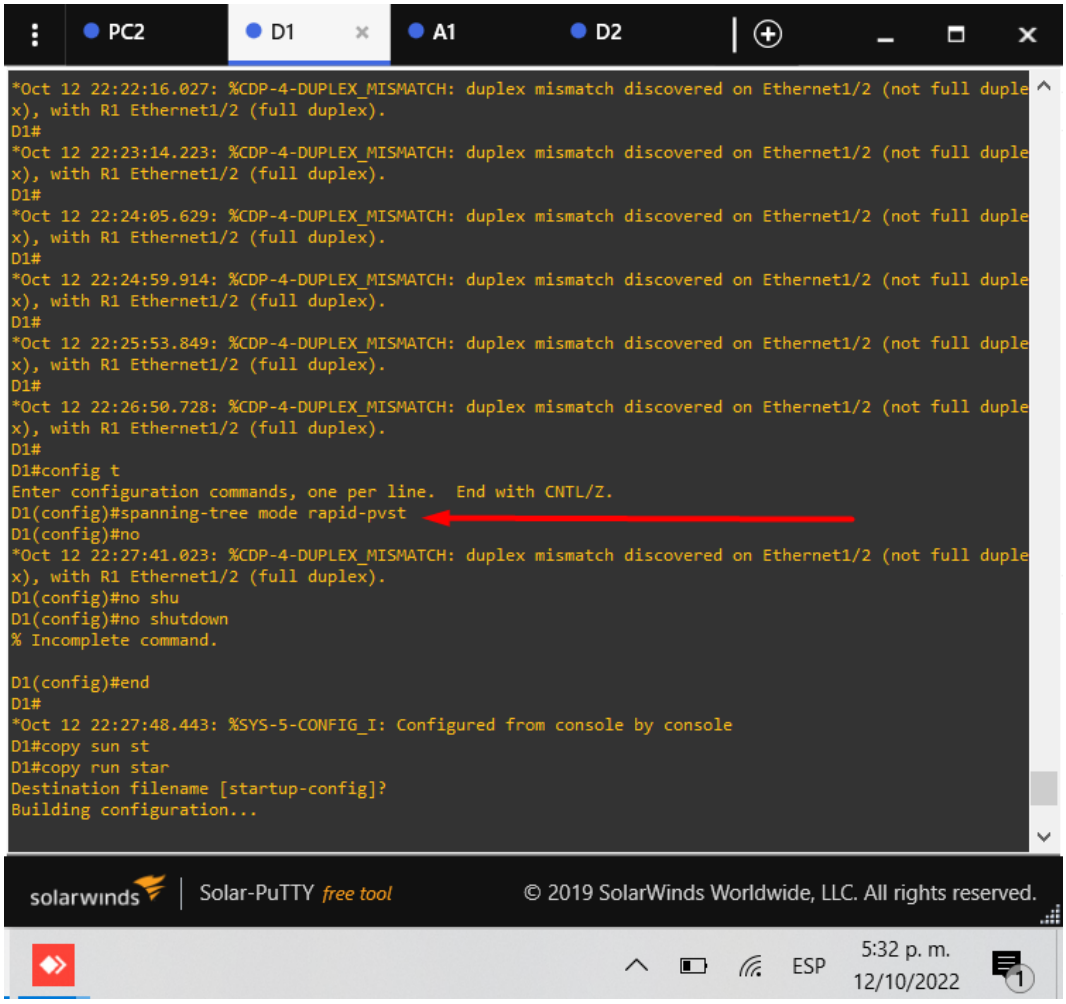
Figura 16. Cambio VLAN nativa a 999 sobre A1.



Fuente: Autor.

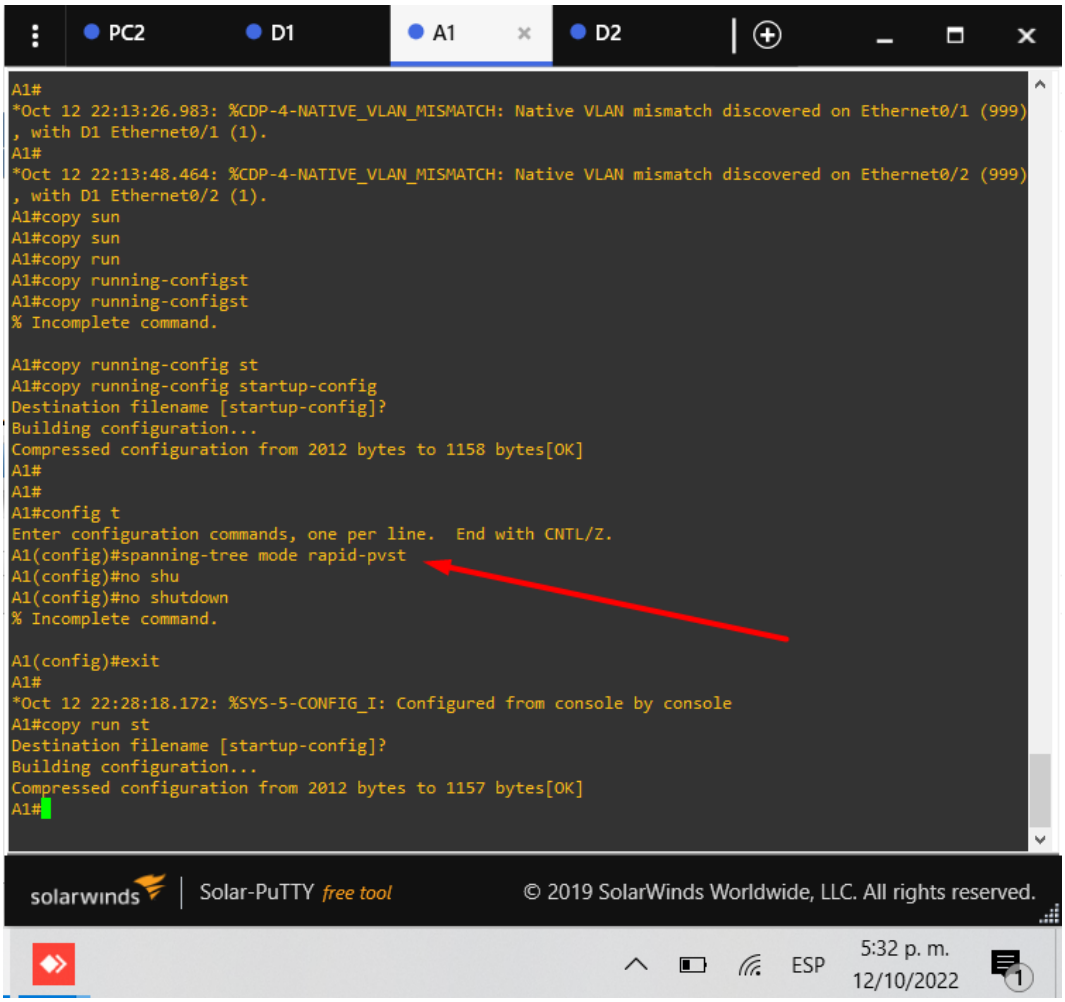
Task 2.3 On all switches, enable the Rapid Spanning-Tree Protocol.

Figura 17. STP en D1.



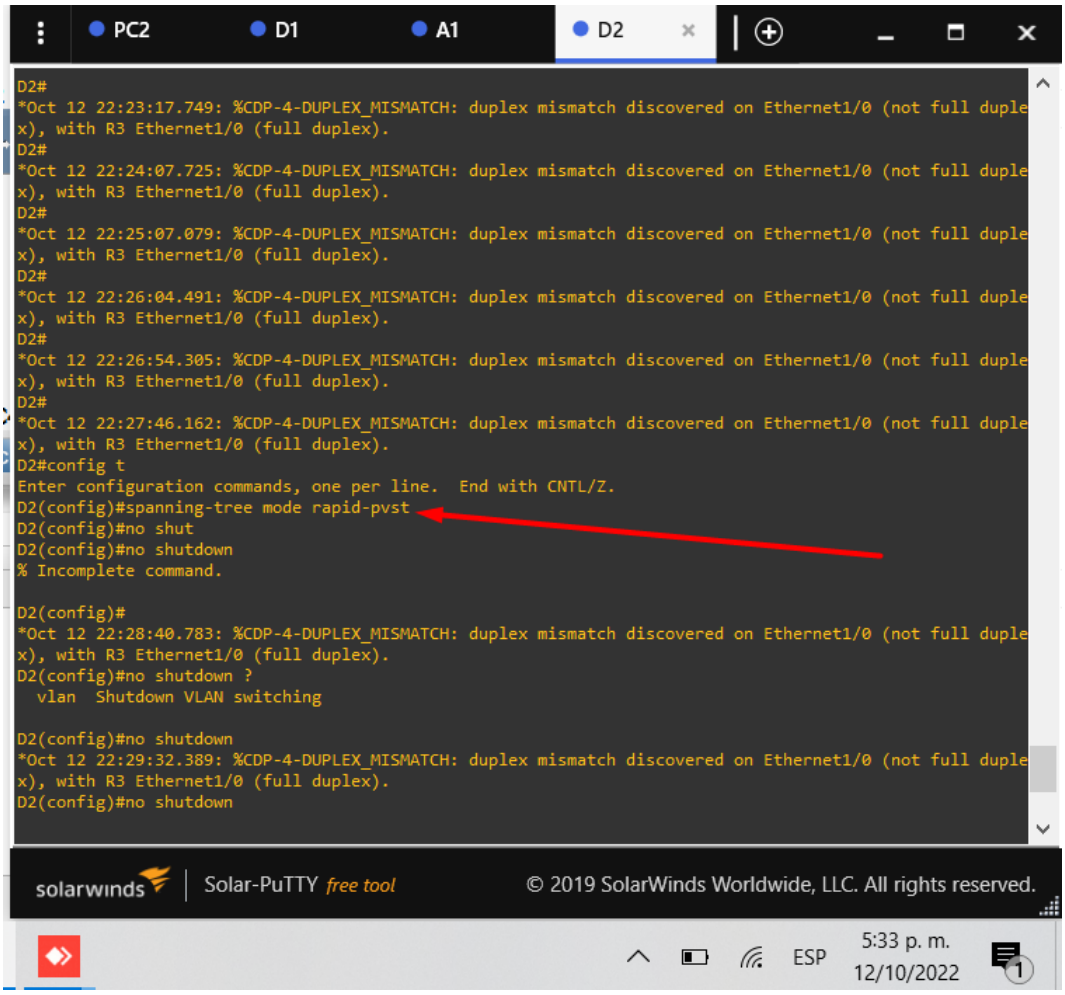
Fuente: Autor.

Figura 18. STP sobre A1.



Fuente: Autor.

Figura 19. STP sobre D2.



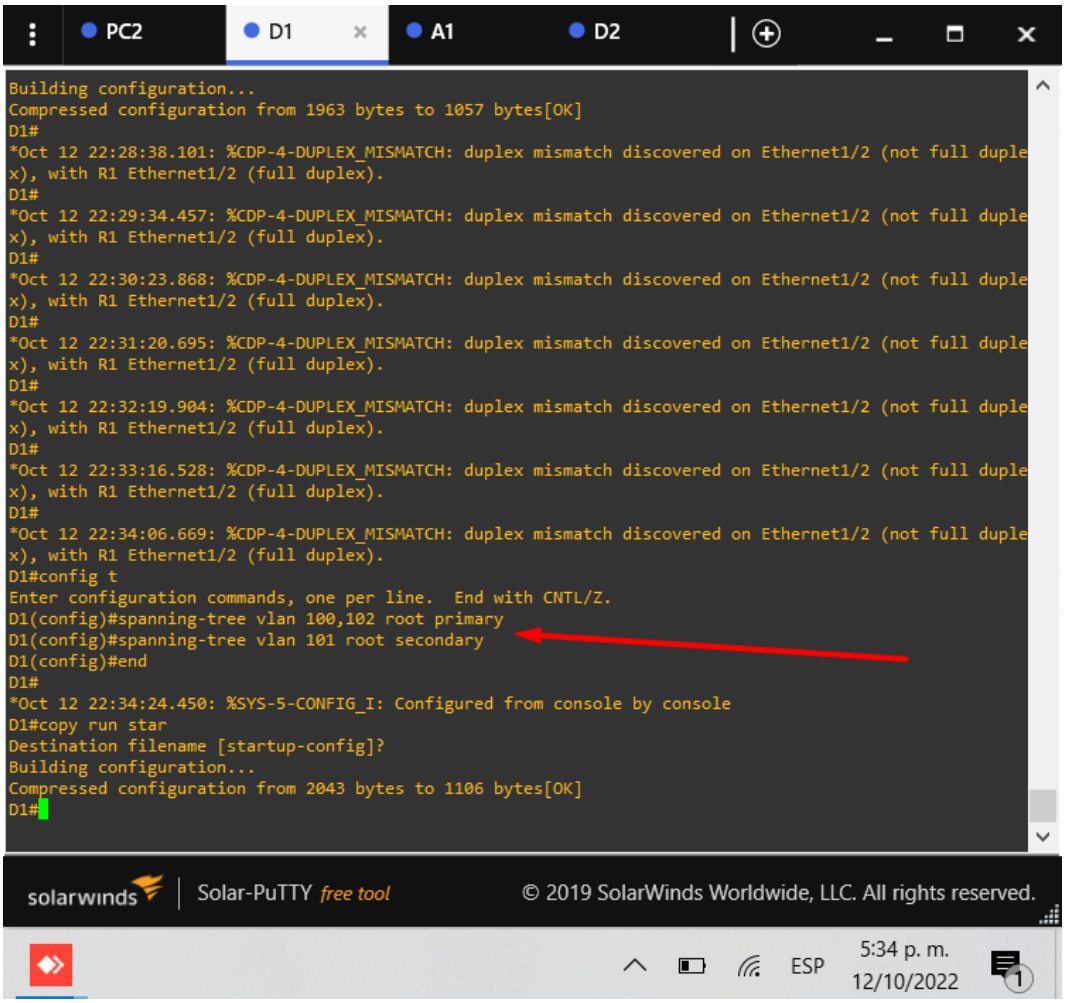
Fuente: Autor.

Task 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.

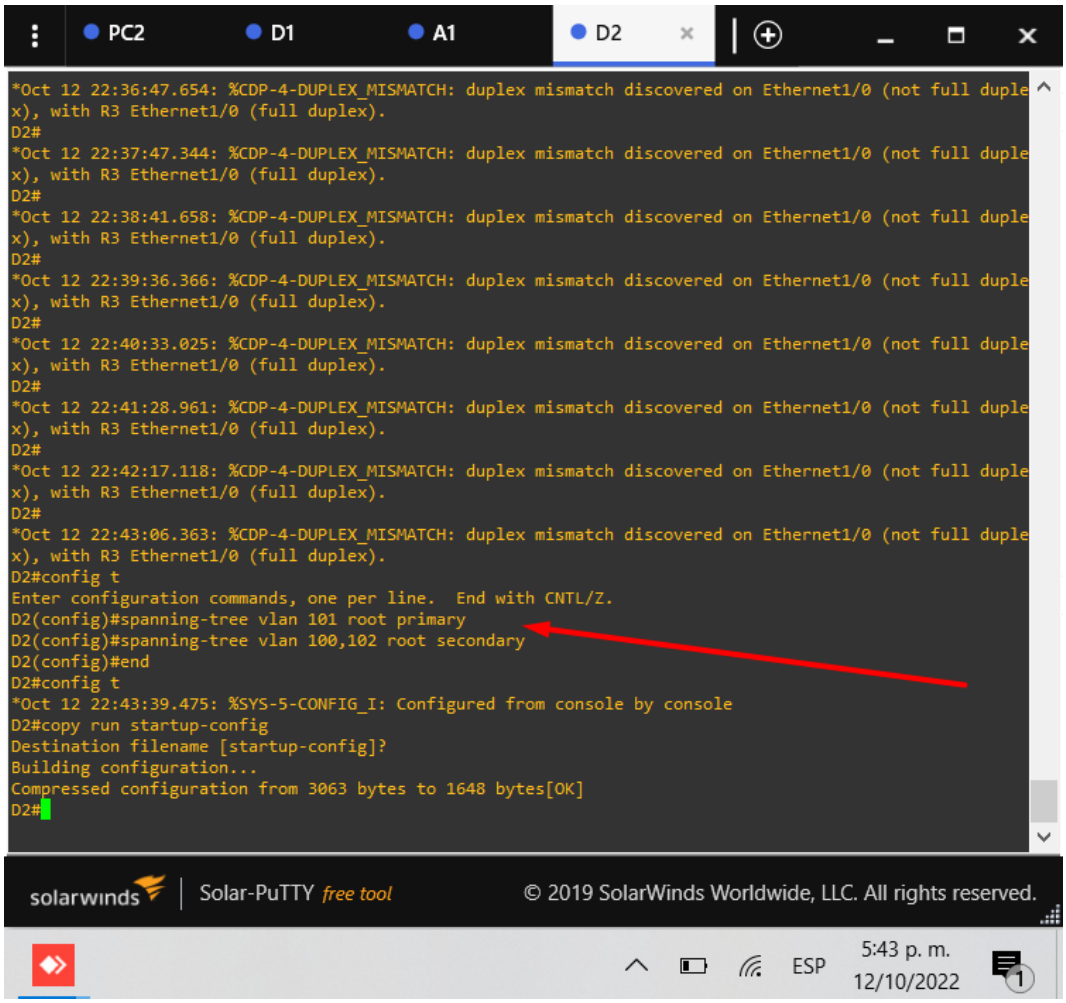
Configure D1 and D2 as root for the appropriate VLANs with mutually supporting priorities in case of switch failure.

Figura 20. Vlan 100 primaria sobre D1.



Fuente: Autor.

Figura 21. Vlan 101 primaria sobre D2.



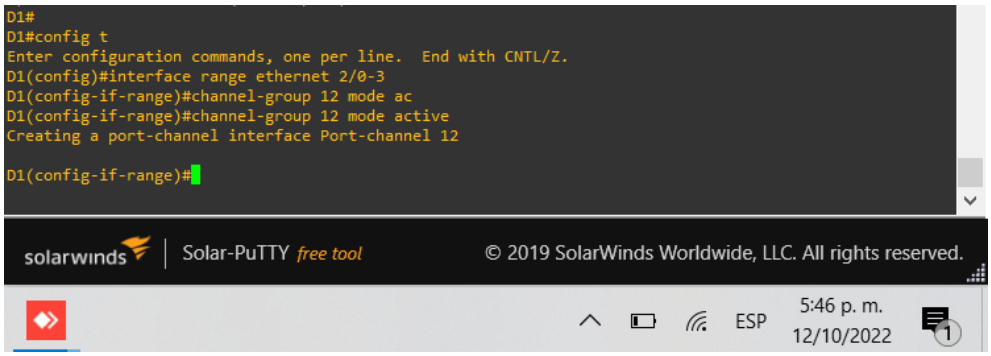
Fuente: Autor.

Task 2.5 On all switches, create LACP EtherChannels as shown in the topology diagram.

Use the following channel numbers:

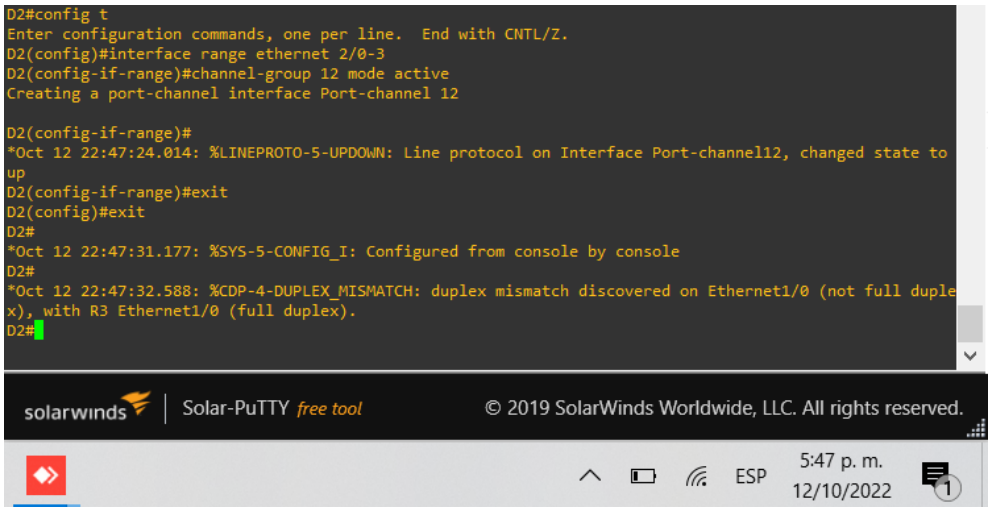
- D1 to D2 – Port channel 12

Figura 22. LACP canal 12 en D1.



Fuente: Autor.

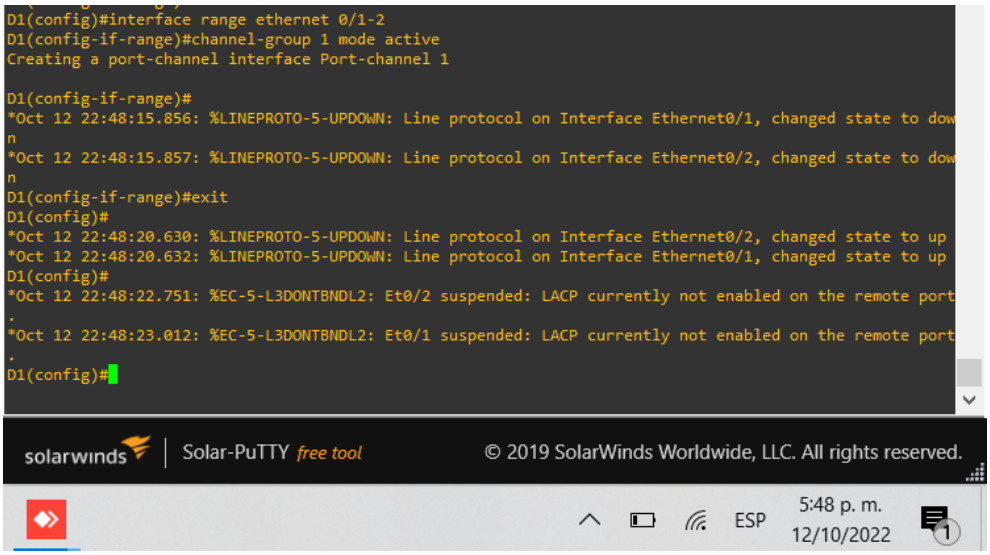
Figura 23. LACP canal 12 en D2.



Fuente: Autor.

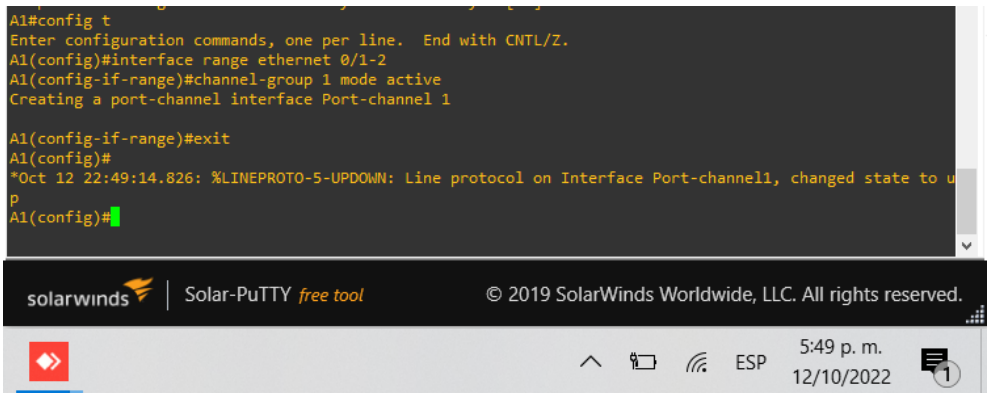
- D1 to A1 – Port channel 1

Figura 24. LACP canal 1 en D1.



Fuente: Autor.

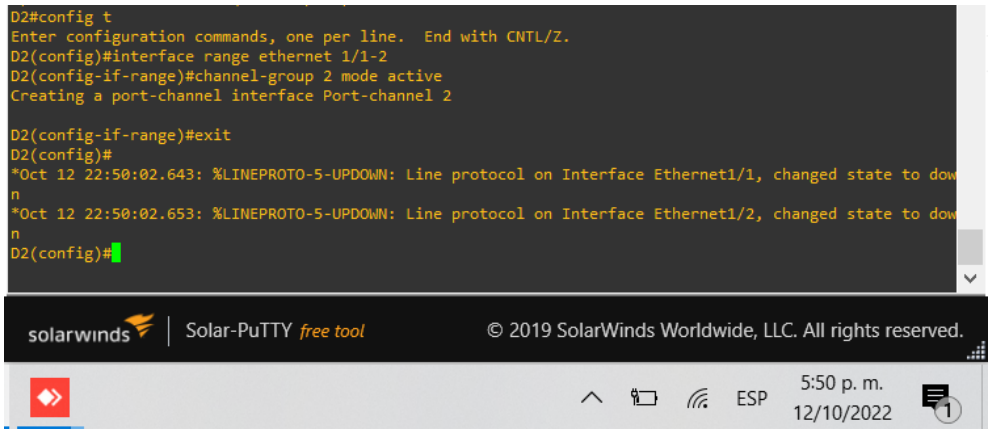
Figura 25. LACP canal 1 en A1.



Fuente: Autor.

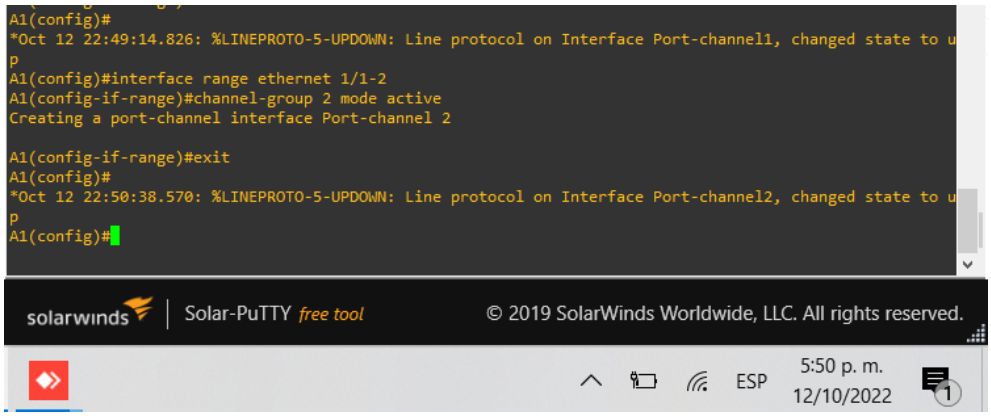
- D2 to A1 – Port channel 2

Figura 26. LACP canal 2 en D2.



Fuente: Autor.

Figura 27. LACP canal 2 en A1.



Fuente: Autor.

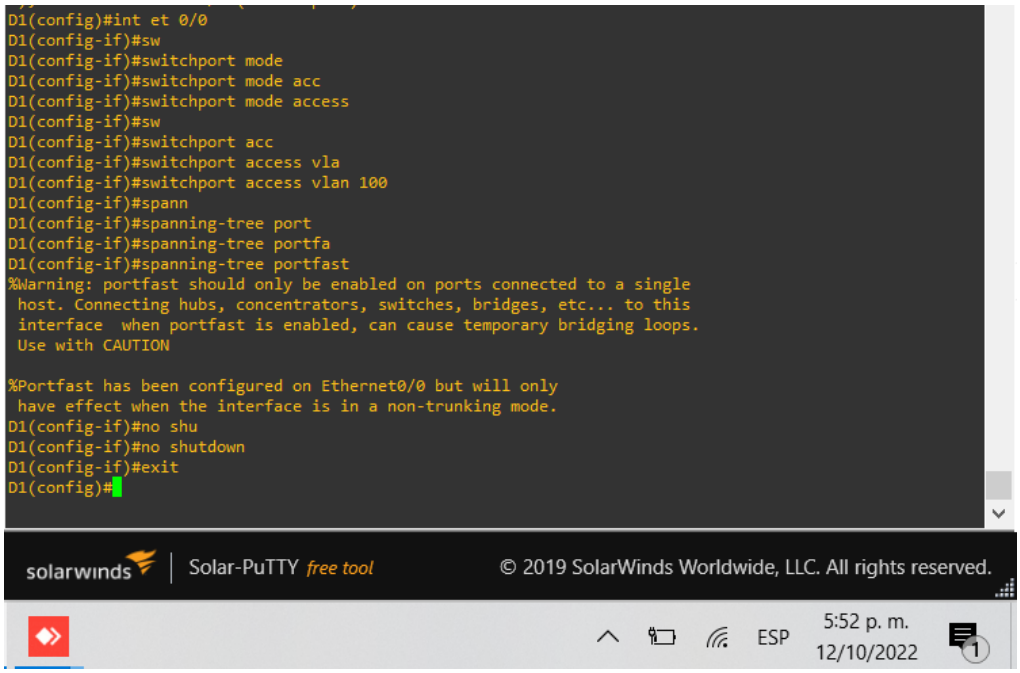
Task 2.6 On all switches, configure host 41ccess ports connecting to PC1, PC2, PC3, and PC4

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

Host ports should transition immediately to forwarding state.

PC1:

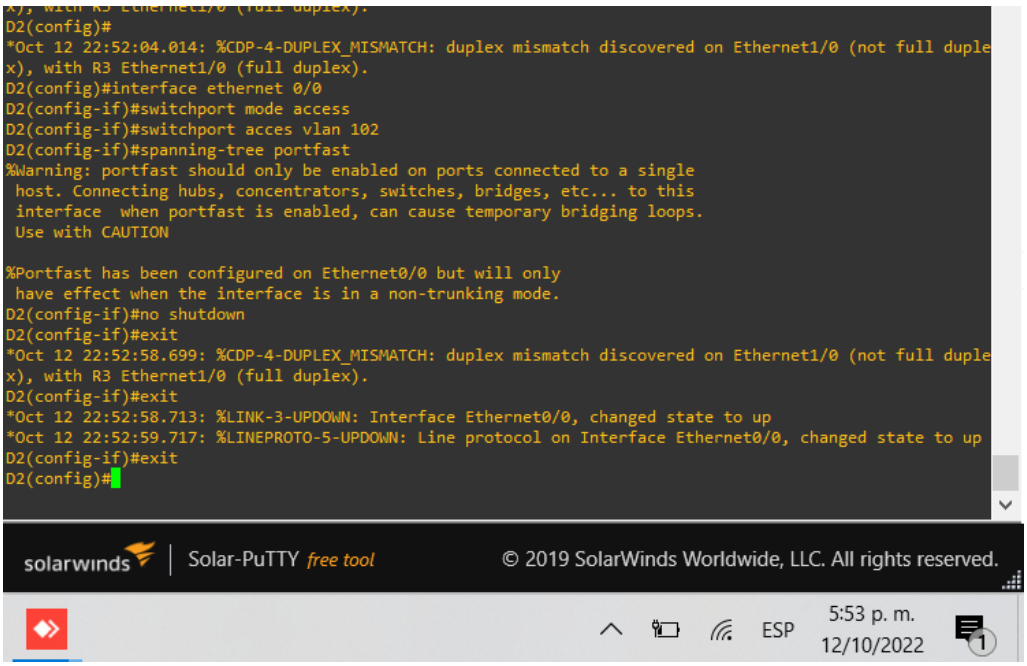
Figura 28. Modo acceso en D1, VLAN 100.



Fuente: Autor.

PC2:

Figura 29. Modo acceso en D2, VLAN 102.



Fuente: Autor.

PC3 y PC4 desde A1:

Figura 30. Modo acceso en A1, VLAN 101.

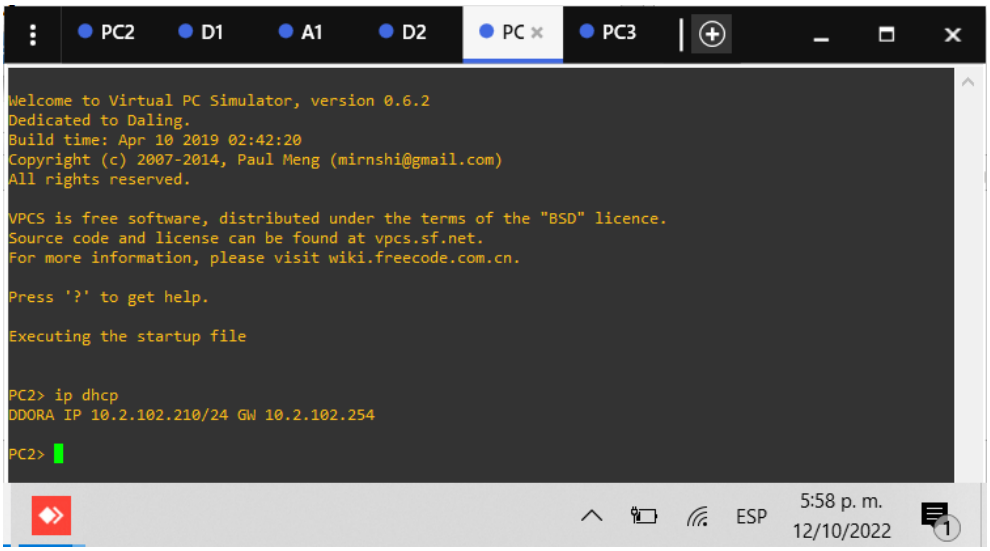
Fuente: Autor.

Task 2.7 Verify IPv4 DHCP services.

PC2 and PC3 are DHCP clients and should be receiving valid IPv4 addresses.

PC2:

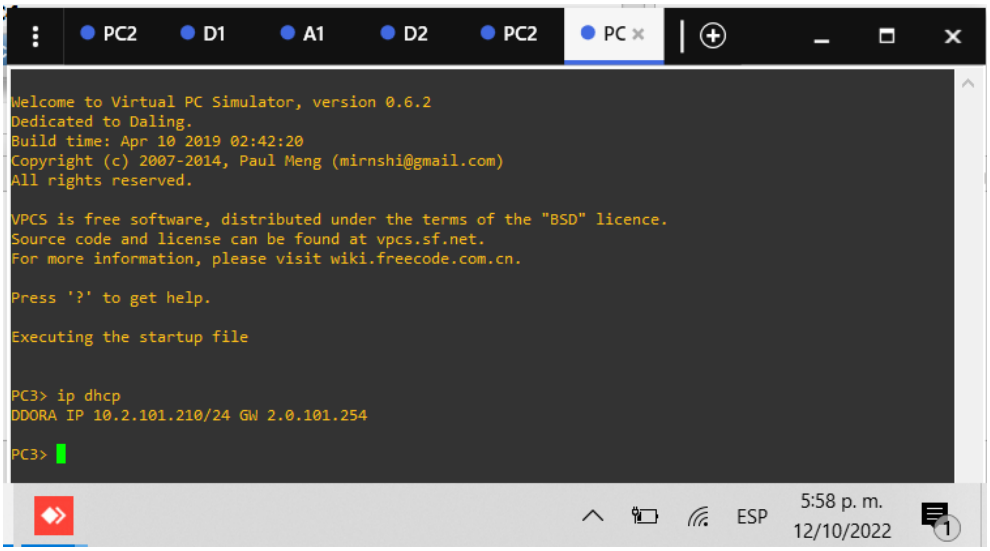
Figura 31. Configuración DHCP sobre PC2.



Fuente: Autor.

PC3:

Figura 32. Configuración DHCP sobre PC3.



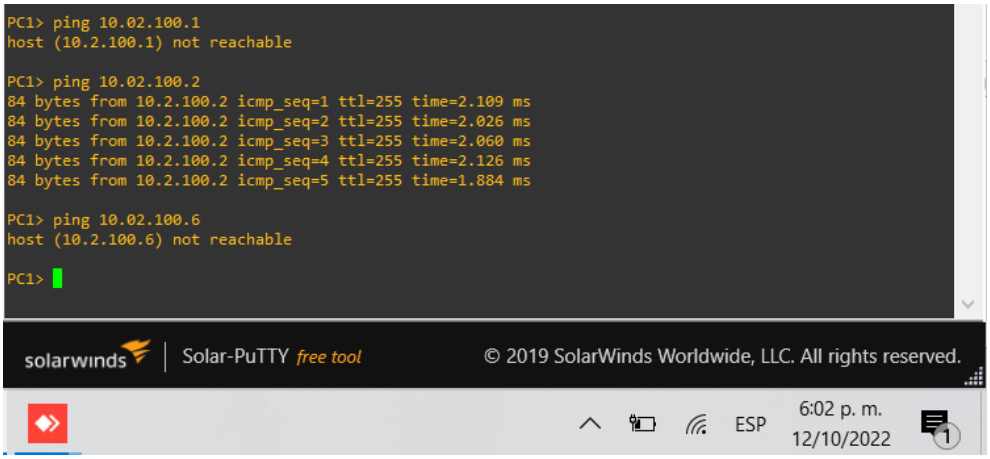
Fuente: Autor.

Task 2.8 Verify local LAN connectivity.

PC1 should successfully ping:

- D1: 10.02.100.1
- D2: 10.02.100.2
- PC4: 10.02.100.6

Figura 33. Prueba PING PC1.

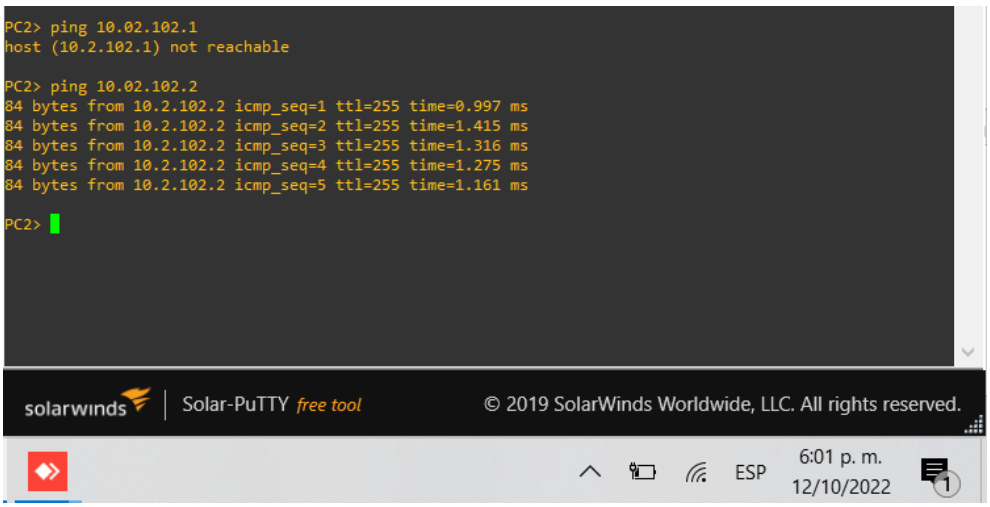


Fuente: Autor.

PC2 should successfully ping:

- D1: 10.02.102.1
- D2: 10.02.102.2

Figura 34. Prueba PING PC2.

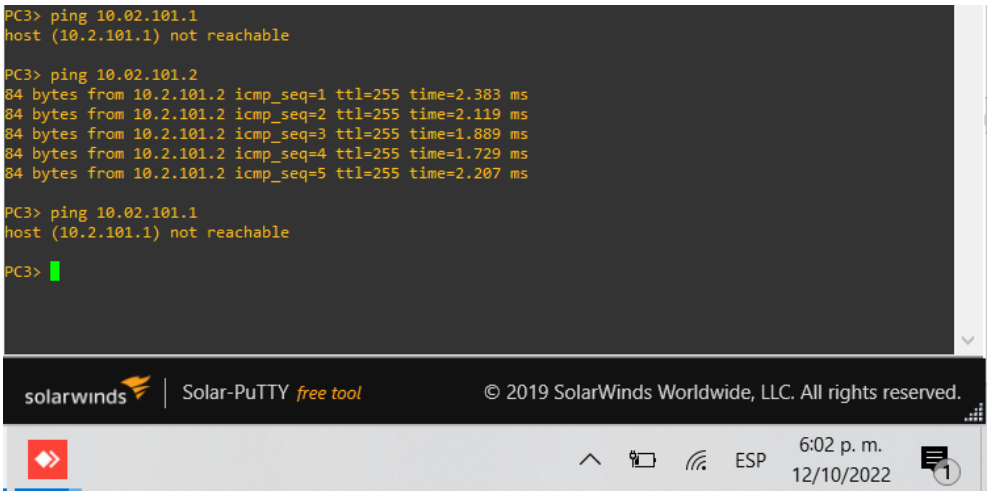


Fuente: Autor.

PC3 should successfully ping:

- D1: 10.02.101.1
- D2: 10.02.101.2

Figura 35. Prueba PING PC3.

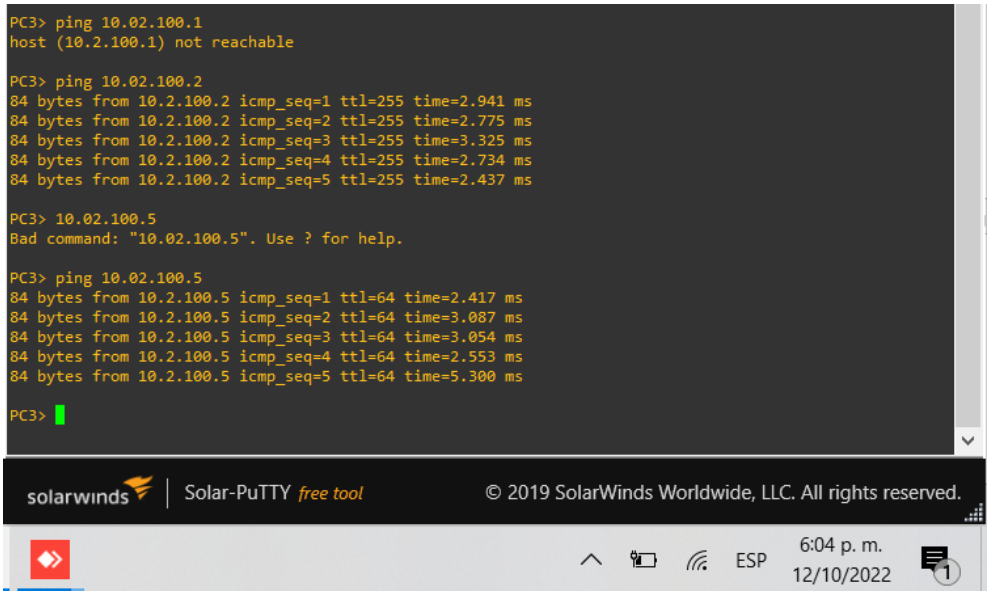


Fuente: Autor.

PC4 should successfully ping:

- D1: 10.02.100.1
- D2: 10.02.100.2
- PC1: 10.02.100.5

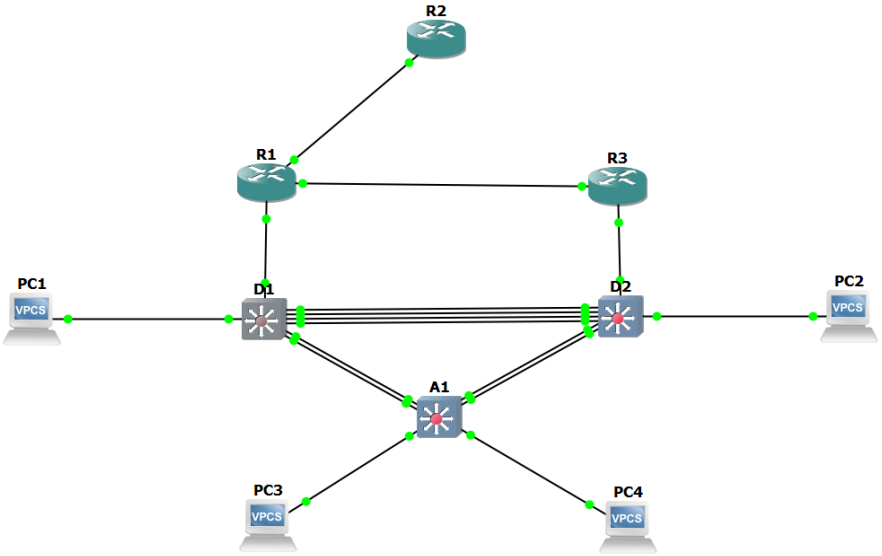
Figura 36. Prueba PING PC4.



Fuente: Autor.

Topología de la red en funcionamiento:

Figura 37. Topología final en funcionamiento.



Fuente: Autor.

ESCENARIO 2

Part 1: Configure Routing Protocols

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

Se asigna el ID para R1

```
R1(config)#router ospf 4                  //creación OSPF con ID 4
R1(config-router)#router-id 0.0.4.1       //IP asignada R1
```

R3: 0.0.4.3
Se asigna el ID para R2

```
R3(config)#router ospf 4                  //creación OSPF con ID 4
R3(config-router)#router-id 0.0.4.3       //IP asignada R2
```

D1: 0.0.4.131
Se asigna el ID para D1

```
D1(config)#router ospf 4                  //creación OSPF con ID 4
D1(config-router)#router-id 0.0.4.131     //IP asignada D1
```

D2: 0.0.4.132
Se asigna el ID para D2

```
D2(config)#router ospf 4                  //creación OSPF con ID 4
D2(config-router)#router-id 0.0.4.132     //IP asignada D2
```

On R1, R3, D1, and D2, advertise all directly connected networks / VLANs in Area 0.

- **On R1, do not advertise the R1 – R2 network.**

  Configuración de R1:

  ```
  R1(config-router)#network 10.02.10.0 0.0.0.255 area 0 //Asignaciones de area 0 a R1
  R1(config-router)#network 10.02.13.0 0.0.0.255 area 0
  ```

R3(config-router)#network 10.02.11.0 0.0.0.255 area 0 //Asignaciones de area 0 a R3
R3(config-router)#network 10.02.13.0 0.0.0.255 area 0

D1(config-router)#network 10.02.10.0 0.0.0.255 area 0 //Asignaciones de area 0 a D1
D1(config-router)#network 10.02.100.0 0.0.0.255 area 0
D1(config-router)#network 10.02.101.0 0.0.0.255 area 0
D1(config-router)#network 10.02.102.0 0.0.0.255 area 0

D2(config-router)#network 10.02.11.0 0.0.0.255 area 0 //Asignaciones de area 0 a D2
D2(config-router)#network 10.02.100.0 0.0.0.255 area 0
D2(config-router)#network 10.02.101.0 0.0.0.255 area 0
D2(config-router)#network 10.02.102.0 0.0.0.255 area 0

- **On R1, propagate a default route. Note that the default route will be provided by BGP.**

R1(config-router)#default-information originate

Disable OSPFv2 advertisements on:

- **D1: All interfaces except E1/2**

D1(config-router)#passive-interface Ethernet 0/0 //Deshabilitación de las interfaces no usadas
D1(config-router)#passive-interface Ethernet 0/1
D1(config-router)#passive-interface Ethernet 0/2
D1(config-router)#passive-interface Ethernet 0/3
D1(config-router)#passive-interface Ethernet 1/0
D1(config-router)#passive-interface Ethernet 1/1
D1(config-router)#passive-interface Ethernet 1/3
D1(config-router)#passive-interface Ethernet 2/0
D1(config-router)#passive-interface Ethernet 2/1
D1(config-router)#passive-interface Ethernet 2/2
D1(config-router)#passive-interface Ethernet 2/3
D1(config-router)#passive-interface Ethernet 3/0
D1(config-router)#passive-interface Ethernet 3/1
D1(config-router)#passive-interface Ethernet 3/2
D1(config-router)#passive-interface Ethernet 3/3

- **D2: All interfaces except E1/0**

D2(config-router)#passive-interface Ethernet 0/0 //Deshabilitación de las interfaces no usadas
D2(config-router)#passive-interface Ethernet 0/1
D2(config-router)#passive-interface Ethernet 0/2
D2(config-router)#passive-interface Ethernet 0/3
D2(config-router)#passive-interface Ethernet 1/1
D2(config-router)#passive-interface Ethernet 1/2
D2(config-router)#passive-interface Ethernet 1/3
D2(config-router)#passive-interface Ethernet 2/0
D2(config-router)#passive-interface Ethernet 2/1
D2(config-router)#passive-interface Ethernet 2/2
D2(config-router)#passive-interface Ethernet 2/3
D2(config-router)#passive-interface Ethernet 3/0
D2(config-router)#passive-interface Ethernet 3/1
D2(config-router)#passive-interface Ethernet 3/2
D2(config-router)#passive-interface Ethernet 3/3

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
Se asigna el ID para R1

R1(config)#ipv6 unicast-routing //Proceso OSPF IPv6 unidifusión
R1(config)#ipv6 router ospf 6 //config OSPF ID 6
R1(config-rtr)#router-id 0.0.6.1 //IP para R1

R3: 0.0.6.3
Se asigna el ID para R2

R3(config)#ipv6 unicast-routing //Proceso OSPF IPv6 unidifusión
R3(config)#ipv6 router ospf 6 //config OSPF ID 6
R3(config-rtr)#router-id 0.0.6.3 //IP para R2

D1: 0.0.6.131
Se asigna el ID para D1

D1(config)#ipv6 unicast-routing //Proceso OSPF IPv6 unidifusión
D1(config)#ipv6 router ospf 6 //config OSPF ID 6
D1(config-rtr)#router-id 0.0.6.131 //IP para D1

D2: 0.0.6.132
Se asigna el ID para D2

```
D2(config)#ipv6 unicast-routing          //Proceso OSPF IPv6 unidifusión
D2(config)#ipv6 router ospf 6            //config OSPF ID 6
D2(config-rtr)#router-id 0.0.6.132       //IP para D2
```

On R1, R3, D1, and D2, advertise all directly connected networks / VLANs in Area 0.

- **On R1, do not advertise the R1 – R2 network.**

  Para R1:
  //a continuación se vinculan el área 6 creada bajo las interfaces ethernet 1/0 y 1/2
  ```
  R1(config)#int E1/0
  R1(config-if)#ipv6 ospf 6 area 0
  R1(config-if)#int E1/2
  R1(config-if)#ipv6 ospf 6 area 0
  ```

  Para R3:
  //a continuación se vinculan el área 6 creada bajo las interfaces ethernet 1/1 y 1/2
  ```
  R3(config)#int E1/2
  R3(config-if)#ipv6 ospf 6 area 0
  R3(config-if)#int E1/1
  R3(config-if)#ipv6 ospf 6 area 0
  ```

  Para D1:
  //a continuación se vinculan el área 6 creada bajo las interfaces ethernet 0/0 ylas vlan 100, 101, 102
  ```
  D1(config)#int E0/0
  D1(config-if)#ipv6 ospf 6 area 0
  D1(config)#int vlan 100
  D1(config-if)#ipv6 ospf 6 area 0
  D1(config)#int vlan 101
  D1(config-if)#ipv6 ospf 6 area 0
  D1(config)#int vlan 102
  D1(config-if)#ipv6 ospf 6 area 0
  ```

  Para D2:
  //a continuación se vinculan el área 6 creada bajo las interfaces ethernet 0/0 ylas vlan 100, 101, 102
  ```
  D2(config)#int E0/0
  D2(config-if)#ipv6 ospf 6 area 0
  ```

D2(config)#int vlan 100
D2(config-if)#ipv6 ospf 6 area 0
D2(config)#int vlan 101
D2(config-if)#ipv6 ospf 6 area 0
D2(config)#int vlan 102
D2(config-if)#ipv6 ospf 6 area 0

- **On R1, propagate a default route. Note that the default route will be provided by BGP.**

R1(config)#ipv6 router ospf 6
R1(config-router)#default-information originate //se abren procesos de información según el BGP a configurar

Disable OSPFv3 advertisements on:

- **D1: All interfaces except E1/2**

D1(config-rtr)#passive-interface Ethernet 0/0 //Se configuran las interfaces de forma pasiva que no son usadas por seguridad
D1(config-rtr)#passive-interface Ethernet 0/1
D1(config-rtr)#passive-interface Ethernet 0/2
D1(config-rtr)#passive-interface Ethernet 0/3
D1(config-rtr)#passive-interface Ethernet 1/0
D1(config-rtr)#passive-interface Ethernet 1/1
D1(config-rtr)#passive-interface Ethernet 1/3
D1(config-rtr)#passive-interface Ethernet 2/0
D1(config-rtr)#passive-interface Ethernet 2/1
D1(config-rtr)#passive-interface Ethernet 2/2
D1(config-rtr)#passive-interface Ethernet 2/3
D1(config-rtr)#passive-interface Ethernet 3/0
D1(config-rtr)#passive-interface Ethernet 3/1
D1(config-rtr)#passive-interface Ethernet 3/2
D1(config-rtr)#passive-interface Ethernet 3/3

- **D2: All interfaces except E1/0**

D2(config-rtr)#passive-interface Ethernet 0/0 //Se configuran las interfaces de forma pasiva que no son usadas por seguridad
D2(config-rtr)#passive-interface Ethernet 0/1
D2(config-rtr)#passive-interface Ethernet 0/2
D2(config-rtr)#passive-interface Ethernet 0/3
D2(config-rtr)#passive-interface Ethernet 1/1
D2(config-rtr)#passive-interface Ethernet 1/2

D2(config-rtr)#passive-interface Ethernet 1/3
D2(config-rtr)#passive-interface Ethernet 2/0
D2(config-rtr)#passive-interface Ethernet 2/1
D2(config-rtr)#passive-interface Ethernet 2/2
D2(config-rtr)#passive-interface Ethernet 2/3
D2(config-rtr)#passive-interface Ethernet 3/0
D2(config-rtr)#passive-interface Ethernet 3/1
D2(config-rtr)#passive-interface Ethernet 3/2
D2(config-rtr)#passive-interface Ethernet 3/3

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.**

  R2(config)#ip route 0.0.0.0 0.0.0.0 0.0.0.0 //IP por defecto

- **An IPv6 default static route.**

  R2(config)#ipv6 route 0::0/64 0::0 //IP por defecto

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

R2(config)#router bgp 500//Se asigna el AS 500 para compartir información importante y estabilizar la conexión entre los dispositivos
R2(config-router)# bgp router-id 2.2.2.2 //IP configurada
R2(config-router)# neighbor 209.165.200.225 remote-as 300 //config de vecinos entre las areas
R2(config-router)# neighbor 2001:db8:200::1 remote-as 300 //config de vecinos entre las areas

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).**

  R2(config-router)# address-family ipv4
  R2(config-router-af)# neighbor 209.165.200.225 activate
  R2(config-router-af)# no neighobor 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
```

In IPv6 address family, advertise:

- **The Loopback 0 IPv4 network (/128).**
- **The default route (::/0).**

```
R2(config-router)#address-family ipv6
R2(config-router-af)# no neighbor 209.165.200.225 activate
R2(config-router-af)# neighobor 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
```

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 10.02.0.0/8.**

  ```
  R1(config)#ip route 10.02.0.0 255.0.0.0 null0
  ```

- **A summary IPv6 route for 2001:db8:100::/48.**

  ```
  R1(config)#ipv6 route 2001:db8:100::/48 null0
  ```

Configure R1 in BGP ASN 300 and use the router-id 1.1.1.1.

```
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
```

Configure an IPv4 and IPv6 neighbor relationship with R2 in ASN 500.

In IPv4 address family:

- **Disable the IPv6 neighbor relationship.**

  ```
  R1(config-router-af)# no neighbor 2001:db8:200::2 activate
  R1(config-router-af)# exit-address-family
  ```

- **Enable the IPv4 neighbor relationship.**

```
R1(config-router)# address-family ipv4 unicast
R1(config-router-af)# neighbor 209.165.200.226 activate
```

- **Advertise the 10.02.0.0/8 network.**

```
R1(config-router-af)# network 10.02.0.0 mask 255.0.0.0
```

In IPv6 address family:

- **Disable the IPv4 neighbor relationship.**

```
R1(config-router)# address-family ipv6 unicast
R1(config-router-af)# no neighbor 209.165.200.226 activate
```

- **Enable the IPv6 neighbor relationship.**

```
R1(config-router-af)# neighbor 2001:db8:200::2 activate
R1(config-router-af)# exit-address-family
```

- **Advertise the 2001:db8:100::/48 network.**

```
R1(config-router-af)# network 2001:db8:100::/48
```

Part 2: Configure Routing Protocols

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.**

```
D1# config ter                  //ingreso modo configuración
D1(config)# track 4 ip sla 4    //creación SLA 4
D1(config-track)# delay down 10 up 15      //configuración del retardo
```

- **Use SLA number 6 for IPv6.**

```
D1(config)# track 6 ip sla 6    //creación SLA 6
D1(config-track)# delay down 10 up 15      //configuración del retardo
```

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.**

```
D1(config)# ip sla 4
D1(config-ip-sla) icmp-echo 10.0.10.1                    //IP para los paquetes
D1(config-ip-sla-echo)#frequency 5                ///frecuencia de cada 5 segundos
D1(config-ip-sla-echo)# exit
D1(config)# ip sla schedule 4 life forever start-time now
```

- **Use track number 6 for IP SLA 6.**

```
D1(config)# ip sla 6                        //asignación de IPv6 para paquetes
D1(config-ip-sla) icmp-echo 2001:db8:100:1010::1
D1(config-ip-sla-echo)frequency 5                ///frecuencia de cada 5 segundos
D1(config-ip-sla-echo)# exit
D1(config)# ip sla schedule 6 life forever start-time now
```

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.**

```
D2#config ter
D2(config)# track 4 ip sla 4                    //creación SLA 4
D2(config)# delay down 10 up 15                 //tiempos de retardo
```

- **Use SLA number 6 for IPv6.**

```
D2(config)# track 6 ip sla 6                    //creación SLA 4
D2(config)# delay down 10 up 15                 //tiempos de retardo
```

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.**

```
D2(config)# ip sla 4
D2(config-ip-sla) icmp-echo 10.0.10.1        //IP para envío de paquetes
D2(config-ip-sla-echo)frequency 5            //frecuencia de 5 segundos
D2(config-ip-sla-echo)# exit                 //Salida
D2(config)# ip sla schedule 4 life forever start-time now
```

- **Use track number 6 for IP SLA 6.**

```
D2(config)# ip sla 6                         //Ingreso al SLA creado
D2(config-ip-sla) icmp-echo 2001:db8:100:1010::1
D2(config-ip-sla-echo)frequency 5    //frecuencia de cada 5 segunos
D2(config-ip-sla-echo)# exit
D2(config)# ip sla schedule 6 life forever start-time now
```

The tracked objects should notify D1 if the IP SLA state changes from down to up after 10 seconds, or from up to down after 15 seconds.

4.3 On D1, configure HSRPv2.

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 10.02.100.254.**

```
D1(config)#interface Vlan100          //se configuran las IP virtuales en la VLAN100
D1(config-if)#standby version 2       //version 2 de HSRP
D1(config-if)#standby 104 ip 10.02.100.254
```

- **Set the group priority to 150.**

```
D1(config-if)#standby 104 priority 150        //cambio de la prioridad del grupo a 150
```

- **Enable preemption.**

```
D1(config-if)#standby 104 preempt             //Preferencia de 104
```

- **Track object 4 and decrement by 60.**

D1(config-if)#standby 104 track 4 decrement 60

Configure IPv4 HSRP group 114 for VLAN 101:

- **Assign the virtual IP address 10.02.101.254.**

  D1(config)#interface Vlan101 //se configuran las IP virtuales en la VLAN101
  D1(config-if)#standby version 2
  D1(config-if)#standby 114 ip 10.02.101.254

- **Enable preemption.**

  D1(config-if)#standby 114 preempt //preferencia del grupo a 114

- **Track object 4 to decrement by 60.**

  D1(config-if)#standby 114 track 4 decrement 60
  D1(config-if)#exit

Configure IPv4 HSRP group 124 for VLAN 102:

- **Assign the virtual IP address 10.02.102.254.**

  D1(config)#interface Vlan102 //se configuran las IP virtuales en la VLAN100
  D1(config-if)#standby version 2
  D1(config-if)#standby 124 ip 10.02.102.254

- **Set the group priority to 150.**

  D1(config-if)#standby 124 priority 150 //Prioridad de 150

- **Enable preemption.**

  D1(config-if)#standby 124 preempt

- **Track object 4 to decrement by 60.**

  D1(config-if)#standby 124 track 4 decrement 60

Configure IPv6 HSRP group 106 for VLAN 100:

- **Assign the virtual IP address using ipv6 autoconfig.**

D1(config)#interface Vlan100
D1(config-if)#standby 106 ipv6 autoconfig

- **Set the group priority to 150.**

  D1(config-if)#standby 106 priority 150

- **Enable preemption.**

  D1(config-if)#standby 106 preempt

- **Track object 6 and decrement by 60.**

  D1(config-if)#standby 106 track 6 decrement 60

Configure IPv6 HSRP group 116 for VLAN 101:

- **Assign the virtual IP address using ipv6 autoconfig.**

  D1(config-if)#standby 116 ipv6 autoconfig

- **Enable preemption.**

  D1(config-if)#standby 116 preempt

- **Track object 6 and decrement by 60.**

  D1(config-if)#standby 116 track 6 decrement 60

Configure IPv6 HSRP group 126 for VLAN 102:

- **Assign the virtual IP address using ipv6 autoconfig.**

  D1(config)#interface Vlan102
  D1(config-if)#standby 126 ipv6 autoconfig

- **Set the group priority to 150.**

  D1(config-if)#standby 126 priority 150

- **Enable preemption.**

  D1(config-if)#standby 126 preempt

- **Track object 6 and decrement by 60.**

  D1(config-if)#standby 126 track 6 decrement 60

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 10.02.100.254.**

  D2(config)#interface Vlan100 //se configuran las IP virtuales en la VLAN100
  D2(config-if)#standby version 2 //V2 de HSRP
  D2(config-if)#standby 104 ip 10.02.100.254

- **Enable preemption.**

  D2(config-if)#standby 104 preempt

- **Track object 4 and decrement by 60.**

  D2(config-if)#standby 104 track 4 decrement 60

Configure IPv4 HSRP group 114 for VLAN 101:

- **Assign the virtual IP address 10.02.101.254.**

  D2(config)#interface Vlan101 //se configuran las IP virtuales en la VLAN101
  D2(config-if)#standby version 2
  D2(config-if)#standby 114 ip 10.02.101.254

- **Set the group priority to 150.**

  D2(config-if)#standby 114 priority 150

- **Enable preemption.**

  D2(config-if)#standby 114 preempt

- **Track object 4 to decrement by 60.**

  D2(config-if)#standby 114 track 4 decrement 60

Configure IPv4 HSRP group 124 for VLAN 102:

- **Assign the virtual IP address 10.02.102.254.**

  D2(config)#interface Vlan102
  D2(config-if)#standby version 2
  D2(config-if)#standby 124 ip 10.02.102.254

- **Enable preemption.**

  D2(config-if)#standby 124 preempt

- **Track object 4 to decrement by 60.**

  D2(config-if)#standby 124 track 4 decrement 60

Configure IPv6 HSRP group 106 for VLAN 100:

- **Assign the virtual IP address using ipv6 autoconfig.**

  D2(config)#interface Vlan100
  D2(config-if)#standby 106 ipv6 autoconfig

- **Enable preemption.**

  D2(config)#interface Vlan100
  D2(config-if)#standby 106 preempt

- **Track object 6 and decrement by 60.**

  D2(config-if)#standby 106 track 6 decrement 60

Configure IPv6 HSRP group 116 for VLAN 101:

- **Assign the virtual IP address using ipv6 autoconfig.**

```
D2(config)#interface Vlan101
D2(config-if)#standby 116 ipv6 autoconfig
```

- **Set the group priority to 150.**

  ```
  D2(config-if)#standby 116 priority 150
  ```

- **Enable preemption.**

  ```
  D2(config-if)#standby 116 preempt
  ```

- **Track object 6 and decrement by 60.**

  ```
  D2(config-if)#standby 116 track 6 decrement 60
  ```

Configure IPv6 HSRP group 126 for VLAN 102:

- **Assign the virtual IP address using ipv6 autoconfig.**

  ```
  D2(config)#interface Vlan102
  D2(config-if)#standby 126 ipv6 autoconfig
  ```

- **Enable preemption.**

  ```
  D2(config-if)#standby 126 preempt
  ```

- **Track object 6 and decrement by 60.**

  ```
  D2(config-if)#standby 126 track 6 decrement 60
  ```

CONCLUSIONES

Gracias a la topología planteada dentro del marco del Diplomado CISCO CCNP, se logra evidenciar como bajo una topología de pocos elementos es posible evidenciar cada tema tratado durante el mismo, diferenciando las configuraciones básicas para capa 2 como capa 3, lo que afianzó en detalle lo previamente adquirido durante cada paso del curso.

Las ventajas presentadas entre Packet Tracert y el software GNS3, es de gran diferencia debido a que este último, permite cargar una imagen del equipo a trabajar de manera tal, que se puede tener alcance a su totalidad de posibles configuraciones y es allí donde el software de Cisco se ve un poco rezagado al impedir lanzar ciertos comandos, inclusive, GNS3 al permitir cargar diversas imágenes, permite topologías más complejas donde pueden intervenir equipos de otras marcas como Mikrotik (por mencionar solo alguna)

Al evidenciar las configuraciones realizadas a cada Switch, se evidencia las buenas prácticas de configuración con el fin de dividir el tráfico existente entre estos elementos o terminales finales para las VLAN 100, 101, 102 sin contar con la redundancia evidenciada en la topología que permite una segunda ruta en cado de posibles fallas de cableado entre los equipos

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