DIPLOMADO DE PROFUNDIZACIÓN CISCO
PRUEBA DE HABILIDADES PRÁCTICAS CCNP

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Diplomado de opción de grado presentado para optar el
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NOTA DE ACEPTACIÓN

Firma del presidente del Jurado

Firma del Jurado

Firma del Jurado

MARIQUITA, 27 de noviembre de 2022

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CONTENIDO

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GLOSARIO

GNS3: Es un software utilizado por cientos de miles de ingenieros de redes a nivel mundial para emular, configurar, probar y solucionar problemas de redes virtuales y reales.

Protocolos enrutamiento: Los protocolos de enrutamiento administran la actividad de enrutamiento en un sistema. Los enrutadores intercambiar información de enrutamiento con otros hosts para mantener las rutas conocidas a las redes remotas.

CCNP: Son las siglas de Cisco Certified Networking Professional. Es decir, un certificado de networking y telecomunicaciones.

Simulación: Consiste en la utilización de ciertas técnicas matemáticas, empleadas en computadores, las cuales permiten imitar el funcionamiento de prácticamente cualquier tipo de operación o proceso del mundo real, es decir, es el estudio del comportamiento de sistemas reales a través del ejercicio de modelos.

Emulación: Es la acción y efecto de emular, es decir, de "imitar" las acciones ajenas en virtud de una cierta rivalidad, muchas veces con miras a superarlas.

Topología de red: Se denomina topología de red a la forma en que se organizan los componentes de una red (cables, tarjetas de red, otros equipos, etc.)

Administraciones en red: se define como el proceso de administración de una red de los fallos y el rendimiento utilizando diversas herramientas y tecnologías para mantenerse al día con los requisitos empresariales. El objetivo de la administración de red es lograr una red libre de errores.

RESUMEN

El siguiente trabajo se construye con el fin de dar cumplimiento a las actividades del Diplomado de profundización Cisco prueba de habilidades prácticas CCNP; el cual consta de cuatro partes:

Construir la red y configurar los parámetros básicos de los dispositivos y el direccionamiento de las interfaces.

Configurar la capa 2 de la red y el soporte del Host.

Configurar los protocolos de enrutamiento.

Configurar la redundancia del primer salto.

Para la parte interna de las redes se utiliza el protocolo de enrutamiento OSPF que funciona de una manera bastante sencilla ya que permite identificar la conmutación y enrutamiento que poseen; con esto se puede establecer a qué distancia esta cada router con el fin de que al momento de enviar paquetes se escoja la ruta más corta y con menos saltos en las redes electrónicas.

Por medio del protocolo BGP se establece la interconexión de redes, y se pueden enviar paquetes de una ruta a otra utilizando parámetros como ancho de banda, precio de la conexión, saturación de red, denegación de paso de paquetes, etc.

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

ABSTRACT

The following work is constructed in order to fulfill the activities of the Cisco proficiency, practical skills CCNP which is divided into four parts:

Build the network and configure the basic parameters of the devices and interface addressing.

Configure the network layer 2 and Host support.

Configure routing protocols.

Configure first hop redundancy.

For the internal part of the networks, it is used the OSPF routing protocol, which works in a quite simple way as it allows to identify the switching and routing they have. This allows establishing how far apart each router is, in order to choose the shortest route with the fewest hops when sending packets in the electronics networks.

By means of the BGP protocol, the interconnection of networks is established, and packets can be sent from one route to another using parameters such as bandwidth, connection price, network saturation, packet passing denial, etc.

Keywords: CISCO, CCNP, Switching, Routing, Networks, Electronics.

INTRODUCCIÓN

En este documento se analizará la configuración de protocolos de enrutamiento de acuerdo a lo solicitado, se realizará la configuración de routers y switches, configuración de interfaces de acuerdo a una topología de red, configuración de la capa 2 de la red y el soporte del Host y se abordarán los pasos para la configuración de varios mecanismos de seguridad en los dispositivos de la topología.

La creación u optimización de una red, además de requerir conocimientos de planificación, diseño e implementación, requiere de una gran inversión económica, por este motivo cada vez es más común que a nivel empresarial y académico se usen simuladores virtuales para probar nuevos conceptos y funcionalidades que se implementaran en sus redes con el fin de reducir riesgos.

Debido al coste elevado del material se hace necesario el uso de simuladores y emuladores de dispositivos. Como herramienta principal para el desarrollo de la práctica para este Diplomado, tenemos al emulador GNS3 (Graphical Network Simulator) que es un software de código abierto (bajo licencia GPL) que nos proporciona una interfaz gráfica para diseñar y configurar redes virtuales, que se ejecutan en el hardware del PC y se pueden utilizar en múltiples sistemas operativos, incluyendo Windows, Linux y MacOS X.

DESARROLLO DEL ESCENARIO DE LA PRUEBA DE HABILIDADES

Topology

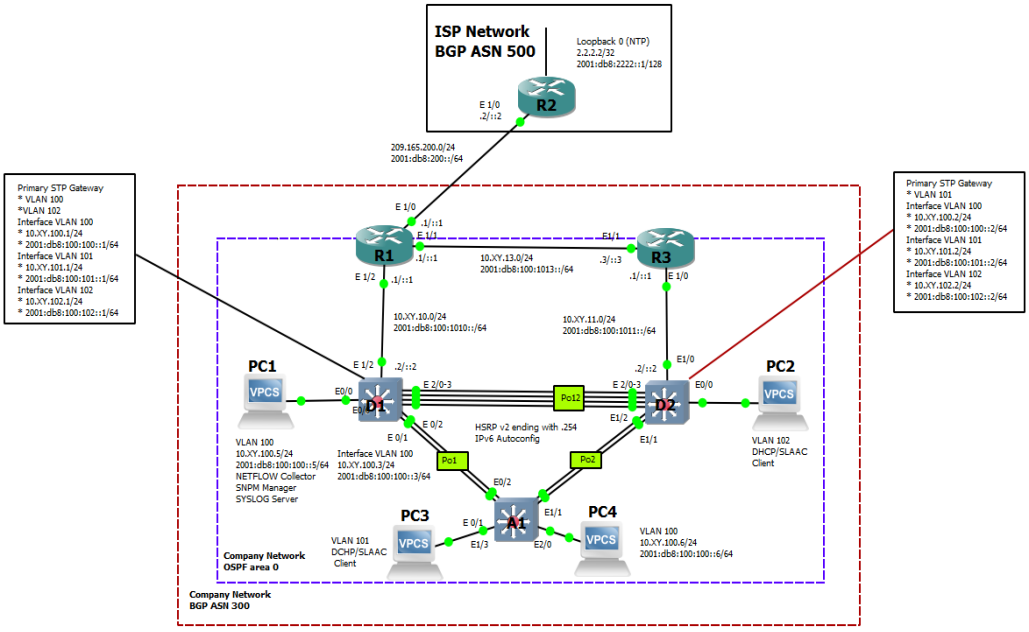

Ilustración 1: Escenario propuesto

Addressing Table

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
R1	E1/2	10.20.10.1/24	2001:db8:100:1010::1/64	fe80::1:2
R1	E1/1	10. 20.13.1/24	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
R2	Loopback 0	2.2.2.2/32	2001:db8:2222::1/128	fe80::2:3
R3	E1/0	10. 20.11.1/24	2001:db8:100:1011::1/64	fe80::3:2
R3	E1/1	10. 20.13.3/24	2001:db8:100:1013::3/64	fe80::3:3
D1	E1/2	10. 20.10.2/24	2001:db8:100:1010::2/64	fe80::d1:1
D1	VLAN 100	10. 20.100.1/24	2001:db8:100:100::1/64	fe80::d1:2
D1	VLAN 101	10.20.101.1/24	2001:db8:100:101::1/64	fe80::d1:3
D1	VLAN 102	10.20.102.1/24	2001:db8:100:102::1/64	fe80::d1:4
D2	E1/0	10.20.11.2/24	2001:db8:100:1011::2/64	fe80::d2:1
D2	VLAN 100	10.20.100.2/24	2001:db8:100:100::2/64	fe80::d2:2

Device	Interface	IPv4 Address	IPv6 Address	IPv6 Link-Local
D2	VLAN 101	10.20.101.2/24	2001:db8:100:101::2/64	fe80::d2:3
D2	VLAN 102	10.20.102.2/24	2001:db8:100:102::2/64	fe80::d2:4
A1	VLAN 100	10.20.100.3/23	2001:db8:100:100::3/64	fe80::a1:1
PC1	NIC	10.20.100.5/24	2001:db8:100:100::5/64	EUI-64
PC2	NIC	DHCP	SLAAC	EUI-64
PC3	NIC	DHCP	SLAAC	EUI-64
PC4	NIC	10.20.100.6/24	2001:db8:100:100::6/64	EUI-64

Tabla 1: Addressing Table

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

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

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

Attach the devices as shown in the topology diagram, and cable as necessary. Se realiza la topología en GNS3 con base a la del escenario propuesto y conectamos los dispositivos.

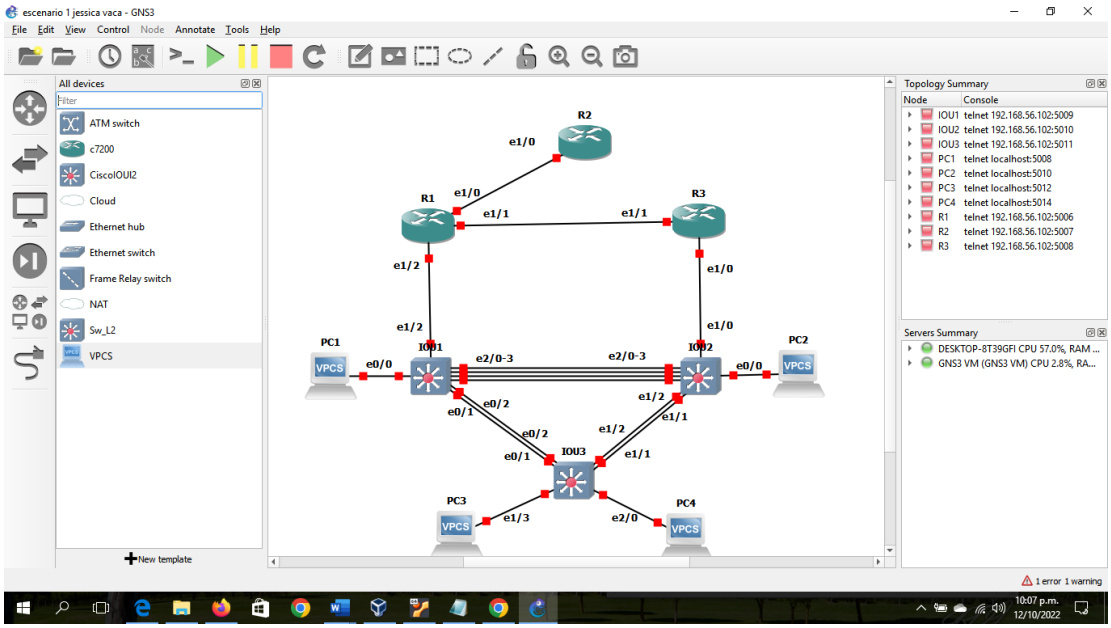

Ilustración 2: Topología Escenario Propuesto en GNS3

Step 2. Configure basic settings for each device.

.

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

Router R1

R1#en
R1#conf term
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#hostname R1
R1(config)#ipv6 unicast-routing
R1(config)#no ip domain lookup
R1(config)#banner motd # R1, ENCOR Skills Assessment#
R1(config)#line con 0
R1(config-line)# exec-timeout 0 0
R1(config-line)# logging synchronous
R1(config-line)# exit
R1(config)#interface e1/0
R1(config-if)# ip address 209.165.200.225 255.255.255.224
R1(config-if)# ipv6 address fe80::1:1 link-local
R1(config-if)# ipv6 address 2001:db8:200::1/64
R1(config-if)# no shutdown
R1(config-if)# exit

```
R1(config)#interface e1/2
R1(config-if)# ip address 10.20.10.1 255.255.255.0
R1(config-if)# ipv6 address fe80::1:2 link-local
R1(config-if)# ipv6 address 2001:db8:100:1010::1/64
R1(config-if)# no shutdown
R1(config-if)# exit
R1(config)#interface e1/1
R1(config-if)# ip address 10.20.13.1 255.255.255.0
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

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

Router R3

```
R3#en
```

```
R3#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#hostname R3
R3(config)#ipv6 unicast-routing
R3(config)#no ip domain lookup
R3(config)#banner motd # R3, ENCOR Skills Assessment#
R3(config)#line con 0
R3(config-line)# exec-timeout 0 0
R3(config-line)# logging synchronous
R3(config-line)# exit
R3(config)#interface e1/0
R3(config-if)# ip address 10.20.11.1 255.255.255.0
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 10.20.13.3 255.255.255.0
R3(config-if)# ipv6 address fe80::3:3 link-local
R3(config-if)# ipv6 address 2001:db8:100:1010::2/64
R3(config-if)# no shutdown
R3(config-if)# exit
```

Switch D1

```
IOU1#en
IOU1#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
IOU1(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 10.20.10.2 255.255.255.0
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 10.20.100.1 255.255.255.0
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 10.20.101.1 255.255.255.0
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 10.20.102.1 255.255.255.0
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 10.20.101.1 10.0.101.109
D1(config)#ip dhcp excluded-address 10.20.101.141 10.0.101.254
D1(config)#ip dhcp excluded-address 10.20.102.1 10.0.102.109
D1(config)#ip dhcp excluded-address 10.20.102.141 10.0.102.254
D1(config)#ip dhcp pool VLAN-101
D1(dhcp-config)# network 10.20.101.0 255.255.255.0
D1(dhcp-config)# default-router 10.20.101.254
D1(dhcp-config)# exit
```

```
D1(config)#ip dhcp pool VLAN-102
D1(dhcp-config)# network 10.20.102.0 255.255.255.0
D1(dhcp-config)# default-router 10.20.102.254
D1(dhcp-config)# exit
D1(config)#interface range e0/0-3,e1/0-1,e1/3,e2/0-3,e3/0-3
D1(config-if-range)# shutdown
D1(config-if-range)# exit
```

Switch D2

```
D2(config)#hostname D2
D2(config)#ip routing
D2(config)#ipv6 unicast-routing
D2(config)#no ip domain lookup
D2(config)#banner motd # D2, ENCOR Skills Assessment#
D2(config)#line con 0
D2(config-line)# exec-timeout 0 0
D2(config-line)# logging synchronous
D2(config-line)# exit
D2(config)#vlan 100
D2(config-vlan)# name Management
D2(config-vlan)# exit
D2(config)#vlan 101
D2(config-vlan)# name UserGroupA
D2(config-vlan)# exit
D2(config)#vlan 102
D2(config-vlan)# name UserGroupB
D2(config-vlan)# exit
D2(config)#vlan 999
D2(config-vlan)# name NATIVE
D2(config-vlan)# exit
D2(config)#interface e1/0
D2(config-if)# no switchport
D2(config-if)# ip address 10.20.11.2 255.255.255.0
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 10.20.100.2 255.255.255.0
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 10.20.101.2 255.255.255.0
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 10.20.102.2 255.255.255.0
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 10.20.101.1 10.0.101.209
D2(config)#ip dhcp excluded-address 10.20.101.241 10.0.101.254
D2(config)#ip dhcp excluded-address 10.20.102.1 10.0.102.209
D2(config)#ip dhcp excluded-address 10.20.102.241 10.0.102.254
D2(config)#ip dhcp pool VLAN-101
D2(dhcp-config)# network 10.20.101.0 255.255.255.0
D2(dhcp-config)# default-router 10.20.101.254
D2(dhcp-config)# exit
D2(config)#ip dhcp pool VLAN-102
D2(dhcp-config)# network 10.20.102.0 255.255.255.0
D2(dhcp-config)# default-router 10.20.102.254
D2(dhcp-config)# exit
D2(config)#interface range e0/0-3,e1/1-3,e2/0-3,e3/0-3
D2(config-if-range)# shutdown
D2(config-if-range)# exit
```

Switch A1

```
IOU3#en
IOU3#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
IOU3(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-if)# ip address 10.20.100.3 255.255.255.0
A1(config-if)# ipv6 address fe80::a1:1 link-local
A1(config-if)# ipv6 address 2001:db8:100:100::3/64
A1(config-if)# no shutdown
A1(config-if)# exit
A1(config)#interface range e0/0,e0/3,e1/0,e2/1-3,e3/0-3
A1(config-if-range)# shutdown
A1(config-if-range)# exit
```

Save the running configuration to startup-config on all devices.
Se usa el comando copy running-config startup-config para tener una copia de seguridad y guardar los cambios realizados en los router y swicthes .

```
R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R2#copy running-config startup-config
Destination filename [startup-config]? 26

Building configuration...
[OK]
R3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
```

D1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
Compressed configuration from 2416 bytes to 1363 bytes[OK]
D2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
Compressed configuration from 2416 bytes to 1363 bytes[OK]
A1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
Compressed configuration from 1644 bytes to 991 bytes[OK]

Configure PC 1 and PC 4 host addressing as shown in the addressing table. Assign a default gateway address of 10.20.100.254 which will be the HSRP virtual IP address used in Part 4.
se configura el PC1 con la dirección IP que esta en la tabla y la puerta de enlace predeterminada 10.20.100.254

PC1> ip 10.20.100.5/24 10.20.100.254
Checking for duplicate address...
PC1 : 10.20.100.5 255.255.255.0 gateway 10.20.100.254

Con el comando show ip miramos la configuración del PC1
PC1> show ip

NAME   : PC1[1]
IP/MASK   : 10.20.100.5/24
GATEWAY   : 10.20.100.254
DNS   :
MAC   : 00:50:79:66:68:00
LPORT   : 10006
RHOST:PORT : 127.0.0.1:10007
MTU: : 1500
para salvar la configuración escribimos save
PC1> save
Saving startup configuration to startup.vpc
. done

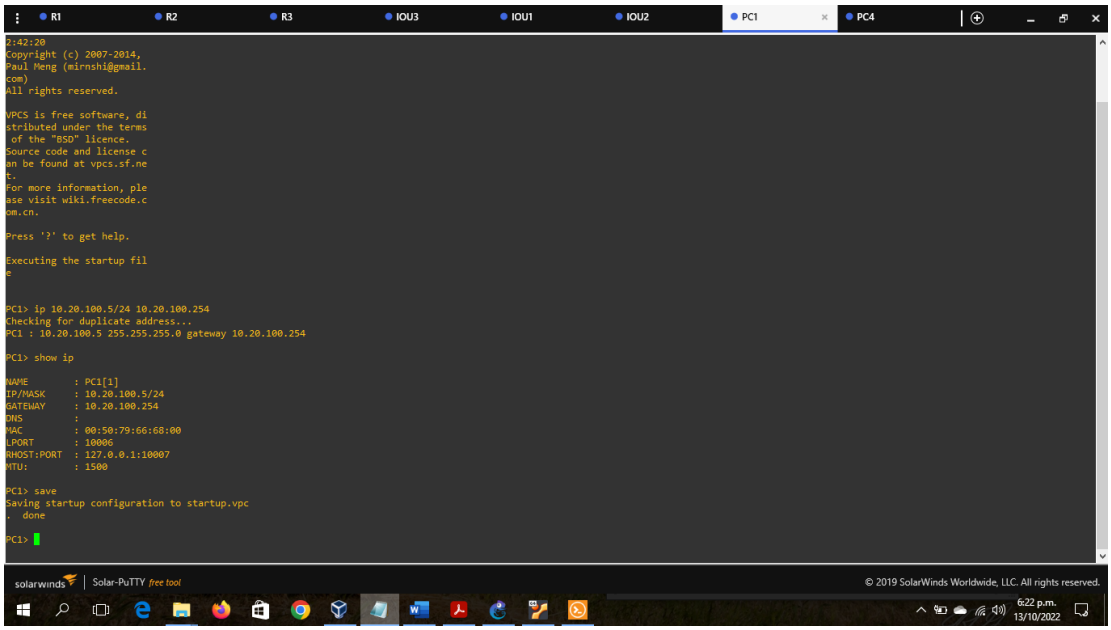

Ilustración 3: Configuración PC1

Hacemos lo mismo en PC4

PC4> ip 10.20.100.6/24 10.20.100.254
Checking for duplicate address...
PC1 : 10.20.100.6 255.255.255.0 gateway 10.20.100.254

PC4> show ip

NAME : PC4[1]
IP/MASK : 10.20.100.6/24
GATEWAY : 10.20.100.254
DNS :
MAC : 00:50:79:66:68:03
LPORT : 10010
RHOST:PORT : 127.0.0.1:10011
MTU: : 1500

PC4> save

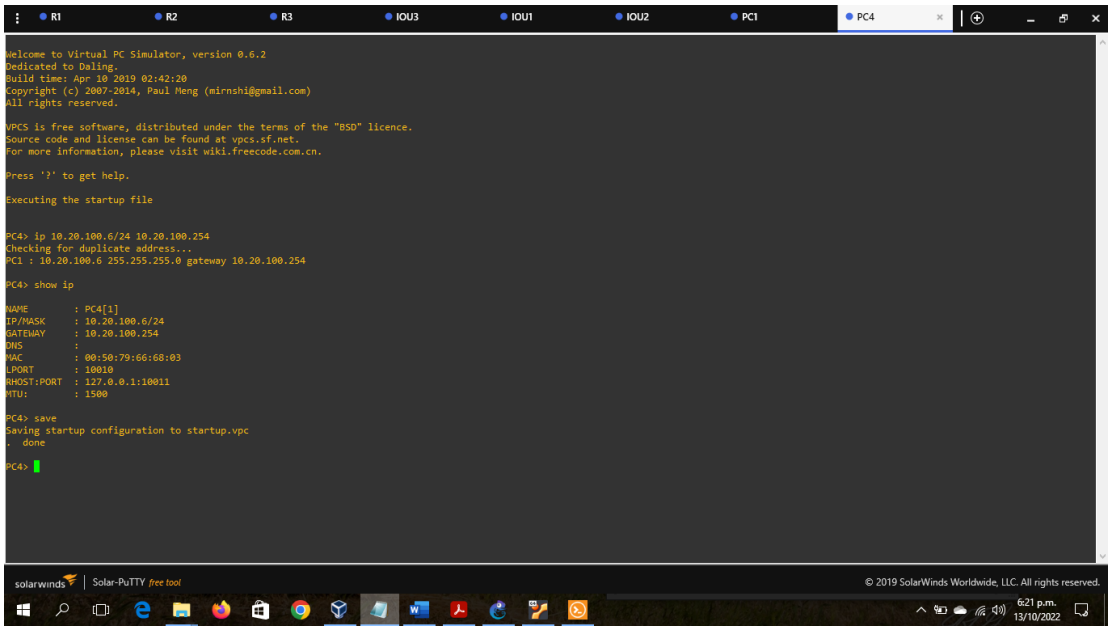

Ilustración 4: Configuración PC4

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:

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

Task#	Task	Specification	Points
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.XY.100.1 D2: 10.XY.100.2 PC4: 10.XY.100.6 PC2 should successfully ping: D1: 10.XY.102.1 D2: 10.XY.102.2 PC3 should successfully ping: D1: 10.XY.101.1 D2: 10.XY.101.2 PC4 should successfully ping: D1: 10.XY.100.1 D2: 10.XY.100.2 PC1: 10.XY.100.5	1

Tabla 2: Tarea 2

2.1 On all switches, configure IEEE 802.1Q trunk interfaces on interconnecting switch links Enable 802.1Q trunk links between:

Seleccionamos las interfaces troncales de cada switch y utilizamos el comando switchport trunk encapsulation dot1q y se habilita la encapsulación luego switchport mode trunky y habiltamos el mode de la troncal.

D1 and D2, D1 and A1

D1
D1 y D2
D1#en
D1#conf term
D1(config)#interface range e2/0-3
D1(config-if-range)#switchport trunk encapsulation dot1q
D1(config-if-range)#switchport mode trunk

D1 y A1

D1(config-if-range)# range e0/1-2
D1(config-if-range)#switchport trunk encapsulation dot1q
D1(config-if-range)#switchport mode trunk

D2 and D1, D2 and A1

D2
D2 and D1
D2(config)#interface range e2/0-3
D2(config-if-range)#switchport trunk encapsulation dot1q
D2(config-if-range)#switchport mode trunk

D2 and A1
D2#en
D2#conf term
D2(config)#interface range e1/1-2
D2(config-if-range)#switchport trunk encapsulation dot1q
D2(config-if-range)#switchport mode trunk

A1 and D1 , A1 and D2

A1
A1 and D1
A1#en
A1#conf term
A1(config)#interface range e0/1-2
A1(config-if-range)#switchport trunk encapsulation dot1q
A1(config-if-range)#switchport mode trunk

A1 and D2
A1#en
A1#conf term
A1(config)#interface range e1/1-2
A1(config-if-range)#switchport trunk encapsulation dot1q
A1(config-if-range)#switchport mode trunk

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

Use VLAN 999 as the native VLAN.

En todos los switches cambie la VLAN nativa en los enlaces troncales.

Se utiliza el comando switchport trunk native vlan 999 en los enlaces troncales de todos los switches.

D1
D1(config)#interface range e2/0-3,e0/1-2
D1(config-if-range)#switchport trunk native vlan 999

D2
D2(config)#interface range e2/0-3,e1/1-2
D2(config-if-range)#switchport trunk native vlan 999

A1
A1(config)#interface range e0/1-2,e1/1-2
A1(config-if-range)#switchport trunk native vlan 999

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

En todos los switches habilite el protocolo Rapid Spanning-Tree (RSTP).
Se usa el comando spanning-tree mode rapid- en cada uno de los switches y se habilita el protocolo.

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

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

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

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.

Se configura el puente raíz entre las vlan 100,102 usando el comando spanning-tree vlan 100,102 root primary, las vlan 100 y 102 quedan como raíz primaria.

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

D1 y D2 deben proporcionar respaldo en caso de falla del puente raíz (root bridge).

Para la vlan de apoyo en caso de fallos se utiliza la vlan 101 con el comando spanning-tree vlan 101 root secondary.

D2
D2(config)# spanning-tree vlan 101 root primary
D2(config)# spanning-tree vlan 100,102 root secondary

2.5 On all switches, create LACP EtherChannels as shown in the topology diagram Use the following channel numbers:

Seleccionamos las interfaces del switch y se configura el canal del grupo y modo activo con el comando channel-group mode active y Se crea EtherChannels LACP en el rango de la interfaz.

D1
D1 to D2 – Port channel 12
D1(config)#interface range e2/0-3
D1(config-if-range)#channel-group 12 mode active
D1(config-if-range)#no shutdown
D1(config-if-range)#exit
D1 to A1 – Port channel 1
D1(config)#interface range e0/1-2
D1(config-if-range)#channel-group 1 mode active
D1(config-if-range)#no shutdown
D1(config-if-range)#exit

D2
D2to D1 – Port channel 12
D2(config)#interface range e2/0-3
D2 (config-if-range)#channel-group 12 mode active
D2 (config-if-range)#no shutdown
D2 (config-if-range)#exit

D2 to A1 – Port channel 2
D2(config)#interface range e1/1-2
D2 (config-if-range)#channel-group 2 mode active
D2 (config-if-range)#no shutdown
D2 (config-if-range)#exit

A1
A1 to D1 – Port channel 1
A1 (config)#interface range e0/1-2
A1 (config-if-range)#channel-group 1 mode active
A1 (config-if-range)#no shutdown
A1 (config-if-range)#exit

A1 to D2 – Port channel 2
A1 (config)#interface range e1/1-2
A1 (config-if-range)#channel-group 2 mode active
A1 (config-if-range)#no shutdown

A1 (config-if-range)#exit

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
Se configuran los puertos con la configuración de VLAN como que se muestra en la topología, selecionamos la interfaz y la configuamos en modo de acceso con el comando switchport mode access yse habilita la vlan del puerto usando switchport access vlan y habiltamos portfast con spanning-tree portfast.

D1
D1(config)#interface e0/0
D1(config-if)#switchport mode access
D1(config-if)#switchport access vlan 100
D1(config-if)#spanning-tree portfast
D1(config-if)#no shutdown
D1(config-if)#exit

D2
D2(config)#interface e0/0
D2(config-if)#switchport mode access
D2(config-if)#switchport access vlan 102
D2(config-if)#spanning-tree portfast
D2(config-if)#no shutdown
D2(config-if)#exit
A1

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

A1(config-if)#no shutdown
A1(config-if)#exit

2.7 Verify IPv4 DHCP services

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

Utilizamos el comando ip dhcp e show ip en el PC2.

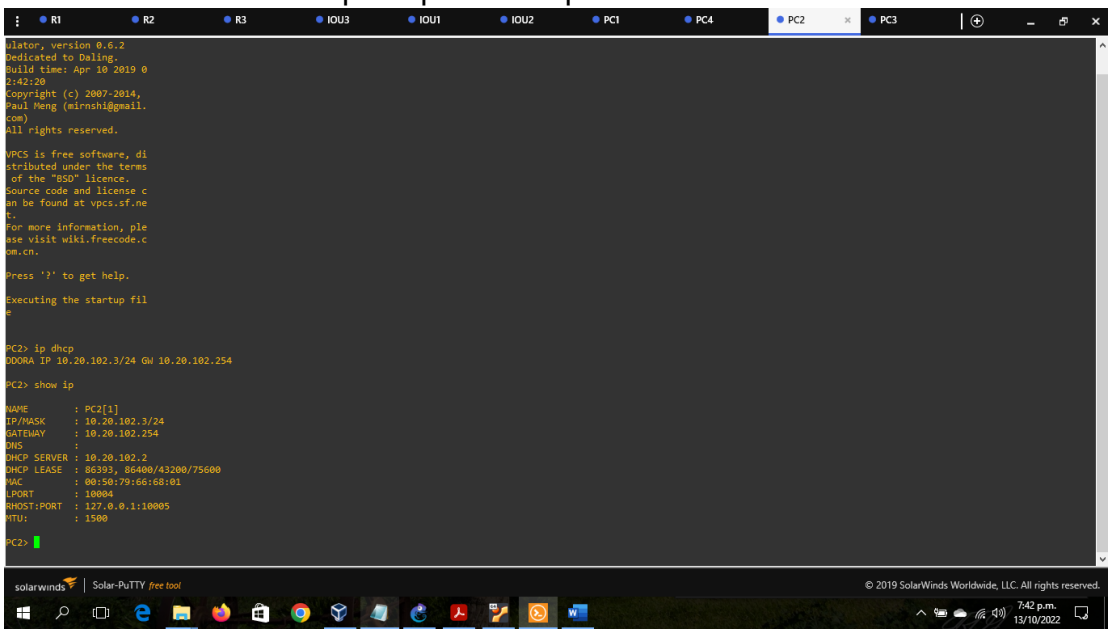

Ilustración 5: Verificación IPv4 en PC2

Utilizamos el comando ip dhcp e show ip en el PC3.

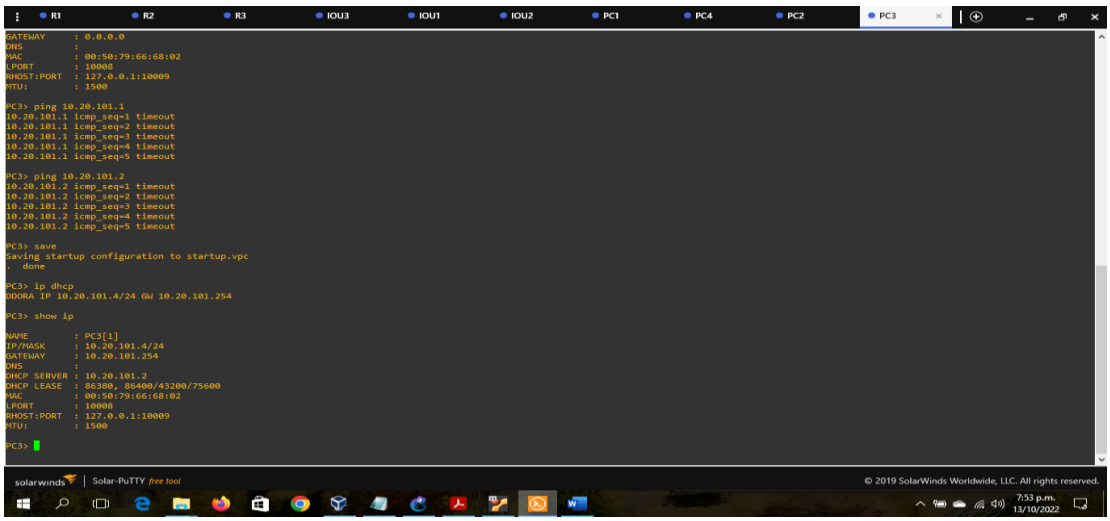

Ilustración 6: Verificación IPv4 en PC3

2.8 Verify local LAN connectivity

PC1 should successfully ping:

D1: 10.20.100.1

D2: 10.20.100.2

PC4: 10.20.100.6

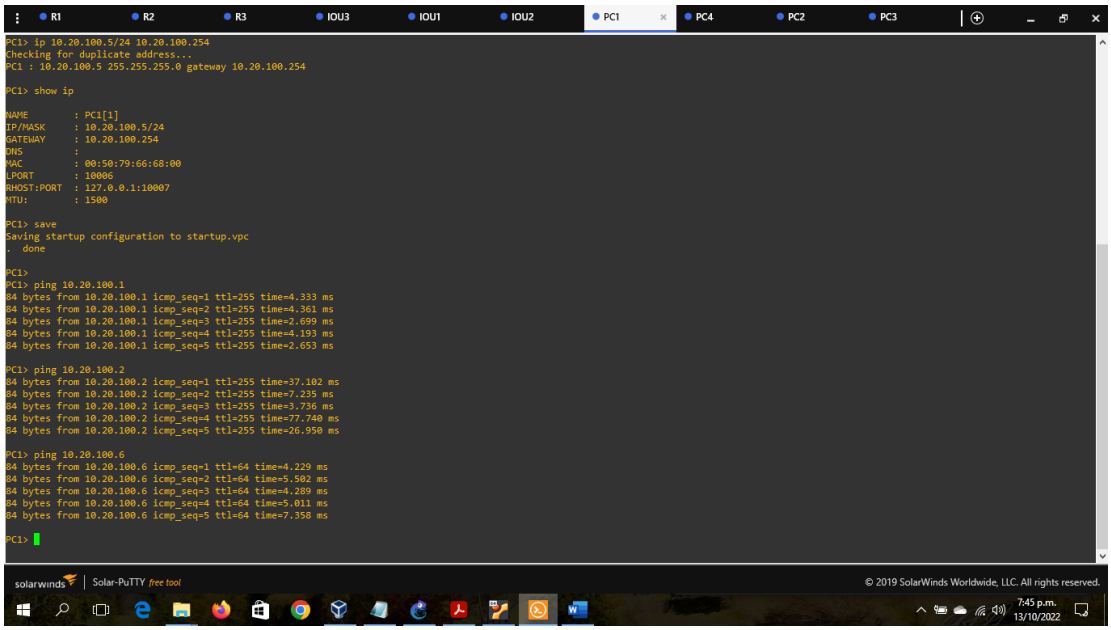

Ilustración 7: Conectividad LAN local desde PC1

PC2 should successfully ping:

D1: 10.20.102.1

D2: 10.20.102.2

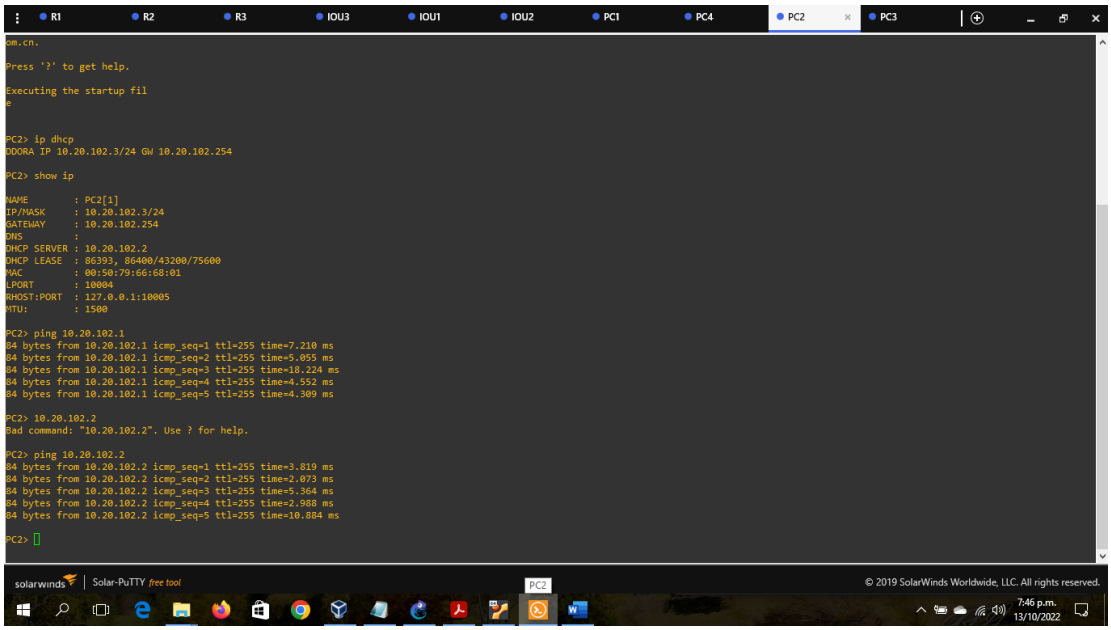

Ilustración 8: Conectividad LAN local desde PC2

PC3 should successfully ping:
D1: 10.20.101.1
D2: 10.20.101.2

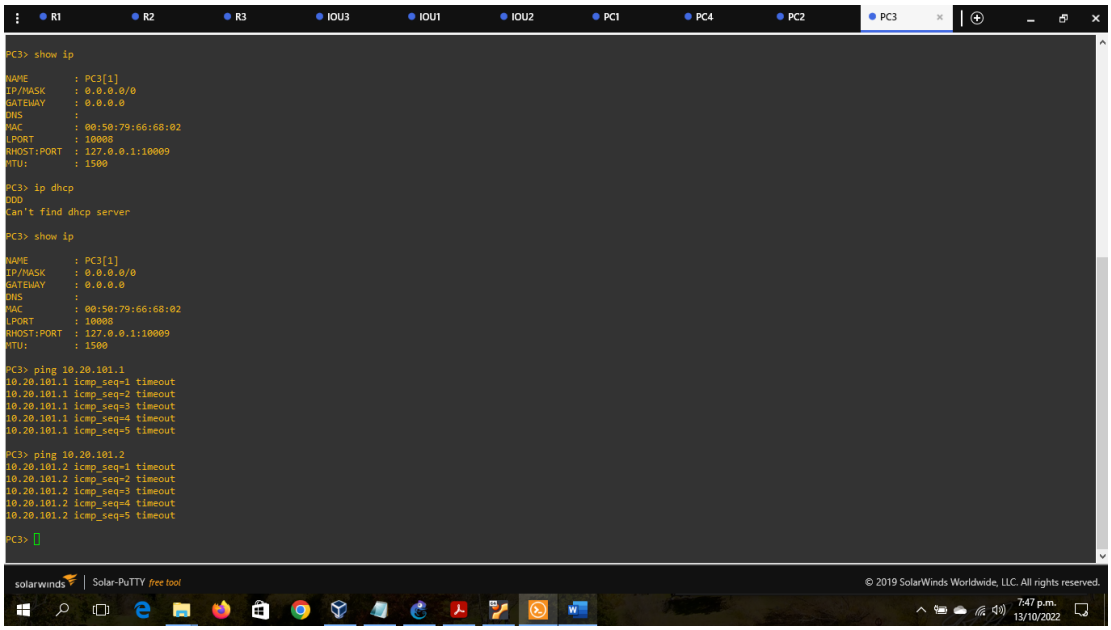

Ilustración 9: Conectividad LAN local desde PC3

PC4 should successfully ping:

D1: 10.20.100.1
D2: 10.20.100.2
PC1: 10.20.100.5

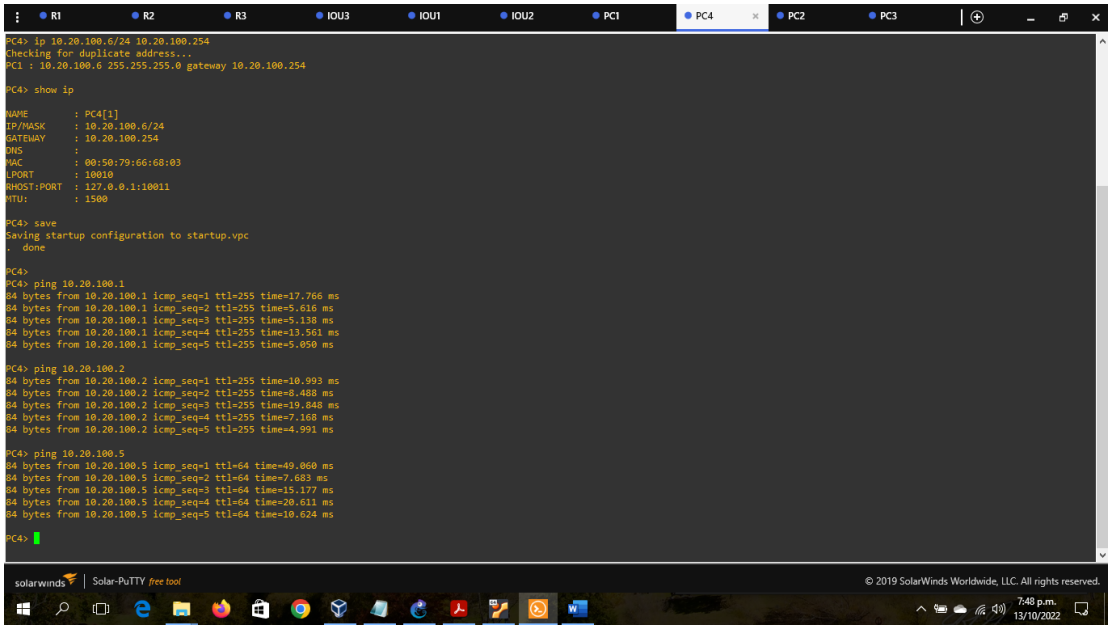

Ilustración 10: Conectividad LAN local desde PC4

Part 3: Configure Routing Protocols

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

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

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: Tarea 3

3.1 On the “Company Network” (i.e., R1, R3, D1, and D2), configure single-area OSPFv2 in area 0.
Entramos al parte de consola de cada dispositivo y habiltamos OSPF utilizando el comando router ospf 4, configuramos el identificador con router-id.
Use OSPF Process ID 4 and assign the following router-IDs:

R1: 0.0.4.1
R1(config)#router ospf 4
R1(config-router)#router-id 0.0.4.1

R3: 0.0.4.3
R3(config)#router ospf 4
R3(config-router)#router-id 0.0.4.3

D1: 0.0.4.131
D1 (config)#router ospf 4

D1 (config-router)#router-id 0.0.4.131

D2: 0.0.4.132
D2 (config)#router ospf 4
D2 (config-router)#router-id 0.0.4.132

On R1, R3, D1, and D2, advertise all directly connected networks / VLANs in Area 0.
Configuramos las redes y el área network 10.20.10.0 0.0.0.255 area 0 utilizando network
R1
R1(config-router)#network 10.20.10.0 0.0.0.255 area 0
R1(config-router)#network 10.20.13.0 0.0.0.255 area 0

R3
R3(config-router)#network 10.20.11.0 0.0.0.255 area 0
R3(config-router)#network 10.20.13.0 0.0.0.255 area 0

D1
D1(config-router)#network 10.20.100.0 0.0.0.255 area 0
D1(config-router)#network 10.20.101.0 0.0.0.255 area 0
D1(config-router)#network 10.20.102.0 0.0.0.255 area 0
D1(config-router)#network 10.20.10.0 0.0.0.255 area 0

D2
D2(config-router)#network 10.20.100.0 0.0.0.255 area 0
D2(config-router)#network 10.20.101.0 0.0.0.255 area 0
D2(config-router)#network 10.20.102.0 0.0.0.255 area 0
D2(config-router)#network 10.20.11.0 0.0.0.255 area 0

On R1, do not advertise the R1 – R2 network.
No se utiliza la red ya que R2 provee el internet

On R1, propagate a default route. Note that the default route will be provided by BGP.
Se genera una ruta predeterminada con default-information originate

R1(config-router)#default-information originate
R1(config-router)#exit

Disable OSPFv2 advertisements on:

D1: All interfaces except E1/2
Se deshabilitan las publicaciones OSPF menos en e1/2
D1(config-router)#passive-interface default
D1(config-router)#no passive-interface e1/2
D1(config-router)#exit

D2: All interfaces except E1/0
Se deshabilitan las publicaciones OSPF menos en e1/0
D2(config-router)#passive-interface default
D2(config-router)#no passive-interface e1/0
D2(config-router)#exit

3.2 On the “Company Network” (i.e., R1, R3, D1, and D2), configure classic single-area OSPFv3 in area 0

En la parte de configuración de consola del R1,R3,D1 y D2 se habilita OSPF utilizando ipv6 router ospf 6 y se configura el identificador de los dispositivos
Use OSPF Process ID 6 and assign the following router-IDs:

R1(config-rtr)#default-information originate
R1(config-rtr)#exit
R1(config)#interface e1/2
R1(config-if)#ipv6 ospf 6 area 0
R1(config-if)#exit
R1(config)#interface e1/1
R1(config-if)#ipv6 ospf 6 area 0
R1(config-if)#exit

R1: 0.0.6.1
R1(config)#ipv6 router ospf 6
R1(config-rtr)#router-id 0.0.6.1

R3: 0.0.6.3
R3(config)#ipv6 router ospf 6
R3(config-rtr)#router-id 0.0.6.3

D1: 0.0.6.131
D1(config)#ipv6 router ospf 6

D1(config-rtr)#router-id 0.0.6.131

D2: 0.0.6.132
D2(config)#ipv6 router ospf 6
D2(config-rtr)#router-id 0.0.6.132

On R1, R3, D1, and D2, advertise all directly connected networks / VLANs in Area 0.
se anuncian todas las redes en el Area utilizando network la VLAN y el area 0
R1
R1(config-router)#network 10.20.10.0 0.0.0.255 area 0
R1(config-router)#network 10.20.13.0 0.0.0.255 area 0

R3
R3(config-router)#network 10.20.11.0 0.0.0.255 area 0
R3(config-router)#network 10.20.13.0 0.0.0.255 area 0

D1
D1(config-router)#network 10.20.100.0 0.0.0.255 area 0
D1(config-router)#network 10.20.101.0 0.0.0.255 area 0
D1(config-router)#network 10.20.102.0 0.0.0.255 area 0
D1(config-router)#network 10.20.10.0 0.0.0.255 area 0

D2
D2(config-router)#network 10.20.100.0 0.0.0.255 area 0
D2(config-router)#network 10.20.101.0 0.0.0.255 area 0
D2(config-router)#network 10.20.102.0 0.0.0.255 area 0
D2(config-router)#network 10.20.11.0 0.0.0.255 area 0

On R1, do not advertise the R1 – R2 network.
No se utiliza la red ya que R2 provee el internet

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

R1(config-router)#default-information originate
R1(config-router)#exit

D1: All interfaces except E1/2
Se deshabilitan las publicaciones OSPF menos en e1/2
D1(config-router)#passive-interface default

D1(config-router)#no passive-interface e1/2
D1(config-router)#exit

D2: All interfaces except E1/0
Se deshabilitan las publicaciones OSPF menos en e1/0
D2(config-router)#passive-interface default
D2(config-router)#no passive-interface e1/0
D2(config-router)#exit

3.3 On R2 in the “ISP Network”, configure MP-BGP.
Configure two default static routes via interface Loopback 0:
Entramos a la parte de consola del R2 y se realiza la configuración.

An IPv4 default static route.
An IPv6 default static route.

Se proporciona la ruta por defecto en IPv6
Router R2
R2#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Ruta predeterminada y salida llopback
R2(config)#ip route 0.0.0.0 0.0.0.0 loopback 0
R2(config)#ipv6 route ::/0 loopback 0

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

Se propaga una ruta por defecto provista por BGP Se asigna el identificador

R2(config)#router bgp 500
R2(config-router)#bgp router-id 2.2.2.2

Configure and enable an IPv4 and IPv6 neighbor relationship with R1 in ASN 300.

Se configuran los vecinos en el Sistema autonomo 300 para IPv4 e IPv6

R2(config-router)#neighbor 209.165.200.225 remote-as 300
R2(config-router)#neighbor 2001:db8:200::1 remote-as 300

In IPv4 address family, advertise:

The Loopback 0 IPv4 network (/32).
The default route (0.0.0.0/0).
Se configura la relación vecino activa
R2(config-router)#address-family ipv4
R2(config-router-af)#neighbor 209.165.200.225 activate

Se excluye la dirección IPv6
R2(config-router-af)#no neighbor 2001:db8:200::1 activate

Se configura con la interfaz loopback de R2
R2(config-router-af)#network 2.2.2.2 mask 255.255.255.255

Se configuran las redes predeterminadas
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)#neighbor 2001:db8:200::1 activate
R2(config-router-af)#network 2001:db8:2222::/128

Redes predeterminadas
R2(config-router-af)#network ::/0
R2(config-router-af)#exit-address-family
R2(config-router)#end

3.4 On R1 in the “ISP Network”, configure MP-BGP

Configure two static summary routes to interface Null 0:

se configura MP-BGP, se crean dos rutas estáticas a la interfaz Null0:
una ruta resumen IPv4 para 10.20.0.0/8 una ruta resumen IPv6 para 2001:db8::/48

A summary IPv4 route for 10.02.0.0/8.
R1(config)#ip route 10.20.0.0 255.0.0.0 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.
Configure an IPv4 and IPv6 neighbor relationship with R2 in ASN 500.

Se configura R1 en BGP ASN 300 y se usa el router.id 1.1.1.1.
R1(config)#router bgp 300

Se asigna el identificador
R1(config-router)#bgp router-id 1.1.1.1

Se configura la relación con R2 en ASN 500
R1(config-router)#neighbor 209.165.200.226 remote-as 500
R1(config-router)#neighbor 2001:db8:200::2 remote-as 500

In IPv4 address family:
R1(config-router)#address-family ipv4 unicast

Disable the IPv6 neighbor relationship.
Se activa la relación con el vecino
R1(config-router-af)#neighbor 209.165.200.226 activate

Enable the IPv4 neighbor relationship.
R1(config-router-af)#no neighbor 2001:db8:200::2 activate

Advertise the 10.20.0.0/8 network.
R1(config-router-af)#network 10.20.0.0 mask 255.0.0.0
R1(config-router-af)#exit-address-family

In IPv6 address family:
R1(config-router)#address-family ipv6 unicast

Disable the IPv4 neighbor relationship.
Se deshabilita la relación con el vecino activa
R1(config-router-af)#no neighbor 209.165.200.226 activate

Enable the IPv6 neighbor relationship.
Se configura la relación con el vecino activa
R1(config-router-af)#neighbor 2001:db8:200::2 activate

Advertise the 2001:db8:100::/48 network
Se configura la dirección ipv6
R1(config-router-af)#network 2001:db8:100::/48
R1(config-router-af)#exit-address-family

R1(config-router)#
R1(config-router)#end

Se verifican cada una de las tareas de la parte 3 en los dispositivos utilizando los siguientes comandos.

show run | section ^router ospf
show run | section ^ipv6 router
show run | section bgp
show run | include router

Ilustración 11: Tarea 3 en R1

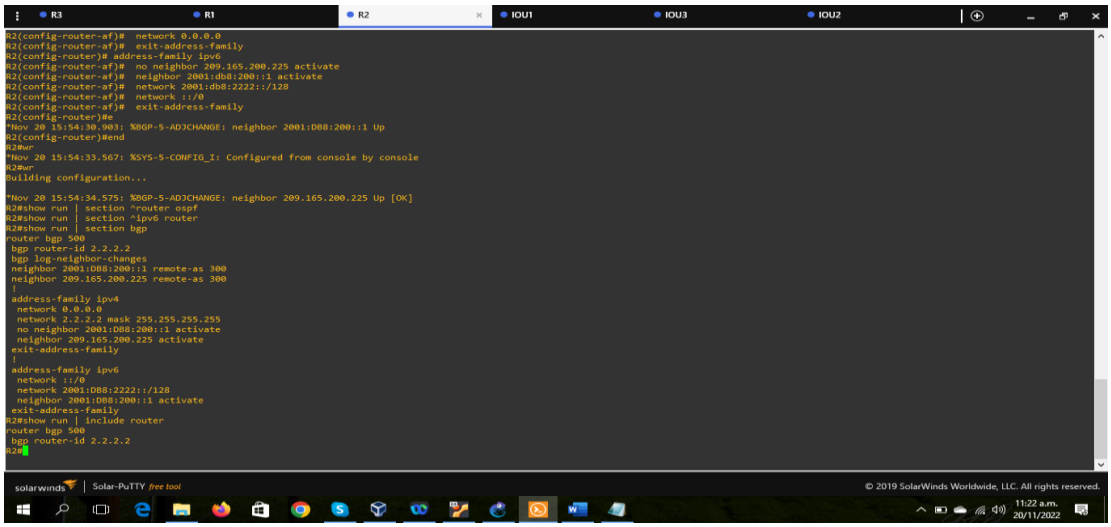

Ilustración 12: Tarea 3 en R2

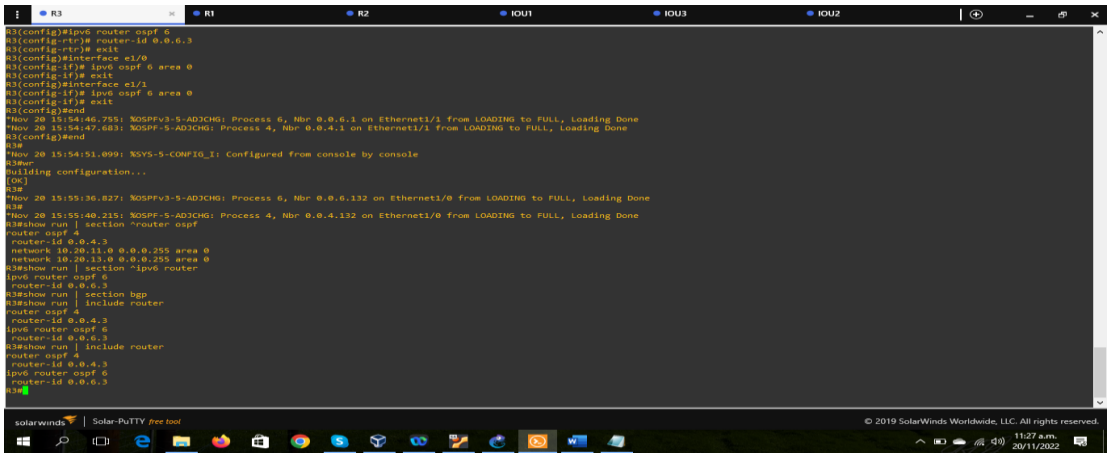

Ilustración 13: Tarea 4 en R3

Ilustración 14: Tarea 4 en D1

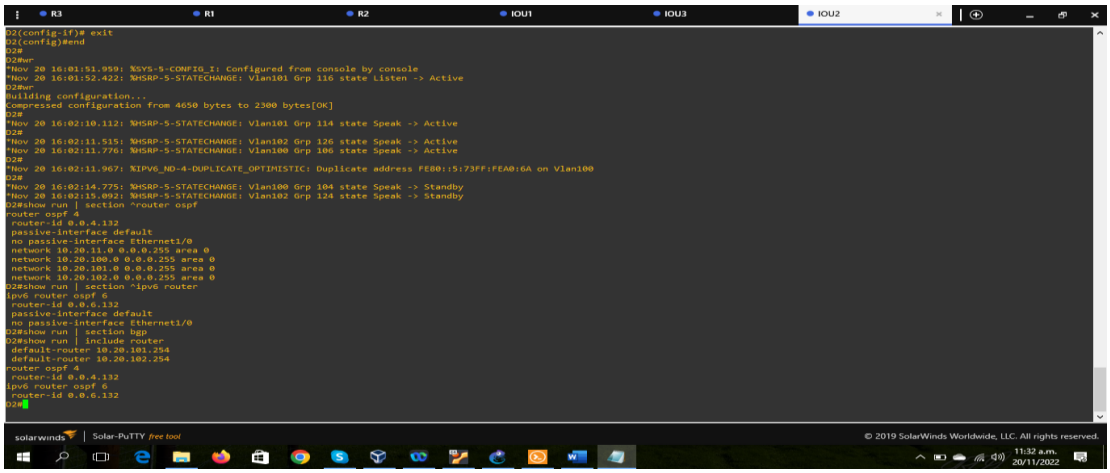

Ilustración 15: Tarea 3 en D2

Part 4: Configure First Hop Redundancy

In this part, you will configure HSRP version 2 to provide first-hop redundancy for hosts in the “Company Network”.

Your configuration tasks are as follows:

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
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.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: Tarea 4

4.1 On D1, create IP SLAs that test the reachability of R1 interface E1/2.
Se crean dos IP slas y se configuran las sla con el comando ip sla y se configura la la interfaz a probar, la frecuencia utilizando icmp-echo, también activamos la operación de sla.

Create two IP SLAs.
Use SLA number 4 for IPv4.
D1(config)#ip sla 4
D1(config-ip-sla)# icmp-echo 10.20.10.1
D1(config-ip-sla-echo)# frequency 5
D1(config-ip-sla-echo)# exit

Use SLA number 6 for IPv6.
D1(config)#track 6 ip sla 6
D1(config-track)# delay down 10 up 15
D1(config-track)# exit

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)#track 4 ip sla 4
D1(config-track)# delay down 10 up 15
D1(config-track)# exit

Use track number 6 for IP SLA 6.
D1(config)#track 6 ip sla 6
D1(config-track)# delay down 10 up 15
D1(config-track)# exit

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)#ip sla schedule 4 life forever start-time now

Use SLA number 6 for IPv6.
D2(config)#ip sla schedule 6 life forever start-time now
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)#track 4 ip sla 4
D2(config-track)# delay down 10 up 15
D2(config-track)# exit
```

Use track number 6 for IP SLA 6.

```
D2(config)#track 6 ip sla 6
D2(config-track)# delay down 10 up 15
D2(config-track)# exit
```

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 10.20.100.254.
Set the group priority to 150.
Enable preemption.
Track object 4 and decrement by 60.

```
D1(config)#interface vlan 100
D1(config-if)# standby version 2
D1(config-if)# standby 104 ip 10.20.100.254
D1(config-if)# standby 104 priority 150
D1(config-if)# standby 104 preempt
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.
Enable preemption.
Track object 4 to decrement by 60.

```
D1(config)#interface vlan 101
D1(config-if)# standby version 2
D1(config-if)# standby 114 ip 10.20.101.254
D1(config-if)# standby 114 preempt
D1(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.
Set the group priority to 150.
Enable preemption.
Track object 4 to decrement by 60.

D1(config)#interface vlan 102
D1(config-if)# standby version 2
D1(config-if)# standby 124 ip 10.20.102.254
D1(config-if)# standby 124 priority 150
D1(config-if)# standby 124 preempt
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.
Set the group priority to 150.
Enable preemption.
Track object 6 and decrement by 60.

D1(config-if)# standby 106 ipv6 autoconfig
D1(config-if)# standby 106 priority 150
D1(config-if)# standby 106 preempt
D1(config-if)# standby 106 track 6 decrement 60
D1(config-if)# exit

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.

D1(config-if)# standby 116 ipv6 autoconfig
D1(config-if)# standby 116 preempt
D1(config-if)# standby 116 track 6 decrement 60
D1(config-if)# exit

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.

D1(config-if)# standby 126 ipv6 autoconfig
D1(config-if)# standby 126 priority 150
D1(config-if)# standby 126 preempt
D1(config-if)# standby 126 track 6 decrement 60

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

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 10.20.100.254.
Enable preemption.

Track object 4 and decrement by 60.

```
D2(config)#interface vlan 100
D2(config-if)# standby version 2
D2(config-if)# standby 104 ip 10.20.100.254
D2(config-if)# standby 104 priority 150
D2(config-if)# standby 104 preempt
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.
Set the group priority to 150.
Enable preemption.
Track object 4 to decrement by 60.

```
D2(config)#interface vlan 101
D2(config-if)# standby version 2
D2(config-if)# standby 114 ip 10.20.101.254
D2(config-if)# standby 114 preempt
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.
Enable preemption.
Track object 4 to decrement by 60.

```
D2(config)#interface vlan 101
D2(config-if)# standby version 2
D2(config-if)# standby 124 ip 10.20.101.254
D2(config-if)# standby 124 preempt
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.
Enable preemption.
Track object 6 and decrement by 60.

D2(config-if)# standby 106 ipv6 autoconfig
D2(config-if)# standby 106 priority 150
D2(config-if)# standby 106 preempt
D2(config-if)# standby 106 track 6 decrement 60
D2(config-if)# exit

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.

D2(config-if)# standby 116 ipv6 autoconfig
D2(config-if)# standby 116 preempt
D2(config-if)# standby 116 track 6 decrement 60
D2(config-if)# exit

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
D2(config-if)# standby 126 ipv6 autoconfig
D2(config-if)# standby 126 priority 150
D2(config-if)# standby 126 preempt
D2(config-if)# standby 126 track 6 decrement 60
D2(config-if)#exit
D2(config)#end

Se verifica la tarea 4 en los dispositivos D1 y D2 utilizando los comandos
show run | section ip sla
show standby brief

Ilustración 16: : Tarea 4 en D1

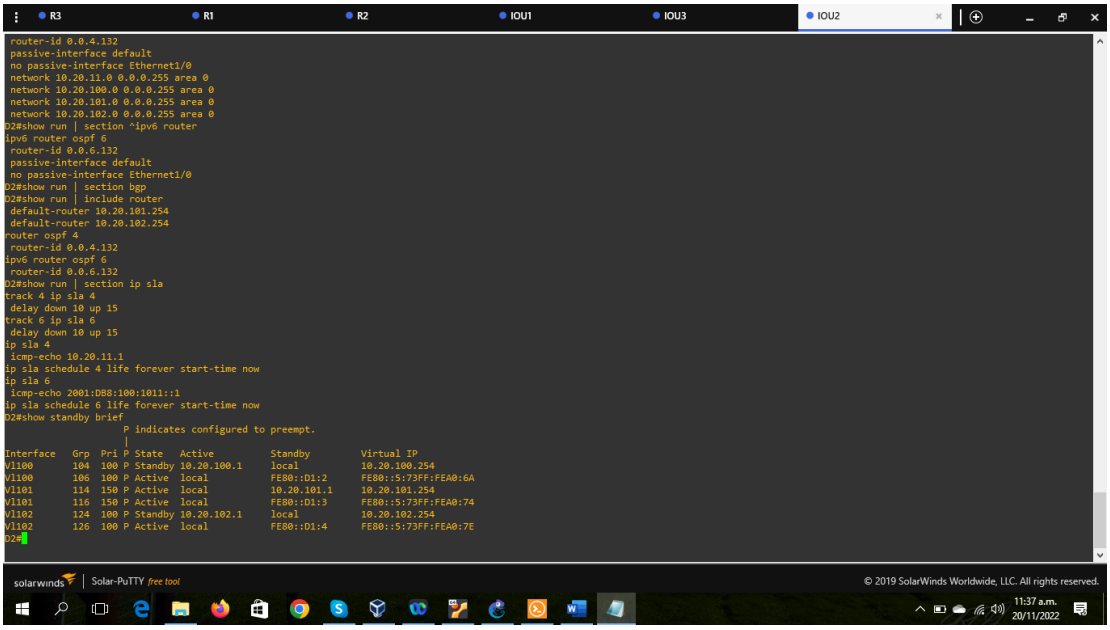

Ilustración 17: Tarea 4 en D2

CONCLUSIONES

Para trabajar con las simulaciones en GNS3 necesitamos: GNS3, la máquina virtual de GNS3: GNS3 VM y una máquina virtual, en este proyecto se utilizó como máquina virtual: VirtualBox, la máquina virtual de GNS3 debe ser de la misma versión de GNS3.

En la parte de configuración de los dispositivos ya que la topología en el escenario propuesto a la de la simulación en GNS3 cambia un poco, se debe tener en cuenta los nombres de las terminales para la configuración de las interfaces.

Cuando se hace la topología en GNS3 hay que importar los Router y Switches, para poder configurarlos, es importante tener un archivo con estos dispositivos y sus imágenes para poder implementarlos en el proyecto.

La simulación en GNS3 tiene una característica muy llamativa y es que podemos llevar nuestro proyecto a la realidad, ósea que si la simulación funciona lo mismo pasará cuando se implemente en una red.

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