DIPLOMADO DE PROFUNDIZACION CISCO
PRUEBA DE HABILIDADES PRÁCTICAS CCNP

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UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA - UNAD ESCUELA DE CIENCIAS BÁSICAS, TECNOLOGÍA E INGENIERÍA - ECBTI
INGENIERÍA ELECTRÓNICA
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Diplomado de opción de grado presentado para optar el título de INGENIERO ELECTRONICO

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Firma del Jurado

VILLANUEVA CASANARE, 24 de noviembre 2022

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Sin lugar a duda, este proyecto tiene unos enormes avances a mi proyección profesional, de esta forma, quiero darle gracias primero a Dios, quien fue que permitió que yo legara hasta este momento, segundo, a mi familia, ya que ellos son una parte principal de todo lo que he anhelado en mi vida.

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GLOSARIO

ASN: Autonomous System Number, se le denomina al grupo de red que es gestionado por algún operador de red por ruteo externo.

BGP: Border Gateway Protocol, utilizado para conectar distintos sistemas autónomos principalmente con el canal de internet.

DHCP: Dynamic Host Configuration Protocol, funciona en el modelo cliente/servidor y proporciona automáticamente direcciones IP y otra información relacionada como la máscara y el Gateway.

HSRP: Host Standby Routing Protocol, asigna a un grupo de redundancia un router activo, otro standby y los demás en estado listen, donde el activo tendrá la IP virtual.

ISP: Internet Service Provider, término que identifica las compañías que proveen acceso a internet.

RESUMEN

En unas de las opciones de grado está el siguiente diplomado, en el encontrará lo referente a ser ingeniero electrónico, se aplican habilidades prácticas de CCNP, bajo el escenario planteado en guía de actividades, dicho escenario se realiza su montaje y puesta en marcha en GNS3.

Esta propuesta lleva una cantidad de conocimientos aplicados, donde se evidencia el uso del protocolo STP y la configuración de VLANs, soluciones de red escalables mediante la configuración básica y avanzada de protocolos de enrutamiento para la implementación de servicios IP.

En un segundo escenario, redes conmutadas mediante el uso del protocolo STP y la configuración de VLANs, diseño y soluciones de redes escalables con configuraciones de protocolos de enrutamiento para lograr implementar servicios IP.

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

ABSTRACT

In one of the degree options there is the following diploma, in the meeting regarding being an electronic engineer, CCNP practical skills are applied, under the scenario proposed in the activity guide, said scenario is assembled and commissioned in GNS3.

This proposal carries a quantity of applied knowledge, where the use of the STP protocol and the VLAN configuration is evidenced, scalable network solutions through the basic and advanced configuration of routing protocols for the implementation of IP services.

In a second scenario, networks switched by using the STP protocol and VLAN configuration, design and scalable network solutions with routing protocol configurations to implement IP services.

Key words: CISCO, CCNP, Routing, Swicthing, Networking, Electronics.

INTRODUCIÓN

Al pasar los años los temas de redes informáticas toman mayor importancia en el día a día de las personas, sociedad y negocios, por esto la importancia del diplomado en CISCO, ya que como futuro ingeniero pueda hacer parte del desarrollo en esta área, comprendiendo el rol que juega para generar la interconexión de protocolos.

En el siguiente trabajo se evidencia una conexión de 3 Router, 3 switchs y 4 PCs, dando una simulación real, configurando direcciones IP y utilizando enlaces. Todo esto generado por el programa Gns3.

En un primer escenario se evidencia la implementación y configuración de redes utilizando protocolos STP, de esta manera, junto con el software se muestra una infraestructura de red jerárquica; entendiendo que dichos protocolos son indispensables para la conexión de los equipos de la LAN.

En el segundo escenario conlleva a un análisis donde el desarrollo de este se implementa redes empresariales con unos accesos más seguros logrando automatizar para lograr buscar soluciones que conlleven a evitar problemas de red corporativos.

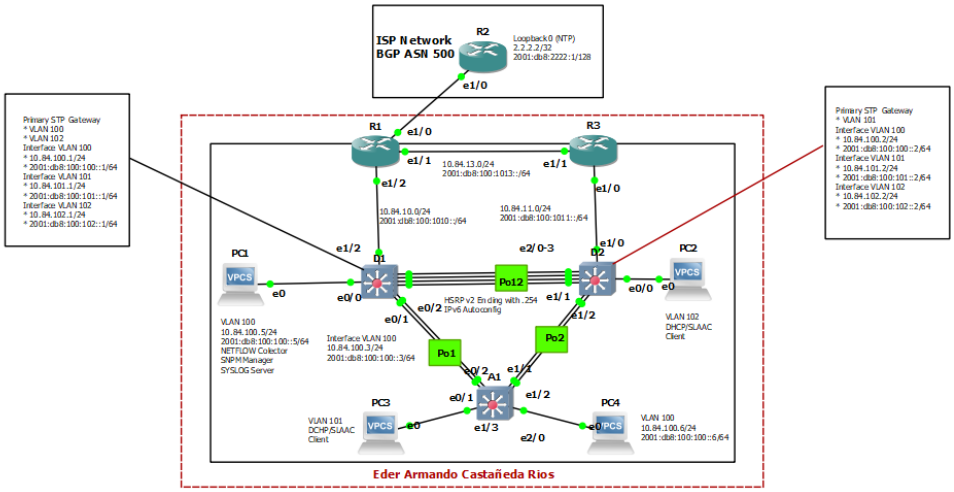
Es importante aplicar redes inalámbricas de acceso remoto, ya que con este proyecto se puede evidenciar o experimentar un análisis de simulaciones de infraestructura de redes empresariales donde se puede aplicar roaming, localización y conjunto de protecciones como administrador.

1. Escenario 1

Tabla 1 Direccionamiento IP

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	10.84.10.1/24	2001:db8:100:1010::1/64	fe80::1:2
	E1/1	10. 84.13.1/24	2001:db8:100:1013::1/64	fe80::1:3
R2	E1/0	209.165.200.226/27	2001:db8:200::2/64	fe80::2:1
	Loopback0	2.2.2.2/32	2001:db8:2222::1/128	fe80::2:3
R3	E1/0	10. 84.11.1/24	2001:db8:100:1011::1/64	fe80::3:2
	E1/1	10. 84.13.3/24	2001:db8:100:1013::3/64	fe80::3:3
D1	E1/2	10. 84.10.2/24	2001:db8:100:1010::2/64	fe80::d1:1
	VLAN 100	10. 84.100.1/24	2001:db8:100:100::1/64	fe80::d1:2
	VLAN 101	10.84.101.1/24	2001:db8:100:101::1/64	fe80::d1:3
	VLAN 102	10.84.102.1/24	2001:db8:100:102::1/64	fe80::d1:4
D2	E1/0	10.84.11.2/24	2001:db8:100:1011::2/64	fe80::d2:1
	VLAN 100	10.84.100.2/24	2001:db8:100:100::2/64	fe80::d2:2
	VLAN 101	10.84.101.2/24	2001:db8:100:101::2/64	fe80::d2:3
	VLAN 102	10.84.102.2/24	2001:db8:100:102::2/64	fe80::d2:4
A1	VLAN 100	10.84.100.3/23	2001:db8:100:100::3/64	fe80::a1:1
PC1	NIC	10.84.100.5/24	2001:db8:100:100::5/64	EUI-64
PC2	NIC	DHCP	SLAAC	EUI-64
PC3	NIC	DHCP	SLAAC	EUI-64
PC4	NIC	10.84.100.6/24	2001:db8:100:100::6/64	EUI-64

Figura 1 topología



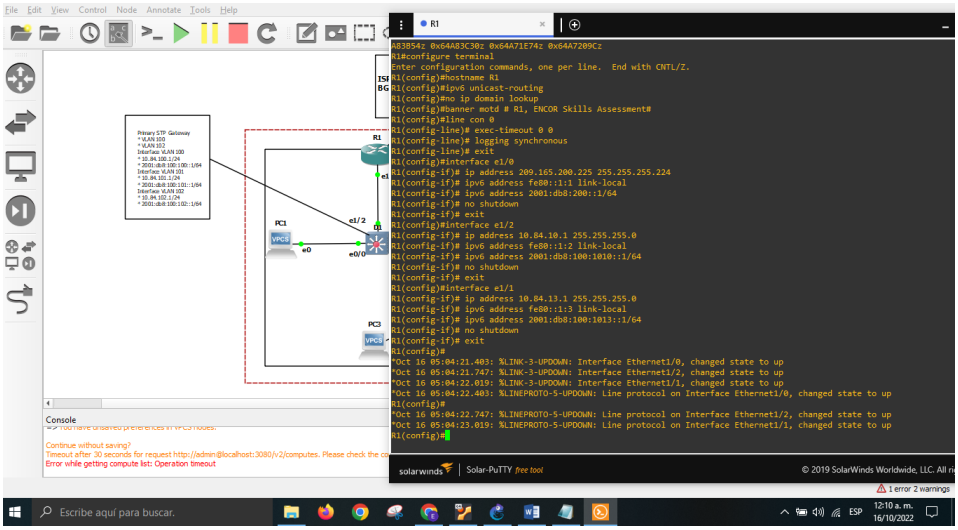
Parte 1 Topología

Router R1

```
hostname R1
ipv6 unicast-routing
no ip domain lookup
banner motd # R1, ENCOR Skills Assessment#
line con 0
 exec-timeout 0 0
 logging synchronous
 exit
interface e1/0
 ip address 209.165.200.225 255.255.255.224
 ipv6 address fe80::1:1 link-local
 ipv6 address 2001:db8:200::1/64
 no shutdown
 exit
interface e1/2
 ip address 10.84.10.1 255.255.255.0
 ipv6 address fe80::1:2 link-local
 ipv6 address 2001:db8:100:1010::1/64
 no shutdown
 exit
interface e1/1
 ip address 10.84.13.1 255.255.255.0
```

```
 ipv6 address fe80::1:3 link-local
 ipv6 address 2001:db8:100:1013::1/64
 no shutdown
 exit
```

Figura 2 configuración Router 1

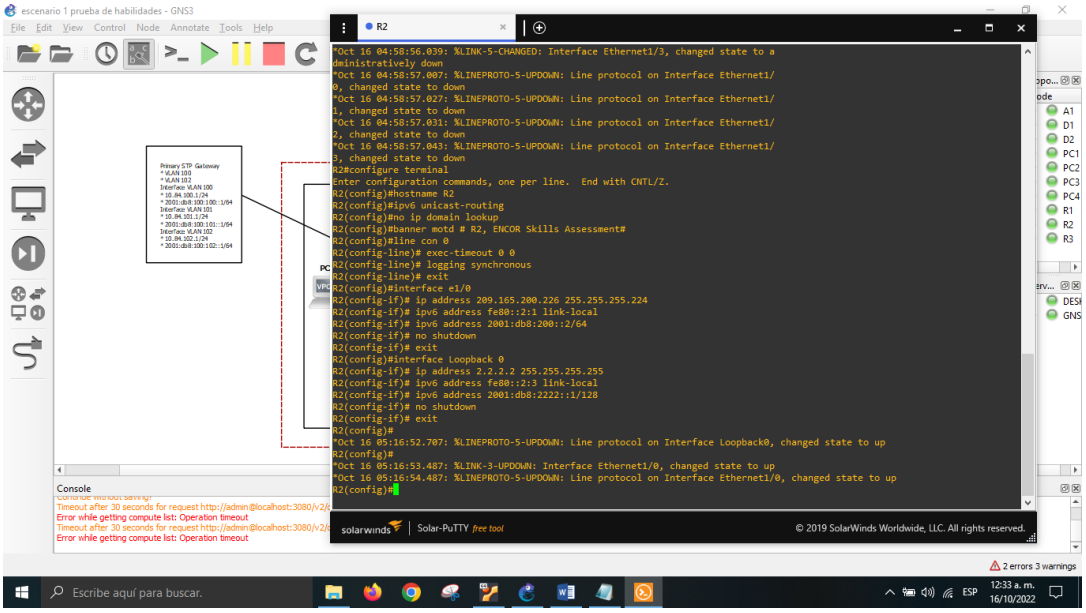


Router R2

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

```
exit
```

Figura 3 Configuración Router 2

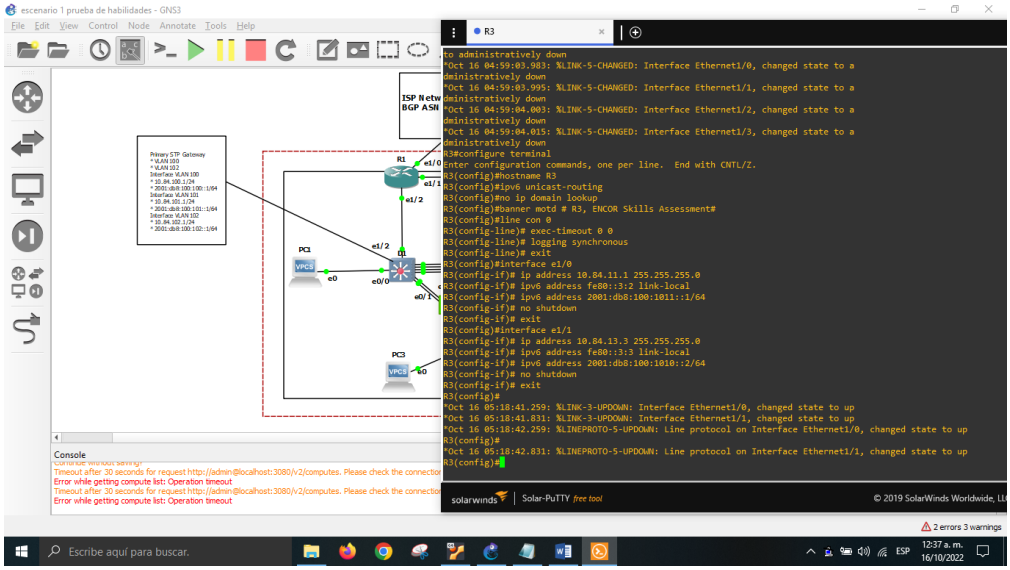


Router R3

```
hostname R3
ipv6 unicast-routing
no ip domain lookup
banner motd # R3, ENCOR Skills Assessment#
line con 0
 exec-timeout 0 0
 logging synchronous
 exit
interface e1/0
 ip address 10.84.11.1 255.255.255.0
 ipv6 address fe80::3:2 link-local
 ipv6 address 2001:db8:100:1011::1/64
 no shutdown
 exit
interface e1/1
 ip address 10.84.13.3 255.255.255.0
 ipv6 address fe80::3:3 link-local
 ipv6 address 2001:db8:100:1010::2/64
 no shutdown
```

```
 exit
```

Figura 4 Configuración Router 3



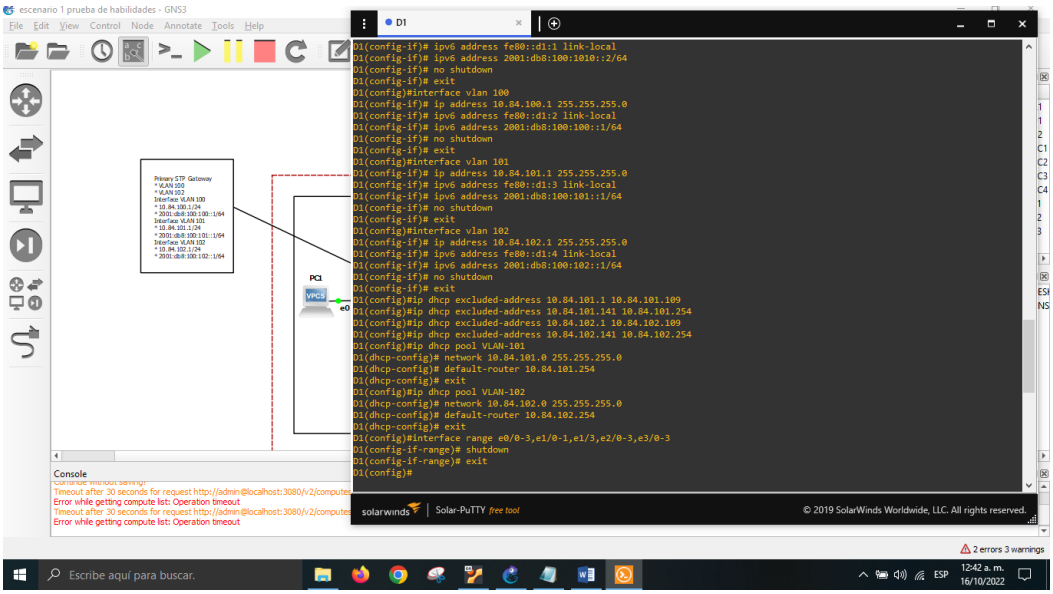
Switch D1

```
hostname D1
ip routing
ipv6 unicast-routing
no ip domain lookup
banner motd # D1, ENCOR Skills Assessment#
line con 0
 exec-timeout 0 0
 logging synchronous
 exit
vlan 100
 name Management
 exit
vlan 101
 name UserGroupA
 exit
vlan 102
 name UserGroupB
 exit
vlan 999
 name NATIVE
```

```
 exit
interface e1/2
 no switchport
 ip address 10.84.10.2 255.255.255.0
 ipv6 address fe80::d1:1 link-local
 ipv6 address 2001:db8:100:1010::2/64
 no shutdown
 exit
interface vlan 100
 ip address 10.84.100.1 255.255.255.0
 ipv6 address fe80::d1:2 link-local
 ipv6 address 2001:db8:100:100::1/64
 no shutdown
 exit
interface vlan 101
 ip address 10.84.101.1 255.255.255.0
 ipv6 address fe80::d1:3 link-local
 ipv6 address 2001:db8:100:101::1/64
 no shutdown
 exit
interface vlan 102
 ip address 10.84.102.1 255.255.255.0
 ipv6 address fe80::d1:4 link-local
 ipv6 address 2001:db8:100:102::1/64
 no shutdown
 exit
ip dhcp excluded-address 10.84.101.1 10.84.101.109
ip dhcp excluded-address 10.84.101.141 10.84.101.254
ip dhcp excluded-address 10.84.102.1 10.84.102.109
ip dhcp excluded-address 10.84.102.141 10.84.102.254
ip dhcp pool VLAN-101
 network 10.84.101.0 255.255.255.0
 default-router 10.84.101.254
 exit
ip dhcp pool VLAN-102
 network 10.84.102.0 255.255.255.0
 default-router 10.84.102.254
 exit
interface range e0/0-3,e1/0-1,e1/3,e2/0-3,e3/0-3
 shutdown
```

```
exit
```

Figura 5 Configuración D1

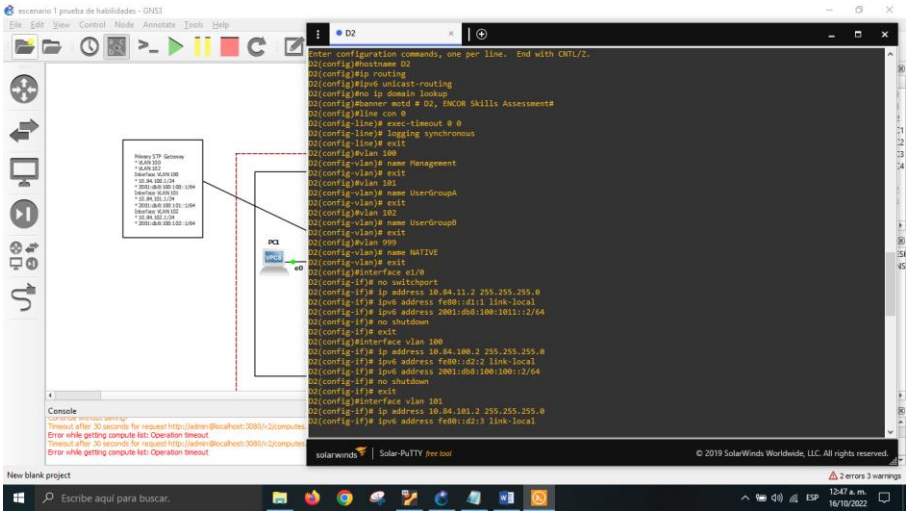


Switch D2

```
hostname D2
ip routing
ipv6 unicast-routing
no ip domain lookup
banner motd # D2, ENCOR Skills Assessment#
line con 0
 exec-timeout 0 0
 logging synchronous
 exit
vlan 100
 name Management
 exit
vlan 101
 name UserGroupA
 exit
vlan 102
 name UserGroupB
 exit
vlan 999
 name NATIVE
```

```
 exit
interface e1/0
 no switchport
 ip address 10.84.11.2 255.255.255.0
 ipv6 address fe80::d1:1 link-local
 ipv6 address 2001:db8:100:1011::2/64
 no shutdown
 exit
interface vlan 100
 ip address 10.84.100.2 255.255.255.0
 ipv6 address fe80::d2:2 link-local
 ipv6 address 2001:db8:100:100::2/64
 no shutdown
 exit
interface vlan 101
 ip address 10.84.101.2 255.255.255.0
 ipv6 address fe80::d2:3 link-local
 ipv6 address 2001:db8:100:101::2/64
 no shutdown
 exit
interface vlan 102
 ip address 10.84.102.2 255.255.255.0
 ipv6 address fe80::d2:4 link-local
 ipv6 address 2001:db8:100:102::2/64
 no shutdown
 exit
ip dhcp excluded-address 10.84.101.1 10.84.101.209
ip dhcp excluded-address 10.84.101.241 10.84.101.254
ip dhcp excluded-address 10.84.102.1 10.84.102.209
ip dhcp excluded-address 10.84.102.241 10.84.102.254
ip dhcp pool VLAN-101
 network 10.84.101.0 255.255.255.0
 default-router 10.84.101.254
 exit
ip dhcp pool VLAN-102
 network 10.84.102.0 255.255.255.0
 default-router 10.84.102.254
 exit
interface range e0/0-3,e1/1-3,e2/0-3,e3/0-3
 shutdown
 exit
```

Figura 6 Configuración D2



Switch A1

```
hostname A1
no ip domain lookup
banner motd # A1, ENCOR Skills Assessment#
line con 0
 exec-timeout 0 0
 logging synchronous
 exit
vlan 100
 name Management
 exit
vlan 101
 name UserGroupA
 exit
vlan 102
 name UserGroupB
 exit
vlan 999
 name NATIVE
 exit
interface vlan 100
 ip address 10.84.100.3 255.255.255.0
 ipv6 address fe80::a1:1 link-local
 ipv6 address 2001:db8:100:100::3/64
```

```
 no shutdown
 exit
interface range e0/0,e0/3,e1/0,e2/1-3,e3/0-3
 shutdown
 exit
```

Figura 7 Configuración A1

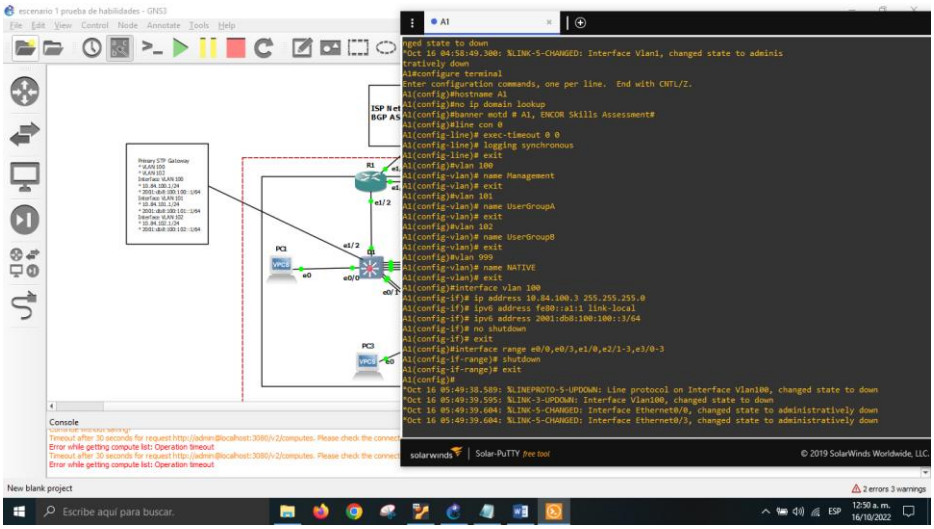
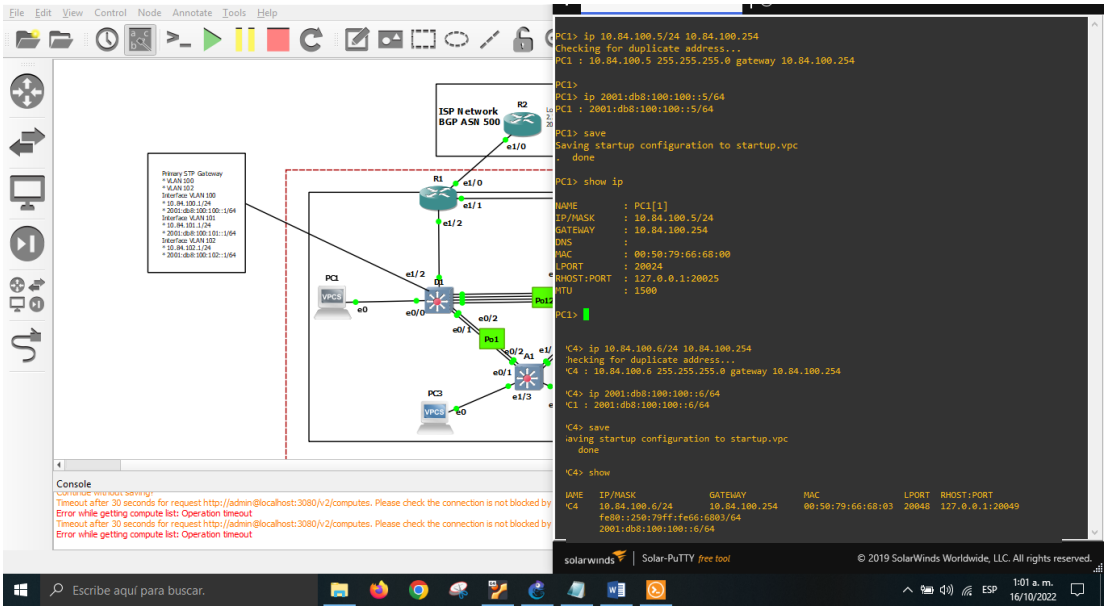


Figura 8 Configuración PC1 - PC4



Parte 2

Tabla 2 tareas escenario 1

Task#	Task	Specification	Points
2.1	On all switches, configure IEEE 802.1Q trunk interfaces on interconnecting switch links	Enable 802.1Q trunk links between: • D1 and D2 • D1 and A1 • D2 and A1	6
2.2	On all switches, change the native VLAN on trunk links.	Use VLAN 999 as the native VLAN.	6
2.3	On all switches, enable the Rapid Spanning-Tree Protocol.	Use Rapid Spanning Tree.	3
2.4	On D1 and D2, configure the appropriate RSTP root bridges based on the information in the topology diagram. D1 and D2 must provide backup in case of root bridge failure.	Configure D1 and D2 as root for the appropriate VLANs with mutually supporting priorities in case of switch failure.	2

2.5	On all switches, create LACP EtherChannels as shown in the topology diagram.	Use the following channel numbers: • D1 to D2 – Port channel 12 • D1 to A1 – Port channel 1 • D2 to A1 – Port channel 2	3
2.6	On all switches, configure host access ports connecting to PC1, PC2, PC3, and PC4.	Configure access ports with appropriate VLAN settings as shown in the topology diagram. Host ports should transition immediately to forwarding state.	4
2.7	Verify IPv4 DHCP services.	PC2 and PC3 are DHCP clients and should be receiving valid IPv4 addresses.	1
2.8	Verify local LAN connectivity.	PC1 should successfully ping: • D1: 10.84.100.1 • D2: 10.84.100.2 • PC4: 10.84.100.6 PC2 should successfully ping: • D1: 10.84.102.1 • D2: 10.84.102.2 PC3 should successfully ping: • D1: 10.84.101.1 • D2: 10.84.101.2 PC4 should successfully ping: • D1: 10.84.100.1 • D2: 10.84.100.2 • PC1: 10.84.100.5	1

Configurar las interfaces troncales

Switch D1:
D1(config)# interface range e2/0 - 3, e0/1 - 2
D1(config-if-range)# switchport trunk encapsulation dot1q
D1(config-if-range)#switchport mode trunk
Switch D2:
D2(config)# interface range e2/0 - 3, e1/1 - 2
D2(config-if-range)#switchport trunk encapsulation dot1q
D2(config-if-range)#switchport mode trunk
D2(config-if-range)#exit
Switch A1:
A1(config)#interface range e0/1 – 2, e1/1-2

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

Configurar la VLAN 99 como nativa

Switch D1:
D1(config)# interface range e2/0 - 3, e0/1 - 2
D1(config-if-range)#switchport trunk native vlan 999
Switch D2:
D2(config)# interface range e2/0 - 3, e1/1 - 2
D2(config-if-range)#switchport trunk native vlan 999
Switch A1:
A1(config)# interface range e0/1 – 2, e1/1-2
A1(config-if-range)#switchport trunk native vlan 999

Habilitar protocolo Rapid Spanning-Tree (RSTP).

Switch D1:
D1(config)#spanning-tree mode rapid-pvst
D1(config)#
Switch D2:
D2(config)#spanning-tree mode rapid-pvst
D2(config)#
Switch A1:
A1(config)#spanning-tree mode rapid-pvst
A1(config)#

Configurar los puentes raíz (root bridges)

Switch D1:
D1(config)#spanning-tree vlan 100 root primary
D1(config)#spanning-tree vlan 102 root primary
D1(config)#spanning-tree vlan 101 root secondary
Switch D2:
D2(config)#spanning-tree vlan 101 root primary
D2(config)#spanning-tree vlan 100 root secondary
D2(config)#spanning-tree vlan 102 root secondary

crear los LACP

Switch D1
D1(config)#interface range e2/0-3
D1(config-if-range)#channel-group
D1(config-if-range)#exit
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

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

Switch A1
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(config)#interface range e1/1-2
A1(config-if-range)#channel-group 2 mode active
A1(config-if-range)#no shutdown
A1(config-if)#spanning-tree portfast
A1(config-if)#no shutdown
A1(config-if)#exit

Configuración los puertos de acceso a los PC.

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

Switch D2
D2(config-if-range)#interface e0/0
D2(config-if-range)#switchport mode access
D2(config-if-range)#switchport access vlan 102
D2(config-if-range)#spanning-tree portfast
D2(config-if-range)#no shutdown
D2(config-if-range)#exit
D2(config)#exit
D2#copy running-config startup-config

Switch 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)#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
A1(config)#exit
A1#copy running-config startup-config
```

Verificar PC en DHCP

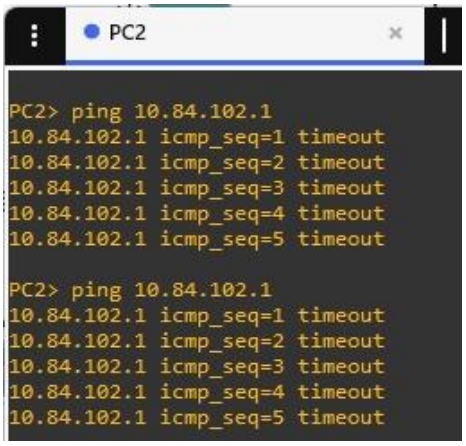
Figura 9 IP de los PC en DHCP

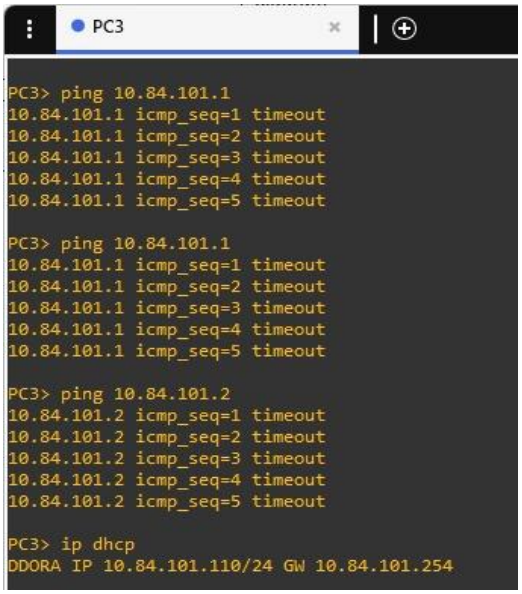
```
PC2> ip dhcp
DDORA
 IP 10.84.102.210/24 GW 10.84.102.254

PC2>
PC2> sh

NAME   IP/MASK              GATEWAY           MAC                LPORT  RHOST:PORT
PC2    10.84.102.210/24     10.84.102.254     00:50:79:66:68:01  20046  127.0.0.1:20047
       fe80::250:79ff:fe66:6801/64
       2001:db8:100:102:2050:79ff:fe66:6801/64 eui-64
```

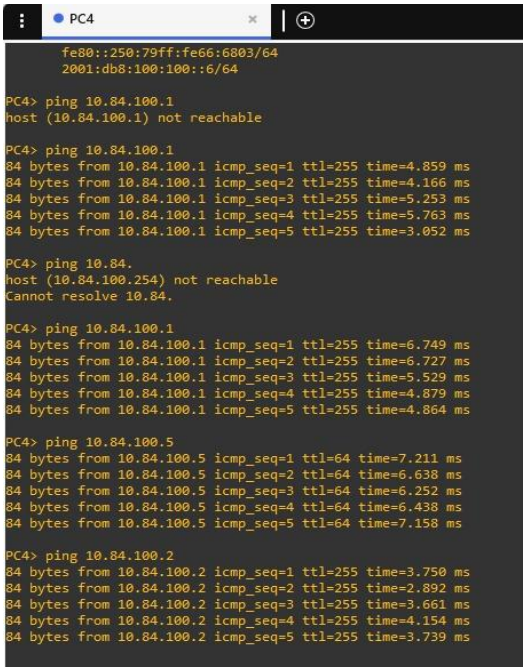
```
PC3> ip dhcp
DD
ORA IP 10.84.101.210/24 GW 10.84.101.254

PC3>
PC3> sh

NAME   IP/MASK              GATEWAY           MAC                LPORT  RHOST:PORT
PC3    10.84.101.210/24     10.84.101.254     00:50:79:66:68:02  20048  127.0.0.1:20049
       fe80::250:79ff:fe66:6802/64
       2001:db8:100:101:2050:79ff:fe66:6802/64 eui-64
```

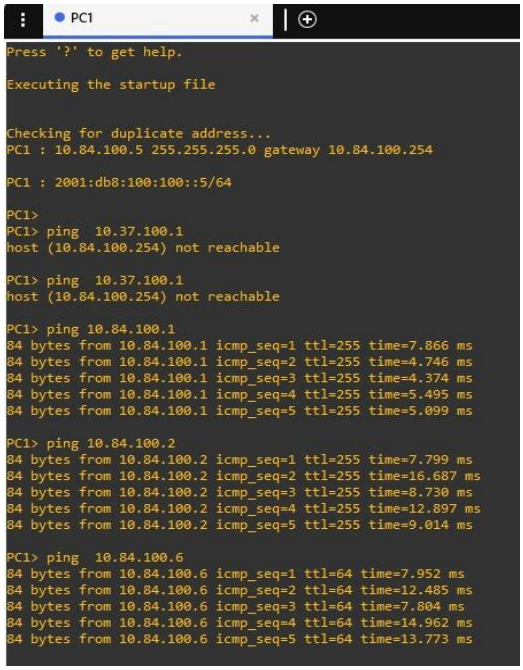
Verificación de la conectividad de la LAN local

Figura 10 Ping entre los dispositivos de la red local









ARCHIVO DE SIMULACIÓN

https://drive.google.com/drive/folders/1hUQMkrO3xXwxTbD_NLUsSF1KLcZ7kFLc?usp=sharing

2. Escenario 2

Parte 1

Tabla 3 tareas escenario 2 parte 1

Task#	Task	Specification	Points
3.1	On the “Company Network” (i.e., R1, R3, D1, and D2), configure single-area OSPFv2 in area 0.	Use OSPF Process ID **4** and assign the following router-IDs: • R1: 0.0.4.1 • R3: 0.0.4.3 • D1: 0.0.4.131 • D2: 0.0.4.132 On R1, R3, D1, and D2, advertise all directly connected networks / VLANs in Area 0. • On R1, do not advertise the R1 – R2 network. • On R1, propagate a default route. Note that the default route will be provided by BGP. Disable OSPFv2 advertisements on: • D1: All interfaces except E1/2 • D2: All interfaces except E1/0	8
3.2	On the “Company Network” (i.e., R1, R3, D1, and D2), configure classic single-area OSPFv3 in area 0.	Use OSPF Process ID **6** and assign the following router-IDs: • R1: 0.0.6.1 • R3: 0.0.6.3 • D1: 0.0.6.131 • D2: 0.0.6.132 On R1, R3, D1, and D2, advertise all directly connected networks / VLANs in Area 0. • On R1, do not advertise the R1 – R2 network. • On R1, propagate a default route. Note that the default route will be provided by BGP. Disable OSPFv3 advertisements on: • D1: All interfaces except E1/2 • D2: All interfaces except E1/0	8

Task#	Task	Specification	Points
3.3	On R2 in the “ISP Network”, configure MP-BGP.	Configure two default static routes via interface Loopback 0: • An IPv4 default static route. • An IPv6 default static route. Configure R2 in BGP ASN **500** and use the router-id 2.2.2.2. Configure and enable an IPv4 and IPv6 neighbor relationship with R1 in ASN 300. In IPv4 address family, advertise: • The Loopback 0 IPv4 network (/32). • The default route (0.0.0.0/0). In IPv6 address family, advertise: • The Loopback 0 IPv4 network (/128). • The default route (::/0).	4
3.4	On R1 in the “ISP Network”, configure MP-BGP.	Configure two static summary routes to interface Null 0: • A summary IPv4 route for 10.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

Tarea 3.1

Router R1: ID 0.0.4.1

```
R1#configure terminal
R1(config)#router ospf 4
R1(config-router)#router-id 0.0.4.1
R1(config-router)#network 10.84.13.0 0.0.0.255 area 0
R1(config-router)#network 10.84.10.0 0.0.0.255 area 0
R1(config-router)#default-information originate
R1(config-router)#exit
```

Router R3: ID 0.0.4.3

```
R3#configure terminal
R3(config)#router ospf 4
R3(config-router)#router-id 0.0.4.3
R3(config-router)#network 10.84.11.0 0.0.0.255 area 0
R3(config-router)#network 10.84.13.0 0.0.0.255 area 0
R3(config-router)#exit
```

Switch D1: ID 0.0.4.131

```
D1(config)#router ospf 4
D1(config-router)#router-id 0.0.4.131
D1(config-router)#network 10.84.100.0 0.0.0.255 area 0
D1(config-router)#network 10.84.101.0 0.0.0.255 area 0
D1(config-router)#network 10.84.102.0 0.0.0.255 area 0
D1(config-router)#network 10.84.10.0 0.0.0.255 area 0
D1(config-router)#passive-interface default
D1(config-router)#no passive-interface e1/2
D1(config-router)#exit
```

Switch D2: ID 0.0.4.132

D2#configure terminal
D2(config)#router ospf 4
D2(config-router)#router-id 0.0.4.132
D2(config-router)#network 10.84.100.2 0.0.0.255 area 0
D2(config-router)#network 10.84.101.2 0.0.0.255 area 0
D2(config-router)#network 10.84.102.2 0.0.0.255 area 0
D2(config-router)#network 10.84.11.0 0.0.0.255 area 0
D2(config-router)#passive-interface default
D2(config-router)#no passive-interface e1/0
D2(config-router)#exit

Figura 11 OSPF en R1

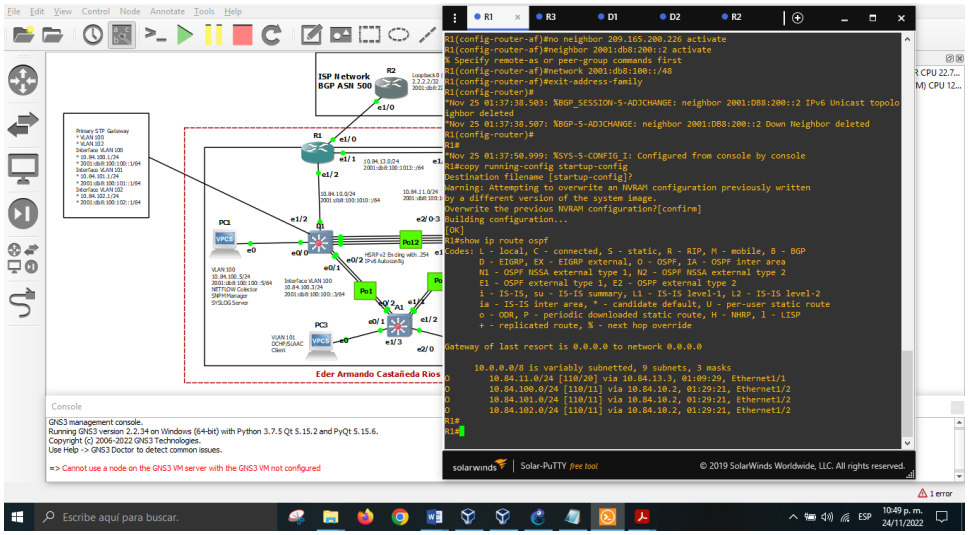


Figura 12 OSPF en R3

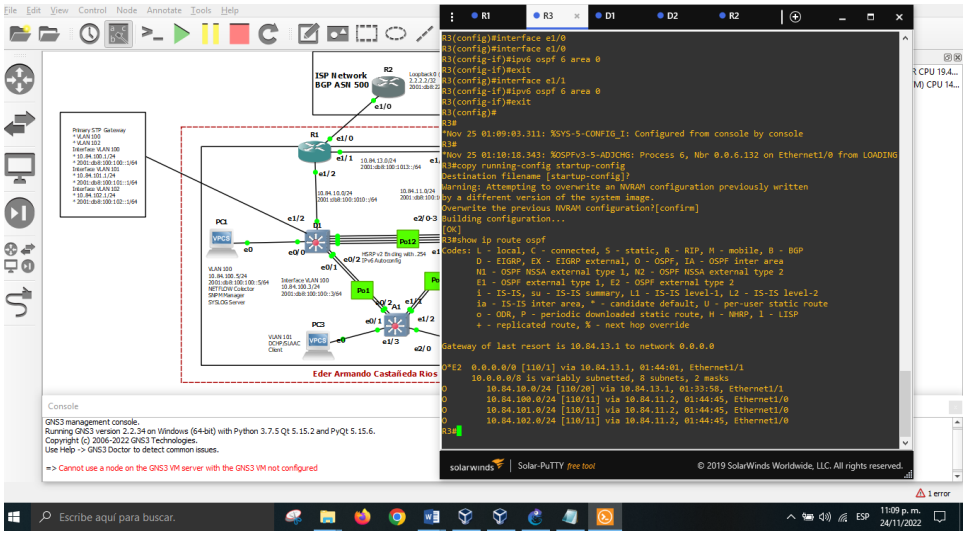


Figura 13 OSPF en D1

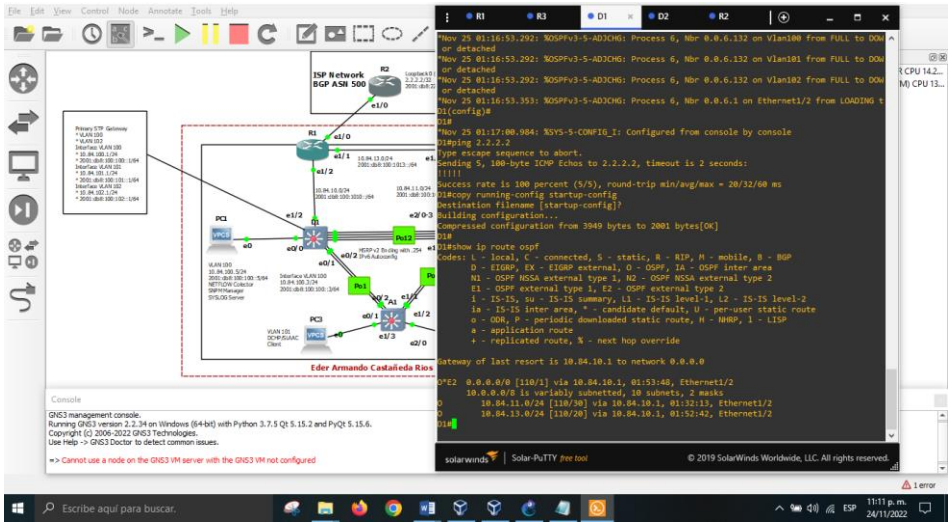
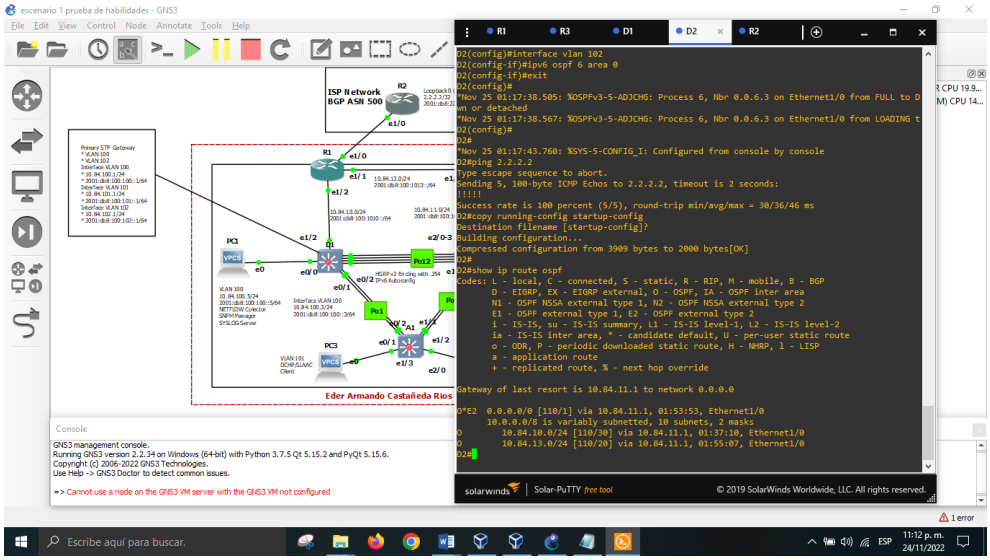


Figura 14 OSPF en D2



Tarea 3.2

Router R1: ID 0.0.6.1

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

Router R3: ID 0.0.6.3

```
R3#configure terminal
R3(config)#ipv6 router ospf 6
R3(config-rtr)#router-id 0.0.6.3
R3(config-rtr)#exit
R3(config)#interface e1/0
R3(config)#interface e1/0
R3(config-if)#ipv6 ospf 6 area 0
R3(config-if)#exit
R3(config)#interface e1/1
R3(config-if)#ipv6 ospf 6 area 0
R3(config-if)#exit
```

Switch D1: ID 0.0.6.131

```
D1#configure terminal
D1(config)#ipv6 router ospf 6
D1(config-rtr)#router-id 0.0.6.131
D1(config-rtr)#passive-interface default
D1(config-rtr)#no passive-interface e1/2
D1(config-rtr)#exit
D1(config)#interface e1/2
D1(config-if)#ipv6 ospf 6 area 0
D1(config-if)#exit
D1(config)#interface vlan 100
D1(config-if)#ipv6 ospf 6 area 0
D1(config-if)#exit
D1(config)#interface vlan 101
D1(config-if)#ipv6 ospf 6 area 0
D1(config-if)#exit
D1(config)#interface vlan 102
D1(config-if)#ipv6 ospf 6 area 0
D1(config-if)#exit
```

Switch D2: ID 0.0.6.132

D2#configure terminal
D2(config)#ipv6 router ospf 6
D2(config-rtr)#router-id 0.0.6.132
D2(config-rtr)#passive-interface default
D2(config-rtr)#no passive-interface e1/0
D2(config-rtr)#exit
D2(config)#interface e1/0
D2(config-if)#ipv6 ospf 6 area 0
D2(config-if)#exit
D2(config)#interface vlan 100
D2(config-if)#ipv6 ospf 6 area 0
D2(config-if)#exit
D2(config)#interface vlan 101
D2(config-if)#ipv6 ospf 6 area 0
D2(config-if)#exit
D2(config)#interface vlan 102
D2(config-if)#ipv6 ospf 6 area 0
D2(config-if)#exit

Figura 15 OSPFv3 en R1

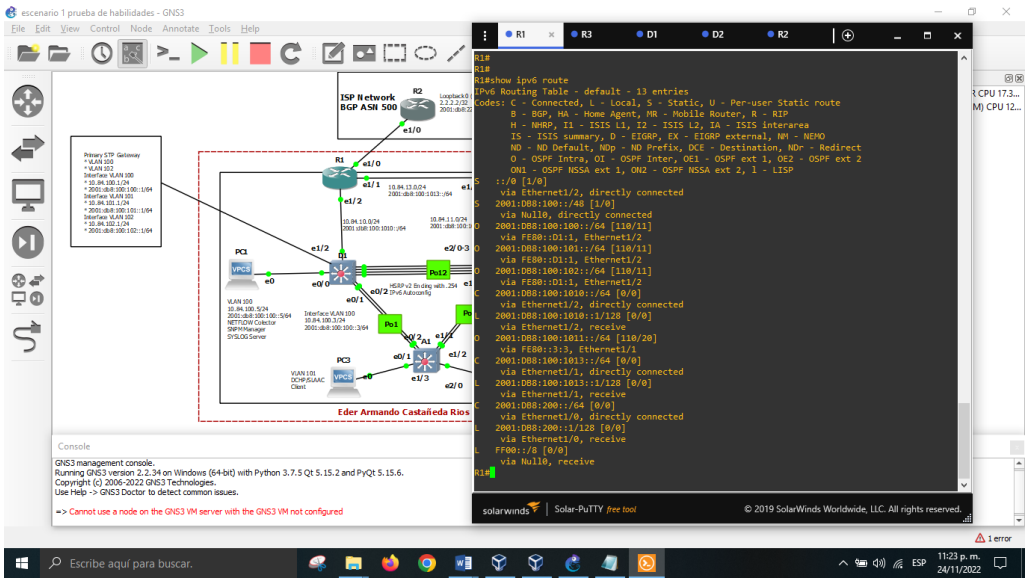


Figura 16 OSPFv3 en R3

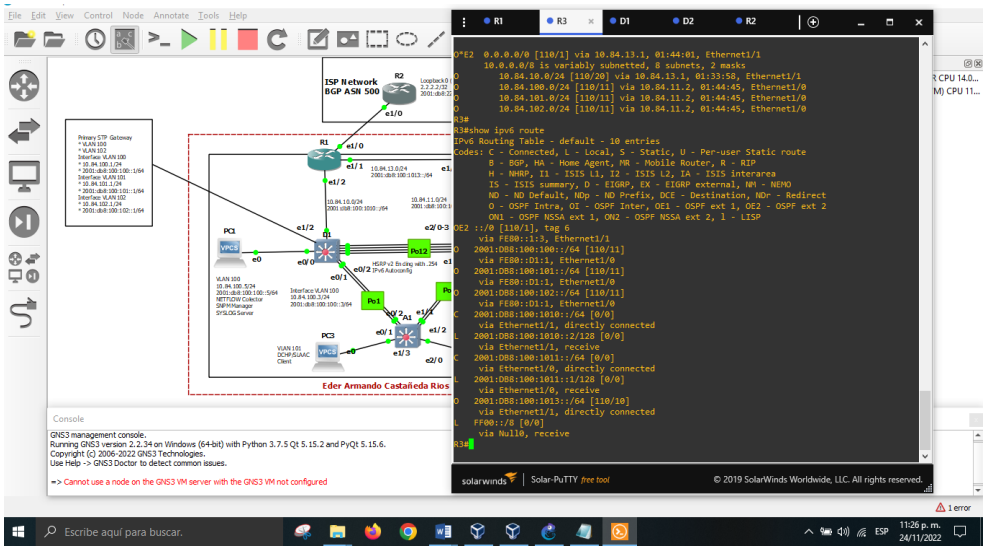


Figura 17 OSPFv3 en D1

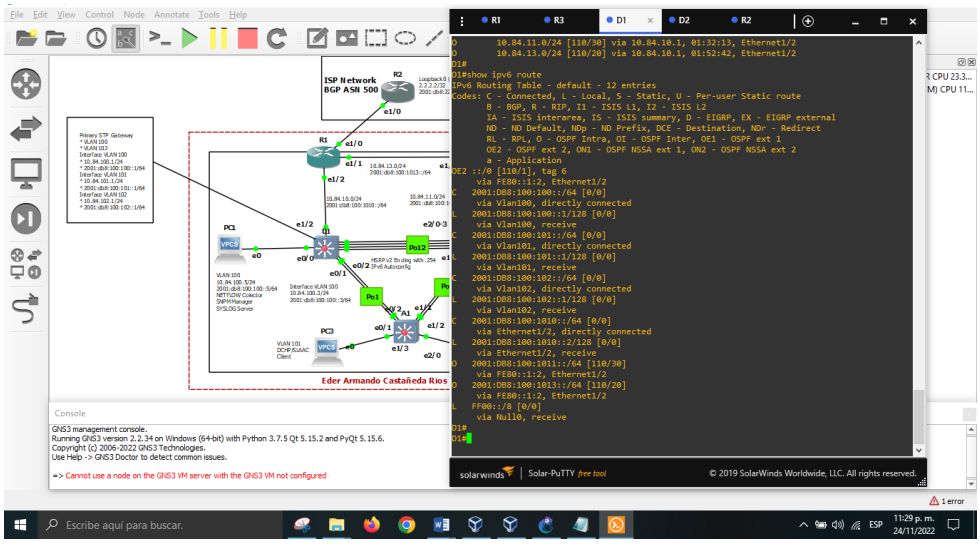
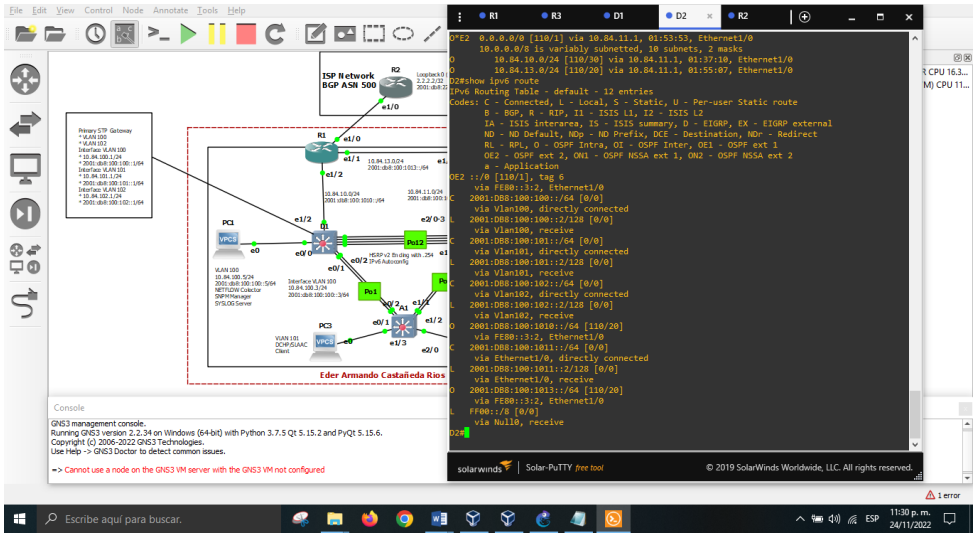


Figura 18 OSPFv3 en D2



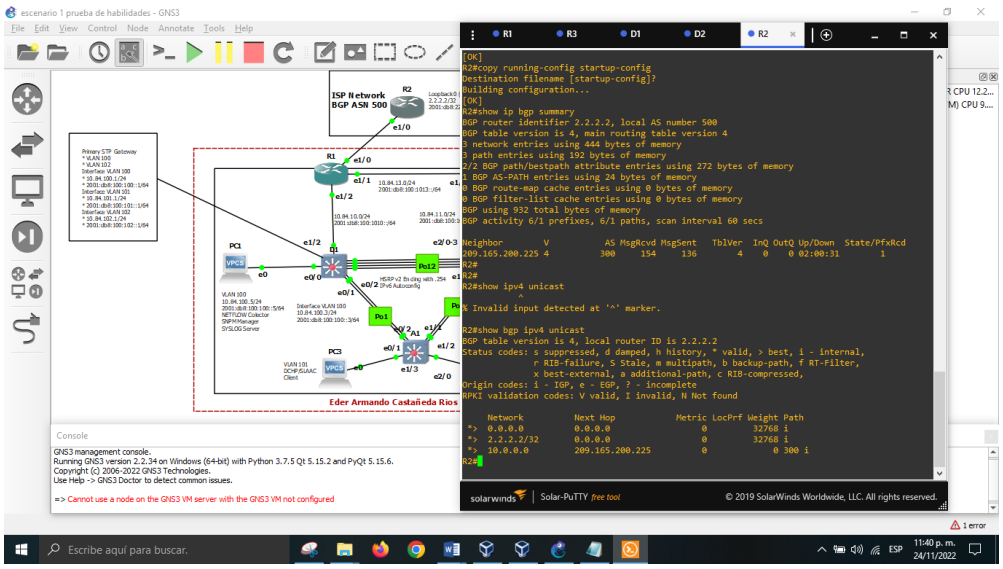
Tarea 3.3

Router R2: BGP ID 2.2.2.2

R2#configure terminal
R2(config)#ip route 0.0.0.0 0.0.0.0 loopback 0
%Default route without gateway, if not a point-to-point interface, may impact performance
R2(config)#ipv6 route ::/0 loopback 0
R2(config)#router bgp 500
R2(config-router)#bgp router-id 2.2.2.2
R2(config-router)#no bgp default ipv4-unicast
R2(config-router)#neighbor 209.165.200.225 remote-as 300
R2(config-router)#neighbor 2001:db8:200::1 remote-as 300
R2(config-router)#address-family ipv4
R2(config-router-af)#neighbor 209.165.200.225 activate
R2(config-router-af)#no neighbor 2001:db8:200::1 activate
R2(config-router-af)#network 2.2.2.2 mask 255.255.255.255
R2(config-router-af)#network 0.0.0.0
R2(config-router-af)#exit-address-family
R2(config-router)#address-family ipv6

R2(config-router-af)#no neighbor 209.165.200.225 activate
R2(config-router-af)#neighbor 2001:db8:200::1 activate
R2(config-router-af)#network 2001:db8:2222::/128
R2(config-router-af)#network ::/0
R2(config-router-af)#exit-address-family

Figura 19 BGP en R2



Tarea 3.4

Router R1: BGP ID 1.1.1.1

R1#configure terminal
R1(config)#ip route 10.84.0.0 255.255.0.0 null0
R1(config)#ipv6 route 2001:db8:100::/48 null0
R1(config)#ipv6 route 2001:db8:100::/48 null0
R1(config)#router bgp 300
R1(config)#router bgp 300
R1(config)#router bgp 300
R1(config)#router bgp 300
R1(config)#router bgp 300
R1(config-router)#bgp router-id 1.1.1.1
R1(config-router)#bgp router-id 1.1.1.1

```
R1(config-router)#bgp router-id 1.1.1.1
R1(config-router)#neighbor 209.165.200.226 remote-as 500
R1(config-router)#neighbor 2001:db8:200::2 remote-as 500
R1(config-router)#address-family ipv4
R1(config-router)#address-family ipv4
R1(config-router-af)#no neighbor 2001:db8:200::2 activate
R1(config-router-af)#neighbor 209.165.200.226 activate
R1(config-router-af)#network 10.84.0.0 mask 255.255.0.0
R1(config-router-af)#network 10.84.0.0 mask 255.255.0.0
R1(config-router-af)#exit-address-family
R1(config-router-af)#exit-address-family
R1(config-router)#address-family ipv6
R1(config-router-af)#no neighbor 209.165.200.226 activate
R1(config-router-af)#neighbor 2001:db8:200::2 activate
R1(config-router-af)#network 2001:db8:100::/48
R1(config-router-af)#network 2001:db8:100::/48
R1(config-router-af)#exit-address-family
```

Figura 20 MP-BGP en R1

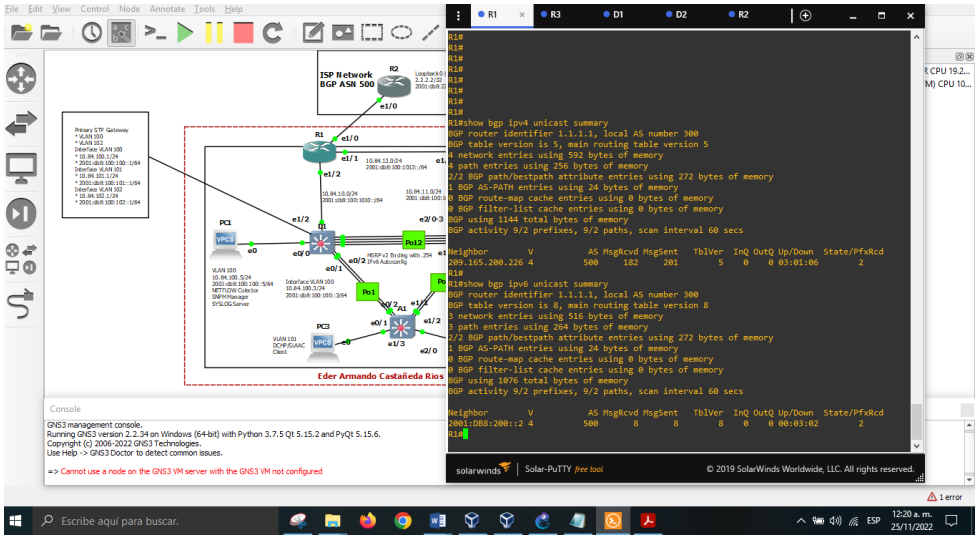


Figura 21 pings IPv4 e IPv6 desde D1 a la interfaz Loopback 0

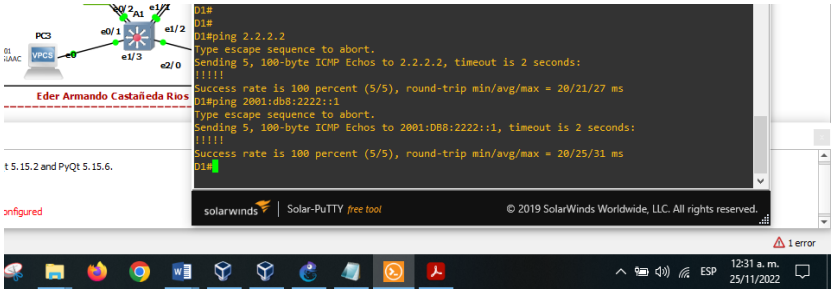
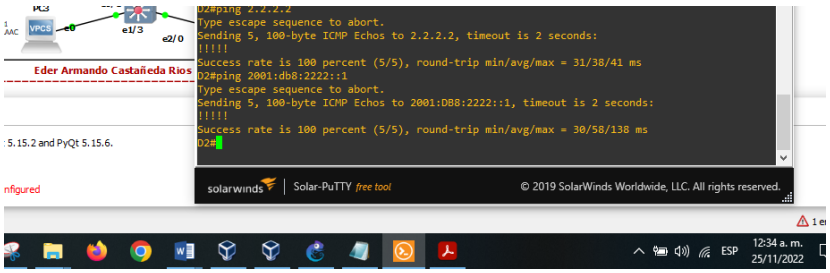


Figura 22 pings IPv4 e IPv6 desde D2 a la interfaz Loopback 0



Parte 2

Tabla 4 tareas escenario 2 parte 2

Task#	Task	Specification	Points
4.1	On D1, create IP SLAs that test the reachability of R1 interface E1/2.	Create two IP SLAs. • Use SLA number **4** for IPv4. • Use SLA number **6** for IPv6. The IP SLAs will test availability of R1 E1/2 interface every 5 seconds. Schedule the SLA for immediate implementation with no end time. Create an IP SLA object for IP SLA 4 and one for IP SLA 6. • Use track number **4** for IP SLA 4. • Use track number **6** for IP SLA 6. The tracked objects should notify D1 if the IP SLA state changes from down to up after 10 seconds, or from up to down after 15 seconds.	2
4.2	On D2, create IP SLAs that test the reachability of R3 interface E1/0.	Create two IP SLAs. • Use SLA number **4** for IPv4. • Use SLA number **6** for IPv6. The IP SLAs will test availability of R3 E1/0 interface every 5 seconds. Schedule the SLA for immediate implementation with no end time. Create an IP SLA object for IP SLA 4 and one for IP SLA 6. • Use track number **4** for IP SLA 4. • Use track number **6** for IP SLA 6. The tracked objects should notify D1 if the IP SLA state changes from down to up after 10 seconds, or from up to down after 15 seconds.	2

Task#	Task	Specification	Points
4.3	On D1, configure HSRPv2.	D1 is the primary router for VLANs 100 and 102; therefore, their priority will also be changed to 150. Configure HSRP version 2. Configure IPv4 HSRP group **104** for VLAN 100: • Assign the virtual IP address **10.XY.100.254**. • Set the group priority to **150**. • Enable preemption. • Track object 4 and decrement by 60. Configure IPv4 HSRP group **114** for VLAN 101: • Assign the virtual IP address **10.XY.101.254**. • Enable preemption. • Track object 4 to decrement by 60. Configure IPv4 HSRP group **124** for VLAN 102: • Assign the virtual IP address **10.XY.102.254**. • Set the group priority to **150**. • Enable preemption. • Track object 4 to decrement by 60. Configure IPv6 HSRP group **106** for VLAN 100: • Assign the virtual IP address using **ipv6 autoconfig**. • Set the group priority to **150**. • Enable preemption. • Track object 6 and decrement by 60. Configure IPv6 HSRP group **116** for VLAN 101: • Assign the virtual IP address using **ipv6 autoconfig**. • Enable preemption. • Track object 6 and decrement by 60. Configure IPv6 HSRP group **126** for VLAN 102: • Assign the virtual IP address using **ipv6 autoconfig**. • Set the group priority to **150**. • Enable preemption. • Track object 6 and decrement by 60.	8

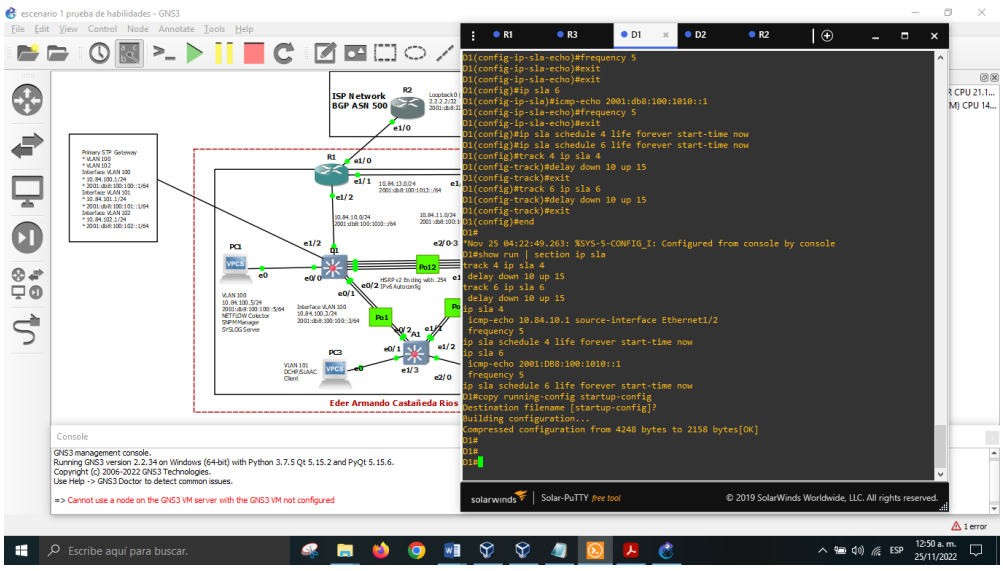
Task#	Task	Specification	Points
	On D2, configure HSRPv2.	D2 is the primary router for VLAN 101; therefore, the priority will also be changed to 150. Configure HSRP version 2. Configure IPv4 HSRP group **104** for VLAN 100: • Assign the virtual IP address **10.XY.100.254**. • Enable preemption. • Track object 4 and decrement by 60. Configure IPv4 HSRP group **114** for VLAN 101: • Assign the virtual IP address **10.XY.101.254**. • Set the group priority to **150**. • Enable preemption. • Track object 4 to decrement by 60. Configure IPv4 HSRP group **124** for VLAN 102: • Assign the virtual IP address **10.XY.102.254**. • Enable preemption. • Track object 4 to decrement by 60. Configure IPv6 HSRP group **106** for VLAN 100: • Assign the virtual IP address using **ipv6 autoconfig**. • Enable preemption. • Track object 6 and decrement by 60. Configure IPv6 HSRP group **116** for VLAN 101: • Assign the virtual IP address using **ipv6 autoconfig**. • Set the group priority to **150**. • Enable preemption. • Track object 6 and decrement by 60. Configure IPv6 HSRP group **126** for VLAN 102: • Assign the virtual IP address using **ipv6 autoconfig**. • Enable preemption. • Track object 6 and decrement by 60.	

Tarea 4.1

Switch D1:

```
D1#configure terminal
D1(config)#ip sla 4
D1(config-ip-sla)#icmp-echo 10.84.10.1 source-interface e1/2
D1(config-ip-sla-echo)#frequency 5
D1(config-ip-sla-echo)#exit
D1(config-ip-sla-echo)#exit
D1(config)#ip sla 6
D1(config-ip-sla)#icmp-echo 2001:db8:100:1010::1
D1(config-ip-sla-echo)#frequency 5
D1(config-ip-sla-echo)#exit
D1(config)#ip sla schedule 4 life forever start-time now
D1(config)#ip sla schedule 6 life forever start-time now
D1(config)#track 4 ip sla 4
D1(config-track)#delay down 10 up 15
D1(config-track)#exit
D1(config)#track 6 ip sla 6
D1(config-track)#delay down 10 up 15
D1(config-track)#exit
```

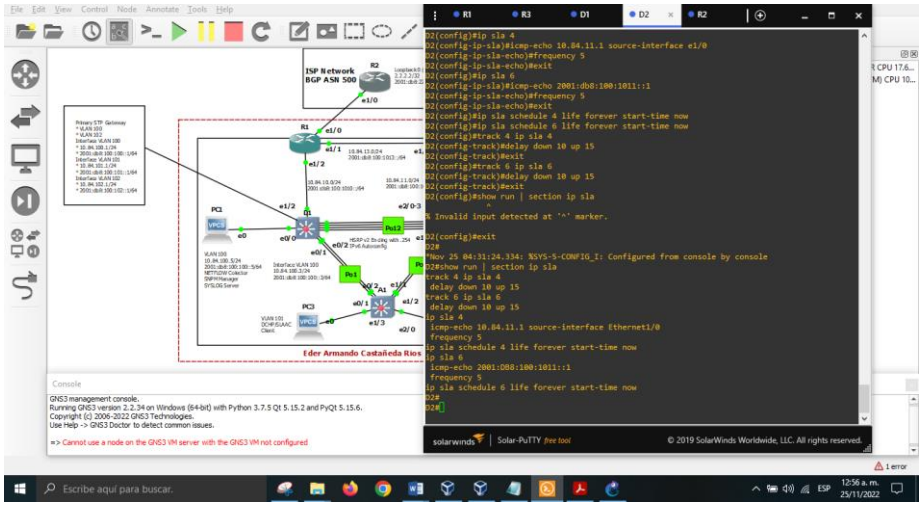
Figura 23 SLA IP en D1



Tarea 4.2

Switch D2:
D2#configure terminal
D2(config)#ip sla 4
D2(config-ip-sla)#icmp-echo 10.84.11.1 source-interface e1/0
D2(config-ip-sla-echo)#frequency 5
D2(config-ip-sla-echo)#exit
D2(config)#ip sla 6
D2(config-ip-sla)#icmp-echo 2001:db8:100:1011::1
D2(config-ip-sla-echo)#frequency 5
D2(config-ip-sla-echo)#exit
D2(config)#ip sla schedule 4 life forever start-time now
D2(config)#ip sla schedule 6 life forever start-time now
D2(config)#track 4 ip sla 4
D2(config-track)#delay down 10 up 15
D2(config-track)#exit
D2(config)#track 6 ip sla 6
D2(config-track)#delay down 10 up 15
D2(config-track)#exit

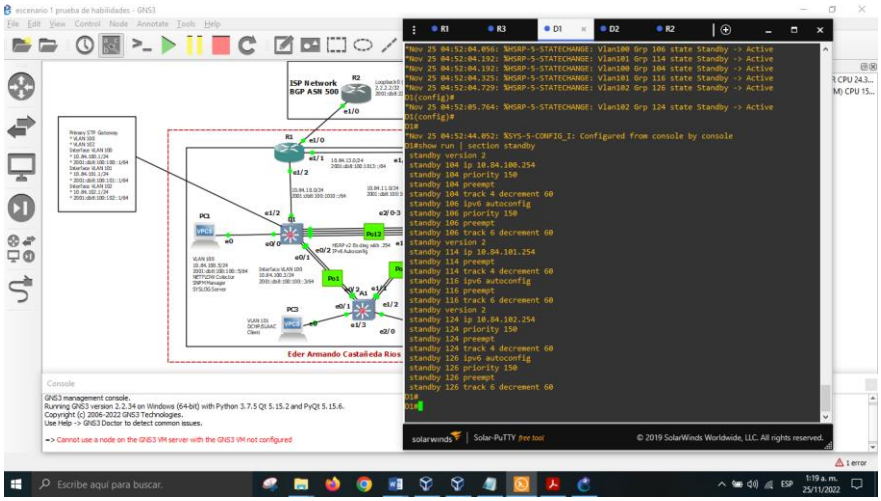
Figura 24 SLA IP en D2



Tarea 4.3.1

```
D1#configure terminal
D1(config)#interface vlan 100
D1(config-if)#standby version 2
D1(config-if)#standby 104 ip 10.84.100.254
D1(config-if)#standby 104 priority 150
D1(config-if)#standby 104 preempt
D1(config-if)#standby 104 track 4 decrement 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
D1(config)#interface vlan 101
D1(config-if)#standby version 2
D1(config-if)#standby 114 ip 10.84.101.254
D1(config-if)#standby 114 preempt
D1(config-if)#standby 114 track 4 decrement 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
D1(config)#interface vlan 102
D1(config-if)#standby version 2
D1(config-if)#standby 124 ip 10.84.102.254
D1(config-if)#standby 124 priority 150
D1(config-if)#standby 124 preempt
D1(config-if)#standby 124 track 4 decrement 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
```

Figura 25 HSRPv2 en D1 con comando show run | section standby

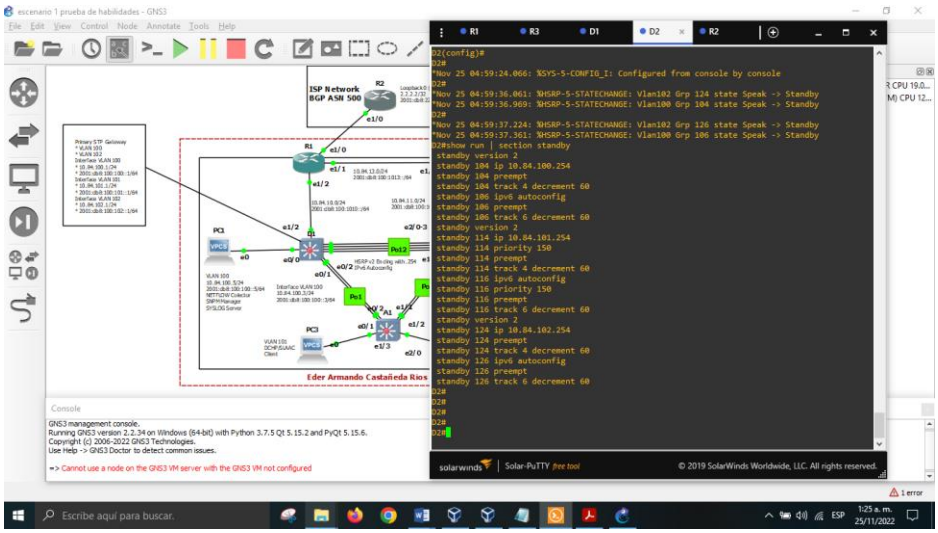


Tarea 4.3.2

D2#configure terminal
D2(config)#interface vlan 100
D2(config-if)#standby version 2
D2(config-if)#standby 104 ip 10.84.100.254
D2(config-if)#standby 104 preempt
D2(config-if)#standby 104 track 4 decrement 60
D2(config-if)#standby 106 ipv6 autoconfig
D2(config-if)#standby 106 preempt
D2(config-if)#standby 106 track 6 decrement 60
D2(config-if)#exit
D2(config)#interface vlan 101
D2(config-if)#standby version 2
D2(config-if)#standby 114 ip 10.84.101.254
D2(config-if)#standby 114 priority 150
D2(config-if)#standby 114 preempt
D2(config-if)#standby 114 track 4 decrement 60
D2(config-if)#standby 116 ipv6 autoconfig
D2(config-if)#standby 116 priority 150
D2(config-if)#standby 116 preempt
D2(config-if)#standby 116 track 6 decrement 60

D2(config-if)#exit
D2(config)#interface vlan 102
D2(config-if)#standby version 2
D2(config-if)#standby 124 ip 10.84.102.254
D2(config-if)#standby 124 preempt
D2(config-if)#standby 124 track 4 decrement 60
D2(config-if)#standby 126 ipv6 autoconfig
D2(config-if)#standby 126 preempt
D2(config-if)#standby 126 track 6 decrement 60
D2(config-if)#exit

Figura 26 HSRPv2 en D2 con comando show run | section standby



CONCLUSIONES

La implementación de Gns3 para una persona con poco manejo de esta se vuelve un desafío, se logra implementar métodos como visitas a páginas de internet para afianzar conocimientos.

Los protocolos de enrutamiento utilizados en la actividad son los que más se acercan a la realidad, de esta forma, se afianzan los conocimientos para cuando se pueda enfrentar a la vida laboral.

Es importante aclarar que con tanta inseguridad que existe con amenazas en las redes se deben implementar protocolos para que de esta forma se logre reforzar dicha seguridad, en este trabajo se concluye con una implementación de la familia AAA donde se loga evidenciar que dicha familia tiene unos privilegios para el administrador.

Las redundancias a nivel de capa 3 también se utilizan para evitar que los dispositivos locales queden fuera de red por algún fallo en el Gateway, utilizando SLAs para monitorear las interfaces del Gateway y el protocolo HSRP.

Es importante lograr planificar redes inalámbricas de acceso remoto, esto ayuda a que se logre aplicar unos servicios tales como: autenticación, roaming y localización.

Al terminar con el desarrollo de los dos escenarios, se fortalecen conocimientos tales como: implementación de servicios IP con servicio en ambientes de red empresariales LAN y WAN, estructurar redes conmutadas utilizando protocolo STP de esta forma se logra comprender o asimilar una estructura de red jerárquica.

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