

DIPLOMADO DE PROFUNDIZACIÓN CISCO
PRUEBA DE HABILIDADES PRACTICAS CCNP

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UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA – UNAD
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NOTA DE ACEPTACIÓN

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Firma del Jurado

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GLOSARIO

LACP: Forma parte de una especificación IEEE (802.3ad) también llamado llamadatrunking que permite agrupar varios puertos físicos para formar un único canal lógico. Un LACP permite que un Switch negocie un grupo automático mediante envió de paquetes.

Port Channel: Es un nombre propiedad de Cisco, construido de acuerdo con los estándares 802.3, permite la agrupación lógica de varios enlaces físicos, esta agrupación es tratada como un único enlace que permite sumar la velocidad nominal de cada puerto físico, usado así para obtener un enlace troncal de alta velocidad.

Rapid Spanning Tree: Es un Protocol de red de la segunda capa OSI que gestiona los enlaces redundantes, especificado en IEEE 802.1w. Cuando se configuran correctamente soluciona problemas de lentitud de STP

OSPF: Open Shortest Path First, es un protocolo de direccionamiento de tipo enlace-estado para encaminamiento jerárquico que usa el algoritmo Dijkstra, para calcular la ruta más corta entre los nodos, desarrollado para las redes IP.

BGP: Border Gateway Protocol, protocolo de puerta de enlace, es un protocolo que intercambia información escalable de dynamic routing usado en la internet por grupos enrutadores para compartir información de enrutamiento, BGP usa parámetros de ruta o atributos para definir políticas de enrutamiento y crear un entorno de enrutamiento estable

HSRP: Es un protocolo exclusivo de Cisco diseñado para permitir la conmutación por falla transparente de un dispositivo Ipv4 de primer salto. HSRP proporciona una alta disponibilidad de red, ya que proporciona redundancia de routing de primer salto para los hosts Ipv4 en las redes configuradas con una dirección Ipv4 de Gateway predeterminado. HSRP se utiliza en un grupo de routers para seleccionar un dispositivo activo y un dispositivo de reserva.

IP SLA: Es una tecnología de Cisco que monitorea activamente el tráfico para medir el desempeño de la red al medir parámetros críticos para el tráfico que pasa a través de los dispositivos con software Cisco IOS y otros servidores de aplicaciones de red. Al aprovechar Cisco IP SLA, es posible hacer que la red sea sensible a métricas críticas que afectan el rendimiento de la red y de sus aplicaciones asociadas.

RESUMEN

Las redes de telecomunicaciones se utilizan cada vez más para el intercambio de información dentro de las organizaciones y hacia internet. Es en estos entornos donde las tecnologías WAN y LAN tienen amplia cabida para implementar protocolos que conecten los dispositivos LAN hacia el exterior.

Este proyecto busca desarrollar una red corporativa compuesta por una switch multicapa con funcionalidades capa 2 y switches con funcionalidades capa 3 que serán los Gateway de la LAN para cada una de las VLANs y dos routers que proveen la salida a internet.

Se pondrán en práctica protocolos de capa 2 como LACP e Etherchannel para aumentar la capacidad de los enlaces y proveer mayor disponibilidad. Mediante el protocolo STP se garantiza una red libre de Loops capa 2.

Los protocolos de enrutamiento como OSPF y BGP se encargan del enrutamiento interno y hacia el exterior respectivamente para los segmentos de red IPv4 e IPv6. Esto combinado con HSRP y IP SLA complementan la disponibilidad de la red corporativa mediante la redundancia física de los Gateway de la LAN.

Esta prueba de habilidades abarca gran parte de los conceptos adquiridos durante todo el curso de CCNP y que son ampliamente utilizados en la vida profesional dentro del área de Networking IP.

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

ABSTRACT

Telecommunications networks are increasingly used for the exchange of information within organizations and to the Internet. It is in these environments where WAN and LAN technologies have ample room to implement protocols that connect LAN devices to the outside.

This project seeks to develop a corporate network made up of a multilayer switch with layer 2 functionalities and switches with layer 3 functionalities that will be the LAN Gateway for each of the VLANs and two routers that provide Internet access.

Layer 2 protocols such as LACP and EtherChannel will be put into practice to increase the capacity of the links and provide greater availability. Through the STP protocol, a loop-free layer 2 network is guaranteed.

Routing protocols such as OSPF and BGP handle internal and external routing respectively for IPv4 and IPv6 network segments. This combined with HSRP and IP SLA complement the availability of the corporate network through the physical redundancy of the LAN Gateways.

This skills test covers a large part of the concepts acquired throughout the CCNP course and that are widely used in professional life within the IP Networking area.

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

INTRODUCCIÓN

Durante el desarrollo de la guía podremos experimentar con protocolos capa dos como LACP sobre switches multicapa que además puede soportar funcionalidades de capa tres como DHCP y el direccionamiento para cada uno de los segmentos de la LAN.

Mediante el uso de GNS3 se implementará una red corporativa típica con dispositivos capa dos y capa tres haciendo uso de imágenes de sistema operativo funcionales sobre una máquina virtual.

La segunda parte de la prueba de habilidades comprende todo lo relacionado a protocolos de enrutamiento como OSPF, BGP y otras funcionalidades adicionales como HSRP e IP SLA para asegurar la redundancia y la alta disponibilidad de los servicios LAN.

DESARROLLO

1. ESCENARIO 1

ENCOR Skills Assessment (Scenario 1)

Topology

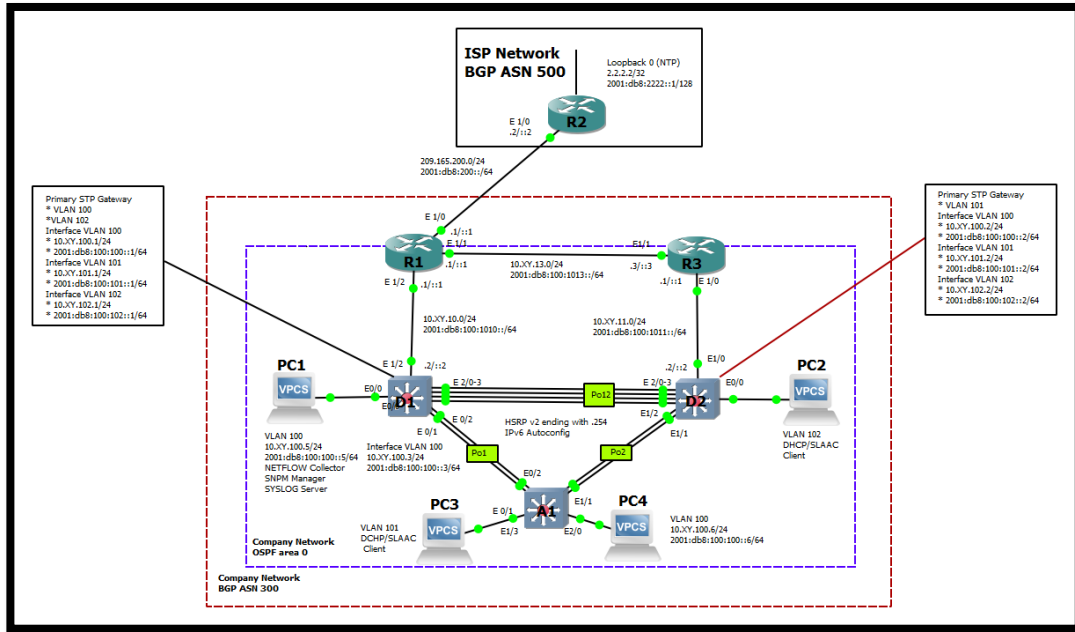


Figura 1. Topologia Escenario 1

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
	E1/2	10.30.10.1/24	2001:db8:100:1010::1/64	fe80::1:2
	E1/1	10.30.13.1/24	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	10.30.11.1/24	2001:db8:100:1011::1/64	fe80::3:2
	E1/1	10.30.13.3/24	2001:db8:100:1013::3/64	fe80::3:3
D1	E1/2	10.30.10.2/24	2001:db8:100:1010::2/64	fe80::d1:1

Device	Interface	IPv4 Address	IPv6 Address	IPv6 Link-Local
	VLAN 100	10.30.100.1/24	2001:db8:100:100::1/64	fe80::d1:2
	VLAN 101	10.30.101.1/24	2001:db8:100:101::1/64	fe80::d1:3
	VLAN 102	10.30.102.1/24	2001:db8:100:102::1/64	fe80::d1:4
D2	E1/0	10.30.11.2/24	2001:db8:100:1011::2/64	fe80::d2:1
	VLAN 100	10.30.100.2/24	2001:db8:100:100::2/64	fe80::d2:2
	VLAN 101	10.30.101.2/24	2001:db8:100:101::2/64	fe80::d2:3
	VLAN 102	10.30.102.2/24	2001:db8:100:102::2/64	fe80::d2:4
A1	VLAN 100	10.30.100.3/23	2001:db8:100:100::3/64	fe80::a1:1
PC1	NIC	10.30.100.5/24	2001:db8:100:100::5/64	EUI-64
PC2	NIC	DHCP	SLAAC	EUI-64
PC3	NIC	DHCP	SLAAC	EUI-64
PC4	NIC	10.30.100.6/24	2001:db8:100:100::6/64	EUI-64

Tabla 1. Tabla de direccionamiento

Objectives

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

Part 2: Configure the Layer 2 Network and Host Support

Part 3: Configure Routing Protocols

Part 4: Configure First-Hop Redundancy

Background / Scenario

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

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

Note: Make sure that the switches have been erased and have no startup configurations. If you are unsure, contact your instructor.

Note: The letters "X, Y" represent the last two digits of your ID number (cédula).

Required Resources

- 3 Routers (Cisco 7200). [Click on the download link of the images for GNS3.](#)
- 3 Switches (Cisco IOU L2). [Click on the download link of the images for GNS3.](#)
- 4 PCs (Use the GNS3's VPCS)
- After the configuration of devices in GNS3, the Slots of the network adapters of the SW must be configured as follows:

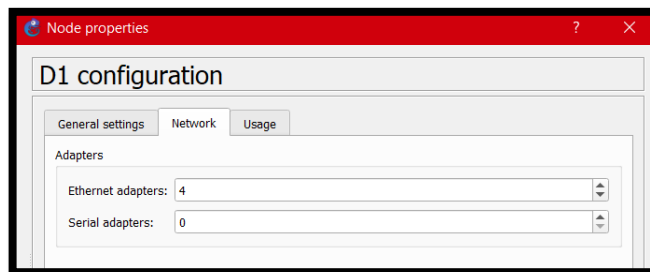


Figura 2. Plantilla Configuración física – Switch

And of the Routers like this:

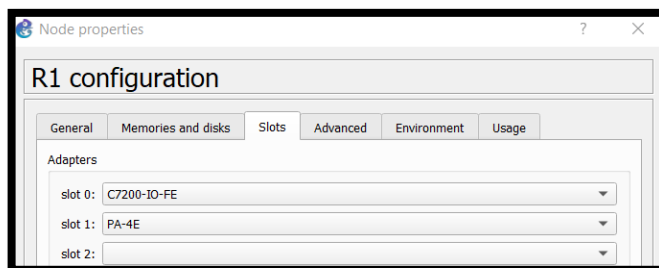


Figura 3. Plantilla Configuración física – Router

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

Step 2: Configure basic settings for each device

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

Se realizo la configuración de acuerdo con la tabla de direccionamiento y la plantilla disponible en la guía

- *En los routers configuramos el direccionamiento IPv4 y IPv6*
- *En los switches multicapa definimos el direccionamiento IPv4 y IPv6 de las interfaces VLAN de la LAN que serán objeto los próximos pasos de configuración.*

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 10.30.10.1 255.255.255.0
  ipv6 address fe80::1:2 link-local
  ipv6 address 2001:db8:100:1010::1/64
  no shutdown
  exit
interface e1/1
  ip address 10.30.13.1 255.255.255.0
  ipv6 address fe80::1:3 link-local
  ipv6 address 2001:db8:100:1013::1/64
  no shutdown
  exit
```

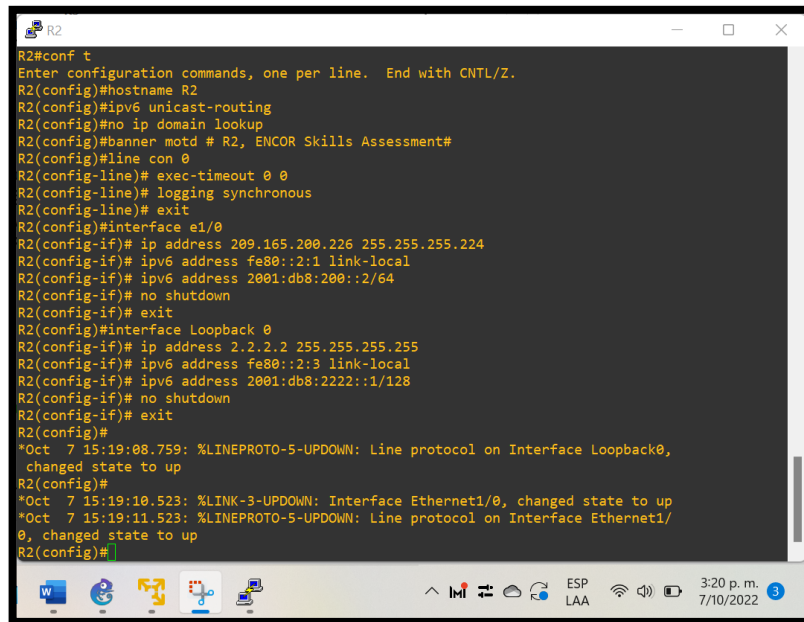


```
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#hostname R1
R1(config)#ipv6 unicast-routing
R1(config)#no ip domain lookup
R1(config)#banner motd # R1, ENCOR Skills Assessment#
R1(config)#line con 0
R1(config-line)# exec-timeout 0 0
R1(config-line)# logging synchronous
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 10.30.10.1 255.255.255.0
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 10.30.13.1 255.255.255.0
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
R1(config)#
```

Figura 4. Configuración de direccionamiento - R1

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
```

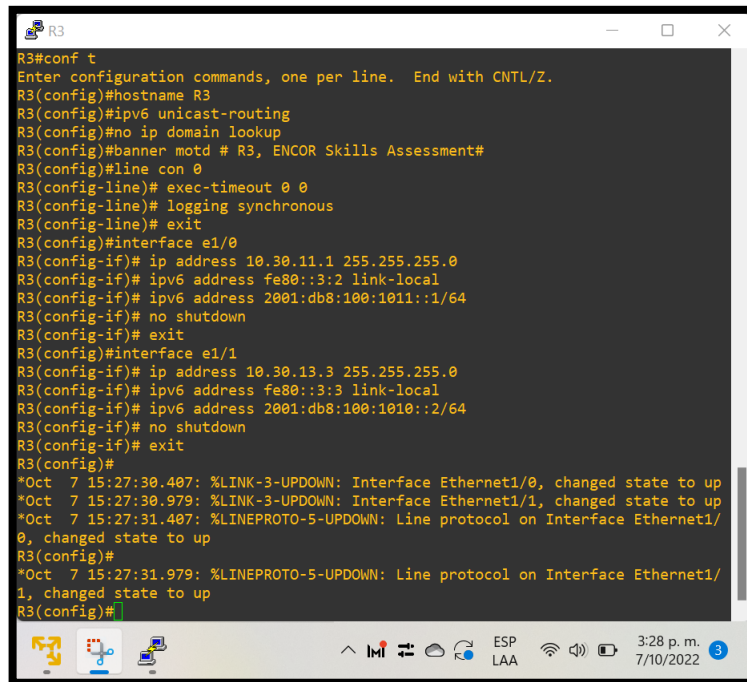


```
R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#hostname R2
R2(config)#ipv6 unicast-routing
R2(config)#no ip domain lookup
R2(config)#banner motd # R2, ENCOR Skills Assessment#
R2(config)#line con 0
R2(config-line)# exec-timeout 0 0
R2(config-line)# logging synchronous
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
R2(config)#
*Oct 7 15:19:08.759: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0,
changed state to up
R2(config)#
*Oct 7 15:19:10.523: %LINK-3-UPDOWN: Interface Ethernet1/0, changed state to up
*Oct 7 15:19:11.523: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/
0, changed state to up
R2(config)#
```

Figura 5. Configuración de Direcccionamiento - R2

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 10.30.11.1 255.255.255.0
  ipv6 address fe80::3:2 link-local
  ipv6 address 2001:db8:100:1011::1/64
  no shutdown
  exit
interface e1/1
  ip address 10.30.13.3 255.255.255.0
  ipv6 address fe80::3:3 link-local
  ipv6 address 2001:db8:100:1010::2/64
  no shutdown
  exit
```



```
R3#conf t
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 10.30.11.1 255.255.255.0
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 10.30.13.3 255.255.255.0
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
R3(config)#
*Oct 7 15:27:30.407: %LINK-3-UPDOWN: Interface Ethernet1/0, changed state to up
*Oct 7 15:27:30.979: %LINK-3-UPDOWN: Interface Ethernet1/1, changed state to up
*Oct 7 15:27:31.407: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/0, changed state to up
R3(config)#
*Oct 7 15:27:31.979: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/1, changed state to up
R3(config)#
```

Figura 6. Configuración de Direccionamiento - R3

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 Gi1/2
```

```

no switchport
ip address 10.30.10.2 255.255.255.0
ipv6 address fe80::d1:1 link-local
ipv6 address 2001:db8:100:1010::2/64
no shutdown
exit
interface vlan 100
ip address 10.30.100.1 255.255.255.0
ipv6 address fe80::d1:2 link-local
ipv6 address 2001:db8:100:100::1/64
no shutdown
exit
interface vlan 101
ip address 10.30.101.1 255.255.255.0
ipv6 address fe80::d1:3 link-local
ipv6 address 2001:db8:100:101::1/64
no shutdown
exit
interface vlan 102
ip address 10.30.102.1 255.255.255.0
ipv6 address fe80::d1:4 link-local
ipv6 address 2001:db8:100:102::1/64
no shutdown
exit
ip dhcp excluded-address 10.30.101.1 10.30.101.109
ip dhcp excluded-address 10.30.101.141 10.30.101.254
ip dhcp excluded-address 10.30.102.1 10.30.102.109
ip dhcp excluded-address 10.30.102.141 10.30.102.254
ip dhcp pool VLAN-101
network 10.30.101.0 255.255.255.0
default-router 10.30.101.254
exit
ip dhcp pool VLAN-102
network 10.30.102.0 255.255.255.0
default-router 10.30.102.254
exit
interface range Gi0/0-3,Gi1/0-1,Gi1/3,Gi2/0-3,Gi3/0-3
shutdown
exit

```

```

D1 - PuTTY
Switch(config)#hostname D1
D1(config)#ip routing
D1(config)#ipv6 unicast-routing
D1(config)#no ip domain lookup
D1(config)#banner motd # D1, ENCOR Skills Assessment#
D1(config)#line con 0
D1(config-line)# exec-timeout 0 0
D1(config-line)# logging synchronous
D1(config-line)# exit
D1(config)#vlan 100
D1(config-vlan)# name Management
D1(config-vlan)# exit
D1(config)#vlan 101
D1(config-vlan)# name UserGroupA
D1(config-vlan)# exit
D1(config)#vlan 102
D1(config-vlan)# name UserGroupB
D1(config-vlan)# exit
D1(config)#vlan 999
D1(config-vlan)# name NATIVE
D1(config-vlan)# exit
D1(config)#interface Gi1/2
D1(config-if)# no switchport
D1(config-if)# ip address 10.30.10.2 255.255.255.0
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 10.30.100.1 255.255.255.0
D1(config-if)# ipv6 address fe80::d1:2 link-local
D1(config-if)# ip
*Oct 7 20:38:27.898: %LINK-3-UPDOWN: Interface GigabitEthernet1/2, changed state to up
*Oct 7 20:38:28.913: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/2, changed state to up
*Oct 7 20:38:29.738: %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan100, changed state to down
D1(config-if)# no shutdown

```

Figura 7. Configuración básica Switch D1

```

D1 - PuTTY
D1(config-if)# ip address 10.30.101.1 255.255.255.0
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 10.30.102.1 255.255.255.0
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 10.30.101.1 10.30.101.109
D1(config)#ip dhcp excluded-address 10.30.101.141 10.30.101.254
D1(config)#ip dhcp excluded-address 10.30.102.1 10.30.102.109
D1(config)#ip dhcp excluded-address 10.30.102.141 10.30.102.254
D1(config)#ip dhcp pool VLAN-101
D1(dhcp-config)# network 10.30.101.0 255.255.255.0
D1(dhcp-config)# default-router 10.30.101.254
D1(dhcp-config)# exit
D1(config)#ip dhcp pool VLAN-102
D1(dhcp-config)# network 10.30.102.0 255.255.255.0
D1(dhcp-config)# default-router 10.30.102.254
D1(dhcp-config)# exit
D1(config)#interface range Gi0/0-3,Gi1/0-1,Gi1/3,Gi2/0-3,Gi3/0-3
D1(config-if-range)# shutdown
D1(config-if-range)# exit
D1(config)#
*Oct 10 02:56:51.905: %PLATFORM-5-SIGNATURE_VERIFIED: Image 'flash0:/vios_l2-adventerprisek9-m' passed code signing verification
D1(config)#

```

Figura 8 Configuración básica Capa 3 Switch D1

Switch D2

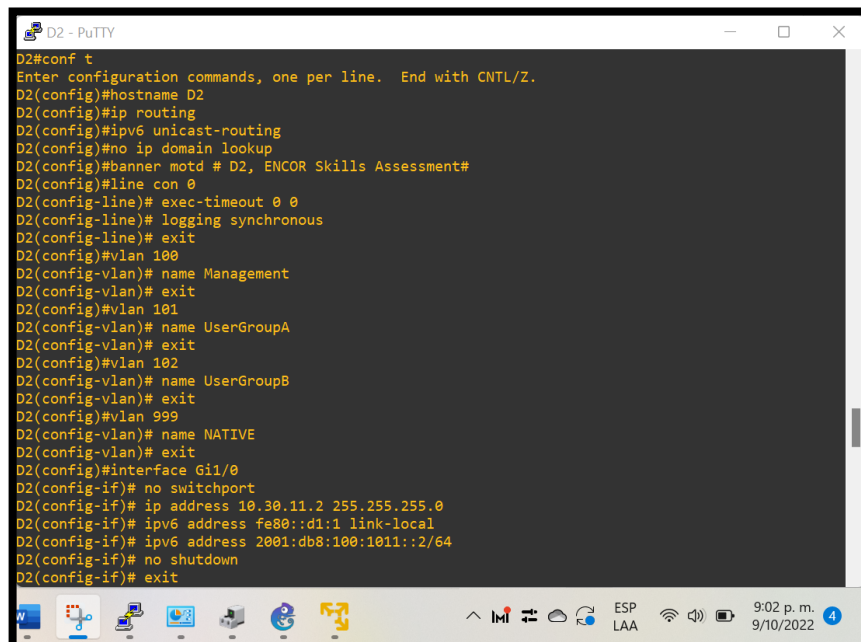
```

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 Gi1/0
  no switchport
  ip address 10.30.11.2 255.255.255.0
  ipv6 address fe80::d1:1 link-local
  ipv6 address 2001:db8:100:1011::2/64
  no shutdown
  exit
interface vlan 100
  ip address 10.30.100.2 255.255.255.0
  ipv6 address fe80::d2:2 link-local
  ipv6 address 2001:db8:100:100::2/64
  no shutdown
  exit
interface vlan 101
  ip address 10.30.101.2 255.255.255.0
  ipv6 address fe80::d2:3 link-local
  ipv6 address 2001:db8:100:101::2/64
  no shutdown
  exit
interface vlan 102
  ip address 10.30.102.2 255.255.255.0
  ipv6 address fe80::d2:4 link-local
  ipv6 address 2001:db8:100:102::2/64
  no shutdown
  exit
ip dhcp excluded-address 10.30.101.1 10.30.101.209
ip dhcp excluded-address 10.30.101.241 10.30.101.254
ip dhcp excluded-address 10.30.102.1 10.30.102.209
```

```
ip dhcp excluded-address 10.30.102.241 10.30.102.254
ip dhcp pool VLAN-101
  network 10.30.101.0 255.255.255.0
  default-router 10.30.101.254
  exit
ip dhcp pool VLAN-102
  network 10.30.102.0 255.255.255.0
  default-router 10.30.102.254
  exit
interface range Gi0/0-3,Gi1/1-3,Gi2/0-3,Gi3/0-3
  shutdown
  exit
```



```
D2-PuTTY
D2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
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 Gi1/0
D2(config-if)# no switchport
D2(config-if)# ip address 10.30.11.2 255.255.255.0
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
```

Figura 9. Configuración básica Switch D2

```
D2 - PuTTY
D2(config)#interface vlan 100
D2(config-if)# ip address 10.30.100.2 255.255.255.0
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 10.30.101.2 255.255.255.0
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 10.30.102.2 255.255.255.0
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 10.30.101.1 10.30.101.209
D2(config)#ip dhcp excluded-address 10.30.101.241 10.30.101.254
D2(config)#ip dhcp excluded-address 10.30.102.1 10.30.102.209
D2(config)#ip dhcp excluded-address 10.30.102.241 10.30.102.254
D2(config)#ip dhcp pool VLAN-101
D2(dhcp-config)# network 10.30.101.0 255.255.255.0
D2(dhcp-config)# default-router 10.30.101.254
D2(dhcp-config)# exit
D2(config)#ip dhcp pool VLAN-102
D2(dhcp-config)# network 10.30.102.0 255.255.255.0
D2(dhcp-config)# default-router 10.30.102.254
D2(dhcp-config)# exit
D2(config)#interface range Gi0/0-3,Gi1/1-3,Gi2/0-3,Gi3/0-3
D2(config-if-range)# shutdown
D2(config-if-range)# exit
```

Figura 10. Configuración básica Capa 3 Switch 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 10.30.100.3 255.255.255.0
  ipv6 address fe80::a1:1 link-local
  ipv6 address 2001:db8:100:100::3/64
  no shutdown
```



```

exit
interface range Gi0/0,Gi0/3,Gi1/0,Gi2/1-3,Gi3/0-3
shutdown
exit

```

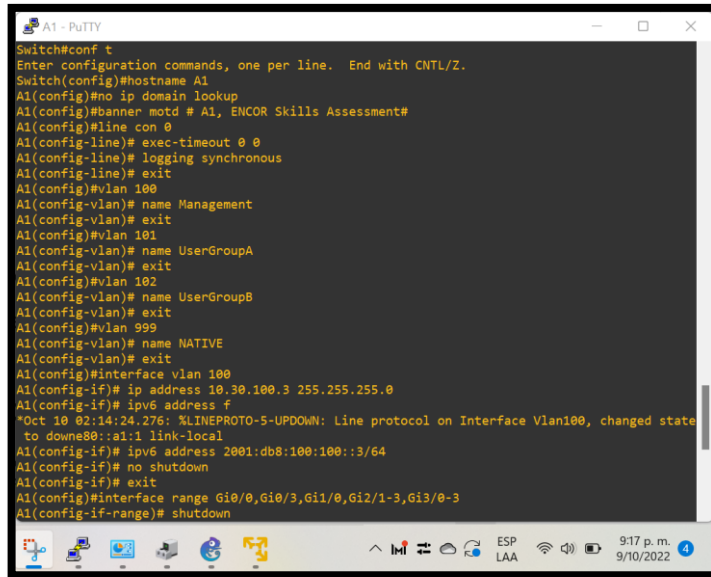


Figura 11. Configuración básica Switch A1

- b. Save the running configuration to startup-config on all devices.
- c. Configure PC 1 and PC 4 host addressing as shown in the addressing table. Assign a default gateway address of 10.30.100.254 which will be the HSRP virtual IP address used in Part 4.

```
PC1> ip 10.30.100.4/24 10.30.100.254
```

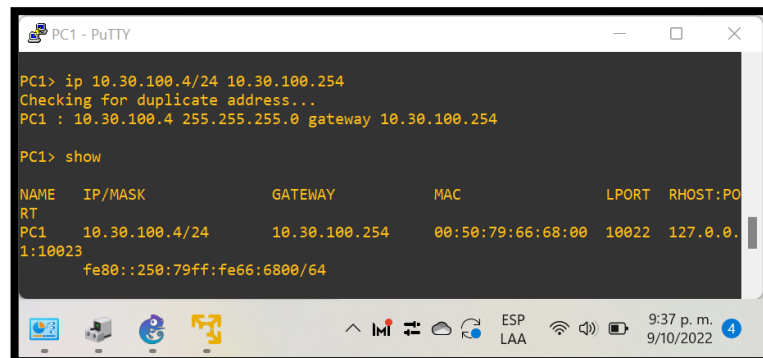


Figura 12. Configuración PC1

```
PC4> ip 10.30.100.6/24 10.30.100.254
```

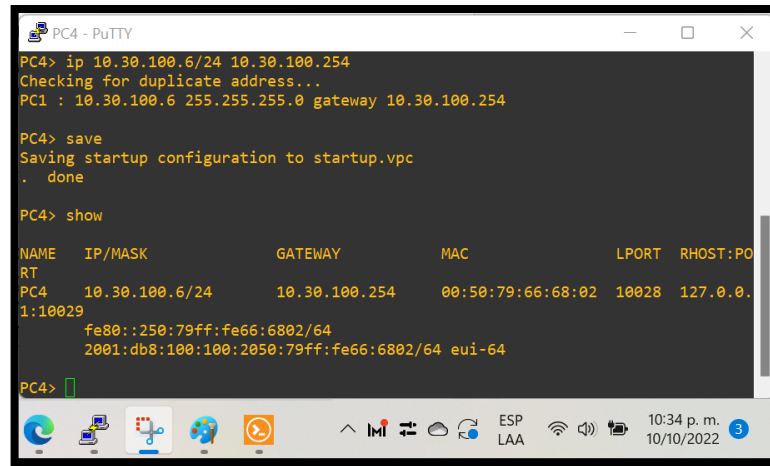


Figura 13. Configuración PC 4

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: <ul style="list-style-type: none"> • 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

Task#	Task	Specification	Points
2.5	On all switches, create LACP EtherChannels as shown in the topology diagram.	Use the following channel numbers: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • D1: 10.30.100.1 • D2: 10.30.100.2 • PC4: 10.30.100.6 PC2 should successfully ping: <ul style="list-style-type: none"> • D1: 10.30.102.1 • D2: 10.30.102.2 PC3 should successfully ping: <ul style="list-style-type: none"> • D1: 10.30.101.1 • D2: 10.30.101.2 PC4 should successfully ping: <ul style="list-style-type: none"> • D1: 10.30.100.1 • D2: 10.30.100.2 • PC1: 10.30.100.5 	1

Tabla 2. Tabla de Configuración

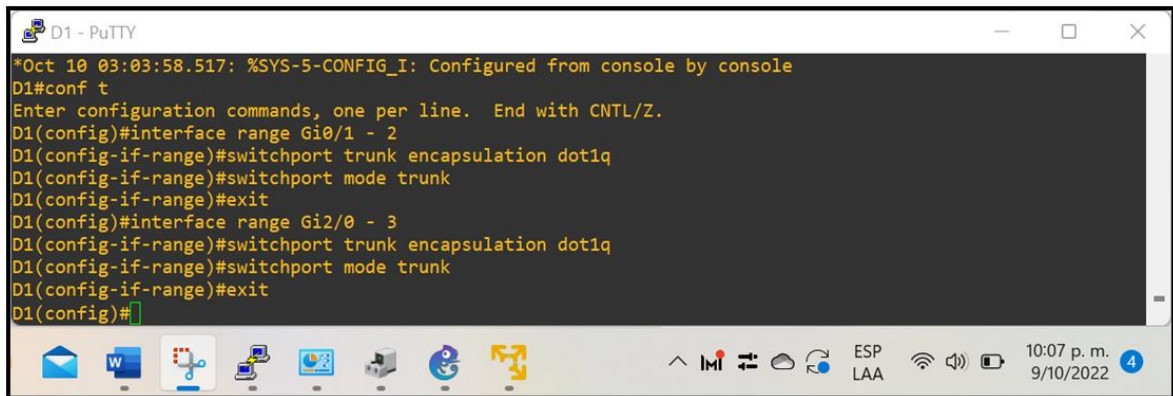
Configuración de Equipos

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

Switch D1

```
interface GigabitEthernet0/1
  switchport trunk encapsulation dot1q
  switchport mode trunk
  negotiation auto
```

```
!  
interface GigabitEthernet0/2  
  switchport trunk encapsulation dot1q  
  switchport mode trunk  
  negotiation auto  
!  
interface GigabitEthernet2/0  
  switchport trunk encapsulation dot1q  
  switchport mode trunk  
  negotiation auto  
!  
interface GigabitEthernet2/1  
  switchport trunk encapsulation dot1q  
  switchport mode trunk  
  negotiation auto  
!  
interface GigabitEthernet2/2  
  switchport trunk encapsulation dot1q  
  switchport mode trunk  
  negotiation auto  
!  
interface GigabitEthernet2/3  
  switchport trunk encapsulation dot1q  
  switchport mode trunk  
  negotiation auto  
!
```



```
D1 - PuTTY
*Oct 10 03:03:58.517: %SYS-5-CONFIG_I: Configured from console by console
D1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
D1(config)#interface range Gi0/1 - 2
D1(config-if-range)#switchport trunk encapsulation dot1q
D1(config-if-range)#switchport mode trunk
D1(config-if-range)#exit
D1(config)#interface range Gi2/0 - 3
D1(config-if-range)#switchport trunk encapsulation dot1q
D1(config-if-range)#switchport mode trunk
D1(config-if-range)#exit
D1(config)#
```

Figura 14. Configuración 802.1q Switch D1

Switch D2

```
interface GigabitEthernet1/1
  switchport trunk encapsulation dot1q
  switchport mode trunk
  negotiation auto
!
interface GigabitEthernet1/2
  switchport trunk encapsulation dot1q
  switchport mode trunk
  negotiation auto
!
interface GigabitEthernet2/0
  switchport trunk encapsulation dot1q
  switchport mode trunk
  negotiation auto
!
interface GigabitEthernet2/1
  switchport trunk encapsulation dot1q
  switchport mode trunk
  negotiation auto
!
interface GigabitEthernet2/2
  switchport trunk encapsulation dot1q
  switchport mode trunk
  negotiation auto
!
```

```
interface GigabitEthernet2/3
  switchport trunk encapsulation dot1q
  switchport mode trunk
  negotiation auto
!
```

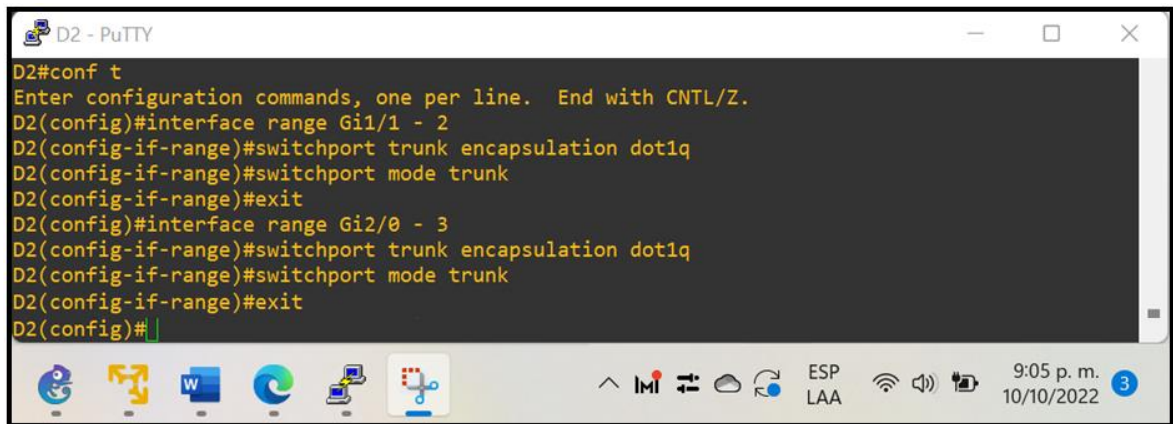


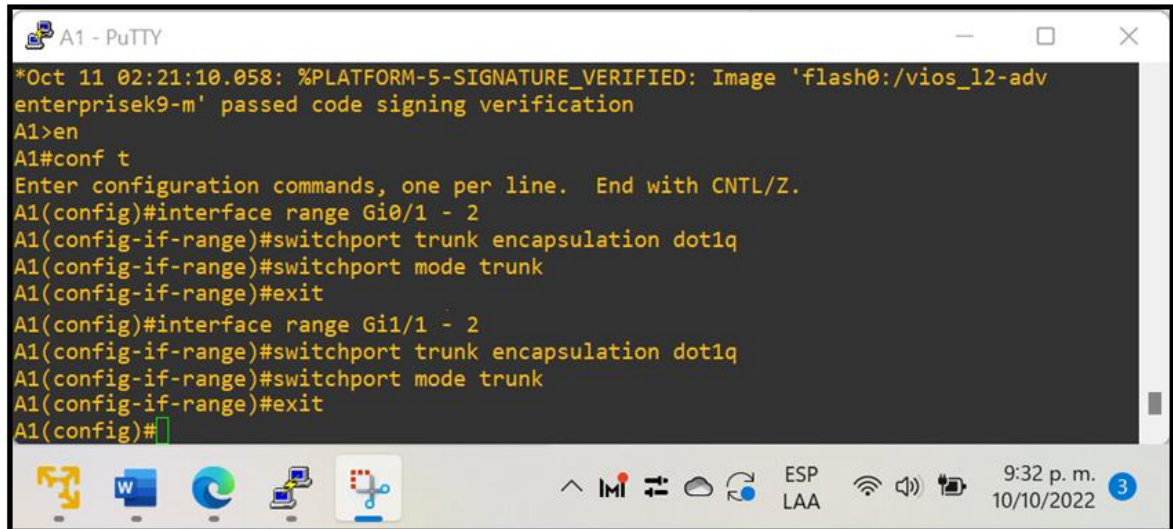
Figura 15. Configuración 802.1q Switch D2

Switch A1

```
interface GigabitEthernet0/1
  switchport trunk encapsulation dot1q
  switchport mode trunk
  negotiation auto
!
interface GigabitEthernet0/2
  switchport trunk encapsulation dot1q
  switchport mode trunk
  negotiation auto
!
interface GigabitEthernet1/1
  switchport trunk encapsulation dot1q
  switchport mode trunk
  negotiation auto
!
interface GigabitEthernet1/2
  switchport trunk encapsulation dot1q
  switchport mode trunk
```

```
negotiation auto
```

```
!
```



```
A1 - PuTTY
*Oct 11 02:21:10.058: %PLATFORM-5-SIGNATURE_VERIFIED: Image 'flash0:/vios_l2-adv
enterprisek9-m' passed code signing verification
A1>en
A1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
A1(config)#interface range Gi0/1 - 2
A1(config-if-range)#switchport trunk encapsulation dot1q
A1(config-if-range)#switchport mode trunk
A1(config-if-range)#exit
A1(config)#interface range Gi1/1 - 2
A1(config-if-range)#switchport trunk encapsulation dot1q
A1(config-if-range)#switchport mode trunk
A1(config-if-range)#exit
A1(config)#
```

Figura 16. Configuración 802.1q Switch A1

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

Switch D1

```
interface GigabitEthernet0/1
  switchport trunk native vlan 999
!
interface GigabitEthernet0/2
  switchport trunk native vlan 999
!
interface GigabitEthernet2/0
  switchport trunk native vlan 999
!
interface GigabitEthernet2/1
  switchport trunk native vlan 999
!
interface GigabitEthernet2/2
  switchport trunk native vlan 999
!
```

```
interface GigabitEthernet2/3
  switchport trunk native vlan 999
!
```

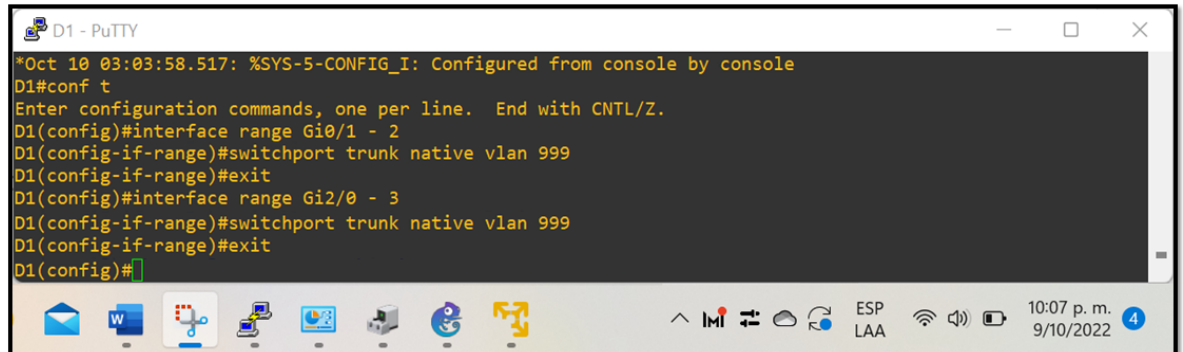
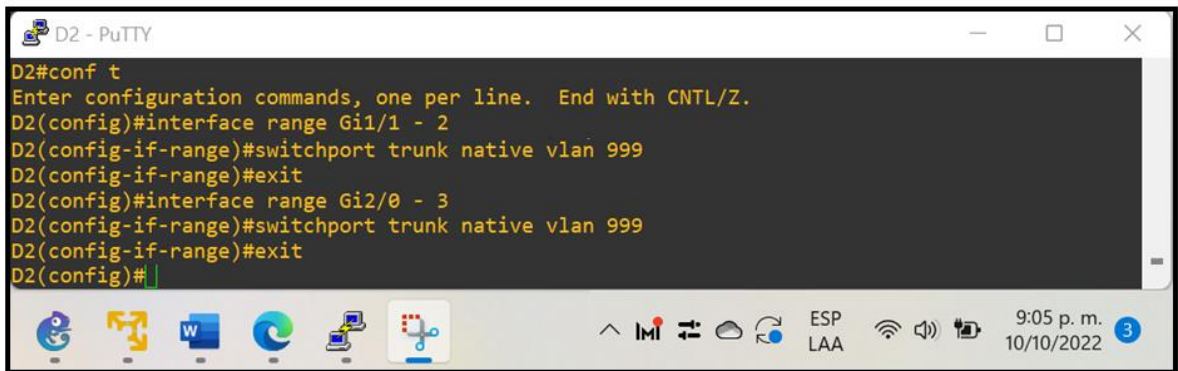


Figura 17. Configuración VLAN Nativa Switch D1

Switch D2

```
interface GigabitEthernet1/1
  switchport trunk native vlan 999
!
interface GigabitEthernet1/2
  switchport trunk native vlan 999
!
interface GigabitEthernet2/0
  switchport trunk native vlan 999
!
interface GigabitEthernet2/1
  switchport trunk native vlan 999
!
interface GigabitEthernet2/2
  switchport trunk native vlan 999
!
interface GigabitEthernet2/3
  switchport trunk native vlan 999
!
```

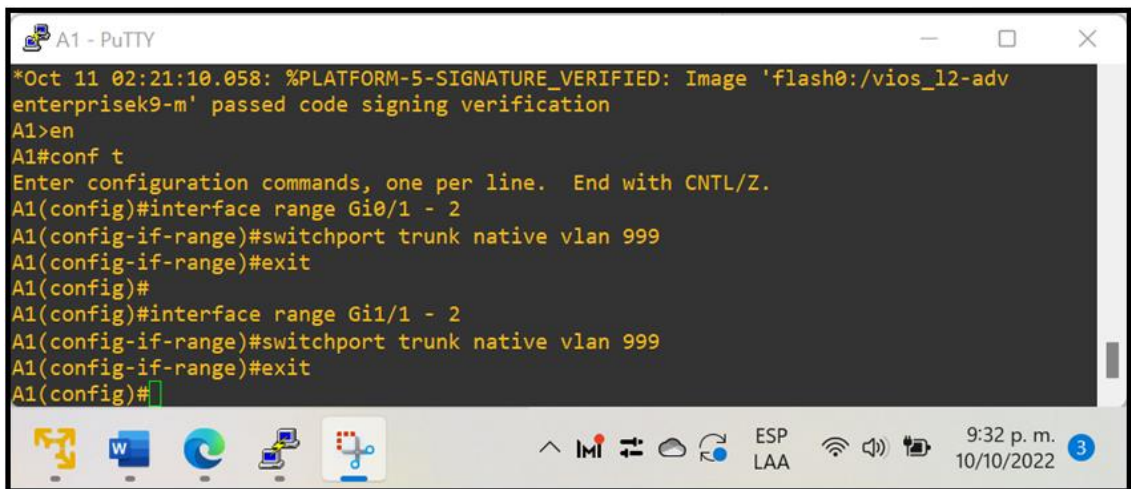



```
D2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
D2(config)#interface range Gi1/1 - 2
D2(config-if-range)#switchport trunk native vlan 999
D2(config-if-range)#exit
D2(config)#interface range Gi2/0 - 3
D2(config-if-range)#switchport trunk native vlan 999
D2(config-if-range)#exit
D2(config)#
```

Figura 18. Configuración VLAN Nativa Switch D2

Switch A1

```
interface GigabitEthernet0/1
switchport trunk native vlan 999
!
interface GigabitEthernet0/2
switchport trunk native vlan 999
!
interface GigabitEthernet1/1
switchport trunk native vlan 999
!
interface GigabitEthernet1/2
switchport trunk native vlan 999
!
```



```
*Oct 11 02:21:10.058: %PLATFORM-5-SIGNATURE_VERIFIED: Image 'flash0:/vios_l2-adv
enterprisek9-m' passed code signing verification
A1>en
A1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
A1(config)#interface range Gi0/1 - 2
A1(config-if-range)#switchport trunk native vlan 999
A1(config-if-range)#exit
A1(config)#
A1(config)#interface range Gi1/1 - 2
A1(config-if-range)#switchport trunk native vlan 999
A1(config-if-range)#exit
A1(config)#
```

Figura 19. Configuración VLAN Nativa Switch D2

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

Switch D1

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



The screenshot shows a PuTTY terminal window titled "D1 - PuTTY". The terminal output includes a timestamped message: "*Oct 10 03:03:58.517: %SYS-5-CONFIG_I: Configured from console by console". Below this, the user enters "D1#conf t", followed by the instruction "Enter configuration commands, one per line. End with CNTL/Z.". The user then enters "D1(config)#spanning-tree mode rapid-pvst" and the prompt returns to "D1(config)#". The Windows taskbar at the bottom shows the time as 10:07 p.m. on 9/10/2022.

Figura 20. Habilitación de protocolo Spanning-Tree Switch D1

Switch D2

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

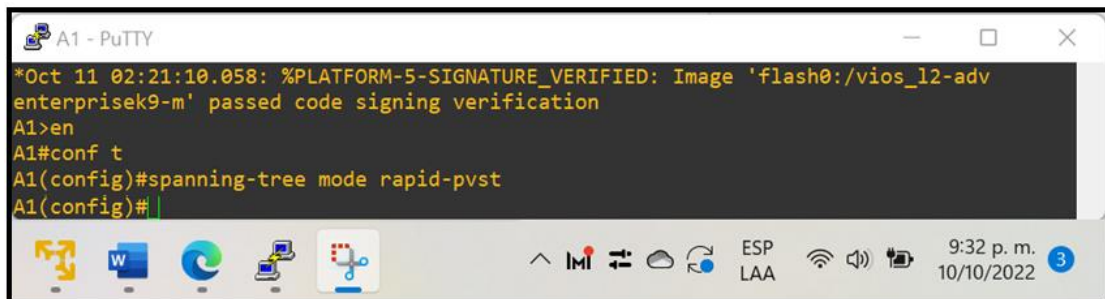


The screenshot shows a PuTTY terminal window titled "D2 - PuTTY". The terminal output includes the instruction "Enter configuration commands, one per line. End with CNTL/Z.". The user enters "D2(config)#spanning-tree mode rapid-pvst" and the prompt returns to "D2(config)#". The Windows taskbar at the bottom shows the time as 9:05 p.m. on 10/10/2022.

Figura 21. Habilitación de protocolo Spanning-Tree Switch D2

Switch A1

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



The screenshot shows a PuTTY terminal window titled "A1 - PuTTY". The terminal output includes a timestamped message: "*Oct 11 02:21:10.058: %PLATFORM-5-SIGNATURE_VERIFIED: Image 'flash0:/vios_l2-adv enterprisek9-m' passed code signing verification". Below this, the user enters "A1>en", followed by "A1#conf t", and then "A1(config)#spanning-tree mode rapid-pvst". The prompt returns to "A1(config)#". The Windows taskbar at the bottom shows the time as 9:32 p.m. on 10/10/2022.

Figura 22. Habilitación de protocolo Spanning-Tree Protocol Switch A1

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.

Switch D1

```
spanning-tree vlan 100,102 priority 24576
spanning-tree vlan 101 priority 28672
```

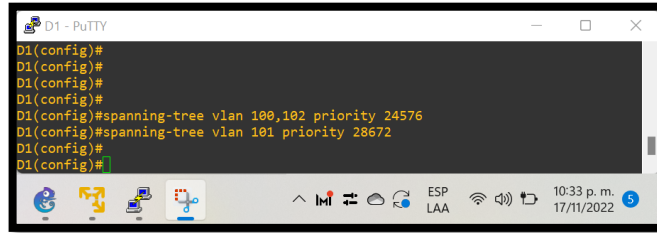


Figura 23. Configuración root bridge – Switch D1

Switch D2

```
spanning-tree vlan 100,102 priority 28672
spanning-tree vlan 101 priority 24576
```

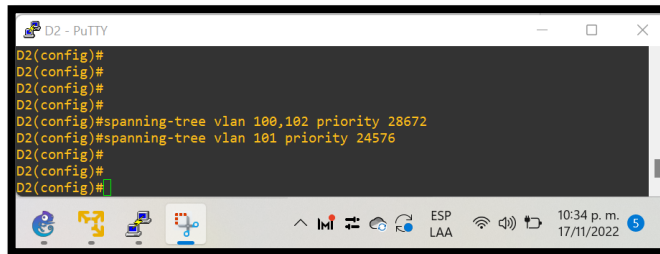


Figura 24. Configuración root bridge – Switch D2

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

Switch D1

```
interface GigabitEthernet0/1
channel-group 1 mode active
!
interface GigabitEthernet0/2
channel-group 1 mode active
!
interface GigabitEthernet2/0
channel-group 12 mode active
!
interface GigabitEthernet2/1
```

```

channel-group 12 mode active
!
interface GigabitEthernet2/2
channel-group 12 mode active
!
interface GigabitEthernet2/3
channel-group 12 mode active
!
interface Port-channel1
switchport trunk encapsulation dot1q
switchport trunk native vlan 999
switchport mode trunk
!
interface Port-channel12
switchport trunk encapsulation dot1q
switchport trunk native vlan 999
switchport mode trunk

```

```

D1(config)#
D1(config)#interface GigabitEthernet0/1
D1(config-if)#channel-group 1 mode active
D1(config-if)#!
D1(config-if)#interface GigabitEthernet2/0
D1(config-if)#channel-group 12 mode active
D1(config-if)#!
D1(config-if)#interface GigabitEthernet2/1
D1(config-if)#channel-group 12 mode active
D1(config-if)#!
D1(config-if)#interface GigabitEthernet2/2
D1(config-if)#channel-group 12 mode active
D1(config-if)#!
D1(config-if)#interface GigabitEthernet2/3
D1(config-if)#channel-group 12 mode active
D1(config-if)#!
D1(config-if)#interface Port-channel1
D1(config-if)#switchport trunk encapsulation dot1q
D1(config-if)#switchport trunk native vlan 999
D1(config-if)#switchport mode trunk
D1(config-if)#!
D1(config-if)#interface Port-channel12
D1(config-if)#switchport trunk encapsulation dot1q
D1(config-if)#switchport trunk native vlan 999
D1(config-if)#switchport mode trunk
D1(config-if)#

```

Figura 25. Creación LACP EtherChannels – Switch D1

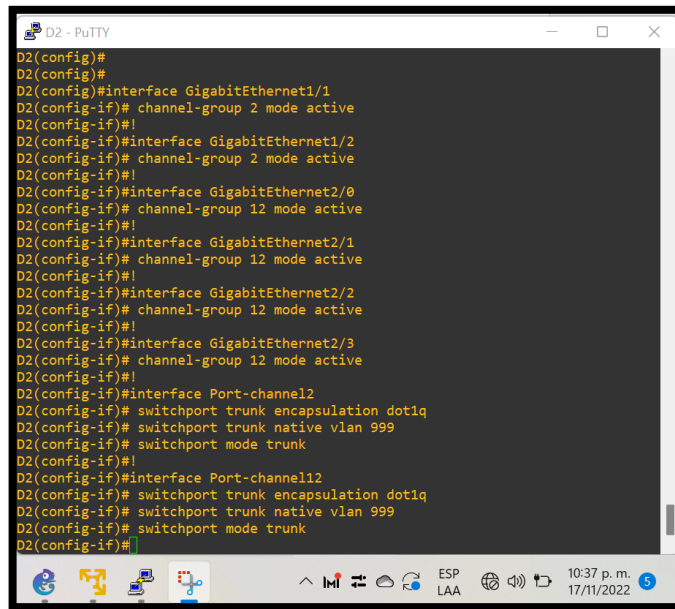
Switch D2

```

interface GigabitEthernet1/1
channel-group 2 mode active

```

```
!  
interface GigabitEthernet1/2  
  channel-group 2 mode active  
!  
interface GigabitEthernet2/0  
  channel-group 12 mode active  
!  
interface GigabitEthernet2/1  
  channel-group 12 mode active  
!  
interface GigabitEthernet2/2  
  channel-group 12 mode active  
!  
interface GigabitEthernet2/3  
  channel-group 12 mode active  
!  
interface Port-channel2  
  switchport trunk encapsulation dot1q  
  switchport trunk native vlan 999  
  switchport mode trunk  
!  
interface Port-channel12  
  switchport trunk encapsulation dot1q  
  switchport trunk native vlan 999  
  switchport mode trunk
```



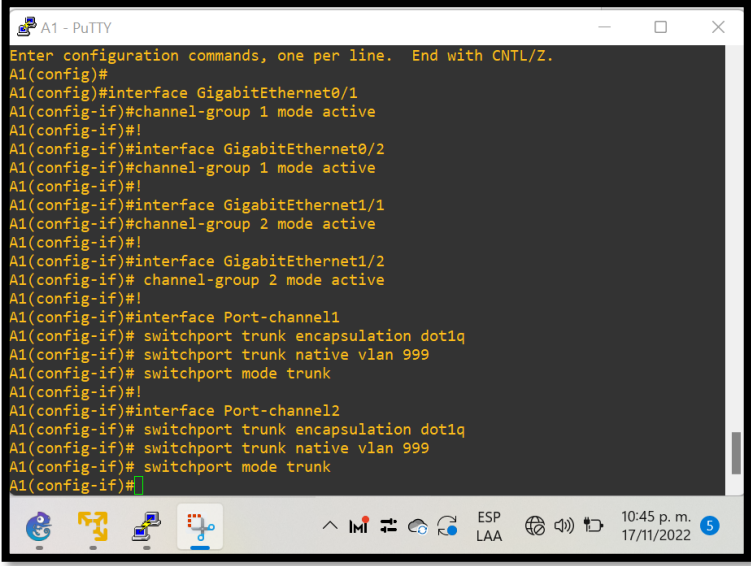
```
D2(config)#
D2(config)#
D2(config)#interface GigabitEthernet1/1
D2(config-if)# channel-group 2 mode active
D2(config-if)#!
D2(config-if)#interface GigabitEthernet1/2
D2(config-if)# channel-group 2 mode active
D2(config-if)#!
D2(config-if)#interface GigabitEthernet2/0
D2(config-if)# channel-group 12 mode active
D2(config-if)#!
D2(config-if)#interface GigabitEthernet2/1
D2(config-if)# channel-group 12 mode active
D2(config-if)#!
D2(config-if)#interface GigabitEthernet2/2
D2(config-if)# channel-group 12 mode active
D2(config-if)#!
D2(config-if)#interface GigabitEthernet2/3
D2(config-if)# channel-group 12 mode active
D2(config-if)#!
D2(config-if)#interface Port-channel2
D2(config-if)# switchport trunk encapsulation dot1q
D2(config-if)# switchport trunk native vlan 999
D2(config-if)# switchport mode trunk
D2(config-if)#!
D2(config-if)#interface Port-channel12
D2(config-if)# switchport trunk encapsulation dot1q
D2(config-if)# switchport trunk native vlan 999
D2(config-if)# switchport mode trunk
D2(config-if)#
```

Figura 26. Creación LACP EtherChannels – Switch D2

Switch A1

```
interface GigabitEthernet0/1
channel-group 1 mode active
!
interface GigabitEthernet0/2
channel-group 1 mode active
!
interface GigabitEthernet1/1
channel-group 2 mode active
!
interface GigabitEthernet1/2
channel-group 2 mode active
!
interface Port-channel1
switchport trunk encapsulation dot1q
switchport trunk native vlan 999
switchport mode trunk
!
interface Port-channel2
switchport trunk encapsulation dot1q
switchport trunk native vlan 999
```

switchport mode trunk



```
A1 - PuTTY
Enter configuration commands, one per line. End with CNTL/Z.
A1(config)#
A1(config)#interface GigabitEthernet0/1
A1(config-if)#channel-group 1 mode active
A1(config-if)#!
A1(config-if)#interface GigabitEthernet0/2
A1(config-if)#channel-group 1 mode active
A1(config-if)#!
A1(config-if)#interface GigabitEthernet1/1
A1(config-if)#channel-group 2 mode active
A1(config-if)#!
A1(config-if)#interface GigabitEthernet1/2
A1(config-if)# channel-group 2 mode active
A1(config-if)#!
A1(config-if)#interface Port-channel1
A1(config-if)# switchport trunk encapsulation dot1q
A1(config-if)# switchport trunk native vlan 999
A1(config-if)# switchport mode trunk
A1(config-if)#!
A1(config-if)#interface Port-channel2
A1(config-if)# switchport trunk encapsulation dot1q
A1(config-if)# switchport trunk native vlan 999
A1(config-if)# switchport mode trunk
A1(config-if)#
```

Figura 27. Creación LACP EtherChannels – Switch A1

Se procede a encender los puertos troncales que conectan los switches y verificar el estado de cada PortChannel

Switch D1

```
D1#show etherchannel summary
```

```
Flags: D - down          P - bundled in port-channel
```

```
I - stand-alone s - suspended
```

```
H - Hot-standby (LACP only)
```

```
R - Layer3          S - Layer2
```

```
U - in use          N - not in use, no aggregation
```

```
f - failed to allocate aggregator
```

```
M - not in use, minimum links not met
```

```
m - not in use, port not aggregated due to minimum links not met
```

```
u - unsuitable for bundling
```

```
w - waiting to be aggregated
```

```
d - default port
```

```
A - formed by Auto LAG
```

Number of channel-groups in use: 2

Number of aggregators: 2

Group	Port-channel	Protocol	Ports
1	Po1 (SU)	LACP	Gi0/1 (P) Gi0/2 (P)
12	Po12 (SU)	LACP	Gi2/0 (P) Gi2/1 (P) Gi2/2 (P) Gi2/3 (P)

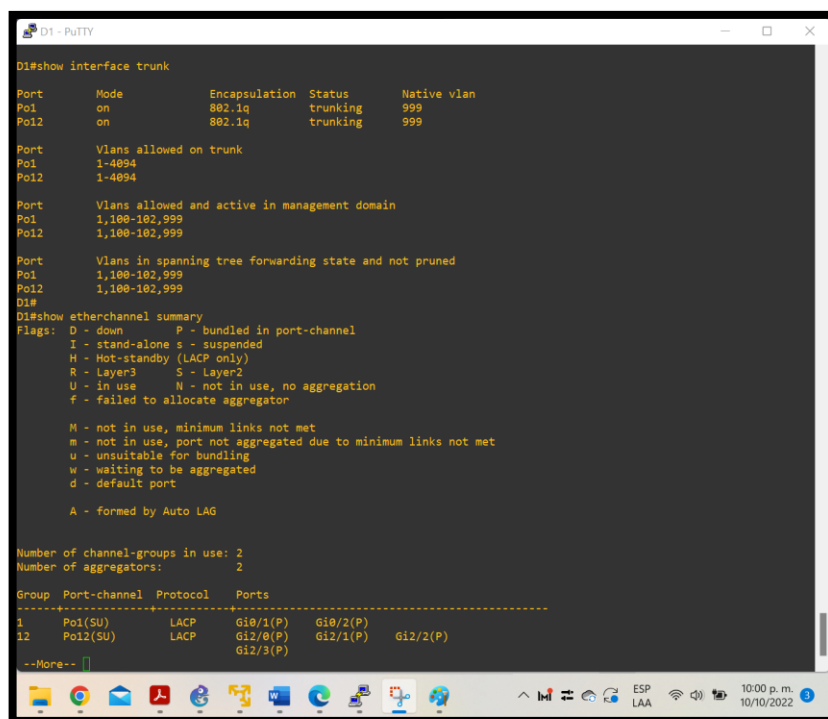


Figura 28. Verificación de estado de cada PortChannel – Switch D1

Switch D2

D2#show etherchannel summary

Flags: D - down P - bundled in port-channel

I - stand-alone s - suspended

H - Hot-standby (LACP only)

R - Layer3 S - Layer2

U - in use N - not in use, no aggregation
f - failed to allocate aggregator

M - not in use, minimum links not met
m - not in use, port not aggregated due to minimum links not met
u - unsuitable for bundling
w - waiting to be aggregated
d - default port

A - formed by Auto LAG

Number of channel-groups in use: 2

Number of aggregators: 2

Group	Port-channel	Protocol	Ports		
-----+-----+-----+-----					

2	Po2 (SU)	LACP	Gi1/1 (P)	Gi1/2 (P)	
12	Po12 (SU)	LACP	Gi2/0 (P)	Gi2/1 (P)	Gi2/2 (P)
			Gi2/3 (P)		

```

D2#show interface trunk

Port      Mode      Encapsulation  Status        Native vlan
Po2       on        802.1q         trunking      999
Po12      on        802.1q         trunking      999

Port      Vlans allowed on trunk
Po2       1-4894
Po12      1-4894

Port      Vlans allowed and active in management domain
Po2       1,100-102,999
Po12      1,100-102,999

Port      Vlans in spanning tree forwarding state and not pruned
Po2       1,100-102,999
Po12      1,100-102,999
D2#

D2#show etherchannel summary
Flags: D - down          P - bundled in port-channel
I - stand-alone s - suspended
H - Hot-standby (LACP only)
R - Layer3      S - Layer2
U - in use      N - not in use, no aggregation
f - failed to allocate aggregator

M - not in use, minimum links not met
m - not in use, port not aggregated due to minimum links not met
u - unsuitable for bundling
w - waiting to be aggregated
d - default port

A - formed by Auto LAG

Number of channel-groups in use: 2
Number of aggregators:          2

Group  Port-channel  Protocol    Ports
-----
2      Po2(SU)       LACP        Gi1/1(P)  Gi1/2(P)
12     Po12(SU)      LACP        Gi2/0(P)  Gi2/1(P)  Gi2/2(P)
Gi2/3(P)

```

Figura 29. Verificación de estado de cada PortChannel – Switch D2

Switch A1

```
A1#show etherchannel summary
```

```
Flags: D - down          P - bundled in port-channel
```

```
I - stand-alone s - suspended
```

```
H - Hot-standby (LACP only)
```

```
R - Layer3      S - Layer2
```

```
U - in use      N - not in use, no aggregation
```

```
f - failed to allocate aggregator
```

```
M - not in use, minimum links not met
```

```
m - not in use, port not aggregated due to minimum links not met
```

```
u - unsuitable for bundling
```

```
w - waiting to be aggregated
```

```
d - default port
```

```
A - formed by Auto LAG
```

Number of channel-groups in use: 2
Number of aggregators: 2

Group	Port-channel	Protocol	Ports
-------	--------------	----------	-------

1	Po1 (SU)	LACP	Gi0/1 (P) Gi0/2 (P)
2	Po2 (SU)	LACP	Gi1/1 (P) Gi1/2 (P)

```
A1#  
A1#show interface trunk  
  
Port      Mode      Encapsulation  Status        Native vlan  
Po1       on        802.1q         trunking     999  
Po2       on        802.1q         trunking     999  
  
Port      Vlans allowed on trunk  
Po1       1-4094  
Po2       1-4094  
  
Port      Vlans allowed and active in management domain  
Po1       1,100-102,999  
Po2       1,100-102,999  
  
Port      Vlans in spanning tree forwarding state and not pruned  
Po1       100,102  
Po2       1,101,999  
A1#  
A1#show etherchannel summary  
Flags: D - down          P - bundled in port-channel  
       I - stand-alone s - suspended  
       H - Hot-standby (LACP only)  
       R - Layer3          S - Layer2  
       U - in use         N - not in use, no aggregation  
       f - failed to allocate aggregator  
  
       M - not in use, minimum links not met  
       m - not in use, port not aggregated due to minimum links not met  
       u - unsuitable for bundling  
       w - waiting to be aggregated  
       d - default port  
  
       A - formed by Auto LAG  
  
Number of channel-groups in use: 2  
Number of aggregators: 2  
  
Group  Port-channel  Protocol  Ports  
-----+-----+-----+-----  
1      Po1(SU)       LACP     Gi0/1(P) Gi0/2(P)  
2      Po2(SU)       LACP     Gi1/1(P) Gi1/2(P)  
--More--
```

Figura 30. Verificación de estado de cada PortChannel – Switch A1

2.6 On all switches, configure host access ports connecting to PC1, PC2, PC3, and PC4.

Switch D1

```
interface GigabitEthernet0/0
switchport access vlan 100
switchport mode access
negotiation auto
spanning-tree portfast edge
```

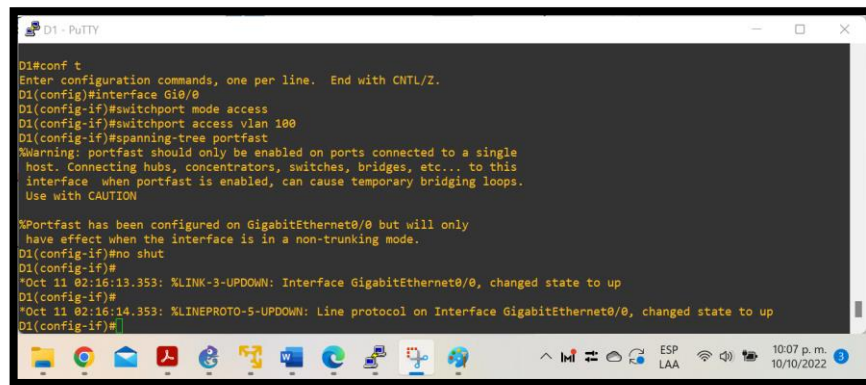


Figura 31. Configuración puertos de Acceso – Switch D1

Switch D2

```
interface GigabitEthernet0/0
switchport access vlan 102
switchport mode access
negotiation auto
spanning-tree portfast edge
```

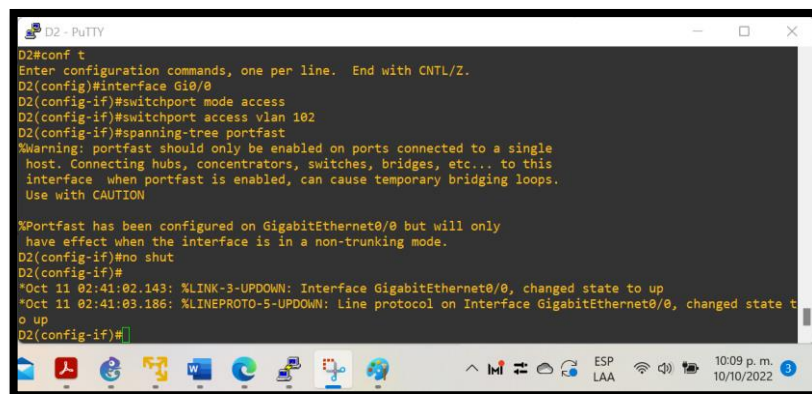
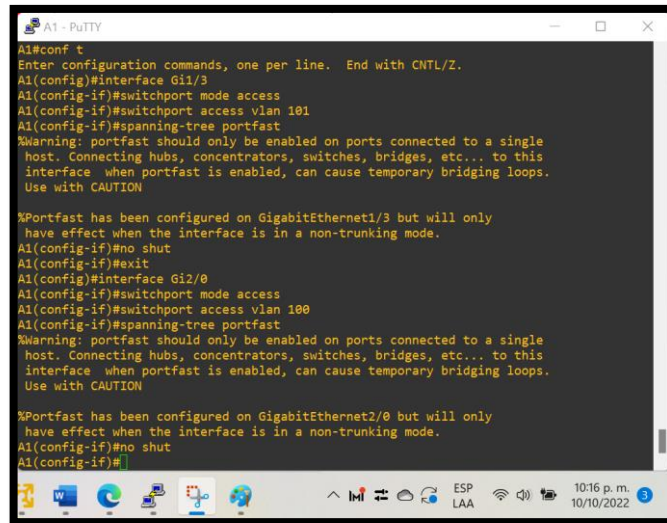


Figura 32. Configuración puertos de Acceso – Switch D2

Switch A1

```
interface GigabitEthernet1/3
switchport access vlan 101
switchport mode access
negotiation auto
spanning-tree portfast edge
!
interface GigabitEthernet2/0
switchport access vlan 100
switchport mode access
negotiation auto
spanning-tree portfast edge
```



```
A1 - PuTTY
A1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
A1(config)#interface Gi1/3
A1(config-if)#switchport mode access
A1(config-if)#switchport access vlan 101
A1(config-if)#spanning-tree portfast
%Warning: portfast should only be enabled on ports connected to a single
host. Connecting hubs, concentrators, switches, bridges, etc... to this
interface when portfast is enabled, can cause temporary bridging loops.
Use with CAUTION

%Portfast has been configured on GigabitEthernet1/3 but will only
have effect when the interface is in a non-trunking mode.
A1(config-if)#no shut
A1(config-if)#exit
A1(config)#interface Gi2/0
A1(config-if)#switchport mode access
A1(config-if)#switchport access vlan 100
A1(config-if)#spanning-tree portfast
%Warning: portfast should only be enabled on ports connected to a single
host. Connecting hubs, concentrators, switches, bridges, etc... to this
interface when portfast is enabled, can cause temporary bridging loops.
Use with CAUTION

%Portfast has been configured on GigabitEthernet2/0 but will only
have effect when the interface is in a non-trunking mode.
A1(config-if)#no shut
A1(config-if)#
```

Figura 33. Configuración puertos de Acceso – Switch A1

2.7 Verify IPv4 DHCP services: PC2 and PC3 are DHCP clients and should be receiving valid IPv4 addresses.

Se habilita DHCP en los PC2 y PC3 y verifico que hayan tomado el direccionamiento definido en el pool

```
PC3> ip dhcp
DORA IP 10.30.101.110/24 GW 10.30.101.254
```

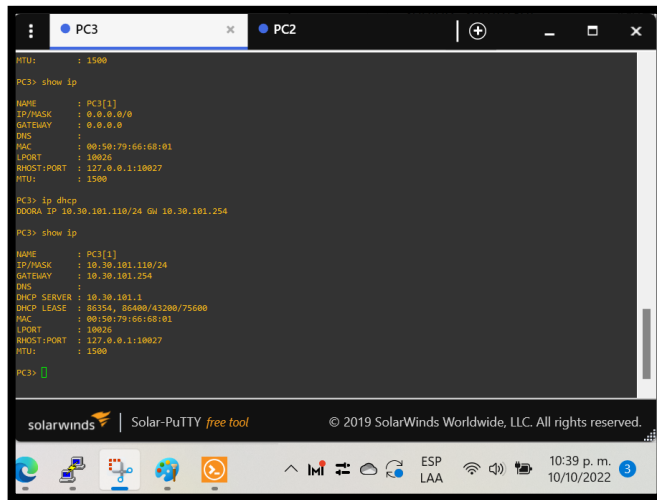


Figura 34. Habilitación DHCP – PC3

IP: 10.30.101.110/24

GW: 10.30.101.254

PC2> ip dhcp

DORA IP 10.30.102.110/24 GW 10.30.102.254

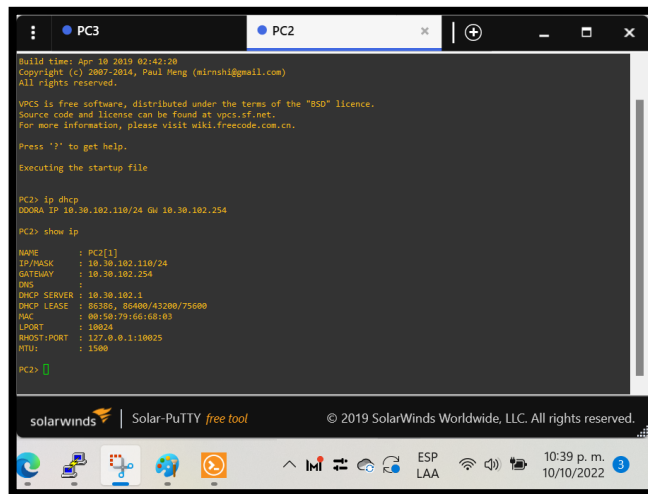


Figura 35. Habilitación DHCP – PC2

IP: 10.30.102.110/24

GW: 10.30.102.254

2.8 Verify local LAN connectivity

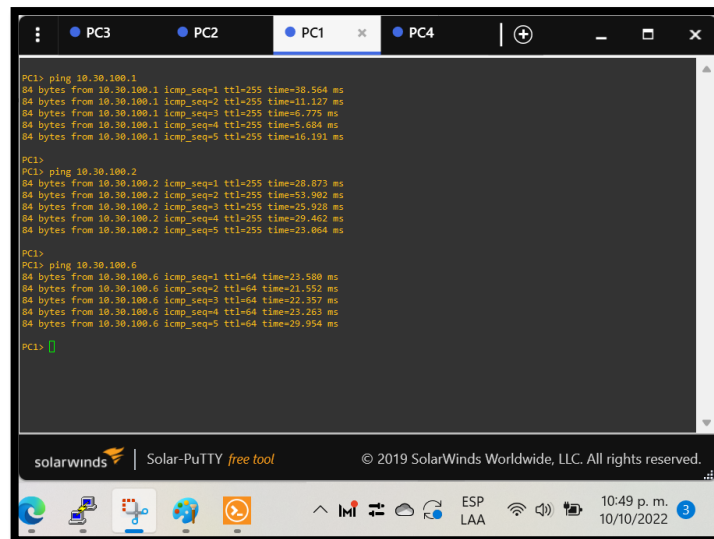
PC1 should successfully ping:

D1: 10.30.100.1
D2: 10.30.100.2
PC4: 10.30.100.6

```
PC1> ping 10.30.100.1
84 bytes from 10.30.100.1 icmp_seq=1 ttl=255 time=751.055 ms
84 bytes from 10.30.100.1 icmp_seq=2 ttl=255 time=329.231 ms
84 bytes from 10.30.100.1 icmp_seq=3 ttl=255 time=138.079 ms
84 bytes from 10.30.100.1 icmp_seq=4 ttl=255 time=187.044 ms
84 bytes from 10.30.100.1 icmp_seq=5 ttl=255 time=322.783 ms
```

```
PC1> ping 10.30.100.2
84 bytes from 10.30.100.2 icmp_seq=1 ttl=255 time=687.229 ms
84 bytes from 10.30.100.2 icmp_seq=2 ttl=255 time=245.189 ms
84 bytes from 10.30.100.2 icmp_seq=3 ttl=255 time=202.603 ms
84 bytes from 10.30.100.2 icmp_seq=4 ttl=255 time=125.198 ms
84 bytes from 10.30.100.2 icmp_seq=5 ttl=255 time=222.155 ms
```

```
PC1> ping 10.30.100.6
84 bytes from 10.30.100.6 icmp_seq=1 ttl=64 time=68.988 ms
84 bytes from 10.30.100.6 icmp_seq=2 ttl=64 time=59.965 ms
84 bytes from 10.30.100.6 icmp_seq=3 ttl=64 time=62.004 ms
84 bytes from 10.30.100.6 icmp_seq=4 ttl=64 time=78.488 ms
84 bytes from 10.30.100.6 icmp_seq=5 ttl=64 time=86.583 ms
```



The image shows a screenshot of a SolarWinds Solar-PuTTY terminal window. The window title bar indicates it is connected to PC1. The terminal output shows the results of three ping commands from PC1. The first command is for 10.30.100.1, showing five successful pings with times ranging from 138.079 ms to 751.055 ms. The second command is for 10.30.100.2, showing five successful pings with times ranging from 125.198 ms to 687.229 ms. The third command is for 10.30.100.6, showing five successful pings with times ranging from 59.965 ms to 86.583 ms. The terminal window is running on a Windows operating system, as indicated by the taskbar at the bottom.

Figura 36. Verificación de conectividad – PC1

PC2 should successfully ping:

D1: 10.30.102.1
D2: 10.30.102.2

```
PC2> ping 10.30.102.1
84 bytes from 10.30.102.1 icmp_seq=1 ttl=255 time=295.471 ms
84 bytes from 10.30.102.1 icmp_seq=2 ttl=255 time=211.317 ms
84 bytes from 10.30.102.1 icmp_seq=3 ttl=255 time=455.042 ms
84 bytes from 10.30.102.1 icmp_seq=4 ttl=255 time=352.197 ms
84 bytes from 10.30.102.1 icmp_seq=5 ttl=255 time=174.158 ms
```

```
PC2> ping 10.30.102.2
84 bytes from 10.30.102.2 icmp_seq=1 ttl=255 time=484.156 ms
84 bytes from 10.30.102.2 icmp_seq=2 ttl=255 time=402.490 ms
84 bytes from 10.30.102.2 icmp_seq=3 ttl=255 time=423.457 ms
84 bytes from 10.30.102.2 icmp_seq=4 ttl=255 time=127.473 ms
84 bytes from 10.30.102.2 icmp_seq=5 ttl=255 time=152.528 ms
```

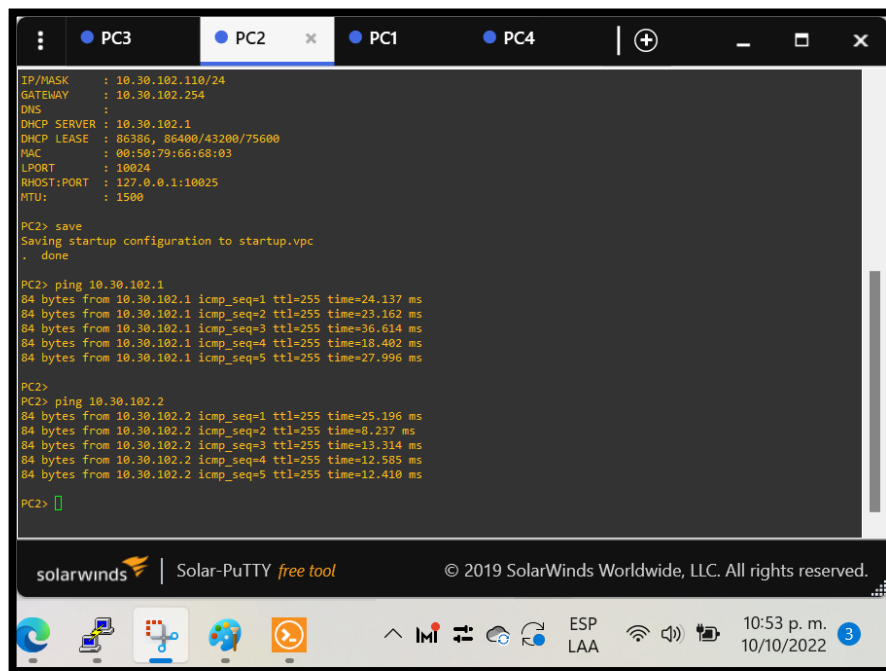


Figura 37. Verificación de conectividad – PC2

PC3 should successfully ping:

D1: 10.30.101.1
D2: 10.30.101.2

```
PC3> ping 10.30.101.1
84 bytes from 10.30.101.1 icmp_seq=1 ttl=255 time=210.094 ms
84 bytes from 10.30.101.1 icmp_seq=2 ttl=255 time=196.762 ms
84 bytes from 10.30.101.1 icmp_seq=3 ttl=255 time=250.798 ms
84 bytes from 10.30.101.1 icmp_seq=4 ttl=255 time=209.900 ms
84 bytes from 10.30.101.1 icmp_seq=5 ttl=255 time=263.184 ms
```

```
PC3>
PC3> ping 10.30.101.2
84 bytes from 10.30.101.2 icmp_seq=1 ttl=255 time=128.004 ms
```



```

84 bytes from 10.30.101.2 icmp_seq=2 ttl=255 time=140.095 ms
84 bytes from 10.30.101.2 icmp_seq=3 ttl=255 time=104.391 ms
84 bytes from 10.30.101.2 icmp_seq=4 ttl=255 time=243.363 ms
84 bytes from 10.30.101.2 icmp_seq=5 ttl=255 time=78.466 ms

```

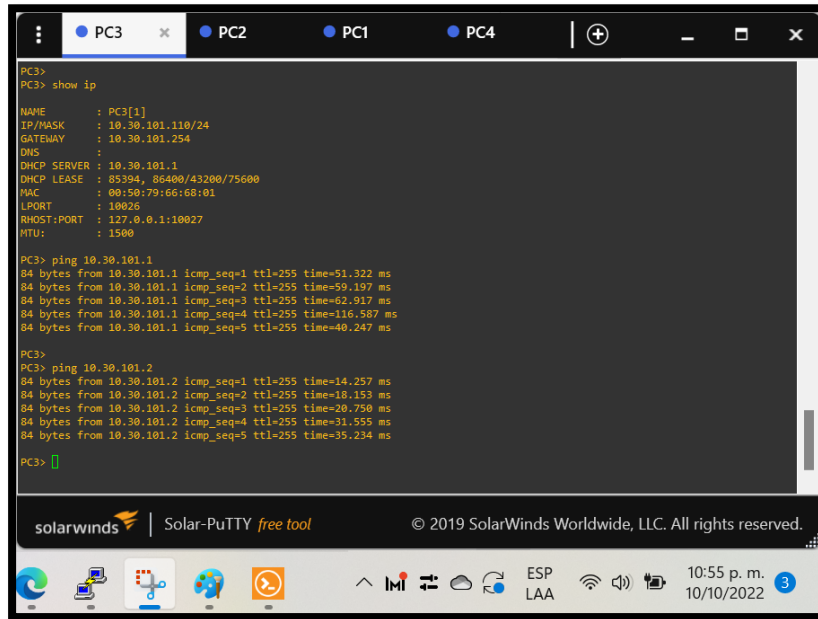


Figura 38. Verificación de conectividad – PC3

PC4 should successfully ping:

D1: 10.30.100.1
D2: 10.30.100.2
PC1: 10.30.100.5

```

PC4> ping 10.30.100.1
84 bytes from 10.30.100.1 icmp_seq=1 ttl=255 time=260.253 ms
84 bytes from 10.30.100.1 icmp_seq=2 ttl=255 time=386.472 ms
84 bytes from 10.30.100.1 icmp_seq=3 ttl=255 time=290.373 ms
84 bytes from 10.30.100.1 icmp_seq=4 ttl=255 time=274.351 ms
84 bytes from 10.30.100.1 icmp_seq=5 ttl=255 time=361.987 ms

```

```

PC4> ping 10.30.100.2
84 bytes from 10.30.100.2 icmp_seq=1 ttl=255 time=302.379 ms
84 bytes from 10.30.100.2 icmp_seq=2 ttl=255 time=298.774 ms
84 bytes from 10.30.100.2 icmp_seq=3 ttl=255 time=126.132 ms
84 bytes from 10.30.100.2 icmp_seq=4 ttl=255 time=365.701 ms
84 bytes from 10.30.100.2 icmp_seq=5 ttl=255 time=227.042 ms

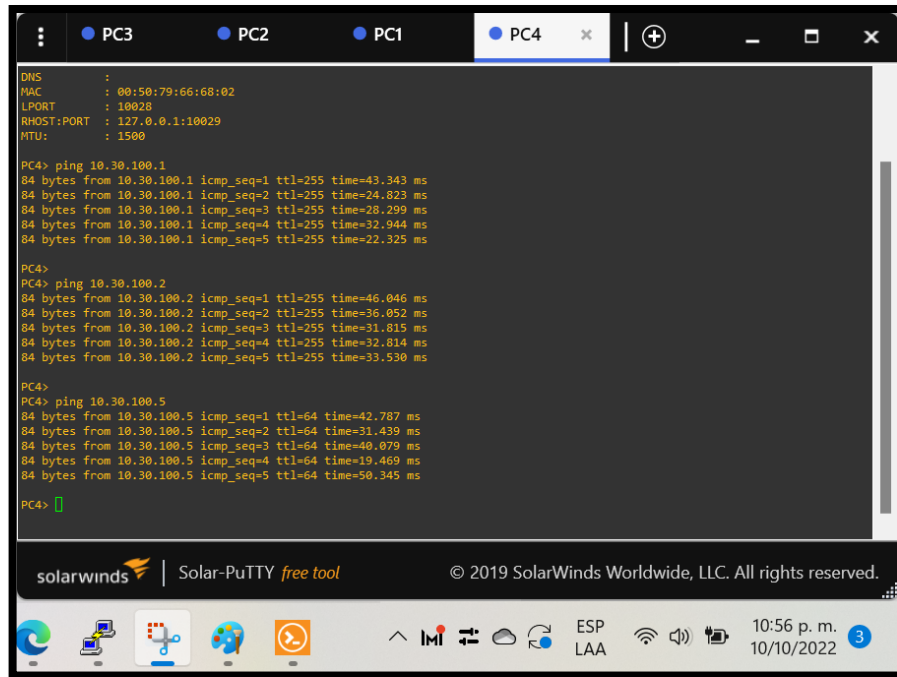
```

```

PC4> ping 10.30.100.5
84 bytes from 10.30.100.5 icmp_seq=1 ttl=64 time=30.633 ms
84 bytes from 10.30.100.5 icmp_seq=2 ttl=64 time=84.990 ms
84 bytes from 10.30.100.5 icmp_seq=3 ttl=64 time=82.448 ms
84 bytes from 10.30.100.5 icmp_seq=4 ttl=64 time=92.217 ms

```

84 bytes from 10.30.100.5 icmp_seq=5 ttl=64 time=94.666 ms



The image shows a SolarWinds Solar-PuTTY terminal window with a dark background. The window title bar includes tabs for PC3, PC2, PC1, and PC4. The terminal output shows the configuration for PC4 and the results of three ping tests. The first test is to 10.30.100.1, the second to 10.30.100.2, and the third to 10.30.100.5. Each test shows five successful pings with 84 bytes received and various TTL and time values. The final ping to 10.30.100.5 shows a TTL of 64 and a time of 94.666 ms. The terminal interface includes the SolarWinds logo, the text 'Solar-PuTTY free tool', and a copyright notice for SolarWinds Worldwide, LLC. The Windows taskbar is visible at the bottom with various system icons and a clock showing 10:56 p.m. on 10/10/2022.

```
DNS :  
MAC : 00:50:79:66:68:02  
LPORT : 10028  
RHOST:PORT : 127.0.0.1:10029  
MTU : 1500  
  
PC4> ping 10.30.100.1  
84 bytes from 10.30.100.1 icmp_seq=1 ttl=255 time=43.343 ms  
84 bytes from 10.30.100.1 icmp_seq=2 ttl=255 time=24.823 ms  
84 bytes from 10.30.100.1 icmp_seq=3 ttl=255 time=28.299 ms  
84 bytes from 10.30.100.1 icmp_seq=4 ttl=255 time=32.944 ms  
84 bytes from 10.30.100.1 icmp_seq=5 ttl=255 time=22.325 ms  
  
PC4>  
PC4> ping 10.30.100.2  
84 bytes from 10.30.100.2 icmp_seq=1 ttl=255 time=46.046 ms  
84 bytes from 10.30.100.2 icmp_seq=2 ttl=255 time=36.052 ms  
84 bytes from 10.30.100.2 icmp_seq=3 ttl=255 time=31.815 ms  
84 bytes from 10.30.100.2 icmp_seq=4 ttl=255 time=32.814 ms  
84 bytes from 10.30.100.2 icmp_seq=5 ttl=255 time=33.530 ms  
  
PC4>  
PC4> ping 10.30.100.5  
84 bytes from 10.30.100.5 icmp_seq=1 ttl=64 time=42.787 ms  
84 bytes from 10.30.100.5 icmp_seq=2 ttl=64 time=31.439 ms  
84 bytes from 10.30.100.5 icmp_seq=3 ttl=64 time=40.079 ms  
84 bytes from 10.30.100.5 icmp_seq=4 ttl=64 time=19.469 ms  
84 bytes from 10.30.100.5 icmp_seq=5 ttl=64 time=94.666 ms  
  
PC4> █
```

Figura 39. Verificación de conectividad – PC4

2. ESCENARIO 2

ENCOR Skills Assessment (Scenario 2)

Continuation of the Scenario 1

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.	<p>Use OSPF Process ID 4 and assign the following router-IDs:</p> <ul style="list-style-type: none">• R1: 0.0.4.1• R3: 0.0.4.3• D1: 0.0.4.131• D2: 0.0.4.132 <p>On R1, R3, D1, and D2, advertise all directly connected networks / VLANs in Area 0.</p> <ul style="list-style-type: none">• 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. <p>Disable OSPFv2 advertisements on:</p> <ul style="list-style-type: none">• D1: All interfaces except Gi1/2• D2: All interfaces except Gi1/0	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.	<p>Use OSPF Process ID 6 and assign the following router-IDs:</p> <ul style="list-style-type: none"> • R1: 0.0.6.1 • R3: 0.0.6.3 • D1: 0.0.6.131 • D2: 0.0.6.132 <p>On R1, R3, D1, and D2, advertise all directly connected networks / VLANs in Area 0.</p> <ul style="list-style-type: none"> • 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. <p>Disable OSPFv3 advertisements on:</p> <ul style="list-style-type: none"> • D1: All interfaces except Gi1/2 • D2: All interfaces except Gi1/0 	8
3.3	On R2 in the "ISP Network", configure MP-BGP.	<p>Configure two default static routes via interface Loopback 0:</p> <ul style="list-style-type: none"> • An IPv4 default static route. • An IPv6 default static route. <p>Configure R2 in BGP ASN 500 and use the router-id 2.2.2.2.</p> <p>Configure and enable an IPv4 and IPv6 neighbor relationship with R1 in ASN 300.</p> <p>In IPv4 address family, advertise:</p> <ul style="list-style-type: none"> • The Loopback 0 IPv4 network (/32). • The default route (0.0.0.0/0). <p>In IPv6 address family, advertise:</p> <ul style="list-style-type: none"> • 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.	<p>Configure two static summary routes to interface Null 0:</p> <ul style="list-style-type: none"> • A summary IPv4 route for 10.30.0.0/8. • A summary IPv6 route for 2001:db8:100::/48. <p>Configure R1 in BGP ASN 300 and use the router-id 1.1.1.1.</p> <p>Configure an IPv4 and IPv6 neighbor relationship with R2 in ASN 500.</p> <p>In IPv4 address family:</p> <ul style="list-style-type: none"> • Disable the IPv6 neighbor relationship. • Enable the IPv4 neighbor relationship. • Advertise the 10.30.0.0/8 network. <p>In IPv6 address family:</p> <ul style="list-style-type: none"> • Disable the IPv4 neighbor relationship. • Enable the IPv6 neighbor relationship. • Advertise the 2001:db8:100::/48 network. 	4

Tabla 3. Tabla de configuraciones Routing Protocol

Part 2: 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.	<p>Create two IP SLAs.</p> <ul style="list-style-type: none"> • Use SLA number 4 for IPv4. • Use SLA number 6 for IPv6. <p>The IP SLAs will test availability of R1 E1/2 interface every 5 seconds.</p> <p>Schedule the SLA for immediate implementation with no end time.</p> <p>Create an IP SLA object for IP SLA 4 and one for IP SLA 6.</p> <ul style="list-style-type: none"> • Use track number 4 for IP SLA 4. • Use track number 6 for IP SLA 6. <p>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.</p>	2
4.2	On D2, create IP SLAs that test the reachability of R3 interface E1/0.	<p>Create two IP SLAs.</p> <ul style="list-style-type: none"> • Use SLA number 4 for IPv4. • Use SLA number 6 for IPv6. <p>The IP SLAs will test availability of R3 E1/0 interface every 5 seconds.</p> <p>Schedule the SLA for immediate implementation with no end time.</p> <p>Create an IP SLA object for IP SLA 4 and one for IP SLA 6.</p> <ul style="list-style-type: none"> • Use track number 4 for IP SLA 4. • Use track number 6 for IP SLA 6. <p>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.</p>	2

Task#	Task	Specification	Points
4.3	On D1, configure HSRPv2.	<p>D1 is the primary router for VLANs 100 and 102; therefore, their priority will also be changed to 150.</p> <p>Configure HSRP version 2.</p> <p>Configure IPv4 HSRP group 104 for VLAN 100:</p> <ul style="list-style-type: none"> • Assign the virtual IP address 10.30.100.254. • Set the group priority to 150. • Enable preemption. • Track object 4 and decrement by 60. <p>Configure IPv4 HSRP group 114 for VLAN 101:</p> <ul style="list-style-type: none"> • Assign the virtual IP address 10.30.101.254. • Enable preemption. • Track object 4 to decrement by 60. <p>Configure IPv4 HSRP group 124 for VLAN 102:</p> <ul style="list-style-type: none"> • Assign the virtual IP address 10.30.102.254. • Set the group priority to 150. • Enable preemption. • Track object 4 to decrement by 60. <p>Configure IPv6 HSRP group 106 for VLAN 100:</p> <ul style="list-style-type: none"> • Assign the virtual IP address using ipv6 autoconfig. • Set the group priority to 150. • Enable preemption. • Track object 6 and decrement by 60. <p>Configure IPv6 HSRP group 116 for VLAN 101:</p> <ul style="list-style-type: none"> • Assign the virtual IP address using ipv6 autoconfig. • Enable preemption. • Track object 6 and decrement by 60. <p>Configure IPv6 HSRP group 126 for VLAN 102:</p> <ul style="list-style-type: none"> • 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.	<p>D2 is the primary router for VLAN 101; therefore, the priority will also be changed to 150.</p> <p>Configure HSRP version 2.</p> <p>Configure IPv4 HSRP group 104 for VLAN 100:</p> <ul style="list-style-type: none"> • Assign the virtual IP address 10.30.100.254. • Enable preemption. • Track object 4 and decrement by 60. <p>Configure IPv4 HSRP group 114 for VLAN 101:</p> <ul style="list-style-type: none"> • Assign the virtual IP address 10.30.101.254. • Set the group priority to 150. • Enable preemption. • Track object 4 to decrement by 60. <p>Configure IPv4 HSRP group 124 for VLAN 102:</p> <ul style="list-style-type: none"> • Assign the virtual IP address 10.30.102.254. • Enable preemption. • Track object 4 to decrement by 60. <p>Configure IPv6 HSRP group 106 for VLAN 100:</p> <ul style="list-style-type: none"> • Assign the virtual IP address using ipv6 autoconfig. • Enable preemption. • Track object 6 and decrement by 60. <p>Configure IPv6 HSRP group 116 for VLAN 101:</p> <ul style="list-style-type: none"> • Assign the virtual IP address using ipv6 autoconfig. • Set the group priority to 150. • Enable preemption. • Track object 6 and decrement by 60. <p>Configure IPv6 HSRP group 126 for VLAN 102:</p> <ul style="list-style-type: none"> • Assign the virtual IP address using ipv6 autoconfig. • Enable preemption. • Track object 6 and decrement by 60. 	

Tabla 4. Tabla de configuraciones first hop redundancy

Configure Routing Protocols

3.1 On the “Company Network” (i.e., R1, R3, D1, and D2), configure single-area OSPFv2 in area 0.

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

- R1: 0.0.4.1
- 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.

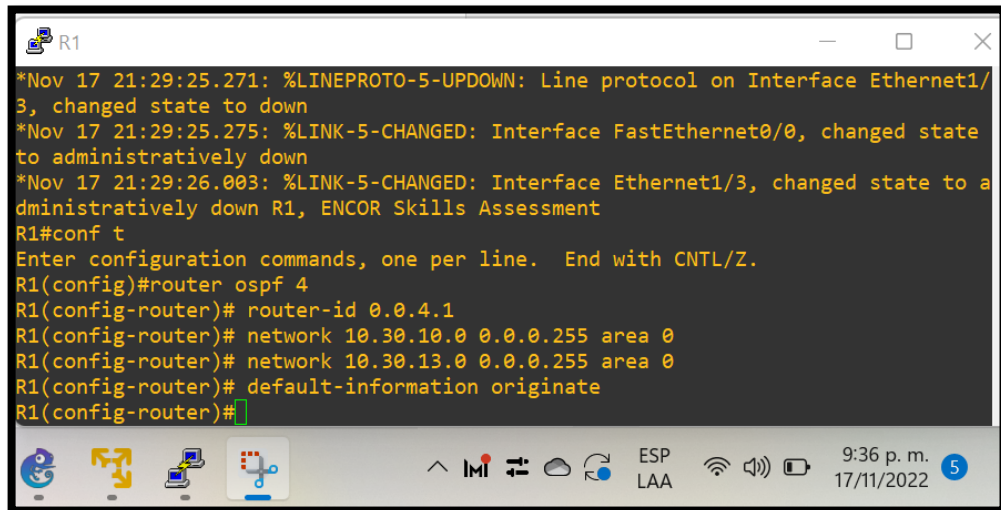
- On R1, do not advertise the R1 – R2 network.
- On R1, propagate a default route. Note that the default route will be provided by BGP.

Disable OSPFv2 advertisements on:

- D1: All interfaces except Gi1/2
- D2: All interfaces except Gi1/0

Router R1

```
router ospf 4
router-id 0.0.4.1
network 10.30.10.0 0.0.0.255 area 0
network 10.30.13.0 0.0.0.255 area 0
default-information originate
```

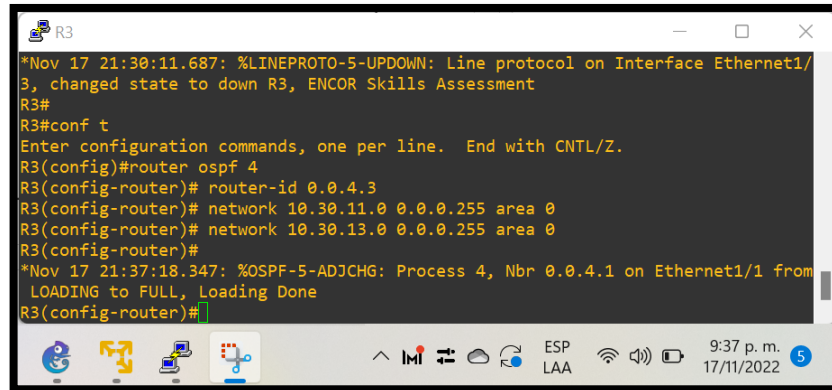


```
R1
*Nov 17 21:29:25.271: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/3, changed state to down
*Nov 17 21:29:25.275: %LINK-5-CHANGED: Interface FastEthernet0/0, changed state to administratively down
*Nov 17 21:29:26.003: %LINK-5-CHANGED: Interface Ethernet1/3, changed state to administratively down
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#router ospf 4
R1(config-router)# router-id 0.0.4.1
R1(config-router)# network 10.30.10.0 0.0.0.255 area 0
R1(config-router)# network 10.30.13.0 0.0.0.255 area 0
R1(config-router)# default-information originate
R1(config-router)#
```

Figura 40. Configuración de OSPF v2 – Router R1

Router R3

```
router ospf 4
router-id 0.0.4.3
network 10.30.11.0 0.0.0.255 area 0
network 10.30.13.0 0.0.0.255 area 0
```

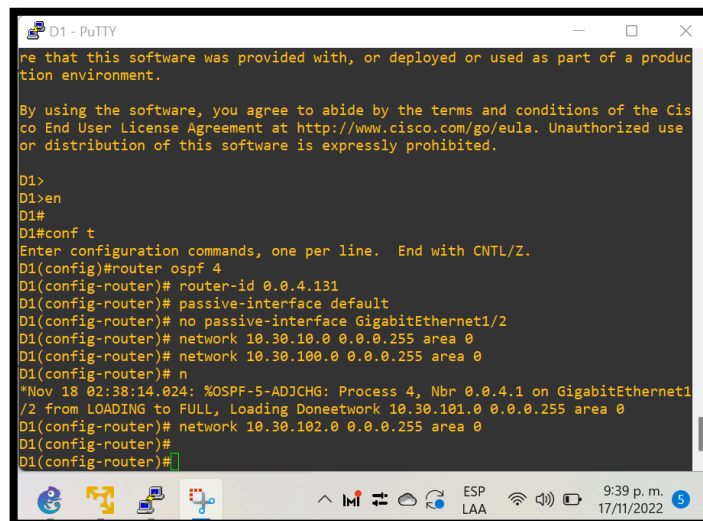


```
R3
*Nov 17 21:30:11.687: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/3, changed state to down R3, ENCOR Skills Assessment
R3#
R3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#router ospf 4
R3(config-router)# router-id 0.0.4.3
R3(config-router)# network 10.30.11.0 0.0.0.255 area 0
R3(config-router)# network 10.30.13.0 0.0.0.255 area 0
R3(config-router)#
*Nov 17 21:37:18.347: %OSPF-5-ADJCHG: Process 4, Nbr 0.0.4.1 on Ethernet1/1 from LOADING to FULL, Loading Done
R3(config-router)#
```

Figura 41. Configuración de OSPF v2 – Router R3

Switch D1

```
router ospf 4
router-id 0.0.4.131
passive-interface default
no passive-interface GigabitEthernet1/2
network 10.30.10.0 0.0.0.255 area 0
network 10.30.100.0 0.0.0.255 area 0
network 10.30.101.0 0.0.0.255 area 0
network 10.30.102.0 0.0.0.255 area 0
```



```
D1 - PuTTY
re that this software was provided with, or deployed or used as part of a production environment.

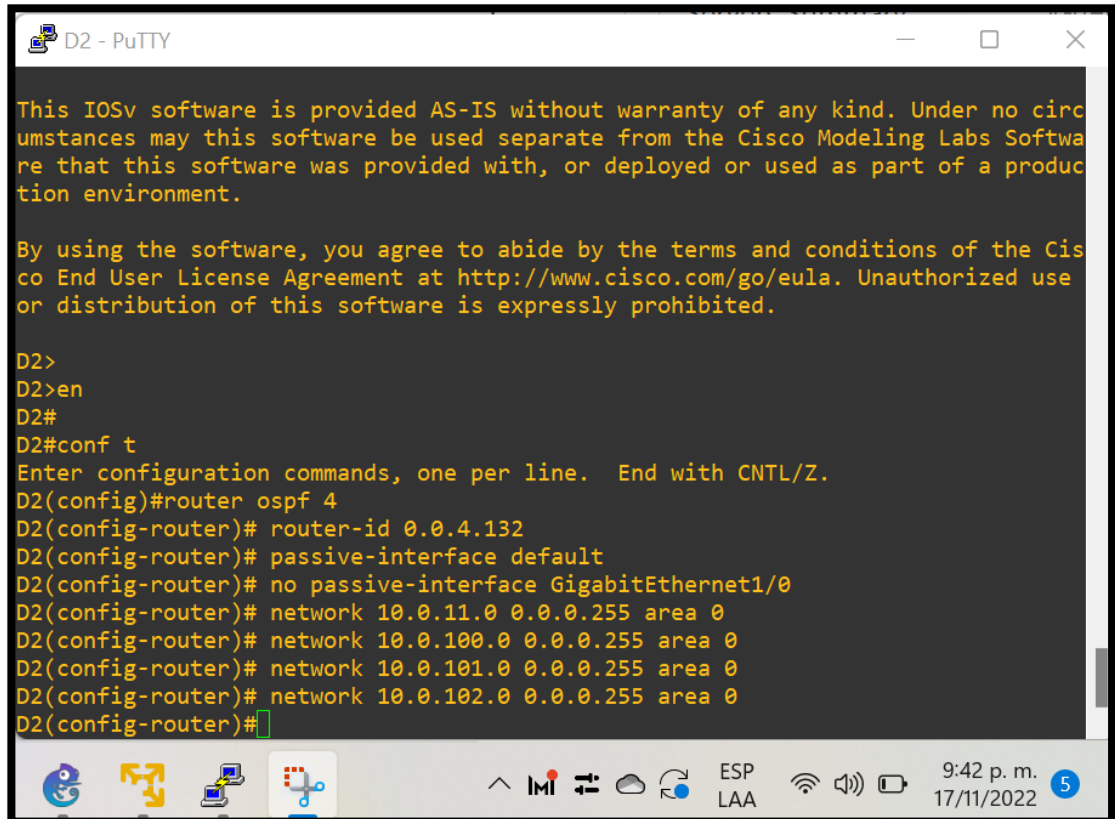
By using the software, you agree to abide by the terms and conditions of the Cisco End User License Agreement at http://www.cisco.com/go/eula. Unauthorized use or distribution of this software is expressly prohibited.

D1>
D1>en
D1#
D1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
D1(config)#router ospf 4
D1(config-router)# router-id 0.0.4.131
D1(config-router)# passive-interface default
D1(config-router)# no passive-interface GigabitEthernet1/2
D1(config-router)# network 10.30.10.0 0.0.0.255 area 0
D1(config-router)# network 10.30.100.0 0.0.0.255 area 0
D1(config-router)# n
*Nov 18 02:38:14.024: %OSPF-5-ADJCHG: Process 4, Nbr 0.0.4.1 on GigabitEthernet1/2 from LOADING to FULL, Loading Done
D1(config-router)# network 10.30.101.0 0.0.0.255 area 0
D1(config-router)#
D1(config-router)#
```

Figura 42. Configuración de OSPF v2– Switch D1

Switch D2

```
router ospf 4
router-id 0.0.4.132
passive-interface default
no passive-interface GigabitEthernet1/0
network 10.0.11.0 0.0.0.255 area 0
network 10.0.100.0 0.0.0.255 area 0
network 10.0.101.0 0.0.0.255 area 0
network 10.0.102.0 0.0.0.255 area 0
```



```
D2 - PuTTY
This IOSv software is provided AS-IS without warranty of any kind. Under no circumstances may this software be used separate from the Cisco Modeling Labs Software that this software was provided with, or deployed or used as part of a production environment.

By using the software, you agree to abide by the terms and conditions of the Cisco End User License Agreement at http://www.cisco.com/go/eula. Unauthorized use or distribution of this software is expressly prohibited.

D2>
D2>en
D2#
D2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
D2(config)#router ospf 4
D2(config-router)# router-id 0.0.4.132
D2(config-router)# passive-interface default
D2(config-router)# no passive-interface GigabitEthernet1/0
D2(config-router)# network 10.0.11.0 0.0.0.255 area 0
D2(config-router)# network 10.0.100.0 0.0.0.255 area 0
D2(config-router)# network 10.0.101.0 0.0.0.255 area 0
D2(config-router)# network 10.0.102.0 0.0.0.255 area 0
D2(config-router)#
```

Figura 43. Configuración de OSPF v2 – Switch D2

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 Gi1/2
D2: All interfaces except Gi1/0

Router R1

```
ipv6 router ospf 6
 router-id 0.0.6.1
 default-information originate
 exit
interface Eth1/1
 ipv6 ospf 6 area 0
 exit
interface Eth1/2
 ipv6 ospf 6 area 0
 exit
```

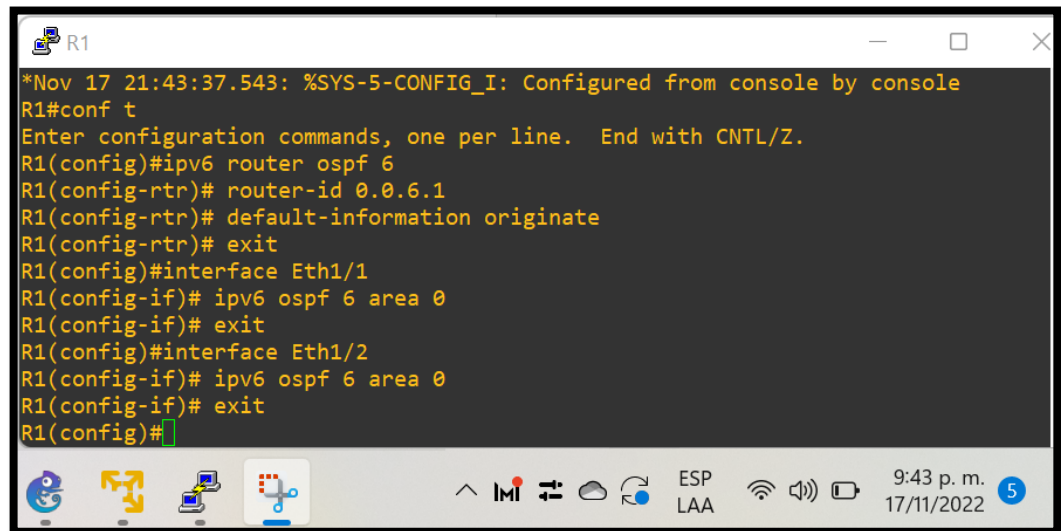


Figura 44. Configuración de OSPF v3 – Router R1

Router R3

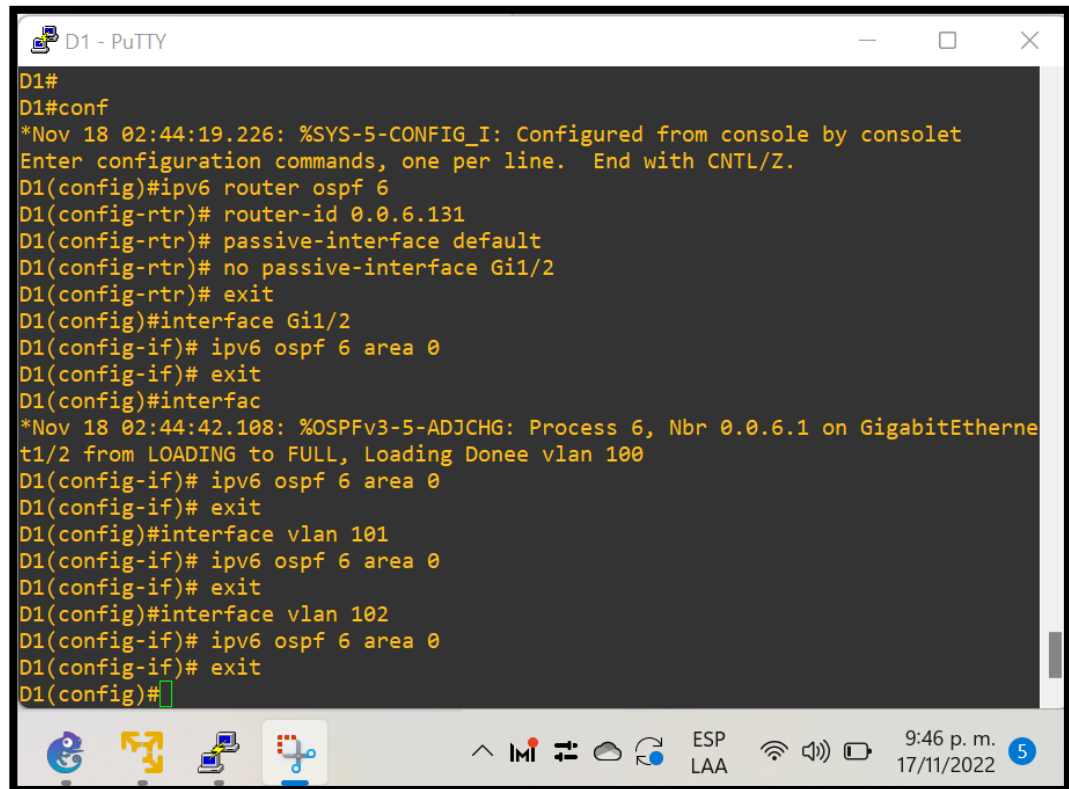
```
ipv6 router ospf 6
 router-id 0.0.6.3
 exit
interface Eth1/0
 ipv6 ospf 6 area 0
 exit
interface Eth1/1
 ipv6 ospf 6 area 0
 exit
```

```
R3
R3(config)#ipv6 router ospf 6
R3(config-rtr)# router-id 0.0.6.3
R3(config-rtr)# exit
R3(config)#interface Eth1/0
R3(config-if)# ipv6 ospf 6 area 0
R3(config-if)# exit
R3(config)#interface Eth1/1
R3(config-if)# ipv6 ospf 6 area 0
R3(config-if)# exit
R3(config)#
*Nov 17 21:44:50.675: %OSPFv3-5-ADJCHG: Process 6, Nbr 0.0.6.1 on Ethernet1/1 fr
om LOADING to FULL, Loading Done
R3(config)#
```

Figura 45. Configuración de OSPF v3 – Router R3

Switch D1

```
ipv6 router ospf 6
 router-id 0.0.6.131
 passive-interface default
 no passive-interface Gi1/2
 exit
interface Gi1/2
 ipv6 ospf 6 area 0
 exit
interface vlan 100
 ipv6 ospf 6 area 0
 exit
interface vlan 101
 ipv6 ospf 6 area 0
 exit
interface vlan 102
 ipv6 ospf 6 area 0
 exit
```

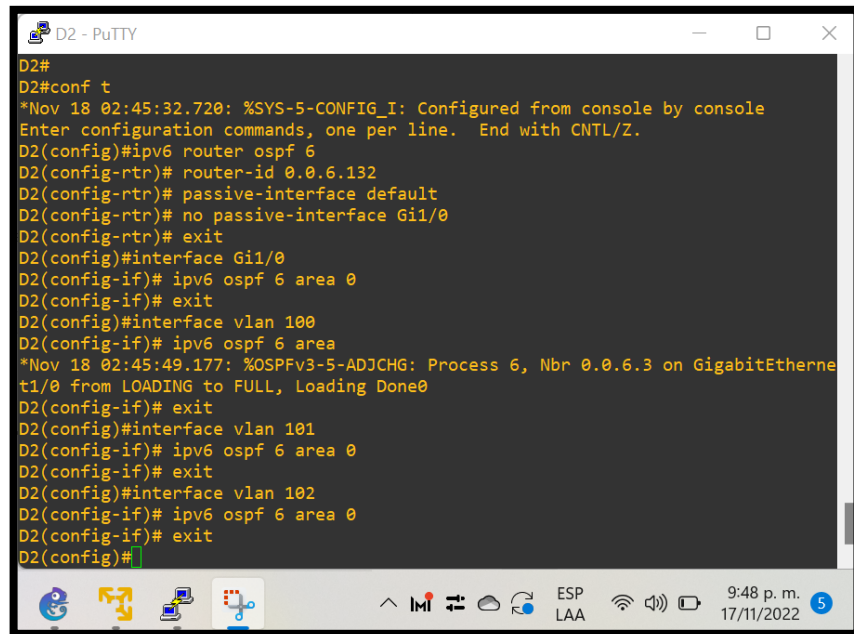


```
D1#
D1#conf
*Nov 18 02:44:19.226: %SYS-5-CONFIG_I: Configured from console by consolet
Enter configuration commands, one per line. End with CNTL/Z.
D1(config)#ipv6 router ospf 6
D1(config-rtr)# router-id 0.0.6.131
D1(config-rtr)# passive-interface default
D1(config-rtr)# no passive-interface Gi1/2
D1(config-rtr)# exit
D1(config)#interface Gi1/2
D1(config-if)# ipv6 ospf 6 area 0
D1(config-if)# exit
D1(config)#interfac
*Nov 18 02:44:42.108: %OSPFv3-5-ADJCHG: Process 6, Nbr 0.0.6.1 on GigabitEtherne
t1/2 from LOADING to FULL, Loading Donee 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
D1(config)#
```

Figura 46. Configuración de OSPF v3 – Switch D1

Switch D2

```
ipv6 router ospf 6
  router-id 0.0.6.132
  passive-interface default
  no passive-interface Gi1/0
  exit
interface Gi1/0
  ipv6 ospf 6 area 0
  exit
interface vlan 100
  ipv6 ospf 6 area 0
  exit
interface vlan 101
  ipv6 ospf 6 area 0
  exit
interface vlan 102
  ipv6 ospf 6 area 0
  exit
```



```
D2#
D2#conf t
*Nov 18 02:45:32.720: %SYS-5-CONFIG_I: Configured from console by console
Enter configuration commands, one per line. End with CNTL/Z.
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 Gi1/0
D2(config-rtr)# exit
D2(config)#interface Gi1/0
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
*Nov 18 02:45:49.177: %OSPFv3-5-ADJCHG: Process 6, Nbr 0.0.6.3 on GigabitEthernet1/0 from LOADING to FULL, Loading Done0
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
D2(config)#
```

Figura 47. Configuración de OSPF v3 – Switch D2

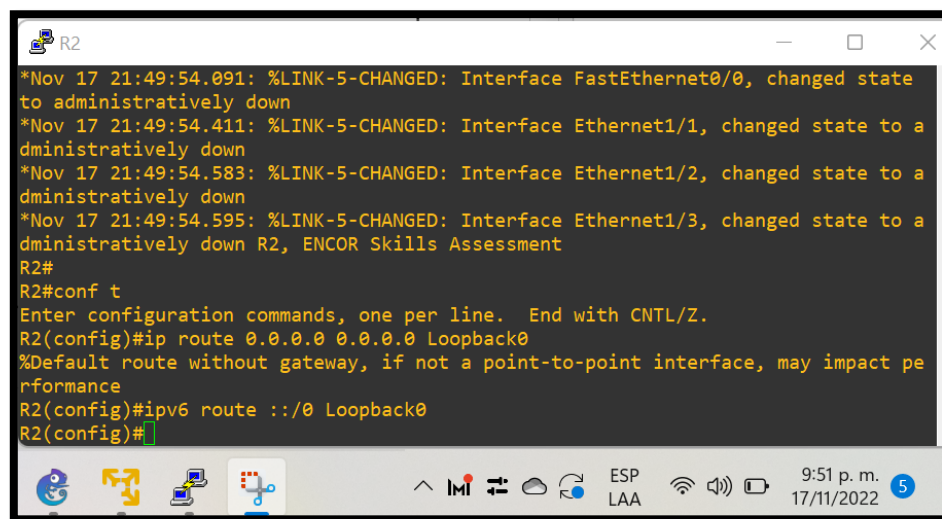
3.3 On R2 in the “ISP Network”, configure MP-BGP.

Router R2

Configure two default static routes via interface Loopback 0:

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

```
ip route 0.0.0.0 0.0.0.0 Loopback0
ipv6 route ::/0 Loopback0
```

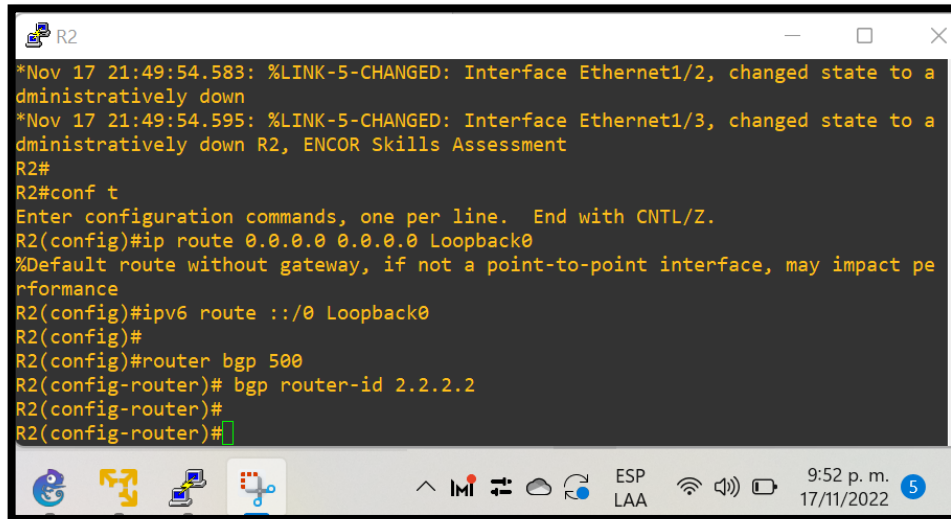


```
R2
*Nov 17 21:49:54.091: %LINK-5-CHANGED: Interface FastEthernet0/0, changed state to administratively down
*Nov 17 21:49:54.411: %LINK-5-CHANGED: Interface Ethernet1/1, changed state to administratively down
*Nov 17 21:49:54.583: %LINK-5-CHANGED: Interface Ethernet1/2, changed state to administratively down
*Nov 17 21:49:54.595: %LINK-5-CHANGED: Interface Ethernet1/3, changed state to administratively down
R2, ENCOR Skills Assessment
R2#
R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#ip route 0.0.0.0 0.0.0.0 Loopback0
%Default route without gateway, if not a point-to-point interface, may impact performance
R2(config)#ipv6 route ::/0 Loopback0
R2(config)#
```

Figura 48. Configuración ruta estática – Router R2

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

```
router bgp 500
  bgp router-id 2.2.2.2
```



```
R2
*Nov 17 21:49:54.583: %LINK-5-CHANGED: Interface Ethernet1/2, changed state to a
dministratively down
*Nov 17 21:49:54.595: %LINK-5-CHANGED: Interface Ethernet1/3, changed state to a
dministratively down R2, ENCOR Skills Assessment
R2#
R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#ip route 0.0.0.0 0.0.0.0 Loopback0
%Default route without gateway, if not a point-to-point interface, may impact pe
rformance
R2(config)#ipv6 route ::/0 Loopback0
R2(config)#
R2(config)#router bgp 500
R2(config-router)# bgp router-id 2.2.2.2
R2(config-router)#
R2(config-router)#
```

Figura 49. Configuración router ID – Router R2

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).

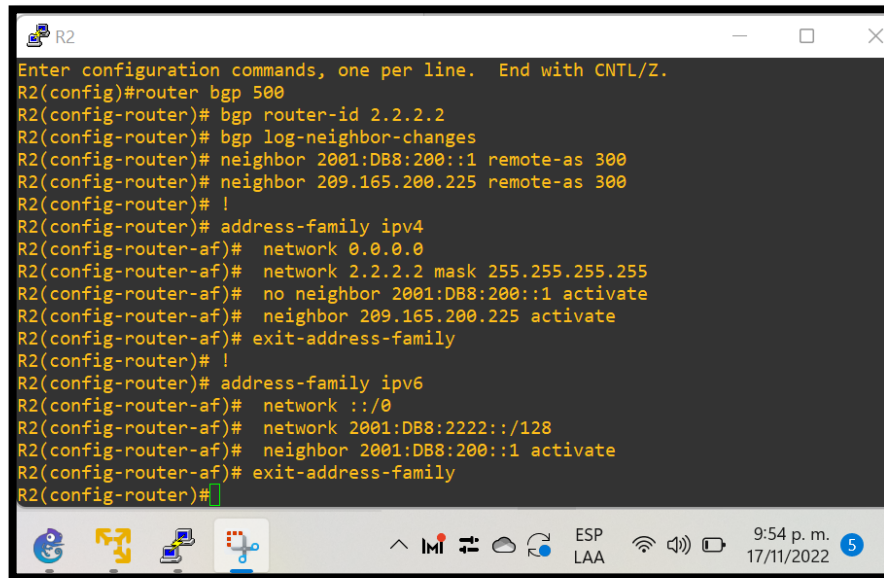
In IPv6 address family, advertise:

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

```
router bgp 500
  bgp router-id 2.2.2.2
  bgp log-neighbor-changes
  neighbor 2001:DB8:200::1 remote-as 300
  neighbor 209.165.200.225 remote-as 300
  !
  address-family ipv4
    network 0.0.0.0
    network 2.2.2.2 mask 255.255.255.255
    no neighbor 2001:DB8:200::1 activate
    neighbor 209.165.200.225 activate
  exit-address-family
  !
  address-family ipv6
    network ::/0
    network 2001:DB8:2222::/128
```



```
neighbor 2001:DB8:200::1 activate
exit-address-family
```



```
R2
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#router bgp 500
R2(config-router)# bgp router-id 2.2.2.2
R2(config-router)# bgp log-neighbor-changes
R2(config-router)# neighbor 2001:DB8:200::1 remote-as 300
R2(config-router)# neighbor 209.165.200.225 remote-as 300
R2(config-router)# !
R2(config-router)# address-family ipv4
R2(config-router-af)# network 0.0.0.0
R2(config-router-af)# network 2.2.2.2 mask 255.255.255.255
R2(config-router-af)# no neighbor 2001:DB8:200::1 activate
R2(config-router-af)# neighbor 209.165.200.225 activate
R2(config-router-af)# exit-address-family
R2(config-router)# !
R2(config-router)# address-family ipv6
R2(config-router-af)# network ::0
R2(config-router-af)# network 2001:DB8:2222::/128
R2(config-router-af)# neighbor 2001:DB8:200::1 activate
R2(config-router-af)# exit-address-family
R2(config-router)#
```

Figura 50. Configuración BGP – Router R2

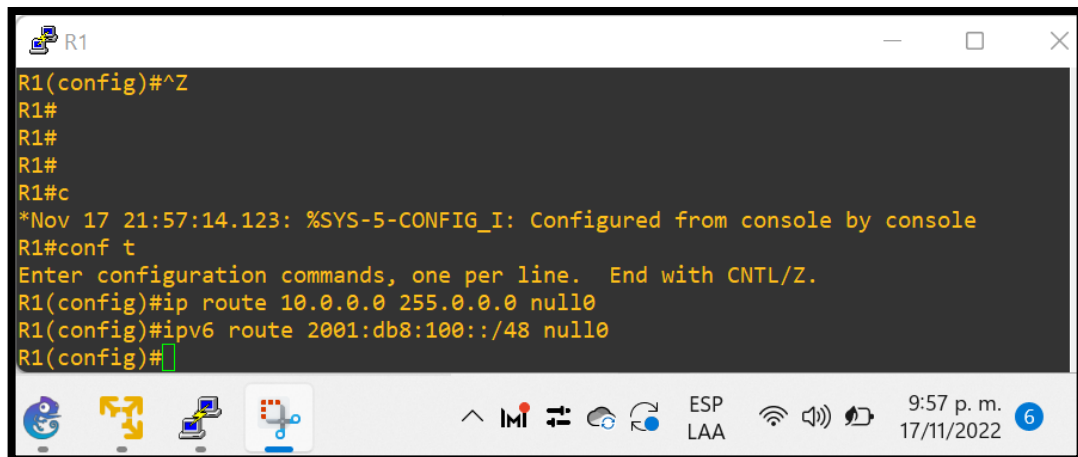
3.4 On R1 in the “ISP Network”, configure MP-BGP.

Router R1

Configure two static summary routes to interface Null 0:

- A summary IPv4 route for 10.30.0.0/8.
- A summary IPv6 route for 2001:db8:100::/48.

```
ip route 10.0.0.0 255.0.0.0 null0
ipv6 route 2001:db8:100::/48 null0
```

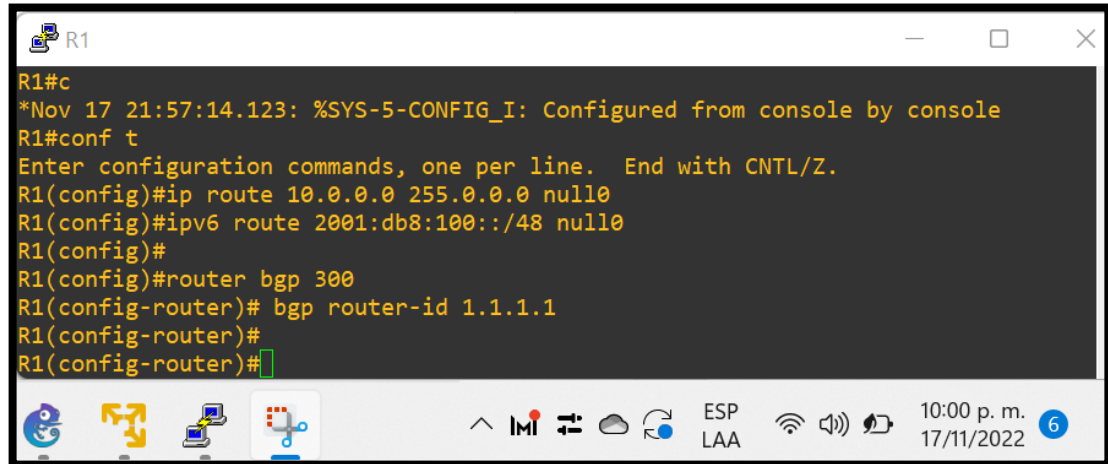


```
R1
R1(config)#^Z
R1#
R1#
R1#
R1#c
*Nov 17 21:57:14.123: %SYS-5-CONFIG_I: Configured from console by console
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#ip route 10.0.0.0 255.0.0.0 null0
R1(config)#ipv6 route 2001:db8:100::/48 null0
R1(config)#
```

Figura 51. Configuración ruta estatica - Router R1

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

```
router bgp 300
  bgp router-id 1.1.1.1
```



```
R1#c
*Nov 17 21:57:14.123: %SYS-5-CONFIG_I: Configured from console by console
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#ip route 10.0.0.0 255.0.0.0 null0
R1(config)#ipv6 route 2001:db8:100::/48 null0
R1(config)#
R1(config)#router bgp 300
R1(config-router)# bgp router-id 1.1.1.1
R1(config-router)#
R1(config-router)#
```

Figura 52. Configuración router ID - Router R1

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 10.30.0.0/8 network.

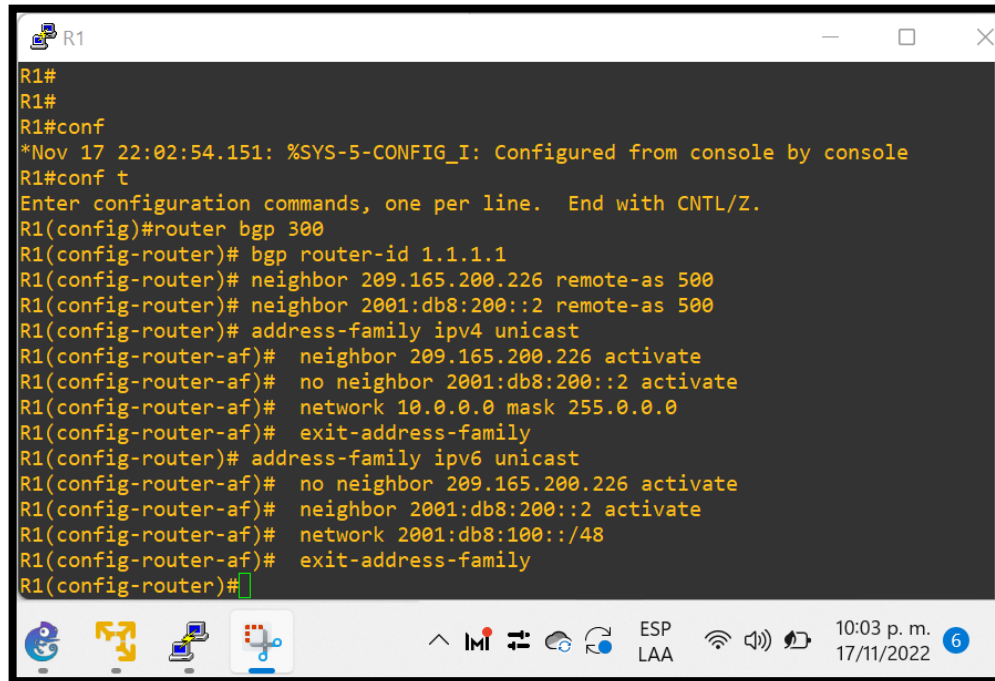
In IPv6 address family:

- Disable the IPv4 neighbor relationship.
- Enable the IPv6 neighbor relationship.

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

```
router bgp 300
  bgp router-id 1.1.1.1
  neighbor 209.165.200.226 remote-as 500
  neighbor 2001:db8:200::2 remote-as 500
  address-family ipv4 unicast
    neighbor 209.165.200.226 activate
    no neighbor 2001:db8:200::2 activate
    network 10.0.0.0 mask 255.0.0.0
  exit-address-family
  address-family ipv6 unicast
```

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



```
R1#
R1#
R1#conf
*Nov 17 22:02:54.151: %SYS-5-CONFIG_I: Configured from console by console
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#router bgp 300
R1(config-router)# bgp router-id 1.1.1.1
R1(config-router)# neighbor 209.165.200.226 remote-as 500
R1(config-router)# neighbor 2001:db8:200::2 remote-as 500
R1(config-router)# address-family ipv4 unicast
R1(config-router-af)# neighbor 209.165.200.226 activate
R1(config-router-af)# no neighbor 2001:db8:200::2 activate
R1(config-router-af)# network 10.0.0.0 mask 255.0.0.0
R1(config-router-af)# exit-address-family
R1(config-router)# address-family ipv6 unicast
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)# exit-address-family
R1(config-router)#
```

Figura 53. Configuración BGP - Router R1

Part 4: Configure First-Hop Redundancy

4.1 On D1, create IP SLAs that test the reachability of R1 interface E1/2.

Switch D1

Create two IP SLAs.

- Use SLA number 4 for IPv4.
- Use SLA number 6 for IPv6.

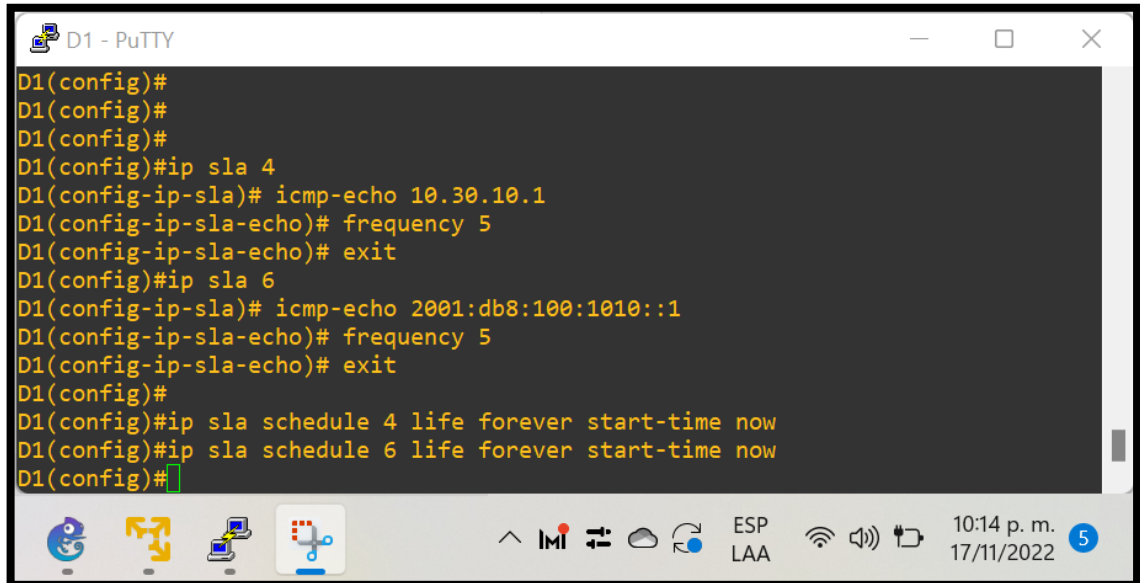
The IP SLAs will test availability of R1 E1/2 interface every 5 seconds.

Schedule the SLA for immediate implementation with no end time.

```
ip sla 4
 icmp-echo 10.30.10.1
 frequency 5
 exit
ip sla 6
 icmp-echo 2001:db8:100:1010::1
 frequency 5
```

```
exit
```

```
ip sla schedule 4 life forever start-time now  
ip sla schedule 6 life forever start-time now
```



```
D1(config)#  
D1(config)#  
D1(config)#  
D1(config)#ip sla 4  
D1(config-ip-sla)# icmp-echo 10.30.10.1  
D1(config-ip-sla-echo)# frequency 5  
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)#  
D1(config)#ip sla schedule 4 life forever start-time now  
D1(config)#ip sla schedule 6 life forever start-time now  
D1(config)#
```

Figura 54. Configuración IP SLA – Switch D1

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.

```
track 4 ip sla 4  
  delay down 10 up 15  
  exit  
track 6 ip sla 6  
  delay down 10 up 15  
  exit
```

```
D1 - PuTTY
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)#
D1(config)#ip sla schedule 4 life forever start-time now
D1(config)#ip sla schedule 6 life forever start-time now
D1(config)#
D1(config)#
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
D1(config)#
```

Figura 55. Configuración track number – Switch D1

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.

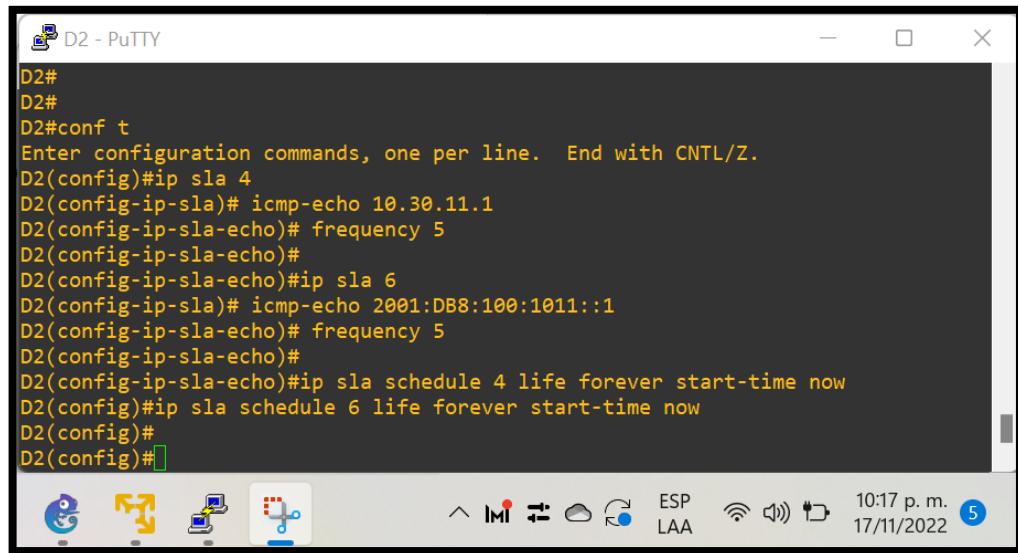
Schedule the SLA for immediate implementation with no end time.

Switch D2

```
ip sla 4
 icmp-echo 10.30.11.1
 frequency 5
```

```
ip sla 6
 icmp-echo 2001:DB8:100:1011::1
 frequency 5
```

```
ip sla schedule 4 life forever start-time now
ip sla schedule 6 life forever start-time now
```



```
D2#
D2#
D2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
D2(config)#ip sla 4
D2(config-ip-sla)# icmp-echo 10.30.11.1
D2(config-ip-sla-echo)# frequency 5
D2(config-ip-sla-echo)#
D2(config-ip-sla-echo)#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)#
D2(config-ip-sla-echo)#ip sla schedule 4 life forever start-time now
D2(config)#ip sla schedule 6 life forever start-time now
D2(config)#
D2(config)#
```

Figura 56. Configuración IP SLA – Switch D2

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.

```
track 4 ip sla 4
  delay down 10 up 15
track 6 ip sla 6
  delay down 10 up 15
```

```
D2 - PuTTY
D2(config-ip-sla-echo)# frequency 5
D2(config-ip-sla-echo)#
D2(config-ip-sla-echo)#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)#
D2(config-ip-sla-echo)#ip sla schedule 4 life forever start-time now
D2(config)#ip sla schedule 6 life forever start-time now
D2(config)#
D2(config)#
D2(config)#track 4 ip sla 4
D2(config-track)# delay down 10 up 15
D2(config-track)#track 6 ip sla 6
D2(config-track)# delay down 10 up 15
D2(config-track)#
D2(config-track)#
```

Figura 57. Configuración track number – Switch D2

4.3 On D1, configure HSRPv2.

Switch D1

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 **10.30.100.254**.
- Set the group priority to **150**.
- Enable preemption.
- Track object 4 and decrement by 60.

```
interface vlan 100
 standby version 2
 standby 104 ip 10.30.100.254
 standby 104 priority 150
 standby 104 preempt
 standby 104 track 4 decrement 60
```

```
D1 on disk. Please wait...
D1#
*Nov 18 03:12:33.728: %GRUB-5-CONFIG_WRITTEN: GRUB configuration was written to
disk successfully.
D1#
D1#
D1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
D1(config)#interface vlan 100
D1(config-if)# standby version 2
D1(config-if)# standby 104 ip 10.30.100.254
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)#
```

Figura 58. Configuración HSRP VLAN 100 – Switch D1

Configure IPv4 HSRP group **114** for VLAN 101:

- Assign the virtual IP address **10.30.101.254**.
- Enable preemption.
- Track object 4 to decrement by 60.

```
interface vlan 101
 standby version 2
 standby 114 ip 10.30.101.254
 standby 114 preempt
 standby 114 track 4 decrement 60
```

```
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)#
*Nov 18 03:15:22.736: %HSRP-5-STATECHANGE: Vlan100 Grp 104 state Standby -> Active
D1(config-if)#
D1(config-if)#exit
D1(config)#interface vlan 101
D1(config-if)# standby version 2
D1(config-if)# standby 114 ip 10.30.101.254
D1(config-if)# standby 114 preempt
D1(config-if)# standby 114 track 4 decrement 60
D1(config-if)#
D1(config-if)#
```

Figura 59. Configuración HSRP VLAN 101 – Switch D1

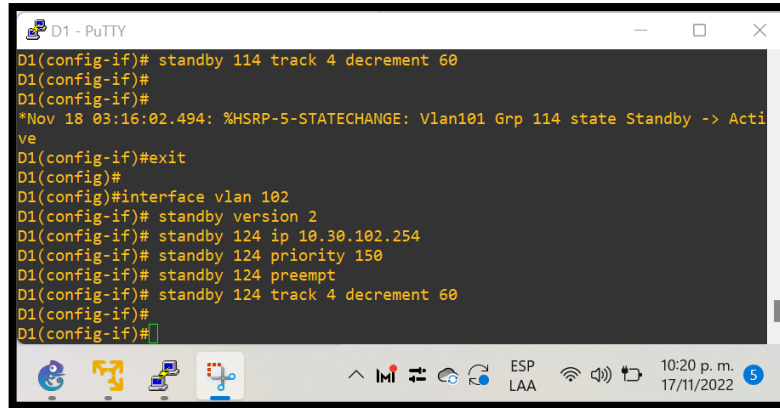
Configure IPv4 HSRP group **124** for VLAN 102:

- Assign the virtual IP address **10.30.102.254**.
- Set the group priority to **150**.
- Enable preemption.
- Track object 4 to decrement by 60.

```
interface vlan 102
```



```
standby version 2
standby 124 ip 10.30.102.254
standby 124 priority 150
standby 124 preempt
standby 124 track 4 decrement 60
```



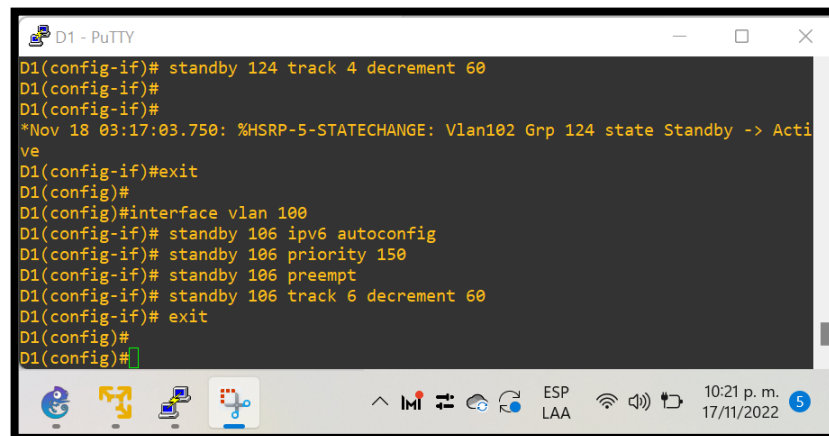
```
D1 - PuTTY
D1(config-if)# standby 114 track 4 decrement 60
D1(config-if)#
D1(config-if)#
*Nov 18 03:16:02.494: %HSRP-5-STATECHANGE: Vlan101 Grp 114 state Standby -> Active
D1(config-if)#exit
D1(config)#
D1(config)#interface vlan 102
D1(config-if)# standby version 2
D1(config-if)# standby 124 ip 10.30.102.254
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)#
D1(config-if)#
```

Figura 60. Configuración HSRP VLAN 102 – Switch D1

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.

```
interface vlan 100
standby 106 ipv6 autoconfig
standby 106 priority 150
standby 106 preempt
standby 106 track 6 decrement 60
exit
```



```
D1 - PuTTY
D1(config-if)# standby 124 track 4 decrement 60
D1(config-if)#
D1(config-if)#
*Nov 18 03:17:03.750: %HSRP-5-STATECHANGE: Vlan102 Grp 124 state Standby -> Active
D1(config-if)#exit
D1(config)#
D1(config)#interface vlan 100
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)#
D1(config)#
```

Figura 61. Configuración HSRP IPv6 VLAN 100 – Switch D1

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.

```
interface vlan 101
 standby 116 ipv6 autoconfig
 standby 116 preempt
 standby 116 track 6 decrement 60
 exit
```

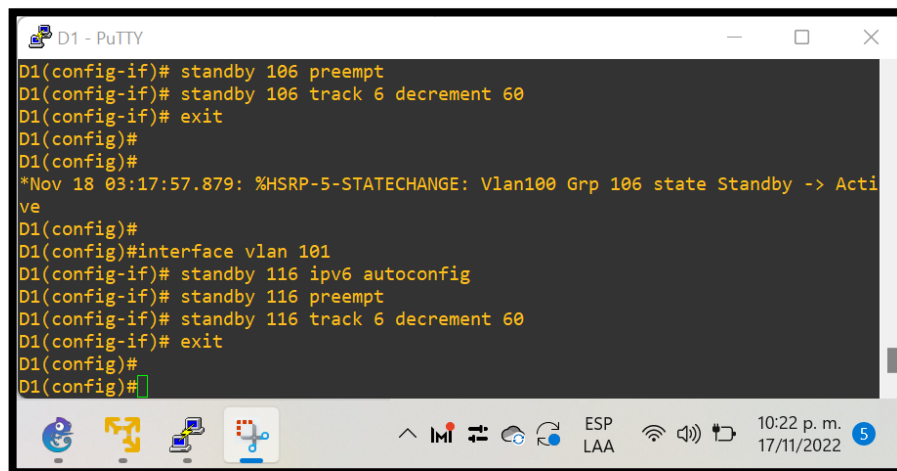
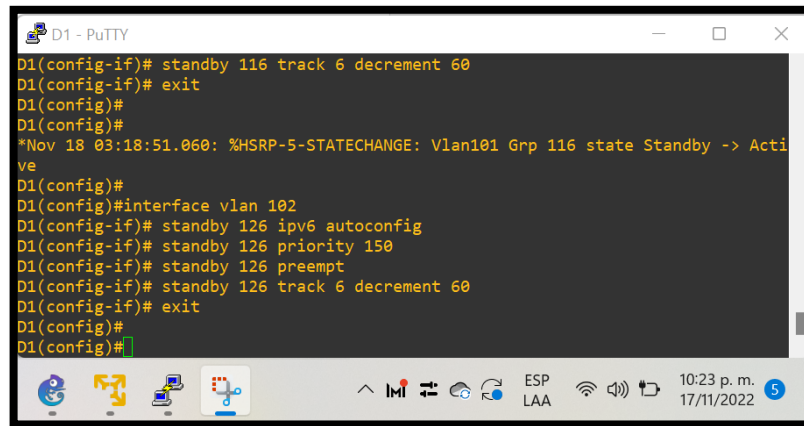


Figura 62. Configuración HSRP IPv6 VLAN 101 – Switch D1

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.

```
interface vlan 102
 standby 126 ipv6 autoconfig
 standby 126 priority 150
 standby 126 preempt
 standby 126 track 6 decrement 60
 exit
```



```
D1(config-if)# standby 116 track 6 decrement 60
D1(config-if)# exit
D1(config)#
D1(config)#
*Nov 18 03:18:51.060: %HSRP-5-STATECHANGE: Vlan101 Grp 116 state Standby -> Active
D1(config)#
D1(config)#interface vlan 102
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)#
D1(config)#
```

Figura 63. Configuración HSRP IPv6 VLAN 102 – Switch D1

On D2, configure HSRPv2.

Switch D2

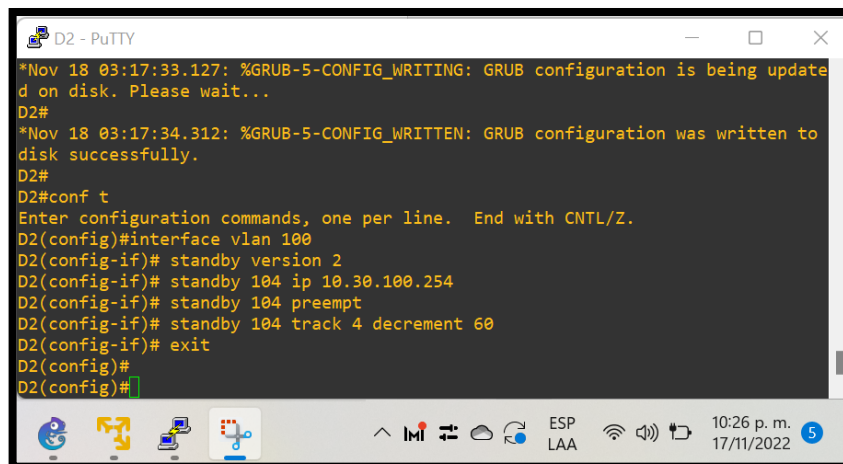
D2 is the primary router for VLAN 101; therefore, the priority will also be changed to 150.

Configure HSRP version 2.

Configure IPv4 HSRP group **104** for VLAN 100:

- Assign the virtual IP address **10.30.100.254**.
- Enable preemption.
- Track object 4 and decrement by 60.

```
interface vlan 100
 standby version 2
 standby 104 ip 10.30.100.254
 standby 104 preempt
 standby 104 track 4 decrement 60
 exit
```



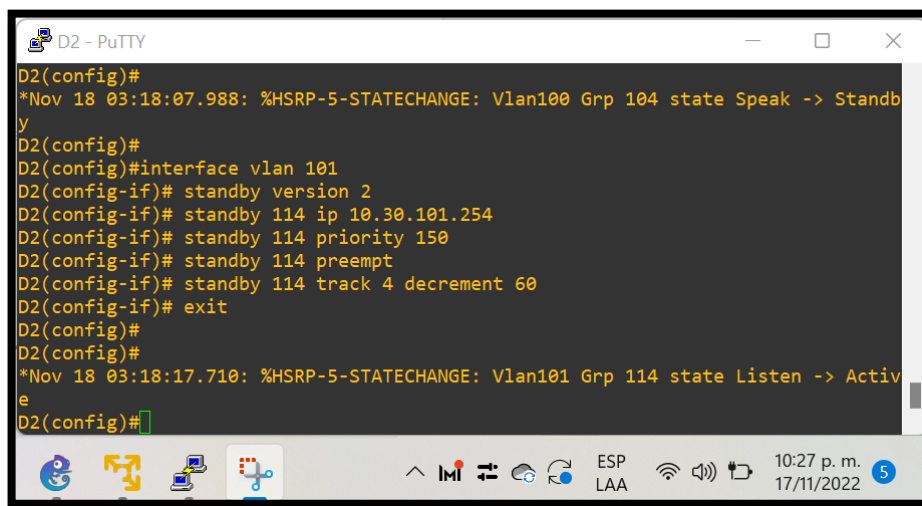
```
*Nov 18 03:17:33.127: %GRUB-5-CONFIG_WRITING: GRUB configuration is being updated on disk. Please wait...
D2#
*Nov 18 03:17:34.312: %GRUB-5-CONFIG_WRITTEN: GRUB configuration was written to disk successfully.
D2#
D2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
D2(config)#interface vlan 100
D2(config-if)# standby version 2
D2(config-if)# standby 104 ip 10.30.100.254
D2(config-if)# standby 104 preempt
D2(config-if)# standby 104 track 4 decrement 60
D2(config-if)# exit
D2(config)#
D2(config)#
```

Figura 64. Configuración HSRP VLAN 100 – Switch D2

Configure IPv4 HSRP group **114** for VLAN 101:

- Assign the virtual IP address **10.30.101.254**.
- Set the group priority to **150**.
- Enable preemption.
- Track object 4 to decrement by 60.

```
interface vlan 101
 standby version 2
 standby 114 ip 10.30.101.254
 standby 114 priority 150
 standby 114 preempt
 standby 114 track 4 decrement 60
 exit
```



```
D2 - PuTTY
D2(config)#
*Nov 18 03:18:07.988: %HSRP-5-STATECHANGE: Vlan100 Grp 104 state Speak -> Standby
D2(config)#
D2(config)#interface vlan 101
D2(config-if)# standby version 2
D2(config-if)# standby 114 ip 10.30.101.254
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)# exit
D2(config)#
D2(config)#
*Nov 18 03:18:17.710: %HSRP-5-STATECHANGE: Vlan101 Grp 114 state Listen -> Active
D2(config)#
```

Figura 65. Configuración HSRP VLAN 100 – Switch D2

Configure IPv4 HSRP group **124** for VLAN 102:

- Assign the virtual IP address **10.30.102.254**.
- Enable preemption.
- Track object 4 to decrement by 60.

```
interface vlan 102
 standby version 2
 standby 124 ip 10.30.102.254
 standby 124 preempt
 standby 124 track 4 decrement 60
 exit
```

```

D2 - PuTTY
D2(config-if)# standby 114 preempt
D2(config-if)# standby 114 track 4 decrement 60
D2(config-if)# exit
D2(config)#
D2(config)#
*Nov 18 03:18:17.710: %HSRP-5-STATECHANGE: Vlan101 Grp 114 state Listen -> Active
D2(config)#
D2(config)#interface vlan 102
D2(config-if)# standby version 2
D2(config-if)# standby 124 ip 10.30.102.254
D2(config-if)# standby 124 preempt
D2(config-if)# standby 124 track 4 decrement 60
D2(config-if)# exit
D2(config)#
D2(config)#

```

Figura 66. Configuración HSRP VLAN 102 – Switch D2

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.

```

interface vlan 100
 standby 106 ipv6 autoconfig
 standby 106 preempt
 standby 106 track 6 decrement 60
 exit

```

```

D2 - PuTTY
D2(config-if)# standby 124 track 4 decrement 60
D2(config-if)# exit
D2(config)#
D2(config)#
*Nov 18 03:19:23.599: %HSRP-5-STATECHANGE: Vlan102 Grp 124 state Speak -> Standby
D2(config)#
D2(config)#interface vlan 100
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)#
*Nov 18 03:20:03.142: %HSRP-5-STATECHANGE: Vlan100 Grp 106 state Speak -> Standby
D2(config)#

```

Figura 67. Configuración HSRP IPv6 VLAN 100 – Switch D2

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.

```
interface vlan 101
 standby 116 ipv6 autoconfig
 standby 116 priority 150
 standby 116 preempt
 standby 116 track 6 decrement 60
 exit
```

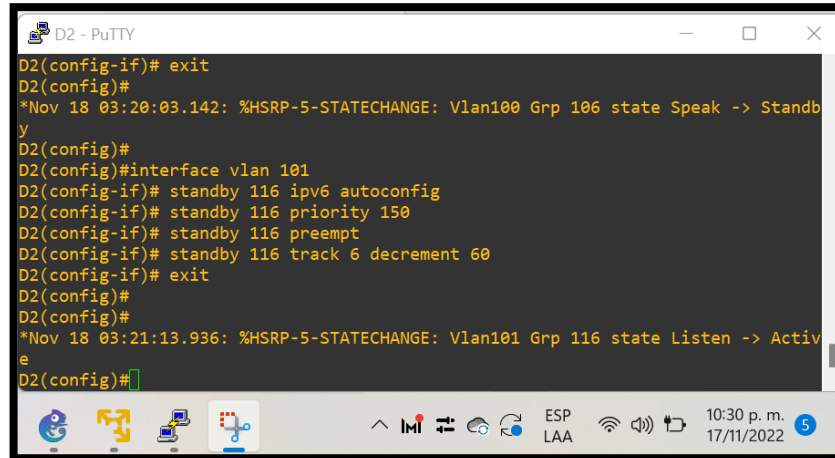


Figura 68. Configuración HSRP IPv6 VLAN 101 – Switch D2

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.

```
interface vlan 102
 standby 126 ipv6 autoconfig
 standby 126 preempt
 standby 126 track 6 decrement 60
 exit
```

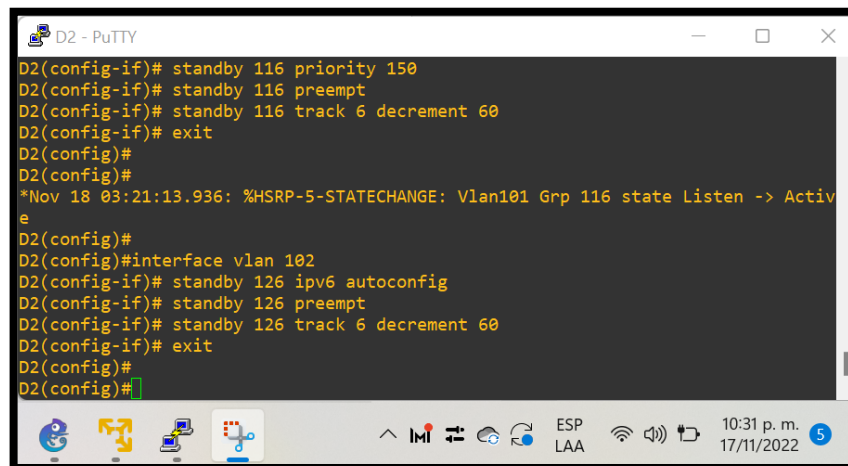


Figura 69. Configuración HSRP IPv6 VLAN 102 – Switch D2

CONCLUSIONES

La simulación del escenario típico de red corporativa mediante GNS3 me permitió investigar acerca de los APPLIANCE de red que no habían sido utilizados en cursos anteriores como el CISCO IOSvL2 con imagen de extensión QCOW2 las cuales requieren de una máquina virtual GNS3 VM o Virtual VOX para su funcionamiento.

Mediante comandos de verificación se pudo validar la operación de los EtherChannel configurados y la conectividad entre dispositivos dentro del mismo segmento de red. Hasta este punto no hace falta un default valido ni protocolo de enrutamiento porque las pruebas fueron ejecutadas sobre segmentos de red directamente conectados.

Las funcionalidades del servidor DHCP en la switch multicapa o router facilitan las labores de despliegue de red y reduce los costos asociados a servidores de propósitos específico

La configuración de EtherChannel mejora la disponibilidad de la red, al mismo tiempo que aumenta el ancho de banda mediante la agrupación lógica de enlaces sin riesgo a Loops en capa dos siempre y cuando se definan correctamente las instancias de Spanning Tree

Esta guía me permitió poner en práctica los conceptos de enrutamiento vistos durante el curso mediante la configuración de OSPFv2 y OSPFv3 para la propagación de rutas IPv4 e IPv6, así como la aplicación de interfaces pasivas para evitar que se intercambien mensajes de OSPF sobre las interfaces LAN

Mediante la configuración de MP-BGP se puso en práctica la implementación del protocolo de Gateway exterior eBGP requerido para intercambio de rutas entre sistemas autónomos externos para la familia ipv4 e ipv6 además de la sumarización de prefijos

El protocolo IP SLA nos permite censar los enlaces WAN y generar acciones mediante tracks para provocar la conmutacion de tráfico en combinación con el protocolo HSRP propietario de CISCO

Con el fin de tener redundancia de hardware en el Gateway de la LAN, se aplicó el protocolo HSRP que nos permite proteger los entornos LAN mediante la definición de una IP virtual como Gateway en dos Routers o switches multicapa. Esta funcionalidad es útil cuando se realizan labores de mantenimiento en los routers de la LAN y no queremos que se presente afectación de servicio

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