

INFORME - PRUEBA DE HABILIDADES PRÁCTICA

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UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA - UNAD
ESCUELA DE CIENCIAS BÁSICAS, TECNOLOGÍA E INGENIERÍA - ECBTI
INGENIERÍA ELECTRÓNICA
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FACATATIVÁ – CUNDINAMARCA, 17 de noviembre de 2022

DEDICATORIA

A mi hermosa hija Hannah por ser mi inspiración día a día, por ser esa persona que me impulsa y me hace sonreír, pero sobre todo por comprender que muchas veces debía primero hacer todas las tareas y luego si podía jugar con ella, por esas noches que se quedó junto a mi para que no me sintiera sola sin importar que tan tarde fuera.

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GLOSARIO

VLAN: Se conoce como virtual LAN y son las redes de área local, crea varias redes lógicas en una red física de manera independiente.

DHCP: Sus siglas Dynamic Host Configuration Protocol, es el protocolo que proporciona las direcciones IP de manera automática, funciona de acuerdo con el modelo cliente/servidor.

ETHERCHANNELS: Son tecnologías que permiten agregar puertos de red y de acuerdo con los estándares 802.3.

OSPFv2: Sus siglas Open Shortest Path First, es el protocolo que permite el enrutamiento dinámico que puede detectar los cambios en la topología para IPv4.

OSPFv3: Sus siglas Open Shortest Path First, es el protocolo que permite el enrutamiento dinámico que puede detectar los cambios en la topología para IPv4.

RSTP: Sus siglas Rapid Spanning Tree Protocol, Se encarga de reducir la convergencia en la topología cuando se presenta algún cambio.

LACP: Sus siglas Link Agregation Control Protocol, se caracteriza por la unión de puertos físicos en un solo puerto lógico con gran ancho de banda.

MP-BGP: Sus siglas Multiprotocol – BGP, es el encargado de llevar la información de IPv6.

RESUMEN

El presente trabajo es desarrollado como requisito de opción de grado en la carrera de ingeniería electrónica, de la Universidad Nacional Abierta y a Distancia, en el cual serán realizadas prácticas en cisco CCNP del escenario 1, el montaje será elaborado por medio del simulador GNS3 y una máquina virtual, donde se importarán las imágenes IOS de los routers y switches, según lo planteado en la guía en cuatro partes.

En la primera parte es necesario crear el montaje de la red teniendo en cuenta la topología indicada, a su vez realizar las configuraciones, ajustes básicos a cada uno de los dispositivos y su direccionamiento de la interfaz de acuerdo con la tabla de direcciones suministrada. En la segunda parte se realizará la configuración de red de capa 2 con la finalidad de poder comunicarse todos los switches, en cuanto a los computadores 2 y 3, deberán recibir direcciones DHCP y SLAAC.

Para la tercera se requiere realizar la configuración de los protocolos de enrutamiento, para ello se configurará el OSPFV2 y OSPFV3, al igual que MP-BGP de acuerdo con cada dispositivo, para finalizar la cuarta parte se configurará la redundancia de primer salto y para ello se creará el SLA IP en R1 E1/2 y R3 E1/0 culminando con la configuración del HSRPv2.

Palabras clave: CCNP, routers, switches, topología, red, DHCP, SLAAC

ABSTRACT

The present work is developed as a requirement of the degree option in the electronic engineering career, of the National Open and Distance University, in which practices will be carried out in cisco CCNP of scenario 1, the assembly will be elaborated by means of the GNS3 simulator and a virtual machine, where the IOS images of the routers and switches will be imported, as outlined in the four-part guide.

In the first part, it is necessary to create the network assembly taking into account the indicated topology, in turn make the configurations, basic adjustments to each of the devices and their interface addressing according to the address table provided. In the second part, the layer 2 network configuration is carried out in order to be able to communicate with all the switches, as for computers 2 and 3, they must receive DHCP and SLAAC addresses.

For the third part it is required to configure the routing protocols, for this OSPFV2 and OSPFV3 will be configured, as well as MP-BGP according to each device, to finish the fourth part the first hop redundancy will be configured and for this the IP SLA will be created in R1 E1/2 and R3 E1/0 culminating with the configuration of HSRPv2.

Keywords: CCNP, routers, switches, topology, network, DHCP, SLAAC

INTRODUCCIÓN

A nivel mundial las redes informáticas cada día toman más fuerza en diferentes ámbitos, como lo son la parte familiar, educativa, comercial, industrial, entre otros, ya que por medio de ellas es posible interactuar y comunicarse tanto los seres humanos, como las compañías empresariales. El diplomado en Cisco CCNP coadyuvara al fortalecimiento de conocimientos y mejora del perfil de ingenieros electrónicos, ya que estos deben contar con la capacidad de poder configurar protocolos de comunicación para así lograr desempeñarse en diferentes campos de acción en la vida laboral.

El diplomado en Cisco CCNP requiere para su desarrollo del escenario 1, implementar 3 router (Cisco 7200), 3 switches (Cisco IOU L2) y 4PCs del GNS3, de acuerdo con la topología y su tabla de direcciones, inicialmente se configurará la topología y se configurará cada elemento (routers, switches, los PCs), para los router R1 y R3, es necesario incluir el comando dúplex half ya que hará posible la comunicación con los switches D1 y D2, para los PC1 y PC4, se les asignará una dirección de puerta de enlace predeterminada y será la HSRP virtual.

Se realizarán las configuraciones de compatibilidad de la red y el host de capa 2, es aquí donde todos los switches podrán establecer comunicación y los PC2 y PC3 deberán recibir las direcciones DHCP y SLAAC, es necesario configurar en los 3 switches las interfaces troncales IEEE 802.1Q, las VLAN, habilitar el protocolo the Rapid Spanning-Tree, crear LACP EtherChannels de acuerdo a cada canal y puerto, en los switches 1 y 2 configurar los RSTP root bridges, para los 4 PCs configurar los puertos de acceso y para los PCs 2 y 3 será necesario comprobar los servicios DHCP IPv4. Finalmente se comprobará la conectividad LAN local, haciendo ping en los computadores.

De igual manera se efectuarán las configuraciones para los protocolos IPv4 e IPv6, haciendo uso de OSPFv2 y OSPFv3 en cada uno de los equipos requeridos, al igual que el MP-BGP para finalizar se configurará la redundancia de primer salto y se deberá crear los SLA IP que permitan la accesibilidad en las interfaces R1 E1/2 y R3 E1/0.

ESCENARIO 1 TOPOLOGÍA

Figura 1 Montaje del escenario propuesto

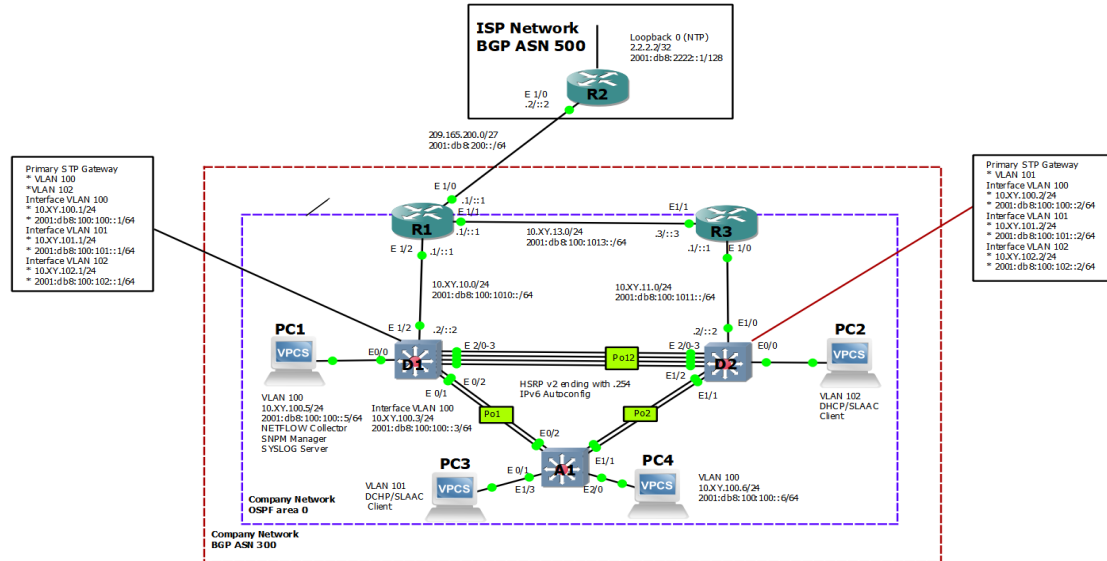


Tabla 1 De direcciones

Dispositivo	Interfaz	Dirección IPv4	Dirección IPv6	Enlace IPv6 local
R1	E1/0	209.165.200.225/27	2001:db8:200::1/64	fe80::1:1
R1	E1/2	10.89.10.1/24	2001:db8:100:1010::1/64	fe80::1:2
R1	E1/1	10.89.13.1/24	2001:db8:100:1013::1/64	fe80::1:3
R2	E1/0	209.165.200.226/27	2001:db8:200::2/64	fe80::2:1
R2	Loopback0	2.2.2.2/32	2001:db8:2222::1/128	fe80::2:3
R3	E1/0	10.89.11.1/24	2001:db8:100:1011::1/64	fe80::3:2
R3	E1/1	10.89.13.3/24	2001:db8:100:1013::3/64	fe80::3:3
D1	E1/2	10.89.10.2/24	2001:db8:100:1010::2/64	fe80::d1:1
D1	vlan 100	10.89.100.1/24	2001:db8:100:100::1/64	fe80::d1:2
D1	vlan 101	10.89.101.1/24	2001:db8:100:101::1/64	fe80::d1:3
D1	vlan 102	10.89.102.1/24	2001:db8:100:102::1/64	fe80::d1:4
D2	E1/0	10.89.11.2/24	2001:db8:100:1011::2/64	fe80::d2:1
D2	vlan 100	10.89.100.2/24	2001:db8:100:100::2/64	fe80::d2:2
D2	vlan 101	10.89.101.2/24	2001:db8:100:101::2/64	fe80::d2:3
D2	vlan 102	10.89.102.2/24	2001:db8:100:102::2/64	fe80::d2:4
A1	vlan 100	10.89.100.3/23	2001:db8:100:100::3/64	fe80::a1:1
PC1	NIC	10.89.100.5/24	2001:db8:100:100::5/64	EUI-64
PC2	NIC	DHCP	SLAAC	EUI-64
PC3	NIC	DHCP	SLAAC	EUI-64
PC4	NIC	10.89.100.6/24	2001:db8:100:100::6/64	EUI-64

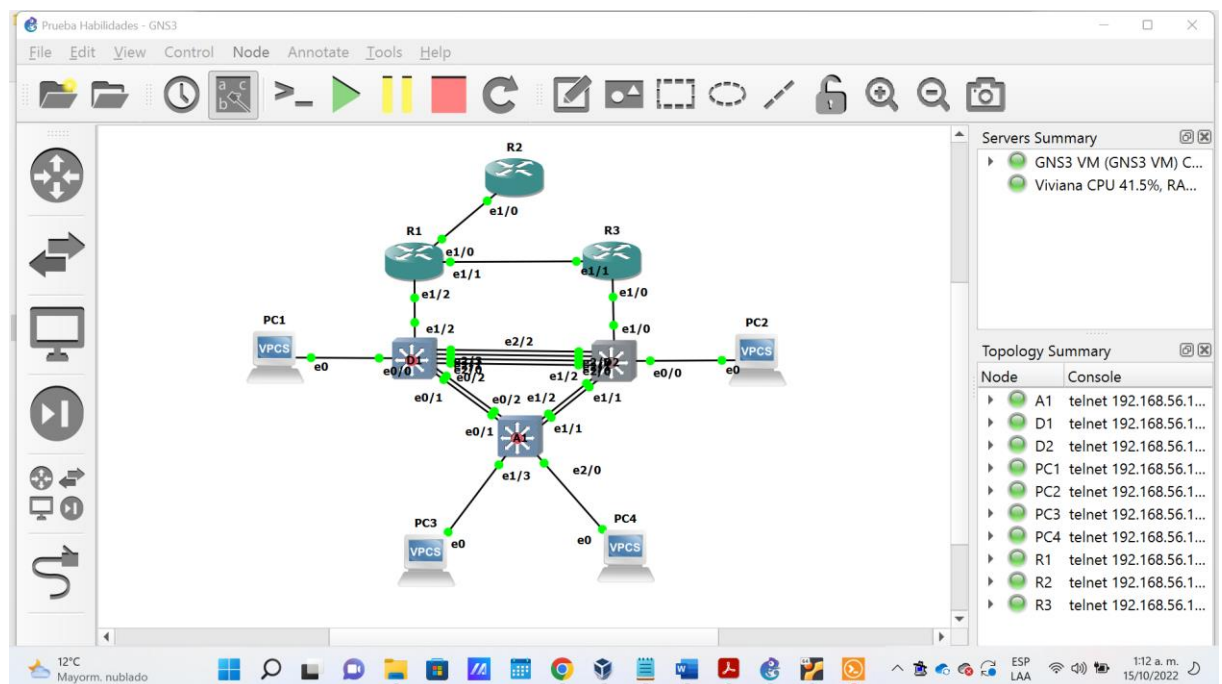
PARTE 1 CONSTRUIR LA RED Y CONFIGURAR LOS AJUSTES BÁSICOS DEL DISPOSITIVO Y EL DIRECCIONAMIENTO DE LA INTERFAZ

En la parte 1 se configurará la topología de la red y se configurarán los ajustes básicos al igual que el direccionamiento de la interfaz.

Paso 1 Cablear la red como se muestra en la topología

Se realiza la conexión de los routers, switches y PCs, teniendo en cuenta el diagrama estipulado.

Figura 2 conexión de los dispositivos.



Paso 2 Configurar los ajustes básicos para cada dispositivo

- Se realiza la configuración básica por medio de la consola a cada uno de los routers y switches, donde se establecen nombres del equipo, para los routers se especifican las interfaces IPv4 e IPv6, mientras que para los switches se crean las VLAN, direcciones IP y DHCP.

Router 1

```
R1#enable //Se ingresa a modo privilegiado
R1#configure terminal // Se ingresa a modo configuración global
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#hostname R1 //Nombre del router
R1(config)# ipv6 unicast-routing //Se habilita el routing en IPv6
R1(config)# no ip domain lookup // Se desactiva la traducción de nombres
R1(config)# banner motd # R1, ENCOR Skills Assessment#
R1(config)# line con 0 //Configuración de la línea de consola
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 10.89.10.1 255.255.255.0
R1(config-if)# duplex half
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 10.89.13.1 255.255.255.0
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)# exit
R1# copy running-config startup-config // Se guarda la configuración
Destination filename [startup-config]?
Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
[OK]
R1#
```

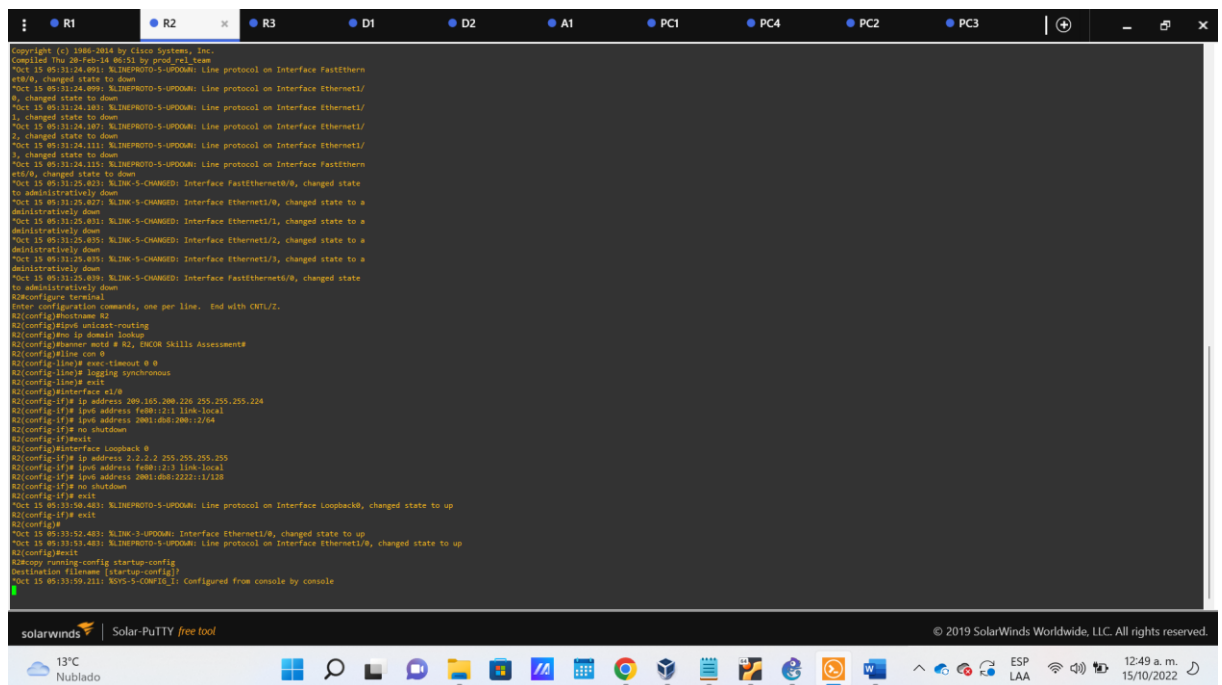


```

R2 (config-if) # no shutdown
R2 (config-if) # exit
R2 (config) # exit
R2 # copy running-config startup-config
Destination filename [startup-config]?
Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
[OK]

```

Figura 4 configuración router R2.



Router 3

```

R3#configure terminal
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

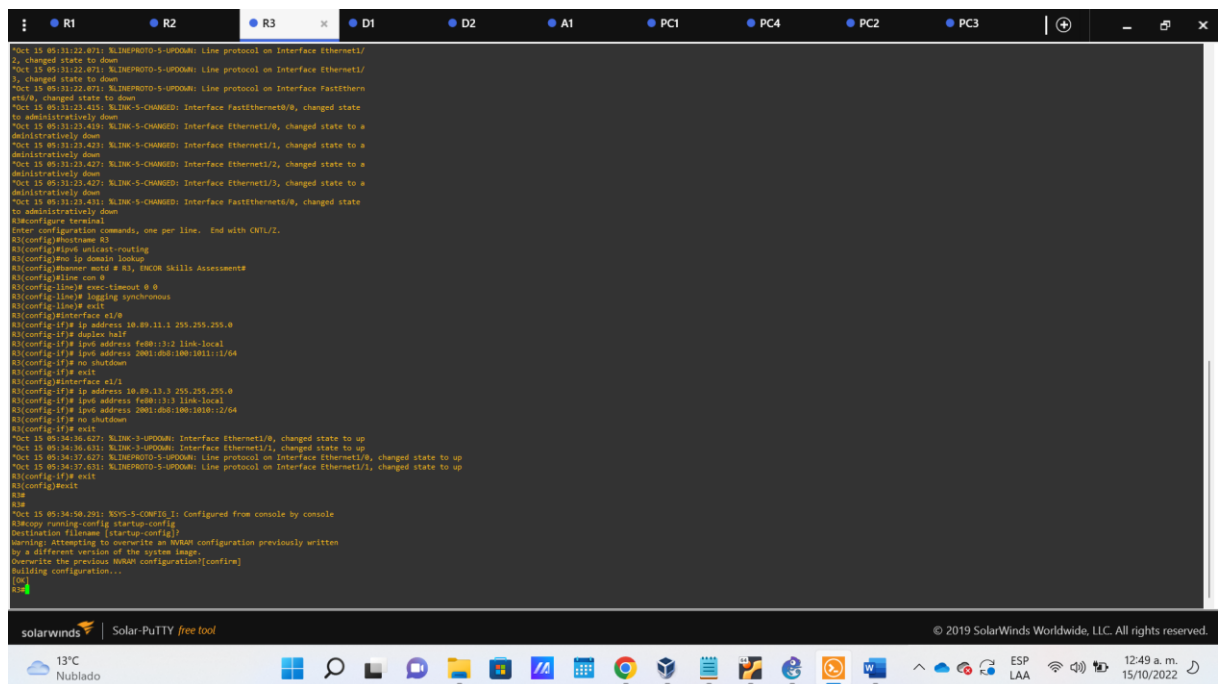
```

```

R3(config)#interface e1/0
R3(config-if)# ip address 10.89.11.1 255.255.255.0
R3(config-if)# duplex half
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 10.89.13.3 255.255.255.0
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)#exit
R3#copy running-config startup-config
Destination filename [startup-config]?
Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
[OK]

```

Figura 5 configuración router R3.



Switch D1

```
D1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
D1(config)#hostname D1
D1(config)#ip routing
D1(config)#ipv6 unicast-routing
D1(config)#no ip domain lookup
D1(config)#banner motd # D1, ENCOR Skills Assessment#
D1(config)#line con 0
D1(config-line)# exec-timeout 0 0
D1(config-line)# logging synchronous
D1(config-line)# exit
D1(config)#vlan 100
D1(config-vlan)# name Management
D1(config-vlan)# exit
D1(config)#vlan 101
D1(config-vlan)# name UserGroupA
D1(config-vlan)# exit
D1(config)#vlan 102
D1(config-vlan)# name UserGroupB
D1(config-vlan)# exit
D1(config)#vlan 999
D1(config-vlan)# name NATIVE
D1(config-vlan)# exit
D1(config)#interface e1/2
D1(config-if)# no switchport
D1(config-if)# ip address 10.89.10.2 255.255.255.0
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 10.89.100.1 255.255.255.0
D1(config-if)# ipv6 address fe80::d1:2 link-local
D1(config-if)# ipv6 address 2001:db8:100:100::1/64
D1(config-if)# no shutdown
D1(config-if)# exit
D1(config)#interface vlan 101
D1(config-if)# ip address 10.89.101.1 255.255.255.0
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 10.89.102.1 255.255.255.0
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 10.89.101.1 10.89.101.109
D1(config)#ip dhcp excluded-address 10.89.101.141 10.89.101.254
D1(config)#ip dhcp excluded-address 10.89.102.1 10.89.102.109
D1(config)#ip dhcp excluded-address 10.89.102.141 10.89.102.254
D1(config)#ip dhcp pool VLAN-101
D1(dhcp-config)# network 10.89.101.0 255.255.255.0
D1(dhcp-config)# default-router 10.89.101.254
D1(dhcp-config)# exit
D1(config)#ip dhcp pool VLAN-102
D1(dhcp-config)# network 10.89.102.0 255.255.255.0
D1(dhcp-config)# default-router 10.89.102.254
D1(dhcp-config)# exit
D1(config)#interface range e0/0-3,e1/0-1,e1/3,e2/0-3,e3/0-3
D1(config-if-range)# shutdown
D1(config-if-range)# exit
D1(config)#exit

```

Figura 6 configuración switch D1.

```

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D1(config)#hostname D1
D1(config)#ip routing
D1(config)#ipvs unicast-routing
D1(config)#ip domain lookup
D1(config)#banner motd # D1, D1COR Skills Assessment#
D1(config)#line con 0
D1(config)#line# exec-timeout 0 0
D1(config)#logging synchronous
D1(config)#exit
D1(config)#vlan 100
D1(config)#vlan# name Management
D1(config)#vlan# exit
D1(config)#vlan 101
D1(config)#vlan# name UserGroup
D1(config)#vlan# exit
D1(config)#vlan 102
D1(config)#vlan# name UserGroup
D1(config)#vlan# exit
D1(config)#vlan 999
D1(config)#vlan# name NATIVE
D1(config)#vlan# exit
D1(config)#interface e1/2
D1(config)# no shutdown
D1(config)# ip address 10.89.10.2 255.255.255.0
D1(config)# ipv6 address fe80::d1:2 link-local
D1(config)# ipv6 address 2001:db8:100:100::1/64
D1(config)# no shutdown
D1(config)# exit
D1(config)#interface vlan 100
D1(config)# ip address 10.89.100.1 255.255.255.0
D1(config)# ipv6 address fe80::d1:1 link-local
D1(config)# ipv6 address 2001:db8:100:100::1/64
D1(config)# no shutdown
D1(config)# exit
D1(config)#interface vlan 101
D1(config)# ip address 10.89.101.1 255.255.255.0
D1(config)# ipv6 address fe80::d1:3 link-local
D1(config)# ipv6 address 2001:db8:100:101::1/64
D1(config)# no shutdown
D1(config)# exit
D1(config)#interface vlan 102
D1(config)# ip address 10.89.102.1 255.255.255.0
D1(config)# ipv6 address fe80::d1:4 link-local
D1(config)# ipv6 address 2001:db8:100:102::1/64
D1(config)# no shutdown
D1(config)# exit
D1(config)# exit
D1(config)# ip dhcp excluded-address 10.89.101.1 10.89.101.109
D1(config)# ip dhcp excluded-address 10.89.101.141 10.89.101.254
D1(config)# ip dhcp excluded-address 10.89.102.1 10.89.102.109
D1(config)# ip dhcp excluded-address 10.89.102.141 10.89.102.254
D1(config)# ip dhcp pool VLAN-101
D1(dhcp-config)# network 10.89.101.0 255.255.255.0
D1(dhcp-config)# default-router 10.89.101.254
D1(dhcp-config)# exit
D1(config)# ip dhcp pool VLAN-102
D1(dhcp-config)# network 10.89.102.0 255.255.255.0
D1(dhcp-config)# exit

```

Switch D2

```
D2#configure terminal
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 e1/0
D2(config-if)# no switchport
D2(config-if)# ip address 10.89.11.2 255.255.255.0
D2(config-if)# ipv6 address fe80::d1:1 link-local
D2(config-if)# ipv6 address 2001:db8:100:1011::2/64
D2(config-if)# no shutdown
D2(config-if)# exit
D2(config)#interface vlan 100
D2(config-if)# ip address 10.89.100.2 255.255.255.0
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 10.89.101.2 255.255.255.0
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
```


Switch A1

```
A1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
A1 (config) # hostname A1
A1(config)#no ip domain lookup
A1(config)#banner motd # A1, ENCOR Skills Assessment#
A1(config)#line con 0
A1(config-line)# exec-timeout 0 0
A1(config-line)# logging synchronous
A1(config-line)# exit
A1(config)#vlan 100
A1(config-vlan)# name Management
A1(config-vlan)# exit
A1(config)#vlan 101
A1(config-vlan)# name UserGroupA
A1(config-vlan)# exit
A1(config)#vlan 102
A1(config-vlan)# name UserGroupB
A1(config-vlan)# exit
A1(config)#vlan 999
A1(config-vlan)# name NATIVE
A1(config-vlan)# exit
A1(config)#interface vlan 100
A1(config-if)# ip address 10.89.100.3 255.255.255.0
A1(config-if)# ipv6 address fe80::a1:1 link-local
A1(config-if)# ipv6 address 2001:db8:100:100::3/64
A1(config-if)# no shutdown
A1(config-if)# exit
A1(config)#interface range e0/0,e0/3,e1/0,e2/1-3,e3/0-3
A1(config-if-range)# shutdown
A1(config-if-range)# exit
A1(config)#exit
A1#
A1#copy running-config startup-config
Destination filename [startup-config]?
Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
Compressed configuration from 1632 bytes to 982 bytes[OK]
```


Figura 10 direccionamiento host PC4.

```

Welcome to Virtual PC Simulator, version 0.0.2
Dedicated to Daling.
Build time: Aug 23 2021 11:15:00
Copyright (c) 2007-2015, Paul Peng (paulpeng@gmail.com)
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Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecore.com.cn.

Press '?' to get help.

Executing the startup file

PC4> ip 10.89.100.6/24 10.89.100.254
Looking for duplicate addresses...
PC4 : 10.89.100.6 255.255.255.0 gateway 10.89.100.254

PC4> save
Saving startup configuration to startup.vpc
Done

PC4> sh

NAME IP/MASK GATEWAY PNC LPORT RHOST:PORT
PC4 10.89.100.6/24 10.89.100.254 00:50:79:66:68:03 20046 127.0.0.1:20047
F001:250:79FF:F666:0003/54
2003:0001:100:100:2000:79FF:F666:0003/64 evl-64

PC4> ping 10.89.100.1
64 bytes from 10.89.100.1: icmp_seq=1 ttl=255 time=4.020 ms
64 bytes from 10.89.100.1: icmp_seq=2 ttl=255 time=2.234 ms
64 bytes from 10.89.100.1: icmp_seq=3 ttl=255 time=1.516 ms
64 bytes from 10.89.100.1: icmp_seq=4 ttl=255 time=4.047 ms
64 bytes from 10.89.100.1: icmp_seq=5 ttl=255 time=0.568 ms

PC4> ping 10.89.100.2
64 bytes from 10.89.100.2: icmp_seq=1 ttl=255 time=1.534 ms
64 bytes from 10.89.100.2: icmp_seq=2 ttl=255 time=0.446 ms
64 bytes from 10.89.100.2: icmp_seq=3 ttl=255 time=0.516 ms
64 bytes from 10.89.100.2: icmp_seq=4 ttl=255 time=0.850 ms
64 bytes from 10.89.100.2: icmp_seq=5 ttl=255 time=0.509 ms

PC4> ping 10.89.100.5
64 bytes from 10.89.100.5: icmp_seq=1 ttl=64 time=3.041 ms
64 bytes from 10.89.100.5: icmp_seq=2 ttl=64 time=1.509 ms
64 bytes from 10.89.100.5: icmp_seq=3 ttl=64 time=0.561 ms
64 bytes from 10.89.100.5: icmp_seq=4 ttl=64 time=1.005 ms
64 bytes from 10.89.100.5: icmp_seq=5 ttl=64 time=0.534 ms

PC4>
  
```

PARTE 2: CONFIGURAR LA COMPATIBILIDAD CON REDES Y HOSTS DE CAPA 2

En la parte 2 la configuración de la red capa 2 se configurará y establecerá el soporte básico de host. Finalizando esta parte, todos los interruptores deben poder comunicarse PC2 y PC3 deben recibir direcciones de DHCP y SLAAC.

Figura 11 Configuración DHCP PC2

```

Welcome to Virtual PC Simulator, vers
on 0.0.2
Dedicated to Daling.
Build time: Aug 23 2021 11:15:00
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aulpeng@gmail.com)
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Source code and license can be found a
t vpcs.sf.net.
For more information, please visit wiki
.freecore.com.cn.

Press '?' to get help.

Executing the startup file

PC2> ip dhcp
DHCPA IP 10.89.102.110/24 GW 10.89.102.254

PC2> save
Saving startup configuration to startup.vpc
Done

PC2> ping 10.89.100.1
64 bytes from 10.89.102.1: icmp_seq=1 ttl=255 time=1.323 ms
64 bytes from 10.89.102.1: icmp_seq=2 ttl=255 time=0.263 ms
64 bytes from 10.89.102.1: icmp_seq=3 ttl=255 time=5.090 ms
64 bytes from 10.89.102.1: icmp_seq=4 ttl=255 time=1.041 ms
64 bytes from 10.89.102.1: icmp_seq=5 ttl=255 time=3.080 ms

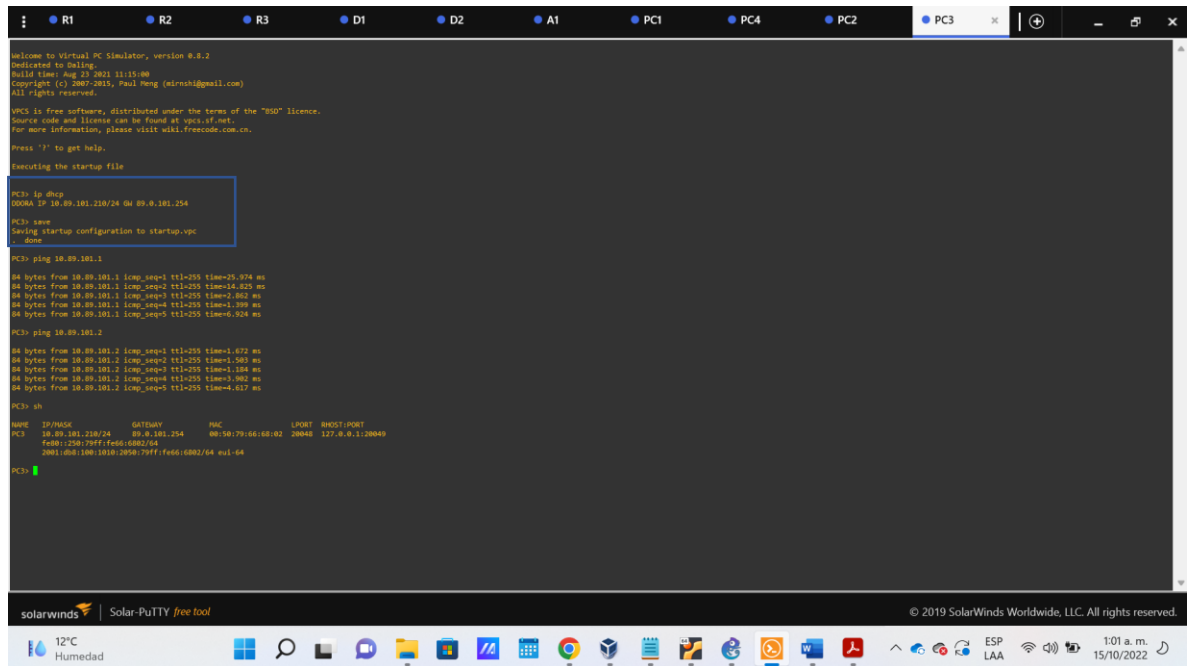
PC2> ping 10.89.102.2
64 bytes from 10.89.102.2: icmp_seq=1 ttl=255 time=3.545 ms
64 bytes from 10.89.102.2: icmp_seq=2 ttl=255 time=1.756 ms
64 bytes from 10.89.102.2: icmp_seq=3 ttl=255 time=0.798 ms
64 bytes from 10.89.102.2: icmp_seq=4 ttl=255 time=1.368 ms
64 bytes from 10.89.102.2: icmp_seq=5 ttl=255 time=1.188 ms

PC2> sh

NAME IP/MASK GATEWAY PNC LPORT RHOST:PORT
PC2 10.89.102.110/24 10.89.102.254 00:50:79:66:68:03 20046 127.0.0.1:20047
F001:250:79FF:F666:0010/54
2003:0001:100:100:2000:79FF:F666:0010/64 evl-64

PC2>
  
```

Figura 12 Configuración DHCP PC3



```
Welcome to Virtual PC Simulator, version 0.8.2
Dedicated to Orsini.
Build time: Aug 23 2021 11:15:00
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All rights reserved.

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Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

PC3> sh
0000A IP 10.89.101.210/24 GW 89.89.101.254

PC3> save
Saving startup configuration to startup.vpc
. done

PC3> ping 10.89.101.1
04 bytes from 10.89.101.1: icmp_seq=1 ttl=255 time=0.974 ms
04 bytes from 10.89.101.1: icmp_seq=2 ttl=255 time=0.829 ms
04 bytes from 10.89.101.1: icmp_seq=3 ttl=255 time=0.862 ms
04 bytes from 10.89.101.1: icmp_seq=4 ttl=255 time=0.899 ms
04 bytes from 10.89.101.1: icmp_seq=5 ttl=255 time=0.924 ms

PC3> ping 10.89.101.2
04 bytes from 10.89.101.2: icmp_seq=1 ttl=255 time=0.677 ms
04 bytes from 10.89.101.2: icmp_seq=2 ttl=255 time=1.503 ms
04 bytes from 10.89.101.2: icmp_seq=3 ttl=255 time=1.184 ms
04 bytes from 10.89.101.2: icmp_seq=4 ttl=255 time=1.902 ms
04 bytes from 10.89.101.2: icmp_seq=5 ttl=255 time=4.617 ms

PC3> sh
NAME IP/MASK GATEWAY MAC LPORT RHOST:PORT
PC3 10.89.101.210/24 89.8.101.254 08:5d:79:66:60:02 20048 127.0.0.1:20048
PC3:1298:79ff:fe66:6002/64
2001:db8:100:1010:2058:79ff:fe66:6002/64 vni-64

PC3>
```

Las tareas de configuración son las siguientes:

Paso 1: Tareas 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8.

Tarea 2.1: configuración interfaces troncales IEEE 802.1Q en los enlaces de conmutación interconectados.

Switch D1

```
D1#enable
D1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
D1(config)#interface range e2/0-3
D1(config-if-range)#switchport trunk encapsulation dot1q
D1(config-if-range)#switchport mode trunk

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

Switch D2

```
D2#enable
```

```
D2#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
D2(config)#interface range e2/0-3
D2(config-if-range)#Switchport trunk encapsulation dot1q
D2(config-if-range)#switchport mode trunk

D2(config)#interface range e1/1-2
D2(config-if-range)#Switchport trunk encapsulation dot1q
D2(config-if-range)#switchport mode trunk
```

Switch A1

```
A1#Enable
A1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
A1(config)#interface range e0/1-2
A1(config-if-range)#switchport trunk encapsulation dot1q
A1(config-if-range)#switchport mode trunk

A1(config)#interface range e1/1-2
A1(config-if-range)#switchport trunk encapsulation dot1q
A1(config-if-range)#switchport mode trunk
```

Tarea 2.2: VLAN nativa en los enlaces troncales

Switch D1

```
D1(config)#interface range e2/0-3
D1(config-if-range)#switchport trunk native vlan 999

D1(config)#interface range e0/1-2
D1(config-if-range)#switchport trunk native vlan 999
```

Switch D2

```
D2(config)#interface range e2/0-3
D2(config-if-range)#switchport trunk native vlan 999

D2(config)#interface range e1/1-2
D2(config-if-range)#switchport trunk native vlan 999
```

Switch A1

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

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

Figura 13 Verificación enlaces troncales D1

```

R1 R2 R3 D1 x D2 A1 PC1 PC4 PC2 PC3
*Oct 15 09:41:58.837: NLMK-3-UPDOWN: Interface Ethernet8/1, changed state to up
*Oct 15 09:41:58.837: NLMK-3-UPDOWN: Interface Ethernet8/2, changed state to up
*Oct 15 09:41:58.837: NLMK-3-UPDOWN: Interface Ethernet8/8, changed state to up
*Oct 15 09:41:58.837: NLMK-3-UPDOWN: Interface Vlan100, changed state to up
D1#
*Oct 15 09:41:59.841: NLINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet8/1, changed state to up
*Oct 15 09:41:59.841: NLINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet8/2, changed state to up
*Oct 15 09:41:59.843: NLINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet8/8, changed state to up
*Oct 15 09:41:59.843: NLINEPROTO-5-UPDOWN: Line protocol on Interface Vlan100, changed state to up
D1#
*Oct 15 09:42:07.956: NCP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Ethernet8/2 (999), with A1 Ethernet8/2 (1).
D1#
*Oct 15 09:42:08.880: NCCS-1-LOADINBL2: (t2/2) suspended: LACP currently not enabled on the remote port.
*Oct 15 09:42:08.880: NCCS-1-LOADINBL2: (f0/1) suspended: LACP currently not enabled on the remote port.
*Oct 15 09:42:08.880: NCCS-1-LOADINBL2: (t2/3) suspended: LACP currently not enabled on the remote port.
*Oct 15 09:42:08.880: NCCS-1-LOADINBL2: (f2/3) suspended: LACP currently not enabled on the remote port.
*Oct 15 09:42:08.880: NCCS-1-LOADINBL2: (t2/8) suspended: LACP currently not enabled on the remote port.
*Oct 15 09:42:08.880: NCCS-1-LOADINBL2: (f2/8) suspended: LACP currently not enabled on the remote port.
*Oct 15 09:42:08.880: NCCS-1-LOADINBL2: (t2/1) suspended: LACP currently not enabled on the remote port.
D1#
*Oct 15 09:42:26.856: NLINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet2/9, changed state to up
*Oct 15 09:42:26.856: NLINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet2/1, changed state to up
*Oct 15 09:42:26.856: NLINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet2/2, changed state to up
*Oct 15 09:42:26.856: NLINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet2/3, changed state to up
D1#
*Oct 15 09:42:31.837: NCP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Ethernet8/1 (999), with A1 Ethernet8/1 (1).
D1#
*Oct 15 09:42:31.856: NLINEPROTO-5-UPDOWN: Line protocol on Interface Port-channel12, changed state to up
D1#
*Oct 15 09:42:37.837: NLMK-3-UPDOWN: Interface Vlan100, changed state to up
*Oct 15 09:42:37.841: NLINEPROTO-5-UPDOWN: Line protocol on Interface Vlan100, changed state to up
D1#
*Oct 15 09:42:38.844: NLINEPROTO-5-UPDOWN: Line protocol on Interface Port-channel1, changed state to up
D1#copy running-config startup-config
Destination filename [startup-config]:
*Oct 15 09:43:02.844: NLMK-3-UPDOWN: Interface Vlan100, changed state to up
*Oct 15 09:43:03.855: NLINEPROTO-5-UPDOWN: Line protocol on Interface Vlan100, changed state to up
Building configuration...
Compressed configuration from 3572 bytes to 1825 bytes[OK]
D1#
D1#show int trunk

Port      Node      Encapsulation  Status  Native vlan
---      -
Po12     on        802.1q         trunking  999
Po12     on        802.1q         trunking  999

Port      Vlans allowed on trunk
---      -
Po1       1-4094
Po12      1-4094

Port      Vlans allowed and active in management domain
---      -
Po1       1,100-102,999
Po12      1,100-102,999

Port      Vlans in spanning tree forwarding state and not pruned
---      -
Po1       1,100-102,999
Po12      1,100-102,999
D1#
solarwinds Solar-PuTTY free tool © 2019 SolarWinds Worldwide, LLC. All rights reserved.
12°C Humedad 10:2 a. m. 15/10/2022

```

Figura 14 Verificación enlaces troncales D2

```

R1 R2 R3 D1 x D2 A1 PC1 PC4 PC2 PC3
*Oct 15 09:42:29.852: NMS-5-CONFIG_1: Configured from console by console
*Oct 15 09:42:29.857: NCP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Ethernet1/2 (999), with A1 Ethernet1/2 (1).
*Oct 15 09:42:29.857: NCP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Ethernet1/1 (999), with A1 Ethernet1/1 (1).
D2#
*Oct 15 09:42:29.857: NLINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet2/3, changed state to up
*Oct 15 09:42:29.858: NLINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet2/2, changed state to up
*Oct 15 09:42:29.858: NLINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet2/1, changed state to up
*Oct 15 09:42:29.858: NLINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet2/8, changed state to up
D2#
*Oct 15 09:42:30.853: NCP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Ethernet1/2 (999), with A1 Ethernet1/2 (1).
*Oct 15 09:42:30.853: NCP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Ethernet1/1 (999), with A1 Ethernet1/1 (1).
*Oct 15 09:42:32.855: NCP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Ethernet1/2 (999), with A1 Ethernet1/2 (1).
*Oct 15 09:42:32.855: NCP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Ethernet1/1 (999), with A1 Ethernet1/1 (1).
D2#
*Oct 15 09:42:33.852: NLINEPROTO-5-UPDOWN: Line protocol on Interface Port-channel12, changed state to up
D2#
*Oct 15 09:42:33.856: NCP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Ethernet1/2 (999), with A1 Ethernet1/2 (1).
*Oct 15 09:42:33.856: NCP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Ethernet1/1 (999), with A1 Ethernet1/1 (1).
*Oct 15 09:42:34.854: NCP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Ethernet1/2 (999), with A1 Ethernet1/2 (1).
*Oct 15 09:42:34.854: NCP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Ethernet1/1 (999), with A1 Ethernet1/1 (1).
D2#
*Oct 15 09:42:35.857: NCP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Ethernet1/2 (999), with A1 Ethernet1/2 (1).
*Oct 15 09:42:35.857: NCP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Ethernet1/1 (999), with A1 Ethernet1/1 (1).
*Oct 15 09:42:37.840: NCCS-1-LOADINBL2: (t1/1) suspended: LACP currently not enabled on the remote port.
*Oct 15 09:42:37.840: NCCS-1-LOADINBL2: (t1/2) suspended: LACP currently not enabled on the remote port.
*Oct 15 09:42:37.840: NCCS-1-LOADINBL2: (t1/3) suspended: LACP currently not enabled on the remote port.
*Oct 15 09:42:37.840: NCCS-1-LOADINBL2: (t1/8) suspended: LACP currently not enabled on the remote port.
*Oct 15 09:42:37.840: NCCS-1-LOADINBL2: (t1/1) suspended: LACP currently not enabled on the remote port.
D2#
*Oct 15 09:42:37.847: NCP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on Ethernet1/1 (999), with A1 Ethernet1/1 (1).
D2#
*Oct 15 09:42:37.983: NLMK-3-UPDOWN: Interface Vlan100, changed state to up
*Oct 15 09:42:37.984: NLINEPROTO-5-UPDOWN: Line protocol on Interface Vlan100, changed state to up
D2#
*Oct 15 09:42:36.845: NLINEPROTO-5-UPDOWN: Line protocol on Interface Port-channel12, changed state to up
D2#
*Oct 15 09:43:02.843: NLMK-3-UPDOWN: Interface Vlan100, changed state to up
*Oct 15 09:43:03.853: NLINEPROTO-5-UPDOWN: Line protocol on Interface Vlan100, changed state to up
D2#copy running-config startup-config
Destination filename [startup-config]:
Building configuration...
Compressed configuration from 3571 bytes to 1825 bytes[OK]
D2#
D2#show int trunk

Port      Node      Encapsulation  Status  Native vlan
---      -
Po12     on        802.1q         trunking  999
Po12     on        802.1q         trunking  999

Port      Vlans allowed on trunk
---      -
Po1       1-4094
Po12      1-4094

Port      Vlans allowed and active in management domain
---      -
Po1       1,100-102,999
Po12      1,100-102,999

Port      Vlans in spanning tree forwarding state and not pruned
---      -
Po1       1,100-102,999
Po12      1,100-102,999
D2#
solarwinds Solar-PuTTY free tool © 2019 SolarWinds Worldwide, LLC. All rights reserved.
12°C Mayorm. nublado 10:2 a. m. 15/10/2022

```

Figura 15 Verificación enlaces troncales A1

```
Creating a port-channel interface Port-channel 2
All(config-if-range)#no shutdown
All(config-if-range)#exit
All(config)#interface e1/3
All(config-if)#switchport mode access
All(config-if)#switchport access vlan 101
All(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 Ethernet1/3 but will only
have effect when the interface is in a non-trunking mode.
All(config-if)#no shutdown
All(config-if)#exit
All(config)#interface e2/9
All(config-if)#switchport mode access
All(config-if)#switchport access vlan 100
All(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 Ethernet2/9 but will only
have effect when the interface is in a non-trunking mode.
All(config-if)#no shutdown
All(config-if)#exit
All(config)#end
A#
*Oct 15 09:42:49.972: NVRAM: CONFIG: Configured from console by console
a1#
*Oct 15 09:42:50.864: NLB19P010-5-UP00A: Line protocol on Interface Port-channel2, changed state to up
*Oct 15 09:42:50.864: NLB19P010-5-UP00A: Line protocol on Interface Port-channel1, changed state to up
A#copy running-config startup-config
Destination filename [startup-config]:
Building configuration...
Compressed configuration from 2533 bytes to 1308 bytes[OK]
a1#show int trunk

Port      Mode      Encapsulation  status      Native vlan
Pci1     on        802.1q          trunking    999
Pci2     on        802.1q          trunking    999

Port      Vlans allowed on trunk
Pci1     1-4094
Pci2     1-4094

Port      Vlans allowed and active in management domain
Pci1     1,100-102,999
Pci2     1,100-102,999

Port      Vlans in spanning tree forwarding state and not pruned
Pci1     100
Pci2     100
A#
```

Tarea 2.3: Habilitación del protocolo Rapid Spanning-Tree

Switch D1

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

Switch D2

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

Switch A1

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

Figura 16 Verificación de spanning-tree D1

```

R1 R2 R3 D1 D2 A1 PC1 PC4 PC2 PC3
*Oct 15 05:42:06.880: MEG-S-LSOONTBNL2: Et1/2 suspended; LACP currently not enabled on the remote port.
*Oct 15 05:42:06.880: MEG-S-LSOONTBNL2: Et1/3 suspended; LACP currently not enabled on the remote port.
*Oct 15 05:42:06.880: MEG-S-LSOONTBNL2: Et1/7 suspended; LACP currently not enabled on the remote port.
*Oct 15 05:42:06.880: MEG-S-LSOONTBNL2: Et1/8 suspended; LACP currently not enabled on the remote port.
*Oct 15 05:42:06.880: MEG-S-LSOONTBNL2: Et1/1 suspended; LACP currently not enabled on the remote port.
*Oct 15 05:42:26.836: NLINPROTO-S-UPDOWN: Line protocol on Interface Ethernet2/0, changed state to up
*Oct 15 05:42:26.836: NLINPROTO-S-UPDOWN: Line protocol on Interface Ethernet2/1, changed state to up
*Oct 15 05:42:26.836: NLINPROTO-S-UPDOWN: Line protocol on Interface Ethernet2/2, changed state to up
*Oct 15 05:42:26.836: NLINPROTO-S-UPDOWN: Line protocol on Interface Ethernet2/3, changed state to up
*Oct 15 05:42:31.837: SCOP-4-NATIVE_VLAN_RESMATCH: Native VLAN mismatch discovered on Ethernet8/1 (999), with A1 Ethernet8/1 (1).
*Oct 15 05:42:33.856: NLINPROTO-S-UPDOWN: Line protocol on Interface Port-channel12, changed state to up
*Oct 15 05:42:37.837: NLIN-3-UPDOWN: Interface Vlan181, changed state to up
*Oct 15 05:42:38.841: NLINPROTO-S-UPDOWN: Line protocol on Interface Vlan181, changed state to up
*Oct 15 05:42:38.844: NLINPROTO-S-UPDOWN: Line protocol on Interface Port-channel1, changed state to up
D1#copy running-config startup-config
Destination filename [startup-config]?
*Oct 15 05:43:02.804: NLIN-3-UPDOWN: Interface Vlan181, changed state to up
*Oct 15 05:43:03.883: NLINPROTO-S-UPDOWN: Line protocol on Interface Vlan181, changed state to up
Building configuration...
Compressed configuration from 3572 bytes to 1825 bytes[OK]
D1#
D1#show int trunk

Port      Mode      Encapsulation  Status      Native vlan
-----
Po1      on        802.1q         trunksing   999
Po12     on        802.1q         trunksing   999

Port      Vlans allowed on trunk
Po1      1-4094
Po12     1-4094

Port      Vlans allowed and active in management domain
Po1      1,100-102,999
Po12     1,100-102,999

Port      Vlans in spanning tree forwarding state and not pruned
Po1      1,100-102,999
Po12     1,100-102,999
D1#show run |include spanning tree
spanning tree
% Invalid input detected at '^' marker.
D1#show run |include spanning tree
D1#show run |include spanning tree
spanning-tree mode rapid-pst
spanning-tree extend system-id
spanning-tree vlan 100,182 priority 24576
spanning-tree vlan 181 priority 20672
spanning-tree portfast edge
D1#

```

Figura 17 Verificación de spanning-tree D2

```

R1 R2 R3 D1 D2 A1 PC1 PC4 PC2 PC3
*Oct 15 05:42:29.880: NLINPROTO-S-UPDOWN: Line protocol on Interface Ethernet2/2, changed state to up
*Oct 15 05:42:29.858: NLINPROTO-S-UPDOWN: Line protocol on Interface Ethernet2/0, changed state to up
*Oct 15 05:42:30.853: SCOP-4-NATIVE_VLAN_RESMATCH: Native VLAN mismatch discovered on Ethernet1/2 (999), with A1 Ethernet1/2 (1).
*Oct 15 05:42:30.853: SCOP-4-NATIVE_VLAN_RESMATCH: Native VLAN mismatch discovered on Ethernet1/1 (999), with A1 Ethernet1/1 (1).
*Oct 15 05:42:32.853: SCOP-4-NATIVE_VLAN_RESMATCH: Native VLAN mismatch discovered on Ethernet1/2 (999), with A1 Ethernet1/2 (1).
*Oct 15 05:42:32.859: SCOP-4-NATIVE_VLAN_RESMATCH: Native VLAN mismatch discovered on Ethernet1/1 (999), with A1 Ethernet1/1 (1).
*Oct 15 05:42:33.852: NLINPROTO-S-UPDOWN: Line protocol on Interface Port-channel12, changed state to up
*Oct 15 05:42:33.856: SCOP-4-NATIVE_VLAN_RESMATCH: Native VLAN mismatch discovered on Ethernet1/2 (999), with A1 Ethernet1/2 (1).
*Oct 15 05:42:33.856: SCOP-4-NATIVE_VLAN_RESMATCH: Native VLAN mismatch discovered on Ethernet1/1 (999), with A1 Ethernet1/1 (1).
*Oct 15 05:42:34.854: SCOP-4-NATIVE_VLAN_RESMATCH: Native VLAN mismatch discovered on Ethernet1/1 (999), with A1 Ethernet1/1 (1).
*Oct 15 05:42:35.857: SCOP-4-NATIVE_VLAN_RESMATCH: Native VLAN mismatch discovered on Ethernet1/2 (999), with A1 Ethernet1/2 (1).
*Oct 15 05:42:35.857: SCOP-4-NATIVE_VLAN_RESMATCH: Native VLAN mismatch discovered on Ethernet1/1 (999), with A1 Ethernet1/1 (1).
*Oct 15 05:42:37.840: MEG-S-LSOONTBNL2: Et1/2 suspended; LACP currently not enabled on the remote port.
*Oct 15 05:42:37.841: SCOP-4-NATIVE_VLAN_RESMATCH: Native VLAN mismatch discovered on Ethernet1/2 (999), with A1 Ethernet1/2 (1).
*Oct 15 05:42:37.847: SCOP-4-NATIVE_VLAN_RESMATCH: Native VLAN mismatch discovered on Ethernet1/1 (999), with A1 Ethernet1/1 (1).
*Oct 15 05:42:37.983: NLIN-3-UPDOWN: Interface Vlan180, changed state to up
*Oct 15 05:42:39.834: NLINPROTO-S-UPDOWN: Line protocol on Interface Vlan180, changed state to up
*Oct 15 05:42:36.845: NLINPROTO-S-UPDOWN: Line protocol on Interface Port-channel12, changed state to up
*Oct 15 05:43:02.803: NLIN-3-UPDOWN: Interface Vlan181, changed state to up
*Oct 15 05:43:03.883: NLINPROTO-S-UPDOWN: Line protocol on Interface Vlan181, changed state to up
D2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
Compressed configuration from 3571 bytes to 1825 bytes[OK]
D2#
D2#show int trunk

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

Port      Vlans allowed on trunk
Po2      1-4094
Po12     1-4094

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#show run |include spanning-tree
spanning-tree mode rapid-pst
spanning-tree extend system-id
spanning-tree vlan 100,182 priority 24576
spanning-tree vlan 181 priority 20672
spanning-tree portfast edge
D2#

```


D2(config-if-range)#no shutdown
 D2(config-if-range)#channel-group 2 mode active
 Creating a port-channel interface Port-channel 2

Switch A1

A1(config-if-range)#channel-group 1 mode active
 Creating a port-channel interface Port-channel 1
 A1(config-if-range)#channel-group 2 mode active
 Creating a port-channel interface Port-channel 2

Figura 19 Verificación del LACP D1

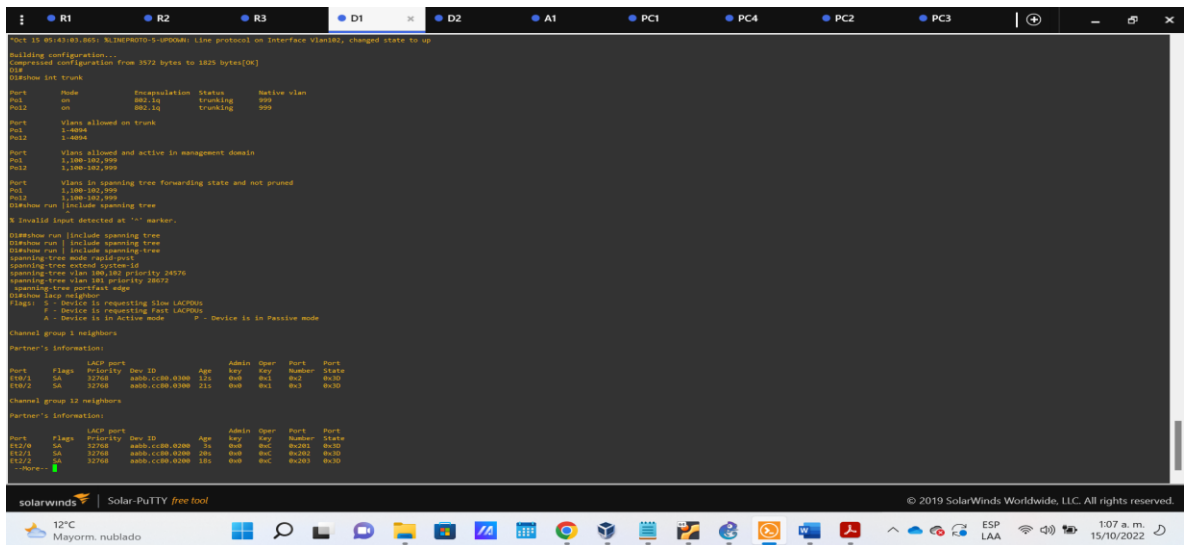


Figura 20 Verificación del LACP D2

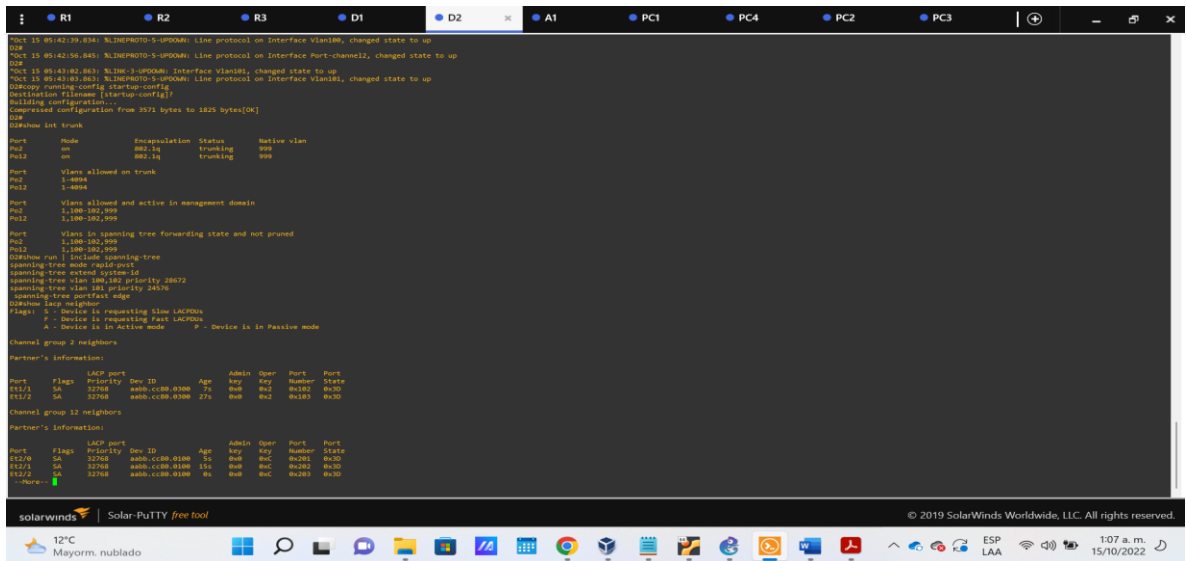


Figura 21 Verificación del LACP A1

```

have effect when the interface is in a non-trunking mode.
A1(config-if)#no shutdown
A1(config-if)#exit
A1(config)#end
A1
Port 15 00142:00:072: 8025-3-COMPTO_1: Configured from console by console
A1#
Port 15 00142:00:084: NL1NEP9070-5-UPO0040: Line protocol on Interface Port-channel1, changed state to up
Port 15 00142:00:084: NL1NEP9070-5-UPO0040: Line protocol on Interface Port-channel1, changed state to up
A1#copy running-config startup-config
Destination filename [startup-config]:
Building configuration...
Compressed configuration from 2537 bytes to 1368 bytes[OK]
A1#show int 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       1,100,102,999
Po2       100

A1#show run | include spanning-tree
spanning-tree mode rapid-pvst
spanning-tree extend system-id
spanning-tree portfast edge
spanning-tree portfast edge
A1#show lacp neighbor
Flags: S - Device is requesting Slow LACPDUs
       F - Device is requesting Fast LACPDUs
       A - Device is in Active mode       P - Device is in Passive mode

Channel group 1 neighbors
Partner's Information:
Port      LACP port  LACP port  Admin Oper  Port  Port
Flags    Priority  Dev ID     Age    key   key   Number State
-----
Et1/1    SA       32768     a0b.cc08-0100  36    0x0  0x1  0x2  0x3D
Et1/2    SA       32768     a0b.cc08-0100  21s   0x0  0x1  0x3  0x3D

Channel group 2 neighbors
Partner's Information:
Port      LACP port  LACP port  Admin Oper  Port  Port
Flags    Priority  Dev ID     Age    key   key   Number State
-----
Et1/1    SA       32768     a0b.cc08-0200  4s    0x0  0x2  0x102 0x3D
Et1/2    SA       32768     a0b.cc08-0200  21s   0x0  0x2  0x103 0x3D
A1#

```

Tarea 2.6: configuración puertos de acceso al host que se conectan a PC1, PC2, PC3 y PC4.

Switch D1

D1(config)#interface e0/0
D1(config-if)#switchport mode access

Switch D2

D2(config)#interface e0/0
D2(config-if)#switchport mode access

Switch A1

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

```
A1(config-if)#switchport access vlan 100
A1(config-if)#spanning-tree portfast
A1(config-if)#no shutdown
A1(config-if)#exit
```

Switch D1

```
D1#enable
D1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
D1(config)#interface range e2/0-3
D1(config-if-range)#switchport trunk encapsulation dot1q
D1(config-if-range)#switchport mode trunk
D1(config-if-range)#switchport trunk native vlan 999
D1(config-if-range)#channel-group 12 mode active
Creating a port-channel interface Port-channel 12
D1(config-if-range)#no shutdown
D1(config-if-range)#exit
D1(config)#interface range e0/1-2
D1(config-if-range)#Switchport trunk encapsulation dot1q
D1(config-if-range)#switchport mode trunk
D1(config-if-range)#switchport trunk native vlan 999
D1(config-if-range)#channel-group 1 mode active
Creating a port-channel interface Port-channel 1
D1(config-if-range)#no shutdown
D1(config-if-range)#exit
D1(config)#spanning-tree mode rapid-pvst
D1(config)#spanning-tree vlan 100,102 root primary
D1(config)#spanning-tree vlan 101 root secondary
D1(config)#interface e0/0
D1(config-if)#switchport mode access
D1(config-if)#switchport access vlan 100
D1(config-if)#spanning-tree portfast
```

Figura 22 Configuración segunda parte switch D1.

```

D1# 15 05:35:43:838: NLINP870-5-UP000N: Line protocol on Interface Ethernet1/9, changed state to down
D1# 15 05:35:43:838: NLINP870-5-UP000N: Line protocol on Interface Ethernet1/1, changed state to down
D1# 15 05:35:43:838: NLINP870-5-UP000N: Line protocol on Interface Ethernet1/2, changed state to down
D1# 15 05:35:43:838: NLINP870-5-UP000N: Line protocol on Interface Ethernet1/3, changed state to down
D1(config)#exit
D1copy running-config startup-config
D1# 15 05:38:08:696: N0Y5-5-COMP10_1: Configured from console by console
Destination filename: [startup-config]
Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
Compressed configuration from 2490 bytes to 1389 bytes[OK]
D1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
D1(config)#interface range e2/0-3
D1(config-if-range)#switchport trunk encapsulation dot1q
D1(config-if-range)#switchport mode trunk
D1(config-if-range)#switchport trunk native vlan 999
D1(config-if-range)#channel-group 12 mode active
Creating a port-channel interface Port-channel 12
D1(config-if-range)#no shutdown
D1(config-if-range)#exit
D1(config)#interface range e1/1-2
D1(config-if-range)#switchport trunk encapsulation dot1q
D1(config-if-range)#switchport mode trunk
D1(config-if-range)#switchport trunk native vlan 999
D1(config-if-range)#channel-group 2 mode active
Creating a port-channel interface Port-channel 2
D1(config-if-range)#no shutdown
D1(config-if-range)#exit
D1(config)#spanning-tree mode rapid-pvst
D1(config)#spanning-tree vlan 100,102 root primary
D1(config)#spanning-tree vlan 101 root secondary
D1(config)#interface e1/9
D1(config-if)#switchport mode access
D1(config-if)#switchport access vlan 100
D1(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 Ethernet1/9 but will only
have effect when the interface is in a non-trunking mode.
D1(config-if)#no shutdown
D1(config-if)#exit
D1(config)#end
D1#
D1# 15 05:41:07:597: N0Y5-5-COMP10_1: Configured from console by console
D1# 15 05:41:08:837: NLINP-5-UP000N: Interface Ethernet1/9, changed state to up
D1# 15 05:41:08:837: NLINP-5-UP000N: Interface Ethernet1/1, changed state to up
D1# 15 05:41:08:837: NLINP-5-UP000N: Interface Ethernet1/2, changed state to up
D1# 15 05:41:08:837: NLINP-5-UP000N: Interface Ethernet1/3, changed state to up
D1# 15 05:41:08:837: NLINP-5-UP000N: Interface Ethernet1/1, changed state to up
D1# 15 05:41:08:837: NLINP-5-UP000N: Interface Ethernet1/2, changed state to up

```

Switch D2

D2#enable

D2#configure terminal

Enter configuration commands, one per line. End with CNTL/Z.

D2(config)#interface range e2/0-3

D2(config-if-range)#Switchport trunk encapsulation dot1q

D2(config-if-range)#switchport mode trunk

D2(config-if-range)#switchport trunk native vlan 999

D2(config-if-range)#channel-group 12 mode active

Creating a port-channel interface Port-channel 12

D2(config-if-range)#no shutdown

D2(config-if-range)#exit

D2(config)#interface range e1/1-2

D2(config-if-range)#Switchport trunk encapsulation dot1q

D2(config-if-range)#switchport mode trunk

D2(config-if-range)#switchport trunk native vlan 999

D2(config-if-range)#channel-group 2 mode active

Creating a port-channel interface Port-channel 2

D2(config-if-range)#no shutdown

D2(config-if-range)#exit

D2(config)#!

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

```

D2(config)#spanning-tree vlan 101 root primary
D2(config)#spanning-tree vlan 100,102 root secondary
D2(config)#!
D2(config)#interface e0/0
D2(config-if)#switchport mode access
D2(config-if)#switchport access vlan 102
D2(config-if)#spanning-tree portfast
D2(config-if)#no shutdown
D2(config-if)#exit
D2(config)#end

```

Figura 23 Configuración segunda parte switch D2.

```

solarwinds | Solar-PuTTY free tool | © 2019 SolarWinds Worldwide, LLC. All rights reserved.
D2(config)#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
D2(config)#interface range e0/0-1
D2(config-if-range)#switchport trunk encapsulation dot1q
D2(config-if-range)#switchport mode trunk
D2(config-if-range)#switchport trunk native vlan 999
D2(config-if-range)#channel-group 1 mode active
Creating a port-channel interface Port-channel 1
D2(config-if-range)#no shutdown
D2(config-if-range)#exit
D2(config)#interface range e1/1-2
D2(config-if-range)#switchport trunk encapsulation dot1q
D2(config-if-range)#switchport mode trunk
D2(config-if-range)#switchport trunk native vlan 999
D2(config-if-range)#channel-group 2 mode active
Creating a port-channel interface Port-channel 2
D2(config-if-range)#no shutdown
D2(config-if-range)#exit
D2(config)#!
D2(config)#spanning-tree mode rapid-pvst
D2(config)#spanning-tree vlan 101 root primary
D2(config)#spanning-tree vlan 100,102 root secondary
D2(config)#!
D2(config)#interface e0/0
D2(config-if)#switchport mode access
D2(config-if)#switchport access vlan 102
D2(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 Ethernet0/0 but will only
have effect when the interface is in a non-trunking mode.
D2(config-if)#no shutdown
D2(config-if)#exit
D2(config)#end
D2#
*Oct 15 05:42:27.837: NLM-3-UPDOWN: Interface Ethernet2/0, changed state to up
*Oct 15 05:42:27.837: NLM-3-UPDOWN: Interface Ethernet2/1, changed state to up
*Oct 15 05:42:27.837: NLM-3-UPDOWN: Interface Ethernet2/2, changed state to up
*Oct 15 05:42:27.837: NLM-3-UPDOWN: Interface Ethernet2/3, changed state to up
*Oct 15 05:42:27.837: NLM-3-UPDOWN: Interface Ethernet1/1, changed state to up
*Oct 15 05:42:27.838: NLM-3-UPDOWN: Interface Ethernet1/2, changed state to up
*Oct 15 05:42:27.838: NLM-3-UPDOWN: Interface Ethernet0/6, changed state to up
*Oct 15 05:42:27.838: NLM-3-UPDOWN: Interface Vlan102, changed state to up
*Oct 15 05:42:28.838: NLINPRTD-3-UPDOWN: Line protocol on Interface Ethernet1/1, changed state to up
*Oct 15 05:42:28.838: NLINPRTD-3-UPDOWN: Line protocol on Interface Ethernet2/2, changed state to up
*Oct 15 05:42:28.838: NLINPRTD-3-UPDOWN: Line protocol on Interface Ethernet0/6, changed state to up
*Oct 15 05:42:28.838: NLINPRTD-3-UPDOWN: Line protocol on Interface Vlan102, changed state to up
*Oct 15 05:42:28.840: NCP-4-NATIVE_VLAN_RESMATCH: Native VLAN mismatch discovered on Ethernet1/1 (999), with A1 Ethernet1/1 (1).
*Oct 15 05:42:28.840: NCP-4-NATIVE_VLAN_RESMATCH: Native VLAN mismatch discovered on Ethernet1/2 (999), with A1 Ethernet1/2 (1).
D2#
*Oct 15 05:42:29.392: N3Y-5-COMP10_1: Configured from console by console
*Oct 15 05:42:29.897: NCP-4-NATIVE_VLAN_RESMATCH: Native VLAN mismatch discovered on Ethernet1/2 (999), with A1 Ethernet1/2 (1).
*Oct 15 05:42:29.897: NCP-4-NATIVE_VLAN_RESMATCH: Native VLAN mismatch discovered on Ethernet1/1 (999), with A1 Ethernet1/1 (1).
D2#

```

Switch A1

```

A1#Enable
A1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
A1(config)#spanning-tree mode rapid-pvst
A1(config)#interface range e0/1-2
A1(config-if-range)#switchport trunk encapsulation dot1q
A1(config-if-range)#switchport mode trunk
A1(config-if-range)#switchport trunk native vlan 999
A1(config-if-range)#channel-group 1 mode active
Creating a port-channel interface Port-channel 1

```

```

A1(config-if-range)#no shutdown
A1(config-if-range)#exit
A1(config)#interface range e1/1-2
A1(config-if-range)#switchport trunk encapsulation dot1q
A1(config-if-range)#switchport mode trunk
A1(config-if-range)#switchport trunk native vlan 999
A1(config-if-range)#channel-group 2 mode active
Creating a port-channel interface Port-channel 2
A1(config-if-range)#no shutdown
A1(config-if-range)#exit
A1(config)#interface e1/3
A1(config-if)#switchport mode access
A1(config-if)#switchport access vlan 101
A1(config-if)#spanning-tree portfast
A1(config-if)#no shutdown
A1(config-if)#exit
A1(config)#interface e2/0
A1(config-if)#switchport mode access
A1(config-if)#switchport access vlan 100
A1(config-if)#spanning-tree portfast
A1(config-if)#no shutdown
A1(config-if)#exit
A1(config)#end

```

Figura 24 Configuración segunda parte switch A1.

```

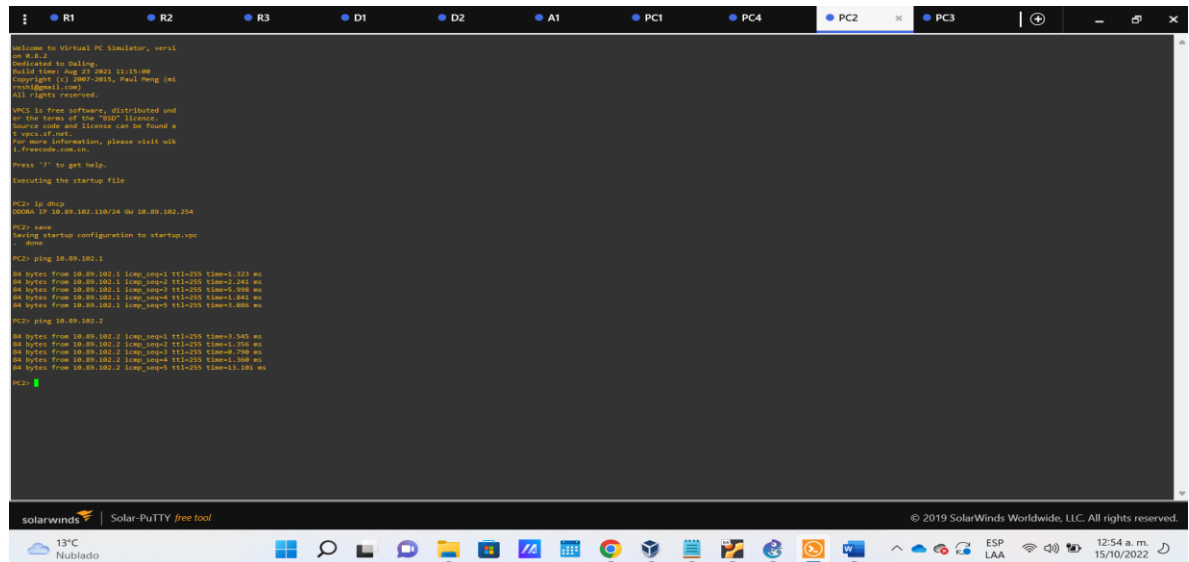
solarwinds Solar-PuTTY free tool
A1(configure terminal)
Enter configure mode, one per line. End with CTRL-Z.
A1(config)#spanning-tree mode rapid-pst
A1(config)#interface range e1/1-2
A1(config-if-range)#switchport trunk encapsulation dot1q
A1(config-if-range)#switchport mode trunk
A1(config-if-range)#switchport trunk native vlan 999
A1(config-if-range)#channel-group 1 mode active
Creating a port-channel interface Port-channel 1
A1(config-if-range)#no shutdown
A1(config-if-range)#exit
A1(config)#interface range e1/1-2
A1(config-if-range)#switchport trunk encapsulation dot1q
A1(config-if-range)#switchport mode trunk
A1(config-if-range)#switchport trunk native vlan 999
A1(config-if-range)#channel-group 2 mode active
Creating a port-channel interface Port-channel 2
A1(config-if-range)#no shutdown
A1(config-if-range)#exit
A1(config)#interface e1/3
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.
Spanning tree will not be started until Spanning tree enabled on this
interface.
SpanningFast has been configured on Ethernet1/3 but will only
have effect when the interface is in a non-trunking mode.
A1(config-if)#no shutdown
A1(config-if)#exit
A1(config)#interface e2/0
A1(config-if)#switchport mode access
A1(config-if)#switchport access vlan 100
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.
Spanning tree will not be started until Spanning tree enabled on this
interface.
SpanningFast has been configured on Ethernet2/0 but will only
have effect when the interface is in a non-trunking mode.
A1(config-if)#no shutdown
A1(config-if)#exit
A1(config)#end
A1#
*Oct 15 05:42:49.972: SV5-S-C0B1G-1: Configured from console by console
A1#
*Oct 15 05:42:56.844: NL1BP070-S-UP000N: Line protocol on Interface Port-channel2, changed state to up
*Oct 15 05:42:56.844: NL1BP070-S-UP000N: Line protocol on Interface Port-channel1, changed state to up
A1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[Compressed configuration from 2533 bytes to 1308 bytes]OK
A1#

```

Tarea 2.7 Comprobación de los servicios DHCP IPv4.

```
PC2> ip dhcp  
DDORA IP 10.89.102.110/24 GW 10.89.102.254  
PC2>
```

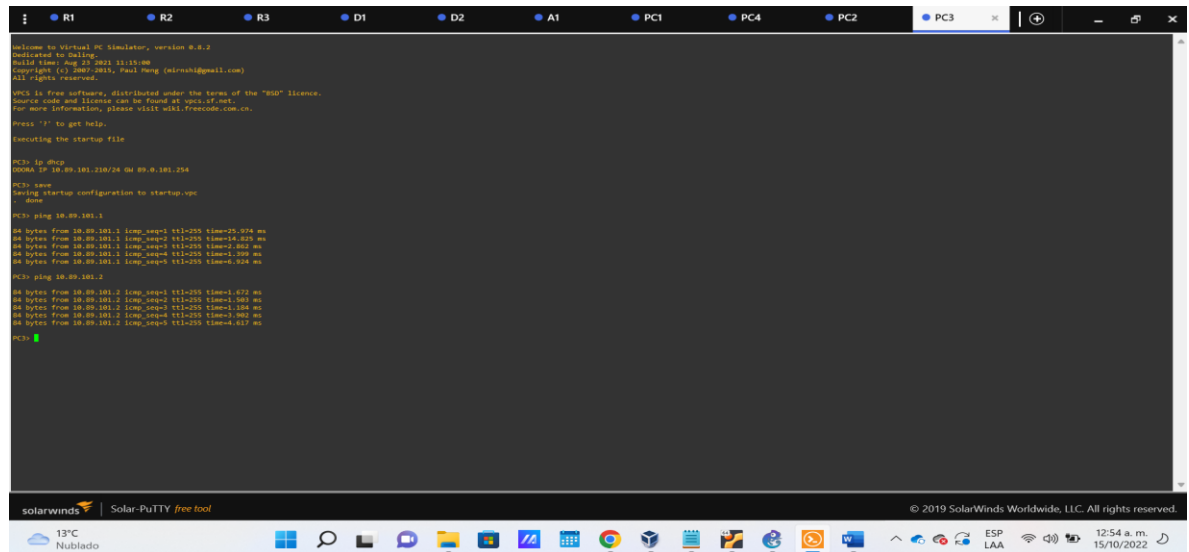
Figura 25 Configuración DHCP IPv4 en PC2.



```
PC2> ip dhcp  
DDORA IP 10.89.102.110/24 GW 10.89.102.254  
PC2> save  
Saving startup configuration to startup.vpc  
PC2>  
PC2> ping 10.89.102.1  
PING: 10.89.102.1: icmp_seq=1 ttl=255 time=1.323 ms  
64 bytes from 10.89.102.1: icmp_seq=2 ttl=255 time=2.241 ms  
64 bytes from 10.89.102.1: icmp_seq=3 ttl=255 time=0.992 ms  
64 bytes from 10.89.102.1: icmp_seq=4 ttl=255 time=1.841 ms  
64 bytes from 10.89.102.1: icmp_seq=5 ttl=255 time=1.486 ms  
PC2> ping 10.89.102.2  
PING: 10.89.102.2: icmp_seq=1 ttl=255 time=1.545 ms  
64 bytes from 10.89.102.2: icmp_seq=2 ttl=255 time=1.256 ms  
64 bytes from 10.89.102.2: icmp_seq=3 ttl=255 time=0.708 ms  
64 bytes from 10.89.102.2: icmp_seq=4 ttl=255 time=1.368 ms  
64 bytes from 10.89.102.2: icmp_seq=5 ttl=255 time=1.181 ms  
PC2>
```

```
PC3> ip dhcp  
DORA IP 10.2.101.110/24 GW 10.2.101.254  
PC3> save
```

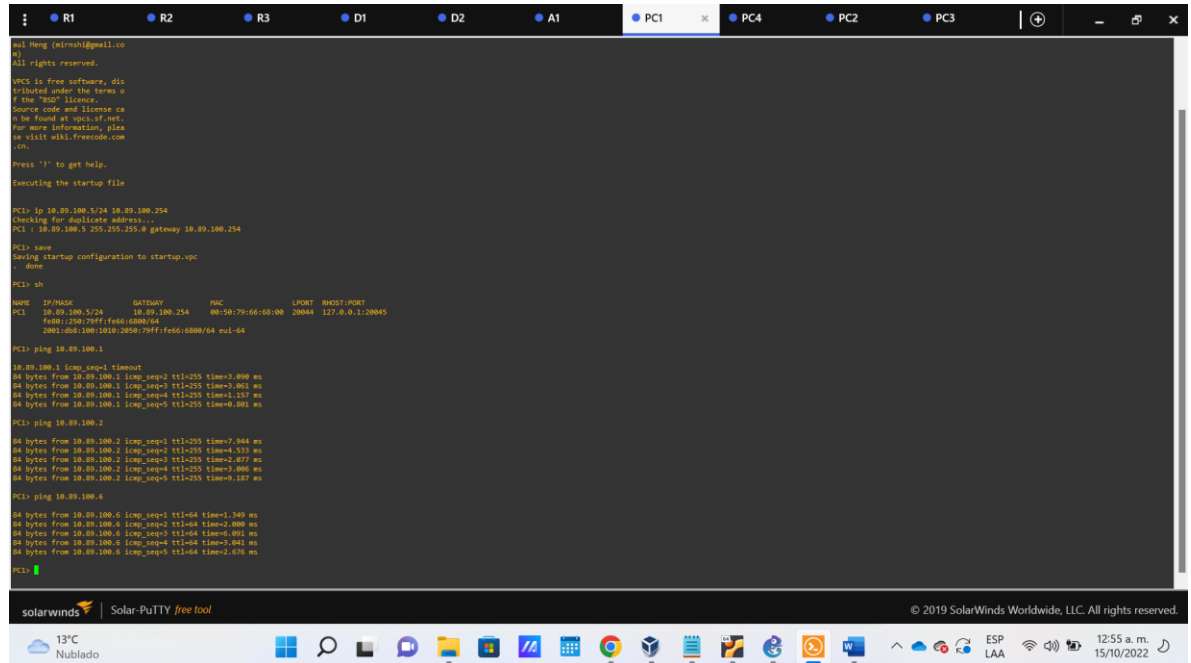
Figura 26 Configuración DHCP IPV4 en PC3.



```
PC3> ip dhcp  
DORA IP 10.2.101.110/24 GW 10.2.101.254  
PC3> save  
Saving startup configuration to startup.vpc  
PC3>  
PC3> ping 10.89.101.1  
PING: 10.89.101.1: icmp_seq=1 ttl=255 time=25.974 ms  
64 bytes from 10.89.101.1: icmp_seq=2 ttl=255 time=14.825 ms  
64 bytes from 10.89.101.1: icmp_seq=3 ttl=255 time=2.882 ms  
64 bytes from 10.89.101.1: icmp_seq=4 ttl=255 time=1.299 ms  
64 bytes from 10.89.101.1: icmp_seq=5 ttl=255 time=0.924 ms  
PC3> ping 10.89.101.2  
PING: 10.89.101.2: icmp_seq=1 ttl=255 time=1.672 ms  
64 bytes from 10.89.101.2: icmp_seq=2 ttl=255 time=1.184 ms  
64 bytes from 10.89.101.2: icmp_seq=3 ttl=255 time=1.184 ms  
64 bytes from 10.89.101.2: icmp_seq=4 ttl=255 time=0.962 ms  
64 bytes from 10.89.101.2: icmp_seq=5 ttl=255 time=1.017 ms  
PC3>
```

Tarea 2.8 Compruebe la conectividad LAN local.

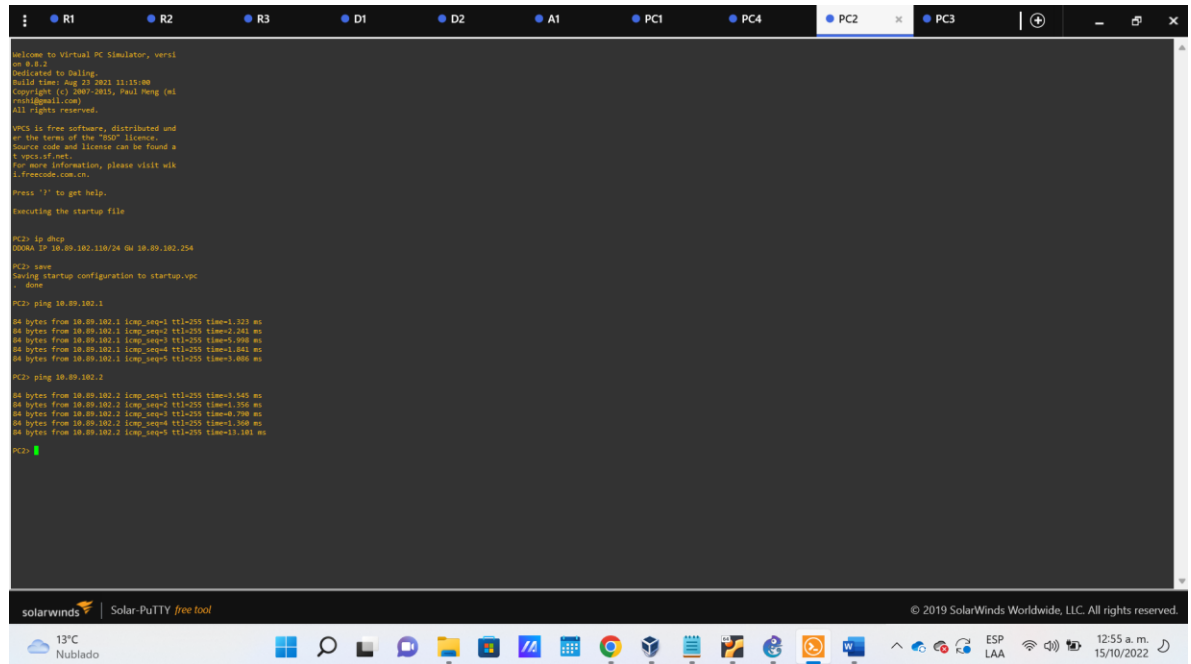
Figura 27 Comprobación conectividad LAN en PC1.



```

R1 R2 R3 D1 D2 A1 PC1 PC4 PC2 PC3
sol Heng (hsnshi@gmail.co
All rights reserved.
VPCS is free software, dist
tributed under the terms o
f the "GNU" license.
Source code and license ca
n be found at vpcs.sf.net.
For more information, plea
se visit wiki.freecode.com
.cn.
Press '?' to get help.
Executing the startup file
PC1> ip 10.89.100.5/24 10.89.100.254
Checking for duplicate address...
PC1 : 10.89.100.5 255.255.255.0 gateway 10.89.100.254
PC1> save
Saving startup configuration to startup.vpc
. Done
PC1> sh
NAME IP/MASK GATEWAY MAC LPORT RHOST:PORT
PC1 10.89.100.5/24 10.89.100.254 08:50:79:66:65:08 20044 127.0.0.1:20045
1001:2001:2001:FC66:6000/64
2002:0d01:1001:1010:2050:79FF:FC66:6000/64 sui-64
PC1> ping 10.89.100.1
10.89.100.1 icmp_seq=1 timeout
64 bytes from 10.89.100.1: icmp_seq=2 ttl=255 time=3.099 ms
64 bytes from 10.89.100.1: icmp_seq=3 ttl=255 time=3.803 ms
64 bytes from 10.89.100.1: icmp_seq=4 ttl=255 time=1.157 ms
64 bytes from 10.89.100.1: icmp_seq=5 ttl=255 time=0.801 ms
PC1> ping 10.89.100.2
64 bytes from 10.89.100.2: icmp_seq=1 ttl=255 time=7.944 ms
64 bytes from 10.89.100.2: icmp_seq=2 ttl=255 time=4.513 ms
64 bytes from 10.89.100.2: icmp_seq=3 ttl=255 time=2.877 ms
64 bytes from 10.89.100.2: icmp_seq=4 ttl=255 time=3.866 ms
64 bytes from 10.89.100.2: icmp_seq=5 ttl=255 time=0.187 ms
PC1> ping 10.89.100.6
64 bytes from 10.89.100.6: icmp_seq=1 ttl=64 time=1.240 ms
64 bytes from 10.89.100.6: icmp_seq=2 ttl=64 time=2.480 ms
64 bytes from 10.89.100.6: icmp_seq=3 ttl=64 time=0.491 ms
64 bytes from 10.89.100.6: icmp_seq=4 ttl=64 time=1.841 ms
64 bytes from 10.89.100.6: icmp_seq=5 ttl=64 time=2.676 ms
PC1>
solarwinds Solar-PuTTY free tool © 2019 SolarWinds Worldwide, LLC. All rights reserved.
13°C Nublado 12:55 a. m. 15/10/2022
```

Figura 28 Comprobación conectividad LAN en PC2.



```

R1 R2 R3 D1 D2 A1 PC1 PC4 PC2 PC3
Welcome to Virtual PC Simulator, versi
on 0.8.2
Dedicated to Daling.
Build time: Aug 23 2021 11:15:00
Copyright (c) 2007-2015, Paul Heng (at
rshk@gmail.com)
All rights reserved.
VPCS is free software, distributed und
er the terms of the "GNU" license.
Source code and license can be found a
t vpcs.sf.net.
For more information, please visit wik
i.freecode.com.cn.
Press '?' to get help.
Executing the startup file
PC2> ip 0/0/0
OOORA IP 10.89.102.110/24 Gw 10.89.102.254
PC2> save
Saving startup configuration to startup.vpc
. Done
PC2> ping 10.89.102.1
64 bytes from 10.89.102.1: icmp_seq=1 ttl=255 time=1.323 ms
64 bytes from 10.89.102.1: icmp_seq=2 ttl=255 time=2.281 ms
64 bytes from 10.89.102.1: icmp_seq=3 ttl=255 time=5.999 ms
64 bytes from 10.89.102.1: icmp_seq=4 ttl=255 time=1.841 ms
64 bytes from 10.89.102.1: icmp_seq=5 ttl=255 time=3.886 ms
PC2> ping 10.89.102.2
64 bytes from 10.89.102.2: icmp_seq=1 ttl=255 time=3.545 ms
64 bytes from 10.89.102.2: icmp_seq=2 ttl=255 time=1.356 ms
64 bytes from 10.89.102.2: icmp_seq=3 ttl=255 time=0.798 ms
64 bytes from 10.89.102.2: icmp_seq=4 ttl=255 time=1.508 ms
64 bytes from 10.89.102.2: icmp_seq=5 ttl=255 time=11.181 ms
PC2>
solarwinds Solar-PuTTY free tool © 2019 SolarWinds Worldwide, LLC. All rights reserved.
13°C Nublado 12:55 a. m. 15/10/2022
```


Figura 29 Comprobación conectividad LAN en PC3.

```

Welcome to Virtual PC Simulator, version 0.8.2
Dedicated to Orling.
Build time: Aug 23 2021 11:15:00
Copyright (c) 2007-2015, Paul Fong (airrsh@gmail.com)
All rights reserved.

VPCS is free software, distributed under the terms of the "BSD" licence.
Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

PC3> ip dhcp
DHCPA IP 10.89.101.210/24 GW 89.8.101.254

PC3> save
Saving startup configuration to startup.vpc
- done

PC3> ping 10.89.101.1
04 bytes from 10.89.101.1: icmp_seq=1 ttl=255 time=0.974 ms
04 bytes from 10.89.101.1: icmp_seq=2 ttl=255 time=0.829 ms
04 bytes from 10.89.101.1: icmp_seq=3 ttl=255 time=2.862 ms
04 bytes from 10.89.101.1: icmp_seq=4 ttl=255 time=1.399 ms
04 bytes from 10.89.101.1: icmp_seq=5 ttl=255 time=0.924 ms

PC3> ping 10.89.101.2
04 bytes from 10.89.101.2: icmp_seq=1 ttl=255 time=1.677 ms
04 bytes from 10.89.101.2: icmp_seq=2 ttl=255 time=1.503 ms
04 bytes from 10.89.101.2: icmp_seq=3 ttl=255 time=1.184 ms
04 bytes from 10.89.101.2: icmp_seq=4 ttl=255 time=1.902 ms
04 bytes from 10.89.101.2: icmp_seq=5 ttl=255 time=4.617 ms

PC3>

```

Figura 30 Comprobación conectividad LAN en PC4.

```

Welcome to Virtual PC Simulator, version 0.8.2
Dedicated to Orling.
Build time: Aug 23 2021 11:15:00
Copyright (c) 2007-2015, Paul Fong (airrsh@gmail.com)
All rights reserved.

VPCS is free software, distributed under the terms of the "BSD" licence.
Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

PC4> ip 10.89.100.6/24 10.89.100.254
Checking for duplicate address...
PC4 : 10.89.100.6 255.255.255.8 gateway 10.89.100.254

PC4> save
Saving startup configuration to startup.vpc
- done

PC4> sh
NAME      IP/NETS      GATEWAY      MAC          LPORT  RHOST:PORT
PC4      10.89.100.6/24  10.89.100.254  86:59:79:66:68:01 20004  127.0.0.1:20051
fe80::138:79ff:fe66:6803%4
2003::603:100:1010:2958:79ff:fe66:6803%4 eui-64

PC4> ping 10.89.100.1
04 bytes from 10.89.100.1: icmp_seq=1 ttl=255 time=4.628 ms
04 bytes from 10.89.100.1: icmp_seq=2 ttl=255 time=7.234 ms
04 bytes from 10.89.100.1: icmp_seq=3 ttl=255 time=2.230 ms
04 bytes from 10.89.100.1: icmp_seq=4 ttl=255 time=1.516 ms
04 bytes from 10.89.100.1: icmp_seq=5 ttl=255 time=2.568 ms

PC4> ping 10.89.100.2
04 bytes from 10.89.100.2: icmp_seq=1 ttl=255 time=1.534 ms
04 bytes from 10.89.100.2: icmp_seq=2 ttl=255 time=0.446 ms
04 bytes from 10.89.100.2: icmp_seq=3 ttl=255 time=1.516 ms
04 bytes from 10.89.100.2: icmp_seq=4 ttl=255 time=4.858 ms
04 bytes from 10.89.100.2: icmp_seq=5 ttl=255 time=2.899 ms

PC4> ping 10.89.100.5
04 bytes from 10.89.100.5: icmp_seq=1 ttl=64 time=3.941 ms
04 bytes from 10.89.100.5: icmp_seq=2 ttl=64 time=12.508 ms
04 bytes from 10.89.100.5: icmp_seq=3 ttl=64 time=0.463 ms
04 bytes from 10.89.100.5: icmp_seq=4 ttl=64 time=3.085 ms
04 bytes from 10.89.100.5: icmp_seq=5 ttl=64 time=5.458 ms

PC4>

```

PARTE 3: CONFIGURAR PROTOCOLOS DE ENRUTAMIENTO

En la parte 3 se configurarán los protocolos de enrutamiento (Ipv4 – Ipv6), logrando una completa convergencia en la red al final, de igual manera al realizar los pings deberán ejecutarse correctamente

Paso 1: TAREAS 3.1, 3.2, 3.3, 3.4

Tarea 3.1: configuración en R1, R3, D1 y D2 el OSPFv2 de área única en el área 0

Router R1

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

R1(config-router)#network 10.89.10.0 0.0.0.255 area 0
R1(config-router)#network 10.89.13.0 0.0.0.255 area 0
R1(config-router)#default-information originate
R1(config-router)#exit
```

Router R3

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

R3(config-router)#network 10.89.11.0 0.0.0.255 area 0
R3(config-router)#network 10.89.13.0 0.0.0.255 area 0
R3(config-router)#exit
```

Switch D1

```
D1(config)#router ospf 4
D1(config-router)#router-id 0.0.4.131

D1(config-router)#network 10.89.100.0 0.0.0.255 area 0
D1(config-router)#network 10.89.101.0 0.0.0.255 area 0
D1(config-router)#network 10.89.102.0 0.0.0.255 area 0
D1(config-router)#network 10.89.10.0 0.0.0.255 area 0

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

Switch D2

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

```
D2(config-router)#network 10.89.100.0 0.0.0.255 area 0
D2(config-router)#network 10.89.101.0 0.0.0.255 area 0
D2(config-router)#network 10.89.102.0 0.0.0.255 area 0
D2(config-router)#network 10.89.11.0 0.0.0.255 area 0
```

```
D2(config-router)#passive-interface default
D2(config-router)#no passive-interface e1/0
D2(config-router)#exit
```

Tarea 3.2: configuración en R1, R3, D1 y D2 el OSPFv3 de área única en el área 0

Router R1

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

```
R1(config-rtr)#default-information originate
R1(config-rtr)#exit
```

```
R1(config)#interface e1/1
R1(config-if)#ipv6 ospf 6 area 0
R1(config-if)#exit
R1(config)#interface e1/2
R1(config-if)#ipv6 ospf 6 area 0
R1(config-if)#exit
```

Router R3

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

```
R3(config)#interface e1/1
R3(config-if)#ipv6 ospf 6 area 0
R3(config-if)#exit
R3(config)#interface e1/0
R3(config-if)#ipv6 ospf 6 area 0
R3(config-if)#exit
R3(config)#end
```

Switch D1

```
D1(config)#ipv6 router ospf 6
D1(config-rtr)#router-id 0.0.6.131
D1(config-rtr)#passive-interface default
```

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

```
D1(config)#interface e1/2
D1(config-if)#ipv6 ospf 6 area 0
D1(config-if)#exit
D1(config)#interface vlan 100
D1(config-if)#ipv6 ospf 6 area 0
D1(config-if)#exit
D1(config)#interface vlan 101
D1(config-if)#ipv6 ospf 6 area 0
D1(config-if)#exit
D1(config)#interface vlan 102
D1(config-if)#ipv6 ospf 6 area 0
D1(config-if)#exit
D1(config)#exit
```

Switch D2

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

```
D2(config-rtr)#passive-interface default
D2(config-rtr)#no passive-interface e1/0
D2(config-rtr)#exit
```

```
D2(config)#interface e1/0
D2(config-if)#ipv6 ospf 6 area 0
D2(config-if)#exit
D2(config)#interface vlan 100
D2(config-if)#ipv6 ospf 6 area 0
D2(config-if)#exit
D2(config)#interface vlan 101
D2(config-if)#ipv6 ospf 6 area 0
D2(config-if)#exit
D2(config)#interface vlan 102
D2(config-if)#ipv6 ospf 6 area 0
D2(config-if)#exit
D2(config)#exit
```

Figura 31 Código Switch D1.

```

#Mon 12 20:20:21.958: N1SERVTO-S-UPD
DAM: Line protocol on Interface Port-c
#Mon 12 20:20:21.978: N1SERVTO-S-UPD
DAM: Line protocol on Interface Vlan182, changed state to up
#Mon 12 20:20:24.988: N1SERVTO-S-UPD
DAM: Line protocol on Interface Vlan181, changed state to up
#Mon 12 20:20:28.987: N1SERVTO-S-UPD
DAM: Line protocol on Interface Vlan180, changed state to up
#Mon 12 20:20:31.957: N1SERVTO-S-UPD
DAM: Line protocol on Interface Vlan180
2: changed state to up (2): INCO: 0x1111: Assessment
D2#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
D2(config)#router ospf 4
D2(config)#router-id 0.0.0.132
D2(config)#network 10.89.100.0 0.0.0.255 area 0
D2(config)#network 10.89.101.0 0.0.0.255 area 0
D2(config)#network 10.89.102.0 0.0.0.255 area 0
D2(config)#network 10.89.103.0 0.0.0.255 area 0
D2(config)#passive-interface default
D2(config)#no passive-interface e1/2
D2(config)#router ospf 6
D2(config)#router-id 0.0.0.131
D2(config)#no passive-interface default
D2(config)#no passive-interface e1/2
D2(config)#interface e1/2
D2(config)#ip address 10.89.100.1 255.255.255.0
D2(config)#interface e1/3
D2(config)#ip address 10.89.101.1 255.255.255.0
D2(config)#interface e1/4
D2(config)#ip address 10.89.102.1 255.255.255.0
D2(config)#interface e1/5
D2(config)#ip address 10.89.103.1 255.255.255.0
D2(config)#
#Mon 12 21:06:39.187: NOSPfv3-S-ADJCHG: Process 6, Nbr 0.0.0.1 on Ethernet1/2 from LOADING to FULL, Loading Done
#Mon 12 21:06:39.125: NOSPfv3-S-ADJCHG: Process 4, Nbr 0.0.0.1 on Ethernet1/2 from LOADING to FULL, Loading Done
D2(config)#
D2#
D2#
#Mon 12 21:06:47.727: NVRM-S-COMP31: Configured from console by console
D2#copy running-config startup-config
Destination filename [startup-config]:
Building configuration...
[OK]
Compressed configuration from 4884 bytes to 2851 bytes[OK]
D2#
D2#
#Mon 12 21:22:22.117: NOSPfv3-S-ADJCHG: Process 6, Nbr 0.0.0.1 on Ethernet1/2 from FULL to DOWN, Neighbor Down: Dead timer expired
D2#
#Mon 12 21:22:29.124: NOSPfv3-S-ADJCHG: Process 4, Nbr 0.0.0.1 on Ethernet1/2 from LOADING to FULL, Loading Done
D2#
  
```

Figura 32 Código Switch D2.

```

DAM: Line protocol on Interface Ethernet1/2, changed state to up
#Mon 12 20:20:17.938: N1SERVTO-S-UPD
DAM: Line protocol on Interface Ethernet1/1, changed state to up
#Mon 12 20:20:17.938: N1SERVTO-S-UPD
DAM: Line protocol on Interface Ethernet1/0, changed state to up
#Mon 12 20:20:18.935: N1SERVTO-S-UPD
DAM: Line protocol on Interface Vlan182, changed state to up
#Mon 12 20:20:21.927: N1SERVTO-S-UPD
DAM: Line protocol on Interface Port-c
#Mon 12 20:20:24.927: N1SERVTO-S-UPD
DAM: Line protocol on Interface Vlan181, changed state to up
#Mon 12 20:20:28.926: N1SERVTO-S-UPD
DAM: Line protocol on Interface Vlan180, changed state to up
#Mon 12 20:20:31.925: N1SERVTO-S-UPD
DAM: Line protocol on Interface Vlan180
3: changed state to up (3): INCO: 0x1111: Assessment
D2#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
D2(config)#router ospf 4
D2(config)#router-id 0.0.0.132
D2(config)#network 10.89.100.0 0.0.0.255 area 0
D2(config)#network 10.89.101.0 0.0.0.255 area 0
D2(config)#network 10.89.102.0 0.0.0.255 area 0
D2(config)#network 10.89.103.0 0.0.0.255 area 0
D2(config)#passive-interface default
D2(config)#no passive-interface e1/2
D2(config)#router ospf 6
D2(config)#router-id 0.0.0.131
D2(config)#no passive-interface default
D2(config)#no passive-interface e1/3
D2(config)#no passive-interface e1/4
D2(config)#interface e1/2
D2(config)#ip address 10.89.100.1 255.255.255.0
D2(config)#interface e1/3
D2(config)#ip address 10.89.101.1 255.255.255.0
D2(config)#interface e1/4
D2(config)#ip address 10.89.102.1 255.255.255.0
D2(config)#interface e1/5
D2(config)#ip address 10.89.103.1 255.255.255.0
D2(config)#
#Mon 12 21:06:31.186: NOSPfv3-S-ADJCHG: Process 6, Nbr 0.0.0.3 on Ethernet1/0 from LOADING to FULL, Loading Done
#Mon 12 21:06:31.234: NOSPfv3-S-ADJCHG: Process 4, Nbr 0.0.0.3 on Ethernet1/0 from LOADING to FULL, Loading Done
  
```

Tarea 3.3: configuración en R2 “ISP Network” el MP-BGP

Router R2

```

R2(config)#ip route 0.0.0.0 0.0.0.0 loopback 0
%Default route without gateway, if not a point-to-point interface, may impact performance
R2(config)#ipv6 route ::/0 loopback 0
  
```

```

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

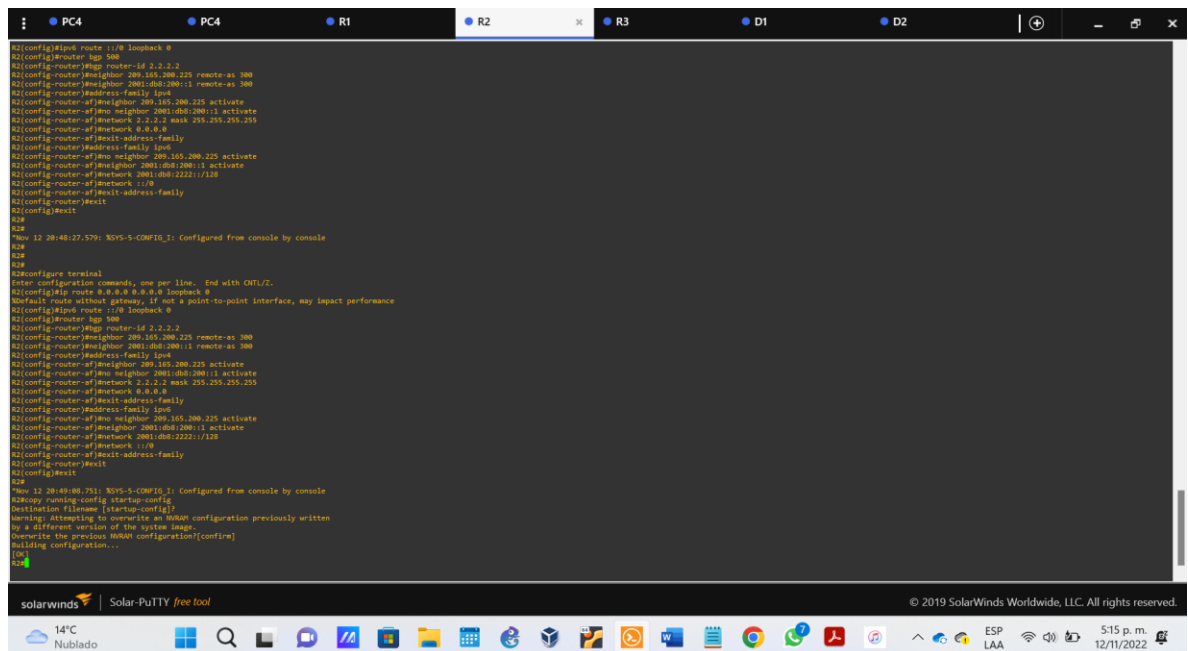
R2(config-router)#neighbor 209.165.200.225 remote-as 300
R2(config-router)#neighbor 2001:db8:200::1 remote-as 300

R2(config-router)#address-family ipv4
R2(config-router-af)#neighbor 209.165.200.225 activate
R2(config-router-af)#no neighbor 2001:db8:200::1 activate
R2(config-router-af)#network 2.2.2.2 mask 255.255.255.255
R2(config-router-af)#network 0.0.0.0
R2(config-router-af)#exit-address-family

R2(config-router)#address-family ipv6
R2(config-router-af)#no neighbor 209.165.200.225 activate
R2(config-router-af)#neighbor 2001:db8:200::1 activate
R2(config-router-af)#network 2001:db8:2222::/128
R2(config-router-af)#network ::/0
R2(config-router-af)#exit-address-family
R2(config-router)#exit
R2(config)#exit

```

Figura 33 Código Router R2.



Tarea 3.4: configuración en R1 “ISP Network” el MP-BGP

Router R1

```

R1(config)#ip route 10.89.0.0 255.0.0.0 null0
%Inconsistent address and mask
R1(config)#ipv6 route 2001:db8:100::/48 null0

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 10.89.0.0 mask 255.0.0.0
% BGP: Incorrect network or mask/prefix-length configured
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)#exit
R1(config)#exit

```

Figura 34 Código Router R1.

```

Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#router ospf 4
R1(config-router)#router-id 0.0.0.1
R1(config-router)#network 10.89.10.0 0.0.0.255 area 0
R1(config-router)#network 10.89.12.0 0.0.0.255 area 0
R1(config-router)#default-information originate
R1(config-router)#exit
R1(config)#router ospf 6
R1(config-router)#router-id 0.0.0.1
R1(config-router)#default-information originate
R1(config-router)#exit
R1(config)#interface s1/1
R1(config-if)#ip ospf 6 area 0
R1(config-if)#exit
R1(config)#interface s1/2
R1(config-if)#ip ospf 6 area 0
R1(config-if)#exit
R1(config)#ip route 10.89.0.0 255.0.0.0 null0
%Inconsistent address and mask
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)#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)#network 10.89.0.0 mask 255.0.0.0
% BGP: Incorrect network or mask/prefix-length configured
R1(config-router-af)#exit-address-family
R1(config-router)#address-family ipv6 unicast
R1(config-router-af)#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)#exit
R1(config)#exit
R1#
Nov 12 20:28:44.679: NVR-5-CFG10_1: Configured from console by console
R1#
Nov 12 20:44:53.819: NOSPv3-5-ADJING: Process 6, Nbr 0.0.0.3 on Ethernet1/1 from LOADING to FULL, Loading Done
R1#
Nov 12 20:45:09.179: NOSPv3-5-ADJING: Process 4, Nbr 0.0.0.3 on Ethernet1/1 from LOADING to FULL, Loading Done
R1#
R1#
R1#
R1#
Nov 12 21:06:13.371: NOSPv3-5-ADJING: Process 6, Nbr 0.0.0.131 on Ethernet1/2 from LOADING to FULL, Loading Done
Nov 12 21:06:13.391: NOSPv3-5-ADJING: Process 4, Nbr 0.0.0.131 on Ethernet1/2 from LOADING to FULL, Loading Done
R1#
Nov 12 21:21:48.471: NOSPv3-5-ADJING: Process 6, Nbr 0.0.0.131 on Ethernet1/2 from LOADING to FULL, Loading Done
R1#

```

PARTE 4: CONFIGURAR LA REDUNDANCIA DE PRIMER SALTO

En la parte 4 se configurará la versión 2 del HSRP para proporcionar redundancia de primer salto para los hosts

Paso 1: TAREAS 4.1, 4.2, 4.3

Tarea 4.1: Crear SLA IP en D1 que apruebe la accesibilidad de la interfaz R1 E1/2

Switch D1

```
D1(config)#ip sla 4
D1(config-ip-sla)#icmp-echo 10.89.10.1
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)#ip sla schedule 4 life forever start-time now
D1(config)#ip sla schedule 6 life forever start-time now

D1(config)#track 4 ip sla 4
D1(config-track)#delay down 10 up 15
D1(config-track)#exit
D1(config)#track 6 ip sla 6
D1(config-track)#delay down 10 up 15
D1(config-track)#exit
```

Tarea 4.2: Crear SLA IP en D2 que apruebe la accesibilidad de la interfaz R3 E1/0

Switch D2

```
D2(config)#ip sla 4
D2(config-ip-sla)#icmp-echo 10.89.11.1
D2(config-ip-sla-echo)#frequency 5
D2(config-ip-sla-echo)#exit
D2(config)#ip sla 6
D2(config-ip-sla)#icmp-echo 2001:db8:100:1011::1
D2(config-ip-sla-echo)#frequency 5
D2(config-ip-sla-echo)#exit
D2(config)#ip sla schedule 4 life forever start-time now
D2(config)#ip sla schedule 6 life forever start-time now
```



```
D2(config)#track 4 ip sla 4
D2(config-track)#delay down 10 up 15
D2(config-track)#exit
D2(config)#track 6 ip sla 6
D2(config-track)#delay down 10 up 15
D2(config-track)#exit
```

Tarea 4.3: Configurar el HSRPv2 en D1

Switch D1

```
D1(config)#interface vlan 100
D1(config-if)#standby version 2
D1(config-if)#standby 104 ip 10.89.100.254
D1(config-if)#standby 104 priority 150
D1(config-if)#standby 104 preempt
D1(config-if)#standby 104 track 4 decrement 60

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

D1(config)#interface vlan 101
D1(config-if)#standby version 2
D1(config-if)#standby 114 ip 10.89.101.254
D1(config-if)#standby 114 preempt
D1(config-if)#standby 114 track 4 decrement 60
D1(config-if)#standby 116 ipv6 autoconfig
D1(config-if)#standby 116 preempt
D1(config-if)#standby 116 track 6 decrement 60
D1(config-if)#exit

D1(config)#interface vlan 102
D1(config-if)#standby version 2
D1(config-if)#standby 124 ip 10.89.102.254
D1(config-if)#standby 124 priority 150
D1(config-if)#standby 124 preempt
D1(config-if)#standby 124 track 4 decrement 60
D1(config-if)#standby 126 ipv6 autoconfig
D1(config-if)#standby 126 priority 150
D1(config-if)#standby 126 preempt
D1(config-if)#standby 126 track 6 decrement 60
D1(config-if)#exit
D1(config)#end
```



```

D2(config-if)#standby 124 ip 10.89.102.254
D2(config-if)#standby 124 preempt
D2(config-if)#standby 124 track 4 decrement 60
D2(config-if)#standby 126 ipv6 autoconfig
D2(config-if)#standby 126 preempt
D2 (config-if) # standby 126 track 6 decrement 60
D2 (config-if) # exit
D2 (config) # end

```

Figura 36 Configuración Switch D2.

```

#Thu 12 21:44:38.236: NMSPPv3-S-AD3CHG: Process 6, Nbr 0.0.0.3 on Ethernet1/0 from LOADING to FULL, Loading Done
D2
D2configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
D2(config)#ip 114 4
D2(config)#ip-114-echo 10.89.11.1
D2(config)#ip-114-echo#frequency 5
D2(config)#ip 114
D2(config)#ip-114-echo#cpu-echo 2001:db8:100:1011:11
D2(config)#ip-114-echo#frequency 5
D2(config)#ip 114 schedule#life forever start-time now
D2(config)#ip 114 schedule#life forever start-time now
D2(config)#track 4 delay down 10 up 15
D2(config)#track 6 delay down 10 up 15
D2(config)#track 4 ip sla 6
D2(config)#track 6 ip sla 6
D2(config)#track 4 ip sla 6
D2(config)#track 6 ip sla 6
D2(config)#interface vlan 101
D2(config-if)#standby version 2
D2(config-if)#standby 124 ip 10.89.102.254
D2(config-if)#standby 124 preempt
D2(config-if)#standby 124 track 4 decrement 60
D2(config-if)#standby 126 ipv6 autoconfig
D2(config-if)#standby 126 preempt
D2(config-if)#standby 126 track 6 decrement 60
D2(config-if)#exit
D2(config)#interface vlan 101
D2(config-if)#standby version 2
D2(config-if)#standby 114 ip 10.89.101.254
D2(config-if)#standby 114 priority 150
D2(config-if)#standby 114 track 4 decrement 60
D2(config-if)#standby 116 ipv6 autoconfig
D2(config-if)#standby 116 priority 150
D2(config-if)#standby 116 track 6 decrement 60
D2(config-if)#exit
D2(config)#interface vlan 102
D2(config-if)#standby version 2
D2(config-if)#standby 124 ip 10.89.102.254
D2(config-if)#standby 124 preempt
D2(config-if)#standby 124 track 4 decrement 60
D2(config-if)#standby 126 ipv6 autoconfig
D2(config-if)#standby 126 preempt
D2(config-if)#standby 126 track 6 decrement 60
D2(config)#end
#Thu 12 22:35:18.923: NMSv3-COMPID_3: Configured from console by console
D2copy running-config startup-config
Destination filename [startup-config]:
Building configuration...
Compressed configuration from 4889 bytes to 2429 bytes[OK]
#Thu 12 22:35:18.923: NMSv3-COMPID_3: Configured from console by console
D2

```

Figura 37 Verificación ruta IPv4.

```

#Thu 12 22:30:09.652: NMSv3-COMPID_3: Configured from console by console
D2
#Thu 12 22:30:11.107: NMSv3-STATECHG: Vlan102 grp 116 state Standby -> Active
#Thu 12 22:30:11.177: NMSv3-STATECHG: Vlan102 grp 126 state Active -> Speak
#Thu 12 22:30:22.100: NMSv3-STATECHG: Vlan100 grp 140 state Standby -> Active
#Thu 12 22:30:22.231: NMSv3-STATECHG: Vlan100 grp 180 state Standby -> Active
D2
#Thu 12 22:30:24.109: NMSv3-STATECHG: Vlan101 grp 114 state Standby -> Active
D2
#Thu 12 22:30:34.107: NMSv3-STATECHG: Vlan102 grp 124 state Standby -> Active
D2copy running-config startup-config
Destination filename [startup-config]:
Building configuration...
Compressed configuration from 4842 bytes to 2422 bytes[OK]
#Thu 12 22:35:39.114: NMSv3-STATECHG: Vlan101 grp 114 state Active -> Speak
#Thu 12 22:35:39.180: NMSv3-STATECHG: Vlan101 grp 116 state Active -> Speak
#Thu 12 22:35:39.180: NMSv3-STATECHG: Vlan101 grp 116 state Speak -> Standby
#Thu 12 22:35:39.180: NMSv3-STATECHG: Vlan101 grp 114 state Speak -> Standby
D2
#Thu 12 23:02:03.185: NMSPPv3-S-AD3CHG: Process 6, Nbr 0.0.0.1 on Ethernet1/2 from LOADING to FULL, Loading Done
D2
#Thu 12 23:02:03.184: NMSPPv3-S-AD3CHG: Process 6, Nbr 0.0.0.1 on Ethernet1/2 from LOADING to FULL, Loading Done
D2show ip route
Codes: L - local, C - connected, S - static, R - RIP, H - mobile, B - BGP
       O - OSPF, I - ISMP, external, O* - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       I - IS-IS, Su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       Ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route, H - NARP, I - ISIS
       * - replicated route, & - next hop override
Gateway of last resort is not set

 10.89.0.0/24 is variably subnetted, 16 subnets, 2 masks
C    10.89.10.0/24 is directly connected, Ethernet1/2
L    10.89.10.2/24 is directly connected, Ethernet1/2
D    10.89.11.0/24 [108/20] via 10.89.10.1, 00:00:00, Ethernet1/2
D    10.89.100.0/24 is directly connected, vlan100
L    10.89.100.1/24 is directly connected, vlan100
D    10.89.101.0/24 is directly connected, vlan101
L    10.89.101.1/24 is directly connected, vlan101
--More--

```

Figura 38 Verificación de las SLAs.

```
PC4 PC4 R1 R2 R3 D1 D2
solarwinds Solar-PuTTY free tool © 2019 SolarWinds Worldwide, LLC. All rights reserved.
13°C Nublado 6:08 p. m. 12/11/2022

copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
Compressed configuration from 4942 bytes to 2422 bytes[OK]
D2#
*Nov 12 22:35:39.114: NSRP-S-STATECHANGE: Vlan181 Grp 114 state Active -> Speak
*Nov 12 22:35:39.114: NSRP-S-STATECHANGE: Vlan181 Grp 114 state Active -> Speak
D2#
*Nov 12 22:35:31.189: NSRP-S-STATECHANGE: Vlan181 Grp 114 state Speak -> Standby
*Nov 12 22:35:31.189: NSRP-S-STATECHANGE: Vlan181 Grp 114 state Speak -> Standby
D2#
*Nov 12 23:02:03.189: NSRP-V1-S-AD3CHG: Process 6, Mbr 0.0.0.1 on Ethernet1/2 from LOADING to FULL, Loading Done
D2#
*Nov 12 23:02:04.584: NSRP-S-AD3CHG: Process 4, Mbr 0.0.0.1 on Ethernet1/2 from LOADING to FULL, Loading Done
D2#
*Nov 12 23:04:31.842: NSRP-S-AD3CHG: Process 4, Mbr 0.0.0.1 on Ethernet1/2 from LOADING to FULL, Loading Done
D2#
D2#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - NSRP non external type 1, N2 - NSRP non external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2
I - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
Ia - IS-IS inter area, * - candidate default, U - per-user static route
o - ODR, P - periodic downloaded static route, H - NHRP, I - IGRP
* - replication route, N - next hop override
+ - replicated route, % - next hop override

Gateway of last resort is not set

10.0.0.0 is variably subnetted, 18 subnets, 2 masks
C    10.0.0.0/24 is directly connected, Ethernet1/2
L    10.0.0.0/24 is directly connected, Ethernet1/2
D    10.0.11.0/24 [180/20] via 10.0.0.18, 00:00:00, Ethernet1/2
D    10.0.13.0/24 [180/20] via 10.0.0.18, 00:00:00, Ethernet1/2
C    10.0.100.0/24 is directly connected, Vlan100
L    10.0.100.0/24 is directly connected, Vlan100
C    10.0.101.0/24 is directly connected, Vlan101
L    10.0.101.0/24 is directly connected, Vlan101
C    10.0.102.0/24 is directly connected, Vlan102
L    10.0.102.0/24 is directly connected, Vlan102
D2#
D2#
D2#
D2#show run | section ip sl
track 4 ip sla 4
delay down 18 up 15
track 6 ip sla 6
delay down 18 up 15
ip sla 4
ip sla echo 10.0.0.1
frequency 5
ip sla schedule 4 life forever start-time now
ip sla 6
ip sla echo 2002:100:100:101::1
frequency 5
ip sla schedule 6 life forever start-time now
D2#
```

CONCLUSIONES

El Diplomado Cisco CCNP es un curso que permitió fortalecer diferentes habilidades en el manejo de redes locales, ya que por medio del simulador GNS3 se pueden diseñar topologías desde básicas hasta complejas.

Con la creación de LACP EtherChannel en los switches, es posible hacer una negociación, este protocolo utiliza una dirección MAC con la que es posible hacer intercambio de mensajes y así mismo validar su compatibilidad.

El protocolo DHCP es cliente/servidor con este automáticamente se genera direcciones IP y hace fácil su administración, convirtiéndolo en un gran avance por su confiabilidad y gran capacidad.

Los protocolos OSPFv2 y OSPFv3 son aquellos protocolos que permiten hacer un enrutamiento dinámico en los protocolos IPV4 e IPV6 ya que su direccionamiento es de tipo enlace-estado.

Para proporcionar la redundancia de primer salto es necesario configurar el protocolo HSRP e implementarle un SLA IP para que sea posible la accesibilidad de las interfaces.

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