

DIPLOMADO DE PROFUNDIZACION CISCO
PRUEBA DE HABILIDADES PRÁCTICAS CCNP

WINEN JAVIER MEJIA MEJIA

UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA
ESCUELA DE CIENCIAS BÁSICAS TECNOLOGÍA E INGENIERÍA
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WINEN JAVIER MEJIA MEJIA

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DIRECTOR:

JUAN ESTEBAN TAPIAS BAENA

UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA
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NOTA DE ACEPTACION

Firma del presidente del jurado

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GLOSARIO

VLAN: Es la tecnología que permite crear una LAN virtual (VLAN), que es una red superpuesta lógica que agrupa un subconjunto de dispositivos que comparten una LAN física, aislando el tráfico para cada grupo.

LACP: Protocolo de control de agregación de enlaces (Link Aggregation Control Protocol), LACP forma parte de una selección de IEEE (802.3ad) que permite agrupar varios puertos físicos para formar un único canal lógico. LACP permite que un switch negocie un grupo automáticamente mediante el envío de paquetes LACP al peer.

RSTP: (Rapid spanning tree protocol) es un protocolo que detecta y evita bucles dentro de la red, gestionando enlaces redundantes, este fue desarrollado para mejorar el funcionamiento del protocolo STP. RSTP trae varias mejoras con respecto a STP, principalmente en lo que tiene que ver con los tiempos de convergencia, además mejora la ruta desde el switch que no es raíz al switch raíz, reemplaza al puerto raíz cuando este entra en fallo, habilitando automáticamente el puerto alternativo

OSPF: Es un protocolo de enrutamiento que basa su funcionamiento en permitir elegir la ruta más corta disponible para la comunicación, esto se mantiene aun cuando se presenta un cambio físico en la topología de la red.

BGP: (Border Gateway Protocol) es un protocolo de puerta de enlace exterior (EGP) estandarizado diseñado para intercambiar información de enrutamiento y accesibilidad entre sistemas autónomos (AS). La información de enrutamiento del BGP incluye la ruta completa a cada destino. El BGP utiliza la información de enrutamiento para mantener una base de datos de información de accesibilidad de red, que intercambia con otros sistemas de la misma característica.

RESUMEN

En la actualidad las necesidades en cuanto a conectividad para el intercambio rápido y constante de información exigen el diseño de redes escalables y de conmutación con un cierto nivel de seguridad, por esto se hace necesario la implementación de tecnologías y uso de protocolos de conmutación mejorados que permitan comunicaciones efectivas a través de las redes de datos, haciendo estas más eficientes y estableciendo alternativas a problemas de interconectividad. Mediante el diplomado CCNP (Cisco Certified Network Professional) se ha logrado desarrollar en el futuro ingeniero la capacidad de diseñar, efectuar implementación, verificar funcionamiento óptimo y solucionar los posibles problemas que se puedan presentar en las redes empresariales.

Durante el desarrollo del diplomado se utilizaron los softwares Packet Tracer y GNS3 que permiten simular los múltiples conceptos vistos, ofreciendo la posibilidad de realizar desde la configuración básica de router y switches como la implementación de los protocolos específicos de enrutamiento como EIGRP, OSPF, BGP, HSRP versión 2, protocolos como NTP, implementación de VLANs y troncales, Spanning Tree, RSTP, LACP, etc.

ABSTRACT

At present, the needs in terms of connectivity for the rapid and constant exchange of information require the design of scalable and switching networks with a certain level of security, for this reason it is necessary to implement technologies and use of improved switching protocols that allow communications to through data networks, making them more efficient and establishing alternatives to interconnectivity problems. Through the CCNP (Cisco Certified Network Professional) diploma, future engineers have developed the ability to design, carry out implementation, verify optimal operation and solve possible problems that may arise in business networks.

During the development of the diploma, the Packet Tracer and GNS3 software was used, which allows simulating the multiple concepts seen, offering the possibility of performing from the basic configuration of the router and switches as well as the implementation of specific routing protocols such as EIGRP, OSPF,

BGP, HSRP version 2, protocols such as NTP, implementation of VLANs and trunks, Spanning Tree, RSTP, LACP, etc.

INTRODUCCION

El objetivo del presente informe es detallar el proceso de aprendizaje y las actividades realizadas durante el diplomado CCNP (Cisco Certified Network Professional), donde se ha logrado fortalecer las capacidades generales del profesional en redes de datos, tales como la habilidad de administrar dispositivos de Networking orientados al diseño de redes escalables y de conmutación, mediante el estudio del modelo OSI y la arquitectura TCP/IP y la posibilidad de aplicar recursos y herramientas que permiten el soporte técnico de las redes de datos y el establecimiento de alternativas a problemas de conectividad.

También se han fortalecido los conocimientos necesarios para la implementación adecuada de niveles de seguridad básicos, mediante la definición de criterios y políticas de seguridad aplicadas a diversos escenarios de las redes empresariales, aplicando tanto destrezas de software como de hardware que permitan asegurar la información transferida frente a cualquier ataque que se pueda presentar desde el interior o exterior de la red.

Adicionalmente se trabajaron técnicas y estrategias para el diseño de redes que puedan ser escalables a futuro, buscando siempre optimizar el rendimiento de estas e incorporar adecuadamente la aplicación de tecnologías y protocolos como: VLAN, RSTP, Protocolo de árbol de expansión por VLAN (Spanning Tree per VLAN - PVSTP), Protocolos de enrutamiento como EIGRP, OSPF, BGP, etc.

DESARROLLO

SCENARIO 1

Next is the configuration of the network so that there is full end-to-end accessibility, so that the hosts have reliable default gateway support, and so that the management protocols are operational within the company network. The routers used in the labs are Cisco 7200 routers. The switches used are Cisco Catalyst L2 switches.

Resources used

3 routers (Cisco 7200).

3 switches (Cisco IOU L2).

4 PCs (VPCS of GNS3)

Topology

Figure 1. Network topology.

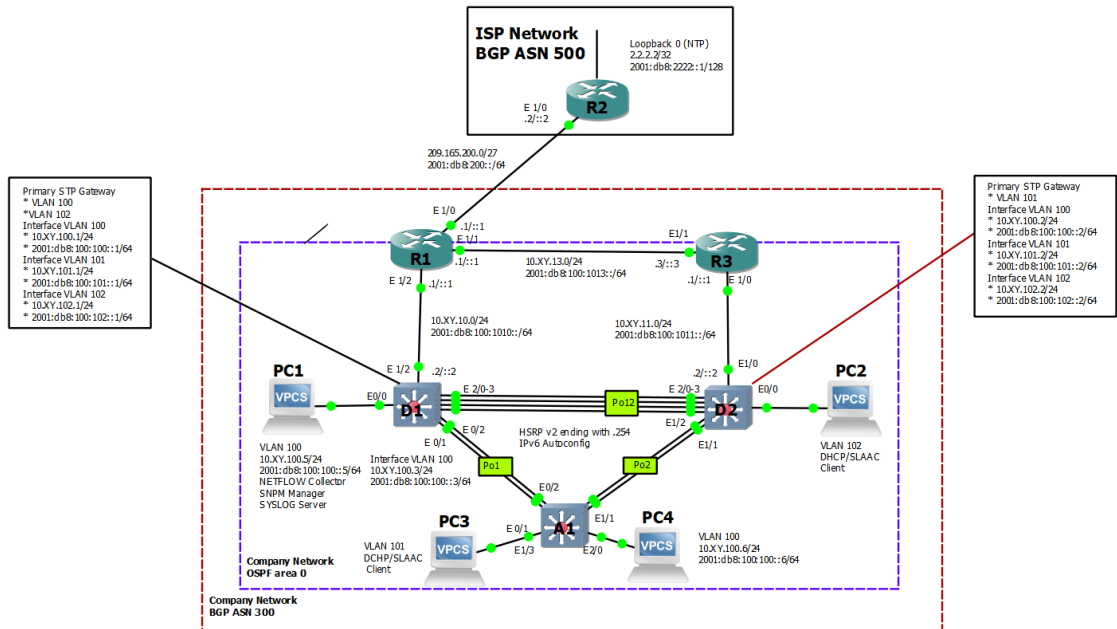


Table 1. Addressing Table.

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	10.48.10.1/24	2001:db8:100:1010::1/64	fe80::1:2
	E1/1	10.48.13.1/24	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	10.48.11.1/24	2001:db8:100:1011::1/64	fe80::3:2
	E1/1	10.48.13.3/24	2001:db8:100:1013::3/64	fe80::3:3
D1	E1/2	10.48.10.2/24	2001:db8:100:1010::2/64	fe80::d1:1
	VLAN 100	10.48.100.1/24	2001:db8:100:100::1/64	fe80::d1:2
	VLAN 101	10.48.101.1/24	2001:db8:100:101::1/64	fe80::d1:3
	VLAN 102	10.48.102.1/24	2001:db8:100:102::1/64	fe80::d1:4
D2	E1/0	10.48.11.2/24	2001:db8:100:1011::2/64	fe80::d2:1
	VLAN 100	10.48.100.2/24	2001:db8:100:100::2/64	fe80::d2:2
	VLAN 101	10.48.101.2/24	2001:db8:100:101::2/64	fe80::d2:3
	VLAN 102	10.48.102.2/24	2001:db8:100:102::2/64	fe80::d2:4
A1	VLAN 100	10.48.100.3/23	2001:db8:100:100::3/64	fe80::a1:1
PC1	NIC	10.48.100.5/24	2001:db8:100:100::5/64	EUI-64
PC2	NIC	DHCP	SLAAC	EUI-64
PC3	NIC	DHCP	SLAAC	EUI-64
PC4	NIC	10.48.100.6/24	2001:db8:100:100::6/64	EUI-64

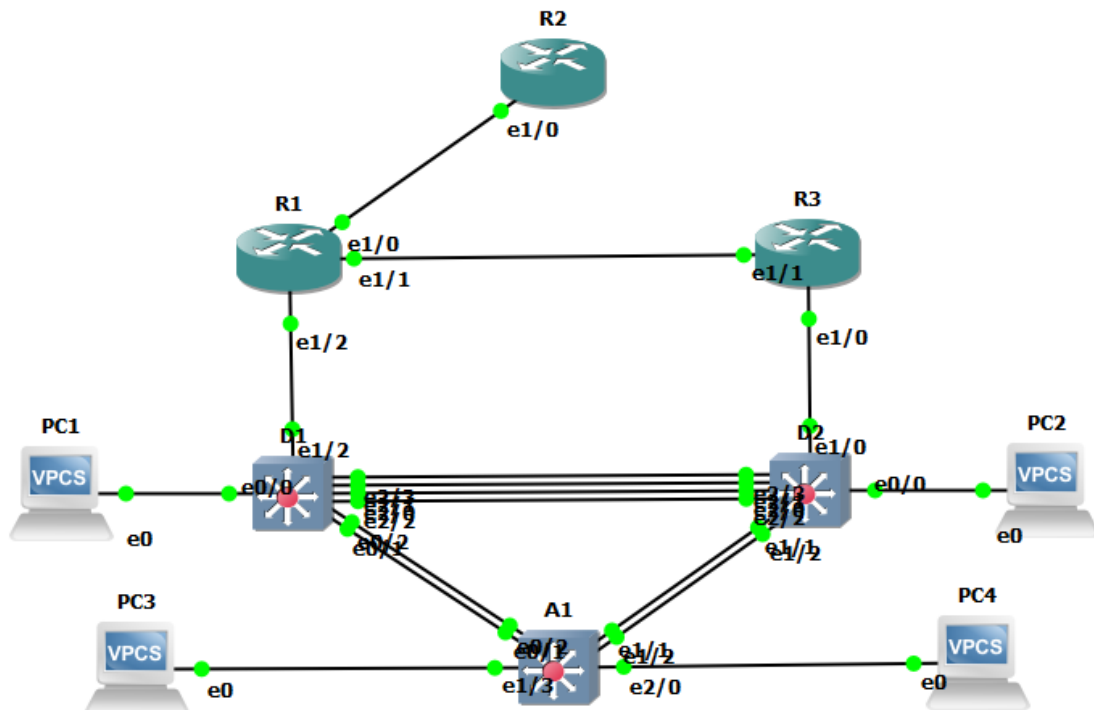
Part 1: Build the Network and Configure Basic Device Settings and Interface Addressing

The network topology configuration is done and the basic settings and interface addressing have been applied.

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

The network is wired as shown in the topology the devices were connected as shown in the topology diagram.

Figure 2. Network topology implemented in GNS3.



Step 2: Configure basic settings for each device.

Global configuration mode was entered through the console to apply the required basic settings. The configuration codes used for each device are described below.

Router R1

```
R1#config terminal
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 10.48.10.1 255.255.255.0
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 10.48.13.1 255.255.255.0
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

```

Figure 3. Command “show ip interface brief” R1.

```

R1(config)#exit
R1#
*Oct 16 07:16:42.931: %SYS-5-CONFIG_I: Configured from console by console
R1#show ip interface brief
Interface          IP-Address      OK? Method Status                Protocol
FastEthernet0/0    unassigned      YES unset  administratively down  down
Ethernet1/0        209.165.200.225 YES manual  up                    up
Ethernet1/1        10.48.13.1      YES manual  up                    up
Ethernet1/2        10.48.10.1      YES manual  up                    up
Ethernet1/3        unassigned      YES unset  administratively down  down
R1#

```

Router 2

```

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
*Oct 16 07:23:31.223: %LINEPROTO-5-UPDOWN: Line protocol on Interface
Loopback0, changed state to up
R2(config-if)# exit
*Oct 16 07:23:33.095: %LINK-3-UPDOWN: Interface Ethernet1/0, changed
state to up
*Oct 16 07:23:34.095: %LINEPROTO-5-UPDOWN: Line protocol on Interface
Ethernet1/0, changed state to up
R2(config-if)# exit
R2(config)#exit

```

Figure 4. Command “show ip interface brief” R2.

```

*Oct 16 07:23:52.603: %SYS-5-CONFIG_I: Configured from console by console
R2#show ip interface brief
Interface              IP-Address      OK? Method Status      Protocol
FastEthernet0/0       unassigned      YES unset  administratively down  down
Ethernet1/0           209.165.200.226 YES manual  up          up
Ethernet1/1           unassigned      YES unset  administratively down  down
Ethernet1/2           unassigned      YES unset  administratively down  down
Ethernet1/3           unassigned      YES unset  administratively down  down
Loopback0             2.2.2.2         YES manual  up          up
R2#

```

Router 3

```
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 10.48.11.1 255.255.255.0
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 10.48.13.3 255.255.255.0
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
```

Figure 5. Command “show ip interface brief” R3.

```
Oct 10 07:54:01: %SYS-5-CONFIG_I: Configured from console by console
R3#show ip interface brief
Interface              IP-Address      OK? Method Status      Protocol
FastEthernet0/0       unassigned      YES unset    administratively down down
Ethernet1/0            10.48.11.1      YES manual  up          up
Ethernet1/1            10.48.13.3      YES manual  up          up
Ethernet1/2            unassigned      YES unset    administratively down down
Ethernet1/3            unassigned      YES unset    administratively down down
R3#
```

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ESP LAA | 2:36 a.m. 16/10/2022

Switch D1

```
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 10.48.10.2 255.255.255.0
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 10.48.100.1 255.255.255.0
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 10.48.101.1 255.255.255.0
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 10.48.102.1 255.255.255.0
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 10.48.101.1 10.48.101.109
```

```

D1(config)#ip dhcp excluded-address 10.48.101.141 10.48.101.254
D1(config)#ip dhcp excluded-address 10.48.102.1 10.48.102.109
D1(config)#ip dhcp excluded-address 10.48.102.141 10.48.102.254
D1(config)#ip dhcp pool VLAN-101
D1(dhcp-config)# network 10.48.101.0 255.255.255.0
D1(dhcp-config)# default-router 10.48.101.254
D1(dhcp-config)# exit
D1(config)#ip dhcp pool VLAN-102
D1(dhcp-config)# network 10.48.102.0 255.255.255.0
D1(dhcp-config)# default-router 10.48.102.254
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)#

```

Figure 6. Command “show ip interface brief” Switch D1.

```

D1#
D1#show ip interface brief
Interface      IP-Address      OK? Method Status      Protocol
Ethernet0/0    unassigned      YES unset  administratively down  down
Ethernet0/1    unassigned      YES unset  administratively down  down
Ethernet0/2    unassigned      YES unset  administratively down  down
Ethernet0/3    unassigned      YES unset  administratively down  down
Ethernet1/0    unassigned      YES unset  administratively down  down
Ethernet1/1    unassigned      YES unset  administratively down  down
Ethernet1/2    10.48.10.2      YES manual  up            up
Ethernet1/3    unassigned      YES unset  administratively down  down
Ethernet2/0    unassigned      YES unset  administratively down  down
Ethernet2/1    unassigned      YES unset  administratively down  down
Ethernet2/2    unassigned      YES unset  administratively down  down
Ethernet2/3    unassigned      YES unset  administratively down  down
Ethernet3/0    unassigned      YES unset  administratively down  down
Ethernet3/1    unassigned      YES unset  administratively down  down
Ethernet3/2    unassigned      YES unset  administratively down  down
Ethernet3/3    unassigned      YES unset  administratively down  down
Vlan1          unassigned      YES unset  administratively down  down
Vlan100        10.48.100.1     YES manual  down          down
Vlan101        10.48.101.1     YES manual  down          down
Vlan102        10.48.102.1     YES manual  down          down
D1#

```

Switch D2

D2#CONFIG 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 10.48.11.2 255.255.255.0


```
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 10.48.100.2 255.255.255.0
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 10.48.101.2 255.255.255.0
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 10.48.102.2 255.255.255.0
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 10.48.101.1 10.48.101.209
D2(config)#ip dhcp excluded-address 10.48.101.241 10.48.101.254
D2(config)#ip dhcp excluded-address 10.48.102.1 10.48.102.209
D2(config)#ip dhcp excluded-address 10.48.102.241 10.48.102.254
D2(config)#ip dhcp pool VLAN-101
D2(dhcp-config)# network 10.48.101.0 255.255.255.0
```

```

D2(dhcp-config)# default-router 48.0.101.254
D2(dhcp-config)# exit
D2(config)#ip dhcp pool VLAN-102
D2(dhcp-config)# network 10.48.102.0 255.255.255.0
D2(dhcp-config)# default-router 10.93.102.254
D2(dhcp-config)# exit
D2(config)#interface range e0/0-3,e1/1-3,e2/0-3,e3/0-3
D2(config-if-range)# shutdown
D2(config-if-range)# exit

```

Figure 7. Command “show ip interface brief” Switch D2.

```

D2#
D2#show ip interface brief
Interface      IP-Address      OK? Method Status      Protocol
Ethernet0/0    unassigned     YES unset  administratively down  down
Ethernet0/1    unassigned     YES unset  administratively down  down
Ethernet0/2    unassigned     YES unset  administratively down  down
Ethernet0/3    unassigned     YES unset  administratively down  down
Ethernet1/0    10.48.11.2     YES manual up          up
Ethernet1/1    unassigned     YES unset  administratively down  down
Ethernet1/2    unassigned     YES unset  administratively down  down
Ethernet1/3    unassigned     YES unset  administratively down  down
Ethernet2/0    unassigned     YES unset  administratively down  down
Ethernet2/1    unassigned     YES unset  administratively down  down
Ethernet2/2    unassigned     YES unset  administratively down  down
Ethernet2/3    unassigned     YES unset  administratively down  down
Ethernet3/0    unassigned     YES unset  administratively down  down
Ethernet3/1    unassigned     YES unset  administratively down  down
Ethernet3/2    unassigned     YES unset  administratively down  down
Ethernet3/3    unassigned     YES unset  administratively down  down
Vlan1          unassigned     YES unset  administratively down  down
Vlan100        10.48.100.2    YES manual down        down
Vlan101        10.48.101.2    YES manual down        down
Vlan102        10.48.102.2    YES manual down        down
D2#

```

Switch A1

```

A1(config)#
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 10.48.100.3 255.255.255.0
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
```

Figure 8. Command “show ip interface brief” Switch A1.

```
A1(config)#exit
A1#
*Oct 16 08:14:09.485: %SYS-5-COMFIG_I: Configured from console by console
A1#show ip interface brief
Interface IP-Address OK? Method Status Protocol
Ethernet0/0 unassigned YES unset administratively down down
Ethernet0/1 unassigned YES unset up up
Ethernet0/2 unassigned YES unset up up
Ethernet0/3 unassigned YES unset administratively down down
Ethernet1/0 unassigned YES unset administratively down down
Ethernet1/1 unassigned YES unset up up
Ethernet1/2 unassigned YES unset up up
Ethernet1/3 unassigned YES unset up up
Ethernet2/0 unassigned YES unset up up
Ethernet2/1 unassigned YES unset administratively down down
Ethernet2/2 unassigned YES unset administratively down down
Ethernet2/3 unassigned YES unset administratively down down
Ethernet3/0 unassigned YES unset administratively down down
Ethernet3/1 unassigned YES unset administratively down down
Ethernet3/2 unassigned YES unset administratively down down
Ethernet3/3 unassigned YES unset administratively down down
Vlan1 unassigned YES unset administratively down down
Vlan100 10.40.100.3 YES manual down down
A1#
```

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

R/ apply the command (copy running-config startup-config) to all devices copy running-config startup-config

Part 2: Configure the Layer 2 Network and Host Support

In this part, the complement to the configuration of the layer 2 network and configuration of the basic host support is developed. all switches are configured to be able to communicate with each other, for PC2 and PC3 DHCP and SLAAC addressing are enabled, for PC1 and PC2 static addressing is assigned.

Table 2. Implemented Configuration Tasks

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	<i>On all switches, change the native VLAN on trunk links.</i>	<i>Use VLAN 999 as the native VLAN.</i>	6
2.3	<i>On all switches, enable the Rapid Spanning-Tree Protocol.</i>	<i>Use Rapid Spanning Tree.</i>	3
2.4	<i>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.</i>	<i>Configure D1 and D2 as root for the appropriate VLANs with mutually supporting priorities in case of switch failure.</i>	2
2.5	<i>On all switches, create LACP EtherChannels as shown in the topology diagram.</i>	<i>Use the following channel numbers:</i> <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

Task#	Task	Specification	Points
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: 10.48.100.1 • D2: 10.48.100.2 • PC4: 10.48.100.6 PC2 should successfully ping: <ul style="list-style-type: none"> • D1: 10.48.102.1 • D2: 10.48.102.2 PC3 should successfully ping: <ul style="list-style-type: none"> • D1: 10.48.101.1 • D2: 10.48.101.2 PC4 should successfully ping: <ul style="list-style-type: none"> • D1: 10.48.100.1 • D2: 10.48.100.2 • PC1: 10.48.100.5 	1

Task 2.1: Enable 802.1Q trunk links between (D1 and D2; D1 and A1; D2 and A1)

SW D1

config terminal

```
interface range e2/0-3,e0/1-2
switchport trunk encapsulation dot1q
switchport mode trunk
no shutdown
exit
```

SW D2

```
config terminal
interface range e2/0-3,e1/1-2
switchport trunk encapsulation dot1q
switchport mode trunk
no shutdown
exit
```

SW A1

```
config terminal
interface range e0/1-2,e1/1-2
switchport trunk encapsulation dot1q
switchport mode trunk
no shutdown
exit
```

Task 2.2: VLAN 999 as the native VLAN

SW D1

```
config terminal
interface range e2/0-3,e0/1-2
switchport trunk native vlan 999
exit
```

SW D2

```
config terminal
interface range e2/0-3,e1/1-2
switchport trunk native vlan 999
exit
```

SW A1

```
config terminal
interface range e0/1-2,e1/1-2
switchport trunk native vlan 999
exit
```


Task 2.3: Use Rapid Spanning Tree and Task 2.4 Configure D1 and D2 as root for the appropriate VLANs with mutually supporting priorities in case of switch failure.

SW D1

```
config term  
spanning-tree mode rapid-pvst  
spanning-tree vlan 100,102 root primary  
spanning-tree vlan 101 root secondary  
exit
```

SW D2

```
config terminal  
spanning-tree mode rapid-pvst  
spanning-tree vlan 101 root primary  
spanning-tree vlan 100,102 root secondary  
exit
```

SW A1

```
config termial  
spanning-tree mode rapid-pvst  
exit
```

Task 2.5: create LACP EtherChannels, Use the following channel numbers, D1 to D2 – Port channel 12, D1 to A1 – Port channel 1, D2 to A1 – Port channel 2

SW D1

```
config term  
interface range e2/0-3  
channel-group 12 mode active  
no shutdown  
exit  
interface range e0/1-2  
channel-group 1 mode active  
no shutdown  
exit
```

SW D2

```
config terminal  
interface range e2/0-3  
channel-group 12 mode active  
no shutdown  
exit  
interface range e1/1-2  
channel-group 2 mode active  
no shutdown  
exit
```

SW A1

```
config terminal
interface range e1/1-2
channel-group 2 mode active
no shutdown
exit
interface range e0/1-2
channel-group 1 mode active
no shutdown
exit
```

Task 2.6: configure host access ports connecting to PC1, PC2, PC3, and PC4

SW D1

```
config terminal
interface e0/0
switchport mode access
switchport access vlan 100
spanning-tree portfast
no shutdown
exit
```

SW D2

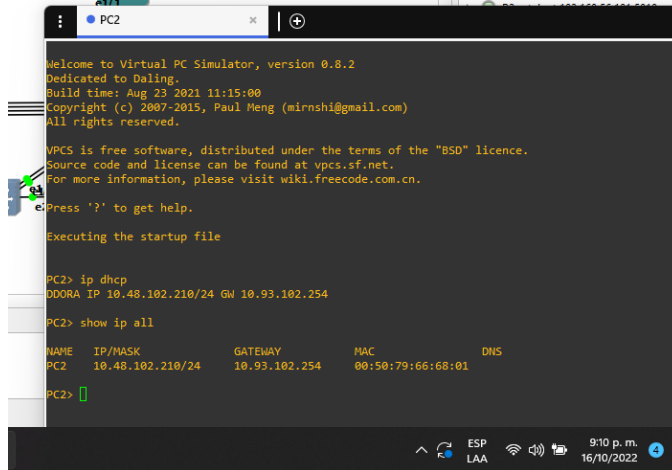
```
Config terminal
interface e0/0
switchport mode access
switchport access vlan 102
spanning-tree portfast
no shutdown
exit
```

SW A1

```
Config terminal
interface e1/3
switchport mode access
switchport access vlan 101
spanning-tree portfast
no shutdown
exit
interface e2/0
switchport mode access
switchport access vlan 100
spanning-tree portfast
no shutdown
exit
```

Task 2.7: Verify IPv4 DHCP services PC2 and PC3

Figure 9. DHCP PC2.



```
Welcome to Virtual PC Simulator, version 0.8.2
Dedicated to Daling.
Build time: Aug 23 2021 11:15:00
Copyright (c) 2007-2015, Paul Meng (mirnshi@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.

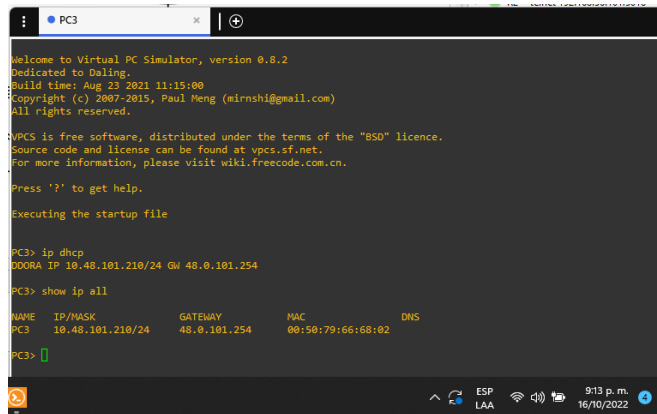
Executing the startup file

PC2> ip dhcp
DDORA IP 10.48.102.210/24 GW 10.93.102.254

PC2> show ip all

NAME  IP/MASK      GATEWAY      MAC          DNS
PC2   10.48.102.210/24  10.93.102.254  00:50:79:66:68:01
```

Figure 10. DHCP PC3.



```
Welcome to Virtual PC Simulator, version 0.8.2
Dedicated to Daling.
Build time: Aug 23 2021 11:15:00
Copyright (c) 2007-2015, Paul Meng (mirnshi@gmail.com)
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> ip dhcp
DDORA IP 10.48.101.210/24 GW 48.0.101.254

PC3> show ip all

NAME  IP/MASK      GATEWAY      MAC          DNS
PC3   10.48.101.210/24  48.0.101.254  00:50:79:66:68:02
```

PC2 and PC3 are receiving the DHCP service, it is evident that valid IPv4 addresses are obtained

Task 2.8: Verify local LAN connectivity.

Figure 11. Ping from PC1.

```
PC1> ip 10.48.100.5 255.255.255.0 10.48.100.1
Checking for duplicate address...
PC1 : 10.48.100.5 255.255.255.0 gateway 10.48.100.1

PC1> ping 10.48.100.1
84 bytes from 10.48.100.1 icmp_seq=1 ttl=255 time=3.514 ms
84 bytes from 10.48.100.1 icmp_seq=2 ttl=255 time=0.283 ms
84 bytes from 10.48.100.1 icmp_seq=3 ttl=255 time=0.577 ms
84 bytes from 10.48.100.1 icmp_seq=4 ttl=255 time=3.095 ms
84 bytes from 10.48.100.1 icmp_seq=5 ttl=255 time=1.849 ms

PC1> ping 10.48.100.2
84 bytes from 10.48.100.2 icmp_seq=1 ttl=255 time=0.813 ms
84 bytes from 10.48.100.2 icmp_seq=2 ttl=255 time=0.607 ms
84 bytes from 10.48.100.2 icmp_seq=3 ttl=255 time=0.381 ms
84 bytes from 10.48.100.2 icmp_seq=4 ttl=255 time=0.988 ms
84 bytes from 10.48.100.2 icmp_seq=5 ttl=255 time=1.290 ms

PC1> ping 10.48.100.6
84 bytes from 10.48.100.6 icmp_seq=1 ttl=64 time=1.011 ms
84 bytes from 10.48.100.6 icmp_seq=2 ttl=64 time=2.177 ms
84 bytes from 10.48.100.6 icmp_seq=3 ttl=64 time=3.161 ms
84 bytes from 10.48.100.6 icmp_seq=4 ttl=64 time=2.476 ms
84 bytes from 10.48.100.6 icmp_seq=5 ttl=64 time=1.332 ms

PC1>
```

Figure 12. Ping from PC2.

```
PC2> ping 10.48.102.1
84 bytes from 10.48.102.1 icmp_seq=1 ttl=255 time=0.648 ms
84 bytes from 10.48.102.1 icmp_seq=2 ttl=255 time=1.274 ms
84 bytes from 10.48.102.1 icmp_seq=3 ttl=255 time=7.516 ms
84 bytes from 10.48.102.1 icmp_seq=4 ttl=255 time=1.239 ms
84 bytes from 10.48.102.1 icmp_seq=5 ttl=255 time=1.254 ms

PC2> ping 10.48.102.2
84 bytes from 10.48.102.2 icmp_seq=1 ttl=255 time=0.297 ms
84 bytes from 10.48.102.2 icmp_seq=2 ttl=255 time=0.026 ms
84 bytes from 10.48.102.2 icmp_seq=3 ttl=255 time=0.397 ms
84 bytes from 10.48.102.2 icmp_seq=4 ttl=255 time=0.568 ms
84 bytes from 10.48.102.2 icmp_seq=5 ttl=255 time=0.407 ms

PC2>
```

Figure 13. Ping from PC3.

```
PC3> ping 10.48.101.1
84 bytes from 10.48.101.1 icmp_seq=1 ttl=255 time=0.761 ms
84 bytes from 10.48.101.1 icmp_seq=2 ttl=255 time=1.104 ms
84 bytes from 10.48.101.1 icmp_seq=3 ttl=255 time=0.961 ms
84 bytes from 10.48.101.1 icmp_seq=4 ttl=255 time=1.039 ms
84 bytes from 10.48.101.1 icmp_seq=5 ttl=255 time=1.229 ms

PC3> ping 10.48.101.2
84 bytes from 10.48.101.2 icmp_seq=1 ttl=255 time=1.425 ms
84 bytes from 10.48.101.2 icmp_seq=2 ttl=255 time=3.371 ms
84 bytes from 10.48.101.2 icmp_seq=3 ttl=255 time=1.745 ms
84 bytes from 10.48.101.2 icmp_seq=4 ttl=255 time=1.221 ms
84 bytes from 10.48.101.2 icmp_seq=5 ttl=255 time=1.898 ms

PC3>
```

Figure 13. Ping from PC4.

```
PC4> ip 10.48.100.6 255.255.255.0 10.48.100.1
Checking for duplicate address...
PC4 : 10.48.100.6 255.255.255.0 gateway 10.48.100.1

PC4> ping 10.48.100.1
84 bytes from 10.48.100.1 icmp_seq=1 ttl=255 time=0.254 ms
84 bytes from 10.48.100.1 icmp_seq=2 ttl=255 time=1.082 ms
84 bytes from 10.48.100.1 icmp_seq=3 ttl=255 time=7.703 ms
84 bytes from 10.48.100.1 icmp_seq=4 ttl=255 time=3.090 ms
84 bytes from 10.48.100.1 icmp_seq=5 ttl=255 time=0.418 ms

PC4> ping 10.48.100.2
84 bytes from 10.48.100.2 icmp_seq=1 ttl=255 time=0.412 ms
84 bytes from 10.48.100.2 icmp_seq=2 ttl=255 time=1.216 ms
84 bytes from 10.48.100.2 icmp_seq=3 ttl=255 time=1.419 ms
84 bytes from 10.48.100.2 icmp_seq=4 ttl=255 time=1.016 ms
84 bytes from 10.48.100.2 icmp_seq=5 ttl=255 time=1.765 ms

PC4> ping 10.48.100.5
84 bytes from 10.48.100.5 icmp_seq=1 ttl=64 time=0.706 ms
84 bytes from 10.48.100.5 icmp_seq=2 ttl=64 time=0.769 ms
84 bytes from 10.48.100.5 icmp_seq=3 ttl=64 time=1.062 ms
84 bytes from 10.48.100.5 icmp_seq=4 ttl=64 time=1.822 ms
84 bytes from 10.48.100.5 icmp_seq=5 ttl=64 time=0.572 ms

PC4>
```

SCENARIO 2: Continuation of the Scenario 1

Part 3: Configure Routing Protocols

In this part, the configurations required to activate the IPv4 and IPv6 routing protocols were made, so that the network is completely convergent.

Table 3. Configuration Tasks for part 3

Task#	Task	Specification	Points
3.1	<p><i>On the “Company Network” (i.e., R1, R3, D1, and D2), configure single-area OSPFv2 in area 0.</i></p>	<p>Use OSPF Process ID 4 and assign the following router-IDs:</p> <ul style="list-style-type: none"> • <i>R1: 0.0.4.1</i> • <i>R3: 0.0.4.3</i> • <i>D1: 0.0.4.131</i> • <i>D2: 0.0.4.132</i> <p>On R1, R3, D1, and D2, advertise all directly connected networks / VLANs in Area 0.</p> <ul style="list-style-type: none"> • <i>On R1, do not advertise the R1 – R2 network.</i> • <i>On R1, propagate a default route. Note that the default route will be provided by BGP.</i> <p>Disable OSPFv2 advertisements on:</p> <ul style="list-style-type: none"> • <i>D1: All interfaces except E1/2</i> • <i>D2: All interfaces except E1/0</i> 	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 E1/2 • D2: All interfaces except E1/0 	8

Task#	Task	Specification	Points
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 10.48.0.0/8. • 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 10.48.0.0/8 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

Task 3.1: Config single-area OSPFv2 in area 0 on the R1, R3, D1, and D2

Router R1

```
config terminal
router ospf 4
router-id 0.0.4.1
network 10.48.10.0 0.0.0.255 area 0
network 10.48.13.0 0.0.0.255 area 0
default-information originate
exit
```

Router R3

```
router ospf 4
router-id 0.0.4.3
network 10.48.11.0 0.0.0.255 area 0
network 10.48.13.0 0.0.0.255 area 0
exit
```

SW D1

```
router ospf 4
router-id 0.0.4.131
network 10.48.100.0 0.0.0.255 area 0
network 10.48.101.0 0.0.0.255 area 0
network 10.48.102.0 0.0.0.255 area 0
```

```
network 10.48.10.0 0.0.0.255 area 0
passive-interface default
no passive-interface e1/2
exit
```

SW D2

```
router ospf 4
router-id 0.0.4.132
network 10.48.11.0 0.0.0.255 area 0
network 10.48.100.0 0.0.0.255 area 0
network 10.48.101.0 0.0.0.255 area 0
network 10.48.102.0 0.0.0.255 area 0
passive-interface default
no passive-interface e1/0
exit
```

Task 3.2: Config classic single-area OSPFv3 in area 0 on the R1, R3, D1, and D2

Router R1

```
ipv6 router ospf 6
router-id 0.0.6.1
default-information originate
exit
interface e1/2
ipv6 ospf 6 area 0
exit
interface e1/1
```

```
ipv6 ospf 6 area 0  
exit
```

Router R3

```
ipv6 router ospf 6  
router-id 0.0.6.3  
exit  
interface e1/0  
ipv6 ospf 6 area 0  
exit  
interface e1/1  
ipv6 ospf 6 area 0  
exit
```

SW D1

```
ipv6 router ospf 6  
router-id 0.0.6.131  
passive-interface default  
no passive-interface e1/2  
exit  
interface e1/2  
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
```

SW D2

```
ipv6 router ospf 6
router-id 0.0.6.132
passive-interface default
no passive-interface e1/0
exit
interface e1/0
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
end
```


Task 3.3: Config MP-BGP on R2 in the “ISP Network”

Router R2

```
ip route 0.0.0.0 0.0.0.0 loopback 0
ipv6 route ::/0 loopback 0
router bgp 500
  bgp router-id 2.2.2.2
  neighbor 209.165.200.225 remote-as 300
  neighbor 2001:db8:200::1 remote-as 300
  address-family ipv4
    neighbor 209.165.200.225 activate
    no neighbor 2001:db8:200::1 activate
    network 2.2.2.2 mask 255.255.255.255
    network 0.0.0.0
  exit-address-family
  address-family ipv6
    no neighbor 209.165.200.225 activate
    neighbor 2001:db8:200::1 activate
    network 2001:db8:2222::1/128
    network ::/0
  exit-address-family
```

Figure 16. "show ip bgp neighbor" command to verify on R2

```
R2#show ip bgp neighbor
BGP neighbor is 209.165.200.225, remote AS 300, external link
  BGP version 4, remote router ID 1.1.1.1
  BGP state = Established, up for 00:47:01
  Last read 00:00:00, last write 00:00:35, hold time is 180, keepalive interval is 60 seconds
  Neighbor sessions:
    1 active, is not multisession capable (disabled)
  Neighbor capabilities:
    Route refresh: advertised and received(new)
    Four-octets ASN Capability: advertised and received
    Address family IPv4 Unicast: advertised and received
    Enhanced Refresh Capability: advertised and received
    Multisession Capability:
    Stateful switchover support enabled: NO for session 1
  Message statistics:
    InQ depth is 0
    OutQ depth is 0

      Sent      Rcvd
  Opens:          1          1
  Notifications:  0          0
  Updates:        2          1
  Keepalives:    52         80
  Route Refresh:  0          0
  Total:         55         82
  Default minimum time between advertisement runs is 30 seconds

For address family: IPv4 Unicast
  Session: 209.165.200.225
  BGP table version 3, neighbor version 3/0
  Output queue size : 0
  Index 1, Advertise bit 0
  1 update-group member
  Slow-peer detection is disabled
  Slow-peer split-update-group dynamic is disabled
  Prefix activity:
    Sent      Rcvd
  ----      ----
  --More--
```

Task 3.4: Config MP-BGP on R1 in the "ISP Network"

Router R1

```
ip route 10.48.0.0 255.0.0.0 null 0
ipv6 route 2001:db8:100::/48 null 0
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 10.48.0.0 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
```

Figure 17. "show ip ospf neighbor" command to verify correct configuration on R1, R3, D1 and D2.

The figure consists of four terminal screenshots, each showing the output of the 'show ip ospf neighbor' command on a different device. Each screenshot includes a table of neighbor information and a status bar at the bottom.

R1#show ip ospf neighbor

Neighbor ID	Pri	State	Dead Time	Address	Interface
0.0.4.3	1	FULL/DR	00:00:35	10.48.13.3	Ethernet1/1
0.0.4.131	1	FULL/DR	00:00:32	10.48.10.2	Ethernet1/2

D1#show ip ospf neighbor

Neighbor ID	Pri	State	Dead Time	Address	Interface
0.0.4.1	1	FULL/BDR	00:00:35	10.48.10.1	Ethernet1/2

D2#show ip ospf neighbor

Neighbor ID	Pri	State	Dead Time	Address	Interface
0.0.4.3	1	FULL/DR	00:00:32	10.48.11.1	Ethernet1/0

R3#show ip ospf neighbor

Neighbor ID	Pri	State	Dead Time	Address	Interface
0.0.4.1	1	FULL/BDR	00:00:36	10.48.13.1	Ethernet1/1
0.0.4.132	1	FULL/BDR	00:00:36	10.48.11.2	Ethernet1/0

Part 4: Configure First Hop Redundancy

This part applies the settings to enable HSRP version 2 which provides first hop redundancy for hosts in enterprise networks.

Table 4. Implemented Configuration for Tasks part 4

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

Task#	Task	Specification	Points
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 10.48.100.254. • 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 10.48.101.254. • 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 10.48.102.254. • 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

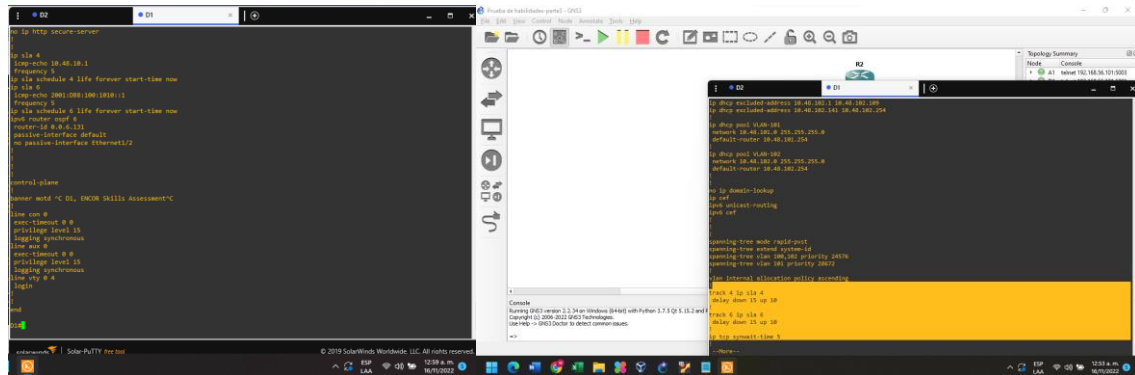
Task#	Task	Specification	Points
	On D2, configure HSRPv2.	<p>D2 is the primary router for VLAN 101; therefore, the priority will also be changed to 150.</p> <p>Configure HSRP version 2.</p> <p>Configure IPv4 HSRP group 104 for VLAN 100:</p> <ul style="list-style-type: none"> • Assign the virtual IP address 10.48.100.254. • 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 10.48.101.254. • 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 10.48.102.254. • 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. 	

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

SW D1

```
ip sla 4
icmp-echo 10.48.10.1
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
track 4 ip sla 4
delay up 10 down 15
exit
track 6 ip sla 6
delay up 10 down 15
exit
```


Figure 18. Verification of creation of IP SLAs in D1



Task 4.2: On D2, create IP SLAs that test the reachability of R3 interface E1/0.

SW D2

```

ip sla 4
icmp-echo 10.48.11.1
frequency 5
exit

ip sla 6
icmp-echo 2001:db8:100:1011::1
frequency 5
exit

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

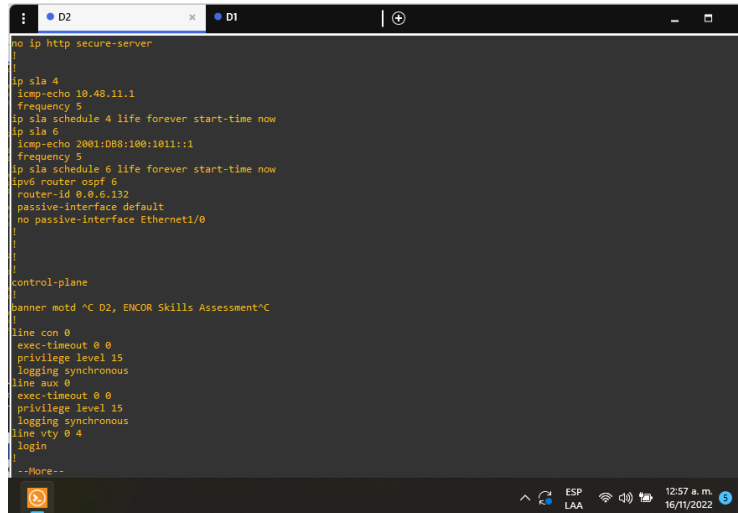
track 4 ip sla 4
delay up 10 down 15
exit

track 6 ip sla 6
    
```

delay up 10 down 15

exit

Figure 19. Verification of creation of IP SLAs in D2



```
no ip http secure-server
!
ip sla 4
icmp-echo 10.48.11.1
frequency 5
ip sla schedule 4 life forever start-time now
ip sla 6
icmp-echo 2001:DB8:100:1011::1
frequency 5
ip sla schedule 6 life forever start-time now
ipv6 router ospf 6
router-id 0.0.6.132
passive-interface default
no passive-interface Ethernet1/0
!
!
control-plane
!
banner motd ^C D2, ENCOR Skills Assessment^C
!
line con 0
exec-timeout 0 0
privilege level 15
logging synchronous
line aux 0
exec-timeout 0 0
privilege level 15
logging synchronous
line vty 0 4
login
!
--More--
```

Task 4.3: On D1 and D2, configure HSRPv2.

SW D1

```
interface vlan 100
standby version 2
standby 104 ip 10.48.100.254
standby 104 priority 150
standby 104 preempt
standby 104 track 4 decrement 60
standby 106 ipv6 autoconfig
standby 106 priority 150
```

```
standby 106 preempt
standby 106 track 6 decrement 60
exit
interface vlan 101
standby version 2
standby 114 ip 10.48.101.254
standby 114 preempt
standby 114 track 4 decrement 60
standby 116 ipv6 autoconfig
standby 116 preempt
standby 116 track 6 decrement 60
exit
interface vlan 102
standby version 2
standby 124 ip 10.48.102.254
standby 124 priority 150
standby 124 preempt
standby 124 track 4 decrement 60
standby 126 ipv6 autoconfig
standby 126 priority 150
standby 126 preempt
standby 126 track 6 decrement 60
exit
```

Figure 20. Checking the HSRPv2 configuration for D1

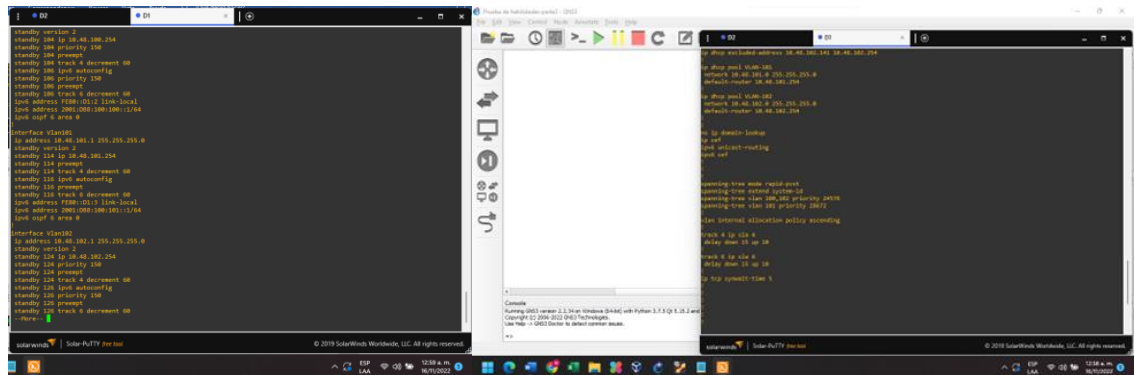
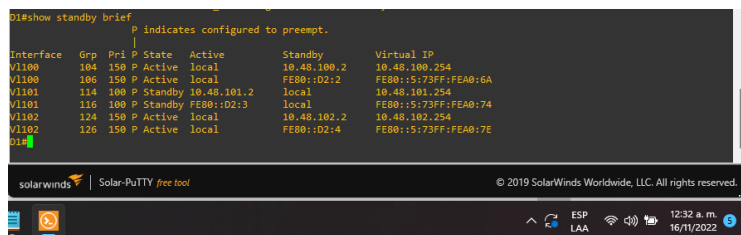


Figure 21. "show standby brief" command for D1



SW D2

```

interface vlan 100
standby version 2
standby 104 ip 10.48.100.254
standby 104 preempt
standby 104 track 4 decrement 60
standby 106 ipv6 autoconfig
standby 106 preempt
  
```

```
standby 106 track 6 decrement 60
exit
interface vlan 101
standby version 2
standby 114 ip 10.48.101.254
standby 114 priority 150
standby 114 preempt
standby 114 track 4 decrement 60
standby 116 ipv6 autoconfig
standby 116 priority 150
standby 116 preempt
standby 116 track 6 decrement 60
exit
interface vlan 102
standby version 2
standby 124 ip 10.48.102.254
standby 124 preempt
standby 124 track 4 decrement 60
standby 126 ipv6 autoconfig
standby 126 preempt
standby 126 track 6 decrement 60
exit
```

Figure 22. Checking the HSRPv2 configuration for D2

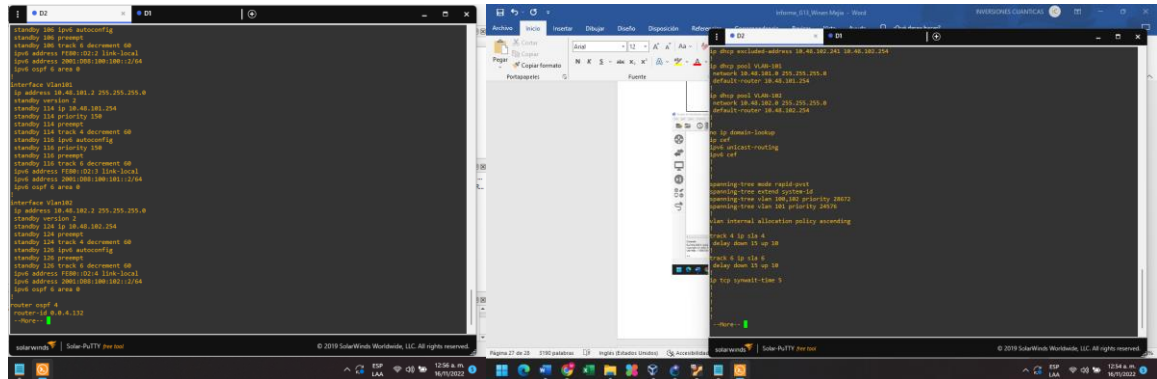
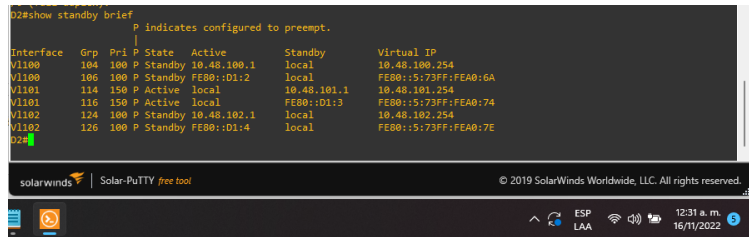


Figure 23. "show standby brief" command for D1



CONCLUSIONES

El desarrollo de las distintas prácticas de aprendizaje durante el diplomado CCNP de Cisco, reforzó las capacidades en la configuración básica de router y switch, permitió adquirir habilidades en el diseño y estructuración de redes conmutadas mediante el uso de los protocolos como STP y RSTP, también se pusieron en práctica los conocimientos en la configuración de VLANs y su enrutamiento.

Otros de los aprendizajes adquiridos, es la capacidad de implementar y diseñar soluciones de redes empresariales escalables mediante la configuración básica y avanzada de protocolos de enrutamiento como OSPF, BGP y HSRP

Por último, se comprendieron las distintas maneras de solucionar errores que se pueden presentar durante la configuración e implementación de una red de datos aplicando adecuadamente comandos para el diagnóstico en ambientes de red corporativos LAN y WAN

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