

DIPLOMADO DE PROFUNDIZACION CISCO
PRUEBA DE HABILIDADES PRÁCTICAS CCNP

LUIS ALBERTO PACHON GOMEZ

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LUIS ALBERTO PACHON GOMEZ

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TUTOR:
GERARDO GRANADOS ACUÑA

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Nota de Aceptación

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Firma del Jurado

Firma del Jurado

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GLOSARIO

ASN: Un sistema autónomo (AS) es una red muy grande con una sola política de enrutamiento. A cada AS se le fija un ASN, que es un número que identifica al AS.

BGP: En telecomunicaciones, el Border Gateway protocol, o BGP es un protocolo para intercambiar información vial entre sistemas autónomos.

DHCP: Dynamic Host Configuration Protocol, es un protocolo cliente/servidor que proporciona automáticamente un host de protocolo Internet (IP) con su respectiva dirección IP, mascara y Gateway.

HSRP: Es un protocolo de Cisco diseñado para permitir la conmutación por error transparente de dispositivos IPv4 de primer salto.

LACP: Es un protocolo de la capa de enlace de datos definido en el estándar IEEE 802.3ad. Facilita un método para controlar la agrupación de varios puertos físicos para formar un solo canal lógico.

ROOT BRIDGE: Es el punto de referencia para los conmutadores en una topología de árbol de expansión. El proceso de selección se produce en todos los conmutadores conectados y el puente con el ID de puente mas bajo se selecciona como puente raíz.

RSTP: Es un protocolo que evita bucles en una red conmutada. Reemplaza a su predecesor; protocolo STP, RSTP trae varias mejoras sobre STP, principalmente en términos de tiempos de convergencia.

VLAN: (LAN Virtual) agrupa lógicamente dispositivos dentro de la misma área de cobertura y crea redes lógicamente diferentes como si fueran redes físicas diferentes.

RESUMEN

Este trabajo se realiza para la opción de grado del programa Ingeniería Electrónica, se realiza una evaluación de habilidades prácticas CCNP. Para dar solución a esta evaluación propuesta se utiliza el simulador GNS3 en el cual se utilizan imágenes IOS de dispositivos CISCO, que son cargadas al simulador con su respectiva licencia y configuradas de acuerdo con la necesidad de la red que se va a implementar.

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

ABSTRACT

This work is carried out for the degree option of the Electronic Engineering program, an evaluation of CCNP practical skills is carried out. To solve this evaluation proposal, the GNS3 simulator is used, in which IOS images of CISCO devices are used, which are loaded into the simulator with their respective license and configured according to the needs of the network to be implemented.

Key words: Cisco, CCNP, Routing, Switching, Networking, Electronics.

INTRODUCCIÓN

En este trabajo se documenta la prueba de habilidades práctica del diplomado de profundización. Con esta actividad se busca obtener los siguientes resultados de aprendizaje; Estructurar redes conmutadas mediante el uso del protocolo STP y la configuración de VLAN; Diseñar soluciones de red escalables mediante la configuración básica y avanzada de protocolos de enrutamiento para la implementación de servicios IP con calidad de servicio en ambientes de red empresariales LAN y WAN; Planificar redes inalámbricas, de acceso remoto y sitio a sitio seguras mediante el análisis de escenarios simulados de infraestructuras de red empresariales para la aplicación de servicios de autenticación, roaming y localización; Implementar redes empresariales con acceso seguro a través de la automatización y virtualización de la red para aplicar metodologías de solución de problemas en ambientes de red corporativos LAN y WAN.

La simulación de cada uno de los escenarios de la prueba de habilidades se realiza con la herramienta GNS3 y se registran los procesos de configuración de cada uno de los dispositivos utilizados en la red.

DESARROLLO

ESCENARIO 1

PARTE 1: Construir la red y configurar los parámetros básicos de los dispositivos y el direccionamiento de las interfaces

PASO1: Cablear la red como se muestra en la topología

Figura 1. Escenario 1

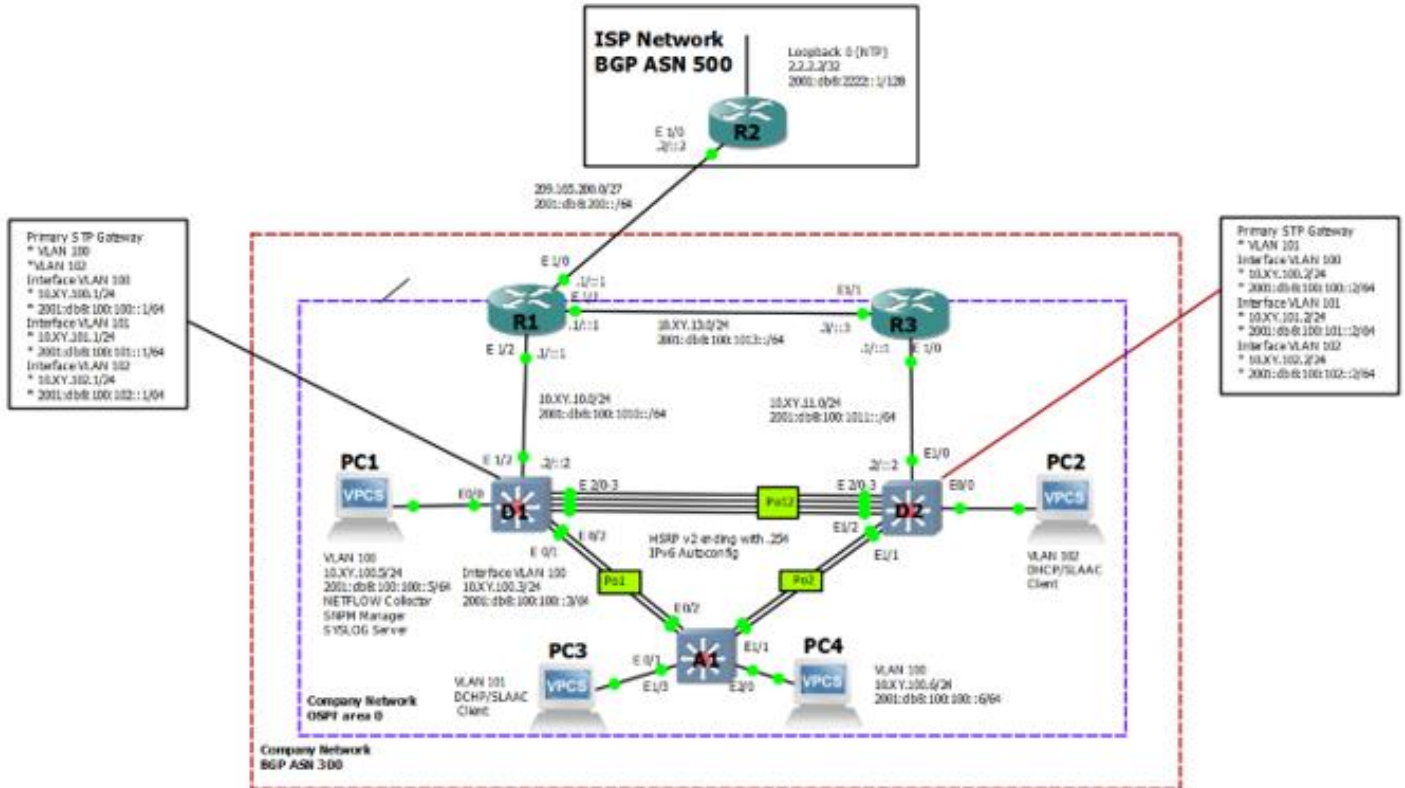


Tabla 1. Direcccionamiento.

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	10.95.10.1/24	2001:db8:100:1010::1/64	fe80::1:2
	E1/1	10.95.13.1/24	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	10.95.11.1/24	2001:db8:100:1011::1/64	fe80::3:2
	E1/1	10.95.13.3/24	2001:db8:100:1013::3/64	fe80::3:3
D1	E1/2	10.95.10.2/24	2001:db8:100:1010::2/64	fe80::d1:1
	VLAN 100	10.95.100.1/24	2001:db8:100:100::1/64	fe80::d1:2
	VLAN 101	10.95.101.1/24	2001:db8:100:101::1/64	fe80::d1:3
	VLAN 102	10.95.102.1/24	2001:db8:100:102::1/64	fe80::d1:4
D2	E1/0	10.95.11.2/24	2001:db8:100:1011::2/64	fe80::d2:1
	VLAN 100	10.95.100.2/24	2001:db8:100:100::2/64	fe80::d2:2
	VLAN 101	10.95.101.2/24	2001:db8:100:101::2/64	fe80::d2:3
	VLAN 102	10.95.102.2/24	2001:db8:100:102::2/64	fe80::d2:4
A1	VLAN 100	10.95.100.3/23	2001:db8:100:100::3/64	fe80::a1:1
PC1	NIC	10.95.100.5/24	2001:db8:100:100::5/64	EUI-64
PC2	NIC	DHCP	SLAAC	EUI-64
PC3	NIC	DHCP	SLAAC	EUI-64
PC4	NIC	10.95.100.6/24	2001:db8:100:100::6/64	EUI-64

PASO 2: Configurar los parámetros básicos para cada dispositivo.

Router 1:

```
R1#conf term
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#hostname R1
R1(config)#ipv6 unicast-routing
R1(config)#no ip domain-lookup
R1(config)#banner motd # R1, ENCOR Skills Assessment#
R1(config)#line con 0
R1(config-line)#exec-timeout 0 0
R1(config-line)#logging synchronous
R1(config-line)#exit
R1(config)#interface e1/0
R1(config-if)#ip address 209.165.200.225 255.255.255.224
R1(config-if)#ipv6 address fe80::1:1 link-local
R1(config-if)#ipv6 address 2001:db8:200::1/64
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#interface e1/2
R1(config-if)#ip address 10.95.10.1 255.255.255.0
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 10.95.13.1 255.255.255.0
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 run star
Destination filename [startup-config]?
Building configuration...
[OK]
R1#
```

Router 2:

```
R2#enable
R2#conf term
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#hostname R2
R2(config)#ipv6 unicast-routing
R2(config)#no ip domain lookup
R2(config)#banner motd # R2, ENCOR Skills Assesment#
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:db8:2222::1/128
R2(config-if)#no shutdown
R2(config-if)#exit
R2(config)#exit
R2#
R2#copy run star
Destination filename [startup-config]?
Building configuration...
[OK]
R2#
```

Router 3:

```
R3#enable
R3#config term
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#hostname R3
R3(config)#ipv6 unicast-routing
R3(config)#no ip domain lookup
R3(config)#banner motd # R3, ENCOR Skills Assesment#
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 10.95.11.1 255.255.255.0
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)#
R3(config-if)#exit
R3(config)#interface e1/1
R3(config-if)#ip address 10.95.13.3 255.255.255.0
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)#
R3#copy run star
Destination filename [startup-config]?
Building configuration...
[OK]
R3#
```

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 10.95.10.2 255.255.255.0
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 10.95.100.1 255.255.255.0
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 10.95.101.1 255.255.255.0
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 10.95.102.1 255.255.255.0
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 10.95.101.1 10.95.101.109
D1(config)#ip dhcp excluded-address 10.95.101.141 10.95.101.254
D1(config)#ip dhcp excluded-address 10.95.102.1 10.95.102.109
D1(config)#ip dhcp excluded-address 10.95.102.141 10.95.102.254
D1(config)#ip dhcp pool VLAN-101
D1(dhcp-config)# network 10.95.101.0 255.255.255.0
D1(dhcp-config)# default-router 10.95.101.254
D1(dhcp-config)# exit
D1(config)#ip dhcp pool VLAN-102
```



```
D1(dhcp-config)# network 10.95.102.0 255.255.255.0
D1(dhcp-config)# default-router 10.95.102.254
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
D1#
*Nov 17 03:48:33.540: %SYS-5-CONFIG_I: Configured from console by console
D1#copy run star
Destination filename [startup-config]?
Building configuration...
Compressed configuration from 2477 bytes to 1373 bytes[OK]
D1#
```

Switch D2:

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

```
D2(config-vlan)# exit
D2(config)#interface e1/0
D2(config-if)# no switchport
D2(config-if)# ip address 10.95.11.2 255.255.255.0
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 10.95.100.2 255.255.255.0
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 10.95.101.2 255.255.255.0
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 10.95.102.2 255.255.255.0
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 10.95.101.1 10.95.101.209
D2(config)#ip dhcp excluded-address 10.95.101.241 10.95.101.254
D2(config)#ip dhcp excluded-address 10.95.102.1 10.95.102.209
D2(config)#ip dhcp excluded-address 10.95.102.241 10.95.102.254
D2(config)#ip dhcp pool VLAN-101
D2(dhcp-config)# network 10.95.101.0 255.255.255.0
D2(dhcp-config)# default-router 95.0.101.254
D2(dhcp-config)# exit
D2(config)#ip dhcp pool VLAN-102
D2(dhcp-config)# network 10.95.102.0 255.255.255.0
D2(dhcp-config)# default-router 10.95.102.254
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
D2(config)#exit
D2#
*Nov 17 04:05:08.629: %SYS-5-CONFIG_I: Configured from console by console
D2#copy run star
Destination filename [startup-config]?
Building configuration...
Compressed configuration from 2476 bytes to 1385 bytes[OK]
D2#
```

Switch A1

```
A1#conf term
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 10.95.100.3 255.255.255.0
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)#
A1(config)#exit
*Nov 17 04:14:07.022: %SYS-5-CONFIG_I: Configured from console by console
A1#copy run star
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 1633 bytes to 985 bytes[OK]
A1#

```

b. Guarde la configuración en ejecución en startup-config en todos los dispositivos.

Figura 2. Startup-config en R1

```

R1
R1(config-if)#no shutdown
R1(config-if)#
*Nov 17 01:19:01.495: %LINK-3-UPDOWN: Interface Ethernet1/0, changed state to up
*Nov 17 01:19:02.495: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/0, changed state to up
R1(config-if)#exit
R1(config)#interface e1/2
R1(config-if)#ip address 10.95.10.1 255.255.255.0
R1(config-if)#ipv6 address fe80::1:2 link-local
R1(config-if)#ipv6 address 2001:db0:100:1010::1/64
R1(config-if)#no shutdown
R1(config-if)#exit
*Nov 17 01:23:20.155: %LINK-3-UPDOWN: Interface Ethernet1/2, changed state to up
*Nov 17 01:23:22.155: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/2, changed state to up
R1(config-if)#exit
R1(config)#interface e1/1
R1(config-if)#ip address 10.95.13.1 255.255.255.0
R1(config-if)#fe80::1:3 link-local
R1(config-if)#
% Invalid input detected at '^' marker.
R1(config-if)#ipv6 address fe80::1:3 link-local
R1(config-if)#ipv6 address 2001:db0:100:1013::1/64
R1(config-if)#no shutdown
R1(config-if)#
*Nov 17 01:28:45.639: %LINK-3-UPDOWN: Interface Ethernet1/1, changed state to up
*Nov 17 01:28:46.639: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/1, changed state to up
R1(config-if)#exit
R1(config)#exit
R1#
*Nov 17 01:28:50.571: %SYS-5-CONFIG_I: Configured from console by console
R1#copy run star
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 3. Startup-config en R2

```
Nov 17 01:46:14.095: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/2, changed state to down
Nov 17 01:46:14.095: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/3, changed state to down
Nov 17 01:46:15.363: %LINK-5-CHANGED: Interface FastEthernet0/0, changed state to administratively down
Nov 17 01:46:15.371: %LINK-5-CHANGED: Interface Ethernet1/0, changed state to administratively down
Nov 17 01:46:15.383: %LINK-5-CHANGED: Interface Ethernet1/4, changed state to administratively down
Nov 17 01:46:15.391: %LINK-5-CHANGED: Interface Ethernet1/2, changed state to administratively down
Nov 17 01:46:15.399: %LINK-5-CHANGED: Interface Ethernet1/3, changed state to administratively down
R2#enable
R2#conf term
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#hostname R2
R2(config)#ipv6 unicast-routing
R2(config)#no ip domain lookup
R2(config)#banner motd # R2, ENCOR Skills Assessment#
R2(config)#line con 0
R2(config-line)#exec-timeout 0 0
R2(config-line)#logging synchronous
R2(config-line)#exit
R2(config)#interface e1/0
R2(config-if)#ip address 209.165.200.226 255.255.255.224
R2(config-if)#ipv6 address fe80::2:1 link-local
R2(config-if)#ipv6 address 2001:db8:2222::1/128
R2(config-if)#no shutdown
R2(config-if)#exit
Nov 17 01:55:56.827: %LINK-3-UPDOWN: Interface Ethernet1/0, changed state to up
Nov 17 01:55:57.827: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/0, changed state to up
R2(config-if)#exit
R2(config)#exit
R2#
Nov 17 01:58:18.627: %SYS-5-CONFIG_I: Configured from console by console
R2#copy run star
Destination filename [startup-config]?
Warning: Attempting to overwrite a NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
[OK]
R2#
```

Figura 4. Startup-config en R3

```
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 10.95.11.1 255.255.255.0
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)#
Nov 17 02:13:16.287: %LINK-3-UPDOWN: Interface Ethernet1/0, changed state to up
Nov 17 02:13:17.287: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/0, changed state to up
R3(config-if)#exit
R3(config)#interface e1/1
R3(config-if)#ip address 10.95.13.3 255.255.255.0
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)#
Nov 17 02:16:49.039: %LINK-3-UPDOWN: Interface Ethernet1/1, changed state to up
Nov 17 02:16:50.039: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/1, changed state to up
R3(config)#exit
R3#
Nov 17 02:17:24.107: %SYS-5-CONFIG_I: Configured from console by console
R3#copy run star
Destination filename [startup-config]?
Warning: Attempting to overwrite a NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
[OK]
R3#
```

Figura 5. Startup-config en D1

```
D1(config-if)# ip address 10.95.100.1 255.255.255.0
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 10.95.101.1 255.255.255.0
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 10.95.102.1 255.255.255.0
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 10.95.101.1 10.95.101.109
D1(config)#ip dhcp excluded-address 10.95.101.141 10.95.101.254
D1(config)#ip dhcp excluded-address 10.95.102.1 10.95.102.109
D1(config)#ip dhcp excluded-address 10.95.102.141 10.95.102.254
D1(config)#ip dhcp pool VLAN-101
D1(dhcp-config)# network 10.95.101.0 255.255.255.0
D1(dhcp-config)# default-router 10.95.101.254
D1(dhcp-config)# exit
D1(dhcp-config)#ip dhcp pool VLAN-102
D1(dhcp-config)# network 10.95.102.0 255.255.255.0
D1(dhcp-config)# default-router 10.95.102.254
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
D1#
*Nov 17 03:48:33.540: %SYS-5-CONFIG_I: Configured from console by console
D1#copy run star
Destination filename [startup-config]?
Building configuration...
```

Figura 6. Startup-config en D2

```
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 10.95.101.2 255.255.255.0
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 10.95.102.2 255.255.255.0
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 10.95.101.1 10.95.101.209
D2(config)#ip dhcp excluded-address 10.95.101.241 10.95.101.254
D2(config)#ip dhcp excluded-address 10.95.102.1 10.95.102.209
D2(config)#ip dhcp excluded-address 10.95.102.241 10.95.102.254
D2(config)#ip dhcp pool VLAN-101
D2(dhcp-config)# network 10.95.101.0 255.255.255.0
D2(dhcp-config)# default-router 95.0.101.254
D2(dhcp-config)# exit
D2(dhcp-config)#ip dhcp pool VLAN-102
D2(dhcp-config)# network 10.95.102.0 255.255.255.0
D2(dhcp-config)# default-router 10.95.102.254
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
D2(config)#exit
D2#
*Nov 17 04:05:08.629: %SYS-5-CONFIG_I: Configured from console by console
D2#copy run star
Destination filename [startup-config]?
Building configuration...
Compressed configuration from 2476 bytes to 1385 bytes[OK]
D2#
```

Figura 7. Startup-config en A1

```

A1((config-if-range)# exit
A1(config)#
*Nov 17 04:13:19.674: %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan100, changed state to down
*Nov 17 04:13:20.699: %LINK-5-UPDOWN: Interface Vlan100, changed state to down
*Nov 17 04:13:20.708: %LINK-5-CHANGED: Interface Ethernet0/0, changed state to administratively down
*Nov 17 04:13:20.721: %LINK-5-CHANGED: Interface Ethernet0/3, changed state to administratively down
*Nov 17 04:13:20.721: %LINK-5-CHANGED: Interface Ethernet1/0, changed state to administratively down
*Nov 17 04:13:20.730: %LINK-5-CHANGED: Interface Ethernet2/1, changed state to administratively down
*Nov 17 04:13:20.730: %LINK-5-CHANGED: Interface Ethernet2/2, changed state to administratively down
*Nov 17 04:13:20.730: %LINK-5-CHANGED: Interface Ethernet2/3, changed state to administratively down
*Nov 17 04:13:20.730: %LINK-5-CHANGED: Interface Ethernet3/0, changed state to administratively down
A1(config)#
*Nov 17 04:13:20.735: %LINK-5-CHANGED: Interface Ethernet3/1, changed state to administratively down
*Nov 17 04:13:20.735: %LINK-5-CHANGED: Interface Ethernet3/2, changed state to administratively down
*Nov 17 04:13:20.747: %LINK-5-CHANGED: Interface Ethernet3/3, changed state to administratively down
*Nov 17 04:13:21.716: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/0, changed state to down
*Nov 17 04:13:21.725: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/3, changed state to down
*Nov 17 04:13:21.725: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet1/0, changed state to down
A1(config)#
*Nov 17 04:13:21.738: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet2/1, changed state to down
*Nov 17 04:13:21.738: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet2/2, changed state to down
*Nov 17 04:13:21.738: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet2/3, changed state to down
*Nov 17 04:13:21.738: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet3/0, changed state to down
*Nov 17 04:13:21.738: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet3/1, changed state to down
*Nov 17 04:13:21.738: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet3/2, changed state to down
A1(config)#
*Nov 17 04:13:21.749: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet3/3, changed state to down
A1(config)#exit
A1#cop
*Nov 17 04:14:07.022: %SYS-5-CONFIG_I: Configured from console by console
A1#copy run star
Destination filename [startup-config]?
Warning: Attempting to overwrite a NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
Compressed configuration from 1633 bytes to 985 bytes[OK]
A1#
```

C. Configurar el direccionamiento de host de PC1 y PC4 como se demuestra en la tabla de direccionamiento.

Figura 8. Startup-config en PC1

```

PC1> ip 10.95.100.5/24
Checking for duplicate address...
PC1 : 10.95.100.5 255.255.255.0

PC1> save
Saving startup configuration to startup.vpc
. done

PC1> show

NAME IP/MASK GATEWAY MAC LPORT RHOST:PORT
PC1 10.95.100.5/24 0.0.0.0 00:50:79:66:68:00 20044 127.0.0.1:20045
fe80::250:79ff:fe66:6800/64

PC1>
```

Figura 9. Startup-config en Pc4

```

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For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

PC4> ip 10.95.100.6/24
Checking for duplicate address...
PC4 : 10.95.100.6 255.255.255.0

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

PC4> show

NAME      IP/MASK      GATEWAY      MAC          LPORT  RHOST:PORT
PC4      10.95.100.6/24  0.0.0.0      00:50:79:66:68:03  20046  127.0.0.1:20047
          fe80::250:79ff:fe66:6803/64

```

PARTE 2: Configurar la capa 2 de la red y el soporte de host.

2.1 Configure las interfaces troncales IEEE802.1Q en los enlaces del switch.

Switch D1

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

2.2 Cambiar la 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
```

2.3 Habilitar el 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
```

2.4 Configure los puentes raíz RSTP (root bridges)

Switch D1

```
D1(config)#spanning-tree vlan 100,102 root primary
D1(config)#spanning-tree vlan 101 root secondary
```

Switch D2

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

2.5 En los switches crear LACP EtherChannels

Switch D1

```
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
```

Switch D2

```
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
```

Switch A1

```
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
```

2.6 Configure los puertos de acceso del host que se conectan a los PC

Switch D1

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

Switch D2

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

Switch A1

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

2.7 Verificar los servicios DHCP IPv4

Figura 10. DHCP IPv4 en Pc2

```

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Press '?' to get help.

Executing the startup file

PC2> ip dhcp
Invalid address

PC2> ip dhcp
DDORA IP 10.95.102.110/24 GW 10.95.102.254

PC2> show

NAME IP/MASK GATEWAY MAC LPORT RHOST:PORT
PC2 10.95.102.110/24 10.95.102.254 00:50:79:66:68:01 20050 127.0.0.1:20051
fe80::250:79ff:fe66:6801/64
2001:db8:100:102:2050:79ff:fe66:6801/64 eui-64

PC2>

```

Figura 11. DHCP IPv4 en Pc3

```

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Press '?' to get help.

Executing the startup file

PC3> ip dhcp
Invalid address

PC3> ip dhcp
DDORA IP 10.95.101.110/24 GW 10.95.101.254

PC3> show

NAME IP/MASK GATEWAY MAC LPORT RHOST:PORT
PC3 10.95.101.110/24 10.95.101.254 00:50:79:66:68:02 20048 127.0.0.1:20049
fe80::250:79ff:fe66:6802/64
2001:db8:100:101:2050:79ff:fe66:6802/64 eui-64

PC3>

```

2.8 Verificar la conectividad LAN local.

Figura 12. PC1 ping: D1: 10.95.100.1, D2: 10.95.100.2, PC4: 10.95.100.6

```
PC1> ping 10.95.100.1
84 bytes from 10.95.100.1 icmp_seq=1 ttl=255 time=0.492 ms
84 bytes from 10.95.100.1 icmp_seq=2 ttl=255 time=0.378 ms
84 bytes from 10.95.100.1 icmp_seq=3 ttl=255 time=0.391 ms
84 bytes from 10.95.100.1 icmp_seq=4 ttl=255 time=0.412 ms
84 bytes from 10.95.100.1 icmp_seq=5 ttl=255 time=0.738 ms

PC1> ping 10.95.100.2
84 bytes from 10.95.100.2 icmp_seq=1 ttl=255 time=0.755 ms
84 bytes from 10.95.100.2 icmp_seq=2 ttl=255 time=0.838 ms
84 bytes from 10.95.100.2 icmp_seq=3 ttl=255 time=0.875 ms
84 bytes from 10.95.100.2 icmp_seq=4 ttl=255 time=0.731 ms
84 bytes from 10.95.100.2 icmp_seq=5 ttl=255 time=0.931 ms

PC1> ping 10.95.100.6
84 bytes from 10.95.100.6 icmp_seq=1 ttl=64 time=0.696 ms
84 bytes from 10.95.100.6 icmp_seq=2 ttl=64 time=0.939 ms
84 bytes from 10.95.100.6 icmp_seq=3 ttl=64 time=0.905 ms
84 bytes from 10.95.100.6 icmp_seq=4 ttl=64 time=0.974 ms
84 bytes from 10.95.100.6 icmp_seq=5 ttl=64 time=0.839 ms

PC1> █
```

Figura 13. PC2 ping: D1: 10.95.102.1, D2: 10.95.102.2

```
PC2> ping 10.95.102.2
84 bytes from 10.95.102.2 icmp_seq=1 ttl=255 time=0.269 ms
84 bytes from 10.95.102.2 icmp_seq=2 ttl=255 time=0.400 ms
84 bytes from 10.95.102.2 icmp_seq=3 ttl=255 time=0.393 ms
84 bytes from 10.95.102.2 icmp_seq=4 ttl=255 time=0.428 ms
84 bytes from 10.95.102.2 icmp_seq=5 ttl=255 time=0.456 ms

PC2> ping 10.95.102.1
84 bytes from 10.95.102.1 icmp_seq=1 ttl=255 time=0.786 ms
84 bytes from 10.95.102.1 icmp_seq=2 ttl=255 time=0.769 ms
84 bytes from 10.95.102.1 icmp_seq=3 ttl=255 time=0.702 ms
84 bytes from 10.95.102.1 icmp_seq=4 ttl=255 time=0.892 ms
84 bytes from 10.95.102.1 icmp_seq=5 ttl=255 time=0.792 ms

PC2> █
```

Figura 14. PC3 ping: D1: 10.95.101.1, D2: 10.95.101.2

```
PC3> pin 10.95.101.1

84 bytes from 10.95.101.1 icmp_seq=1 ttl=255 time=1.135 ms
84 bytes from 10.95.101.1 icmp_seq=2 ttl=255 time=1.320 ms
84 bytes from 10.95.101.1 icmp_seq=3 ttl=255 time=1.170 ms
84 bytes from 10.95.101.1 icmp_seq=4 ttl=255 time=1.228 ms
84 bytes from 10.95.101.1 icmp_seq=5 ttl=255 time=1.300 ms

PC3> ping 10.95.101.2

84 bytes from 10.95.101.2 icmp_seq=1 ttl=255 time=0.729 ms
84 bytes from 10.95.101.2 icmp_seq=2 ttl=255 time=0.832 ms
84 bytes from 10.95.101.2 icmp_seq=3 ttl=255 time=0.917 ms
84 bytes from 10.95.101.2 icmp_seq=4 ttl=255 time=0.774 ms
84 bytes from 10.95.101.2 icmp_seq=5 ttl=255 time=1.169 ms

PC3> █
```

Figura 15. PC4 ping: D1: 10.95.100.1, D2: 10.95.100.2, PC1: 10.95.100.5

```
PC4> ping 10.95.100.1

84 bytes from 10.95.100.1 icmp_seq=1 ttl=255 time=0.656 ms
84 bytes from 10.95.100.1 icmp_seq=2 ttl=255 time=1.115 ms
84 bytes from 10.95.100.1 icmp_seq=3 ttl=255 time=0.851 ms
84 bytes from 10.95.100.1 icmp_seq=4 ttl=255 time=1.058 ms
84 bytes from 10.95.100.1 icmp_seq=5 ttl=255 time=0.842 ms

PC4> ping 10.95.100.2

84 bytes from 10.95.100.2 icmp_seq=1 ttl=255 time=2.242 ms
84 bytes from 10.95.100.2 icmp_seq=2 ttl=255 time=1.504 ms
84 bytes from 10.95.100.2 icmp_seq=3 ttl=255 time=1.063 ms
84 bytes from 10.95.100.2 icmp_seq=4 ttl=255 time=1.355 ms
84 bytes from 10.95.100.2 icmp_seq=5 ttl=255 time=1.351 ms

PC4> ping 10.95.100.5

84 bytes from 10.95.100.5 icmp_seq=1 ttl=64 time=0.789 ms
84 bytes from 10.95.100.5 icmp_seq=2 ttl=64 time=1.137 ms
84 bytes from 10.95.100.5 icmp_seq=3 ttl=64 time=0.913 ms
84 bytes from 10.95.100.5 icmp_seq=4 ttl=64 time=0.851 ms
84 bytes from 10.95.100.5 icmp_seq=5 ttl=64 time=0.765 ms

PC4> █
```


ESCENARIO 2

PARTE 3: Configurar protocolos de enrutamiento

3.1 Configurar OSPFv2 de área única en el área 0.

Router 1

```
R1(config)#router ospf 4
R1(config-router)#router-id 0.0.4.1
R1(config-router)#network 10.95.10.0 0.0.0.255 area 0
R1(config-router)#network 10.95.13.0 0.0.0.255 area 0
R1(config-router)#default-information originate
R1(config-router)#exit
```

Router 3

```
R3#config term
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#router ospf 4
R3(config-router)#router-id 0.0.4.3
R3(config-router)#network 10.95.11.0 0.0.0.255 area 0
R3(config-router)#network 10.95.13.0 0.0.0.255 area 0
R3(config-router)#exit
```

Switch D1

```
D1#config term
Enter configuration commands, one per line. End with CNTL/Z.
D1(config)#router ospf 4
D1(config-router)#router-id 0.0.4.131
D1(config-router)#network 10.95.100.0 0.0.0.255 area 0
D1(config-router)#network 10.95.101.0 0.0.0.255 area 0
D1(config-router)#network 10.95.102.0 0.0.0.255 area 0
```

```
D1(config-router)#network 10.95.10.0 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 10.95.100.0 0.0.0.255 area 0
D2(config-router)#network 10.95.101.0 0.0.0.255 area 0
D2(config-router)#network 10.95.102.0 0.0.0.255 area 0
D2(config-router)#network 10.95.11.0 0.0.0.255 area 0
D2(config-router)#passive-interface default
D2(config-router)#no passive-interface e1/0
D2(config-router)#exit
```

3.2 Configurar OSPFv3 clásico de área única en el área 0

Router 1

```
R1(config)#ipv6 router ospf 6
R1(config-rtr)#router-id 0.0.6.1
R1(config-rtr)#default-information originate
R1(config-rtr)#exit
R1(config)#interface e1/2
R1(config-if)#ipv6 ospf 6 area 0
R1(config-if)#exit
R1(config)#interface e1/1
R1(config-if)#ipv6 ospf 6 area 0
R1(config-if)#exit
```

Router 3

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

```
R3(config)#interface e1/0
R3(config-if)#ipv6 ospf 6 area 0
R3(config-if)#exit
R3(config)#interface e1/1
R3(config-if)#ipv6 ospf 6 area 0
R3(config-if)#exit
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)#end
D1(config)#end
```

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)#end
```

3.3 En el R2 en la red ISP Configurar MP-BGP

Router 2

```
R2(config)#ip route 0.0.0.0 0.0.0.0 loopback 0
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)#

```

3.4 En el R1 en la red ISP configurar MP-BGP

Router 1

```

R1(config)#ip route 10.0.0.0 255.0.0.0 null0
R1(config)#
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)#no neighbor 2001:db8:200::2 activate
R1(config-router-af)#network 10.0.0.0 mask 255.0.0.0
R1(config-router-af)#exit-address-family
R1(config-router)#address-family ipv6 unicast
R1(config-router-af)#no neighbor 209.165.200.226 activate
R1(config-router-af)#neighbor 2001:db8:200::2 activate
R1(config-router-af)#network 2001:db8:100::/48
R1(config-router-af)#exit-address-family
R1(config-router)#

```

PARTE 4: Configurar la redundancia del primer salto.

4.1 En D1, cree IP SLAs que prueben la accesibilidad de la interfaz E1/2 de R1

Switch D1

```
D1(config)#ip sla 4
D1(config-ip-sla)#icmp-echo 10.95.10.1
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
```

4.2 En D2, cree IP SLAs que prueben la accesibilidad de la interfaz E1/0 de R3

Switch D2

```
D2(config)#ip sla 4
D2(config-ip-sla-echo)#icmp-echo 10.95.11.1
D2(config-ip-sla-echo)#Frequency 5
D2(config-ip-sla-echo)#Exit
D2(config)#ip sla 6
D2(config-ip-sla-echo)#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
```

4.3 En D1, configurar HSRPv2

```
D1(config)#Interface vlan 100
D1(config-if)#Standby version 2
D1(config-if)#Standby 104 ip 10.95.100.254
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 10.95.101.254
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 10.95.102.254
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
```

4.4 En D2, configurar HSRPv2

```
D2(config)#Interface vlan 100
D2(config-if)#Standby version 2
D2(config-if)#Standby 104 ip 10.95.100.254
D2(config-if)#Standby 104 preempt
D2(config-if)#Standby 104 track 4 decrement 60
D2(config-if)#Standby 106 ipv6 autoconfig
D2(config-if)#Standby 106 preempt
D2(config-if)#Standby 106 track 6 decrement 60
D2(config-if)#Exit
D2(config)#Interface vlan 101
D2(config-if)#Standby version 2
D2(config-if)#Standby 114 ip 10.95.101.254
D2(config-if)#Standby 114 priority 150
D2(config-if)#Standby 114 preempt
D2(config-if)#Standby 114 track 4 decrement 60
D2(config-if)#Standby 116 ipv6 autoconfig
D2(config-if)#Standby 116 priority 150
D2(config-if)#Standby 116 preempt
D2(config-if)#Standby 116 track 6 decrement 60
D2(config-if)#Exit
D2(config)#Interface vlan 102
D2(config-if)#Standby version 2
D2(config-if)#Standby 124 ip 10.95.102.254
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
```


CONCLUSIONES

Se realiza la configuración de los dispositivos, en la conexión de los switch con los router se tiene discrepancia dúplex (Duplex Mismatch) se revisa y se encuentra que el router y el switch están funcionando en diferentes modos dúplex. El router funciona en medio dúplex (half dúplex) y el switch en dúplex completo (full dúplex).

La discrepancia dúplex puede ser por configurar manual dos interfaces de red conectadas en diferentes modos dúplex o al conectar un dispositivo que realiza la negociación automática con otro dispositivo que se configura manualmente en un modo dúplex completo.

En el desarrollo de la actividad se encuentra que algunos comandos para OSPFv3 no son aceptados en las imágenes de los dispositivos utilizados. Pero el software GNS3 nos da facilidad para estudiar varios escenarios donde construyen topologías y se configuran los dispositivos similar a los reales.

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