

DIPLOMADO DE PROFUNDIZACIÓN CISCO
PRUEBA DE HABILIDADES PRÁCTICAS CCNP

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UNIVERSIDAD NACIONAL ABIERTA A DISTANCIA - UNAD
ESCUELA DE CIENCIAS BÁSICAS TECNOLOGÍA E INGENIERÍA - ECBTI
INGENIERÍA EN TELECOMUNICACIONES
SANTIAGO DE CALI
2020

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Diplomado de opción de grado presentado para optar el título de
INGENIERO DE TELECOMUNICACIONES

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2020

Nota de aceptación

Firma del presidente del jurado

Firma del jurado

Firma del jurado

Santiago de Cali, 21 de julio de 2020

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GLOSARIO

ROUTER: Es un dispositivo que proporciona conectividad a nivel de red o nivel tres en el modelo OSI. Su función principal consiste en enviar o encaminar paquetes de datos de una red a otra, es decir, interconectar subredes.

RED: Es un conjunto de equipos informáticos y software conectados entre sí por medio de dispositivos físicos o inalámbricos que envían y reciben impulsos eléctricos, ondas electromagnéticas o cualquier otro medio para el transporte de datos, con la finalidad de compartir información, recursos y ofrecer servicios.

DIRECCIÓN IP: Dirección de protocolo de Internet, la forma estándar de identificar un equipo que está conectado a Internet, de forma similar a como un número de teléfono identifica un aparato de teléfono en una red telefónica. La dirección IP consta de cuatro números separados por puntos, en que cada número es menor de 256; por ejemplo 192.168.1.2, dicha dirección IP es asignada de manera permanente o temporal a cada equipo conectado a la red.

ANCHO DE BANDA – BANDWIDTH: Cantidad de datos que puede ser enviada o recibida durante un cierto tiempo a través de un determinado circuito de comunicación. Técnicamente, es la diferencia en hertzios (Hz) entre la frecuencia más alta y baja de un canal de transmisión.

OSPF: Es un protocolo de encaminamiento jerárquico de pasarela interior, que usa el algoritmo Dijkstra enlace-estado (LSA - Link State Algorithm) para calcular la ruta más corta posible. Usa “cost” como su medida de métrica. Además, construye una base de datos enlace-estado idéntica en todos los encaminadores de la zona.

EIGRP: El protocolo de enrutamiento de gateway interior mejorado (Enhanced Interior Gateway Routing Protocol, EIGRP) es una versión mejorada del protocolo IGRP original desarrollado por Cisco Systems. EIGRP combina las ventajas de los protocolos de estado de enlace con las de los protocolos de vector de distancia.

RESUMEN

El desarrollo de este trabajo comprende el desarrollo del conocimiento adquirido en el diplomado de profundización Cisco CCNP sobre temas de instalación, configuración y operación de redes LAN y WAN mediante el uso medio-avanzado de dispositivos de red como routers y switches. El diplomado se centra en capacitarnos para planificar, implementar, verificar y solucionar problemas en redes de datos.

En el siguiente trabajo encontraremos dos escenarios donde se abordarán los temas tratados durante el desarrollo del diplomado en la plataforma Cisco. El primer escenario abordará conceptos principales como protocolos de enrutamiento EIGRP, OSPF, BGP, redistribución de rutas, entre otros, así como nuevos e interesantes temas, como Dynamic Multi VPN, VRF Lite y protocolos en IPv6. El segundo escenario por su parte se centra en switches y se abordará conceptos principales como operaciones y puertos de switches, VLANs y troncales, Spanning Tree, entre otros, así como nuevos e interesantes temas, como manejo de ataques de spoofing y configuración de usuarios.

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

ABSTRACT

The development of this work includes the development of the knowledge acquired in the Cisco CCNP diploma course on installation, configuration and operation of LAN and WAN networks through the medium-advanced use of network devices such as routers and switches. The course focuses on training in planning, implementing, verifying and solving problems in data networks.

In the following work we will find two scenarios where the topics covered during the development of the diploma on the Cisco platform will be addressed. The first scenario will address main concepts such as EIGRP routing protocols, OSPF, BGP, route redistribution, among others, as well as new and interesting topics such as Dynamic Multi VPN, VRF Lite and protocols in IPv6. The second scenario focuses on switches and will address main concepts such as operations and ports of switches, VLANs and trunks, Spanning Tree, among others, as well as new and interesting topics, such as handling spoofing attacks and user configuration.

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

INTRODUCCIÓN

El desarrollo de este trabajo evalúa y pone en marcha los conocimientos adquiridos durante el diplomado de profundización Cisco CCNP, a través del cual se busca medir las habilidades y competencias que como estudiante logré alcanzar a través del desarrollo de laboratorios y evaluaciones. Esta actividad contará dos escenarios propuestos en el que se abordan temas de routing y switching respectivamente con el fin de aplicar todo lo visto en escenarios con requerimientos reales. Se utilizan herramientas como GNS3 para la emulación de los dispositivos de red y putty para la configuración y puesta en marcha de los escenarios planteados.

El primer escenario hace uso de tres routers en el que debemos utilizar protocolos de enrutamiento OSPF e EIGRP para proporcionar conectividad entre las distintas sedes y completar otras configuraciones para probar finalmente conectividad entre un punto y otro tanto en IPv4 como IPv6.

El segundo escenario por tu parte, hace uso de switches en los que debemos configurar diferentes enlaces Etherchannel de capa 2 y capa 3, creación de VLAN's y la publicación de estas, también se configura VTP y Spanning tree para finalmente comprobar en cada switch dichas configuraciones.

1. Escenario 1

Una empresa de confecciones posee tres sucursales distribuidas en las ciudades de Cali, Barranquilla y Ocaña, en donde el estudiante será el administrador de la red, el cual deberá configurar e interconectar entre sí cada uno de los dispositivos que forman parte del escenario, acorde con los lineamientos establecidos para el direccionamiento IP, protocolos de enrutamiento y demás aspectos que forman parte de la topología de red.

Topología de red

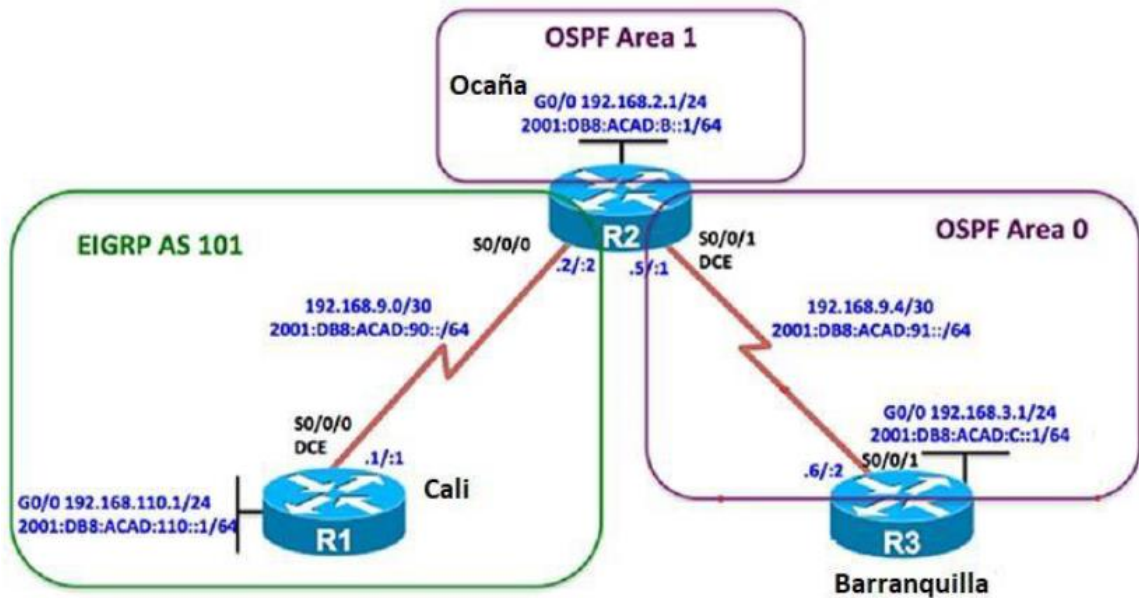


Figura 1. Topología de red escenario 1

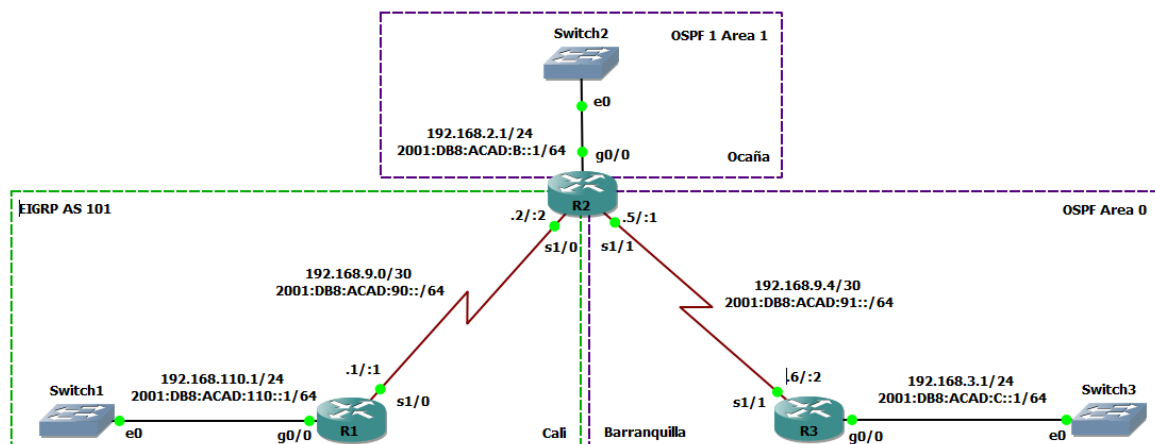


Figura 2. Topología de red escenario 1, diseño propio

Configurar la topología de red, de acuerdo con las siguientes especificaciones.

1.1 Parte 1: Configuración del escenario propuesto

1. Configurar las interfaces con las direcciones IPv4 e IPv6 que se muestran en la topología de red.

R1

```
Router> enable
Router# configure terminal
Router(config)# hostname R1
R1(config)#
R1(config)# interface serial 1/0
R1(config-if)# description Enlace a R2
R1(config-if)# ip address 192.168.9.1 255.255.255.252
R1(config-if)# ipv6 address 2001:db8:acad:90::1/64
R1(config-if)# no shutdown
R1(config-if)# exit
R1(config-if)#
R1(config)# interface gigabitethernet 0/0
R1(config-if)# description Lan Cali
R1(config-if)# ip address 192.168.110.1 255.255.255.0
R1(config-if)# ipv6 address 2001:db8:acad:110::1/64
R1(config-if)# no shutdown
R1(config-if)# exit
```

```
R1#show ip interface brief | include up
GigabitEthernet0/0      192.168.110.1    YES NVRAM  up          up
Serial1/0               192.168.9.1     YES NVRAM  up          up
R1#
R1#
R1#show ipv6 interface brief | include up
GigabitEthernet0/0     [up/up]
Serial1/0              [up/up]
R1#
R1#show ipv6 interface brief
Ethernet0/0            [administratively down/down]
                       unassigned
GigabitEthernet0/0     [up/up]
                       FE80::C801:4FF:FE5C:8
                       2001:DB8:ACAD:110::1
Serial1/0              [up/up]
                       FE80::C801:4FF:FE5C:6
                       2001:DB8:ACAD:90::1
```

Figura 3. Direccionamiento IP de R1

R2

```
Router> enable
Router# configure terminal
Router(config)# hostname R2
R2(config)#
R2(config)# interface serial 1/0
R2(config-if)# description "Enlace a R1"
R2 config-if)# ip address 192.168.9.2 255.255.255.252
R2(config-if)# ipv6 address 2001:db8:acad:90::2/64
R1(config-if)# no shutdown
R1(config-if)# exit
R1(config-if)#
R2(config)# interface serial 1/1
R2(config-if)# description "Enlace a R3"
R2 config-if)# ip address 192.168.9.5 255.255.255.252
R2(config-if)# ipv6 address 2001:db8:acad:91::1/64
R1(config-if)# no shutdown
R1(config-if)# exit
R1(config-if)#
R1(config)# interface gigabitethernet 0/0
R1(config-if)# description "Lan Ocaña"
R1(config-if)# ip address 192.168.2.1 255.255.255.0
R1(config-if)# ipv6 address 2001:db8:acad:b::1/64
R1(config-if)# no shutdown
R1(config-if)# exit
```

```
R2#show ip interface brief | include up
GigabitEthernet0/0    192.168.2.1    YES manual up    up
Serial1/0             192.168.9.2    YES manual up    up
Serial1/1             192.168.9.5    YES manual up    up
R2#
R2#show ipv6 interface brief
Ethernet0/0           [administratively down/down]
    unassigned
GigabitEthernet0/0   [up/up]
    FE80::C802:4FF:FE6B:8
    2001:DB8:ACAD:B::1
Serial1/0             [up/up]
    FE80::C802:4FF:FE6B:6
    2001:DB8:ACAD:90::2
Serial1/1             [up/up]
    FE80::C802:4FF:FE6B:6
    2001:DB8:ACAD:91::1
Serial1/2             [administratively down/down]
    unassigned
Serial1/3             [administratively down/down]
    unassigned
```

Figura 4. Direccionamiento IP de R2

R3

```
Router> enable
Router# configure terminal
Router(config)# hostname R3
R3(config)#
R3(config)# interface serial 1/1
R3(config-if)# description Enlace a R2
R3(config-if)# ip address 192.168.9.6 255.255.255.252
R3(config-if)# ipv6 address 2001:db8:acad:91::2/64
R3(config-if)# no shutdown
R3(config-if)# exit
R3(config-if)#
R3(config)# interface gigabitethernet 0/0
R3(config-if)# description Lan Barranquilla
R3(config-if)# ip address 192.168.3.1 255.255.255.0
R3(config-if)# ipv6 address 2001:db8:acad:c::1/64
R3(config-if)# no shutdown
R3(config-if)# exit
```

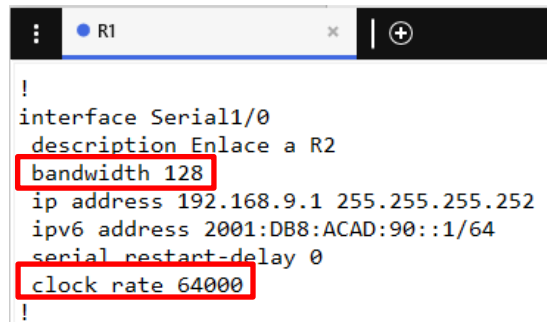
```
R3#show ip interface brief | include up
GigabitEthernet0/0      192.168.3.1      YES manual up      up
Serial1/1                192.168.9.6      YES manual up      up
R3#
R3#show ipv6 interface brief
Ethernet0/0              [administratively down/down]
    unassigned
GigabitEthernet0/0      [up/up]
    FE80::C803:5FF:FE4E:8
    2001:DB8:ACAD:C::1
Serial1/0                 [administratively down/down]
    unassigned
Serial1/1                 [up/up]
    FE80::C803:5FF:FE4E:6
    2001:DB8:ACAD:91::2
Serial1/2                 [administratively down/down]
    unassigned
Serial1/3                 [administratively down/down]
    unassigned
```

Figura 5. Direccionamiento IP de R3

- Ajustar el ancho de banda a 128 kbps sobre cada uno de los enlaces seriales ubicados en R1, R2, y R3 y ajustar la velocidad de reloj de las conexiones de DCE según sea apropiado.

R// R1

```
R1(config)# interface serial 1/0
R1(config-if)# bandwidth 128
R1(config-if)# clock rate 64000
R1(config-if)# exit
```

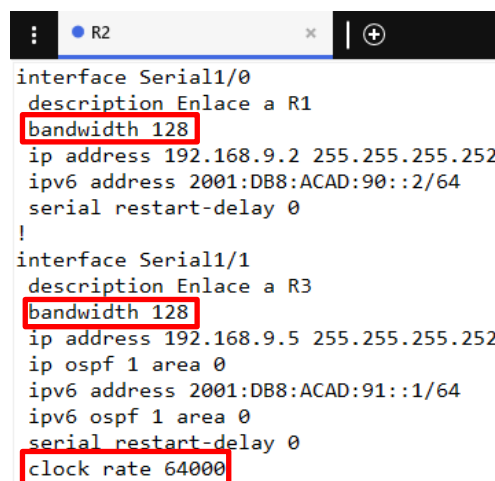


```
!
interface Serial1/0
description Enlace a R2
bandwidth 128
ip address 192.168.9.1 255.255.255.252
ipv6 address 2001:DB8:ACAD:90::1/64
serial restart-delay 0
clock rate 64000
!
```

Figura 6. Configuración de ancho de banda y clock rate R1

R2

```
R1(config)# interface serial 1/0
R1(config-if)# bandwidth 128
R1(config-if)# exit
R1(config-if)#
R1(config)# interface serial 1/1
R1(config-if)# bandwidth 128
R1(config-if)# clock rate 64000
R1(config-if)# exit
```



```
!
interface Serial1/0
description Enlace a R1
bandwidth 128
ip address 192.168.9.2 255.255.255.252
ipv6 address 2001:DB8:ACAD:90::2/64
serial restart-delay 0
!
interface Serial1/1
description Enlace a R3
bandwidth 128
ip address 192.168.9.5 255.255.255.252
ip ospf 1 area 0
ipv6 address 2001:DB8:ACAD:91::1/64
ipv6 ospf 1 area 0
serial restart-delay 0
clock rate 64000
!
```

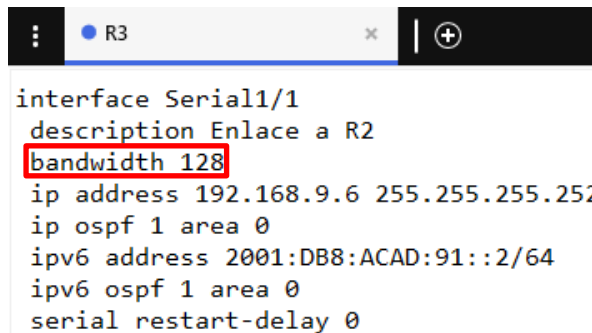
Figura 7. Configuración de ancho de banda y clock rate R2

R3

```
R3(config)# interface serial 1/1
```

```
R3(config-if)# bandwidth 128
```

```
R3(config-if)# exit
```



```
interface Serial1/1
description Enlace a R2
bandwidth 128
ip address 192.168.9.6 255.255.255.252
ip ospf 1 area 0
ipv6 address 2001:DB8:ACAD:91::2/64
ipv6 ospf 1 area 0
serial restart-delay 0
```

Figura 8. Configuración de ancho de banda y clock rate R3

3. En R2 y R3 configurar las familias de direcciones OSPFv3 para IPv4 e IPv6. Utilice el identificador de enrutamiento 2.2.2.2 en R2 y 3.3.3.3 en R3 para ambas familias de direcciones.

R// R2

El enrutamiento IPv6 está deshabilitado de manera predeterminada, para habilitar el enrutamiento IPv6, se utilizará el comando `ipv6 unicast-routing` en el modo de configuración global en ambos routers.

```
R2(config)# router ospf 1
```

```
R2(config-router)# router-id 2.2.2.2
```

```
R2(config-router)# exit
```

```
R2(config)#
```

```
R2(config)# ipv6 unicast-routing
```

```
R2(config)# router ospf 1
```

```
R2(config-router)# router-id 2.2.2.2
```

```
R2(config-router)# exit
```

```

router ospf 1
router-id 2.2.2.2
area 1 stub no-summary
redistribute eigrp 101 subnets
network 192.168.2.0 0.0.0.255 area 1
network 192.168.9.4 0.0.0.3 area 0
!
ipv6 router ospf 1
router-id 2.2.2.2
area 1 stub no-summary
redistribute eigrp 101

```

Figura 9. Configuración de OSPF en R2

R3

```

R3(config)# router ospf 1
R3(config-router)# router-id 3.3.3.3
R3(config-router)# exit
R3(config)#
R3(config)# ipv6 unicast-routing
R3(config)# router ospf 1
R3(config-router)# router-id 3.3.3.3
R3(config-router)# exit

```

```

router ospf 1
router-id 3.3.3.3
network 192.168.3.0 0.0.0.255 area 0
network 192.168.9.4 0.0.0.3 area 0
default-information originate
!
ip forward-protocol nd
!
!
no ip http server
no ip http secure-server
!
ipv6 router ospf 1
router-id 3.3.3.3
default-information originate

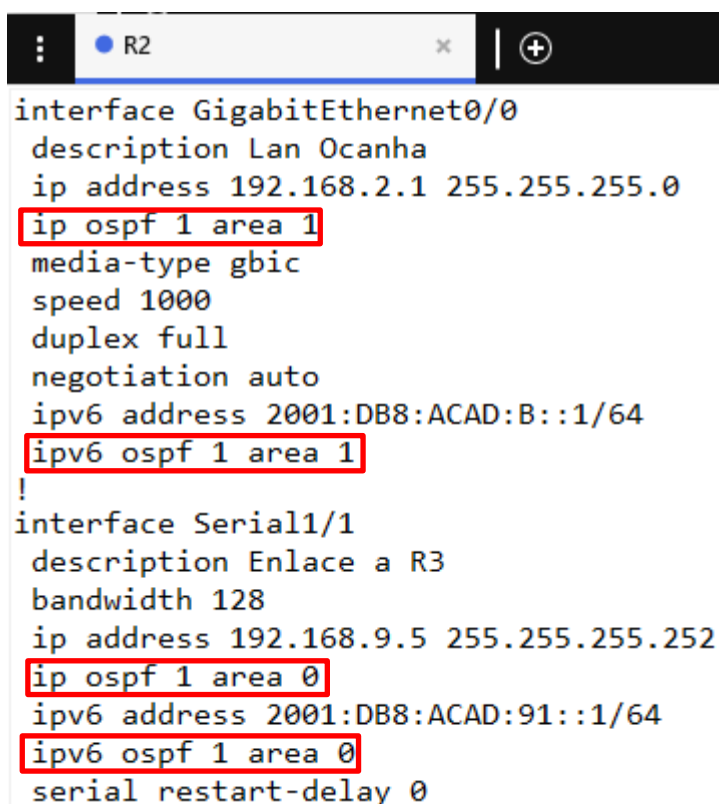
```

Figura 10. Configuración de OSPF en R3

4. En R2, configurar la interfaz F0/0 en el área 1 de OSPF y la conexión serial entre R2 y R3 en OSPF área 0.

R// Se configuran sobre las interfaces gigabitethernet 0/0 y serial 1/1

```
R2(config)# interface gigabitethernet 0/0
R2(config-if)# ip ospf 1 area 1
R2(config-if)# ipv6 ospf 1 area 1
R2(config-if)# exit
R2(config)#
R2(config)# interface serial 1/1
R2(config-if)# ip ospf 1 area 0
R2(config-if)# ipv6 ospf 1 area 0
R2(config-if)# exit
```



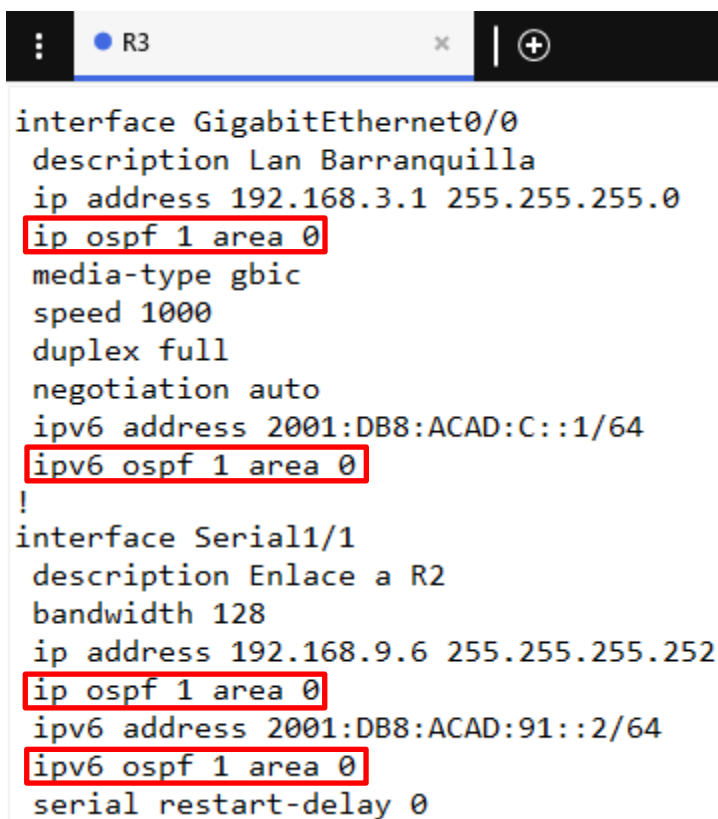
```
interface GigabitEthernet0/0
description Lan Ocanha
ip address 192.168.2.1 255.255.255.0
ip ospf 1 area 1
media-type gbic
speed 1000
duplex full
negotiation auto
ipv6 address 2001:DB8:ACAD:B::1/64
ipv6 ospf 1 area 1
!
interface Serial1/1
description Enlace a R3
bandwidth 128
ip address 192.168.9.5 255.255.255.252
ip ospf 1 area 0
ipv6 address 2001:DB8:ACAD:91::1/64
ipv6 ospf 1 area 0
serial restart-delay 0
```

Figura 11. Configuración de OSPF sobre interfaces de R2

5. En R3, configurar la interfaz F0/0 y la conexión serial entre R2 y R3 en OSPF área 0.

R// Se configuran sobre las interfaces gigabitethernet 0/0 y serial 1/1

```
R2(config)# interface gigabitethernet 0/0
R2(config-if)# ip ospf 1 area 0
R2(config-if)# ipv6 ospf 1 area 0
R2(config-if)# exit
R2(config)#
R2(config)# interface serial 1/1
R2(config-if)# ip ospf 1 area 0
R2(config-if)# ipv6 ospf 1 area 0
R2(config-if)# exit
```



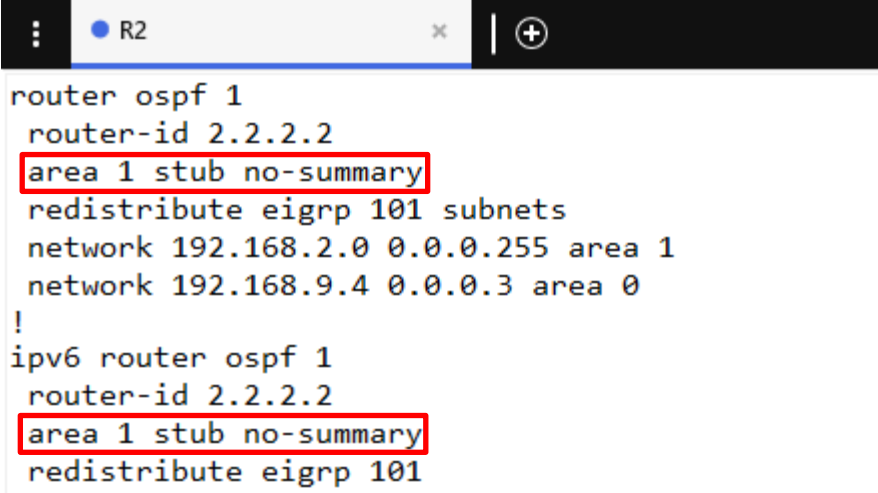
```
R3
interface GigabitEthernet0/0
  description Lan Barranquilla
  ip address 192.168.3.1 255.255.255.0
  ip ospf 1 area 0
  media-type gbic
  speed 1000
  duplex full
  negotiation auto
  ipv6 address 2001:DB8:ACAD:C::1/64
  ipv6 ospf 1 area 0
!
interface Serial1/1
  description Enlace a R2
  bandwidth 128
  ip address 192.168.9.6 255.255.255.252
  ip ospf 1 area 0
  ipv6 address 2001:DB8:ACAD:91::2/64
  ipv6 ospf 1 area 0
  serial restart-delay 0
```

Figura 12. Configuración de OSPF sobre interfaces de R3

6. Configurar el área 1 como un área totalmente Stubby.

R// R2

```
R2(config)# router ospf 1  
R2(config-router)# area 1 stub no-summary  
R2(config-router)# exit  
R2(config)#  
R2(config)# router ospf 1  
R2(config-router)# area 1 stub no-summary  
R2(config-router)# exit
```



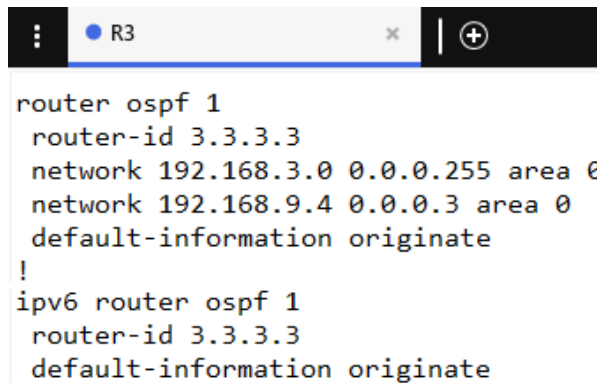
```
router ospf 1  
router-id 2.2.2.2  
area 1 stub no-summary  
redistribute eigrp 101 subnets  
network 192.168.2.0 0.0.0.255 area 1  
network 192.168.9.4 0.0.0.3 area 0  
!  
ipv6 router ospf 1  
router-id 2.2.2.2  
area 1 stub no-summary  
redistribute eigrp 101
```

Figura 13. Verificación del área 1 totalmente Stubby

7. Propagar rutas por defecto de IPv4 y IPv6 en R3 al interior del dominio OSPFv3. Nota: Es importante tener en cuenta que una ruta por defecto es diferente a la definición de rutas estáticas.

R//

```
R3(config)# ipv6 router ospf 1  
R3(config-rtr)# default-information originate  
R3(config-router)# exit  
R3(config)#  
R3(config)# ip router ospf 1  
R3(config-rtr)# default-information originate  
R3(config-router)# exit
```



```
router ospf 1
  router-id 3.3.3.3
  network 192.168.3.0 0.0.0.255 area 0
  network 192.168.9.4 0.0.0.3 area 0
  default-information originate
!
ipv6 router ospf 1
  router-id 3.3.3.3
  default-information originate
```

Figura 14. Verificación de propagación de rutas en R3

8. Realizar la configuración del protocolo EIGRP para IPv4 como IPv6. Configurar la interfaz F0/0 de R1 y la conexión entre R1 y R2 para EIGRP con el sistema autónomo 101. Asegúrese de que el resumen automático está desactivado.
9. Configurar las interfaces pasivas para EIGRP según sea apropiado.

8-9 R// R1

```
R1(config)# router eigrp 101
R1(config-router)# network 192.168.110.0
R1(config-router)# network 192.168.9.0 0.0.0.3
R1(config-router)# passive-interface gigabitethernet 0/0
R1(config-router)# exit
R1(config)#
R1(config)# ipv6 unicast-routing
R1(config)# ipv6 router eigrp 101
R1(config-rtr)# eigrp router-id 1.1.1.1
R1(config-rtr)# no shutdown
R1(config-rtr)# passive-interface gigabitethernet 0/0
R1(config-rtr)# exit
R1(config)#
R1(config)# interface serial 1/0
R1(config-if)# ipv6 eigrp 101
R1(config-if)# exit
R1(config)#
R1(config)# interface gigabitethernet 0/0
R1(config-if)# ipv6 eigrp 101
R1(config-if)# exit
```

```

R1
interface GigabitEthernet0/0
description Lan Cali
ip address 192.168.110.1 255.255.255.0
media-type gbic
speed 1000
duplex full
negotiation auto
ipv6 address 2001:DB8:ACAD:110::1/64
ipv6 eigrp 101
!
interface Serial1/0
description Enlace a R2
bandwidth 128
ip address 192.168.9.1 255.255.255.252
ipv6 address 2001:DB8:ACAD:90::1/64
ipv6 eigrp 101
serial restart-delay 0
clock rate 64000

```

Figura 15. Verificación de EIGRP sobre interfaces de R1

```

R1
router eigrp 101
network 192.168.9.0 0.0.0.3
network 192.168.110.0
passive-interface GigabitEthernet0/0
!
ipv6 router eigrp 101
passive-interface GigabitEthernet0/0
eigrp router-id 1.1.1.1

```

Figura 16. Verificación de configuración EIGRP en R1

R2

```
R2(config)# router eigrp 101
R2(config-router)# eigrp router-id 2.2.2.2
R2(config-router)# network 192.168.9.0 0.0.0.3
R2(config-router)# exit
R2(config)#
R2(config)# ipv6 router eigrp 101
R2(config-rtr)# eigrp router-id 2.2.2.2
R2(config-rtr)# no shutdown
R2(config-rtr)# exit
R2(config)#
R2(config)# interface serial 1/0
R2(config-if)# ipv6 eigrp 101
R2(config-if)# exit
R2(config)#
R2(config)# interface gigabitethernet 0/0
R2(config-if)# ipv6 eigrp 101
R2(config-if)# exit
```

```
R2#show ip eigrp neighbors
EIGRP-IPv4 Neighbors for AS(101)
H   Address                Interface                Hold Uptime    SRTT   RTO  Q  Seq
                               (sec)           (ms)          1170  0  24
0   192.168.9.1             Se1/0                   10 02:59:01   153
R2#
R2#show ipv6 eigrp neighbors
EIGRP-IPv6 Neighbors for AS(101)
H   Address                Interface                Hold Uptime    SRTT   RTO  Q  Seq
                               (sec)           (ms)          1182  0  4
0   Link-local address:    Se1/0                   10 00:44:49   100
    FE80::C801:4FF:FE5C:6
```

Figura 17. Visualización de vecinos EIGRP en IPv4 e IPv6 en R2


```

R2#show ip route eigrp
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
       + - replicated route, % - next hop override

```

Gateway of last resort is not set

```

D      192.168.110.0/24 [90/20512256] via 192.168.9.1, 02:35:18, Serial1/0

```

R2#

```

R2#show ipv6 route eigrp

```

IPv6 Routing Table - default - 9 entries

```

Codes: C - Connected, L - Local, S - Static, U - Per-user Static route

```

```

       B - BGP, R - RIP, H - NHRP, I1 - ISIS L1

```

```

       I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary, D - EIGRP

```

```

       EX - EIGRP external, ND - ND Default, NDp - ND Prefix, DCE - Destination

```

```

       NDr - Redirect, O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF ext 1

```

```

       OE2 - OSPF ext 2, ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2, l - LISP

```

```

D      2001:DB8:ACAD:110::/64 [90/20512256]

```

```

       via FE80::C801:4FF:FE5C:6, Serial1/0

```

Figura 18. Tabla de enrutamiento EIGRP en IPv4 e IPv6 en R2

10. En R2, configurar la redistribución mutua entre OSPF y EIGRP para IPv4 e IPv6. Asignar métricas apropiadas cuando sea necesario.

R//

```

R2(config)#router ospf 1

```

```

R2(config-router)#redistribute eigrp 101 subnets

```

```

R2(config-router)#exit

```

```

R2(config)#

```

```

R2(config)#ipv6 router ospf 1

```

```

R2(config-rtr)#redistribute eigrp 101

```

```

R2(config-rtr)#exit

```

```

R2(config)#

```

```

R2(config)#router eigrp 101

```

```

R2(config-router)#redistribute ospf 1 metric 10000 100 255 1 1500

```

```

R2(config-router)#exit

```

```

R2(config)#

```

```

R2(config)#ipv6 router eigrp 101

```

```

R2(config-rtr)#redistribute ospf 1 metric 10000 100 255 1 1500

```

```

R2(config-rtr)#exit

```

```
router eigrp 101
  distribute-list OSPF1-FILTER out ospf 1
  network 192.168.9.0 0.0.0.3
  redistribute ospf 1 metric 10000 100 255 1 1500
  eigrp router-id 2.2.2.2
!
router ospf 1
  router-id 2.2.2.2
  area 1 stub no-summary
  redistribute eigrp 101 subnets
  network 192.168.2.0 0.0.0.255 area 1
  network 192.168.9.4 0.0.0.3 area 0
!
ipv6 router eigrp 101
  eigrp router-id 2.2.2.2
  redistribute ospf 1 metric 10000 100 255 1 1500
!
ipv6 router ospf 1
  router-id 2.2.2.2
  area 1 stub no-summary
  redistribute eigrp 101
```

Figura 19. Validación de redistribución de rutas entre OSPF y EIGRP

11. En R2, de hacer publicidad de la ruta 192.168.3.0/24 a R1 mediante una lista de distribución y ACL.

R//

```
R2(config)# ip access-list standard OSPF1-FILTER
R2(config-std-nacl)# remark Used with DList to filter OSPF 1 routes
R2(config-std-nacl)# deny 192.168.3.0 0.0.0.255
R2(config-std-nacl)# permit any
R2(config-std-nacl)# exit
R2(config)#
R2(config)# router eigrp 101
R2(config-router)# distribute-list OSPF1-FILTER out ospf 1
R2(config-router)# exit
```

```
R2#show ip access-lists
Standard IP access list OSPF1-FILTER
 10 deny 192.168.3.0, wildcard bits 0.0.0.255 (3 matches)
 20 permit any (6 matches)
```

Figura 20. Comprobación de ACL creada en R2

Si ejecutamos el comando **show ip route 192.168.3.0** antes de ingresar la ACL desde R1 veremos lo siguiente:

```
R1#show ip route 192.168.3.0
Routing entry for 192.168.3.0/24
  Known via "eigrp 101", distance 170, metric 20537600, type external
  Redistributing via eigrp 101
  Last update from 192.168.9.2 on Serial1/0, 00:00:02 ago
  Routing Descriptor Blocks:
  * 192.168.9.2, from 192.168.9.2, 00:00:02 ago, via Serial1/0
    Route metric is 20537600, traffic share count is 1
    Total delay is 21000 microseconds, minimum bandwidth is 128 Kbit
    Reliability 255/255, minimum MTU 1500 bytes
    Loading 1/255, Hops 1
```

Figura 21. Tabla de enrutamiento hacia la red 192.168.3.0

Para comprobar el funcionamiento de la ACL creada veremos ahora el resultado del comando **show ip route 192.168.3.0** después de ingresar la ACL desde R1.

```
R1#show ip route 192.168.3.0
% Network not in table
R1#
```

Figura 22. Tabla de enrutamiento hacia la red 192.168.3.0 sin datos

1.2 Parte 2: Verificar conectividad de red y control de la trayectoria.

- a) Registrar las tablas de enrutamiento en cada uno de los routers, acorde con los parámetros de configuración establecidos en el escenario propuesto.

R// R1

```
R1#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
       + - replicated route, % - next hop override
```

```
Gateway of last resort is not set
```

```
D EX 192.168.2.0/24 [170/20537600] via 192.168.9.2, 00:40:07, Serial1/0
     192.168.9.0/24 is variably subnetted, 3 subnets, 2 masks
C     192.168.9.0/30 is directly connected, Serial1/0
L     192.168.9.1/32 is directly connected, Serial1/0
D EX 192.168.9.4/30 [170/20537600] via 192.168.9.2, 00:15:51, Serial1/0
     192.168.110.0/24 is variably subnetted, 2 subnets, 2 masks
C     192.168.110.0/24 is directly connected, GigabitEthernet0/0
L     192.168.110.1/32 is directly connected, GigabitEthernet0/0
```

Figura 23. Tabla de enrutamiento IPv4 de R1

```
R1#show ipv6 route
IPv6 Routing Table - default - 8 entries
Codes: C - Connected, L - Local, S - Static, U - Per-user Static route
       B - BGP, R - RIP, H - NHRP, I1 - ISIS L1
       I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary, D - EIGRP
       EX - EIGRP external, ND - ND Default, NDp - ND Prefix, DCE - Destination
       NDr - Redirect, O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF ext 1
       OE2 - OSPF ext 2, ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2, l - LISP
D 2001:DB8:ACAD:B::/64 [90/20512256]
  via FE80::C802:4FF:FE6B:6, Serial1/0
EX 2001:DB8:ACAD:C::/64 [170/20537600]
  via FE80::C802:4FF:FE6B:6, Serial1/0
C 2001:DB8:ACAD:90::/64 [0/0]
  via Serial1/0, directly connected
L 2001:DB8:ACAD:90::1/128 [0/0]
  via Serial1/0, receive
D 2001:DB8:ACAD:91::/64 [90/21024000]
  via FE80::C802:4FF:FE6B:6, Serial1/0
C 2001:DB8:ACAD:110::/64 [0/0]
  via GigabitEthernet0/0, directly connected
L 2001:DB8:ACAD:110::1/128 [0/0]
  via GigabitEthernet0/0, receive
L FF00::/8 [0/0]
  via Null0, receive
```

Figura 24. Tabla de enrutamiento IPv6 de R1

R2

```
R2#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
       + - replicated route, % - next hop override
```

```
Gateway of last resort is not set
```

```
          192.168.2.0/24 is variably subnetted, 2 subnets, 2 masks
C           192.168.2.0/24 is directly connected, GigabitEthernet0/0
L           192.168.2.1/32 is directly connected, GigabitEthernet0/0
O           192.168.3.0/24 [110/782] via 192.168.9.6, 00:05:04, Serial1/1
          192.168.9.0/24 is variably subnetted, 4 subnets, 2 masks
C           192.168.9.0/30 is directly connected, Serial1/0
L           192.168.9.2/32 is directly connected, Serial1/0
C           192.168.9.4/30 is directly connected, Serial1/1
L           192.168.9.5/32 is directly connected, Serial1/1
D           192.168.110.0/24 [90/20512256] via 192.168.9.1, 00:05:13, Serial1/0
```

Figura 25. Tabla de enrutamiento IPv4 de R2

```
R2#show ipv6 route
IPv6 Routing Table - default - 9 entries
Codes: C - Connected, L - Local, S - Static, U - Per-user Static route
       B - BGP, R - RIP, H - NHRP, I1 - ISIS L1
       I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary, D - EIGRP
       EX - EIGRP external, ND - ND Default, NDp - ND Prefix, DCE - Destination
       NDr - Redirect, O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF ext 1
       OE2 - OSPF ext 2, ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2, l - LISP
C 2001:DB8:ACAD:B::/64 [0/0]
   via GigabitEthernet0/0, directly connected
L 2001:DB8:ACAD:B::1/128 [0/0]
   via GigabitEthernet0/0, receive
O 2001:DB8:ACAD:C::/64 [110/782]
   via FE80::C803:5FF:FE4E:6, Serial1/1
C 2001:DB8:ACAD:90::/64 [0/0]
   via Serial1/0, directly connected
L 2001:DB8:ACAD:90::2/128 [0/0]
   via Serial1/0, receive
C 2001:DB8:ACAD:91::/64 [0/0]
   via Serial1/1, directly connected
L 2001:DB8:ACAD:91::1/128 [0/0]
   via Serial1/1, receive
D 2001:DB8:ACAD:110::/64 [90/20512256]
   via FE80::C801:4FF:FE5C:6, Serial1/0
L FF00::/8 [0/0]
   via Null0, receive
```

Figura 26. Tabla de enrutamiento IPv6 de R2

R3

```
R3#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
       + - replicated route, % - next hop override
```

Gateway of last resort is not set

```
O IA 192.168.2.0/24 [110/782] via 192.168.9.5, 00:07:37, Serial1/1
     192.168.3.0/24 is variably subnetted, 2 subnets, 2 masks
C     192.168.3.0/24 is directly connected, GigabitEthernet0/0
L     192.168.3.1/32 is directly connected, GigabitEthernet0/0
     192.168.9.0/24 is variably subnetted, 3 subnets, 2 masks
O E2 192.168.9.0/30 [110/20] via 192.168.9.5, 00:07:37, Serial1/1
C     192.168.9.4/30 is directly connected, Serial1/1
L     192.168.9.6/32 is directly connected, Serial1/1
O E2 192.168.110.0/24 [110/20] via 192.168.9.5, 00:07:40, Serial1/1
```

Figura 27. Tabla de enrutamiento IPv4 de R3

```
R3#show ipv6 route
IPv6 Routing Table - default - 7 entries
Codes: C - Connected, L - Local, S - Static, U - Per-user Static route
       B - BGP, R - RIP, H - NHRP, I1 - ISIS L1
       I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary, D - EIGRP
       EX - EIGRP external, ND - ND Default, NDp - ND Prefix, DCE - Destination
       NDR - Redirect, O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF ext 1
       OE2 - OSPF ext 2, ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2, l - LISP
OI 2001:DB8:ACAD:B::/64 [110/782]
   via FE80::C802:4FF:FE6B:6, Serial1/1
C 2001:DB8:ACAD:C::/64 [0/0]
   via GigabitEthernet0/0, directly connected
L 2001:DB8:ACAD:C::1/128 [0/0]
   via GigabitEthernet0/0, receive
C 2001:DB8:ACAD:91::/64 [0/0]
   via Serial1/1, directly connected
L 2001:DB8:ACAD:91::2/128 [0/0]
   via Serial1/1, receive
OE2 2001:DB8:ACAD:110::/64 [110/20]
   via FE80::C802:4FF:FE6B:6, Serial1/1
L FF00::/8 [0/0]
   via Null0, receive
```

Figura 28. Tabla de enrutamiento IPv6 de R3

b) Verificar comunicación entre routers mediante el comando ping y traceroute

R// R1 a R2

```
R1#ping 192.168.9.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.9.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 12/29/64 ms
R1#
R1#traceroute 192.168.9.2
Type escape sequence to abort.
Tracing the route to 192.168.9.2
VRF info: (vrf in name/id, vrf out name/id)
  1 192.168.9.2 8 msec 80 msec 48 msec
R1#
R1#ping 2001:db8:acad:90::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD:90::2, timeout is 2 seconds
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/28/72 ms
R1#
R1#traceroute 2001:db8:acad:90::2
Type escape sequence to abort.
Tracing the route to 2001:DB8:ACAD:90::2

  1 2001:DB8:ACAD:90::2 68 msec 12 msec 24 msec
R1#
R1#ping 192.168.2.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.2.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 16/35/92 ms
R1#
R1#traceroute 192.168.2.1
Type escape sequence to abort.
Tracing the route to 192.168.2.1
VRF info: (vrf in name/id, vrf out name/id)
  1 192.168.9.2 12 msec 52 msec 52 msec
R1#
R1#ping 2001:db8:acad:b::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD:B::1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/29/84 ms
R1#
R1#traceroute 2001:db8:acad:b::1
Type escape sequence to abort.
Tracing the route to 2001:DB8:ACAD:B::1

  1 2001:DB8:ACAD:90::2 12 msec 28 msec 28 msec
R1#ping 192.168.9.5
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.9.5, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 12/29/52 ms
R1#
R1#ping 2001:db8:acad:91::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD:91::1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 16/32/52 ms
```

Figura 29. Ping y tracerouter de R1 a R2

R1 a R3

No habrá ping hacia la red 192.168.3.1 debido a la ACL que aplicamos anteriormente.

```
R1#ping 192.168.9.6
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.9.6, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 64/120/172 ms
R1#
R1#traceroute 192.168.9.6
Type escape sequence to abort.
Tracing the route to 192.168.9.6
VRF info: (vrf in name/id, vrf out name/id)
  1 192.168.9.2 20 msec 32 msec 20 msec
  2 192.168.9.6 100 msec 64 msec 32 msec
R1#
R1#ping 192.168.3.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.3.1, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
```

Figura 30. Ping y tracerouter de R1 a R3

R2 a R1

```
R2#ping 192.168.9.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.9.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/44/80 ms
R2#
R2#traceroute 2001:db8:acad:90::1
Type escape sequence to abort.
Tracing the route to 2001:DB8:ACAD:90::1

  1 2001:DB8:ACAD:90::1 64 msec 44 msec 64 msec
R2#
R2#ping 192.168.110.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.110.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/41/56 ms
R2#
R2#traceroute 2001:db8:acad:110::1
Type escape sequence to abort.
Tracing the route to 2001:DB8:ACAD:110::1

  1 2001:DB8:ACAD:90::1 48 msec 28 msec 32 msec
```

Figura 31. Ping y tracerouter de R2 a R1

R2 a R3

```
R2#ping 192.168.9.6
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.9.6, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 12/40/96 ms
R2#
R2#traceroute 2001:db8:acad:91::2
Type escape sequence to abort.
Tracing the route to 2001:DB8:ACAD:91::2

  1 2001:DB8:ACAD:91::2 8 msec 4 msec 120 msec
R2#
R2#ping 192.168.3.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.3.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 12/29/60 ms
R2#
R2#ping 2001:db8:acad:c::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD:C::1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 12/38/116 ms
```

Figura 32. Ping y tracerouter de R2 a R3

R3 a R1

```
R3#ping 192.168.9.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.9.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 28/47/104 ms
R3#
R3#traceroute 192.168.9.1
Type escape sequence to abort.
Tracing the route to 192.168.9.1
VRF info: (vrf in name/id, vrf out name/id)
  1 192.168.9.5 116 msec 36 msec 12 msec
  2 192.168.9.1 24 msec 40 msec 36 msec
R3#
R3#ping 192.168.110.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.110.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 32/59/132 ms
R3#
R3#traceroute 192.168.110.1
Type escape sequence to abort.
Tracing the route to 192.168.110.1
VRF info: (vrf in name/id, vrf out name/id)
  1 192.168.9.5 8 msec 28 msec 52 msec
  2 192.168.9.1 68 msec 36 msec 32 msec
R3#
R3#ping 2001:db8:acad:110::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD:110::1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 24/48/132 ms
R3#
R3#traceroute 2001:db8:acad:110::1
Type escape sequence to abort.
Tracing the route to 2001:DB8:ACAD:110::1

  1 2001:DB8:ACAD:91::1 88 msec 16 msec 4 msec
  2 2001:DB8:ACAD:90::1 56 msec 64 msec 36 msec
```

Figura 33. Ping y tracerouter de R3 a R1

c) Verificar que las rutas filtradas no están presentes en las tablas de enrutamiento de los routers correctas.

R// Vemos la red 192.168.3.0 en la tabla de enrutamiento de R1 antes de aplicar la ACL del punto 11.

```
R1#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
       + - replicated route, % - next hop override
```

Gateway of last resort is not set

```
D EX 192.168.2.0/24 [170/20537600] via 192.168.9.2, 02:39:48, Serial1/0
D EX 192.168.3.0/24 [170/20537600] via 192.168.9.2, 00:00:08, Serial1/0
      192.168.9.0/24 is variably subnetted, 3 subnets, 2 masks
C      192.168.9.0/30 is directly connected, Serial1/0
L      192.168.9.1/32 is directly connected, Serial1/0
D EX 192.168.9.4/30 [170/20537600] via 192.168.9.2, 02:39:48, Serial1/0
      192.168.110.0/24 is variably subnetted, 2 subnets, 2 masks
C      192.168.110.0/24 is directly connected, GigabitEthernet0/0
L      192.168.110.1/32 is directly connected, GigabitEthernet0/0
```

Figura 34. Tabla de enrutamiento de R1 antes de aplicar ACL.

Ahora en la tabla de enrutamiento de R1 no vemos la red 192.168.3.0 después de aplicar al ACL.

```
R1#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
       + - replicated route, % - next hop override
```

Gateway of last resort is not set

```
D EX 192.168.2.0/24 [170/20537600] via 192.168.9.2, 00:40:07, Serial1/0
      192.168.9.0/24 is variably subnetted, 3 subnets, 2 masks
C      192.168.9.0/30 is directly connected, Serial1/0
L      192.168.9.1/32 is directly connected, Serial1/0
D EX 192.168.9.4/30 [170/20537600] via 192.168.9.2, 00:15:51, Serial1/0
      192.168.110.0/24 is variably subnetted, 2 subnets, 2 masks
C      192.168.110.0/24 is directly connected, GigabitEthernet0/0
L      192.168.110.1/32 is directly connected, GigabitEthernet0/0
```

Figura 35. Tabla de enrutamiento de R1 después de aplicar ACL.

2. Escenario 2

Una empresa de comunicaciones presenta una estructura Core acorde a la topología de red, en donde el estudiante será el administrador de la red, el cual deberá configurar e interconectar entre sí cada uno de los dispositivos que forman parte del escenario, acorde con los lineamientos establecidos para el direccionamiento IP, etherchannels, VLANs y demás aspectos que forman parte del escenario propuesto.

Topología de red

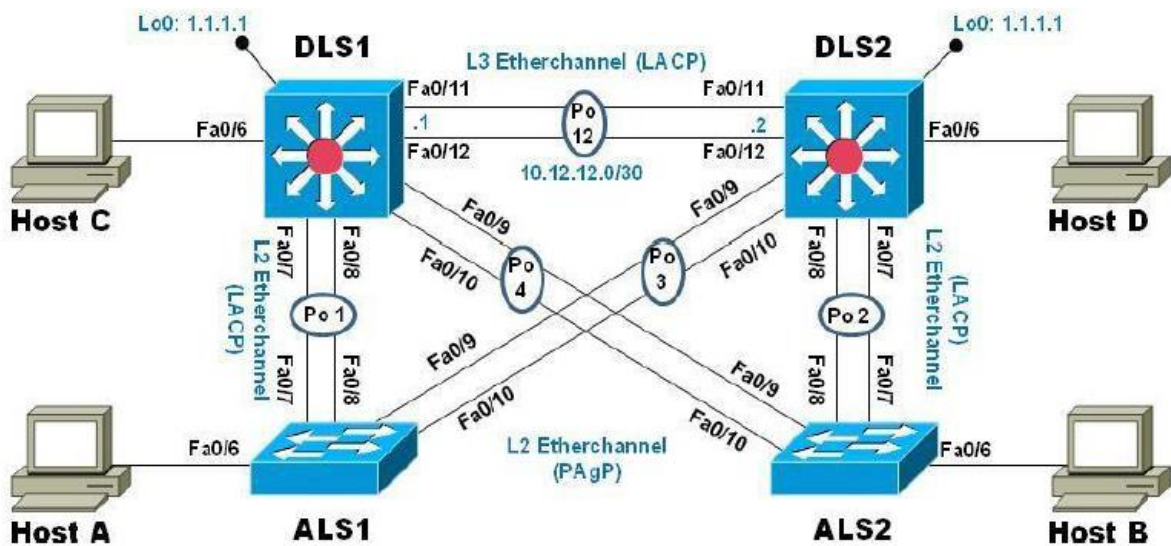


Figura 36. Topología de red escenario 2.

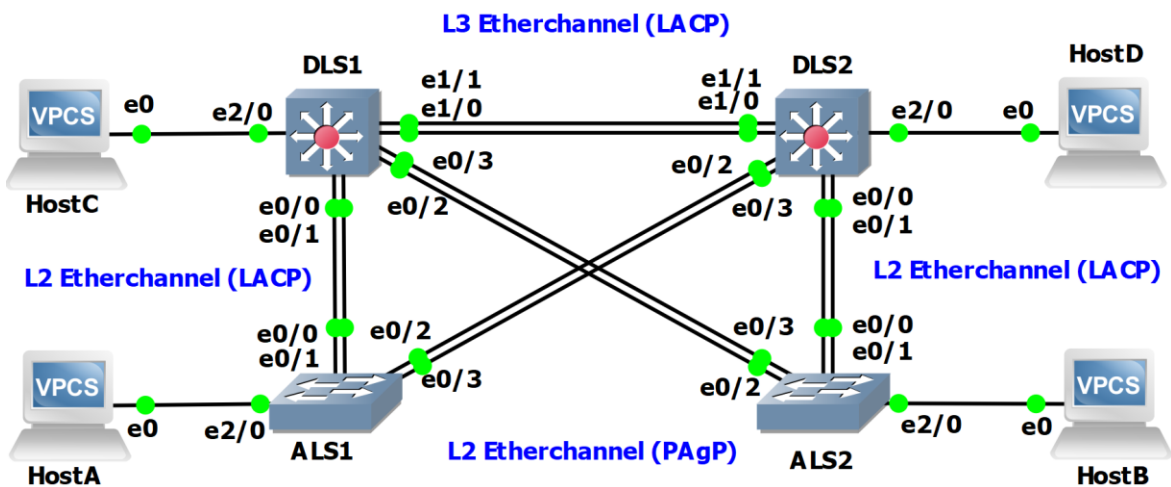


Figura 37. Topología de red escenario 2, diseño propio.

2.1 Parte 1: Configurar la red de acuerdo con las especificaciones.

- a) Apagar todas las interfaces en cada switch.
- b) Asignar un nombre a cada switch acorde al escenario establecido.

R// DLS1

```
IOU1# conf t
IOU1# hostname DLS1
DLS1(config)# interface range Ethernet 0/0-3, ethernet 1/0-3
DLS1(config-if-range)# shutdown
DLS1(config)# exit
DLS1(config)# interface range ethernet 2/0-3, ethernet 3/0-3
DLS1(config-if-range)# shutdown
DLS1(config)# exit
```

```
DLS1#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              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
```

Figura 38. Interfaces apagadas en DLS1.

DLS2

```
IOU2# conf t
IOU2# hostname DLS2
DLS2(config)# interface range ethernet 0/0-3, ethernet 1/0-3
DLS2(config-if-range)# shutdown
DLS2(config)# exit
DLS2(config)# interface range ethernet 2/0-3, ethernet 3/0-3
DLS2(config-if-range)# shutdown
DLS2(config)# exit
```

```

DLS2#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        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

```

Figura 39. Interfaces apagadas en DLS2.

ALS1

```

IOU3# conf t
IOU3# hostname ALS1
ALS1(config)# interface range ethernet 0/0-3, ethernet 1/0-3
ALS1(config-if-range)# shutdown
ALS1(config)# exit
ALS1(config)# interface range ethernet 2/0-3, ethernet 3/0-3
ALS1(config-if-range)# shutdown
ALS1(config)# exit

```

```

ALS1#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        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

```

Figura 40. Interfaces apagadas en ALS1.

ALS2

```
IOU4# conf t
IOU4# hostname ALS2
ALS2(config)# interface range ethernet 0/0-3, ethernet 1/0-3
ALS2(config-if-range)# shutdown
ALS2(config)# exit
ALS2(config)# interface range ethernet 2/0-3, ethernet 3/0-3
ALS2(config-if-range)# shutdown
ALS2(config)# exit
```

```
ALS2#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              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
```

Figura 41. Interfaces apagadas en ALS2.

- c) Configurar los puertos troncales y Port-channels tal como se muestra en el diagrama.
1. La conexión entre DLS1 y DLS2 será un EtherChannel capa-3 utilizando LACP. Para DLS1 se utilizará la dirección IP 10.12.12.1/30 y para DLS2 utilizará 10.12.12.2/30.

R// DLS1

```
DLS1(config)# default interface range ethernet 1/0-1
DLS1(config)# interface port-channel 12
DLS1(config-if)# no switchport
DLS1(config-if)# ip address 10.12.12.1 255.255.255.252
DLS1(config-if-range)# exit
DLS1(config)# interface range ethernet 1/0-1
DLS1(config-if-range)# no switchport
DLS1(config-if-range)# channel-group 12 mode active
DLS1(config-if-range)# no shutdown
DLS1(config-if-range)# exit
```

```

DLS1#show etherchannel summary
Flags: D - down          P - bundled in port-channel
       I - stand-alone  s - suspended
       H - Hot-standby (LACP only)
       R - Layer3       S - Layer2
       U - in use       N - not in use, no aggregation
       f - failed to allocate aggregator

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

       A - formed by Auto LAG

Number of channel-groups in use: 1
Number of aggregators:          1

Group Port-channel Protocol Ports
-----
12    Po12(RU)       LACP    Et1/0(P) Et1/1(P)

```

Figura 42. Etherchannel LACP capa 3 en DLS1.

DLS2

```

DLS2(config)# default interface range ethernet 1/0-1
DLS2(config)# interface port-channel 12
DLS2(config-if)# no switchport
DLS2(config-if)# ip address 10.12.12.2 255.255.255.252
DLS2(config-if-range)# exit
DLS2(config)# interface range ethernet 1/0-1
DLS2(config-if-range)# no switchport
DLS2(config-if-range)# channel-group 12 mode active
DLS2(config-if-range)# no shutdown
DLS2(config-if-range)# exit

```

```

DLS2#show etherchannel summary
Flags: D - down          P - bundled in port-channel
       I - stand-alone  s - suspended
       H - Hot-standby (LACP only)
       R - Layer3       S - Layer2
       U - in use       N - not in use, no aggregation
       f - failed to allocate aggregator

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

       A - formed by Auto LAG

Number of channel-groups in use: 1
Number of aggregators:          1

Group Port-channel Protocol Ports
-----
12    Po12(RU)       LACP    Et1/0(P) Et1/1(P)

```

Figura 43. Etherchannel LACP capa 3 en DLS2.

2. Los Port-channels en las interfaces Fa0/7 y Fa0/8 utilizarán LACP.

R// DLS1

```
DLS1(config)# interface range ethernet 0/0-1
DLS1(config-if-range)# switchport trunk encapsulation dot1q
DLS1(config-if-range)# switchport mode trunk
DLS1(config-if-range)# switchport nonegotiate
DLS1(config-if-range)# channel-group 1 mode active
DLS1(config-if-range)# no shutdown
DLS1(config-if-range)# exit
```

```
DLS1#show interfaces trunk
```

Port	Mode	Encapsulation	Status	Native vlan
Po1	on	802.1q	trunking	1

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

```
Port          Vlans allowed and active in management domain
Po1           1
```

```
Port          Vlans in spanning tree forwarding state and not pruned
Po1           1
```

Figura 44. Enlace troncal Etherchannel 1 en DLS1.

```
DLS1#show etherchannel summary
```

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

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

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

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

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

Group	Port-channel	Protocol	Ports
1	Po1(SU)	LACP	Et0/0(P) Et0/1(P)
12	Po12(RU)	LACP	Et1/0(P) Et1/1(P)

Figura 45. Etherchannel Capa 2 Po1 en DLS1.

ALS1

```
ALS1(config)# interface range ethernet 0/0-1
ALS1(config-if-range)# switchport trunk encapsulation dot1q
ALS1(config-if-range)# switchport mode trunk
ALS1(config-if-range)# switchport nonegotiate
ALS1(config-if-range)# channel-group 1 mode active
ALS1(config-if-range)# no shutdown
ALS1(config-if-range)# exit
```

```
ALS1#show interfaces trunk
```

Port	Mode	Encapsulation	Status	Native vlan
Po1	on	802.1q	trunking	1

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

```
Port          Vlans allowed and active in management domain
Po1           1
```

```
Port          Vlans in spanning tree forwarding state and not pruned
Po1           1
```

Figura 46. Enlace troncal Etherchannel Po1 en ALS1.

```
ALS1#show etherchannel summary
```

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

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

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

```
Number of channel-groups in use: 1
Number of aggregators:          1
```

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

Group	Port-channel	Protocol	Ports
1	Po1(SU)	LACP	Et0/0(P) Et0/1(P)

Figura 47. Etherchannel Capa 2 Po1 en ALS1.

DLS2

```
DLS2(config)# interface range ethernet 0/0-1
DLS2(config-if-range)# switchport trunk encapsulation dot1q
DLS2(config-if-range)# switchport mode trunk
DLS2(config-if-range)# switchport nonegotiate
DLS2(config-if-range)# channel-group 2 mode active
DLS2(config-if-range)# no shutdown
DLS2(config-if-range)# exit
```

```
DLS2#show interfaces trunk
```

Port	Mode	Encapsulation	Status	Native vlan
Po2	on	802.1q	trunking	1

Port	Vlans allowed on trunk
Po2	1-4094

Port	Vlans allowed and active in management domain
Po2	1

Port	Vlans in spanning tree forwarding state and not pruned
Po2	1

Figura 48. Enlace troncal Etherchannel Po2 en DLS2.

```
DLS2#show etherchannel summary
```

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

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

       A - formed by Auto LAG
```

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

Group	Port-channel	Protocol	Ports
2	Po2(SU)	LACP	Et0/0(P) Et0/1(P)
12	Po12(RU)	LACP	Et1/0(P) Et1/1(P)

Figura 49. Etherchannel Capa 2 Po2 en DLS2.

3. Los Port-channels en las interfaces F0/9 y fa0/10 utilizará PAgP.

R// DLS1

```
DLS1(config)# interface range ethernet 0/2-3
DLS1(config-if-range)# switchport trunk encapsulation dot1q
DLS1(config-if-range)# switchport mode trunk
DLS1(config-if-range)# switchport nonegotiate
DLS1(config-if-range)# channel-group 4 mode desirable
DLS1(config-if-range)# no shutdown
DLS1(config-if-range)# exit
```

```
DLS1#show interfaces trunk
```

Port	Mode	Encapsulation	Status	Native vlan
Po1	on	802.1q	trunking	1
Po4	on	802.1q	trunking	1

```
Port      Vlans allowed on trunk
```

```
Po1      1-4094
Po4      1-4094
```

```
Port      Vlans allowed and active in management domain
```

```
Po1      1
Po4      1
```

```
Port      Vlans in spanning tree forwarding state and not pruned
```

```
Po1      1
Po4      none
```

Figura 52. Enlace troncal Etherchannel Po4 en DLS1.

```
DLS1#show etherchannel summary
```

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

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

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

```
u - unsuitable for bundling
```

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

```
d - default port
```

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

```
Number of channel-groups in use: 3
```

```
Number of aggregators: 3
```

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

Group	Port-channel	Protocol	Ports
1	Po1(SU)	LACP	Et0/0(P) Et0/1(P)
4	Po4(SU)	PAgP	Et0/2(P) Et0/3(P)
12	Po12(RU)	LACP	Et1/0(P) Et1/1(P)

Figura 53. Etherchannel Capa 2 Po4 en DLS1.

DLS2

```
DLS2(config)# interface range ethernet 0/2-3
DLS2(config-if-range)# switchport trunk encapsulation dot1q
DLS2(config-if-range)# switchport mode trunk
DLS2(config-if-range)# switchport nonegotiate
DLS2(config-if-range)# channel-group 3 mode desirable
DLS2(config-if-range)# no shutdown
DLS2(config-if-range)# exit
```

```
DLS2#show interfaces trunk
```

Port	Mode	Encapsulation	Status	Native vlan
Po2	on	802.1q	trunking	1
Po3	on	802.1q	trunking	1

Port	Vlans allowed on trunk
Po2	1-4094
Po3	1-4094

Port	Vlans allowed and active in management domain
Po2	1
Po3	1

Port	Vlans in spanning tree forwarding state and not pruned
Po2	none
Po3	1

Figura 56. Enlace troncal Etherchannel Po3 en DLS2.

```
DLS2#show etherchannel summary
```

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

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

       A - formed by Auto LAG
```

```
Number of channel-groups in use: 3
Number of aggregators:          3
```

Group	Port-channel	Protocol	Ports
2	Po2(SU)	LACP	Et0/0(P) Et0/1(P)
3	Po3(SU)	PAgP	Et0/2(P) Et0/3(P)
12	Po12(RU)	LACP	Et1/0(P) Et1/1(P)

Figura 57. Etherchannel Capa 2 Po3 en DLS2.

ALS1

```
ALS1(config)# interface range ethernet 0/2-3
ALS1(config-if-range)# switchport trunk encapsulation dot1q
ALS1(config-if-range)# switchport mode trunk
ALS1(config-if-range)# switchport nonegotiate
ALS1(config-if-range)# channel-group 3 mode desirable
ALS1(config-if-range)# no shutdown
ALS1(config-if-range)# exit
```

```
ALS1#show interfaces trunk

Port      Mode      Encapsulation  Status      Native vlan
-----
Po1       on        802.1q         trunking    1
Po3       on        802.1q         trunking    1

Port      Vlans allowed on trunk
-----
Po1       1-4094
Po3       1-4094

Port      Vlans allowed and active in management domain
-----
Po1       1
Po3       1

Port      Vlans in spanning tree forwarding state and not pruned
-----
Po1       1
Po3       none
```

Figura 58. Enlace troncal Etherchannel Po3 en ALS1.

```
ALS1#show etherchannel summary
Flags: D - down          P - bundled in port-channel
       I - stand-alone  s - suspended
       H - Hot-standby (LACP only)
       R - Layer3       S - Layer2
       U - in use       N - not in use, no aggregation
       f - failed to allocate aggregator

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

       A - formed by Auto LAG

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

Group  Port-channel  Protocol    Ports
-----+-----+-----+-----
1      Po1(SU)       LACP        Et0/0(P)  Et0/1(P)
3      Po3(SU)       PAgP        Et0/2(P)  Et0/3(P)
```

Figura 59. Etherchannel Capa 2 Po3 en DLS2.

4. Todos los puertos troncales serán asignados a la VLAN 800 como la VLAN nativa.

R// DLS1

Se hará la configuración de la vlan 800 en los puertos troncales Ethernet 0/0-3 que van hacia ALS1 y ALS2 mas no a los puertos Ethernet 1/0-1 que van a DLS2 porque estos fueron seteados como puertos de capa 3 previamente y no es posible setearle Vlan's.

```
DLS1(config)# vlan 800
DLS1(config-if)# name Nativa
DLS1(config-if)# exit
DLS1(config)# int ran e0/0-3
DLS1(config-if-range)# switchport trunk native vlan 800
DLS1(config-if-range)# exit
DLS1(config)# int port-channel 1
DLS1(config-if)# switchport trunk native vlan 800
DLS1(config-if)# exit
DLS1(config)# int port-channel 4
DLS1(config-if)# switchport trunk native vlan 800
DLS1(config-if)# exit
```

```
interface Port-channel1
  switchport trunk encapsulation dot1q
  switchport trunk native vlan 800
  switchport mode trunk
  switchport nonegotiate
!
interface Port-channel4
  switchport trunk encapsulation dot1q
  switchport trunk native vlan 800
  switchport mode trunk
  switchport nonegotiate
!
interface Port-channel12
  no switchport
  ip address 10.12.12.1 255.255.255.252
!
interface Ethernet0/0
  switchport trunk encapsulation dot1q
  switchport trunk native vlan 800
  switchport mode trunk
  switchport nonegotiate
  channel-group 1 mode active
!
interface Ethernet0/1
  switchport trunk encapsulation dot1q
  switchport trunk native vlan 800
  switchport mode trunk
  switchport nonegotiate
  channel-group 1 mode active
!
interface Ethernet0/2
  switchport trunk encapsulation dot1q
  switchport trunk native vlan 800
  switchport mode trunk
  switchport nonegotiate
  channel-group 4 mode desirable
!
interface Ethernet0/3
  switchport trunk encapsulation dot1q
  switchport trunk native vlan 800
  switchport mode trunk
  switchport nonegotiate
  channel-group 4 mode desirable
```

Figura 60. VLAN 800 setead a puertos troncales en DLS1.

DLS2

Se hará la configuración de la vlan 800 en los puertos troncales Ethernet 0/0-3 que van hacia ALS1 y ALS2 mas no a los puertos Ethernet 1/0-1 que van a DLS1 porque estos fueron seteados como puertos de capa 3 previamente y no es posible setearle vlan's.

```
DLS2(config)# vlan 800
DLS2(config-if)# name Nativa
DLS2(config-if)# exit
DLS2(config)# int ran e0/0-3
DLS2(config-if-range)# switchport trunk native vlan 800
DLS2(config-if-range)# exit
DLS2(config)# int port-channel 2
DLS2(config-if)# switchport trunk native vlan 800
DLS2(config-if)# exit
DLS2(config)# int port-channel 3
DLS2(config-if)# switchport trunk native vlan 800
DLS2(config-if)# exit
```

```
interface Port-channel2
  switchport trunk encapsulation dot1q
  switchport trunk native vlan 800
  switchport mode trunk
  switchport nonegotiate
!
interface Port-channel3
  switchport trunk encapsulation dot1q
  switchport trunk native vlan 800
  switchport mode trunk
  switchport nonegotiate
!
interface Port-channel12
  no switchport
  ip address 10.12.12.2 255.255.255.252
!
interface Ethernet0/0
  switchport trunk encapsulation dot1q
  switchport trunk native vlan 800
  switchport mode trunk
  switchport nonegotiate
  channel-group 2 mode active
!
interface Ethernet0/1
  switchport trunk encapsulation dot1q
  switchport trunk native vlan 800
  switchport mode trunk
  switchport nonegotiate
  channel-group 2 mode active
!
interface Ethernet0/2
  switchport trunk encapsulation dot1q
  switchport trunk native vlan 800
  switchport mode trunk
  switchport nonegotiate
  channel-group 3 mode desirable
!
interface Ethernet0/3
  switchport trunk encapsulation dot1q
  switchport trunk native vlan 800
  switchport mode trunk
  switchport nonegotiate
  channel-group 3 mode desirable
```

Figura 61. VLAN 800 setead a puertos troncales en DLS2.

ALS1

```
ALS1(config)# vlan 800
ALS1(config-if)# name Nativa
ALS1(config-if)# exit
ALS1(config)# int ran e0/0-3
ALS1(config-if-range)# switchport trunk native vlan 800
ALS1(config-if-range)# exit
ALS1(config)# int port-channel 1
ALS1(config-if)# switchport trunk native vlan 800
ALS1(config-if)# exit
ALS1(config)# int port-channel 3
ALS1(config-if)# switchport trunk native vlan 800
ALS1(config-if)# exit
```

```
interface Port-channel1
 switchport trunk encapsulation dot1q
 switchport trunk native vlan 800
 switchport mode trunk
 switchport nonegotiate
!
interface Port-channel3
 switchport trunk encapsulation dot1q
 switchport trunk native vlan 800
 switchport mode trunk
 switchport nonegotiate
!
interface Ethernet0/0
 switchport trunk encapsulation dot1q
 switchport trunk native vlan 800
 switchport mode trunk
 switchport nonegotiate
 channel-group 1 mode active
!
interface Ethernet0/1
 switchport trunk encapsulation dot1q
 switchport trunk native vlan 800
 switchport mode trunk
 switchport nonegotiate
 channel-group 1 mode active
!
interface Ethernet0/2
 switchport trunk encapsulation dot1q
 switchport trunk native vlan 800
 switchport mode trunk
 switchport nonegotiate
 channel-group 3 mode desirable
!
interface Ethernet0/3
 switchport trunk encapsulation dot1q
 switchport trunk native vlan 800
 switchport mode trunk
 switchport nonegotiate
 channel-group 3 mode desirable
```

Figura 62. VLAN 800 seteada a puertos troncales en ALS1.

ALS2

```
ALS2(config)# vlan 800
ALS2(config-if)# name Nativa
ALS2(config-if)# exit
ALS2(config)# int ran e0/0-3
ALS2(config-if-range)# switchport trunk native vlan 800
ALS2(config-if-range)# exit
ALS2(config)# int port-channel 2
ALS2(config-if)# switchport trunk native vlan 800
ALS2(config-if)# exit
ALS2(config)# int port-channel 4
ALS2(config-if)# switchport trunk native vlan 800
ALS2(config-if)# exit
```

```
interface Port-channel2
  switchport trunk encapsulation dot1q
  switchport trunk native vlan 800
  switchport mode trunk
  switchport nonegotiate
!
interface Port-channel4
  switchport trunk encapsulation dot1q
  switchport trunk native vlan 800
  switchport mode trunk
  switchport nonegotiate
!
interface Ethernet0/0
  switchport trunk encapsulation dot1q
  switchport trunk native vlan 800
  switchport mode trunk
  switchport nonegotiate
  channel-group 2 mode active
!
interface Ethernet0/1
  switchport trunk encapsulation dot1q
  switchport trunk native vlan 800
  switchport mode trunk
  switchport nonegotiate
  channel-group 2 mode active
!
interface Ethernet0/2
  switchport trunk encapsulation dot1q
  switchport trunk native vlan 800
  switchport mode trunk
  switchport nonegotiate
  channel-group 4 mode desirable
!
interface Ethernet0/3
  switchport trunk encapsulation dot1q
  switchport trunk native vlan 800
  switchport mode trunk
  switchport nonegotiate
  channel-group 4 mode desirable
```

Figura 63. VLAN 800 seteada a puertos troncales en ALS2.

- d) Configurar DLS1, ALS1, y ALS2 para utilizar VTP versión 3
1. Utilizar el nombre de dominio UNAD con la contraseña cisco123
 2. Configurar DLS1 como servidor principal para las VLAN.
 3. Configurar ALS1 y ALS2 como clientes VTP.

R// DLS1

```
DLS1# vtp primary vlan
DLS1(config)# conf t
DLS1(config)# vtp domain UNAD
DLS1(config)# vtp version 3
DLS1(config)# vtp mode server
DLS1(config)# vtp password cisco123
```

```
DLS1#show vtp status
VTP Version capable          : 1 to 3
VTP version running         : 3
VTP Domain Name              : UNAD
VTP Pruning Mode             : Disabled
VTP Traps Generation        : Disabled
Device ID                    : aabb.cc80.0100
```

Feature VLAN:

```
-----
VTP Operating Mode           : Primary Server
Number of existing VLANs     : 6
Number of existing extended VLANs : 0
Maximum VLANs supported locally : 4096
Configuration Revision       : 1
Primary ID                   : aabb.cc80.0100
Primary Description          : DLS1
MD5 digest                   : 0x85 0x41 0x77 0x34 0x81 0x17 0x5C 0xD0
                             0xD5 0xC4 0xA9 0x3C 0xF6 0x47 0x01 0x74
```

Feature MST:

```
-----
VTP Operating Mode           : Transparent
```

Feature UNKNOWN:

```
-----
VTP Operating Mode           : Transparent
```

Figura 64. Estado de la configuración de VTP en DLS1.

ALS1

```
ALS1(config)# vtp domain UNAD
ALS1(config)# vtp version 3
ALS1(config)# vtp mode client
ALS1(config)# vtp password cisco123
```

```
ALS1#show vtp status
VTP Version capable           : 1 to 3
VTP version running          : 3
VTP Domain Name               : UNAD
VTP Pruning Mode              : Disabled
VTP Traps Generation          : Disabled
Device ID                     : aabb.cc80.0300
```

Feature VLAN:

```
VTP Operating Mode            : Client
Number of existing VLANs      : 6
Number of existing extended VLANs : 0
Maximum VLANs supported locally : 4096
Configuration Revision        : 0
Primary ID                    : 0000.0000.0000
Primary Description           :
MD5 digest                    :
```

Feature MST:

```
VTP Operating Mode            : Transparent
```

Feature UNKNOWN:

```
VTP Operating Mode            : Transparent
```

Figura 65. Estado de la configuración de VTP en ALS1.

ALS2

```
ALS2(config)# vtp domain UNAD
ALS2(config)# vtp version 3
ALS2(config)# vtp mode client
ALS2(config)# vtp password cisco123
```

```
ALS2#show vtp status
VTP Version capable           : 1 to 3
VTP version running          : 3
VTP Domain Name               : UNAD
VTP Pruning Mode              : Disabled
VTP Traps Generation          : Disabled
Device ID                     : aabb.cc80.0400
```

Feature VLAN:

```
VTP Operating Mode            : Client
Number of existing VLANs      : 6
Number of existing extended VLANs : 0
Maximum VLANs supported locally : 4096
Configuration Revision        : 0
Primary ID                    : 0000.0000.0000
Primary Description           :
MD5 digest                    :
```

Feature MST:

```
VTP Operating Mode            : Transparent
```

Feature UNKNOWN:

```
VTP Operating Mode            : Transparent
```

Figura 66. Estado de la configuración de VTP en ALS2.

e) Configurar en el servidor principal las siguientes VLAN:

Número de VLAN	Nombre de VLAN	Número de VLAN	Nombre de VLAN
800	NATIVA	434	ESTACIONAMIENTO
12	EJECUTIVOS	123	MANTENIMIENTO
234	HUESPEDES	1010	VOZ
1111	VIDEONET	3456	ADMINISTRACIÓN

Tabla 1.VLAN's

R// DLS1

```
DLS1(config)# vlan 12
DLS1(config-vlan)# name Ejecutivos
DLS1(config)# exit
DLS1(config)# vlan 234
DLS1(config-vlan)# name Huespedes
DLS1(config)# exit
DLS1(config)# vlan 1111
DLS1(config-vlan)# name Videonet
DLS1(config)# exit
DLS1(config)# vlan 434
DLS1(config-vlan)# name Estacionamiento
DLS1(config)# exit
DLS1(config)# vlan 123
DLS1(config-vlan)# name Mantenimiento
DLS1(config)# exit
DLS1(config)# vlan 1010
DLS1(config-vlan)# name Voz
DLS1(config)# exit
DLS1(config)# vlan 3456
DLS1(config-vlan)# name Administracion
DLS1(config)# exit
```

```
DLS1#show vlan
```

VLAN	Name	Status	Ports
1	default	active	Et1/2, Et1/3, Et2/0, Et2/1 Et2/2, Et2/3, Et3/0, Et3/1 Et3/2, Et3/3
12	Ejecutivos	active	
123	Mantenimiento	active	
234	Huespedes	active	
434	Estacionamiento	active	
800	Nativa	active	
1002	fddi-default	act/unsup	
1003	trcrf-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trbrf-default	act/unsup	
1010	Voz	active	
1111	Videonet	active	
3456	administracion	active	

Figura 67. Creación de VLAN's en DLS1.

f) En DLS1, suspender la VLAN 434.

R// DLS1

```
DLS1(config)# vlan 434  
DLS1(config-vlan)# state suspend
```

```
DLS1#show vlan
```

VLAN	Name	Status	Ports
1	default	active	Et1/2, Et1/3, Et2/0, Et2/1 Et2/2, Et2/3, Et3/0, Et3/1 Et3/2, Et3/3
12	Ejecutivos	active	
123	Mantenimiento	active	
234	Huespedes	active	
434	Estacionamiento	suspended	
800	Nativa	active	
1002	fddi-default	act/unsup	
1003	trcrf-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trbrf-default	act/unsup	
1010	Voz	active	
1111	Videonet	active	
3456	administracion	active	

Figura 68. VLAN 434 suspendida en DLS1.

g) Configurar DLS2 en modo VTP transparente VTP utilizando VTP versión 2, y configurar en DLS2 las mismas VLAN que en DLS1.

R// DLS2

```
DLS2(config)# vtp domain UNAD
DLS2(config)# vtp version 2
DLS2(config)# vtp mode transparent
DLS2(config)# vlan 12
DLS2(config-vlan)# name Ejecutivos
DLS2(config)# exit
DLS2(config)# vlan 234
DLS2(config-vlan)# name Huespedes
DLS2(config)# exit
DLS2(config)# vlan 1111
DLS2(config-vlan)# name Videonet
DLS2(config)# exit
DLS2(config)# vlan 434
DLS2(config-vlan)# name Estacionamiento
DLS2(config)# exit
DLS2(config)# vlan 123
DLS2(config-vlan)# name Mantenimiento
DLS2(config)# exit
DLS2(config)# vlan 1010
DLS2(config-vlan)# name Voz
DLS2(config)# exit
DLS2(config)# vlan 3456
DLS2(config-vlan)# name Administracion
DLS2(config)# exit
```

```

DLS2#show vtp status
VTP Version capable      : 1 to 3
VTP version running     : 2
VTP Domain Name         : UNAD
VTP Pruning Mode        : Disabled
VTP Traps Generation    : Disabled
Device ID               : aabb.cc80.0200
Configuration last modified by 10.12.12.2 at 6-26-20 19:11:17

```

```

Feature VLAN:
-----
VTP Operating Mode      : Transparent
Maximum VLANs supported locally : 1005
Number of existing VLANs : 6
Configuration Revision  : 0
MD5 digest              : 0x95 0x53 0xA6 0x5A 0xE6 0x6B 0x2D 0x99
                        0xE9 0x7C 0x3A 0x5D 0xDD 0x5B 0xA1 0x3B

```

Figura 69. Estado de la configuración de VTP en DLS2.

```
DLS2#show vlan
```

VLAN Name	Status	Ports
1 default	active	Et1/2, Et1/3, Et2/0, Et2/1 Et2/2, Et2/3, Et3/0, Et3/1 Et3/2, Et3/3
12 Ejecutivos	active	
123 Mantenimiento	active	
234 Huespedes	active	
434 Estacionamiento	active	
800 Nativa	active	
1002 fddi-default	act/unsup	
1003 trcrf-default	act/unsup	
1004 fddinet-default	act/unsup	
1005 trbrf-default	act/unsup	
1010 Voz	active	
1111 Videonet	active	
3456 Administracion	active	

Figura 70. Creación de VLAN's en DLS2.

h) Suspende VLAN 434 en DLS2.

R// DLS2

```
DLS2(config)# vlan 434  
DLS2(config-vlan)# state suspend
```

```
DLS2#show vlan
```

VLAN	Name	Status	Ports
1	default	active	Et1/2, Et1/3, Et2/0, Et2/1 Et2/2, Et2/3, Et3/0, Et3/1 Et3/2, Et3/3
12	Ejecutivos	active	
123	Mantenimiento	active	
234	Huespedes	active	
434	Estacionamiento	suspended	
800	Nativa	active	
1002	fddi-default	act/unsup	
1003	trcrf-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trbrf-default	act/unsup	
1010	Voz	active	
1111	Videonet	active	
3456	Administracion	active	

Figura 71. VLAN 434 suspendida en DLS2.

i) En DLS2, crear VLAN 567 con el nombre de CONTABILIDAD. La VLAN de CONTABILIDAD no podrá estar disponible en cualquier otro Switch de la red.

R// DLS2

```
DLS2(config)# vlan 567  
DLS2(config-vlan)# name Contabilidad  
DLS2(config-vlan)# private-vlan isolated  
DLS2(config-vlan)# exit
```

```
DLS2#show vlan
```

VLAN	Name	Status	Ports
1	default	active	Et1/2, Et1/3, Et2/0, Et2/1 Et2/2, Et2/3, Et3/0, Et3/1 Et3/2, Et3/3
12	Ejecutivos	active	
123	Mantenimiento	active	
234	Huespedes	active	
434	Estacionamiento	suspended	
567	Contabilidad	active	
800	Nativa	active	
1002	fddi-default	act/unsup	
1003	trcrf-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trbrf-default	act/unsup	
1010	Voz	active	
1111	Videonet	active	
3456	Administracion	active	

Figura 72. Creación de VLAN 567 en DLS2.

- j) Configurar DLS1 como Spanning tree root para las VLAN 1, 12, 434, 800, 1010, 1111 y 3456 y como raíz secundaria para las VLAN 123 y 234.

R// DLS1

```
DLS1(config)# spanning-tree vlan 1,12,434,800,1010,1111,3456 root  
primary
```

```
DLS1(config)# spanning-tree vlan 123,234 root secondary
```

```
!  
spanning-tree mode rapid-pvst  
spanning-tree extend system-id  
spanning-tree vlan 1,12,434,800,1010,1111,3456 priority 24576  
spanning-tree vlan 123,234 priority 28672  
!
```

Figura 73. Configuración STP en DLS1.

k) Configurar DLS2 como Spanning tree root para las VLAN 123 y 234 y como una raíz secundaria para las VLAN 12, 434, 800, 1010, 1111 y 3456.

R// DLS2

```
DLS2(config)# spanning-tree vlan 123,234 root primary
DLS2(config)# spanning-tree vlan 1,12,434,800,1010,1111,3456 root
secondary

!
spanning-tree mode rapid-pvst
spanning-tree extend system-id
spanning-tree vlan 12,434,800,1010,1111,3456 priority 28672
spanning-tree vlan 123,234 priority 24576
!
```

Figura 74. Configuración STP en DLS2.

l) Configurar todos los puertos como troncales de tal forma que solamente las VLAN que se han creado se les permitirá circular a través de estos puertos.

R// DLS1

```
DLS1(config)# interface range ethernet 0/0 - 1, e0/2 - 3
DLS1(config-if-range)# switchport trunk allowed vlan
800,12,234,1111,434,123,1010,3456
DLS1(config-if-range)# exit
```

```
DLS1#show interfaces trunk
```

Port	Mode	Encapsulation	Status	Native vlan
Po1	on	802.1q	trunking	800
Po4	on	802.1q	trunking	800

Port	Vlans allowed on trunk
Po1	12,123,234,434,800,1010,1111,3456
Po4	12,123,234,434,800,1010,1111,3456

Port	Vlans allowed and active in management domain
Po1	12,123,234,800,1010,1111,3456
Po4	12,123,234,800,1010,1111,3456

Port	Vlans in spanning tree forwarding state and not pruned
Po1	12,123,234,800,1010,1111,3456
Po4	12,800,1010,1111,3456

Figura 75. VLAN's permitidas en DLS1.

DLS2

```
DLS2(config)# interface range ethernet 0/0 - 1, e0/2 - 3
DLS2(config-if-range)#      switchport      trunk      allowed      vlan
800,12,234,1111,434,123,1010,3456,567
DLS2(config-if-range)# exit
```

```
DLS2#show interfaces trunk

Port      Mode      Encapsulation  Status      Native vlan
Po2       on        802.1q         trunking    800
Po3       on        802.1q         trunking    800

Port      Vlans allowed on trunk
Po2       12,123,234,434,567,800,1010,1111,3456
Po3       12,123,234,434,567,800,1010,1111,3456

Port      Vlans allowed and active in management domain
Po2       12,123,234,567,800,1010,1111,3456
Po3       12,123,234,567,800,1010,1111,3456

Port      Vlans in spanning tree forwarding state and not pruned
Po2       123,234,567
Po3       12,123,234,567,800,1010,1111,3456
```

Figura 76. VLAN's permitidas en DLS2.

ALS1

```
ALS1(config)# interface range ethernet 0/0 - 1, e0/2 - 3
ALS1(config-if-range)#      switchport      trunk      allowed      vlan
800,12,234,1111,434,123,1010,3456
ALS1(config-if-range)# exit
```

```
ALS1#show interfaces trunk

Port      Mode      Encapsulation  Status      Native vlan
Po1       on        802.1q         trunking    800
Po3       on        802.1q         trunking    800

Port      Vlans allowed on trunk
Po1       12,123,234,434,800,1010,1111,3456
Po3       12,123,234,434,800,1010,1111,3456

Port      Vlans allowed and active in management domain
Po1       12,123,234,800,1010,1111,3456
Po3       12,123,234,800,1010,1111,3456

Port      Vlans in spanning tree forwarding state and not pruned
Po1       12,123,234,800,1010,1111,3456
Po3       12,123,234,800,1010,1111,3456
```

Figura 77. VLAN's permitidas en ALS1.

ALS2

```
ALS2(config)# interface range ethernet 0/0 - 1, e0/2 - 3
ALS2(config-if-range)#      switchport      trunk      allowed      vlan
800,12,234,1111,434,123,1010,3456
ALS2(config-if-range)# exit
```

```
ALS2#show interfaces trunk
```

Port	Mode	Encapsulation	Status	Native vlan
Po2	on	802.1q	trunking	800
Po4	on	802.1q	trunking	800

Port	Vlans allowed on trunk
Po2	12,123,234,434,800,1010,1111,3456
Po4	12,123,234,434,800,1010,1111,3456

Port	Vlans allowed and active in management domain
Po2	12,123,234,800,1010,1111,3456
Po4	12,123,234,800,1010,1111,3456

Port	Vlans in spanning tree forwarding state and not pruned
Po2	12,123,234,800,1010,1111,3456
Po4	12,123,234,800,1010,1111,3456

Figura 78. VLAN's permitidas en ALS2.

- m) Configurar las siguientes interfaces como puertos de acceso, asignados a las VLAN de la siguiente manera:

Interfaz	DLS1	DLS2	ALS1	ALS2
Interfaz Fa0/6	3456	12, 1010	123, 1010	234
Interfaz Fa0/15	1111	1111	1111	1111
Interfaces F0 /16-18		567		

Tabla 2. Distribución de puertos de acceso de la guía.

Nota: Debido a que un puerto no puede tener configuradas dos VLAN's se solicita a la tutora Paulita Flor la asignación correcta de las VLAN:

Interfaz	DLS1	DLS2	ALS1	ALS2
Interfaz Fa0/6	3456	12	123	234
Interfaz Fa0/15	1111	1111	1111	1111
Interfaces F0 /16			567	
Interfaces F0/18			1010	

Tabla 3. Distribución de puertos de acceso de la guía corregida.

Interfaz	DLS1	DLS2	ALS1	ALS2
Interfaz Et 2/0	3456	12	123	234
Interfaz Et 3/0	1111	1111	1111	1111
Interfaz Et 3/1		567		
Interfaz 3/3		1010		

Tabla 4. Distribución de puertos de acceso homologado en mi laboratorio.

R// DLS1

```

DLS1(config)# interface ethernet 2/0
DLS1(config-if)# switchport mode access
DLS1(config-if)# switchport access vlan 3456
DLS1(config-if)# no shutdown
DLS1(config-if)# exit
DLS1(config)# interface ethernet 3/0
DLS1(config-if)# switchport mode access
DLS1(config-if)# switchport access vlan 1111
DLS1(config-if)# no shutdown
DLS1(config-if)# exit
DLS1(config)# interface ethernet 3/1
DLS1(config-if)# switchport mode access
DLS1(config-if)# switchport access vlan 567
DLS1(config-if)# no shutdown
DLS1(config-if)# exit
DLS1(config)# interface ethernet 3/3
DLS1(config-if)# switchport mode access
DLS1(config-if)# switchport access vlan 1010
DLS1(config-if)# no shutdown
DLS1(config-if)# exit

```

Recordemos que la VLAN 567 está creada solo en el switch DLS2 y que no se podía replicar en los demás switches por lo tanto esta VLAN no se verá reflejada en el resto de switches.


```
DLS1#show vlan
```

VLAN	Name	Status	Ports
1	default	active	Et1/2, Et1/3, Et2/1, Et2/2 Et2/3, Et3/2
12	Ejecutivos	active	
123	Mantenimiento	active	
234	Huespedes	active	
434	Estacionamiento	suspended	
800	Nativa	active	
1002	fddi-default	act/unsup	
1003	trcrf-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trbrf-default	act/unsup	
1010	Voz	active	Et3/3
1111	Videonet	active	Et3/0
3456	administracion	active	Et2/0

Figura 79. Asignación de VLAN's en puertos de DLS1.

DLS2

```
DLS2(config)# interface ethernet 2/0
DLS2(config-if)# switchport mode access
DLS2(config-if)# switchport access vlan 12
DLS2(config-if)# no shutdown
DLS2(config-if)# exit
DLS2(config)# interface ethernet 3/0
DLS2(config-if)# switchport mode access
DLS2(config-if)# switchport access vlan 1111
DLS2(config-if)# no shutdown
DLS2(config-if)# exit
DLS2(config)# interface ethernet 3/1
DLS2(config-if)# switchport mode access
DLS2(config-if)# switchport access vlan 567
DLS2(config-if)# no shutdown
DLS2(config-if)# exit
DLS2(config)# interface ethernet 3/3
DLS2(config-if)# switchport mode access
DLS2(config-if)# switchport access vlan 1010
DLS2(config-if)# no shutdown
DLS2(config-if)# exit
```

En DLS2 si veremos la asignación de la VLAN 567 sobre el puerto Ethernet 3/1 porque en este switch fue donde la creamos previamente.

```
DLS2#show vlan
```

VLAN	Name	Status	Ports
1	default	active	Et1/2, Et1/3, Et2/1, Et2/2 Et2/3, Et3/2
12	Ejecutivos	active	Et2/0
123	Mantenimiento	active	
234	Huespedes	active	
434	Estacionamiento	suspended	
567	Contabilidad	active	Et3/1
800	Nativa	active	
1002	fddi-default	act/unsup	
1003	trcrf-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trbrf-default	act/unsup	
1010	Voz	active	Et3/3
1111	Videonet	active	Et3/0
3456	Administracion	active	

Figura 80. Asignación de VLAN's en puertos de DLS2.

ALS1

```
ALS1(config)# interface ethernet 2/0
ALS1(config-if)# switchport mode access
ALS1(config-if)# switchport access vlan 123
ALS1(config-if)# no shutdown
ALS1(config-if)# exit
ALS1(config)# interface ethernet 3/0
ALS1(config-if)# switchport mode access
ALS1(config-if)# switchport access vlan 1111
ALS1(config-if)# no shutdown
ALS1(config-if)# exit
ALS1(config)# interface ethernet 3/1
ALS1(config-if)# switchport mode access
ALS1(config-if)# switchport access vlan 567
ALS1(config-if)# no shutdown
ALS1(config-if)# exit
ALS1(config)# interface ethernet 3/3
ALS1(config-if)# switchport mode access
ALS1(config-if)# switchport access vlan 1010
ALS1(config-if)# no shutdown
ALS1(config-if)# exit
```

```
ALS1#show vlan
```

VLAN	Name	Status	Ports
1	default	active	Et1/0, Et1/1, Et1/2, Et1/3 Et2/1, Et2/2, Et2/3, Et3/2
12	Ejecutivos	active	
123	Mantenimiento	active	Et2/0
234	Huespedes	active	
434	Estacionamiento	suspended	
800	Nativa	active	
1002	fddi-default	act/unsup	
1003	trcrf-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trbrf-default	act/unsup	
1010	Voz	active	Et3/3
1111	Videonet	active	Et3/0
3456	administracion	active	

Figura 81. Asignación de VLAN's en puertos de ALS1.

ALS2

```
ALS2(config)# interface ethernet 2/0
ALS2(config-if)# switchport mode access
ALS2(config-if)# switchport access vlan 234
ALS2(config-if)# no shutdown
ALS2(config-if)# exit
ALS2(config)# interface ethernet 3/0
ALS2(config-if)# switchport mode access
ALS2(config-if)# switchport access vlan 1111
ALS2(config-if)# no shutdown
ALS2(config-if)# exit
ALS2(config)# interface ethernet 3/1
ALS2(config-if)# switchport mode access
ALS2(config-if)# switchport access vlan 567
ALS2(config-if)# no shutdown
ALS2(config-if)# exit
ALS2(config)# interface ethernet 3/3
ALS2(config-if)# switchport mode access
ALS2(config-if)# switchport access vlan 1010
ALS2(config-if)# no shutdown
ALS2(config-if)# exit
```

```
ALS2#show vlan
```

VLAN	Name	Status	Ports
1	default	active	Et1/0, Et1/1, Et1/2, Et1/3 Et2/1, Et2/2, Et2/3, Et3/2
12	Ejecutivos	active	
123	Mantenimiento	active	
234	Huespedes	active	Et2/0
434	Estacionamiento	suspended	
800	Nativa	active	
1002	fddi-default	act/unsup	
1003	trcrf-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trbrf-default	act/unsup	
1010	Voz	active	Et3/3
1111	Videonet	active	Et3/0
3456	administracion	active	

Figura 82. Asignación de VLAN's en puertos de ALS2.

2.2 Parte 2: conectividad de red de prueba y las opciones configuradas.

- Verificar la existencia de las VLAN correctas en todos los switches y la asignación de puertos troncales y de acceso.

R// DLS1

Con el comando **show vlan** podemos verificar la VLAN's creadas y puertos de acceso asignados a estas.

```
DLS1#show vlan
```

VLAN	Name	Status	Ports
1	default	active	Et1/2, Et1/3, Et2/1, Et2/2 Et2/3, Et3/2
12	Ejecutivos	active	
123	Mantenimiento	active	
234	Huespedes	active	
434	Estacionamiento	suspended	
800	Nativa	active	
1002	fddi-default	act/unsup	
1003	trcrf-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trbrf-default	act/unsup	
1010	Voz	active	Et3/3
1111	Videonet	active	Et3/0
3456	administracion	active	Et2/0

Figura 83. VLAN's creadas en DLS1 y puertos asignados.

Validaremos las interfaces troncales en DLS1 y las VLAN que están permitidas a través de estos enlaces con el comando **show interfaces trunk**.

```
DLS1#show interfaces trunk
```

Port	Mode	Encapsulation	Status	Native vlan
Po1	on	802.1q	trunking	800
Po4	on	802.1q	trunking	800

Port	Vlans allowed on trunk
Po1	12,123,234,434,800,1010,1111,3456
Po4	12,123,234,434,800,1010,1111,3456

Port	Vlans allowed and active in management domain
Po1	12,123,234,800,1010,1111,3456
Po4	12,123,234,800,1010,1111,3456

Port	Vlans in spanning tree forwarding state and not pruned
Po1	12,123,234,800,1010,1111,3456
Po4	12,800,1010,1111,3456

Figura 84. Enlaces troncales y VLAN's en DLS1.

Cabe mencionar que el enlace entre DLS1 y DLS2(Po12) no es un enlace troncal debido a que es un enlace capa 3, por lo tanto, en DLS1 y DLS2 hay enlaces troncales hacia ALS1 y ALS2 únicamente.

DLS2

Con el comando **show vlan** podemos verificar la VLAN's creadas y puertos de acceso asignados a estas.

```
DLS2#show vlan
```

VLAN	Name	Status	Ports
1	default	active	Et1/2, Et1/3, Et2/1, Et2/2 Et2/3, Et3/2
12	Ejecutivos	active	Et2/0
123	Mantenimiento	active	
234	Huespedes	active	
434	Estacionamiento	suspended	
567	Contabilidad	active	Et3/1
800	Nativa	active	
1002	fddi-default	act/unsup	
1003	trcrf-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trbrf-default	act/unsup	
1010	Voz	active	Et3/3
1111	Videonet	active	Et3/0
3456	Administracion	active	

Figura 85. VLAN's creadas en DLS2 y puertos asignados.

Validaremos las interfaces troncales en DLS2 y las VLAN que están permitidas a través de estos enlaces con el comando **show interfaces trunk**.

```
DLS2#show interfaces trunk
```

Port	Mode	Encapsulation	Status	Native vlan
Po2	on	802.1q	trunking	800
Po3	on	802.1q	trunking	800

Port	Vlans allowed on trunk
Po2	12,123,234,434,567,800,1010,1111,3456
Po3	12,123,234,434,567,800,1010,1111,3456

Port	Vlans allowed and active in management domain
Po2	12,123,234,567,800,1010,1111,3456
Po3	12,123,234,567,800,1010,1111,3456

Port	Vlans in spanning tree forwarding state and not pruned
Po2	123,234,567
Po3	12,123,234,567,800,1010,1111,3456

Figura 86. Enlaces troncales y VLAN's en DLS2.

ALS1

Con el comando **show vlan** podemos verificar la VLAN's creadas y puertos de acceso asignados a estas.

```
ALS1#show vlan
```

VLAN	Name	Status	Ports
1	default	active	Et1/0, Et1/1, Et1/2, Et1/3 Et2/1, Et2/2, Et2/3, Et3/2
12	Ejecutivos	active	
123	Mantenimiento	active	Et2/0
234	Huespedes	active	
434	Estacionamiento	suspended	
800	Nativa	active	
1002	fddi-default	act/unsup	
1003	trcrf-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trbrf-default	act/unsup	
1010	Voz	active	Et3/3
1111	Videonet	active	Et3/0
3456	administracion	active	

Figura 87. VLAN's creadas en ALS1 y puertos asignados.

Validaremos las interfaces troncales en DLS2 y las VLAN que están permitidas a través de estos enlaces con el comando **show interfaces trunk**.

```
ALS1#show interfaces trunk
```

Port	Mode	Encapsulation	Status	Native vlan
Po1	on	802.1q	trunking	800
Po3	on	802.1q	trunking	800

Port	Vlans allowed on trunk
Po1	12,123,234,434,800,1010,1111,3456
Po3	12,123,234,434,800,1010,1111,3456

Port	Vlans allowed and active in management domain
Po1	12,123,234,800,1010,1111,3456
Po3	12,123,234,800,1010,1111,3456

Port	Vlans in spanning tree forwarding state and not pruned
Po1	12,123,234,800,1010,1111,3456
Po3	12,123,234,800,1010,1111,3456

Figura 88. Enlaces troncales y VLAN's en ALS1.

ALS2

Con el comando **show vlan** podemos verificar la VLAN's creadas y puertos de acceso asignados a estas.

```
ALS2#show vlan
```

VLAN	Name	Status	Ports
1	default	active	Et1/0, Et1/1, Et1/2, Et1/3 Et2/1, Et2/2, Et2/3, Et3/2
12	Ejecutivos	active	
123	Mantenimiento	active	
234	Huespedes	active	Et2/0
434	Estacionamiento	suspended	
800	Nativa	active	
1002	fddi-default	act/unsup	
1003	trcrf-default	act/unsup	
1004	fdinet-default	act/unsup	
1005	trbrf-default	act/unsup	
1010	Voz	active	Et3/3
1111	Videonet	active	Et3/0
3456	administracion	active	

Figura 89. VLAN's creadas en ALS2 y puertos asignados.

Validaremos las interfaces troncales en DLS2 y las VLAN que están permitidas a través de estos enlaces con el comando **show interfaces trunk**.

```
ALS2#show interfaces trunk

Port      Mode           Encapsulation  Status        Native vlan
Po2       on             802.1q         trunking      800
Po4       on             802.1q         trunking      800

Port      Vlans allowed on trunk
Po2       12,123,234,434,800,1010,1111,3456
Po4       12,123,234,434,800,1010,1111,3456

Port      Vlans allowed and active in management domain
Po2       12,123,234,800,1010,1111,3456
Po4       12,123,234,800,1010,1111,3456

Port      Vlans in spanning tree forwarding state and not pruned
Po2       12,123,234,800,1010,1111,3456
Po4       12,123,234,800,1010,1111,3456
```

Figura 90. Enlaces troncales y VLAN's en ALS1.

b. Verificar que el EtherChannel entre DLS1 y ALS1 está configurado correctamente

R// DLS1

Con el comando **show etherchannel** podemos ver la configuración del enlace Etherchannel entre DLS1 y ALS1, que en este caso corresponde al grupo Po1 capa 2.

```
DLS1#show etherchannel
Channel-group listing:
-----

Group: 1
-----
Group state = L2
Ports: 2  Maxports = 4
Port-channels: 1 Max Port-channels = 4
Protocol:  LACP
Minimum Links: 0

Group: 4
-----
Group state = L2
Ports: 2  Maxports = 4
Port-channels: 1 Max Port-channels = 1
Protocol:  PAgP
Minimum Links: 0

Group: 12
-----
Group state = L3
Ports: 2  Maxports = 4
Port-channels: 1 Max Port-channels = 4
Protocol:  LACP
Minimum Links: 0
```

Figura 91. Configuración de grupos Etherchannel en DLS1.

Con el comando **show etherchannel summary** podemos validar que el enlace etherchannel es funcional gracias a las banderas de ayuda que no indican que el enlace es de capa 2(**S**) y esta en uso(**U**), también podemos observar los puertos asociados a este enlace.

```
DLS1#show etherchannel summary
Flags: D - down          P - bundled in port-channel
       I - stand-alone  s - suspended
       H - Hot-standby (LACP only)
       R - Layer3       S - Layer2
       U - in use       N - not in use, no aggregation
       f - failed to allocate aggregator

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

       A - formed by Auto LAG

Number of channel-groups in use: 3
Number of aggregators:          3
```

Group	Port-channel	Protocol	Ports
1	Po1(SU)	LACP	Et0/0(P) Et0/1(P)
4	Po4(SU)	PAgP	Et0/2(P) Et0/3(P)
12	Po12(RU)	LACP	Et1/0(P) Et1/1(P)

Figura 92. Configuración Etherchannel en DLS1.

Podemos comprobar en ALS1 que el enlace Etherchannel está operativo.

```
ALS1#show etherchannel summary
Flags: D - down          P - bundled in port-channel
       I - stand-alone  s - suspended
       H - Hot-standby (LACP only)
       R - Layer3       S - Layer2
       U - in use       N - not in use, no aggregation
       f - failed to allocate aggregator

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

       A - formed by Auto LAG

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

Group	Port-channel	Protocol	Ports
1	Po1(SU)	LACP	Et0/0(P) Et0/1(P)
3	Po3(SU)	PAgP	Et0/2(P) Et0/3(P)

Figura 93. Configuración Etherchannel en ALS1.

- c. Verificar la configuración de Spanning tree entre DLS1 o DLS2 para cada VLAN

R// Con el comando **show spanning-tree vlan_id** podemos validar la configuración STP.

DLS1

```
DLS1#show spanning-tree vlan 12
```

VLAN0012

```
Spanning tree enabled protocol rstp
Root ID    Priority    24588
           Address    aabb.cc00.0100
           This bridge is the root
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

Bridge ID  Priority    24588 (priority 24576 sys-id-ext 12)
           Address    aabb.cc00.0100
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
           Aging Time  300 sec
```

Interface	Role	Sts	Cost	Prio.Nbr	Type
Po1	Desg	FWD	56	128.65	Shr
Po4	Desg	FWD	56	128.66	Shr

```
DLS1#show spanning-tree vlan 123
```

VLAN0123

```
Spanning tree enabled protocol rstp
Root ID    Priority    24699
           Address    aabb.cc00.0200
           Cost        112
           Port        65 (Port-channel1)
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

Bridge ID  Priority    28795 (priority 28672 sys-id-ext 123)
           Address    aabb.cc00.0100
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
           Aging Time  300 sec
```

Interface	Role	Sts	Cost	Prio.Nbr	Type
Po1	Root	FWD	56	128.65	Shr
Po4	Altn	BLK	56	128.66	Shr

Figura 94. STP VLAN 12,234 en DLS1.

Observamos que la VLAN 434 al estar suspendida en configuraciones previas, no nos aparece información sobre esta con STP.

```
DLS1#show spanning-tree vlan 234
```

```
VLAN0234
```

```
Spanning tree enabled protocol rstp
  Root ID    Priority    24810
             Address    aabb.cc00.0200
             Cost        112
             Port        65 (Port-channel1)
             Hello Time  2 sec    Max Age 20 sec    Forward Delay 15 sec

  Bridge ID  Priority    28906 (priority 28672 sys-id-ext 234)
             Address    aabb.cc00.0100
             Hello Time  2 sec    Max Age 20 sec    Forward Delay 15 sec
             Aging Time  300 sec

Interface                Role Sts Cost          Prio.Nbr Type
-----
Po1                       Root FWD 56            128.65  Shr
Po4                       Altn BLK 56            128.66  Shr
```

```
DLS1#show spanning-tree vlan 434
```

```
Spanning tree instance(s) for vlan 434 does not exist.
```

Figura 95. STP VLAN 234,434 en DLS1.

```
DLS1#show spanning-tree vlan 800
```

```
VLAN0800
```

```
Spanning tree enabled protocol rstp
  Root ID    Priority    25376
             Address    aabb.cc00.0100
             This bridge is the root
             Hello Time  2 sec    Max Age 20 sec    Forward Delay 15 sec

  Bridge ID  Priority    25376 (priority 24576 sys-id-ext 800)
             Address    aabb.cc00.0100
             Hello Time  2 sec    Max Age 20 sec    Forward Delay 15 sec
             Aging Time  300 sec

Interface                Role Sts Cost          Prio.Nbr Type
-----
Po1                       Desg FWD 56            128.65  Shr
Po4                       Desg FWD 56            128.66  Shr
```

Figura 96. STP VLAN 800 en DLS1.

```
DLS1#show spanning-tree vlan 1010
```

VLAN1010

```
Spanning tree enabled protocol rstp
Root ID    Priority    25586
           Address    aabb.cc00.0100
           This bridge is the root
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
```

```
Bridge ID  Priority    25586 (priority 24576 sys-id-ext 1010)
           Address    aabb.cc00.0100
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
           Aging Time  300 sec
```

Interface	Role	Sts	Cost	Prio.Nbr	Type
Et3/3	Desg	FWD	100	128.16	Shr
Po1	Desg	FWD	56	128.65	Shr
Po4	Desg	FWD	56	128.66	Shr

```
DLS1#show spanning-tree vlan 1111
```

VLAN1111

```
Spanning tree enabled protocol rstp
Root ID    Priority    25687
           Address    aabb.cc00.0100
           This bridge is the root
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
```

```
Bridge ID  Priority    25687 (priority 24576 sys-id-ext 1111)
           Address    aabb.cc00.0100
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
           Aging Time  300 sec
```

Interface	Role	Sts	Cost	Prio.Nbr	Type
Et3/0	Desg	FWD	100	128.13	Shr
Po1	Desg	FWD	56	128.65	Shr
Po4	Desg	FWD	56	128.66	Shr

Figura 97. STP VLAN 1010,1111 en DLS1.

```
DLS1#show spanning-tree vlan 3456
```

VLAN3456

```
Spanning tree enabled protocol rstp
Root ID    Priority    28032
           Address    aabb.cc00.0100
           This bridge is the root
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

Bridge ID  Priority    28032 (priority 24576 sys-id-ext 3456)
           Address    aabb.cc00.0100
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
           Aging Time  300 sec
```

Interface	Role	Sts	Cost	Prio.Nbr	Type
Et2/0	Desg	FWD	100	128.9	Shr
Po1	Desg	FWD	56	128.65	Shr
Po4	Desg	FWD	56	128.66	Shr

Figura 98. STP VLAN 3456 en DLS1.

DLS2

```
DLS2#show spanning-tree vlan 12
```

VLAN0012

```
Spanning tree enabled protocol rstp
Root ID    Priority    24588
           Address    aabb.cc00.0100
           Cost        112
           Port        66 (Port-channel3)
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

Bridge ID  Priority    28684 (priority 28672 sys-id-ext 12)
           Address    aabb.cc00.0200
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
           Aging Time  300 sec
```

Interface	Role	Sts	Cost	Prio.Nbr	Type
Et2/0	Desg	FWD	100	128.9	Shr
Po2	Altn	BLK	56	128.65	Shr
Po3	Root	FWD	56	128.66	Shr

Figura 99. STP VLAN 12 en DLS2.

```
DLS2#show spanning-tree vlan 123
```

```
VLAN0123
```

```
Spanning tree enabled protocol rstp
Root ID    Priority    24699
           Address    aabb.cc00.0200
           This bridge is the root
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

Bridge ID  Priority    24699 (priority 24576 sys-id-ext 123)
           Address    aabb.cc00.0200
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
           Aging Time  300 sec
```

Interface	Role	Sts	Cost	Prio.Nbr	Type
Po2	Desg	FWD	56	128.65	Shr
Po3	Desg	FWD	56	128.66	Shr

```
DLS2#show spanning-tree vlan 234
```

```
VLAN0234
```

```
Spanning tree enabled protocol rstp
Root ID    Priority    24810
           Address    aabb.cc00.0200
           This bridge is the root
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

Bridge ID  Priority    24810 (priority 24576 sys-id-ext 234)
           Address    aabb.cc00.0200
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
           Aging Time  300 sec
```

Interface	Role	Sts	Cost	Prio.Nbr	Type
Po2	Desg	FWD	56	128.65	Shr
Po3	Desg	FWD	56	128.66	Shr

Figura 100. STP VLAN 123,234 en DLS2.

```
DLS2#show spanning-tree vlan 434
```

```
Spanning tree instance(s) for vlan 434 does not exist
```

```
DLS2#show spanning-tree vlan 567
```

```
VLAN0567
```

```
Spanning tree enabled protocol rstp
Root ID      Priority    33335
             Address    aabb.cc00.0200
             This bridge is the root
             Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

Bridge ID    Priority    33335 (priority 32768 sys-id-ext 567)
             Address    aabb.cc00.0200
             Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time  300 sec
```

Interface	Role	Sts	Cost	Prio.Nbr	Type
Po2	Desg	FWD	56	128.65	Shr
Po3	Desg	FWD	56	128.66	Shr

```
DLS2#show spanning-tree vlan 1010
```

```
VLAN1010
```

```
Spanning tree enabled protocol rstp
Root ID      Priority    25586
             Address    aabb.cc00.0100
             Cost      112
             Port      66 (Port-channel3)
             Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

Bridge ID    Priority    29682 (priority 28672 sys-id-ext 1010)
             Address    aabb.cc00.0200
             Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time  300 sec
```

Interface	Role	Sts	Cost	Prio.Nbr	Type
Et3/3	Desg	FWD	100	128.16	Shr
Po2	Altn	BLK	56	128.65	Shr
Po3	Root	FWD	56	128.66	Shr

Figura 101. STP VLAN 434,567,1010 en DLS2.

```
DLS2#show spanning-tree vlan 1111
```

```
VLAN1111
```

```
Spanning tree enabled protocol rstp
Root ID    Priority    25687
           Address    aabb.cc00.0100
           Cost      112
           Port      66 (Port-channel3)
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
```

```
Bridge ID  Priority    29783 (priority 28672 sys-id-ext 1111)
           Address    aabb.cc00.0200
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
           Aging Time  300 sec
```

Interface	Role	Sts	Cost	Prio.Nbr	Type
Et3/0	Desg	FWD	100	128.13	Shr
Po2	Altn	BLK	56	128.65	Shr
Po3	Root	FWD	56	128.66	Shr

```
DLS2#show spanning-tree vlan 3456
```

```
VLAN3456
```

```
Spanning tree enabled protocol rstp
Root ID    Priority    28032
           Address    aabb.cc00.0100
           Cost      112
           Port      66 (Port-channel3)
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
```

```
Bridge ID  Priority    32128 (priority 28672 sys-id-ext 3456)
           Address    aabb.cc00.0200
           Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
           Aging Time  300 sec
```

Interface	Role	Sts	Cost	Prio.Nbr	Type
Po2	Altn	BLK	56	128.65	Shr
Po3	Root	FWD	56	128.66	Shr

Figura 102. STP VLAN 1111,3456 en DLS2.

CONCLUSIONES

El desarrollo del primer escenario nos da la capacidad para configurar y administrar dispositivos de capa 3 orientados al diseño de redes escalables mediante el estudio del modelo OSI, la arquitectura TCP/IP, y el uso de recursos y herramientas en función de los protocolos y servicios de una red.

Con el desarrollo de este trabajo se fortalecen los conocimientos necesarios para el diseño de redes escalables aplicando niveles de seguridad mediante la definición de criterios y políticas de seguridad.

Se realiza resolución de problemas y soporte de las comunicaciones a través de las redes de datos estableciendo alternativas a problemas de interconectividad a través de comandos show para diagnosticar problemas y tener un panorama amplio de la configuración dada y poder dar con la solución.

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