

DIPLOMADO DE PROFUNDIZACIÓN CISCO  
PRUEBA DE HABILIDADES PRÁCTICAS CCNP

**JAIRO ALONSO GUEVARA MERA**

UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA – UNAD  
ESCUELA DE CIENCIAS BÁSICAS, TECNOLOGÍA E INGENIERÍA – ECBTI  
INGENIERÍA DE TELECOMUNICACIONES  
POPAYÁN  
2019

**DIPLOMADO DE PROFUNDIZACIÓN CISCO  
PRUEBA DE HABILIDADES PRÁCTICAS CCNP**

**JAIRO ALONSO GUEVARA MERA**

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

**DIRECTOR:  
MSc. GERARDO GRANADOS ACUÑA**

**UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA – UNAD  
ESCUELA DE CIENCIAS BÁSICAS, TECNOLOGÍA E INGENIERÍA – ECBTI  
INGENIERÍA DE TELECOMUNICACIONES  
POPAYÁN  
2019**

NOTA DE ACEPTACIÓN

---

---

---

---

---

---

---

---

---

Firma del Presidente del Jurado

---

Firma del Jurado

---

Firma del Jurado

Popayán, 8 de diciembre de 2019

## AGRADECIMIENTOS

Agradezco principalmente a Dios, por darme toda la fortaleza espiritual y por guiarme por un buen camino para así poder culminar esta etapa en mi vida. Así mismo quiero agradecer a toda mi familia, la cual estuvo presente en la realización de esta meta y fueron ellos los que me ayudaron a no desfallecer. A todos los tutores y directores de los diferentes cursos, los cuales me orientaron para poder realizar un excelente trabajo y así cumplir todos los objetivos plasmados en todo este tiempo y poder llegar a donde me encuentro en estos momentos.

## CONTENIDO

AGRADECIMIENTOS.....	4
CONTENIDO .....	5
LISTA DE TABLAS .....	6
LISTA DE FIGURAS.....	7
RESUMEN.....	8
ABSTRACT .....	8
INTRODUCCIÓN.....	9
DESARROLLO .....	10
1. Escenario 1 .....	10
2. Escenario 2 .....	22
CONCLUSIONES .....	36
BIBLIOGRAFÍA.....	37

## LISTA DE TABLAS

Tabla 1. VLAN .....	27
Tabla 2. Configuración de Interfaces como puertos de acceso .....	30

## LISTA DE FIGURAS

Figura 1. Escenario 1 .....	10
Figura 2. Simulación escenario 1 .....	10
Figura 3. Tabla de enrutamiento R1 .....	17
Figura 4. Tabla de enrutamiento R2 .....	18
Figura 5. Tabla de enrutamiento R3 .....	19
Figura 6. Ping desde R1 .....	20
Figura 7. Rutas filtradas.....	21
Figura 8. Escenario 2.....	22
Figura 9. Simulación escenario 2.....	22
Figura 10. VLAN en DLS1 .....	32
Figura 11. VLAN en DLS2 .....	32
Figura 12. VLAN en ALS1.....	33
Figura 13. VLAN en ALS2.....	33
Figura 14. EtherChannel en DLS1 .....	34
Figura 15. EtherChannel en ALS1 .....	34
Figura 16. Spanning tree en DLS1.....	35
Figura 17. Spanning tree en DLS2.....	35

## RESUMEN

En el siguiente trabajo, se realiza la actividad final del curso de profundización CISCO CCNP, en el cual se pone a prueba al estudiante mediante la solución de problemas relacionados con redes; aquí se abordan dos (2) escenarios propuestos, acompañado de los respectivos procesos de documentación de la solución, correspondientes al registro de la configuración de cada uno de los dispositivos, el registro de los procesos de verificación de conectividad mediante el uso de comandos ping, traceroute, show ip route y las respectivas evidencias de configuración de los dispositivos en el simulador Packet Tracer, las cuales dan veracidad del trabajo realizado.

Palabras clave: CISCO, CCNP, Redes, Ping, Traceroute.

## ABSTRACT

In the following work, the final activity of the CISCO CCNP deepening course is carried out, in which the student is tested by solving problems related to networks; Here two (2) proposed scenarios are addressed, accompanied by the respective documentation processes of the solution, corresponding to the registration of the configuration of each of the devices, the registration of the connectivity verification processes through the use of ping commands, traceroute, show ip route and the respective evidence of configuration of the devices in the Packet Tracer simulator, which give veracity of the work done.

Keywords: CISCO, CCNP, Networking, Ping, Traceroute.

## INTRODUCCIÓN

El curso de profundización CISCO CCNP, busca identificar el grado de desarrollo de competencias y habilidades que fueron adquiridas a lo largo del mismo. Lo esencial es poner a prueba los niveles de comprensión y solución de problemas relacionados con diversos aspectos de Networking.

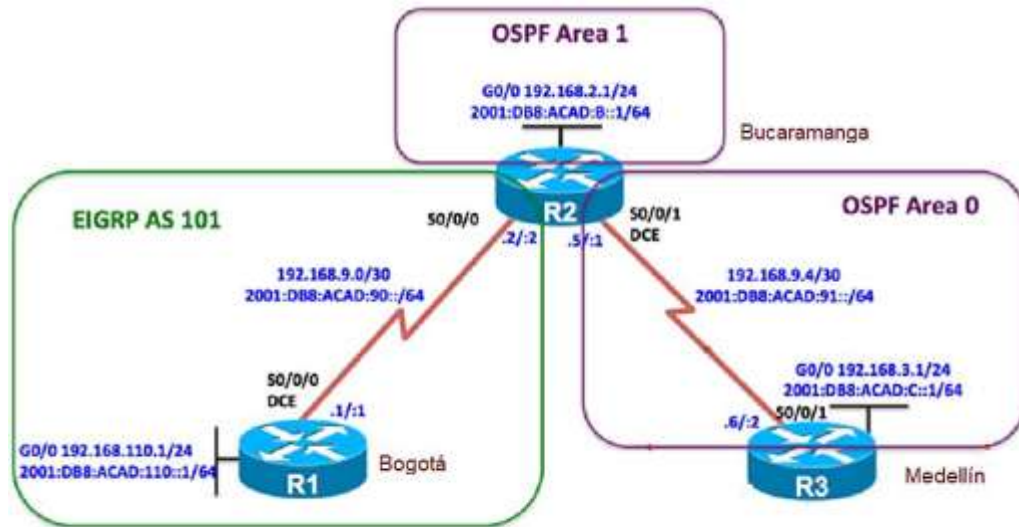
En el desarrollo del presente trabajo, se abordarán temas tales como: Basic Network and Routing Concepts, EIGRP Implementation, OSPF Implementation, Manipulating Routing Updates, Switch Fundamentals Review, Network Design Fundamentals, Campus Network Architecture, SpanningTreeImplementation e Inter VLAN Routing, los cuales fueron tratados a lo largo del Diplomado de profundización CISCO CCNP.

## DESARROLLO

### 1. Escenario 1

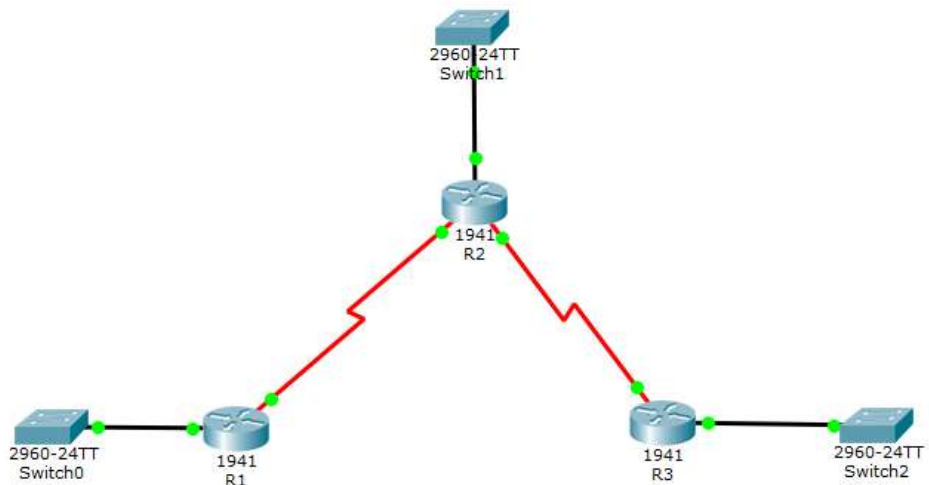
#### Topología de red

Figura 1. Escenario 1



Configurar la topología de red, de acuerdo con las siguientes especificaciones.  
**Parte 1: Configuración del escenario propuesto**

Figura 2. Simulación escenario 1



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

**R1:**

```
enable
configure terminal
no ip domain-lookup
hostname R1
ipv6 unicast-routing
line console 0
logging synchronous
exec-timeout 0 0
exit
interface g0/0
ip address 192.168.110.1 255.255.255.0
ipv6 address 2001:db8:acad:110::1/64
no shutdown
exit
interface s0/0/0
ip address 192.168.9.1 255.255.255.252
ipv6 address 2001:db8:acad:90::1/64
ipv6 address fe80::1 link-local
exit
```

**R2:**

```
enable
configure terminal
hostname R2
ipv6 unicast-routing
no ip domain-lookup
line console 0
logging synchronous
exec-timeout 0 0
interface s0/0/0
ip address 192.168.9.2 255.255.255.252
ipv6 address 2001:db8:acad:90::2/64
ipv6 address fe80::2 link-local
no shutdown
exit
interface s0/0/1
ip address 192.168.9.5 255.255.255.252
ipv6 address 2001:db8:acad:91::1/64
ipv6 address fe80::2 link-local
```

```
clock rate 128000
no shutdown
exit
interface g0/0
ip address 192.168.2.1 255.255.255.0
ipv6 address 2001:db8:acad:b::1/64
no shutdown
exit
```

### **R3:**

```
enable
configure terminal
hostname R3
ipv6 unicast-routing
no ip domain-lookup
line console 0
logging synchronous
exec-timeout 0 0
exit
interface s0/0/1
ip address 192.168.9.6 255.255.255.252
ipv6 address 2001:db8:acad:91::2/64
ipv6 address fe80::3 link-local
no shutdown
exit
interface g0/0
ip address 192.168.3.1 255.255.255.0
ipv6 address 2001:db8:acad:c::1/64
no shutdown
exit
```

2. 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.

### **R1:**

```
interface s0/0/0
bandwidth 128
clock rate 128000
no shutdown
```

**R2:**  
interface s0/0/0  
bandwidth 128  
no shutdown  
exit  
interface s0/0/1  
bandwidth 128  
clock rate 128000  
no shutdown  
exit

**R3:**  
interface s0/0/1  
bandwidth 128  
no shutdown  
exit

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.

**R2:**  
  
router ospfv3 1  
address-family ipv4 unicast  
router-id 2.2.2.2  
exit  
address-family ipv6 unicast  
router-id 2.2.2.2  
exit

**R3:**  
  
router ospfv3 1  
address-family ipv4 unicast  
router-id 3.3.3.3  
passive-interface g0/0  
default-information originate always  
exit  
address-family ipv6 unicast  
router-id 3.3.3.3  
passive-interface g0/0  
default-information originate always  
exit

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.

**R2:**

```
interface g0/0
ospfv3 1 ipv4 area 1
ospfv3 1 ipv6 area 1
exit
interface s0/0/1
ospfv3 1 ipv4 area 0
ospfv3 1 ipv6 area 0
exit
```

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

**R3:**

```
interface g0/0
ospfv3 1 ipv4 area 1
ospfv3 1 ipv6 area 1
exit
interface s0/0/1
ospfv3 1 ipv4 area 0
ospfv3 1 ipv6 area 0
exit
```

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

**R2:**

```
router ospfv3 1
address-family ipv4 unicast
area 1 stub no-summary
exit
address-family ipv6 unicast
area 1 stub no-summary
exit
```

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.**

**R3:**

```
router ospfv3 1
address-family ipv4 unicast
default-information originate always
exit-address-family
address-family ipv6 unicast
default-information originate always
exit
```

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.

**R1:**

```
router eigrp DUAL-STACK
address-family ipv4 unicast autonomous-system 101
interface g0/0
passive-interface
exit
topology base
exit
network 192.168.9.0 0.0.0.3
network 192.168.110.0 0.0.0.255
eigrp router-id 1.1.1.1
exit
address-family ipv6 unicast autonomous-system 101
interface g0/0
passive-interface
exit
topology base
exit
eigrp router-id 1.1.1.1
exit
```

9. Configurar las interfaces pasivas para EIGRP según sea apropiado.

**R1:**

```
int g0/0
passive-interface
exit
```

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

**R2:**

```
router eigrp DUAL-STACK
address-family ipv4 unicast autonomous-system 101
topology base
distribute-list 1 out
distribute-list R3-to-R1 out
redistribute ospfv3 1 metric 1500 100 255 1 1500
exit-af-topology
address-family ipv6 unicast autonomous-system 101
topology base
redistribute ospf 1 metric 1500 100 255 1 1500
exit-af-topology
exit
```

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

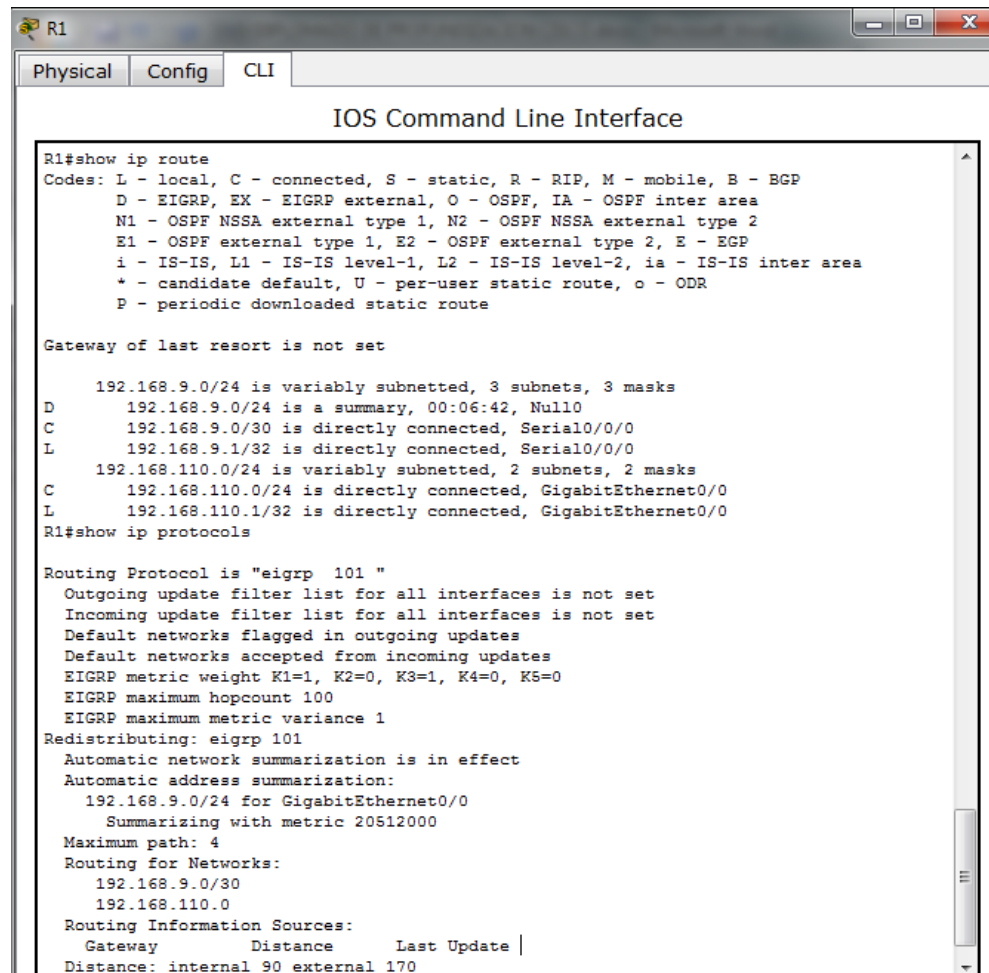
**R2:**

```
access-list 1 deny 192.168.3.0 0.0.0.255
access-list 1 permit any
```

**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.

Figura 3. Tabla de enrutamiento R1



```
R1
Physical Config CLI
IOS Command Line Interface
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, E - EGP
       i - IS-IS, 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

Gateway of last resort is not set

    192.168.9.0/24 is variably subnetted, 3 subnets, 3 masks
D       192.168.9.0/24 is a summary, 00:06:42, Null0
C       192.168.9.0/30 is directly connected, Serial0/0/0
L       192.168.9.1/32 is directly connected, Serial0/0/0
    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
R1#show ip protocols

Routing Protocol is "eigrp 101 "
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Default networks flagged in outgoing updates
  Default networks accepted from incoming updates
  EIGRP metric weight K1=1, K2=0, K3=1, K4=0, K5=0
  EIGRP maximum hopcount 100
  EIGRP maximum metric variance 1
  Redistributing: eigrp 101
    Automatic network summarization is in effect
  Automatic address summarization:
    192.168.9.0/24 for GigabitEthernet0/0
      Summarizing with metric 20512000
  Maximum path: 4
  Routing for Networks:
    192.168.9.0/30
    192.168.110.0
  Routing Information Sources:
    Gateway         Distance      Last Update |
  Distance: internal 90 external 170
```

Figura 4. Tabla de enrutamiento R2

```

R2
Physical Config CLI
IOS Command Line Interface

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, E - EGP
       i - IS-IS, 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

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
    192.168.9.0/24 is variably subnetted, 4 subnets, 2 masks
C       192.168.9.0/30 is directly connected, Serial0/0/0
L       192.168.9.2/32 is directly connected, Serial0/0/0
C       192.168.9.4/30 is directly connected, Serial0/0/1
L       192.168.9.5/32 is directly connected, Serial0/0/1

R2#show ip prot
R2#show ip protocols

Routing Protocol is "eigrp 101 "
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Default networks flagged in outgoing updates
  Default networks accepted from incoming updates
  EIGRP metric weight K1=1, K2=0, K3=1, K4=0, K5=0
  EIGRP maximum hopcount 100
  EIGRP maximum metric variance 1
  Redistributing: eigrp 101, ospf 1
    Automatic network summarization is in effect
  Automatic address summarization:
    Maximum path: 4
  Routing for Networks:
  Routing Information Sources:
    Gateway         Distance         Last Update
  Distance: internal 90 external 170

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 2.2.2.2
  Number of areas in this router is 1. 0 normal 1 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
  Routing Information Sources:
    Gateway         Distance         Last Update
  Distance: (default is 110)

R2#

```

Figura 5. Tabla de enrutamiento R3

```

R3
Physical Config CLI
IOS Command Line Interface
R3(config-rtr)#exit
R3(config)#exit
R3#
%SYS-5-CONFIG_I: Configured from console by console

R3#show ip ro
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, E - EGP
       i - IS-IS, 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

Gateway of last resort is not set

      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, 2 subnets, 2 masks
C       192.168.9.4/30 is directly connected, Serial0/0/1
L       192.168.9.6/32 is directly connected, Serial0/0/1
R3#show ip pr
R3#show ip protocols

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 3.3.3.3
  Number of areas in this router is 0. 0 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
  Passive Interface(s):
    GigabitEthernet0/0
  Routing Information Sources:
    Gateway         Distance         Last Update
  Distance: (default is 110)

R3#

```

- b. Verificar comunicación entre routers mediante el comando ping y traceroute

Figura 6. Ping desde R1

```
R1
Physical Config CLI
IOS Command Line Interface
R1#
R1#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 = 1/10/21 ms

R1#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 = 2/17/79 ms

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 = 1/1/2 ms

R1#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 = 0/5/18 ms

R1#ping 2001:db8:acad:90::1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:db8:acad:90::1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 2/7/27 ms

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 = 1/5/25 ms

R1#
```

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

Figura 7. Rutas filtradas

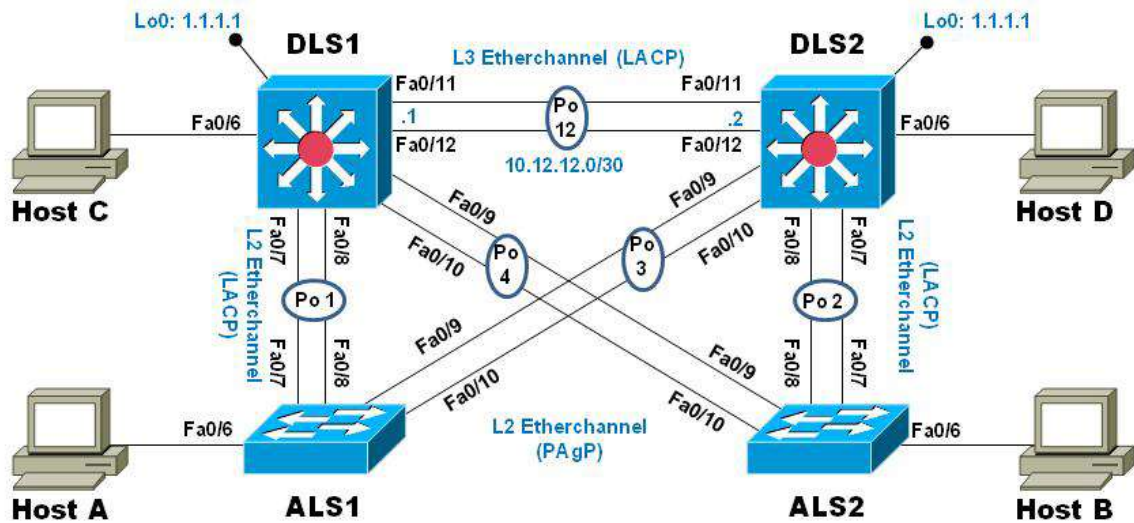
```
R2#show access-lists
Standard IP access list 1
 10 deny 192.168.3.0 0.0.0.255
 20 permit any
R2#
```

**Nota:** Puede ser que Una o más direcciones no serán accesibles desde todos los routers después de la configuración final debido a la utilización de listas de distribución para filtrar rutas y el uso de IPv4 e IPv6 en la misma red.

## 2. Escenario 2

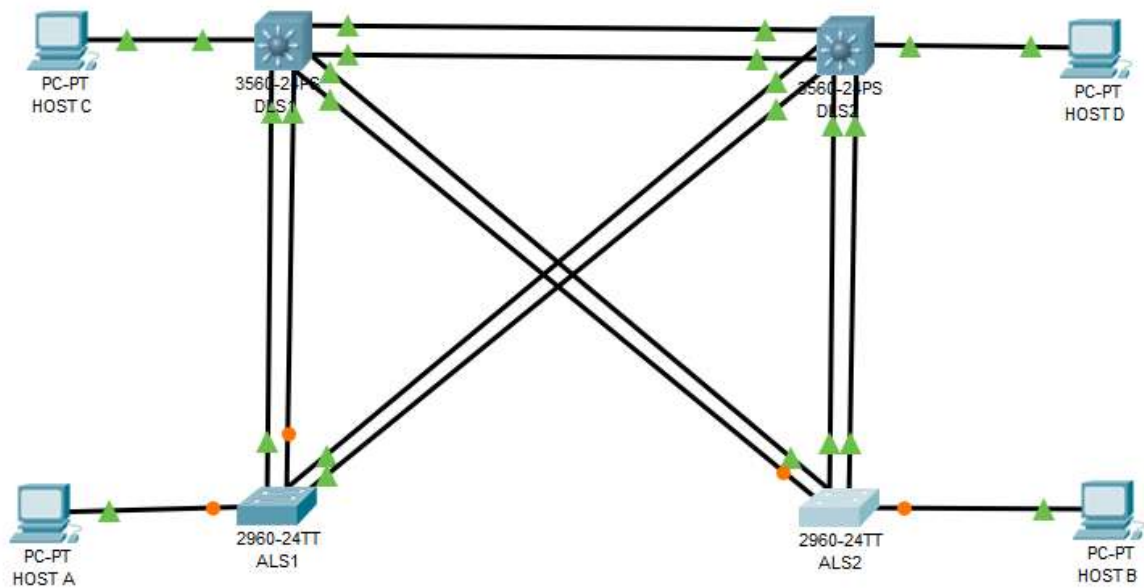
### Topología de red

Figura 8. Escenario 2



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

Figura 9. Simulación escenario 2



- a. Apagar todas las interfaces en cada switch.

**DLS1:**

```
Interface range f0/1-24, g0/1-2  
shutdown  
exit
```

**DLS2:**

```
interface range f0/1-24, g0/1-2  
shutdown  
exit
```

**ALS1:**

```
interface range f0/1-24, g0/1-2  
shutdown  
exit
```

**ALS2:**

```
interface range f0/1-24, g0/1-2  
shutdown  
exit
```

- b. Asignar un nombre a cada switch acorde al escenario establecido.

**DLS1:**

```
configure terminal  
hostname DLS1
```

**DLS2:**

```
configure terminal  
hostname DLS2
```

**ALS1:**

```
configure terminal  
hostname ALS1
```

**ALS2:**

```
configure terminal  
hostname 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.
  - 2) Los Port-channels en las interfaces Fa0/7 y Fa0/8 utilizarán LACP.
  - 3) Los Port-channels en las interfaces F0/9 y fa0/10 utilizará PAgP.
  - 4) Todos los puertos troncales serán asignados a la VLAN 800 como la VLAN nativa.

**DLS1:**

```
interface range f0/11-12
no switchport
channel-group 12 mode active
no shutdown
exit
interface port-channel 12
ip address 10.12.12.1 255.255.255.252
exit
interface range f0/7-10
switchport trunk encapsulation dot1q
switchport trunk native vlan 800
switchport mode trunk
switchport nonegotiate
no shutdown
exit
interface range f0/7-8
desc member of po1 to ALS1
channel-group 1 mode active
exit
interface range f0/9-10
desc member of po4 to ALS2
channel-group 4 mode desirable
exit
```

**DLS2:**

```
interface range f0/11-12
no switchport
channel-group 12 mode active
no shutdown
exit
```

```
interface port-channel 12
ip address 10.12.12.2 255.255.255.252
exit
interface range f0/7-10
switchport trunk encapsulation dot1q
switchport trunk native vlan 800
switchport mode trunk
switchport nonegotiate
no shutdown
exit
interface range f0/7-8
desc member of po1 to ALS2
channel-group 2 mode active
exit
interface range f0/9-10
desc member of po3 to ALS1
channel-group 3 mode desirable
exit
```

#### **ALS1:**

```
interface range f0/7-10
switchport trunk native vlan 800
switchport mode trunk
switchport nonegotiate
no shutdown
exit
interface range f0/7-8
desc member of po1 to DLS1
channel-group 1 mode active
switchport trunk allowed vlan 12,123,234,800,1010,1111,3456
no shutdown
exit
interface range f0/9-10
desc member of po 3 to DLS2
channel-group 3 mode desirable
switchport trunk allowed vlan 12,123,234,800,1010,1111,3456
no shutdown
exit
interface vlan 3456
ip address 10.34.56.101 255.255.255.0
no shutdown
exit
ip default-gateway 10.34.56.254
```

**ALS2:**

```
interface range f0/7-10
switchport trunk native vlan 800
switchport mode trunk
switchport nonegotiate
exit
interface range f0/7-8
desc member of po2 to DLS2
channel-group 2 mode active
switchport trunk allowed vlan 12,123,234,800,1010,1111,3456
no shutdown
exit
interface range f0/9-10
desc member of po 4 to DLS1
channel-group 4 mode desirable
switchport trunk allowed vlan 12,123,234,800,1010,1111,3456
no shutdown
exit
interface vlan 3456
ip add 10.34.56.102 255.255.255.0
no shutdown
exit
ip default-gateway 10.34.56.254
```

- 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.

**DLS1:**

```
vtp domain UNAD
vtp version 3
vtp password cisco123
vtp primary vlan
```

**ALS1:**

```
vtp domain UNAD
vtp version 3
vtp mode client
vtp password cisco123
```

**ALS2:**

```
vtp domain UNAD  
vtp version 3  
vtp mode client  
vtp password cisco123
```

e. Configurar en el servidor principal las siguientes VLAN:

Tabla 1. 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

**DLS1:**

```
vlan 800  
name NATIVA  
exit  
vlan 434  
name ESTACIONAMIENTO  
exit  
vlan 12  
name EJECUTIVOS  
exit  
vlan 123  
name MANTENIMIENTO  
exit  
vlan 234  
name HUESPEDES  
exit  
vlan 1010  
name VOZ  
exit  
vlan 1111  
name VIDEONET  
exit  
vlan 3456  
name ADMINISTRACION
```

- f. En DLS1, suspender la VLAN 434.

**DLS1:**

```
vlan 434
state suspend
exit
```

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

**DLS2:**

```
vtp version 2
vtp mode transparent
vlan 800
name NATIVA
exit
vlan 434
name ESTACIONAMIENTO
exit
vlan 12
name EJECUTIVOS
exit
vlan 123
name MANTENIMIENTO
exit
vlan 234
name HUESPEDES
exit
vlan 1010
name VOZ
exit
vlan 1111
name VIDEONET
exit
vlan 3456
name ADMINISTRACION
```

- h. Suspender VLAN 434 en DLS2.

**DLS2:**

```
vlan 434
state suspend
exit
```

- 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.

**DLS2:**

```
vlan 567
name CONTABILIDAD
exit
```

- 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.

**DLS1:**

```
spanning-tree vlan 1,12,434,800,1010,1111,3456 root primary
spanning-tree vlan 123,234 root secondary
```

- 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.

**DLS2:**

```
spanning-tree vlan 123,234 root primary
spanning-tree vlan 1,12,434,800,1010,3456 root secondary
```

- 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 éstos puertos.

**DLS1:**

```
interface port-channel 1
switchport trunk allowed vlan 12,123,234,800,1010,1111,3456
exit
interface port-channel 4
switchport trunk allowed vlan 12,123,234,800,1010,1111,3456
```

**DLS2:**

```
interface port-channel 2
switchport trunk allowed vlan 12,123,234,800,1010,1111,3456
exit
interface port-channel 3
switchport trunk allowed vlan 12,123,234,800,1010,1111,3456
exit
```

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

Tabla 2. Configuración de Interfaces como puertos de acceso

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		

**DLS1:**

```
interface f0/6
switchport host
switchport access vlan 3456
no shutdown
exit
interface f0/15
switchport host
switchport access vlan 1111
no shutdown
exit
```

**DLS2:**

```
interface f0/6
switchport host
switchport access vlan 12
switchport voice vlan 1010
no shutdown
exit
interface f0/15
switchport host
switchport access vlan 1111
no shutdown
exit
interface range f0/16-18
switchport host
switchport access vlan 567
no shutdown
```

**ALS1:**

```
interface f0/6
switchport host
switchport access vlan 123
switchport voice vlan 1010
no shutdown
exit
interface f0/15
switchport host
switchport access vlan 1111
no shutdown
exit
```

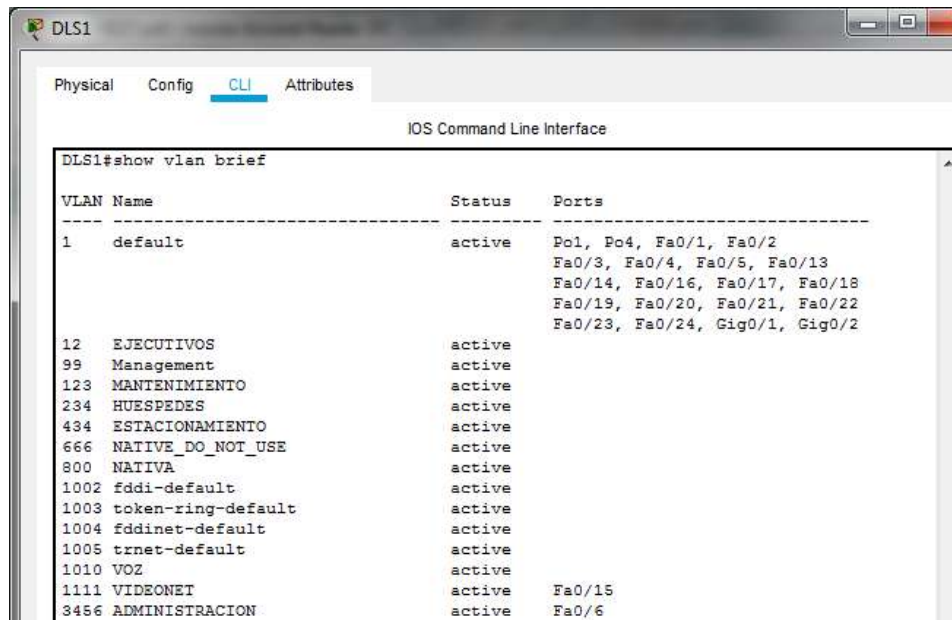
**ALS2:**

```
interface f0/6
switchport host
switchport access vlan 234
no shutdown
exit
interface f0/15
switchport host
switchport access vlan 1111
no shutdown
exit
```

## Part 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

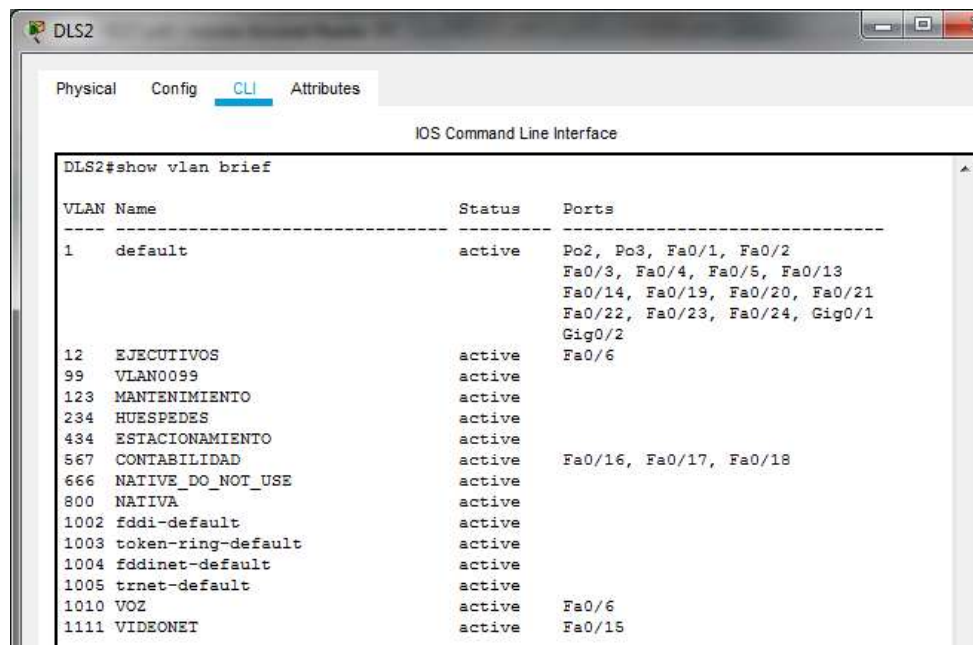
Figura 10. VLAN en DLS1



The screenshot shows the CLI of switch DLS1. The command 'show vlan brief' has been executed, displaying a table of VLANs and their associated ports.

VLAN	Name	Status	Ports
1	default	active	Po1, Po4, Fa0/1, Fa0/2, Fa0/3, Fa0/4, Fa0/5, Fa0/13, Fa0/14, Fa0/16, Fa0/17, Fa0/18, Fa0/19, Fa0/20, Fa0/21, Fa0/22, Fa0/23, Fa0/24, Gig0/1, Gig0/2
12	EJECUTIVOS	active	
99	Management	active	
123	MANTENIMIENTO	active	
234	HUESPEDES	active	
434	ESTACIONAMIENTO	active	
666	NATIVE_DO_NOT_USE	active	
800	NATIVA	active	
1002	fddi-default	active	
1003	token-ring-default	active	
1004	fddinet-default	active	
1005	trnet-default	active	
1010	VOZ	active	
1111	VIDEONET	active	Fa0/15
3456	ADMINISTRACION	active	Fa0/6

Figura 11. VLAN en DLS2



The screenshot shows the CLI of switch DLS2. The command 'show vlan brief' has been executed, displaying a table of VLANs and their associated ports.

VLAN	Name	Status	Ports
1	default	active	Po2, Po3, Fa0/1, Fa0/2, Fa0/3, Fa0/4, Fa0/5, Fa0/13, Fa0/14, Fa0/19, Fa0/20, Fa0/21, Fa0/22, Fa0/23, Fa0/24, Gig0/1, Gig0/2
12	EJECUTIVOS	active	
99	VLAN0099	active	
123	MANTENIMIENTO	active	
234	HUESPEDES	active	
434	ESTACIONAMIENTO	active	
567	CONTABILIDAD	active	Fa0/16, Fa0/17, Fa0/18
666	NATIVE_DO_NOT_USE	active	
800	NATIVA	active	
1002	fddi-default	active	
1003	token-ring-default	active	
1004	fddinet-default	active	
1005	trnet-default	active	
1010	VOZ	active	Fa0/6
1111	VIDEONET	active	Fa0/15

Figura 12. VLAN en ALS1

```
ALS1#show vlan brief
```

VLAN Name	Status	Ports
1 default	active	Po1, Po3, Fa0/1, Fa0/2 Fa0/3, Fa0/4, Fa0/5, Fa0/11 Fa0/12, Fa0/13, Fa0/14, Fa0/16 Fa0/17, Fa0/18, Fa0/19, Fa0/20 Fa0/21, Fa0/22, Fa0/23, Fa0/24 Gig0/1, Gig0/2
99 VLAN0099	active	
666 NATIVE_DO_NOT_USE	active	
1002 fddi-default	active	
1003 token-ring-default	active	
1004 fddinet-default	active	
1005 trnet-default	active	

Figura 13. VLAN en ALS2

```
ALS2#show vlan brief
```

VLAN Name	Status	Ports
1 default	active	Po2, Po4, Fa0/1, Fa0/2 Fa0/3, Fa0/4, Fa0/5, Fa0/11 Fa0/12, Fa0/13, Fa0/14, Fa0/16 Fa0/17, Fa0/18, Fa0/19, Fa0/20 Fa0/21, Fa0/22, Fa0/23, Fa0/24 Gig0/1, Gig0/2
99 VLAN0099	active	
666 NATIVE_DO_NOT_USE	active	
1002 fddi-default	active	
1003 token-ring-default	active	
1004 fddinet-default	active	
1005 trnet-default	active	

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

Figura 14. EtherChannel en DLS1

DLS1#show etherchannel summary

Flags: D - down P - in port-channel  
 I - stand-alone s - suspended  
 H - Hot-standby (LACP only)  
 R - Layer3 S - Layer2  
 U - in use f - failed to allocate aggregator  
 u - unsuitable for bundling  
 w - waiting to be aggregated  
 d - default port

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

Group	Port-channel	Protocol	Ports
1	Po1 (SD)	LACP	Fa0/7 (I) Fa0/8 (I)
4	Po4 (SD)	PAgP	Fa0/9 (I) Fa0/10 (I)
12	Po12 (RU)	LACP	Fa0/11 (P) Fa0/12 (P)

Figura 15. EtherChannel en ALS1

ALS1#show etherchannel summary

Flags: D - down P - in port-channel  
 I - stand-alone s - suspended  
 H - Hot-standby (LACP only)  
 R - Layer3 S - Layer2  
 U - in use f - failed to allocate aggregator  
 u - unsuitable for bundling  
 w - waiting to be aggregated  
 d - default port

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

Group	Port-channel	Protocol	Ports
1	Po1 (SD)	LACP	Fa0/7 (I) Fa0/8 (I)
3	Po3 (SD)	PAgP	Fa0/9 (I) Fa0/10 (I)

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

Figura 16. Spanning tree en DLS1

```

DLS1#show spanning-tree summary
Switch is in pvst mode
Root bridge for: default EJECUTIVOS Management MANTENIMIENTO HUESPEDES
ESTACIONAMIENTO NATIVO_DO_NOT_USE NATIVA
Extended system ID is enabled
PortFast Default is disabled
PortFast BPDU Guard Default is disabled
PortFast BPDU Filter Default is disabled
Loopguard Default is disabled
EtherChannel misconfig guard is disabled
UplinkFast is disabled
BackboneFast is disabled
Configured Pathcost method used is short

Name          Blocking Listening Learning Forwarding STP Active
-----
VLAN0001      0         0         0         6         6
VLAN0012      0         0         0         4         4
VLAN0099      0         0         0         4         4
VLAN0123      0         0         0         4         4
VLAN0234      0         0         0         4         4
VLAN0434      0         0         0         4         4
VLAN0666      0         0         0         4         4
VLAN0800      2         0         0         2         4
-----
9 vlans      2         0         0         22        34
  
```

Figura 17. Spanning tree en DLS2

```

DLS2#show spanning-tree summary
Switch is in pvst mode
Root bridge for: EJECUTIVOS MANTENIMIENTO HUESPEDES ESTACIONAMIENTO CONTABILIDAD
Extended system ID is enabled
PortFast Default is disabled
PortFast BPDU Guard Default is disabled
PortFast BPDU Filter Default is disabled
Loopguard Default is disabled
EtherChannel misconfig guard is disabled
UplinkFast is disabled
BackboneFast is disabled
Configured Pathcost method used is short

Name          Blocking Listening Learning Forwarding STP Active
-----
VLAN0001      3         0         0         3         6
VLAN0012      0         0         0         3         3
VLAN0099      3         0         0         1         4
VLAN0123      0         0         0         4         4
VLAN0234      0         0         0         4         4
VLAN0434      0         0         0         4         4
VLAN0667      0         0         0         4         4
VLAN0666      3         0         0         1         4
VLAN0800      3         0         0         1         4
-----
9 vlans      12        0         0         27        39
  
```

## CONCLUSIONES

Se logra configurar plataformas de conmutación basadas en switches, mediante el uso de protocolos como STP y la configuración de VLANs en escenarios de red corporativos, para comprender el modo de operación de las subredes y los beneficios de administrar dominios de broadcast independientes, en múltiples escenarios al interior de una red jerárquica convergente.

Se usa comandos IOS de configuración avanzada en routers (con direccionamiento IPv4 e IPv6) para protocolos de enrutamiento como: OSPFv3, EIGRP y BGP, en entornos de direccionamiento sin clase, con la intención de diseñar e implementar soluciones de redes escalables, mediante el uso de los principios de enrutamiento y conmutación de paquetes en ambientes LAN y WAN.

Se identifican situaciones problemáticas asociadas con aspectos de conmutación y enrutamiento, mediante el uso eficiente de estrategias basadas en comandos IOS y estadísticas de tráfico en las interfaces, con el fin de resolver conflictos de configuración y conectividad en contextos de redes LAN y WAN.

## BIBLIOGRAFÍA

- Teare, D., Vachon B., Graziani, R. (2015). CISCO Press (Ed). Basic Network and Routing Concepts. Implementing Cisco IP Routing (ROUTE) Foundation Learning Guide CCNP ROUTE 300-101. Recuperado de <https://1drv.ms/b/s!AmIJYei-NT1IlnMfy2rhPZHwEoWx>
- Teare, D., Vachon B., Graziani, R. (2015). CISCO Press (Ed). EIGRP Implementation. Implementing Cisco IP Routing (ROUTE) Foundation Learning Guide CCNP ROUTE 300-101. Recuperado de <https://1drv.ms/b/s!AmIJYei-NT1IlnMfy2rhPZHwEoWx>
- Teare, D., Vachon B., Graziani, R. (2015). CISCO Press (Ed). OSPF Implementation. Implementing Cisco IP Routing (ROUTE) Foundation Learning Guide CCNP ROUTE 300-101. Recuperado de <https://1drv.ms/b/s!AmIJYei-NT1IlnMfy2rhPZHwEoWx>
- Teare, D., Vachon B., Graziani, R. (2015). CISCO Press (Ed). Manipulating Routing Updates. Implementing Cisco IP Routing (ROUTE) Foundation Learning Guide CCNP ROUTE 300-101. Recuperado de <https://1drv.ms/b/s!AmIJYei-NT1IlnMfy2rhPZHwEoWx>
- Teare, D., Vachon B., Graziani, R. (2015). CISCO Press (Ed). Enterprise Internet Connectivity. Implementing Cisco IP Routing (ROUTE) Foundation Learning Guide CCNP ROUTE 300-101. Recuperado de <https://1drv.ms/b/s!AmIJYei-NT1IlnMfy2rhPZHwEoWx>
- Teare, D., Vachon B., Graziani, R. (2015). CISCO Press (Ed). Implementing a Border Gateway Protocol (BGP). Implementing Cisco IP Routing (ROUTE) Foundation Learning Guide CCNP ROUTE 300-101. Recuperado de <https://1drv.ms/b/s!AmIJYei-NT1IlnMfy2rhPZHwEoWx>
- Macfarlane, J. (2014). Network Routing Basics : Understanding IP Routing in Cisco Systems. Recuperado de <http://bibliotecavirtual.unad.edu.co:2048/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=e000xww&AN=158227&lang=es&site=ehost-live>

Froom, R., Frahim, E. (2015). CISCO Press (Ed). Network Design Fundamentals. Implementing Cisco IP Switched Networks (SWITCH) Foundation Learning Guide CCNP SWITCH 300-115. Recuperado de <https://1drv.ms/b/s!AmlJYei-NT1InWR0hoMxgBNv1CJ>

Hucaby, D. (2015). CISCO Press (Ed). CCNP Routing and Switching SWITCH 300-115 Official Cert Guide. Recuperado de <https://1drv.ms/b/s!AglGg5JUgUBthF16RWCSsCZnfDo2>

Donohue, D. (2017). CISCO Press (Ed). CCNP Quick Reference. Recuperado de <https://1drv.ms/b/s!AglGg5JUgUBthFt77ehzL5gp0OKD>

Froom, R., Frahim, E. (2015). CISCO Press (Ed). First Hop Redundancy Protocols. Implementing Cisco IP Switched Networks (SWITCH) Foundation Learning Guide CCNP SWITCH 300-115. Recuperado de <https://1drv.ms/b/s!AmlJYei-NT1InWR0hoMxgBNv1CJ>

Froom, R., Frahim, E. (2015). CISCO Press (Ed). Network Management. Implementing Cisco IP Switched Networks (SWITCH) Foundation Learning Guide CCNP SWITCH 300-115. Recuperado de <https://1drv.ms/b/s!AmlJYei-NT1InWR0hoMxgBNv1CJ>

Froom, R., Frahim, E. (2015). CISCO Press (Ed). v. Implementing Cisco IP Switched Networks (SWITCH) Foundation Learning Guide CCNP SWITCH 300-115. Recuperado de <https://1drv.ms/b/s!AmlJYei-NT1InWR0hoMxgBNv1CJ>

Froom, R., Frahim, E. (2015). CISCO Press (Ed). Campus Network Security. Implementing Cisco IP Switched Networks (SWITCH) Foundation Learning Guide CCNP SWITCH 300-115. Recuperado de <https://1drv.ms/b/s!AmlJYei-NT1InWR0hoMxgBNv1CJ>