PASÓ 11 - PRUEBA DE HABILIDADES

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INTRODUCCIÓN

La presente actividad conlleva aplicar el conocimiento adquirido durante el diplomado de profundización CCNA1 y CCNA2 a través del cual se pondrá en práctica todo el conocimiento recopilado durante este curso, se trataran temas importantes como configuración VLANs, protocolos de enrutamientos RIP, OSPF versión 2, DHCPv4 y ACL lista de accesos.

Por otra parte, se analizaran y diseñaran las redes contenidas en la guía las cuales deben cumplir con unas características definidas, esta actividad se desarrollara con la ayuda de un simulador de redes como packet tracer propietario de cisco.

1. OBJETIVOS

1.1 GENERAL

Identificar el nivel de habilidades que fueron adquiridas a lo largo del diplomado, poniendo a prueba los niveles de comprensión y solución de problemas relacionados con diversos aspectos de Networking.

1.2 ESPECIFICOS

A. Identificar y configurar los protocolos de enrutamientos necesarios.
B. Verificar tablas de enrutamiento en cada dispositivo.
C. Realizar configuración básica a dispositivos de comunicación como Routers, Switch y Servidores.
D. Implementar de DHCP y NAT en dispositivos de comunicación.
E. Configurar y verificar listas de control de acceso ACL
F. Verificar conectividad entre los dispositivos de una topología.

2. ESCENARIO 1

Una empresa posee sucursales distribuidas en las ciudades de Bogotá y Medellín, 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.

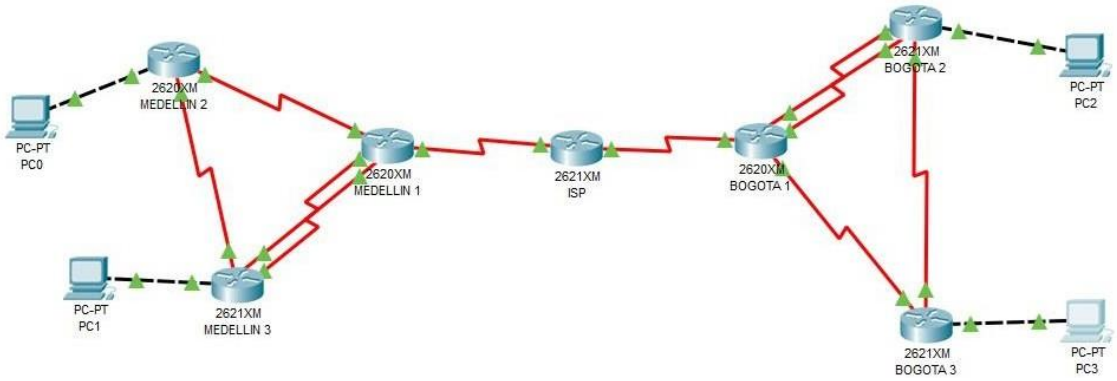


Figura 1 caso 1

Tabla 1 Tabla de enrutamiento caso 1

Ciudad	Puertos	IP
Medellin 3	f0/0, s0/0, s0/1, s0/2	172.29.4.129, 172.29.6.2, 172.29.6.9, 172.29.6.2
Medellin 2	f0/0, s0/0, s0/1	172.29.4.1, 172.29.6.1, 172.29.6.5
Medellin 1	s0/0, s0/1, s0/2, s0/3	209.17.220.1, 172.29.6.2, 172.29.6.14, 172.29.6.10
Bogotá 3	f0/0, s0/0, s0/1	172.29.1.1, 172.29.3.10, 172.29.3.14
Bogotá 2	f0/0, s0/0, s0/1, s0/2	172.29.0.1, 172.29.3.2, 172.29.3.6, 172.29.3.13
Bogotá 1	s0/0, s0/1, s0/2, s0/3	209.17.220.5, 172.29.3.1, 172.29.3.5, 172.29.3.9
ISP	S0/0, s0/1	209.17.220.2, 209.17.220.6

CONFIGURACIÓN MEDELLIN 3

Interface seriales S0/0, S0/1, S0/2

```
MEDELLIN_3(config)#interface serial 0/0
MEDELLIN_3(config-if)#ip address 172.29.6.13 255.255.255.252
MEDELLIN_3(config-if)#no shutdown
MEDELLIN_3(config-if)#exit
MEDELLIN_3(config)#interface serial 0/1
MEDELLIN_3(config-if)#ip address 172.29.6.9 255.255.255.252
MEDELLIN_3(config-if)#no shutdown
MEDELLIN_3(config-if)#exit
MEDELLIN_3(config)#interface serial 0/2
MEDELLIN_3(config-if)#ip address 172.29.6.13 255.255.255.252
MEDELLIN_3(config-if)#no shutdown
MEDELLIN_3(config-if)#ip address 172.29.6.2 255.255.255.252
MEDELLIN_3(config-if)#no shutdown
```

MEDELLIN 1

Interface seriales S0/0, S0/1, S0/2, s0/3

```
MEDELLIN_1(config)#interface Serial0/0
MEDELLIN_1(config-if)#ip address 209.17.220.1 255.255.255.252
MEDELLIN_1(config)#interface Serial0/1
MEDELLIN_1(config-if)#ip address 172.29.6.2 255.255.255.252

MEDELLIN_1(config)#interface Serial0/2
MEDELLIN_1(config-if)#ip address 172.29.6.14 255.255.255.252

MEDELLIN_1(config)#interface Serial0/3
MEDELLIN_1(config-if)#ip address 172.29.6.10 255.255.255.252
```

MEDELLIN 2

Interface seriales S0/0, S0/1

```
MEDELLIN_2(config)#interface Serial0/0
MEDELLIN_2(config-if)#ip address 172.29.6.1 255.255.255.252
MEDELLIN_2(config)#interface Serial0/1

MEDELLIN_2(config-if)#ip address 172.29.6.5 255.255.255.252
MEDELLIN_2(config-if)#
```

BOGOTA 1

Interface serials s0/0, 0/1, 0/2, 0/3

```
BOGOTA_1(config)#INTerface serial 0/0
BOGOTA_1(config-if)#ip address 209.17.220.5 255.255.255.252
BOGOTA_1(config-if)#no shutdown

BOGOTA_1(config)#interface serial 0/1
BOGOTA_1(config-if)#ip address 172.29.3.1 255.255.255.252
BOGOTA_1(config-if)#no shutdown

BOGOTA_1(config)#interface serial 0/2
BOGOTA_1(config-if)#ip address 172.29.3.5 255.255.255.252
BOGOTA_1(config-if)#no shutdown

BOGOTA_1(config)#interface serial 0/3

BOGOTA_1(config-if)#ip address 172.29.3.9 255.255.255.252
BOGOTA_1(config-if)#no shutdown
```

BOGOTA 2

Interface serials s0/0, 0/1, 0/2

```
Router(config)#interface serial 0/0
Router(config-if)#ip address 172.29.3.2 255.255.255.252
Router(config-if)#no shutdown

Router(config-if)#exit
Router(config)#interface serial 0/1
Router(config-if)#ip address 172.29.3.6 255.255.255.252
Router(config-if)#no shutdown

Router(config-if)#exit
Router(config)#interface serial 0/2
Router(config-if)#ip address 172.29.3.13 255.255.255.252
Router(config-if)#no shutdown
```

BOGOTA 2

Interface seriales s0/0, 0/1

```
BOGOTA_3(config)#INTerface SErial 0/0
BOGOTA_3(config-if)#ip address 172.29.3.10 255.255.255.252
BOGOTA_3(config-if)#no shutdown
BOGOTA_3(config-if)#exit
BOGOTA_3(config)#interface serial 0/1
BOGOTA_3(config-if)#ip address 172.29.3.14 255.255.255.252
BOGOTA_3(config-if)#no shutdown
```

ISP

Interface serials s0/0, 0/1

```
ISP(config)#interface SErial 0/1
ISP(config-if)#IP ADDress 209.17.220.6 255.255.255.252
ISP(config-if)#no shutdown
ISP(config)#interface serial 0/0
ISP(config-if)#i address 209.17.220.2 255.255.255.252
ISP(config-if)#no shutdown
```

2.2 PARTE 1: CONFIGURACIÓN DEL ENRUTAMIENTO

A. Configurar el enrutamiento en la red usando el protocolo RIP versión 2, declare la red principal, desactive la sumarización automática.

BOGOTA 3

```
BOGOTA_3(config)#router rip
BOGOTA_3(config-router)#version 2
BOGOTA_3(config-router)#network 172.29.0.0
BOGOTA_3(config-router)#network 172.29.3.0
BOGOTA_3(config-router)#no auto-summary
```

BOGOTA 2

```
BOGOTA_2(config)#router rip
BOGOTA_2(config-router)#version 2
BOGOTA_2(config-router)#network 172.29.3.0
BOGOTA_2(config-router)#network 172.29.0.0
BOGOTA_2(config-router)#no auto-summary
```

BOGOTA 1

```
BOGOTA_1(config)#router rip
BOGOTA_1(config-router)#version 2
BOGOTA_1(config-router)#network 172.29.3.0
BOGOTA_1(config-router)#no auto-summary
```

MEDELLIN 3

```
MEDELLIN_3(config)#router rip
MEDELLIN_3(config-router)#version 2
MEDELLIN_3(config-router)#network 172.29.6.0
MEDELLIN_3(config-router)#network 172.29.4.0
MEDELLIN_3(config-router)#no auto-summary
```

MEDELLIN 2

```
MEDELLIN_2(config)#router rip
MEDELLIN_2(config-router)#version 2
MEDELLIN_2(config-router)#network 172.29.6.0
MEDELLIN_2(config-router)#network 172.29.4.0
MEDELLIN_2(config-router)#no auto-summary
```

MEDELLIN 1

```
MEDELLIN_1(config)#ROuter RIp
MEDELLIN_1(config-router)#VERsion 2
MEDELLIN_1(config-router)#NEtwork 172.29.6.0
MEDELLIN_1(config-router)#NO Auto-summary
```

B. Los routers Bogota1 y Medellín deberán añadir a su configuración de enrutamiento una ruta por defecto hacia el ISP y, a su vez, redistribuirla dentro de las publicaciones de RIP.

BOGOTA 1

```
BOGOTA_1(config)#ip route 0.0.0.0 0.0.0.0 serial 0/0
```

MEDELLIN 1

```
MEDELLIN_1(config)#ip route 0.0.0.0 0.0.0.0 serial 0/0
MEDELLIN_1(config)#router rip
```

MEDELLIN_1(config-router)#version 2
MEDELLIN_1(config-router)#default-information originate

```
BOGOTA_1#show ip route
Codes: C - connected, S - static, I - IGRP, 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 0.0.0.0 to network 0.0.0.0

     172.29.0.0/30 is subnetted, 4 subnets
C       172.29.3.0 is directly connected, Serial0/1
C       172.29.3.4 is directly connected, Serial0/2
C       172.29.3.8 is directly connected, Serial0/3
R       172.29.3.12 [120/1] via 172.29.3.2, 00:00:15, Serial0/1
                    [120/1] via 172.29.3.6, 00:00:15, Serial0/2
                    [120/1] via 172.29.3.10, 00:00:22, Serial0/3
     209.17.220.0/30 is subnetted, 1 subnets
C       209.17.220.4 is directly connected, Serial0/0
S*   0.0.0.0/0 is directly connected, Serial0/0

BOGOTA_1#
```

Figura 2 ip route bogota

C. El router ISP deberá tener una ruta estática dirigida hacia cada red interna de Bogotá y Medellín para el caso se sumarizan las subredes de cada uno a /22.

ISP#configure terminal
ISP(config)#ip route 0.0.0.0 0.0.0.0 172.29.1.0
ISP(config)#ip route 0.0.0.0 0.0.0.0 172.29.3.0
ISP(config)#ip route 0.0.0.0 0.0.0.0 172.29.0.0
ISP(config)#ip route 0.0.0.0 0.0.0.0 172.29.6.0

ISP(config)#ip route 0.0.0.0 0.0.0.0 172.29.4.0

```
ISP#show ip route
Codes: C - connected, S - static, I - IGRP, 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

     209.17.220.0/30 is subnetted, 2 subnets
C       209.17.220.0 is directly connected, Serial0/0
C       209.17.220.4 is directly connected, Serial0/1

ISP#
```

Figura 3 ip route ISP

2.3 PARTE 2: TABLA DE ENRUTAMIENTO.

D. Verificar la tabla de enrutamiento en cada uno de los routers para comprobar las redes y sus rutas.
E. Verificar el balanceo de carga que presentan los routers.

Solución

Se verifica el balanceo de carga y las rutas y redes disponibles.

```
MEDELLIN_3#SHOW IP ROUte
Codes: C - connected, S - static, I - IGRP, 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 172.29.6.10 to network 0.0.0.0

     172.29.0.0/30 is subnetted, 4 subnets
C       172.29.6.0 is directly connected, Serial0/2
R       172.29.6.4 [120/2] via 172.29.6.10, 00:00:26, Serial0/1
                   [120/2] via 172.29.6.14, 00:00:26, Serial0/0
C       172.29.6.8 is directly connected, Serial0/1
C       172.29.6.12 is directly connected, Serial0/0
R*   0.0.0.0/0 [120/1] via 172.29.6.10, 00:00:26, Serial0/1
               [120/1] via 172.29.6.14, 00:00:26, Serial0/0

MEDELLIN_3#
```

Figura 4 ip route medellin 3

MEDELLIN 2

```
MEDELLIN_2#SHOw IP ROUte
Codes: C - connected, S - static, I - IGRP, 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 172.29.6.2 to network 0.0.0.0

     172.29.0.0/30 is subnetted, 4 subnets
C       172.29.6.0 is directly connected, Serial0/0
C       172.29.6.4 is directly connected, Serial0/1
R       172.29.6.8 [120/1] via 172.29.6.2, 00:00:28, Serial0/0
R       172.29.6.12 [120/1] via 172.29.6.2, 00:00:28, Serial0/0
R*   0.0.0.0/0 [120/1] via 172.29.6.2, 00:00:28, Serial0/0

MEDELLIN_2#
```

Figura 5 ip route medellin 2

MEDELLIN 1

```
MEDELLIN_1>SHOW IP ROUte
Codes: C - connected, S - static, I - IGRP, 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 0.0.0.0 to network 0.0.0.0

     172.29.0.0/30 is subnetted, 4 subnets
C       172.29.6.0 is directly connected, Serial0/1
R       172.29.6.4 [120/1] via 172.29.6.1, 00:00:06, Serial0/1
C       172.29.6.8 is directly connected, Serial0/3
C       172.29.6.12 is directly connected, Serial0/2
     209.17.220.0/30 is subnetted, 1 subnets
C       209.17.220.0 is directly connected, Serial0/0
S*   0.0.0.0/0 is directly connected, Serial0/0

MEDELLIN_1>
```

Figura 6 ip route medellin 1

BOGOTA 3

```
BOGOTA_3>SHOW IP ROUte
Codes: C - connected, S - static, I - IGRP, 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 172.29.3.9 to network 0.0.0.0

     172.29.0.0/30 is subnetted, 4 subnets
R       172.29.3.0 [120/1] via 172.29.3.13, 00:00:03, Serial0/1
                   [120/1] via 172.29.3.9, 00:00:16, Serial0/0
R       172.29.3.4 [120/1] via 172.29.3.13, 00:00:03, Serial0/1
                   [120/1] via 172.29.3.9, 00:00:16, Serial0/0
C       172.29.3.8 is directly connected, Serial0/0
C       172.29.3.12 is directly connected, Serial0/1
R*   0.0.0.0/0 [120/1] via 172.29.3.9, 00:00:16, Serial0/0

BOGOTA_3>
```

Figura 7 ip route bogota 3

BOGOTA 2

```
BOGOTA_2>SHOW IP ROUte
Codes: C - connected, S - static, I - IGRP, 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 172.29.3.1 to network 0.0.0.0

     172.29.0.0/30 is subnetted, 4 subnets
C       172.29.3.0 is directly connected, Serial0/0
C       172.29.3.4 is directly connected, Serial0/1
R       172.29.3.8 [120/1] via 172.29.3.14, 00:00:22, Serial0/2
                   [120/1] via 172.29.3.1, 00:00:28, Serial0/0
                   [120/1] via 172.29.3.5, 00:00:28, Serial0/1
C       172.29.3.12 is directly connected, Serial0/2
R*   0.0.0.0/0 [120/1] via 172.29.3.1, 00:00:28, Serial0/0
               [120/1] via 172.29.3.5, 00:00:28, Serial0/1

BOGOTA_2>
```

Figura 8 ip route bogota 2

BOGOTA 1

```
BOGOTA_1>SHOW IP ROUte
Codes: C - connected, S - static, I - IGRP, 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 0.0.0.0 to network 0.0.0.0

     172.29.0.0/30 is subnetted, 4 subnets
C       172.29.3.0 is directly connected, Serial0/1
C       172.29.3.4 is directly connected, Serial0/2
C       172.29.3.8 is directly connected, Serial0/3
R       172.29.3.12 [120/1] via 172.29.3.2, 00:00:13, Serial0/1
                    [120/1] via 172.29.3.6, 00:00:13, Serial0/2
                    [120/1] via 172.29.3.10, 00:00:19, Serial0/3
     209.17.220.0/30 is subnetted, 1 subnets
C       209.17.220.4 is directly connected, Serial0/0
S*   0.0.0.0/0 is directly connected, Serial0/0

BOGOTA_1>
```

Figura 9 ip route bogota 1

a. **Obsérvese en los routers Bogotá1 y Medellín1 cierta similitud por su ubicación, por tener dos enlaces de conexión hacia otro router y por la ruta por defecto que manejan.**

b. **Los routers Medellín2 y Bogotá2 también presentan redes conectadas directamente y recibidas mediante RIP.**

Solución

Los routers muestran rutas conectadas mediante rip

Se observan similitudes en las redes y rutas.

BOGOTA 1

```
BOGOTA_1#show  ip route
Codes: C - connected, S - static, I - IGRP, 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 0.0.0.0 to network 0.0.0.0

     172.29.0.0/30 is subnetted, 4 subnets
C       172.29.3.0 is directly connected, Serial0/1
C       172.29.3.4 is directly connected, Serial0/2
C       172.29.3.8 is directly connected, Serial0/3
R       172.29.3.12 [120/1] via 172.29.3.2, 00:00:07, Serial0/1
                    [120/1] via 172.29.3.6, 00:00:07, Serial0/2
                    [120/1] via 172.29.3.10, 00:00:03, Serial0/3
     209.17.220.0/30 is subnetted, 1 subnets
C       209.17.220.4 is directly connected, Serial0/0
S*   0.0.0.0/0 is directly connected, Serial0/0

BOGOTA_1#
```

Figura 10 ip route bogota 1

MEDELLIN 1

```
MEDELLIN_1#show ip rp
                 ^
% Invalid input detected at '^' marker.

MEDELLIN_1#show ip rou
MEDELLIN_1#show ip route
Codes: C - connected, S - static, I - IGRP, 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 0.0.0.0 to network 0.0.0.0

     172.29.0.0/30 is subnetted, 4 subnets
C       172.29.6.0 is directly connected, Serial0/1
R       172.29.6.4 [120/1] via 172.29.6.1, 00:00:09, Serial0/1
C       172.29.6.8 is directly connected, Serial0/3
C       172.29.6.12 is directly connected, Serial0/2
     209.17.220.0/30 is subnetted, 1 subnets
C       209.17.220.0 is directly connected, Serial0/0
S*   0.0.0.0/0 is directly connected, Serial0/0

MEDELLIN_1#
```

Figura 11 ip route medellin 1

c. Las tablas de los routers restantes deben permitir visualizar rutas redundantes para el caso de la ruta por defecto.

Solución

Los demás router muestran rutas redundantes para el caso de rutas por defectos.

BOGOTA 2

```
BOGOTA_2#show ip route
Codes: C - connected, S - static, I - IGRP, 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 172.29.3.5 to network 0.0.0.0

     172.29.0.0/30 is subnetted, 4 subnets
C       172.29.3.0 is directly connected, Serial0/0
C       172.29.3.4 is directly connected, Serial0/1
R       172.29.3.8 [120/1] via 172.29.3.5, 00:00:03, Serial0/1
                   [120/1] via 172.29.3.14, 00:00:25, Serial0/2
                   [120/1] via 172.29.3.1, 00:00:03, Serial0/0
C       172.29.3.12 is directly connected, Serial0/2
R*   0.0.0.0/0 [120/1] via 172.29.3.5, 00:00:03, Serial0/1
               [120/1] via 172.29.3.1, 00:00:03, Serial0/0

BOGOTA_2#
```

Figura 12 ip route bogota 2

BOGOTA 3

```
BOGOTA_3>SHOw IP ROUte
Codes: C - connected, S - static, I - IGRP, 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 172.29.3.9 to network 0.0.0.0

     172.29.0.0/30 is subnetted, 4 subnets
R       172.29.3.0 [120/1] via 172.29.3.9, 00:00:23, Serial0/0
                   [120/1] via 172.29.3.13, 00:00:14, Serial0/1
R       172.29.3.4 [120/1] via 172.29.3.9, 00:00:23, Serial0/0
                   [120/1] via 172.29.3.13, 00:00:14, Serial0/1
C       172.29.3.8 is directly connected, Serial0/0
C       172.29.3.12 is directly connected, Serial0/1
R*   0.0.0.0/0 [120/1] via 172.29.3.9, 00:00:23, Serial0/0

BOGOTA 3>
```

Figura 13 ip route bogota 3

MEDELLIN 2

```
MEDELLIN_2>SHOw IP ROUte
Codes: C - connected, S - static, I - IGRP, 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 172.29.6.2 to network 0.0.0.0

     172.29.0.0/30 is subnetted, 4 subnets
C       172.29.6.0 is directly connected, Serial0/0
C       172.29.6.4 is directly connected, Serial0/1
R       172.29.6.8 [120/1] via 172.29.6.2, 00:00:15, Serial0/0
R       172.29.6.12 [120/1] via 172.29.6.2, 00:00:15, Serial0/0
R*   0.0.0.0/0 [120/1] via 172.29.6.2, 00:00:15, Serial0/0

MEDELLIN_2>
```

Figura 14 ip route medellin 2

MEDELLIN 3

```
MEDELLIN_3>SHOw IP ROUte
Codes: C - connected, S - static, I - IGRP, 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 172.29.6.14 to network 0.0.0.0

     172.29.0.0/30 is subnetted, 4 subnets
C       172.29.6.0 is directly connected, Serial0/2
R       172.29.6.4 [120/2] via 172.29.6.14, 00:00:01, Serial0/0
                   [120/2] via 172.29.6.10, 00:00:01, Serial0/1
C       172.29.6.8 is directly connected, Serial0/1
C       172.29.6.12 is directly connected, Serial0/0
R*   0.0.0.0/0 [120/1] via 172.29.6.14, 00:00:01, Serial0/0
               [120/1] via 172.29.6.10, 00:00:01, Serial0/1

MEDELLIN_3>
```

Figura 15 ip route medellin 3

d. El router ISP solo debe indicar sus rutas estáticas adicionales a las directamente conectadas.

```
ISP#show ip route
Codes: C - connected, S - static, I - IGRP, 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 172.29.4.0 to network 0.0.0.0

     172.29.0.0/30 is subnetted, 2 subnets
S       172.29.0.0 is directly connected, Serial0/1
S       172.29.4.0 is directly connected, Serial0/0
     209.17.220.0/30 is subnetted, 2 subnets
C       209.17.220.0 is directly connected, Serial0/0
C       209.17.220.4 is directly connected, Serial0/1
S*   0.0.0.0/0 [1/0] via 172.29.4.0
               [1/0] via 172.29.0.0

ISP#
```

Figura 16 ip route ISP

Parte 3: Deshabilitar la propagación del protocolo RIP.

a. Para no propagar las publicaciones por interfaces que no lo requieran se debe deshabilitar la propagación del protocolo RIP, en la siguiente tabla se indican las interfaces de cada router que no necesitan desactivación.

Solución

Los routers que tiene interface que no necesitan rutas conectadas son:

MEDELLIN 2

Interface f0/0

```
MEDELLIN_2(config)#ROUter RIp
MEDELLIN_2(config-router)#VE
MEDELLIN_2(config-router)#VErsion 2
MEDELLIN_2(config-router)#PAS
MEDELLIN_2(config-router)#PASsive-interface F
MEDELLIN_2(config-router)#PASsive-interface FastEthernet 0/0
MEDELLIN_2(config-router)#
```

Figura 17 configurracion RIP medellin 2

MEDELLIN 3

Interface f0/0

```
MEDELLIN_3(config)#ROUter RIp
MEDELLIN_3(config-router)#VE
MEDELLIN_3(config-router)#VErsion 2
MEDELLIN_3(config-router)#no
MEDELLIN_3(config-router)#pas
MEDELLIN_3(config-router)#passive-interface
% Incomplete command.
MEDELLIN_3(config-router)#passive-interface fa
MEDELLIN_3(config-router)#passive-interface fastEthernet 0/0
MEDELLIN_3(config-router)#
```

Figura 18 configurracion RIP medellin 3

BOGOTA 3

Interface f0/0

```
BOGOTA_3(config)#router rip
BOGOTA_3(config-router)#ver
BOGOTA_3(config-router)#version 2
BOGOTA_3(config-router)#pa
BOGOTA_3(config-router)#passive-interface fas
BOGOTA_3(config-router)#passive-interface fastEthernet 0/0
BOGOTA_3(config-router)#
```

Figura 19 configurracion RIP bogota 3

BOGOTA 2

Interface f0/0

```
BOGOTA_2(config)#router rip
BOGOTA_2(config-router)#ver
BOGOTA_2(config-router)#version 2
BOGOTA_2(config-router)#pa
BOGOTA_2(config-router)#passive-interface fas
BOGOTA_2(config-router)#passive-interface fastEthernet 0/0
BOGOTA_2(config-router)#
```

Figura 20 configurracion RIP bogota 2

Parte 4: Verificación del protocolo RIP.

a. **Verificar y documentar las opciones de enrutamiento configuradas en los routers, como el passive interface para la conexión hacia el ISP, la versión de RIP y las interfaces que participan de la publicación entre otros datos.**

BOGOTA 1

```
BOGOTA_1#show ip protocols
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 8 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 2, receive 2
  Interface             Send  Recv  Triggered RIP  Key-chain
  Serial0/1             2     2
  Serial0/2             2     2
  Serial0/3             2     2
Automatic network summarization is not in effect
Maximum path: 4
Routing for Networks:
        172.29.0.0
Passive Interface(s):
Routing Information Sources:
          Gateway         Distance      Last Update
          172.29.3.2           120      00:00:08
          172.29.3.6           120      00:00:08
          172.29.3.10          120      00:00:19
Distance: (default is 120)
```

Figura 21 show ip protocols

BOGOTA 2

```
BOGOTA_2>show ip protocols
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 14 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 2, receive 2
  Interface             Send  Recv  Triggered RIP  Key-chain
  Serial0/0             2     2
  Serial0/1             2     2
  Serial0/2             2     2
Automatic network summarization is not in effect
Maximum path: 4
Routing for Networks:
          172.29.0.0
Passive Interface(s):
          FastEthernet0/0
Routing Information Sources:
          Gateway         Distance      Last Update
          172.29.3.5           120      00:00:20
          172.29.3.1           120      00:00:20
          172.29.3.14          120      00:00:21
Distance: (default is 120)
BOGOTA_2>
```

Figura 22 Figura 23 show ip protocols bogota 2

BOGOTA 3

```
BOGOTA_3>show ip protocols
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 15 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 2, receive 2
  Interface             Send  Recv  Triggered RIP  Key-chain
  Serial0/0             2     2
  Serial0/1             2     2
Automatic network summarization is not in effect
Maximum path: 4
Routing for Networks:
           172.29.0.0
Passive Interface(s):
           FastEthernet0/0
Routing Information Sources:
           Gateway         Distance      Last Update
           172.29.3.9           120      00:00:10
           172.29.3.13          120      00:00:02
Distance: (default is 120)
BOGOTA_3>
```

Figura 24 Figura 25 show ip protocols bogota 3

MEDELLIN 1

```
MEDELLIN_1>show  ip protocols
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 7 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 2, receive 2
  Interface             Send  Recv  Triggered RIP  Key-chain
  Serial0/3             2     2
  Serial0/2             2     2
  Serial0/1             2     2
Automatic network summarization is not in effect
Maximum path: 4
Routing for Networks:
           172.29.0.0
Passive Interface(s):
Routing Information Sources:
           Gateway         Distance      Last Update
           172.29.6.1           120      00:00:30
Distance: (default is 120)
MEDELLIN_1>
```

Figura 26 Figura 27 show ip protocols medellin 1

MEDELLIN 2

```
MEDELLIN_2>show ip protocols
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 13 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 2, receive 2
  Interface             Send  Recv  Triggered RIP  Key-chain
  Serial0/0             2     2
  Serial0/1             2     2
Automatic network summarization is not in effect
Maximum path: 4
Routing for Networks:
           172.29.0.0
Passive Interface(s):
           FastEthernet0/0
Routing Information Sources:
           Gateway         Distance      Last Update
           172.29.6.2           120      00:00:06
Distance: (default is 120)
MEDELLIN_2>
```

Figura 28 show ip protocols medellin 2

MEDELLIN 3

```
MEDELLIN_3>show ip protocols
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 10 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 2, receive 2
  Interface              Send  Recv  Triggered RIP  Key-chain
  Serial0/1              2     2
  Serial0/0              2     2
  Serial0/2              2     2
Automatic network summarization is not in effect
Maximum path: 4
Routing for Networks:
           172.29.0.0
Passive Interface(s):
           FastEthernet0/0
Routing Information Sources:
           Gateway         Distance      Last Update
           172.29.6.14           120      00:00:15
           172.29.6.10           120      00:00:15
Distance: (default is 120)
MEDELLIN_3>
```

Figura 29 show ip protocols medellin 3

b. Verificar y documentar la base de datos de RIP de cada router, donde se informa de manera detallada de todas las rutas hacia cada red.

BOGOTA 1

```
BOGOTA_1#show ip route | begin Gateway
Gateway of last resort is 0.0.0.0 to network 0.0.0.0

     172.29.0.0/30 is subnetted, 4 subnets
C       172.29.3.0 is directly connected, Serial0/1
C       172.29.3.4 is directly connected, Serial0/2
C       172.29.3.8 is directly connected, Serial0/3
R       172.29.3.12 [120/1] via 172.29.3.2, 00:00:20, Serial0/1
                    [120/1] via 172.29.3.6, 00:00:20, Serial0/2
                    [120/1] via 172.29.3.10, 00:00:01, Serial0/3
     209.17.220.0/30 is subnetted, 1 subnets
C       209.17.220.4 is directly connected, Serial0/0
S*   0.0.0.0/0 is directly connected, Serial0/0
```

Figura 30 show ip route bogota 1

BOGOTA 2

```
BOGOTA_2>show ip route | begin Gateway
Gateway of last resort is 172.29.3.5 to network 0.0.0.0

     172.29.0.0/30 is subnetted, 4 subnets
C       172.29.3.0 is directly connected, Serial0/0
C       172.29.3.4 is directly connected, Serial0/1
R       172.29.3.8 [120/1] via 172.29.3.5, 00:00:10, Serial0/1
                   [120/1] via 172.29.3.14, 00:00:22, Serial0/2
                   [120/1] via 172.29.3.1, 00:00:10, Serial0/0
C       172.29.3.12 is directly connected, Serial0/2
R*   0.0.0.0/0 [120/1] via 172.29.3.5, 00:00:10, Serial0/1
               [120/1] via 172.29.3.1, 00:00:10, Serial0/0

BOGOTA_2>
```

Figura 31 show ip route bogota 2

BOGOTA 3

```
BOGOTA_3>show ip route | begin Gateway
Gateway of last resort is 172.29.3.9 to network 0.0.0.0

     172.29.0.0/30 is subnetted, 4 subnets
R       172.29.3.0 [120/1] via 172.29.3.9, 00:00:23, Serial0/0
                   [120/1] via 172.29.3.13, 00:00:00, Serial0/1
R       172.29.3.4 [120/1] via 172.29.3.9, 00:00:23, Serial0/0
                   [120/1] via 172.29.3.13, 00:00:00, Serial0/1
C       172.29.3.8 is directly connected, Serial0/0
C       172.29.3.12 is directly connected, Serial0/1
R*   0.0.0.0/0 [120/1] via 172.29.3.9, 00:00:23, Serial0/0

BOGOTA_3>
```

Figura 32 show ip route bogota 3

MEDELLIN 1

```
MEDELLIN_1>show ip route | begin Gateway
Gateway of last resort is 0.0.0.0 to network 0.0.0.0

     172.29.0.0/30 is subnetted, 4 subnets
C       172.29.6.0 is directly connected, Serial0/1
R       172.29.6.4 [120/1] via 172.29.6.1, 00:00:11, Serial0/1
C       172.29.6.8 is directly connected, Serial0/3
C       172.29.6.12 is directly connected, Serial0/2
     209.17.220.0/30 is subnetted, 1 subnets
C       209.17.220.0 is directly connected, Serial0/0
S*   0.0.0.0/0 is directly connected, Serial0/0

MEDELLIN_1>
```

Figura 33 show ip route medellin 1

MEDELLIN 2

```
MEDELLIN_2>show ip route | begin Gateway
Gateway of last resort is 172.29.6.2 to network 0.0.0.0

     172.29.0.0/30 is subnetted, 4 subnets
C       172.29.6.0 is directly connected, Serial0/0
C       172.29.6.4 is directly connected, Serial0/1
R       172.29.6.8 [120/1] via 172.29.6.2, 00:00:15, Serial0/0
R       172.29.6.12 [120/1] via 172.29.6.2, 00:00:15, Serial0/0
R*   0.0.0.0/0 [120/1] via 172.29.6.2, 00:00:15, Serial0/0

MEDELLIN_2>
MEDELLIN_2>
```

Figura 34 show ip route medellin 2

MEDELLIN 3

```
MEDELLIN_3>show ip route | begin Gateway
Gateway of last resort is 172.29.6.14 to network 0.0.0.0

     172.29.0.0/30 is subnetted, 4 subnets
C       172.29.6.0 is directly connected, Serial0/2
R       172.29.6.4 [120/2] via 172.29.6.14, 00:00:21, Serial0/0
                   [120/2] via 172.29.6.10, 00:00:21, Serial0/1
C       172.29.6.8 is directly connected, Serial0/1
C       172.29.6.12 is directly connected, Serial0/0
R*   0.0.0.0/0 [120/1] via 172.29.6.14, 00:00:21, Serial0/0
               [120/1] via 172.29.6.10, 00:00:21, Serial0/1

MEDELLIN_3>
```

Figura 35 show ip route medellin 3

Parte 5: Configurar encapsulamiento y autenticación PPP.

a. Según la topología se requiere que el enlace Medellín1 con ISP sea configurado con autenticación PAT.

Se configura usuario y contraseña

USUARIO: MEDELLIN_1 y ISP
CLAVE: cisco

```
ISP(config)#username MEDELLIN_1 password cisco
ISP(config)#p
MEDELLIN_1(config)#username ISP password cisco
MEDELLIN_1(config)#
```

Figura 36 usuario y contraseña isp

Se verifica con el comando show interfaces serial 0/0 que tipo de encapsulación tiene y es HDLC

```
MEDELLIN_1>show interfaces serial 0/0
Serial0/0 is up, line protocol is down (disabled)
  Hardware is HD64570
  Internet address is 209.17.220.1/30
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
```

Figura 37 estado de la interface medellin 1

Se cambia la encapsulación por PPP

```
MEDELLIN_1(config-if)#encapsulation ppp
MEDELLIN_1(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0, changed
state to up
```

```
MEDELLIN_1#show interfaces serial 0/0
Serial0/0 is up, line protocol is up (connected)
  Hardware is HD64570
  Internet address is 209.17.220.1/30
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation PPP, loopback not set, keepalive set (10 sec)
  LCP Open
```

Figura 38 estado de la interface serial medellin 1

Se configuro la autenticación en los puertos correspondientes

```
Serial0/0 LCP: State is Open
Serial0/0 PPP: Phase is AUTHENTICATING
Serial0/0 LCP: State is Open
Serial0/0 PPP: Phase is AUTHENTICATING
Serial0/0 LCP: State is Open
Serial0/0 PPP: Phase is AUTHENTICATING
Serial0/0 LCP: State is Open
Serial0/0 PPP: Phase is AUTHENTICATING
Serial0/0 LCP: State is Open
Serial0/0 PPP: Phase is AUTHENTICATING
Serial0/0 LCP: State is Open
Serial0/0 PPP: Phase is AUTHENTICATING
Serial0/0 LCP: State is Open
Serial0/0 PPP: Phase is AUTHENTICATING
```

Figura 39 verificacion de conexión ppoe

b. El enlace Bogotá1 con ISP se debe configurar con autenticación CHAT.

Se verifica con el comando show interfaces serial 0/1 que tipo de encapsulación tiene y es HDLC

```
BOGOTA_1>show interfaces serial 0/1
Serial0/1 is up, line protocol is up (connected)
  Hardware is HD64570
  Internet address is 172.29.3.1/30
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0 (size/max/drops); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/1000/64/0 (size/max total/threshold/drops)
     Conversations  0/0/256 (active/max active/max total)
     Reserved Conversations 0/0 (allocated/max allocated)
     Available Bandwidth 1158 kilobits/sec
  5 minute input rate 21 bits/sec, 0 packets/sec
  5 minute output rate 26 bits/sec, 0 packets/sec
     317 packets input, 21860 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     307 packets output, 26640 bytes, 0 underruns
     0 output errors, 0 collisions, 1 interface resets
     0 output buffer failures, 0 output buffers swapped out
```

Figura 40 estado de la interface serial bogota 1

Se cambia la encapsulación por PPP

```
BOGOTA_1(config)#INTERface serial 0/1
BOGOTA_1(config-if)#en
BOGOTA_1(config-if)#encapsulation ppp
BOGOTA_1(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1, changed state to down

BOGOTA_1(config-if)#
BOGOTA_1(config-if)#exit
BOGOTA_1(config)#exit
BOGOTA_1#
%SYS-5-CONFIG_I: Configured from console by console

BOGOTA_1#sho
BOGOTA_1#show in
BOGOTA_1#show interfaces se
BOGOTA_1#show interfaces serial 0/1
Serial0/1 is up, line protocol is down (disabled)
  Hardware is HD64570
  Internet address is 172.29.3.1/30
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation PPP, loopback not set, keepalive set (10 sec)
  LCP Closed
  Closed: LEXCP, BRIDGECP, IPCP, CCP, CDPCP, LLC2, BACP
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
```

Figura 41 verificacion de conexión ppp

Se crea usuario para ambos routers

USUARIO: BOGOTA_1 y ISP

CLAVE: cisco

```
BOGOTA_1(config-if)#username ISP password cisco
BOGOTA_1(config)#
```

```
ISP(config)#username BOGOTA_1 password cisco
ISP(config)#
```

Figura 42 nombre sw bogota 1

Se configuro la autenticación en los puertos correspondientes

```
ISP(config)#interface serial 0/1
ISP(config-if)#pp
ISP(config-if)#ppp au
ISP(config-if)#ppp authentication ch
ISP(config-if)#ppp authentication chap
ISP(config-if)#
```

```
BOGOTA_1(config-if)#ppp authentication ch
BOGOTA_1(config-if)#ppp authentication chap
BOGOTA_1(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0, changed
state to down

BOGOTA_1(config-if)#
```

Figura 43 autenticacion interface serial isp

Se verifica que funcione el protocolo debug ppp negotiation, debug ppp packet

Para el protocolo undebug all

```
BOGOTA_1#debug ppp negotiation
PPP protocol negotiation debugging is on
BOGOTA_1#
```

```
ISP#debug ppp negotiation
PPP protocol negotiation debugging is on
ISP#
```

Figura 44 negociacion debug bogota 1

Parte 6: Configuración de PAT.

a. **En la topología, si se activa NAT en cada equipo de salida (Bogotá1 y Medellín1), los routers internos de una ciudad no podrán llegar hasta los routers internos en el otro extremo, sólo existirá comunicación hasta los routers Bogotá1, ISP y Medellín1.**

Solución

Antes de activar el NAT

Se verifica la conectividad entre los router externos para este caso se realiza ping entre Bogotá 3 a Medellín 3, la interface serial a la cual se le hizo ping fue s0/1 con ip 172.29.6.9, con esto se demuestra la conectividad de extremos a extremo.

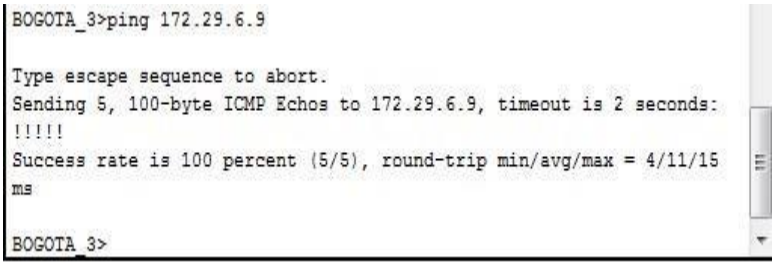


Figura 45 ping bogota 3

Medellín 2 a Bogotá 2 interface serial 0/1 ip 172.29.3.6 con esto se demuestra la conectividad de extremos a extremo.

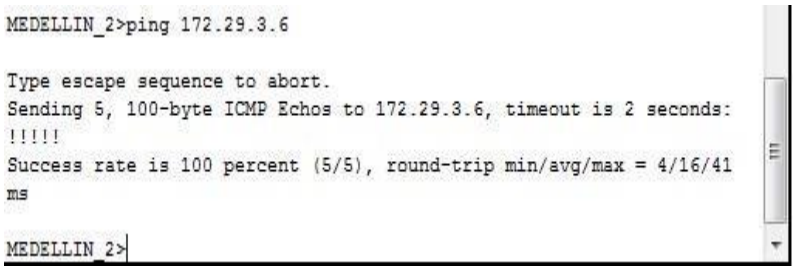


Figura 46 ping medellin 2

Después de activar el NAT

Después de activar el NAT no se ve red exterior interna

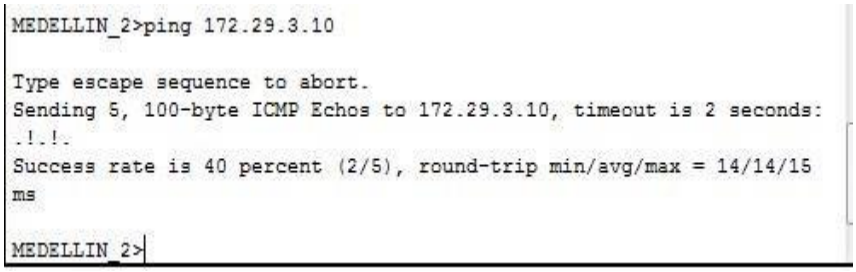


Figura 47 ping medellin 2 nat

b. **Después de verificar lo indicado en el paso anterior proceda a configurar el NAT en el router Medellín1. Compruebe que la traducción de direcciones indique las interfaces de entrada y de salida. Al realizar una prueba de ping, la dirección debe ser traducida automáticamente a la dirección de la interfaz serial 0/0 del router Medellín1, cómo diferente puerto.**

Solución

MEDELLIN 1

Se configuran las ip de las interfaces que son direcciones internas al router seriales 0/1, 0/3, 0/2. Se evidencia la interface serial con dirección global interna

```
MEDELLIN_1(config)#ip nat inside source static 172.29.6.1 209.17.220.1
MEDELLIN_1(config)#interface serial 0/1
MEDELLIN_1(config-if)#ip nat inside
MEDELLIN_1(config-if)#exit
MEDELLIN_1(config)#interface serial 0/0
MEDELLIN_1(config-if)#ip nat outside

MEDELLIN_1(config)#ip nat inside source static 172.29.6.10 209.17.220.1
MEDELLIN_1(config)#interface serial 0/3
MEDELLIN_1(config-if)#ip nat inside
MEDELLIN_1(config-if)#exit
MEDELLIN_1(config)#interface serial 0/0
MEDELLIN_1(config-if)#ip nat outside

MEDELLIN_1(config)#ip nat inside source static 172.29.6.14 209.17.220.1
MEDELLIN_1(config)#interface serial 0/2
MEDELLIN_1(config-if)#ip nat inside
MEDELLIN_1(config-if)#exit
MEDELLIN_1(config)#interface serial 0/0
MEDELLIN_1(config-if)#ip nat outside
```

Se realiza ping del router Medellin2 a Bogotá 3 y se evidencia el NAT

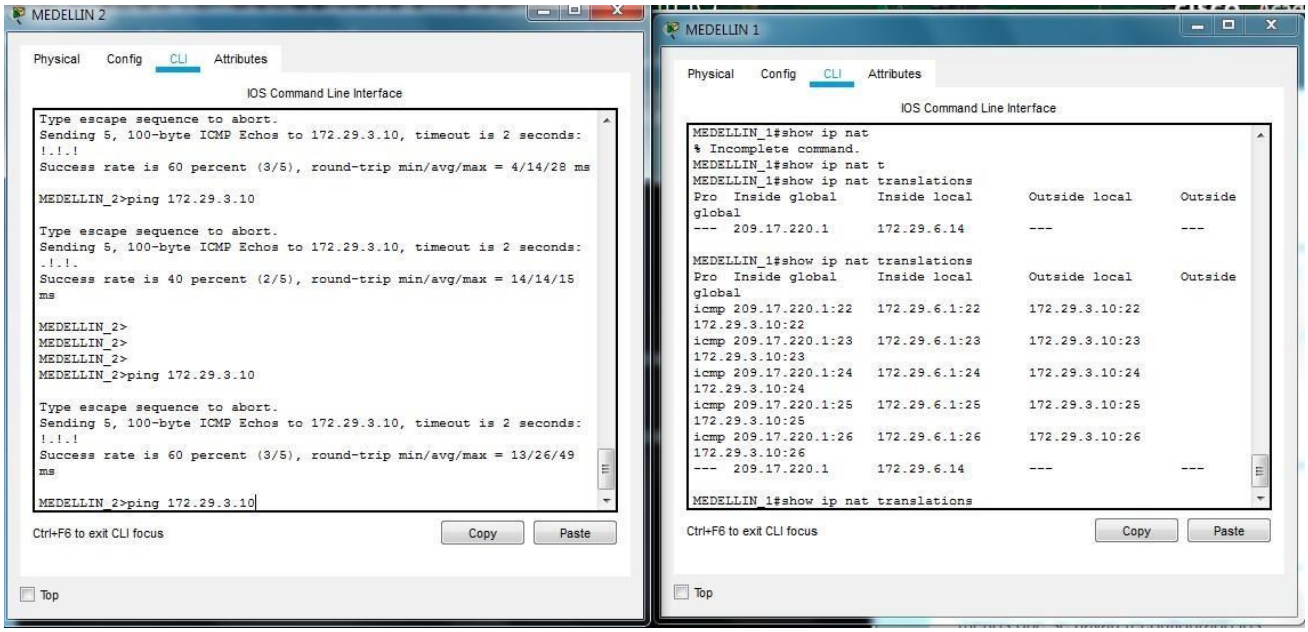


Figura 48 ping medellin 2 a bogota 3

c. Proceda a configurar el NAT en el router Bogotá1. Compruebe que la traducción de direcciones indique las interfaces de entrada y de salida. Al realizar una prueba de ping, la dirección debe ser traducida automáticamente a la dirección de la interfaz serial 0/1/0 del router Bogotá1, cómo diferente puerto.

Solución

BOGOTA 1

Se configuran las ip de las interfaces que son direcciones internas al router seriales 0/1, 0/3, 0/2. Se evidencia la interface serial con dirección global interna

BOGOTA_1(config)#ip nat inside source static 172.29.3.1 209.17.220.5
BOGOTA_1(config)#interface serial 0/1
BOGOTA_1(config-if)#ip nat inside
BOGOTA_1(config-if)#exit

BOGOTA_1(config)#interface serial 0/0
BOGOTA_1(config-if)#ip nat outside

BOGOTA_1(config)#ip nat inside source static 172.29.3.5 209.17.220.5
BOGOTA_1(config)#interface serial 0/2
BOGOTA_1(config-if)#ip nat inside
BOGOTA_1(config-if)#exit
BOGOTA_1(config)#interface serial 0/0
BOGOTA_1(config-if)#ip nat outside

BOGOTA_1(config)#ip nat inside source static 172.29.3.9 209.17.220.5
BOGOTA_1(config)#interface serial 0/3
BOGOTA_1(config-if)#ip nat inside
BOGOTA_1(config-if)#exit
BOGOTA_1(config)#interface serial 0/0
BOGOTA_1(config-if)#ip nat outside

Se realiza ping del router Bogota3 a Medellín 2 y se evidencia el NAT

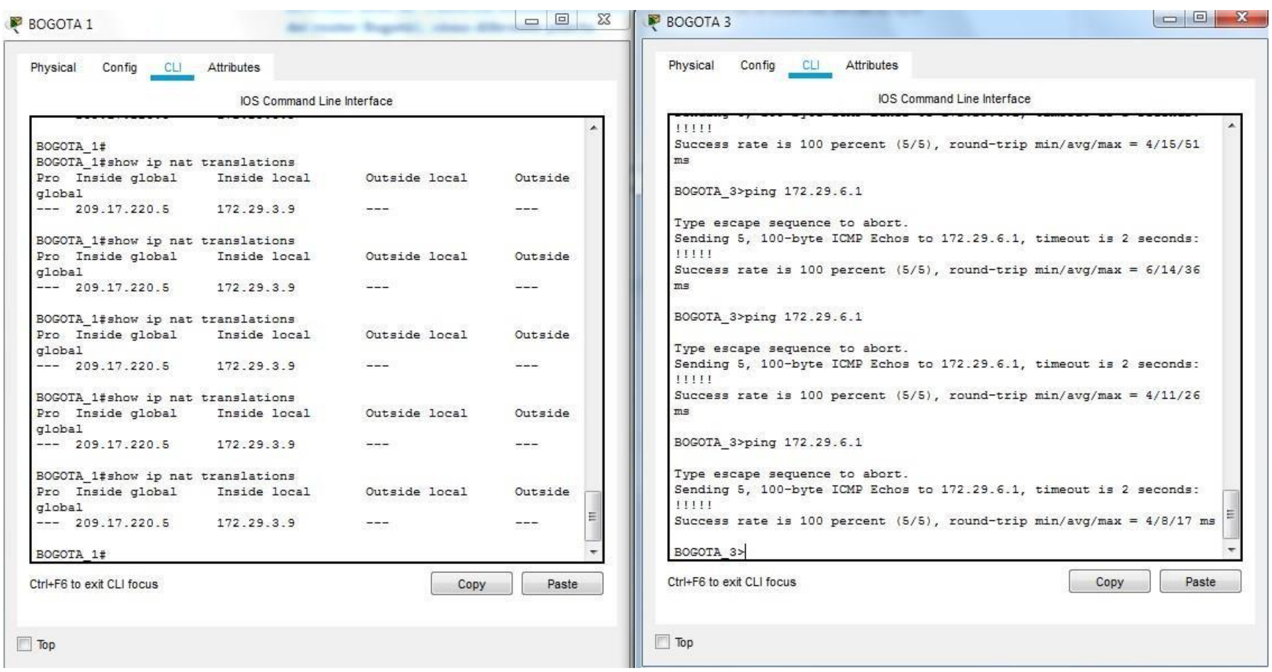


Figura 49 ping bogota 3 a medellin 2

Parte 7: Configuración del servicio DHCP.

a. Configurar la red Medellín2 y Medellín3 donde el router Medellín 2 debe ser el servidor DHCP para ambas redes Lan.

Se configura el servidor DHCP en Medellín 2 y este debe darle servicio al medellin3

Se configura el puerto f0/0 de Medellín 2 la red es 172.29.4.0/25

MEDELLIN_2(config)#interface fastEthernet 0/0
MEDELLIN_2(config-if)#ip address 172.29.4.1 255.255.255.128
MEDELLIN_2(config-if)#no shutdown

Se configura el puerto f0/0 de Medellín 3 la red es 172.29.4.128/25

MEDELLIN_3(config)#interface fastEthernet 0/0
MEDELLIN_3(config-if)#ip address 172.29.4.129 255.255.255.128
MEDELLIN_3(config-if)#no shutdown

Ahora se procede a configurar el pool en Medellín 2

Se realiza exclusiones de ip de las diferentes pool de direcciones, las 10 primeras de cada red.

MEDELLIN_2(config)#ip dhcp excluded-address 172.29.4.1 172.29.4.10
MEDELLIN_2(config)#ip dhcp excluded-address 172.29.4.129 172.29.4.139

Se crea el pool de cada red Medellin_2 y Medellin_3

MEDELLIN_2(config)#ip dhcp pool medellin_2
MEDELLIN_2(dhcp-config)#network 172.29.4.0 255.255.255.128
MEDELLIN_2(dhcp-config)#default-router 172.29.4.1

MEDELLIN_2(config)#ip dhcp pool medellin_3
MEDELLIN_2(dhcp-config)#network 172.29.4.128 255.255.255.128

MEDELLIN_2(dhcp-config)#default-router 172.29.4.129

Se agrega las redes nuevas a rip medellin_2 y medellin_3
MEDELLIN_2(config)#router rip
MEDELLIN_2(config-router)#version 2
MEDELLIN_2(config-router)#network 172.29.4.0
MEDELLIN_2(config-router)#network 172.29.4.128
MEDELLIN_2(config-router)#network 172.29.0.0
MEDELLIN_2(config-router)#network 172.29.1.0
MEDELLIN_2(config-router)#no auto-summary

MEDELLIN_3(config-router)#version 2
MEDELLIN_3(config-router)#network 172.29.4.0
MEDELLIN_3(config-router)#network 172.29.4.128
MEDELLIN_3(config-router)#no auto-summary

Se comprueba entrega de dhcp a la red conectada a medellin_2

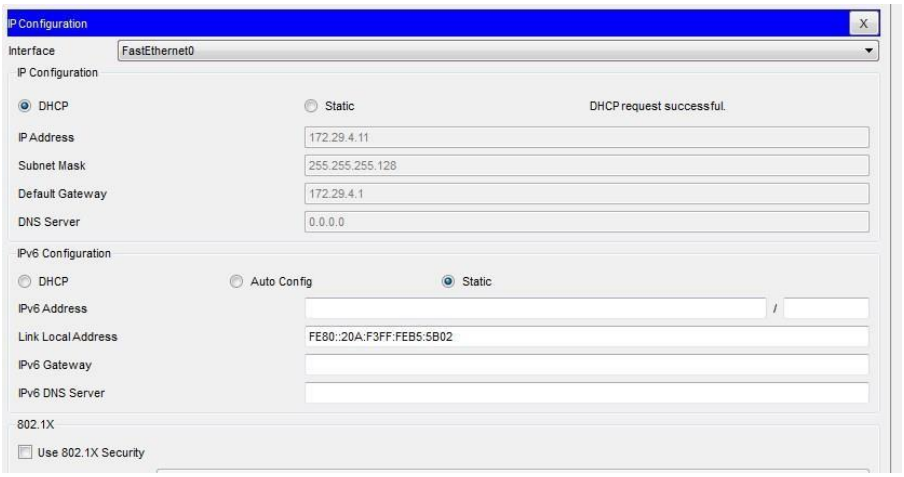


Figura 50 dhcp medellin 2

Se comprueba entrega de dhcp a la red conectada a medellin_3

No es posible hasta que se active recibir notificaciones dhcp en los routers

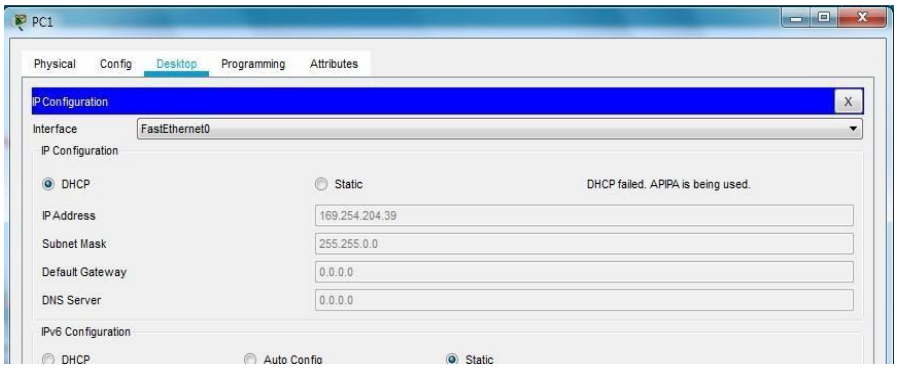


Figura 51 dhcp medellin 3

b. El router Medellín3 deberá habilitar el paso de los mensajes broadcast hacia la IP del router Medellín2.

Se habilita el router medellin_3 para el paso broadcast

MEDELLIN_3(config)#interface fastEthernet 0/0
MEDELLIN_3(config-if)#ip helper-address 172.29.6.5
MEDELLIN_3(config-if)#exit

Se comprueba entrega de dhcp a la red conectada a medellin_3

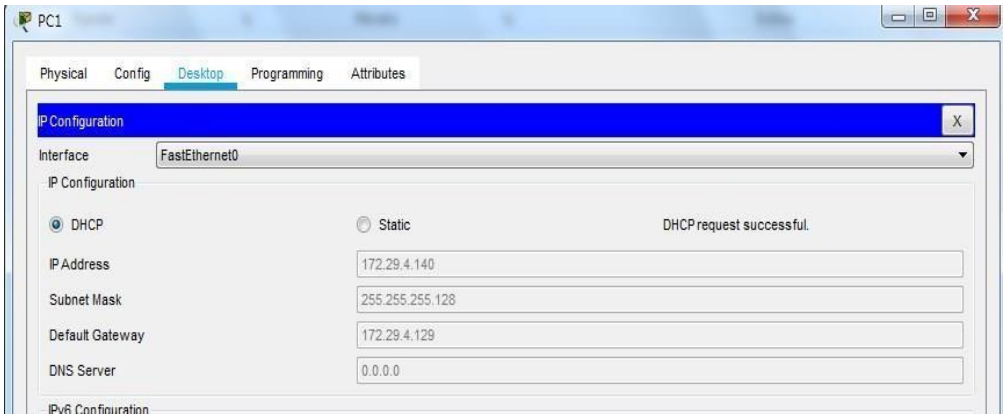


Figura 52 dhcp medellin 3 ok

c. Configurar la red Bogotá2 y Bogotá3 donde el router Bogota 2 debe ser el servidor DHCP para ambas redes Lan.

Se configura el servidor DHCP en Bogota 2 y este debe darle servicio al Bogota3

Se configura el puerto f0/0 de Bogota 2 la red es 172.29.0.0/24

```
BOGOTA_2(config)#interface fastEthernet 0/0
BOGOTA_2(config-if)#ip address 172.29.0.1 255.255.255.0
BOGOTA_2(config-if)#no shutdown
```

Se configura el puerto f0/0 de Bogotá 3 la red es 172.29.1.0 /24

```
BOGOTA_3(config)#interface fastEthernet 0/0
BOGOTA_3(config-if)#ip ad
BOGOTA_3(config-if)#ip address 172.29.1.1 255.255.255.0
BOGOTA_3(config-if)#no shu
BOGOTA_3(config-if)#no shutdown
```

Ahora se procede a configurar el pool en Bogotá 2

Se realiza exclusiones de ip de las diferentes pool de direcciones, las 10 primeras de cada red.

```
BOGOTA_2(config)#ip dhcp excluded-address 172.29.0.1 172.29.0.10
BOGOTA_2(config)#ip dhcp excluded-address 172.29.1.1 172.29.1.10
```

Se crea el pool de cada red Bogota_2 y Bogota_3

```
BOGOTA_2(config)#ip dhcp pool bogota_2
BOGOTA_2(dhcp-config)#network 172.29.0.0 255.255.255.0
BOGOTA_2(dhcp-config)#default-router 172.29.0.1

BOGOTA_2(config)#ip dhcp pool bogota_3
BOGOTA_2(dhcp-config)#network 172.29.1.0 255.255.255.0
BOGOTA_2(dhcp-config)#default-router 172.29.1.1
```

Se agrega las redes nuevas a rip medellin_2 y medellin_3

BOGOTA_2(config-router)#version 2
BOGOTA_2(config-router)#network 172.29.1.0
BOGOTA_2(config-router)#network 172.29.0.0
BOGOTA_2(config-router)#no auto-summary

BOGOTA_3(config)#router rip
BOGOTA_3(config-router)#version 2
BOGOTA_3(config-router)#network 172.29.0.0
BOGOTA_3(config-router)#network 172.29.1.0
BOGOTA_3(config-router)#no auto-summary

Se comprueba entrega de dhcp a la red conectada a bogota_2

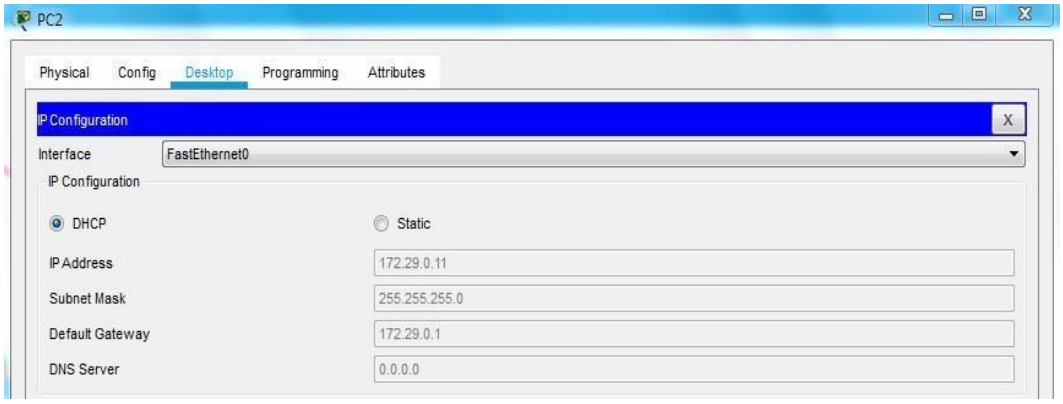


Figura 53 dhcp bogota 2

a. El router Bogota3 deberá habilitar el paso de los mensajes broadcast hacia la IP del router Bogota2.

Se habilita el router bogota_3 para el paso broadcast

BOGOTA_3(config)#interface fastEthernet 0/0
BOGOTA_3(config-if)#ip helper-address 172.29.3.14
BOGOTA_3(config-if)#exit

13. Verificar procesos de comunicación y redireccionamiento de tráfico en los routers mediante el uso de Ping y Traceroute.

Se hace ping y tracert de medellin_2 a medellin_1 y 3

```
MEDELLIN_2>ping 172.29.6.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.29.6.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/5 ms

MEDELLIN_2>traer
MEDELLIN_2>tr
MEDELLIN_2>traceroute 172.29.6.2
Type escape sequence to abort.
Tracing the route to 172.29.6.2

  1   172.29.6.2      1 msec    2 msec    1 msec
MEDELLIN_2>
```

Figura 54 ping medellin 2

```
MEDELLIN_2>traceroute 172.29.6.2
Type escape sequence to abort.
Tracing the route to 172.29.6.2

  1   172.29.6.2      1 msec    2 msec    1 msec
MEDELLIN_2>
MEDELLIN_2>
MEDELLIN_2>
MEDELLIN_2>traceroute 172.29.6.13
Type escape sequence to abort.
Tracing the route to 172.29.6.13

  1   172.29.6.2      16 msec   1 msec    1 msec
  2   172.29.6.13     2 msec    3 msec    1 msec
MEDELLIN_2>ping 172.29.6.13

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.29.6.13, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/7/30 ms

MEDELLIN_2>ping 172.29.6.10

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.29.6.10, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/3/10 ms

MEDELLIN_2>traceroute 172.29.6.10
Type escape sequence to abort.
Tracing the route to 172.29.6.10

  1   172.29.6.2      17 msec   1 msec    1 msec
MEDELLIN_2>
```

Figura 55 traceroute medellin 2

Se hace ping y tracert de medellin_2 a medellin_1 interface s0/0

```
MEDELLIN_2>traceroute 209.17.220.1
Type escape sequence to abort.
Tracing the route to 209.17.220.1

  1   172.29.6.2      19 msec   1 msec    1 msec
MEDELLIN_2>ping 209.17.220.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.17.220.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/6/26 ms

MEDELLIN_2>
```

Figura 56 traceroute medellin 2

Se hace ping y tracert de medellin_2 a isp y bogota_1 interface s0/0

```
MEDELLIN_2>traceroute 209.17.220.1
Type escape sequence to abort.
Tracing the route to 209.17.220.1

  1   172.29.6.2      19 msec   1 msec    1 msec
MEDELLIN_2>ping 209.17.220.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.17.220.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/6/26 ms

MEDELLIN_2>traceroute 209.17.220.2
Type escape sequence to abort.
Tracing the route to 209.17.220.2

  1   172.29.6.2      1 msec    3 msec    0 msec
  2   209.17.220.2    2 msec    0 msec    1 msec
MEDELLIN_2>traceroute 209.17.220.6
Type escape sequence to abort.
Tracing the route to 209.17.220.6

  1   172.29.6.2      6 msec    0 msec    0 msec
  2   209.17.220.2    2 msec    2 msec    1 msec
MEDELLIN_2>traceroute 209.17.220.5
Type escape sequence to abort.
Tracing the route to 209.17.220.5

  1   172.29.6.2      10 msec   1 msec    0 msec
  2   209.17.220.2    3 msec    2 msec    2 msec
  3   209.17.220.5    5 msec    12 msec   12 msec
MEDELLIN 2>
```

Figura 57 resultados tracerourte medellin 2

Se hace ping y tracert de medellin_2 a bogota_3 interface s0/0

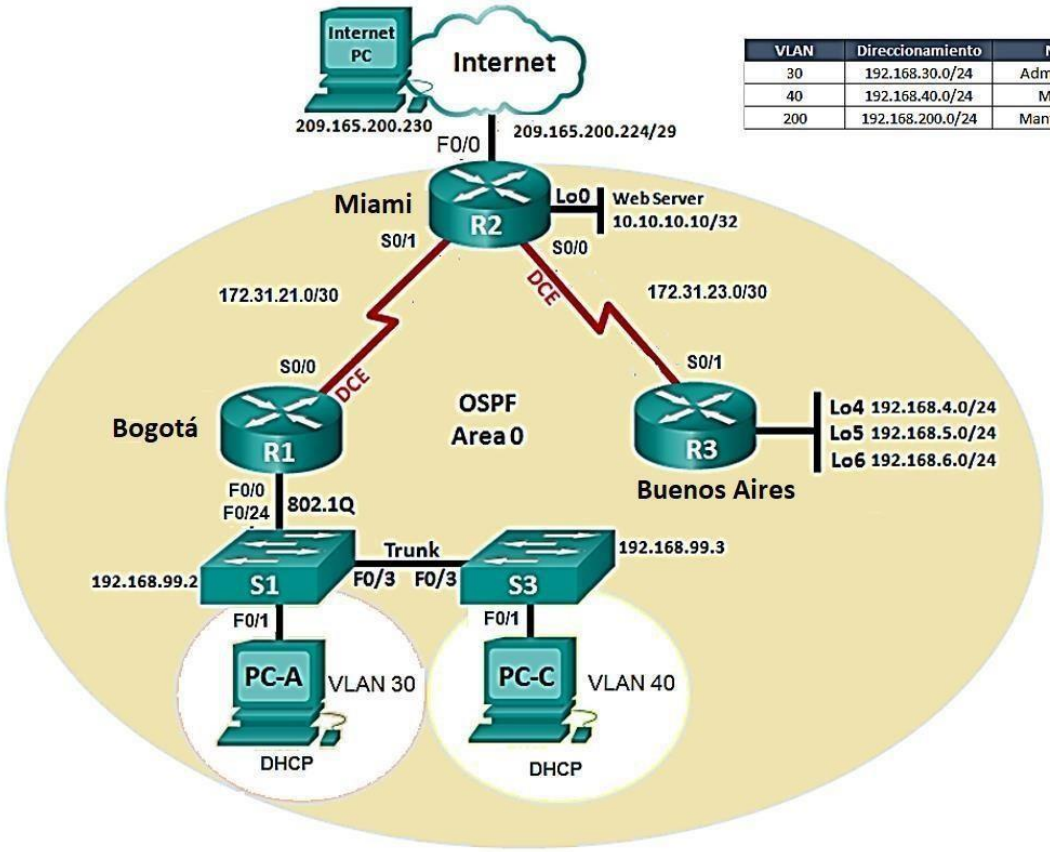
```
MEDELLIN_2>traceroute 172.29.3.10
Type escape sequence to abort.
Tracing the route to 172.29.3.10

  1   172.29.6.2      1 msec    4 msec    1 msec
  2   209.17.220.2    2 msec    1 msec    1 msec
  3   *     11 msec   *
  4   172.29.3.10     13 msec   *     13 msec
MEDELLIN_2>
```

Figura 58 resultados tracerourte medellin 2

Escenario 2

Escenario: Una empresa de Tecnología posee tres sucursales distribuidas en las ciudades de Miami, Bogotá y Buenos Aires, 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.



VLAN	Direccionamiento	Nombre
30	192.168.30.0/24	Administración
40	192.168.40.0/24	Mercadeo
200	192.168.200.0/24	Mantenimiento

Figura 59 topología de red ejemplo 2

1. **Configurar el direccionamiento IP acorde con la topología de red para cada uno de los dispositivos que forman parte del escenario**

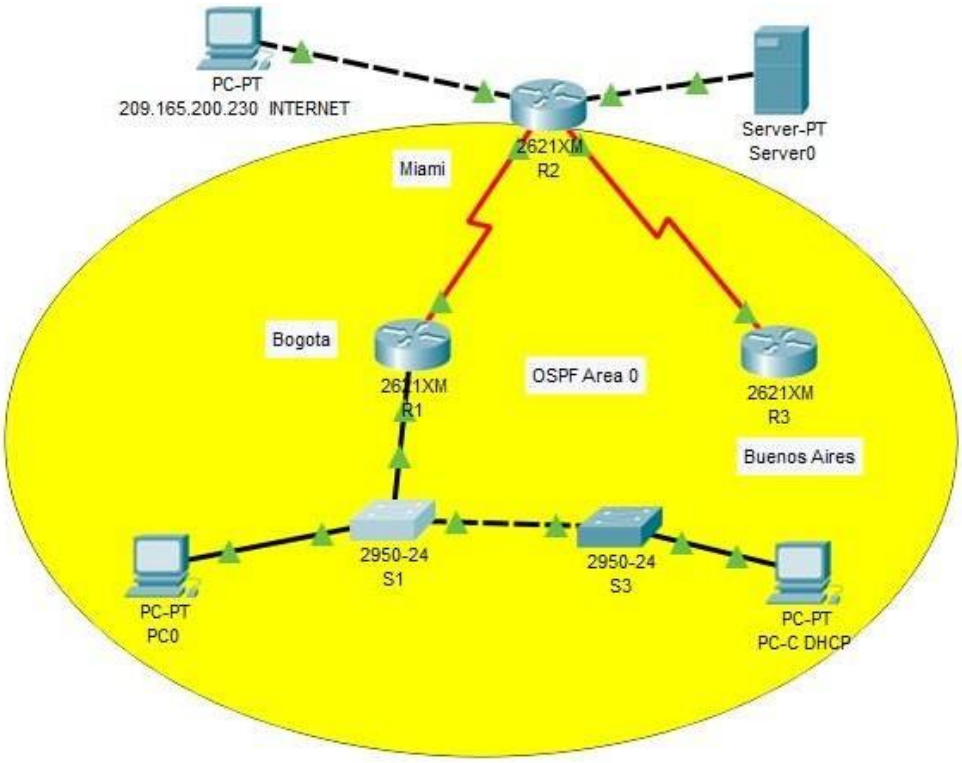


Figura 60 topologia red 2

Solución

R1

Se configura puerto serial s0/0 es enlace con R2

Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface serial 0/0
Router(config-if)#description conexion R2
Router(config-if)#IP ADdress 172.31.21.2 255.255.255.252
Router(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/0, changed state to down

Configuration Puerto del SW1

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface fastEthernet 0/0
Router(config-if)#description conexion S1
Router(config-if)#IP ADdress 192.168.99.1 255.255.255.0
Router(config-if)#NO SHUtdown

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0,
changed state to up
```

R2

Se configura puerto serial s0/0 es enlace con R1

```
R2(config)#interface serial 0/0
R2(config-if)#description conexion R1
R2(config-if)#ip address 172.31.21.1 255.255.255.252
R2(config-if)#no shutdown
```

Se configura puerto serial s0/1 es enlace con R3

```
R2(config)#interface serial 0/1
R2(config-if)#description conexion R3
R2(config-if)#ip address 172.31.23.1 255.255.255.252
R2(config-if)#no shutdown
```

Se configura puerto Fastethernet 0/0 es enlace con internet.

R2(config)#interface fastEthernet 0/0
R2(config-if)#description conexion internet
R2(config-if)#ip address 209.165.200.224 255.255.255.248
Bad mask /29 for address 209.165.200.224
R2(config-if)#no shutdown

R3

Se configura puerto serial s0/0 es enlace con R2

R3(config)#interface serial 0/0
R3(config-if)#description conexion R2
R3(config-if)#ip address 172.31.23.2 255.255.255.252
R3(config-if)#no shutdown

Interface loopback 4

R3(config)#interface loopback 4

R3(config-if)#
%LINK-5-CHANGED: Interface Loopback4, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback4, changed state to up

R3(config-if)#ip address 192.168.4.1 255.255.255.0
R3(config-if)#no shutdown

Interface loopback 5

R3(config)#interface loopback 5

R3(config-if)#
%LINK-5-CHANGED: Interface Loopback5, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback5, changed state to up

R3(config-if)#ip ad
R3(config-if)#ip address 192.168.5.1 255.255.255.0
R3(config-if)#no shu

Interface loopback 6

R3(config)#interface loopback 6

R3(config-if)#
%LINK-5-CHANGED: Interface Loopback6, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback6, changed state to up

R3(config-if)#ip ad
R3(config-if)#ip address 192.168.6.1 255.255.255.0
R3(config-if)#no shu
R3(config-if)#no shutdown
R3(config-if)#

2. Configurar el protocolo de enrutamiento OSPFv2 bajo los siguientes criterios:

OSPFv2 area 0

Configuration Item or Task	Specification
Router ID R1	1.1.1.1
Router ID R2	5.5.5.5
Router ID R3	8.8.8.8
Configurar todas las interfaces LAN como pasivas	
Establecer el ancho de banda para enlaces seriales en	256 Kb/s
Ajustar el costo en la métrica de S0/0 a	9500

Figura 61 criterios a configurar

Se configura el protocolo OSPF según los criterios de la guía.

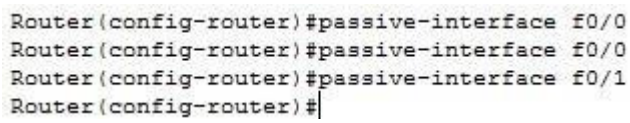
Solution

OSPF R1

```
Router(config)#router ospf 2
Router(config-router)#router-id 1.1.1.1
Router(config-router)#network 172.31.21.0 0.0.0.3 a
Router(config-router)#network 172.31.21.0 0.0.0.3 area 0
Router(config-router)#network 192.168.30.0 0.0.0.255 area 0
Router(config-router)#network 192.168.30.0 0.0.0.255 area 0
Router(config-router)#network 192.168.40.0 0.0.0.255 area 0
Router(config-router)#network 192.168.200.0 0.0.0.255 area 0
Router(config-router)#
```

Configurar todas las interfaces LAN como pasivas

```
Router(config-router)#passive-interface f0/0
Router(config-router)#passive-interface f0/0
Router(config-router)#passive-interface f0/1
Router(config-router)#
```



Establecer el ancho de banda 256 Kb/s y el costo 9500

```
Router(config)#interface serial 0/0
Router(config-if)#ban
Router(config-if)#bandwidth 256
Router(config-if)#ip os
Router(config-if)#ip ospf coa
Router(config-if)#ip ospf co
Router(config-if)#ip ospf cost 9500
```

OSPF R2

R2(config)#router ospf 2
R2(config-router)#router-id 5.5.5.5
R2(config-router)#network 172.31.21.0 0.0.0.3 are
R2(config-router)#network 172.31.21.0 0.0.0.3 area 0 R2(config-router)#network 172.31.21.0 0.0.0.3 area 0
02:20:43: %OSPF-5-ADJCHG: Process 2, Nbr 1.1.1.1 on Serial0/0 frouter-id
5.5.5.5
R2(config-router)#network 172.31.23.0 0.0.0.3 area 0
R2(config-router)#network 10.10.10.0 0.0.0.255 area 0
R2(config-router)#network 172.31.23.0 0.0.0.3 area 0

Configurar todas las interfaces LAN como pasivas

R2(config-router)#passive-interface f
R2(config-router)#passive-interface fastEthernet 0/0
R2(config-router)#passive-interface fastEthernet 0/1
R2(config-router)#passive-interface fastEthernet 1/0
R2(config-router)#

Establecer el ancho de banda 256 Kb/s y el costo 9500

R2(config)#interface serial 0/0
R2(config-if)#ban
R2(config-if)#bandwidth 256
R2(config-if)#ip ospf cost 9500

OSPF R3

R3(config)#router ospf 2
R3(config-router)#router-id 8.8.8.8
R3(config-router)#network 172.31.23.0 0.0.0.3 area 0
R3(config-router)#

01:35:11: %OSPF-5-ADJCHG: Process 2, Nbr 5.5.5.5 on Serial0/0 from LOADING to FULL, Loading Done

R3(config-router)#network 192.168.4.0 0.0.3.255 area 0
R3(config-router)#network 192.168.5.0 0.0.3.255 area 0
R3(config-router)#network 192.168.6.0 0.0.3.255 area 0

Configurar todas las interfaces LAN como pasivas

R3(config-router)#passive-interface lo
R3(config-router)#passive-interface loopback 4
R3(config-router)#passive-interface loopback 5
R3(config-router)#passive-interface loopback 6
R3(config-router)#passive-interface fas
R3(config-router)#passive-interface fastEthernet 0/0
R3(config-router)#passive-interface fastEthernet 0/1

Establecer el ancho de banda 256 Kb/s y el costo 9500

R3(config)#interface serial 0/0
R3(config-if)#ba
R3(config-if)#bandwidth 256
R3(config-if)#
R3#

Verificar información de OSPF

- **Visualizar tablas de enrutamiento y routers conectados por OSPFv2**
- **Visualizar lista resumida de interfaces por OSPF en donde se ilustre el costo de cada interface**
- **Visualizar el OSPF Process ID, Router ID, Address summarizations, Routing Networks, and passive interfaces configuradas en cada router.**

Solución

R1
show ip ospf neighbor

```
Router>show ip ospf neighbor

Neighbor ID     Pri   State           Dead Time   Address
Interface
5.5.5.5           0   FULL/  -        00:00:35    172.31.21.1
Serial0/0
Router>
```

Figura 62 verificar protocolo ospf

show ip protocols

```
Router>show ip protocols

Routing Protocol is "ospf 2"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 1.1.1.1
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    172.31.21.0 0.0.0.3 area 0
    192.168.30.0 0.0.0.255 area 0
    192.168.40.0 0.0.0.255 area 0
    192.168.200.0 0.0.0.255 area 0
  Passive Interface(s):
    FastEthernet0/0
    FastEthernet0/1
  Routing Information Sources:
    Gateway         Distance      Last Update
    1.1.1.1              110      00:27:26
    5.5.5.5              110      00:15:04
    8.8.8.8              110      00:06:38
  Distance: (default is 110)

Router>
```

Figura 63 verificar protocol ppp

show ip ospf

```
Router>show ip ospf
 Routing Process "ospf 2" with ID 1.1.1.1
 Supports only single TOS(TOS0) routes
 Supports opaque LSA
 SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
 Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs
 Number of external LSA 0. Checksum Sum 0x000000
 Number of opaque AS LSA 0. Checksum Sum 0x000000
 Number of DCbitless external and opaque AS LSA 0
 Number of DoNotAge external and opaque AS LSA 0
 Number of areas in this router is 1. 1 normal 0 stub 0 nssa
 External flood list length 0
    Area BACKBONE(0)
        Number of interfaces in this area is 1
        Area has no authentication
        SPF algorithm executed 13 times
        Area ranges are
        Number of LSA 3. Checksum Sum 0x01b8a0
        Number of opaque link LSA 0. Checksum Sum 0x000000
        Number of DCbitless LSA 0
        Number of indication LSA 0
        Number of DoNotAge LSA 0
        Flood list length 0

Router>
```

Figura 64 veriifacar protocolo ospf

R2

show ip ospf neighbor

```
R2#show ip ospf neighbor

Neighbor ID     Pri   State           Dead Time   Address
Interface
8.8.8.8           0   FULL/  -        00:00:32    172.31.23.2
Serial0/1
1.1.1.1           0   FULL/  -        00:00:35    172.31.21.2
Serial0/0
R2#
```

Figura 65 veriifacar protocolo ospf

show ip protocols

```
R2#show ip protocols

Routing Protocol is "ospf 2"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 5.5.5.5
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    172.31.21.0 0.0.0.3 area 0
    172.31.23.0 0.0.0.3 area 0
    10.10.10.0 0.0.0.255 area 0
  Passive Interface(s):
    FastEthernet0/0
    FastEthernet0/1
    FastEthernet1/0
  Routing Information Sources:
    Gateway         Distance      Last Update
    1.1.1.1              110      00:01:02
    5.5.5.5              110      00:18:40
    8.8.8.8              110      00:10:14
  Distance: (default is 110)

R2#
```

Figura 66 veriifacar protocolo protocols

show ip ospf

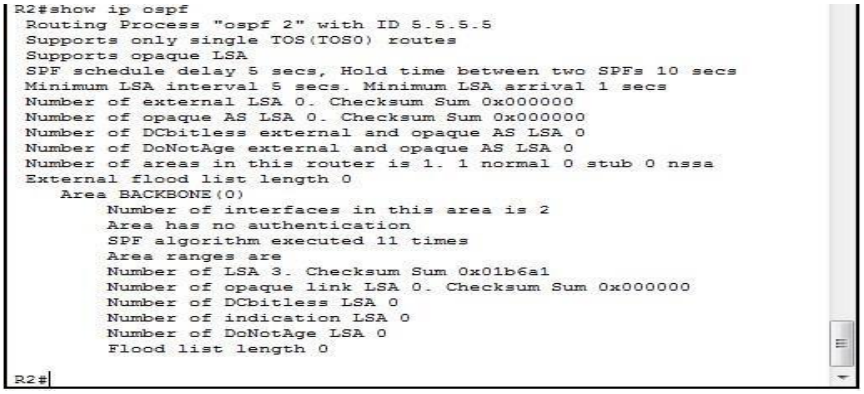


Figura 67 verificar protocolo ospf

R3

show ip ospf neighbor

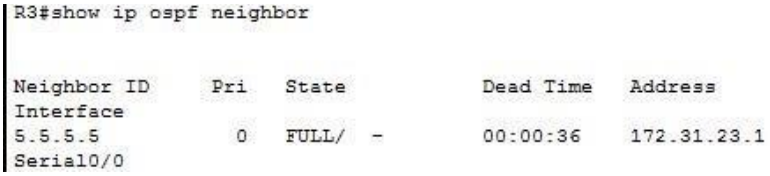


Figura 68 verificar protocolo ospf

show ip protocols

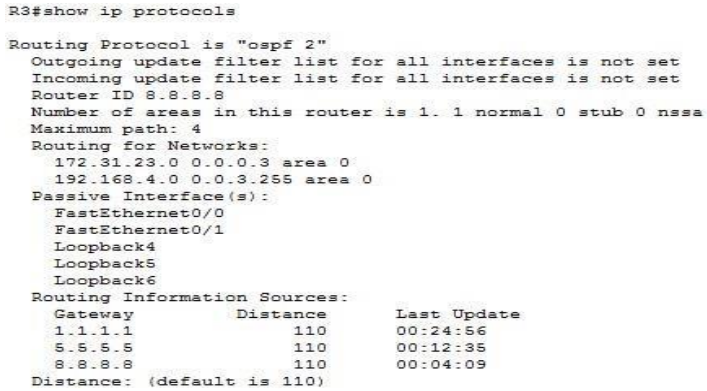


Figura 69 verificar protocolos

show ip ospf

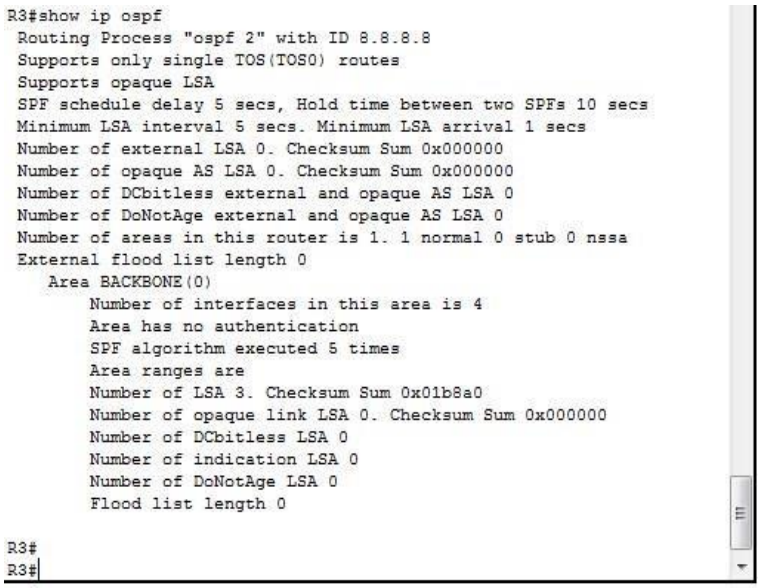


Figura 70 verificar protocolo ospf

3. Configurar VLANs, Puertos troncales, puertos de acceso, encapsulamiento, Inter-VLAN Routing y Seguridad en los Switches acorde a la topología de red establecida.

Solución

S1

Se crean las vlan 30, 40 y 200

Switch#configure terminal
Switch(config)#hostname S1
S1(config)#vlan 30
S1(config-vlan)#name administracion
S1(config-vlan)#vlan 40
S1(config-vlan)#name mercadeo
S1(config-vlan)#vlan 200
S1(config-vlan)#name mantenimiento

S1 Puertos Troncales F0/3 y F0/24

```
S1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
S1(config)#interface fastEthernet 0/3
S1(config-if)#switchport mode trunk
S1(config-if)#switchport trunk native vlan 1
S1(config-if)#exit
S1(config)#interface fastEthernet 0/24
S1(config-if)#switchport mode trunk
S1(config-if)#switchport trunk native vlan 1
S1(config-if)#no shutdown
```

S3 Se crean las vlan 30, 40 y 200

```
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#vlan 30
Switch(config-vlan)#name administracion
Switch(config-vlan)#vlan 40
Switch(config-vlan)#name mercadeo
Switch(config-vlan)#vlan 200
Switch(config-vlan)#name mantenimiento
```

S3 Puertos Troncales F0/3 y F0/24

```
Switch(config)#interface fastEthernet 0/3
Switch(config-if)#switchport trunk native vlan 1
Switch(config-if)#no shutdown
Switch(config-if)#exit
Switch(config)#interface fastEthernet 0/24
Switch(config-if)#switchport mode trunk
Switch(config-if)#switchport trunk native vlan 1
Switch(config-if)#no shutdown
```

5. Asignar direcciones IP a los Switches acorde a los lineamientos.

Solución

S1 Asignación de IP vlan de mantenimiento 192.168.99.2/24

```
S1(config)#interface vlan 200
S1(config-if)#ip address 192.168.99.2 255.255.255.0
S1(config-if)#no shutdown
```

S3 Asignación de IP vlan de mantenimiento 192.168.99.3/24

```
Switch(config)#interface vlan 200
Switch(config-if)#ip address 192.168.99.3 255.255.255.0
Switch(config-if)#no shutdown
```

4. **En el Switch 3 deshabilitar DNS lookup**

```
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#no ip domain-lookup
```

5. **Desactivar todas las interfaces que no sean utilizadas en el esquema de red.**

S1 Puertos modo Access y apagados

S1(config)#interface range fastEthernet 0/1-2, fas
S1(config)#interface range fastEthernet 0/1-2, fastEthernet 0/4-23
S1(config-if-range)#switchport mo
S1(config-if-range)#switchport mode access
S1(config-if-range)#shutdown

S3 Puertos modo Access y apagados

Switch(config)#interface range fastEthernet 0/1-2, fastEthernet 0/4-24
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#shutdown

Implement DHCP and NAT for IPv4

Router(config)#interface fastEthernet 0/0.30
Router(config-subif)#description vlan mercadeo Router(config-subif)#encapsulation dot1Q 30
Router(config-subif)#ip address 192.168.30.1 255.255.255.0
Router(config-subif)#exit
Router(config)#interface fastEthernet 0/0.40
Router(config-subif)#description vlan mercadeo
Router(config-subif)#encapsulation dot1Q 40
Router(config-subif)#ip address 192.168.40.1 255.255.255.0
Router(config-subif)#
Router(config-subif)#exit
Router(config)#interface fastEthernet 0/0.200
Router(config-subif)#description vlan mantenimiento
Router(config-subif)#encapsulation dot1Q 200
Router(config-subif)#ip address 192.168.200.1 255.255.255.0
Router(config-subif)#no shutdown

8. Configurar R1 como servidor DHCP para las VLANs 30 y 40.

Router(config)#ip dhcp pool administracion
Router(dhcp-config)#dns-server 10.10.10.11
Router(dhcp-config)#domain-name ccna-unad.com
Router(dhcp-config)#default-router 192.168.30.1

```
Router(dhcp-config)#exit
Router(config)#ip dhcp pool mercadeo
Router(dhcp-config)#dns-server 10.10.10.11
Router(dhcp-config)#default-router 192.168.40.1
Router(dhcp-config)#network 192.168.40.0 255.255.255.0
```

9. Reservar las primeras 30 direcciones IP de las VLAN 30 y 40 para configuraciones estáticas.

Configurar DHCP pool para VLAN 30	Name: ADMINISTRACION DNS-Server: 10.10.10.11 Domain-Name: ccna-unad.com Establecer default gateway.
Configurar DHCP pool para VLAN 40	Name: MERCADEO DNS-Server: 10.10.10.11 Domain-Name: ccna-unad.com Establecer default gateway.

Figura 71 parametros acconfigurar

```
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip dhcp excluded-address 192.168.30.1 192.168.30.30
Router(config)#ip dhcp excluded-address 192.168.40.1 192.168.40.30
```

10. Configurar NAT en R2 para permitir que los host puedan salir a internet

```
R2#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#user webuser privilege 15 secret admin12345
R2(config)#ip nat inside source static 10.10.10.10 209.165.200.229
R2(config)#int
R2(config)#interface f
R2(config)#interface fastEthernet 0/0
R2(config-if)#ip nat outside
R2(config)#interface fastEthernet 0/1
```

R2(config-if)#ip nat inside

11. **Configurar al menos dos listas de acceso de tipo estándar a su criterio en para restringir o permitir tráfico desde R1 o R3 hacia R2.**

R2(config)#ip access-list st
R2(config)#ip access-list standard ADMIN
R2(config-std-nacl)#per
R2(config-std-nacl)#permit ho
R2(config-std-nacl)#permit host 172.31.21.1
R2(config-std-nacl)#exit
R2(config)#

12. **Configurar al menos dos listas de acceso de tipo extendido o nombradas a su criterio en para restringir o permitir tráfico desde R1 o R3 hacia R2.**

R2(config)#access-list 100 permit icmp any any echo-repl
R2(config)#access-list 100 permit icmp any any echo-reply
R2(config)#exit
R2#

13. **Verificar procesos de comunicación y redireccionamiento de tráfico en los routers mediante el uso de Ping y Traceroute.**

R3

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0, changed
state to down

00:05:26: %OSPF-5-ADJCHG: Process 2, Nbr 5.5.5.5 on Serial0/0 from
FULL to DOWN, Neighbor Down: Interface down or detached

%LINK-5-CHANGED: Interface Serial0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0, changed
state to up

00:05:38: %OSPF-5-ADJCHG: Process 2, Nbr 5.5.5.5 on Serial0/0 from
LOADING to FULL, Loading Done


R3>
R3>confi
R3>confiter
R3>en
R3>enable
R3#ping 172.31.23.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.31.23.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/3/12 ms

R3#
```

Figura 72 ping r3

R2

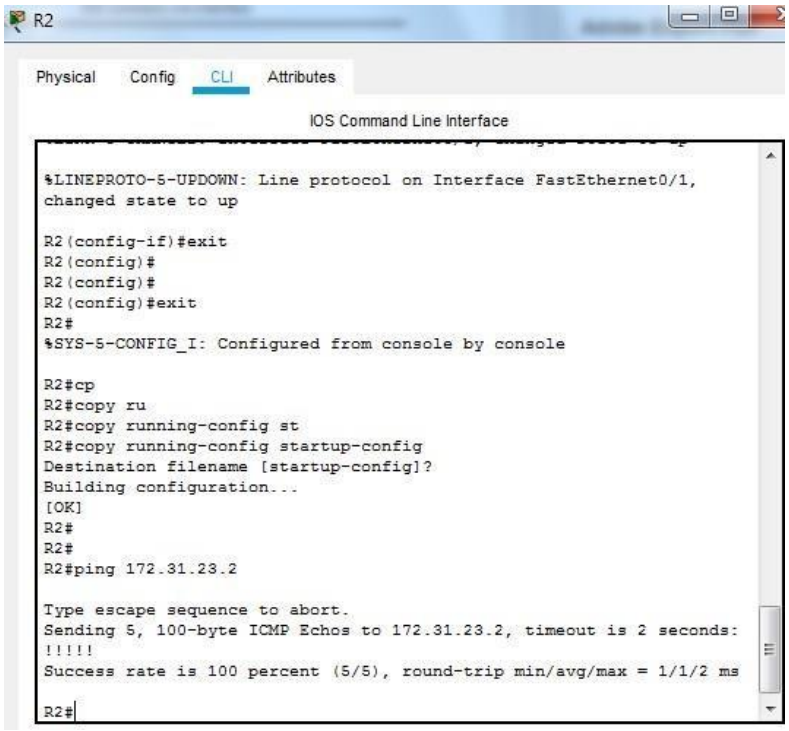


Figura 73 ping R2

Conclusiones

- Se identificaron los diferentes protocolos de enrutamiento dinámicos como rip u osfp en sus versiones 2, cual es su función y que protocolo se comporta mejor según se requiera en la red, rip es un protocolo para redes pequeñas donde funciona como puerta de enlace, osfp es óptimo en redes grandes facilita el enrutamiento ya que busca el camino más corto es un protocolo de borde interior.

- Se verifico la configuración de la tabla de enrutamiento de los diferentes dispositivos, observándose las diferentes rutas y que protocolo las generó. Según el protocolo de enrutamiento se puede observar que ruta tomo y si la ruta es estática o conque protocolo se aprendió.

- Se comprobó la utilidad de los servicios de NAT y DHCP y lo prácticos que pueden llegar a ser para administrar direccionamiento IP, ya que con NAT se puede reutilizar direcciones ip optimizando este recurso tan valioso. Con el fin de conectar host a una red DHCP es óptimo ya que no hay que estar en el sitio y realizar cambios mánales en el direccionamiento cada vez que se realiza un cambio este protocolo lo realizar automáticamente.

- Se conoció y configuro las listas de ACL con el fin de establecer conexión con otros dispositivos.

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