PRUEBA DE HABILIDADES PRACTICAS CCNA

OSCAR EDUARDO CASTILLO ORTIZ

INFORME FINAL

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Dedico este trabajo a mi esposa, mi hijo y toda mi familia que me acompaño y estuvo presente durante mi camino para lograr mis metas.

Aaron es y será mi motor para el continuo aprendizaje y mejoramiento profesional y de calidad de vida.

A mi esposa por apoyarme y acompañarme durante este camino.

CONTENIDO

TABLA DE ILUSTRACIONES

INTRODUCCION

Durante el curso de diplomado se realizó el estudio de los módulos 1: Introducción a las redes donde se aborda todas las temáticas relacionadas con el Modelo OSI y TCP/IP realizando un enfoque minucioso y profundo de cada capa, sus tecnologías, protocolos y aplicaciones, todo esto acompañado de diferentes actividades practicas que se desarrollaron con el uso de Packet Tracert o GNS3 según el caso. En segundo modulo denominado: Routing y Switching permitió conocer mas a fondo los protocolos de enrutamiento y el funcionamiento de conmutadores desde una perspectiva más práctica, aplicando los conceptos en laboratorios virtuales por medio de las plataformas antes mencionadas. Para finalización del diplomado y como cierre se realizo este informe para evidenciar todo el conocimiento adquirido aplicado a dos casos de uso prácticos, esto apoyado de la herramienta Packet Tracert, tendrá desarrollo de diferentes puntos, se anexaron las líneas de código de configuración y pantallazos de los comandos show para mostrar las funcionalidades y sus aplicaciones. El siguiente informe se desarrolló de la siguiente manera: Primero colocando la problemática o caso de estudio, posteriormente las actividades necesarias para solucionar el caso, y finalmente mostrando las verificaciones o sustento de funcionalidades requeridas en el análisis de la necesidad del caso.

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.

Topología de red

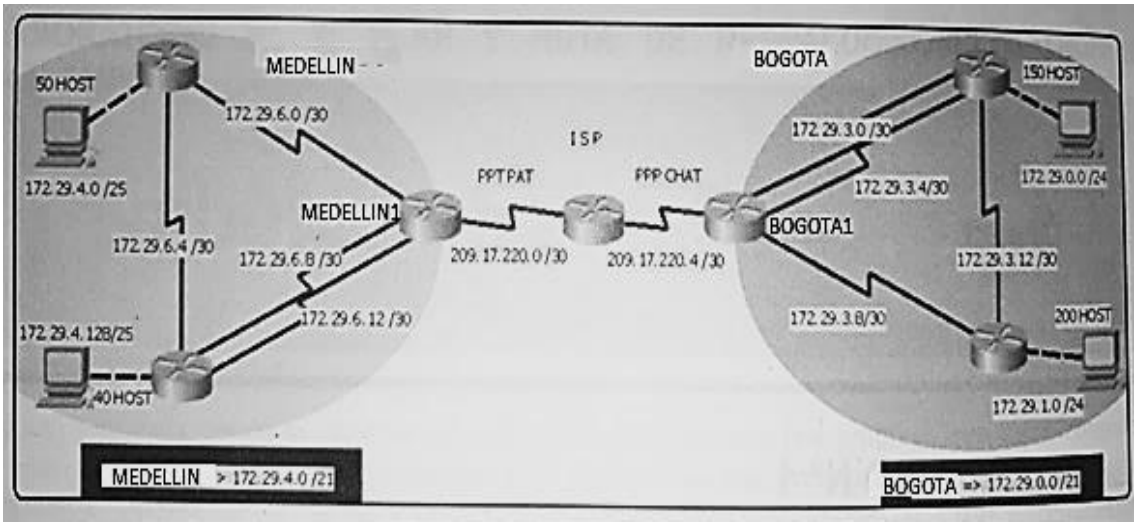


Ilustración 1: Diagrama de red propuesto

Realizar la conexión fisica de los equipos con base en la topología de red

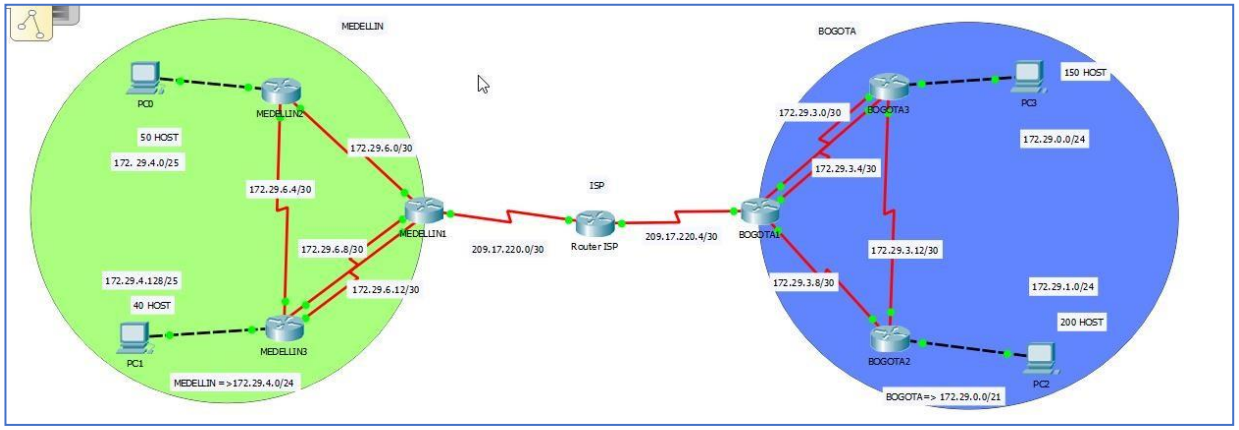


Ilustración 2: Diagrama desarrollado en Packet Tracert

DESARROLLO

Como trabajo inicial se realizó lo siguiente:

Se configuraron las contraseñas y asignacion de hostname a cada dispositivo acorde a la topologia, asi mismo se configuro el banner motd para tener un mensaje inicial cada vez que se conecte por consola al equipo

----Router Medellin 1—--

```
enable
config t
hostname MEDELLIN1
enable secret Unad2019
line con 0
password consoUnad2019
login
line vty 0 4
password vtyUnad2019
login
banner motd "Solo personal autorizado por la UNAD"
service password-encryption
```

----Router Medellin 2—--

```
enable
config t
hostname MEDELLIN2
enable secret Unad2019
line con 0
password consoUnad2019
login
line vty 0 4
password vtyUnad2019
login
banner motd "Solo personal autorizado por la UNAD"
service password-encryption
```

----Router Medellin 3—

```
enable
config t
hostname MEDELLIN3
enable secret Unad2019
line con 0
password consoUnad2019
login
line vty 0 4
password vtyUnad2019
login
banner motd "Solo personal autorizado por la UNAD"
service password-encryption
```

----Router Bogota 1—

```
enable
config t
hostname BOGOTA1
enable secret Unad2019
line con 0
password consoUnad2019
login
line vty 0 4
password vtyUnad2019
login
banner motd "Solo personal autorizado por la UNAD"
service password-encryption
```

----Router Bogota 2—

```
enable
config t
hostname BOGOTA2
enable secret Unad2019
line con 0
password consoUnad2019
login
line vty 0 4
password vtyUnad2019
login
banner motd "Solo personal autorizado por la UNAD"
```

service password-encryption

----Router Bogota 3----

enable
config t
hostname BOGOTA3
enable secret Unad2019
line con 0
password consoUnad2019
login
line vty 0 4
password vtyUnad2019
login
banner motd "Solo personal autorizado por la UNAD"
service password-encryption

----Router ISP—

enable
config t
hostname ISP
enable secret Unad2019
line con 0
password consoUnad2019
login
line vty 0 4
password vtyUnad2019
login
banner motd "Solo personal autorizado por la UNAD"
service password-encryption

Parte 1: Configuración del enrutamiento

a. Se configuro el enrutamiento en la red usando el protocolo RIP versión 2, declarando la red principal, se desactivo la sumarización automática.

----- Medellin 1-------

```
!
router rip
version 2
redistribute static
passive-interface Serial0/1/1
network 172.29.0.0
no auto-summary
!
```

---- Medellin 3-----

```
!
router rip
version 2
passive-interface GigabitEthernet0/0
network 172.29.0.0
no auto-summary
!
```

---- Medellin 2-----

```
!
router rip
version 2
passive-interface GigabitEthernet0/0
network 172.29.0.0
no auto-summary
!
```

---- Bogota 1-----

```
!
router rip
version 2
redistribute static
passive-interface Serial0/1/1
network 172.29.0.0
no auto-summary
```

---- Bogota 3-----

```
!
router rip
version 2
passive-interface GigabitEthernet0/0
network 172.29.0.0
no auto-summary
!
```

---- Bogota 2-----

```
!
router rip
version 2
passive-interface GigabitEthernet0/0
network 172.29.0.0
no auto-summary
!
```

b. En los routers Bogota1 y Medellín se añadio rutas por defecto de salida hacia internet con la IP del punto a punto que corresponde al ISP, esto para tener salida a internet y esa ruta se distribuye a travez del protocolo RIP para la salida de internet.

---- Bogota 1-----

```
!
ip route 0.0.0.0 0.0.0.0 209.17.220.6
!
!
router rip
version 2
redistribute static
passive-interface Serial0/1/1
network 172.29.0.0
no auto-summary
!
```

---- Medellin 1-----

```
!
ip route 0.0.0.0 0.0.0.0 209.17.220.2
router rip
version 2
redistribute static
passive-interface Serial0/1/1
network 172.29.0.0
no auto-summary
```

c. El router ISP tiene una ruta estática dirigida hacia cada red interna de Bogotá y Medellín para tener conexión hacia las ciudades, se utilizo una ruta sumarizada con mascara /.

```
!
ip route 172.29.4.0 255.255.252.0 209.17.220.1
ip route 172.29.0.0 255.255.252.0 209.17.220.5
!
```

Parte 2: Tabla de Enrutamiento.

a. Verificacion de la tabla de enrutamiento en cada uno de los routers para comprobar las redes y sus rutas.

```
BOGOTA1#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 209.17.220.6 to network 0.0.0.0

     172.29.0.0/16 is variably subnetted, 9 subnets, 3 masks
R       172.29.0.0/24 [120/1] via 172.29.3.2, 00:00:13, Serial0/0/0
                      [120/1] via 172.29.3.6, 00:00:13, Serial0/0/1
R       172.29.1.0/24 [120/1] via 172.29.3.10, 00:00:20, Serial0/1/0
C       172.29.3.0/30 is directly connected, Serial0/0/0
L       172.29.3.1/32 is directly connected, Serial0/0/0
C       172.29.3.4/30 is directly connected, Serial0/0/1
L       172.29.3.5/32 is directly connected, Serial0/0/1
C       172.29.3.8/30 is directly connected, Serial0/1/0
L       172.29.3.9/32 is directly connected, Serial0/1/0
R       172.29.3.12/30 [120/1] via 172.29.3.10, 00:00:20, Serial0/1/0
                       [120/1] via 172.29.3.2, 00:00:13, Serial0/0/0
                       [120/1] via 172.29.3.6, 00:00:13, Serial0/0/1
     209.17.220.0/24 is variably subnetted, 3 subnets, 2 masks
C       209.17.220.4/30 is directly connected, Serial0/1/1
L       209.17.220.5/32 is directly connected, Serial0/1/1
C       209.17.220.6/32 is directly connected, Serial0/1/1
S*   0.0.0.0/0 [1/0] via 209.17.220.6

BOGOTA1#
```

Ilustración 3: Tabla de enrutamiento Bogota1

```
BOGOTA2#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 172.29.3.9 to network 0.0.0.0

     172.29.0.0/16 is variably subnetted, 9 subnets, 3 masks
R       172.29.0.0/24 [120/1] via 172.29.3.13, 00:00:08, Serial0/0/1
C       172.29.1.0/24 is directly connected, GigabitEthernet0/0
L       172.29.1.1/32 is directly connected, GigabitEthernet0/0
R       172.29.3.0/30 [120/1] via 172.29.3.9, 00:00:23, Serial0/0/0
                      [120/1] via 172.29.3.13, 00:00:08, Serial0/0/1
R       172.29.3.4/30 [120/1] via 172.29.3.9, 00:00:23, Serial0/0/0
                      [120/1] via 172.29.3.13, 00:00:08, Serial0/0/1
C       172.29.3.8/30 is directly connected, Serial0/0/0
L       172.29.3.10/32 is directly connected, Serial0/0/0
C       172.29.3.12/30 is directly connected, Serial0/0/1
L       172.29.3.14/32 is directly connected, Serial0/0/1
R*   0.0.0.0/0 [120/1] via 172.29.3.9, 00:00:23, Serial0/0/0
```

Ilustración 4: Tabla de enrutamiento Bogota 2

```
BOGOTA3#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 172.29.3.5 to network 0.0.0.0

     172.29.0.0/16 is variably subnetted, 10 subnets, 3 masks
C       172.29.0.0/24 is directly connected, GigabitEthernet0/0
L       172.29.0.1/32 is directly connected, GigabitEthernet0/0
R       172.29.1.0/24 [120/1] via 172.29.3.14, 00:00:17, Serial0/0/1
C       172.29.3.0/30 is directly connected, Serial0/0/0
L       172.29.3.2/32 is directly connected, Serial0/0/0
C       172.29.3.4/30 is directly connected, Serial0/1/0
L       172.29.3.6/32 is directly connected, Serial0/1/0
R       172.29.3.8/30 [120/1] via 172.29.3.14, 00:00:17, Serial0/0/1
                      [120/1] via 172.29.3.1, 00:00:01, Serial0/0/0
                      [120/1] via 172.29.3.5, 00:00:01, Serial0/1/0
C       172.29.3.12/30 is directly connected, Serial0/0/1
L       172.29.3.13/32 is directly connected, Serial0/0/1
R*   0.0.0.0/0 [120/1] via 172.29.3.5, 00:00:01, Serial0/1/0
               [120/1] via 172.29.3.1, 00:00:01, Serial0/0/0
```

Ilustración 5: Tabla de enrutamiento Bogota 3

```
MEDELLIN1#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 209.17.220.2 to network 0.0.0.0

     172.29.0.0/16 is variably subnetted, 9 subnets, 3 masks
R       172.29.4.0/25 [120/1] via 172.29.6.2, 00:00:27, Serial0/0/0
R       172.29.4.128/25 [120/1] via 172.29.6.10, 00:00:19, Serial0/1/0
                        [120/1] via 172.29.6.14, 00:00:19, Serial0/0/1
C       172.29.6.0/30 is directly connected, Serial0/0/0
L       172.29.6.1/32 is directly connected, Serial0/0/0
R       172.29.6.4/30 [120/1] via 172.29.6.2, 00:00:27, Serial0/0/0
                      [120/1] via 172.29.6.10, 00:00:19, Serial0/1/0
                      [120/1] via 172.29.6.14, 00:00:19, Serial0/0/1
C       172.29.6.8/30 is directly connected, Serial0/1/0
L       172.29.6.9/32 is directly connected, Serial0/1/0
C       172.29.6.12/30 is directly connected, Serial0/0/1
L       172.29.6.13/32 is directly connected, Serial0/0/1
     209.17.220.0/24 is variably subnetted, 3 subnets, 2 masks
C       209.17.220.0/30 is directly connected, Serial0/1/1
L       209.17.220.1/32 is directly connected, Serial0/1/1
C       209.17.220.2/32 is directly connected, Serial0/1/1
S*   0.0.0.0/0 [1/0] via 209.17.220.2

MEDELLIN1#
```

Ilustración 6: Tabla de enrutamiento Medellin 1

```
MEDELLIN2#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 172.29.6.1 to network 0.0.0.0

     172.29.0.0/16 is variably subnetted, 9 subnets, 3 masks
C       172.29.4.0/25 is directly connected, GigabitEthernet0/0
L       172.29.4.1/32 is directly connected, GigabitEthernet0/0
R       172.29.4.128/25 [120/1] via 172.29.6.6, 00:00:26, Serial0/0/1
C       172.29.6.0/30 is directly connected, Serial0/0/0
L       172.29.6.2/32 is directly connected, Serial0/0/0
C       172.29.6.4/30 is directly connected, Serial0/0/1
L       172.29.6.5/32 is directly connected, Serial0/0/1
R       172.29.6.8/30 [120/1] via 172.29.6.1, 00:00:00, Serial0/0/0
                      [120/1] via 172.29.6.6, 00:00:26, Serial0/0/1
R       172.29.6.12/30 [120/1] via 172.29.6.1, 00:00:00, Serial0/0/0
                       [120/1] via 172.29.6.6, 00:00:26, Serial0/0/1
R*   0.0.0.0/0 [120/1] via 172.29.6.1, 00:00:00, Serial0/0/0

MEDELLIN2#
```

Ilustración 7: Tabla de enrutamiento Medellin 2

```
MEDELLIN3#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 172.29.6.13 to network 0.0.0.0

     172.29.0.0/16 is variably subnetted, 10 subnets, 3 masks
R       172.29.4.0/25 [120/1] via 172.29.6.5, 00:00:27, Serial0/1/0
C       172.29.4.128/25 is directly connected, GigabitEthernet0/0
L       172.29.4.129/32 is directly connected, GigabitEthernet0/0
R       172.29.6.0/30 [120/1] via 172.29.6.9, 00:00:22, Serial0/0/1
                      [120/1] via 172.29.6.13, 00:00:22, Serial0/0/0
                      [120/1] via 172.29.6.5, 00:00:27, Serial0/1/0
C       172.29.6.4/30 is directly connected, Serial0/1/0
L       172.29.6.6/32 is directly connected, Serial0/1/0
C       172.29.6.8/30 is directly connected, Serial0/0/1
L       172.29.6.10/32 is directly connected, Serial0/0/1
C       172.29.6.12/30 is directly connected, Serial0/0/0
L       172.29.6.14/32 is directly connected, Serial0/0/0
R*   0.0.0.0/0 [120/1] via 172.29.6.13, 00:00:22, Serial0/0/0
               [120/1] via 172.29.6.9, 00:00:22, Serial0/0/1
```

Ilustración 8: Tabla de enrutamiento Medellin 3

b. Verificacion del balanceo de carga que presentan los routers.

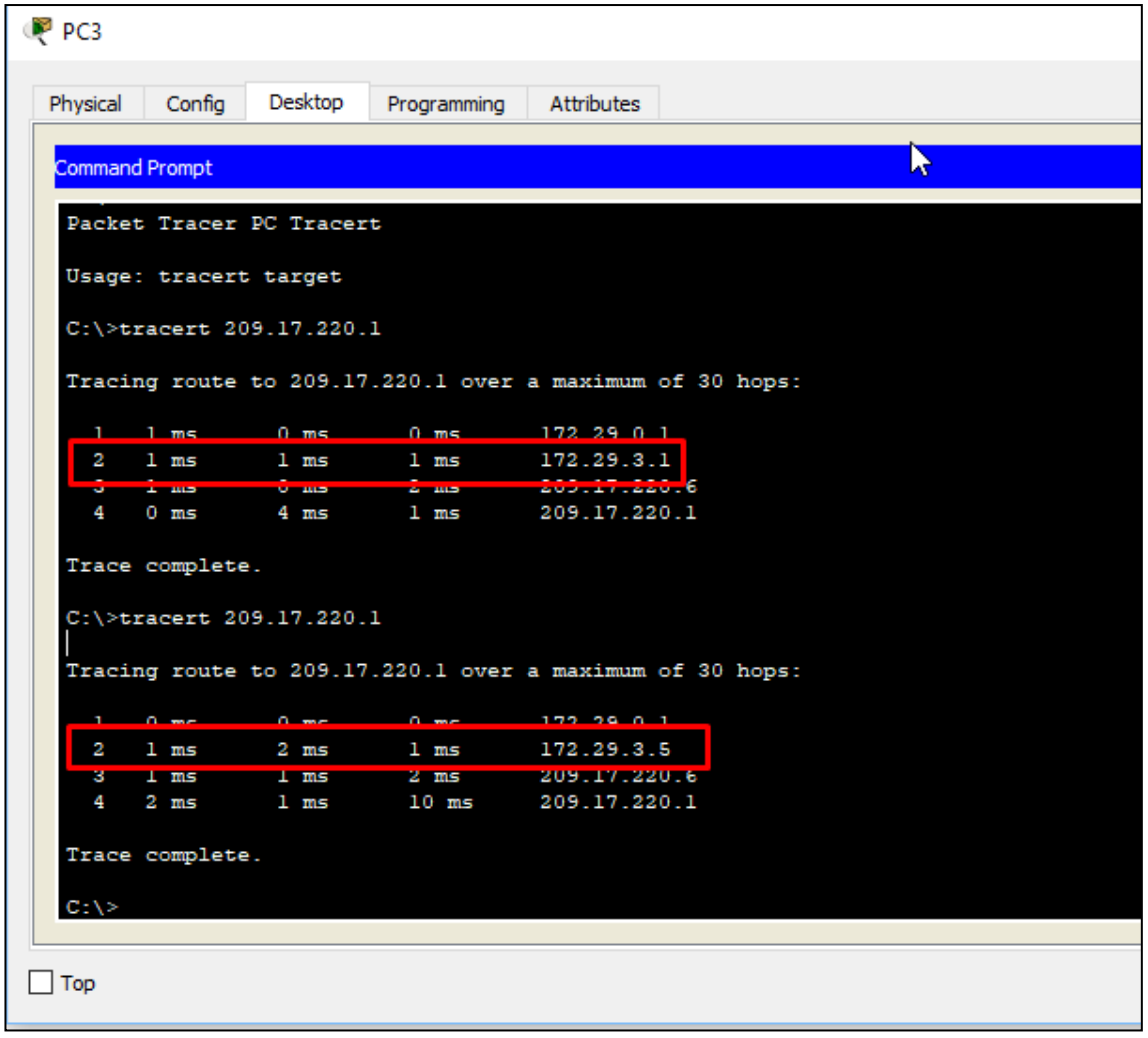


Ilustración 9: Ping PCA Verificación de balanceo

Nota: En el primero tracert, el paquete sale a travez del enlace 172.29.3.1, mientras que en el segundo se ve que sale a traves del enlace 172.29.3.5 pues el balancea las conexiones, enviando por los enlaces por turnos.

c. **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.**

```
BOGOTA3#show ip route rip
     172.29.0.0/16 is variably subnetted, 10 subnets, 3 masks
R       172.29.1.0/24 [120/1] via 172.29.3.14, 00:00:24, Serial0/0/1
R       172.29.3.8/30 [120/1] via 172.29.3.14, 00:00:24, Serial0/0/1
                      [120/1] via 172.29.3.5, 00:00:26, Serial0/1/0
                      [120/1] via 172.29.3.1, 00:00:26, Serial0/0/0
R*   0.0.0.0/0 [120/1] via 172.29.3.5, 00:00:26, Serial0/1/0
R*   0.0.0.0/0 [120/1] via 172.29.3.1, 00:00:26, Serial0/0/0
```

Ilustración 10: Doble enlace Bogota3

```
MEDELLIN3#show ip route rip
     172.29.0.0/16 is variably subnetted, 10 subnets, 3 masks
R       172.29.4.0/25 [120/1] via 172.29.6.5, 00:00:20, Serial0/1/0
R       172.29.6.0/30 [120/1] via 172.29.6.9, 00:00:14, Serial0/0/1
                      [120/1] via 172.29.6.13, 00:00:14, Serial0/0/0
                      [120/1] via 172.29.6.5, 00:00:20, Serial0/1/0
R*   0.0.0.0/0 [120/1] via 172.29.6.13, 00:00:14, Serial0/0/0
R*   0.0.0.0/0 [120/1] via 172.29.6.9, 00:00:14, Serial0/0/1
```

Ilustración 11: Doble enlace Medellin3

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

```
MEDELLIN2#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 172.29.6.1 to network 0.0.0.0

     172.29.0.0/16 is variably subnetted, 9 subnets, 3 masks
C       172.29.4.0/25 is directly connected, GigabitEthernet0/0
L       172.29.4.1/32 is directly connected, GigabitEthernet0/0
R       172.29.4.128/25 [120/1] via 172.29.6.6, 00:00:19, Serial0/0/1
C       172.29.6.0/30 is directly connected, Serial0/0/0
L       172.29.6.2/32 is directly connected, Serial0/0/0
C       172.29.6.4/30 is directly connected, Serial0/0/1
L       172.29.6.5/32 is directly connected, Serial0/0/1
R       172.29.6.8/30 [120/1] via 172.29.6.6, 00:00:19, Serial0/0/1
                      [120/1] via 172.29.6.1, 00:00:06, Serial0/0/0
R       172.29.6.12/30 [120/1] via 172.29.6.1, 00:00:06, Serial0/0/0
                       [120/1] via 172.29.6.6, 00:00:19, Serial0/0/1
R*   0.0.0.0/0 [120/1] via 172.29.6.1, 00:00:06, Serial0/0/0

MEDELLIN2#
```

Ilustración 12: Rutas RIP Medellin2

```
BOGOTA2#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 172.29.3.9 to network 0.0.0.0

     172.29.0.0/16 is variably subnetted, 9 subnets, 3 masks
R       172.29.0.0/24 [120/1] via 172.29.3.13, 00:00:26, Serial0/0/1
C       172.29.1.0/24 is directly connected, GigabitEthernet0/0
L       172.29.1.1/32 is directly connected, GigabitEthernet0/0
R       172.29.3.0/30 [120/1] via 172.29.3.13, 00:00:26, Serial0/0/1
                      [120/1] via 172.29.3.9, 00:00:13, Serial0/0/0
R       172.29.3.4/30 [120/1] via 172.29.3.13, 00:00:26, Serial0/0/1
                      [120/1] via 172.29.3.9, 00:00:13, Serial0/0/0
C       172.29.3.8/30 is directly connected, Serial0/0/0
L       172.29.3.10/32 is directly connected, Serial0/0/0
C       172.29.3.12/30 is directly connected, Serial0/0/1
L       172.29.3.14/32 is directly connected, Serial0/0/1
R*   0.0.0.0/0 [120/1] via 172.29.3.9, 00:00:13, Serial0/0/0

BOGOTA2#
```

Ilustración 13: Rutas RIP Bogota 2

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

```
BOGOTA3#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 172.29.3.5 to network 0.0.0.0

     172.29.0.0/16 is variably subnetted, 10 subnets, 3 masks
C       172.29.0.0/24 is directly connected, GigabitEthernet0/0
L       172.29.0.1/32 is directly connected, GigabitEthernet0/0
R       172.29.1.0/24 [120/1] via 172.29.3.14, 00:00:16, Serial0/0/1
C       172.29.3.0/30 is directly connected, Serial0/0/0
L       172.29.3.2/32 is directly connected, Serial0/0/0
C       172.29.3.4/30 is directly connected, Serial0/1/0
L       172.29.3.6/32 is directly connected, Serial0/1/0
R       172.29.3.8/30 [120/1] via 172.29.3.14, 00:00:16, Serial0/0/1
                      [120/1] via 172.29.3.5, 00:00:10, Serial0/1/0
                      [120/1] via 172.29.3.1, 00:00:10, Serial0/0/0
C       172.29.3.12/30 is directly connected, Serial0/0/1
L       172.29.3.13/32 is directly connected, Serial0/0/1
R*   0.0.0.0/0 [120/1] via 172.29.3.5, 00:00:10, Serial0/1/0
               [120/1] via 172.29.3.1, 00:00:10, Serial0/0/0

BOGOTA3#
```

Ilustración 14: Ruta por defecto doble Bogota3

```
MEDELLIN3#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 172.29.6.9 to network 0.0.0.0

     172.29.0.0/16 is variably subnetted, 10 subnets, 3 masks
R       172.29.4.0/25 [120/1] via 172.29.6.5, 00:00:22, Serial0/1/0
C       172.29.4.128/25 is directly connected, GigabitEthernet0/0
L       172.29.4.129/32 is directly connected, GigabitEthernet0/0
R       172.29.6.0/30 [120/1] via 172.29.6.5, 00:00:22, Serial0/1/0
                      [120/1] via 172.29.6.9, 00:00:12, Serial0/0/1
                      [120/1] via 172.29.6.13, 00:00:12, Serial0/0/0
C       172.29.6.4/30 is directly connected, Serial0/1/0
L       172.29.6.6/32 is directly connected, Serial0/1/0
C       172.29.6.8/30 is directly connected, Serial0/0/1
L       172.29.6.10/32 is directly connected, Serial0/0/1
C       172.29.6.12/30 is directly connected, Serial0/0/0
L       172.29.6.14/32 is directly connected, Serial0/0/0
R*   0.0.0.0/0 [120/1] via 172.29.6.9, 00:00:12, Serial0/0/1
               [120/1] via 172.29.6.13, 00:00:12, Serial0/0/0

MEDELLIN3#
```

Ilustración 15: Ruta por defecto doble Medellin3

f. El router ISP indica sus rutas estáticas adicionales a las directamente conectadas.

```
ISP#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

     172.29.0.0/22 is subnetted, 2 subnets
S       172.29.0.0/22 [1/0] via 209.17.220.5
S       172.29.4.0/22 [1/0] via 209.17.220.1
     209.17.220.0/24 is variably subnetted, 6 subnets, 2 masks
C       209.17.220.0/30 is directly connected, Serial0/0/1
C       209.17.220.1/32 is directly connected, Serial0/0/1
L       209.17.220.2/32 is directly connected, Serial0/0/1
C       209.17.220.4/30 is directly connected, Serial0/0/0
C       209.17.220.5/32 is directly connected, Serial0/0/0
L       209.17.220.6/32 is directly connected, Serial0/0/0

ISP#
```

Ilustración 16: Rutas ISP

Parte 3 y 4: Deshabilitar la propagación del protocolo RIP.

a. **Debido a que el protocolo RIP realiza propagación de los mensajes de protocolo de RIP a través de todas sus interfaces, es necesario desactivar la propagación en las interfaces que no están involucradas en el protocolo RIP.**

ROUTER	INTERFAZ
Bogota1	SERIAL0/0/0; SERIAL0/0/1; SERIAL0/1/0
Bogota2	SERIAL0/0/0; SERIAL0/0/1
Bogota3	SERIAL0/0/0; SERIAL0/0/1; SERIAL0/1/0
Medellín1	SERIAL0/0/0; SERIAL0/0/1; SERIAL0/1/0
Medellín2	SERIAL0/0/0; SERIAL0/0/1
Medellín3	SERIAL0/0/0; SERIAL0/0/1; SERIAL0/1/0
ISP	No lo requiere

Tabla 1

---- Bogota 1-----
!
router rip
version 2
redistribute static
passive-interface Serial0/1/1
network 172.29.0.0
no auto-summary
---- Bogota 2-----
router rip
version 2
passive-interface GigabitEthernet0/0
network 172.29.0.0
no auto-summary
---- Bogota 3-----
!
router rip
version 2
passive-interface GigabitEthernet0/0
network 172.29.0.0
no auto-summary
!
---- Medellin 1-----
!
router rip
version 2
redistribute static

```
passive-interface Serial0/1/1
network 172.29.0.0
no auto-summary
---- Medellin 2-----
!
router rip
version 2
passive-interface GigabitEthernet0/0
network 172.29.0.0
no auto-summary
!
---- Medellin 3-----
!
router rip
version 2
passive-interface GigabitEthernet0/0
network 172.29.0.0
no auto-summary
!
```

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

```
BOGOTA1#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 209.17.220.6 to network 0.0.0.0

     172.29.0.0/16 is variably subnetted, 9 subnets, 3 masks
R       172.29.0.0/24 [120/1] via 172.29.3.2, 00:00:13, Serial0/0/0
                      [120/1] via 172.29.3.6, 00:00:13, Serial0/0/1
R       172.29.1.0/24 [120/1] via 172.29.3.10, 00:00:20, Serial0/1/0
C       172.29.3.0/30 is directly connected, Serial0/0/0
L       172.29.3.1/32 is directly connected, Serial0/0/0
C       172.29.3.4/30 is directly connected, Serial0/0/1
L       172.29.3.5/32 is directly connected, Serial0/0/1
C       172.29.3.8/30 is directly connected, Serial0/1/0
L       172.29.3.9/32 is directly connected, Serial0/1/0
R       172.29.3.12/30 [120/1] via 172.29.3.10, 00:00:20, Serial0/1/0
                       [120/1] via 172.29.3.2, 00:00:13, Serial0/0/0
                       [120/1] via 172.29.3.6, 00:00:13, Serial0/0/1
     209.17.220.0/24 is variably subnetted, 3 subnets, 2 masks
C       209.17.220.4/30 is directly connected, Serial0/1/1
L       209.17.220.5/32 is directly connected, Serial0/1/1
C       209.17.220.6/32 is directly connected, Serial0/1/1
S*   0.0.0.0/0 [1/0] via 209.17.220.6

BOGOTA1#
```

Ilustración 17: Tabla de enrutamiento RIP Bogota 1

```
MEDELLIN1#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 209.17.220.2 to network 0.0.0.0

     172.29.0.0/16 is variably subnetted, 9 subnets, 3 masks
R       172.29.4.0/25 [120/1] via 172.29.6.2, 00:00:27, Serial0/0/0
R       172.29.4.128/25 [120/1] via 172.29.6.10, 00:00:19, Serial0/1/0
                        [120/1] via 172.29.6.14, 00:00:19, Serial0/0/1
C       172.29.6.0/30 is directly connected, Serial0/0/0
L       172.29.6.1/32 is directly connected, Serial0/0/0
R       172.29.6.4/30 [120/1] via 172.29.6.2, 00:00:27, Serial0/0/0
                      [120/1] via 172.29.6.10, 00:00:19, Serial0/1/0
                      [120/1] via 172.29.6.14, 00:00:19, Serial0/0/1
C       172.29.6.8/30 is directly connected, Serial0/1/0
L       172.29.6.9/32 is directly connected, Serial0/1/0
C       172.29.6.12/30 is directly connected, Serial0/0/1
L       172.29.6.13/32 is directly connected, Serial0/0/1
     209.17.220.0/24 is variably subnetted, 3 subnets, 2 masks
C       209.17.220.0/30 is directly connected, Serial0/1/1
L       209.17.220.1/32 is directly connected, Serial0/1/1
C       209.17.220.2/32 is directly connected, Serial0/1/1
S*   0.0.0.0/0 [1/0] via 209.17.220.2

MEDELLIN1#
```

Ilustración 18: Tabla de enrutamiento RIP Medellin 1

```
MEDELLIN2#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 172.29.6.1 to network 0.0.0.0

     172.29.0.0/16 is variably subnetted, 9 subnets, 3 masks
C       172.29.4.0/25 is directly connected, GigabitEthernet0/0
L       172.29.4.1/32 is directly connected, GigabitEthernet0/0
R       172.29.4.128/25 [120/1] via 172.29.6.6, 00:00:19, Serial0/0/1
C       172.29.6.0/30 is directly connected, Serial0/0/0
L       172.29.6.2/32 is directly connected, Serial0/0/0
C       172.29.6.4/30 is directly connected, Serial0/0/1
L       172.29.6.5/32 is directly connected, Serial0/0/1
R       172.29.6.8/30 [120/1] via 172.29.6.6, 00:00:19, Serial0/0/1
                      [120/1] via 172.29.6.1, 00:00:06, Serial0/0/0
R       172.29.6.12/30 [120/1] via 172.29.6.1, 00:00:06, Serial0/0/0
                       [120/1] via 172.29.6.6, 00:00:19, Serial0/0/1
R*   0.0.0.0/0 [120/1] via 172.29.6.1, 00:00:06, Serial0/0/0

MEDELLIN2#
```

Ilustración 19: Tabla de enrutamiento RIP Medellin2

```
BOGOTA2#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 172.29.3.9 to network 0.0.0.0

     172.29.0.0/16 is variably subnetted, 9 subnets, 3 masks
R       172.29.0.0/24 [120/1] via 172.29.3.13, 00:00:26, Serial0/0/1
C       172.29.1.0/24 is directly connected, GigabitEthernet0/0
L       172.29.1.1/32 is directly connected, GigabitEthernet0/0
R       172.29.3.0/30 [120/1] via 172.29.3.13, 00:00:26, Serial0/0/1
                      [120/1] via 172.29.3.9, 00:00:13, Serial0/0/0
R       172.29.3.4/30 [120/1] via 172.29.3.13, 00:00:26, Serial0/0/1
                      [120/1] via 172.29.3.9, 00:00:13, Serial0/0/0
C       172.29.3.8/30 is directly connected, Serial0/0/0
L       172.29.3.10/32 is directly connected, Serial0/0/0
C       172.29.3.12/30 is directly connected, Serial0/0/1
L       172.29.3.14/32 is directly connected, Serial0/0/1
R*   0.0.0.0/0 [120/1] via 172.29.3.9, 00:00:13, Serial0/0/0

BOGOTA2#
```

Ilustración 20: Tabla de enrutamiento RIP Bogota2

```
BOGOTA3#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 172.29.3.5 to network 0.0.0.0

     172.29.0.0/16 is variably subnetted, 10 subnets, 3 masks
C       172.29.0.0/24 is directly connected, GigabitEthernet0/0
L       172.29.0.1/32 is directly connected, GigabitEthernet0/0
R       172.29.1.0/24 [120/1] via 172.29.3.14, 00:00:16, Serial0/0/1
C       172.29.3.0/30 is directly connected, Serial0/0/0
L       172.29.3.2/32 is directly connected, Serial0/0/0
C       172.29.3.4/30 is directly connected, Serial0/1/0
L       172.29.3.6/32 is directly connected, Serial0/1/0
R       172.29.3.8/30 [120/1] via 172.29.3.14, 00:00:16, Serial0/0/1
                      [120/1] via 172.29.3.5, 00:00:10, Serial0/1/0
                      [120/1] via 172.29.3.1, 00:00:10, Serial0/0/0
C       172.29.3.12/30 is directly connected, Serial0/0/1
L       172.29.3.13/32 is directly connected, Serial0/0/1
R*   0.0.0.0/0 [120/1] via 172.29.3.5, 00:00:10, Serial0/1/0
               [120/1] via 172.29.3.1, 00:00:10, Serial0/0/0

BOGOTA3#
```

Ilustración 21: Tabla de enrutamiento RIP Bogota3

```
MEDELLIN3#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 172.29.6.9 to network 0.0.0.0

     172.29.0.0/16 is variably subnetted, 10 subnets, 3 masks
R       172.29.4.0/25 [120/1] via 172.29.6.5, 00:00:22, Serial0/1/0
C       172.29.4.128/25 is directly connected, GigabitEthernet0/0
L       172.29.4.129/32 is directly connected, GigabitEthernet0/0
R       172.29.6.0/30 [120/1] via 172.29.6.5, 00:00:22, Serial0/1/0
                      [120/1] via 172.29.6.9, 00:00:12, Serial0/0/1
                      [120/1] via 172.29.6.13, 00:00:12, Serial0/0/0
C       172.29.6.4/30 is directly connected, Serial0/1/0
L       172.29.6.6/32 is directly connected, Serial0/1/0
C       172.29.6.8/30 is directly connected, Serial0/0/1
L       172.29.6.10/32 is directly connected, Serial0/0/1
C       172.29.6.12/30 is directly connected, Serial0/0/0
L       172.29.6.14/32 is directly connected, Serial0/0/0
R*   0.0.0.0/0 [120/1] via 172.29.6.9, 00:00:12, Serial0/0/1
               [120/1] via 172.29.6.13, 00:00:12, Serial0/0/0

MEDELLIN3#
```

Ilustración 22: Tabla de enrutamiento RIP Medellin3

Parte 5: Configurar encapsulamiento y autenticación PPP:

a. Los enlaces entre Medellin1 y Bogota1 contra el ISP serán autenticadas con protocolo PPP, Medellín con PAP y Bogotá con CHAP.

---------- Medellin----------

```
!
username ISP password 7 0814424F0D4B55464B
!
interface Serial0/1/1
ip address 209.17.220.1 255.255.255.252
ip helper-address 172.29.6.2
encapsulation          ppp
ppp authentication pap
ppp pap sent-username MEDELLIN1 password 0 Unad2019
ip nat outside
!
```

---------- ISP----------

```
!
username MEDELLIN1 password 7 0814424F0D4B55464B
!
interface Serial0/0/1
ip address 209.17.220.2 255.255.255.252
encapsulation  ppp
ppp authentication pap
ppp pap sent-username ISP password 0 Unad2019
clock rate 128000
!
```

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

---------- Bogota----------

```
!
username ISP password 7 0814424F0D4B55464B
!
interface Serial0/1/1
ip address 209.17.220.5 255.255.255.252
ip helper-address 172.29.6.2
encapsulation          ppp
ppp authentication chap
ip nat outside
!
```

---------- ISP----------

```
!
username BOGOTA1 password 7 0814424F0D4B55464B
!
interface Serial0/0/0
ip address 209.17.220.6 255.255.255.252
encapsulation    ppp
ppp authentication chap
clock rate 128000
!
```

Parte 6: Configuración de PAT.

a. **Se configura PAT en las interfaces de salida de Bogota1 y Medellin1 para tener internet en las redes locales detrás de ese router.**

```
---------- Bogota----------
!
interface Serial0/0/0
ip nat inside
!
interface Serial0/0/1
ip nat inside
!
interface Serial0/1/0
ip nat inside
!
interface Serial0/1/1
ip nat outside
!
!
ip nat inside source list 1 interface Serial0/1/1 overload
!
access-list 1 permit 172.29.0.0 0.0.3.255
!

---------- Medellin----------

!
interface Serial0/0/0
ip nat inside
!
interface Serial0/0/1
ip nat inside
!
interface Serial0/1/0
ip nat inside
!
interface Serial0/1/1
ip nat outside
!
ip nat inside source list 1 interface Serial0/1/1 overload
!
access-list 1 permit 172.29.4.0 0.0.3.255
```

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 0/1/0 del router Medellín1, cómo diferente puerto.**

```
BOGOTA1#show ip nat translations
Pro  Inside global     Inside local       Outside local      Outside global
icmp 209.17.220.5:1    172.29.1.2:1       209.17.220.1:1     209.17.220.1:1
icmp 209.17.220.5:25   172.29.0.2:25      209.17.220.1:25    209.17.220.1:25
icmp 209.17.220.5:26   172.29.0.2:26      209.17.220.1:26    209.17.220.1:26
icmp 209.17.220.5:27   172.29.0.2:27      209.17.220.1:27    209.17.220.1:27
icmp 209.17.220.5:28   172.29.0.2:28      209.17.220.1:28    209.17.220.1:28
icmp 209.17.220.5:2    172.29.1.2:2       209.17.220.1:2     209.17.220.1:2
icmp 209.17.220.5:3    172.29.1.2:3       209.17.220.1:3     209.17.220.1:3
icmp 209.17.220.5:4    172.29.1.2:4       209.17.220.1:4     209.17.220.1:4
```

Ilustración 23: Traducciones NAT Bogota1

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.**

```
MEDELLIN1#show ip nat translations
Pro  Inside global     Inside local       Outside local      Outside global
icmp 209.17.220.1:1024 172.29.4.130:1     209.17.220.5:1     209.17.220.5:1024
icmp 209.17.220.1:1025 172.29.4.130:2     209.17.220.5:2     209.17.220.5:1025
icmp 209.17.220.1:1026 172.29.4.130:3     209.17.220.5:3     209.17.220.5:1026
icmp 209.17.220.1:1027 172.29.4.130:4     209.17.220.5:4     209.17.220.5:1027
icmp 209.17.220.1:1    172.29.4.2:1       209.17.220.5:1     209.17.220.5:1
icmp 209.17.220.1:2    172.29.4.2:2       209.17.220.5:2     209.17.220.5:2
icmp 209.17.220.1:3    172.29.4.2:3       209.17.220.5:3     209.17.220.5:3
icmp 209.17.220.1:4    172.29.4.2:4       209.17.220.5:4     209.17.220.5:4
```

Ilustración 24: Traducciones NAT Medellin1

Parte 7: Configuración del servicio DHCP.

a. **Se configuro el router Medellin2 como servidor DHCP para Medellin 2 y Medellin3.**

```
ip dhcp excluded-address 172.29.4.1
ip dhcp excluded-address 172.29.4.129
!
ip dhcp pool Medellin2
 network 172.29.4.0 255.255.255.128
 default-router 172.29.4.1
ip dhcp pool Medellin3
 network 172.29.4.128 255.255.255.128
 default-router 172.29.4.129
```

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

```
!
interface GigabitEthernet0/0
ip address 172.29.4.129 255.255.255.128
ip helper-address 172.29.6.5
duplex auto
speed auto
```

c. **Configurar la red Bogotá2 y Bogotá3 donde el router Medellín2 debe ser el servidor DHCP para ambas redes Lan.**

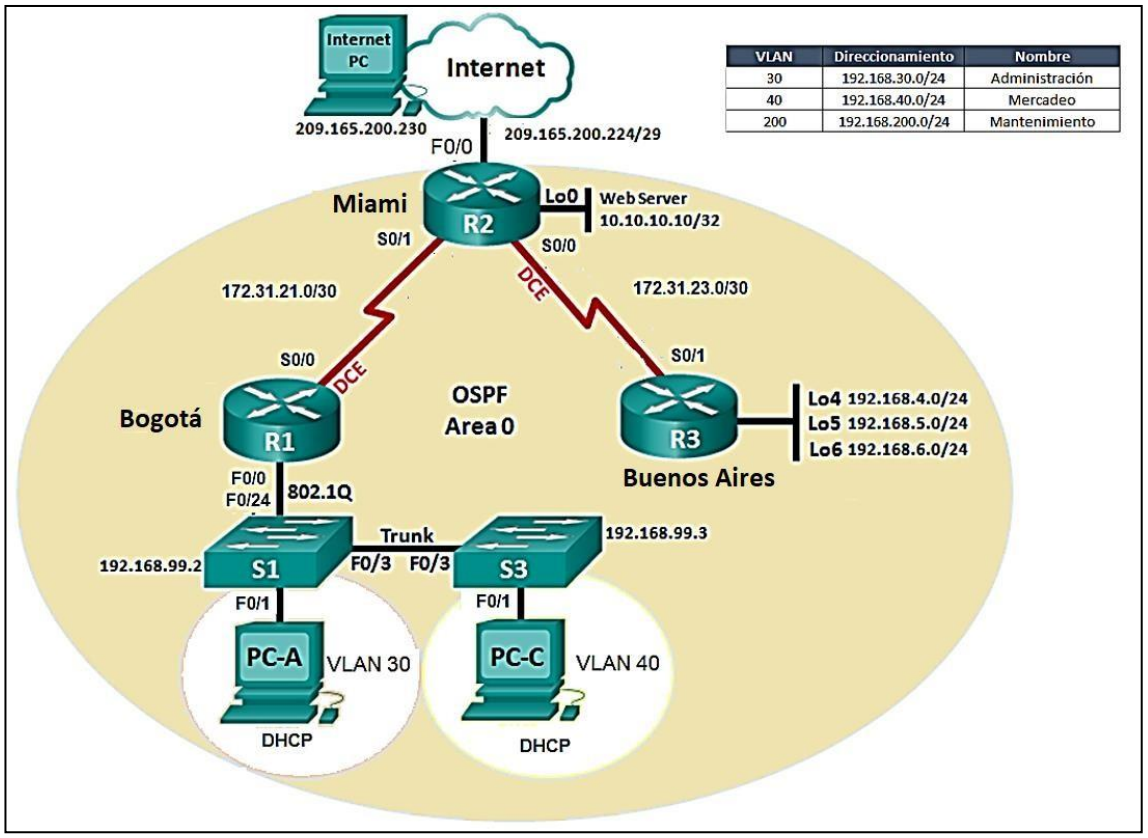
```
!
ip dhcp excluded-address 172.29.1.1
ip dhcp excluded-address 172.29.0.1
ip dhcp pool Bogota3
network 172.29.0.0 255.255.255.0
default-router 172.29.0.1
ip dhcp pool Bogota2
network 172.29.1.0 255.255.255.0
default-router 172.29.1.1
```

d. **Configure el router Bogotá1 para que habilite el paso de los mensajes Broadcast hacia la IP del router Bogotá2.**

```
interface Serial0/1/1
ip address 209.17.220.5 255.255.255.252
ip helper-address 172.29.6.2
encapsulation ppp
ppp authentication chap
ip nat outside
!
```

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

Ilustración 25: Diagrama de red Escenario 2

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

```
R1#show ip int brief
Interface              IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0     unassigned      YES unset  up                    up
GigabitEthernet0/0.30  192.168.30.1    YES manual up                    up
GigabitEthernet0/0.40  192.168.40.1    YES manual up                    up
GigabitEthernet0/1     unassigned      YES unset  administratively down down
GigabitEthernet0/2     unassigned      YES unset  administratively down down
Serial0/0/0            172.31.21.2     YES manual up                    up
Serial0/0/1            unassigned      YES unset  administratively down down
Vlan1                  unassigned      YES unset  administratively down down
```

Ilustración 26: DIreccionamiento R1

```
R2#sh ip int brief
Interface              IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0     209.165.200.225 YES manual up                    up
GigabitEthernet0/1     unassigned      YES unset  administratively down down
GigabitEthernet0/2     unassigned      YES unset  administratively down down
Serial0/0/0            172.31.23.1     YES manual up                    up
Serial0/0/1            172.31.21.1     YES manual up                    up
Loopback0              10.10.10.10     YES manual up                    up
Vlan1                  unassigned      YES unset  administratively down down
R2#
```

Ilustración 27:Direccionamiento R2

```
R3#sh ip int brief
Interface              IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0     unassigned      YES unset  administratively down down
GigabitEthernet0/1     unassigned      YES unset  administratively down down
GigabitEthernet0/2     unassigned      YES unset  administratively down down
Serial0/0/0            unassigned      YES unset  administratively down down
Serial0/0/1            172.31.23.2     YES manual up                    up
Loopback4              192.168.4.1     YES manual up                    up
Loopback5              192.168.5.1     YES manual up                    up
Loopback6              192.168.6.1     YES manual up                    up
Vlan1                  unassigned      YES unset  administratively down down
R3#
```

Ilustración 28: Direccionamiento R3

```
FastEthernet0/17       unassigned      YES manual administratively down down
FastEthernet0/18       unassigned      YES manual administratively down down
FastEthernet0/19       unassigned      YES manual administratively down down
FastEthernet0/20       unassigned      YES manual administratively down down
FastEthernet0/21       unassigned      YES manual administratively down down
FastEthernet0/22       unassigned      YES manual administratively down down
FastEthernet0/23       unassigned      YES manual administratively down down
FastEthernet0/24       unassigned      YES manual up                    up
GigabitEthernet0/1     unassigned      YES manual down                  down
GigabitEthernet0/2     unassigned      YES manual down                  down
Vlan1                  unassigned      YES manual administratively down down
Vlan99                 192.168.99.2    YES manual administratively down down
S1#
```

Ilustración 29: Configuración Interface vlan 99 S1

```
FastEthernet0/17       unassigned      YES manual administratively down down
FastEthernet0/18       unassigned      YES manual administratively down down
FastEthernet0/19       unassigned      YES manual administratively down down
FastEthernet0/20       unassigned      YES manual administratively down down
FastEthernet0/21       unassigned      YES manual administratively down down
FastEthernet0/22       unassigned      YES manual administratively down down
FastEthernet0/23       unassigned      YES manual administratively down down
FastEthernet0/24       unassigned      YES manual administratively down down
GigabitEthernet0/1     unassigned      YES manual down                  down
GigabitEthernet0/2     unassigned      YES manual down                  down
Vlan1                  unassigned      YES manual administratively down down
Vlan99                 192.168.99.3    YES manual down                  down
S3#
```

Ilustración 30: Configuración Interface Vlan 99 S3

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

Tabla 2

Verificar información de OSPF

- Visualización de tablas de enrutamiento y routers conectados por OSPFv2

```
R1#sh ip route ospf
     10.0.0.0/32 is subnetted, 1 subnets
O       10.10.10.10 [110/9501] via 172.31.21.1, 00:07:50, Serial0/0/0
     172.31.0.0/16 is variably subnetted, 3 subnets, 2 masks
O       172.31.23.0 [110/19000] via 172.31.21.1, 00:07:50, Serial0/0/0
     192.168.4.0/32 is subnetted, 1 subnets
O       192.168.4.1 [110/19001] via 172.31.21.1, 00:07:30, Serial0/0/0
     192.168.5.0/32 is subnetted, 1 subnets
O       192.168.5.1 [110/19001] via 172.31.21.1, 00:07:30, Serial0/0/0
     192.168.6.0/32 is subnetted, 1 subnets
O       192.168.6.1 [110/19001] via 172.31.21.1, 00:07:30, Serial0/0/0
     209.165.200.0/29 is subnetted, 1 subnets
O       209.165.200.224 [110/9501] via 172.31.21.1, 00:07:50, Serial0/0/0
O*E2 0.0.0.0/0 [110/1] via 172.31.21.1, 00:07:50, Serial0/0/0

R1#
```

Ilustración 31: Tabla de enrutamiento OSPF

```
R2#sh ip route ospf
     192.168.4.0/32 is subnetted, 1 subnets
O       192.168.4.1 [110/9501] via 172.31.23.2, 00:08:02, Serial0/0/0
     192.168.5.0/32 is subnetted, 1 subnets
O       192.168.5.1 [110/9501] via 172.31.23.2, 00:08:02, Serial0/0/0
     192.168.6.0/32 is subnetted, 1 subnets
O       192.168.6.1 [110/9501] via 172.31.23.2, 00:08:02, Serial0/0/0
O    192.168.30.0 [110/391] via 172.31.21.2, 00:08:12, Serial0/0/1
O    192.168.40.0 [110/391] via 172.31.21.2, 00:08:12, Serial0/0/1

R2#
```

Ilustración 32: Tabla de enrutamiento OSPF R2

```
R3#sh ip route ospf
     10.0.0.0/32 is subnetted, 1 subnets
O       10.10.10.10 [110/391] via 172.31.23.1, 00:08:21, Serial0/0/1
     172.31.0.0/16 is variably subnetted, 3 subnets, 2 masks
O       172.31.21.0 [110/780] via 172.31.23.1, 00:08:21, Serial0/0/1
O    192.168.30.0 [110/781] via 172.31.23.1, 00:08:21, Serial0/0/1
O    192.168.40.0 [110/781] via 172.31.23.1, 00:08:21, Serial0/0/1
     209.165.200.0/29 is subnetted, 1 subnets
O       209.165.200.224 [110/391] via 172.31.23.1, 00:08:21, Serial0/0/1
O*E2 0.0.0.0/0 [110/1] via 172.31.23.1, 00:08:21, Serial0/0/1

R3#
```

Ilustración 33: Tabla de enrutamiento OSPF R3

- Visualización de lista resumida de interfaces por OSPF en donde se ilustre el costo de cada interface

```
R1#show ip ospf interface serial 0/0/0

Serial0/0/0 is up, line protocol is up
  Internet address is 172.31.21.2/30, Area 0
  Process ID 1, Router ID 5.5.5.5, Network Type POINT-TO-POINT, Cost: 9500
  Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
  No designated router on this network
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:00
  Index 3/3, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1 , Adjacent neighbor count is 1
    Adjacent with neighbor 1.1.1.1
  Suppress hello for 0 neighbor(s)
R1#
```

Ilustración 34: Costos OSPF Interfaces R1

```
R2#show ip ospf interface serial 0/0/0

Serial0/0/0 is up, line protocol is up
  Internet address is 172.31.23.1/30, Area 0
  Process ID 1, Router ID 1.1.1.1, Network Type POINT-TO-POINT, Cost: 9500
  Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
  No designated router on this network
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:05
  Index 4/4, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1 , Adjacent neighbor count is 1
    Adjacent with neighbor 8.8.8.8
  Suppress hello for 0 neighbor(s)
R2#
```

Ilustración 35: Costos OSPF Interfaces R2

```
R2#show ip ospf interface serial 0/0/1

Serial0/0/1 is up, line protocol is up
  Internet address is 172.31.21.1/30, Area 0
  Process ID 1, Router ID 1.1.1.1, Network Type POINT-TO-POINT, Cost: 390
  Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
  No designated router on this network
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:01
  Index 3/3, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1 , Adjacent neighbor count is 1
    Adjacent with neighbor 5.5.5.5
  Suppress hello for 0 neighbor(s)
R2#
```

Ilustración 36: Costos OSPF Interfaces R2

```
R3#show ip ospf interface se
R3#show ip ospf interface serial 0/0/1

Serial0/0/1 is up, line protocol is up
  Internet address is 172.31.23.2/30, Area 0
  Process ID 1, Router ID 8.8.8.8, Network Type POINT-TO-POINT, Cost: 390
  Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
  No designated router on this network
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:04
  Index 4/4, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1 , Adjacent neighbor count is 1
    Adjacent with neighbor 1.1.1.1
  Suppress hello for 0 neighbor(s)
R3#
```

Ilustración 37: Costos OSPF Interfaces R3

- Visualizacion de OSPF Process ID, Router ID, Address summarizations, Routing Networks, and passive interfaces configuradas en cada router.

```
!
hostname R2
!
router ospf 1
router-id 1.1.1.1
log-adjacency-changes
passive-interface GigabitEthernet0/0
network 10.10.10.10 0.0.0.0 area 0
network 172.31.23.0 0.0.0.3 area 0
network 172.31.21.0 0.0.0.3 area 0
network 209.165.200.224 0.0.0.7 area 0
default-information originate
!
hostname R2
!
router ospf 1
router-id 5.5.5.5
log-adjacency-changes
passive-interface GigabitEthernet0/0
network 172.31.21.0 0.0.0.3 area 0
network 192.168.30.0 0.0.0.255 area 0
network 192.168.40.0 0.0.0.255 area 0
!
hostname R3
!
```

```
router ospf 1
router-id 8.8.8.8
log-adjacency-changes
passive-interface Loopback4
passive-interface Loopback5
passive-interface Loopback6
network 172.31.23.0 0.0.0.3 area 0
network 192.168.4.0 0.0.0.255 area 0
network 192.168.5.0 0.0.0.255 area 0
network 192.168.6.0 0.0.0.255 area 0
!
```

1. Configuración de las VLANs, Puertos troncales, puertos de acceso, encapsulamiento, InterVLAN Routing y Seguridad en los Switches acorde a la topología de red establecida.

Configuracion S1 - Interfaces

```
hostname S1
!
enable secret 5 $1$mERr$KORB0osdOtQ20NLXFlO/h0
!
interface  FastEthernet0/1
switchport access vlan 30
switchport mode access
!
interface FastEthernet0/2
shutdown
!
interface FastEthernet0/3
switchport mode trunk
!
interface FastEthernet0/4
shutdown
!
interface FastEthernet0/5
shutdown
!
interface FastEthernet0/6
shutdown
!
interface FastEthernet0/7
shutdown
!
interface FastEthernet0/8
shutdown
```

```
!
interface FastEthernet0/9
shutdown
!
interface FastEthernet0/10
shutdown
!
interface FastEthernet0/11
shutdown
!
interface FastEthernet0/12
shutdown
!
interface FastEthernet0/13
shutdown
!
interface FastEthernet0/14
shutdown
!
interface FastEthernet0/15
shutdown
!
interface FastEthernet0/16
shutdown
!
interface FastEthernet0/17
shutdown
!
interface FastEthernet0/18
shutdown
!
interface FastEthernet0/19
shutdown
!
interface FastEthernet0/20
shutdown
!
interface FastEthernet0/21
shutdown
!
interface FastEthernet0/22
shutdown
!
interface FastEthernet0/23
shutdown
```

```
!
interface FastEthernet0/24
switchport mode trunk
!
interface GigabitEthernet0/1
!
interface GigabitEthernet0/2
!
interface Vlan1
no ip address
shutdown
!
interface Vlan99
mac-address 0060.2fe2.9001
ip address 192.168.99.2 255.255.255.0
shutdown
!
```

Configuracion S1 - Interfaces

S3#show running-config

```
hostname S3
no ip domain-lookup
interface  FastEthernet0/1
switchport access vlan 40
switchport mode access
!
interface FastEthernet0/2
shutdown
!
interface FastEthernet0/3
switchport mode trunk
!
interface FastEthernet0/4
shutdown
!
interface FastEthernet0/5
shutdown
!
interface FastEthernet0/6
shutdown
!
interface FastEthernet0/7
shutdown
```

```
!
interface FastEthernet0/8
shutdown
!
interface FastEthernet0/9
shutdown
!
interface FastEthernet0/10
shutdown
!
interface FastEthernet0/11
shutdown
!
interface FastEthernet0/12
shutdown
!
interface FastEthernet0/13
shutdown
!
interface FastEthernet0/14
shutdown
!
interface FastEthernet0/15
shutdown
!
interface FastEthernet0/16
shutdown
!
interface FastEthernet0/17
shutdown
!
interface FastEthernet0/18
shutdown
!
interface FastEthernet0/19
shutdown
!
interface FastEthernet0/20
shutdown
!
interface FastEthernet0/21
shutdown
!
interface FastEthernet0/22
shutdown
```

!
interface FastEthernet0/23
shutdown
!
interface FastEthernet0/24
shutdown
!
interface GigabitEthernet0/1
!
interface GigabitEthernet0/2
!
interface Vlan99
mac-address 0001.64b6.0c01
ip address 192.168.99.3 255.255.255.0
!
Configuracion R2 – InterVLAN Routing

¡
interface GigabitEthernet0/0
no ip address
ip access-group UNAD in
duplex auto
speed auto
!
interface GigabitEthernet0/0.30
encapsulation dot1Q 30
ip address 192.168.30.1 255.255.255.0
ip access-group UNAD in
!
interface GigabitEthernet0/0.40
encapsulation dot1Q 40
ip address 192.168.40.1 255.255.255.0
ip access-group UNAD in
!

En el Switch 3 se deshabilito DNS lookup

!
!
no ip domain-lookup
!
!

1. **Asignar direcciones IP a los Switches acorde a los lineamientos.**

```
!
interface Vlan99
 mac-address 0001.64b6.0c01
 ip address 192.168.99.3 255.255.255.0
!

!
interface Vlan99
mac-address 0060.2fe2.9001
ip address 192.168.99.2 255.255.255.0
shutdown
!
```

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

```
!
interface  FastEthernet0/1
switchport access vlan 40
switchport mode access
!
interface FastEthernet0/2
shutdown
!
interface FastEthernet0/3
switchport mode trunk
!
interface FastEthernet0/4
shutdown
!
interface FastEthernet0/5
shutdown
!
interface FastEthernet0/6
shutdown
!
interface FastEthernet0/7
shutdown
!
interface FastEthernet0/8
shutdown
!
```

```
interface FastEthernet0/9
shutdown
!
interface FastEthernet0/10
shutdown
!
interface FastEthernet0/11
shutdown
!
interface FastEthernet0/12
shutdown
!
interface FastEthernet0/13
shutdown
!
interface FastEthernet0/14
shutdown
!
interface FastEthernet0/15
shutdown
!
interface FastEthernet0/16
shutdown
!
interface FastEthernet0/17
shutdown
!
interface FastEthernet0/18
shutdown
!
interface FastEthernet0/19
shutdown
!
interface FastEthernet0/20
shutdown
!
interface FastEthernet0/21
shutdown
!
interface FastEthernet0/22
shutdown
!
interface FastEthernet0/23
shutdown
!
```

```
interface FastEthernet0/24
shutdown
!


interface  FastEthernet0/1
switchport access vlan 30
switchport mode access
!
interface FastEthernet0/2
shutdown
!
interface FastEthernet0/3
switchport mode trunk
!
interface FastEthernet0/4
shutdown
!
interface FastEthernet0/5
shutdown
!
interface FastEthernet0/6
shutdown
!
interface FastEthernet0/7
shutdown
!
interface FastEthernet0/8
shutdown
!
interface FastEthernet0/9
shutdown
!
interface FastEthernet0/10
shutdown
!
interface FastEthernet0/11
shutdown
!
interface FastEthernet0/12
shutdown
!
interface FastEthernet0/13
shutdown
!
```

```
interface FastEthernet0/14
shutdown
!
interface FastEthernet0/15
shutdown
!
interface FastEthernet0/16
shutdown
!
interface FastEthernet0/17
shutdown
!
interface FastEthernet0/18
shutdown
!
interface FastEthernet0/19
shutdown
!
interface FastEthernet0/20
shutdown
!
interface FastEthernet0/21
shutdown
!
interface FastEthernet0/22
shutdown
!
interface FastEthernet0/23
shutdown
!
```

1. Implementación de DHCP y NAT for IPv4
2. Configurar R1 como servidor DHCP para las VLANs 30 y 40.
3. 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.

```
!
ip dhcp excluded-address 192.168.30.1 192.168.30.30
ip dhcp excluded-address 192.168.40.1 192.168.30.30
!
ip dhcp pool Vlan30Administracion
 network 192.168.30.0 255.255.255.0
 default-router 192.168.30.1
dns-server 10.10.10.11
domain-name ccna-unad.com

ip dhcp pool Vlan40Mercadeo
 network 192.168.40.0 255.255.255.0
 default-router 192.168.40.1
 dns-server 10.10.10.11
domain-name ccna-unad.com
!
!
```

1. **Configurar NAT en R2 para permitir que los hosts puedan salir a internet**

```
!
ip nat inside source list 1 interface GigabitEthernet0/0 overload

access-list 1 permit 192.168.4.0 0.0.0.255
access-list 1 permit 192.168.5.0 0.0.0.255
access-list 1 permit 192.168.6.0 0.0.0.255
access-list 1 permit 192.168.30.0 0.0.0.255
access-list 1 permit 192.168.40.0 0.0.0.255
!

interface GigabitEthernet0/0
ip address 209.165.200.225 255.255.255.248
ip access-group UNADPermit out
ip nat outside
duplex auto
speed auto
!
!
interface Serial0/0/0
bandwidth 256
ip address 172.31.23.1 255.255.255.252
ip ospf cost 9500
ip access-group UNADPermit in
ip nat inside
clock rate 128000
!
```

```
interface Serial0/0/1
bandwidth 256
ip address 172.31.21.1 255.255.255.252
ip access-group UNADPermit in
ip nat inside
!
```

1. **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.**

```
!
ip access-list extended  UNAD
permit ip 192.168.30.0 0.0.0.255 any
permit ip 192.168.40.0 0.0.0.255 any
permit udp any eq bootpc any
deny ip any any
!


interface Serial0/0/0
bandwidth 256
ip address 172.31.21.2 255.255.255.252
ip ospf cost 9500
ip access-group UNAD out
clock rate 128000
!

!
interface GigabitEthernet0/0.30
encapsulation dot1Q 30
ip address 192.168.30.1 255.255.255.0
ip access-group UNAD in
!
interface GigabitEthernet0/0.40
encapsulation dot1Q 40
ip address 192.168.40.1 255.255.255.0
ip access-group UNAD in
!
```

1. **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.**

```
!
access-list 1 permit 192.168.4.0 0.0.0.255
```

```
access-list 1 permit 192.168.5.0 0.0.0.255
access-list 1 permit 192.168.6.0 0.0.0.255
access-list 1 deny any
! !
interface Serial0/0/1
bandwidth 256
ip address 172.31.23.2 255.255.255.252
ip access-group 1 out
!
!
interface Loopback4
ip address 192.168.4.1 255.255.255.0
!
interface Loopback5
ip address 192.168.5.1 255.255.255.0
ip access-group 1 in
!
interface Loopback6
ip address 192.168.6.1 255.255.255.0
ip access-group 1 in
!
```

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

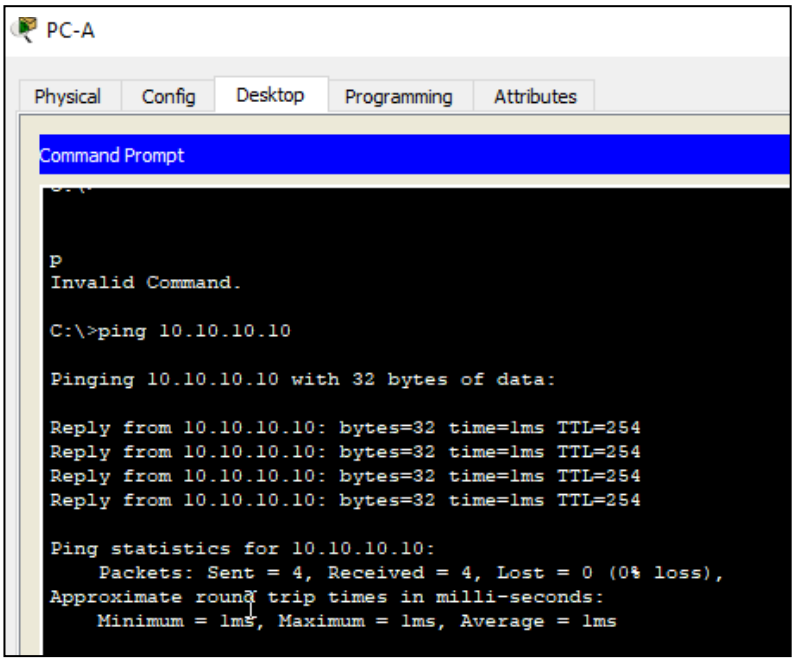


Ilustración 38: Verificacion PING PC-A

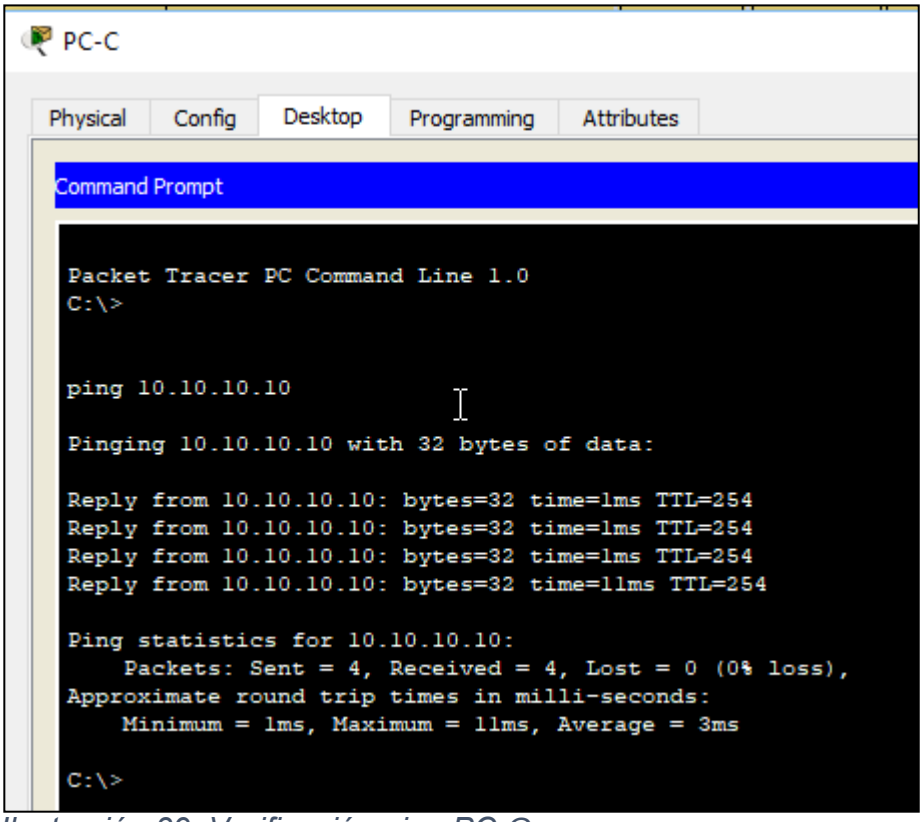


Ilustración 39: Verificación ping PC-C

CONCLUSIONES

Durante el Desarrollo de los dos ejercicios se pudo evidenciar las funcionalidades que presentan los dispositivos Cisco a la hora de resolver problemas o necesidades de red.

Dentro de las funcionalidades vistas y aprendidas se vieron las siguientes tecnologías:

En el primer escenario se validaron los conceptos vistos de enrutamiento empezando por el protocolo RIP que permite realizar un despliegue de enrutamiento dinámico más básico basado en saltos, y en el ejercicio practico los todos los routers de cada ciudad se comparten sus redes directamente conectadas para crear una convergencia de red y tener redundancia en caso de fallos de internet.

En la ciudad de Medellín 2 se configuro como servidor DHCP para entregar el direccionamiento de red de los otros routers y para habilitar el envío de peticiones broadcast se habilito el protocolo dhcp relay para enviar las solicitudes DHCP.

En los enlaces de cada ciudad contra el ISP se habilito el protocolo PPP, protocolo punto a punto mediante autenticación de usuario y contraseña que permite tener una seguridad, trazabilidad y control sobre los clientes que se quieren conectar en el proveedor de servicios.

En el segundo escenario se desplego un protocolo más avanzado, pues su métrica de decisiones acerca de selección de enrutamiento utiliza más variables como costo, ancho de banda, lo que nos permite tener un entorno de enrutamiento mas avanzado. En este ejercicio igual que en el primero se realizó la distribución de ruta estática que permitió que los demás routers conozcan cual es la salida por defecto (tradicionalmente internet), por otro lado, se vieron conceptos de seguridad al crear ACLs para ser aplicadas de mantera que restringieran el tráfico hacia dispositivos críticos.

En los dos ejercicios se trabajo con protocolo NAT que permite traducir IPs Privadas hacia IPs públicas, para el aprovechamiento de recursos públicos, y a su vez proporcionan un entorno de seguridad, pues el dispositivo NAT se crea como un perímetro.

Para concluir en los escenarios se plasmó todo el conocimiento adquirido en el diplomado de forma práctica, funcional, conociendo una razón de cada configuración, comando dentro de los dispositivos. Esto permitió tener un acercamiento mas real de la teoría en un caso de estudio tradicional.

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