DIPLOMADO DE PROFUNDIZACION CISCO - DISEÑO E IMPLEMENTACION DE SOLUCIONES INTEGRADAS LAN/WAN

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UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA
ESCUELA DE CIENCIAS BÁSICAS, TECNOLOGÍA E INGENIERÍA
COLOMBIA
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DIPLOMADO DE PROFUNDIZACION CISCO - DISEÑO E IMPLEMENTACION DE SOLUCIONES INTEGRADAS LAN/WAN

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PRUEBA DE HABILIDADES PRÁCTICAS CCNA R&S
Presentado como requisito para obtener a título de
INGENIERO ELECTRÓNICO

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COLOMBIA
2019

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Firma de jurado

Medellín, 23 de mayo de 2019

DEDICATORIA

Dedico este trabajo a Dios, padres y hermanos
quienes han sido un apoyo incondicional
y la motivación en todos los aspectos de mi vida.

AGRADECIMIENTOS

Expreso mis más sinceros agradecimientos a todas aquellas personas que de una u otra manera estuvieron presentes y apoyaron mi proceso de formación profesional; su apoyo técnico y moral me permitió continuar para alcanzar así este objetivo pese a las dificultades que se presentaron en el camino.

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https://drive.google.com/open?id=17ZoouSBSmtWyExkDINYzCBtpQgkYTqkS

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https://drive.google.com/file/d/1-U1Wgp0pmMAUuzs8wRDpLs2uD8R8C7lP/view?usp=sharing

INTRODUCCIÒN

Este documento contiene el desarrollo de los escenarios planteados como prueba de habilidades del Diplomado de profundización UNAD CISCO CCNA 1 y 2; el cual es requisito para obtener el título como INGENIERO ELECTRÓNICO.

El desarrollo consta del diseño, configuración e interconexiones de redes a nivel empresarial poniendo a prueba el nivel de comprensión y capacidad de solución de problemas en cuanto al movimiento de paquetes o información en las redes.

El primer escenario plantea las interconexiones de diferentes sucursales mediante el protocolo de enrutamiento RIP, encapsulamiento PPP y autenticaciones PAP y CHAP, listas de acceso ACL, direccionamiento de hosts mediante DHCP y traducción de direcciones de red NAT.

El segundo escenario plantea la interconexión de 3 sucursales de una empresa con requerimientos de direccionamiento y configuración básicas acorde a la topología planteada, con uso de VLANs, seguridad 802.1Q, protocolo de enrutamiento OSPFv2, entre otros.

Los diferentes conceptos y comandos contenidos cada una de las unidades del curso de CCNA R&S, proporcionan las herramientas para el desarrollo de cada uno de los escenarios que consta esta prueba.

La información que se encuentra en el presente trabajo está debidamente documentada mediante la norma ICONTEC NTC 1486.

1 OBJETIVOS

1.1 OBJETIVO GENERAL

Resolver los dos escenarios de estudio planteados como prueba de habilidades del Diplomado de profundización UNAD CISCO CCNA 1 y 2 poniendo en práctica los conceptos básicos aprendidos sobre fundamentos, ruteo y conmutación de redes.

1.2 OBJETIVOS ESPECÍFICOS

- Diseñar un esquema de direccionamiento según los requerimientos de cada escenario.
- Realizar básica a los dispositivos de red.
- Aplicar las diferentes configuraciones para direcciones IP, RIP, encapsulamiento, OSFP, DHCP, ACL, NAT, VLANs según lo solicitado.
- Describir el paso a paso de cada una de las etapas realizadas para el desarrollo de los dos casos.
- Verificar la conectividad y efectividad de las configuraciones mediante los comandos ping, tracert, show ip route, y show ip protocols.

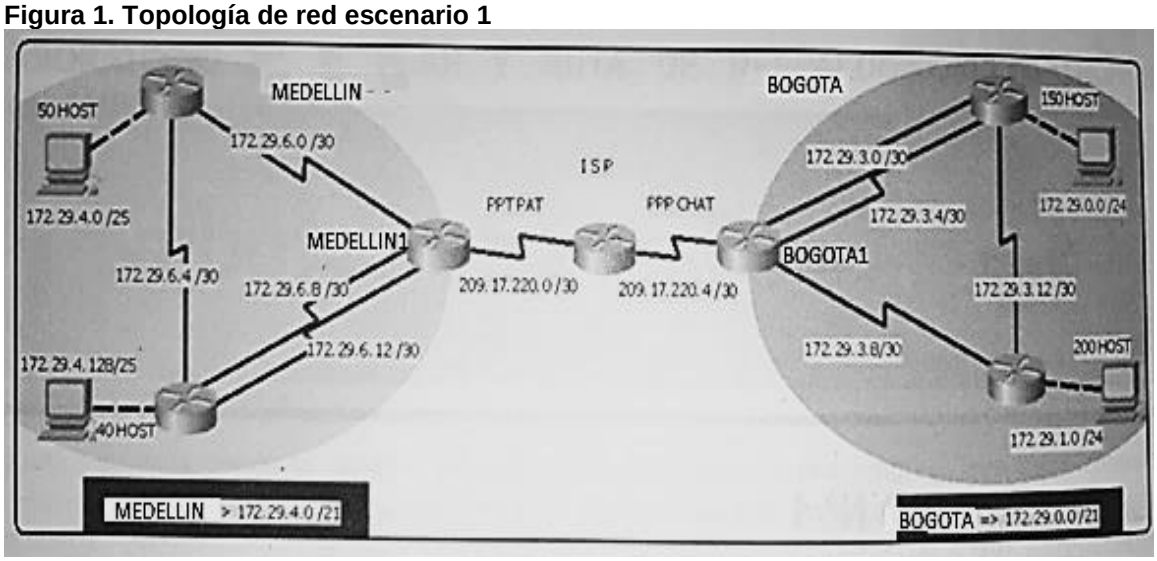
2 DESARROLLO DE ESCENARIOS

2.1 DESCRIPCIÒN 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

Figura 1. Topología de red escenario 1



Fuente: Tomado de la guìa para la prueba de habilidades

Este escenario plantea el uso de RIP como protocolo de enrutamiento, considerando que se tendran rutas por defecto redistribuidas; asimismo, habilitar el encapsulamiento PPP y su autenticación.

Los routers Bogota2 y medellin2 proporcionan el servicio DHCP a su propia red LAN y a los routers 3 de cada ciudad.

Debe configurar PPP en los enlaces hacia el ISP, con autenticación.

Debe habilitar NAT de sobrecarga en los routers Bogota1 y medellin1.

2.1.1 Configuraciòn bàsica de los equipos

Realizar las rutinas de diagnóstico y dejar los equipos listos para su configuración (asignar nombres de equipos, asignar claves de seguridad, etc).

a. Dispositivos requeridos

4 Routers (Cisco 1841) con 2 puertos FastEthernet, 4 puertos Seriales MEDELLIN 1, MEDELLIN3, BOGOTA1 Y BOGOTA3
3 Routers (Cisco 1841) con 2 puertos FastEthernet, 2 puertos Seriales: ISP, MEDELLIN2, BOGOTA2
4 PCs con sistema operativo Windows 7
Cables Serial y Ethernet

b. Instalación de las tarjetas de comunicaciones

Figura 2. Tarjeta de com. 4 puertos seriales

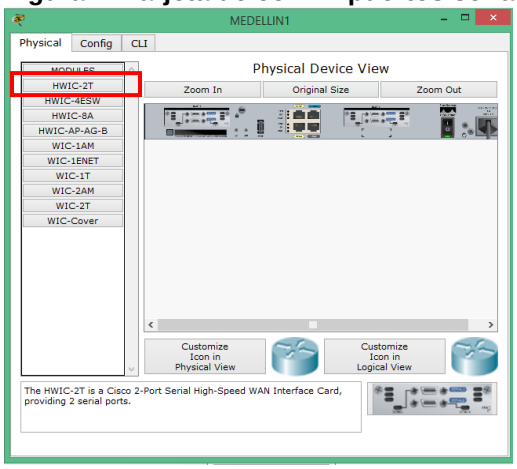
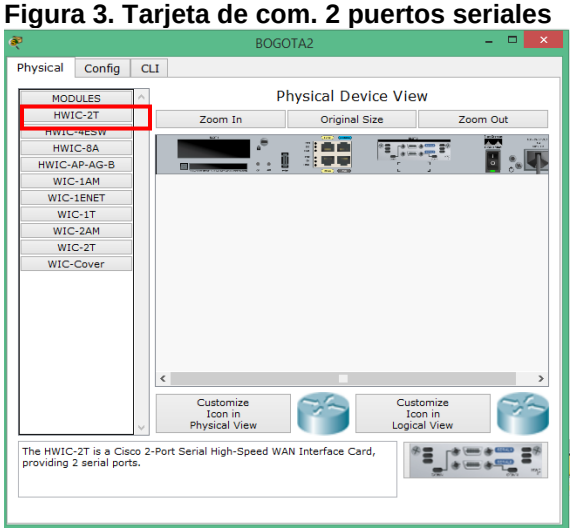
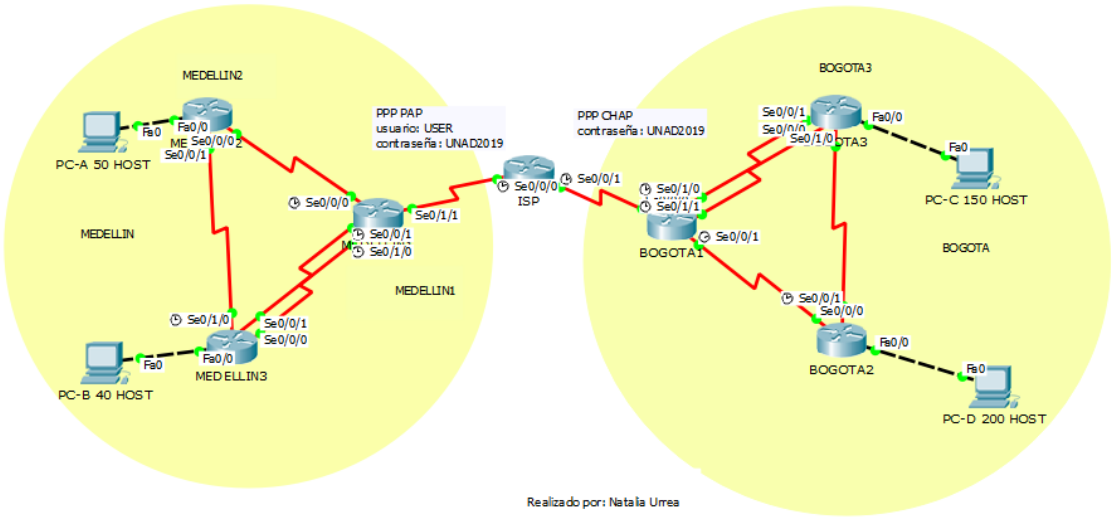


Figura 3. Tarjeta de com. 2 puertos seriales



c. Conexión de los equipos según topología base

Figura 4. Topología creada escenario 1



d. Configuraciòn bàsica de los equipos

- Configuraciòn bàsica ISP

Router>en

Router#conf t

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#hostname ISP

ISP(config)#no ip domain-lookup

ISP(config)#line console 0

ISP(config-line)#password cisco

ISP(config-line)#login

ISP(config-line)#line vty 0 15

ISP(config-line)#password cisco

ISP(config-line)#login

ISP(config-line)#exit

ISP(config)#enable secret class

ISP(config)#service password-encryption

ISP(config)#banner motd $ Prohibido el acceso a personal no autorizado $

- Configuraciòn bàsica MEDELLIN1

Router>en

Router#conf t

Router(config)#hostname MEDELLIN1

MEDELLIN1(config)#no ip domain-lookup

MEDELLIN1(config)#line console 0

MEDELLIN1(config-line)#password cisco

MEDELLIN1(config-line)#login

MEDELLIN1(config-line)#line vty 0 15

MEDELLIN1(config-line)#password cisco

MEDELLIN1(config-line)#login

MEDELLIN1(config-line)#exit

MEDELLIN1(config)#enable secret class

MEDELLIN1(config)#service password-encryption

MEDELLIN1(config)#banner motd $Prohibido el acceso a personal no autorizado $

- Configuraciòn bàsica MEDELLIN2

Router>en

Router#conf t

Router(config)#hostname MEDELLIN2

MEDELLIN2(config)#no ip domain-lookup

MEDELLIN2(config)#line console 0

MEDELLIN2(config-line)#password cisco

MEDELLIN2(config-line)#login

MEDELLIN2(config-line)#line vty 0 15

MEDELLIN2(config-line)#password cisco

MEDELLIN2(config-line)#login

MEDELLIN2(config-line)#exit

MEDELLIN2(config)#enable secret class

MEDELLIN2(config)#service password-encryption

MEDELLIN2(config)#banner motd $Prohibido el acceso a personal no autorizado $

- Configuraciòn bàsica MEDELLIN3

Router>en

Router#conf t

Router(config)#hostname MEDELLIN3

MEDELLIN3(config)#no ip domain-lookup

MEDELLIN3(config)#line console 0

MEDELLIN3(config-line)#password cisco

MEDELLIN3(config-line)#login

MEDELLIN3(config-line)#line vty 0 15

MEDELLIN3(config-line)#password cisco

MEDELLIN3(config-line)#login

MEDELLIN3(config-line)#exit

MEDELLIN3(config)#enable secret class

MEDELLIN3(config)#service password-encryption

MEDELLIN3(config)#banner motd $Prohibido el acceso a personal no autorizado $

- Configuraciòn bàsica BOGOTA1

Router>en

Router#conf t

Router(config)#hostname BOGOTA1

BOGOTA1(config)#no ip domain-lookup

BOGOTA1(config)#line console 0

BOGOTA1(config-line)#password cisco

BOGOTA1(config-line)#login

BOGOTA1(config-line)#line vty 0 15

BOGOTA1(config-line)#password cisco

BOGOTA1(config-line)#login

BOGOTA1(config-line)#enable secret class

BOGOTA1(config)#service password-encryption

BOGOTA1(config)#banner motd $ Prohibido el acceso a personal no autorizado $

- Configuraciòn bàsica BOGOTA2

Router>en
Router#conf t
Router(config)#hostname BOGOTA2
BOGOTA2(config)#no ip domain-lookup
BOGOTA2(config)#line console 0
BOGOTA2(config-line)#password cisco
BOGOTA2(config-line)#login
BOGOTA2(config-line)#line vty 0 15
BOGOTA2(config-line)#password cisco
BOGOTA2(config-line)#login
BOGOTA2(config-line)#enable secret class
BOGOTA2(config)#service password-encryption
BOGOTA2(config)#banner motd $Prohibido el acceso a personal no autorizado $

- Configuraciòn bàsica BOGOTA3

Router>en
Router#conf t
Router(config)#hostname BOGOTA3
BOGOTA3(config)#no ip domain-lookup
BOGOTA3(config)#line console 0
BOGOTA3(config-line)#password cisco
BOGOTA3(config-line)#login
BOGOTA3(config-line)#line vty 0 15
BOGOTA3(config-line)#password cisco
BOGOTA3(config-line)#login
BOGOTA3(config-line)#enable secret class
BOGOTA3(config)#service password-encryption
BOGOTA3(config)#banner motd $ Prohibido el acceso a personal no autorizado $

e. Configuraciòn direccionamiento IP

Configurar el direccionamiento a los diferentes equipos segùn la siguiente tabla:

- Direccionamiento IP IPS

```
ISP(config)#int s0/0/0
ISP(config-if)#description conexion con MEDELLIN1
ISP(config-if)#ip address 209.17.220.1 255.255.255.252
ISP(config-if)#clock rate 128000
ISP(config-if)#no sh
ISP(config-if)#int s0/0/1
ISP(config-if)#description conexion con BOGOTA1
ISP(config-if)#ip address 209.17.220.5 255.255.255.252
ISP(config-if)#clock rate 128000
ISP(config-if)#no sh
```

- Direccionamiento IP MEDELLIN 1

```
MEDELLIN1(config)#int s0/0/0
MEDELLIN1(config-if)#description Conexion hacia MEDELLIN2
MEDELLIN1(config-if)#ip address 172.29.6.1 255.255.255.252
MEDELLIN1(config-if)#clock rate 128000
MEDELLIN1(config-if)#no sh
MEDELLIN1(config-if)#int s0/0/1
MEDELLIN1(config-if)#description Conexion1 hacia MEDELLIN3
MEDELLIN1(config-if)#ip address 172.29.6.9 255.255.255.252
MEDELLIN1(config-if)#clock rate 128000
MEDELLIN1(config-if)#no sh
MEDELLIN1(config-if)#int s0/1/0
MEDELLIN1(config-if)#description Conexion2 hacia MEDELLIN3
MEDELLIN1(config-if)#ip address 172.29.6.13 255.255.255.252
MEDELLIN1(config-if)#clock rate 128000
MEDELLIN1(config-if)#no sh
```

MEDELLIN1(config-if)#int s0/1/1
MEDELLIN1(config-if)#description Conexion hacia ISP
MEDELLIN1(config-if)#ip address 209.17.220.2 255.255.255.252
MEDELLIN1(config-if)#clock rate 128000
MEDELLIN1(config-if)#no sh

- Direccionamiento IP MEDELLIN 2

MEDELLIN2(config)#int s0/0/0
MEDELLIN2(config-if)#description Conexion con MEDELLIN1
MEDELLIN2(config-if)#ip address 172.29.6.2 255.255.255.252
MEDELLIN2(config-if)#clock rate 128000
MEDELLIN2(config-if)#no sh
MEDELLIN2(config-if)#int s0/0/1
MEDELLIN2(config-if)#description Conexion con MEDELLIN3
MEDELLIN2(config-if)#ip address 172.29.6.5 255.255.255.252
MEDELLIN2(config-if)#clock rate 128000
MEDELLIN2(config-if)#no sh
MEDELLIN2(config-if)#int f0/0
MEDELLIN2(config-if)#description Conexion con hosts
MEDELLIN2(config-if)#ip address 172.29.4.1 255.255.255.128
MEDELLIN2(config-if)#no sh

- Direccionamiento IP MEDELLIN3

MEDELLIN3(config)#int s0/0/0
MEDELLIN3(config-if)#description Conexion2 hacia MEDELLIN1
MEDELLIN3(config-if)#ip address 172.29.6.14 255.255.255.252
MEDELLIN3(config-if)#clock rate 128000
MEDELLIN3(config-if)#no sh
MEDELLIN3(config-if)#int s0/0/1
MEDELLIN3(config-if)#description Conexion1 hacia MEDELLIN1
MEDELLIN3(config-if)#ip address 172.29.6.10 255.255.255.252

MEDELLIN3(config-if)#clock rate 128000
MEDELLIN3(config-if)#no sh
MEDELLIN3(config-if)#int s0/1/0
MEDELLIN3(config-if)#description Conexion hacia MEDELLIN2
MEDELLIN3(config-if)#ip address 172.29.6.6 255.255.255.252
MEDELLIN3(config-if)#clock rate 128000
MEDELLIN3(config-if)#no sh
MEDELLIN3(config-if)#int f0/0
MEDELLIN3(config-if)#description Conexion hacia hosts
MEDELLIN3(config-if)#ip address 172.29.4.129 255.255.255.128
MEDELLIN3(config-if)#no sh

- Direccionamiento IP BOGOTA1

BOGOTA1(config)#int s0/0/0
BOGOTA1(config-if)#description Conexion con ISP
BOGOTA1(config-if)#ip address 209.17.220.6 255.255.255.252
BOGOTA1(config-if)#clock rate 128000
BOGOTA1(config-if)#no sh
BOGOTA1(config-if)#int s0/0/1
BOGOTA1(config-if)#description Conexion con BOGOTA2
BOGOTA1(config-if)#ip address 172.29.3.9 255.255.255.252
BOGOTA1(config-if)#clock rate 128000
BOGOTA1(config-if)#no sh
BOGOTA1(config-if)#int s0/1/0
BOGOTA1(config-if)#description Conexion1 con BOGOTA2
BOGOTA1(config-if)#ip address 172.29.3.5 255.255.255.252
BOGOTA1(config-if)#clock rate 128000
BOGOTA1(config-if)#no sh
BOGOTA1(config-if)#int s0/1/1
BOGOTA1(config-if)#description Conexion2 con BOGOTA2
BOGOTA1(config-if)#ip address 172.29.3.1 255.255.255.252

BOGOTA1(config-if)#clock rate 128000
BOGOTA1(config-if)#no sh

- Direccionamiento IP BOGOTA2

BOGOTA2(config)#int s0/0/0
BOGOTA2(config-if)#description Conexion con BOGOTA1
BOGOTA2(config-if)#ip address 172.29.3.10 255.255.255.252
BOGOTA2(config-if)#clock rate 128000
BOGOTA2(config-if)#no sh
BOGOTA2(config-if)#int s0/0/1
BOGOTA2(config-if)#description Conexion con BOGOTA3
BOGOTA2(config-if)#ip address 172.29.3.13 255.255.255.252
BOGOTA2(config-if)#clock rate 128000
BOGOTA2(config-if)#no sh
BOGOTA2(config-if)#int f0/0
BOGOTA2(config-if)#description Conexion con host
BOGOTA2(config-if)#ip address 172.29.1.1 255.255.255.0
BOGOTA2(config-if)#exit
BOGOTA2(config)#exit

- Direccionamiento IP BOGOTA3

BOGOTA3(config)#int s0/0/0
BOGOTA3(config-if)#description Conexion2 hacia BOGOTA1
BOGOTA3(config-if)#ip address 172.29.3.2 255.255.255.252
BOGOTA3(config-if)#clock rate 128000
BOGOTA3(config-if)#no sh
BOGOTA3(config-if)#int s0/0/1
BOGOTA3(config-if)#description Conexion1 hacia BOGOTA1
BOGOTA3(config-if)#ip address 172.29.3.6 255.255.255.252
BOGOTA3(config-if)#clock rate 128000
BOGOTA3(config-if)#no sh

BOGOTA3(config-if)#int s0/1/0

BOGOTA3(config-if)#description Conexion hacia BOGOTA2

BOGOTA3(config-if)#ip address 172.29.3.14 255.255.255.252

BOGOTA3(config-if)#clock rate 128000

BOGOTA3(config-if)#no sh

BOGOTA3(config-if)#int f0/0

BOGOTA3(config-if)#description Conexion hacia hosts

BOGOTA3(config-if)#ip address 172.29.0.1 255.255.255.0

BOGOTA3(config-if)#no sh

2.1.2 Configuración del enrutamiento

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

- Enrutamiento en router ISP

Verificaciòn con ip route antes de rip en router ISP

Figura 5. Verificaciòn con ip route antes de rip en router ISP

```
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, Serial0/0/0
C       209.17.220.4 is directly connected, Serial0/0/1
```

Còdigo de configuraciòn de route rip

ISP(config)#route rip

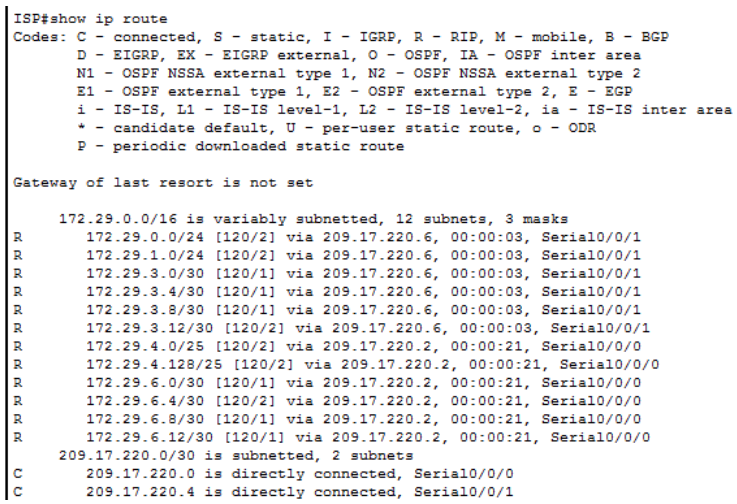
ISP(config-router)#version 2

ISP(config-router)#network 209.17.220.0

ISP(config-router)#network 209.17.220.4

ISP(config-router)#no auto-summary

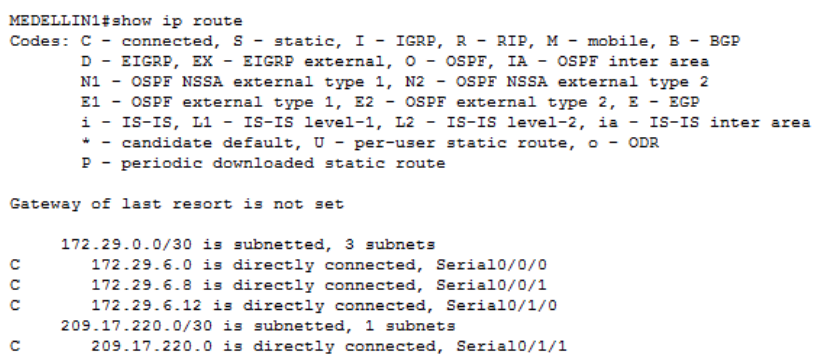
Figura 6. Verificaciòn con ip route despuès de rip en router ISP



```
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

     172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
R       172.29.0.0/24 [120/2] via 209.17.220.6, 00:00:03, Serial0/0/1
R       172.29.1.0/24 [120/2] via 209.17.220.6, 00:00:03, Serial0/0/1
R       172.29.3.0/30 [120/1] via 209.17.220.6, 00:00:03, Serial0/0/1
R       172.29.3.4/30 [120/1] via 209.17.220.6, 00:00:03, Serial0/0/1
R       172.29.3.8/30 [120/1] via 209.17.220.6, 00:00:03, Serial0/0/1
R       172.29.3.12/30 [120/2] via 209.17.220.6, 00:00:03, Serial0/0/1
R       172.29.4.0/25 [120/2] via 209.17.220.2, 00:00:21, Serial0/0/0
R       172.29.4.128/25 [120/2] via 209.17.220.2, 00:00:21, Serial0/0/0
R       172.29.6.0/30 [120/1] via 209.17.220.2, 00:00:21, Serial0/0/0
R       172.29.6.4/30 [120/2] via 209.17.220.2, 00:00:21, Serial0/0/0
R       172.29.6.8/30 [120/1] via 209.17.220.2, 00:00:21, Serial0/0/0
R       172.29.6.12/30 [120/1] via 209.17.220.2, 00:00:21, Serial0/0/0
     209.17.220.0/30 is subnetted, 2 subnets
C       209.17.220.0 is directly connected, Serial0/0/0
C       209.17.220.4 is directly connected, Serial0/0/1
```

- Enrutamiento en router MEDELLIN1

Figura 7. Verificaciòn con ip route antes de rip en MEDELLIN1



```
MEDELLIN1#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

     172.29.0.0/30 is subnetted, 3 subnets
C       172.29.6.0 is directly connected, Serial0/0/0
C       172.29.6.8 is directly connected, Serial0/0/1
C       172.29.6.12 is directly connected, Serial0/1/0
     209.17.220.0/30 is subnetted, 1 subnets
C       209.17.220.0 is directly connected, Serial0/1/1
```

Còdigo de configuraciòn de route rip

MEDELLIN1(config)#route rip

MEDELLIN1(config-router)#version 2

MEDELLIN1(config-router)#network 172.29.6.0

MEDELLIN1(config-router)#network 172.29.6.8

MEDELLIN1(config-router)#network 172.29.6.12

MEDELLIN1(config-router)#network 209.17.220.0

MEDELLIN1(config-router)#no auto-summary

Figura 8. Verificaciòn con ip route despuès de rip en MEDELLIN1

```
MEDELLIN1#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

     172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
R       172.29.0.0/24 [120/3] via 209.17.220.1, 00:00:16, Serial0/1/1
R       172.29.1.0/24 [120/3] via 209.17.220.1, 00:00:16, Serial0/1/1
R       172.29.3.0/30 [120/2] via 209.17.220.1, 00:00:16, Serial0/1/1
R       172.29.3.4/30 [120/2] via 209.17.220.1, 00:00:16, Serial0/1/1
R       172.29.3.8/30 [120/2] via 209.17.220.1, 00:00:16, Serial0/1/1
R       172.29.3.12/30 [120/3] via 209.17.220.1, 00:00:16, Serial0/1/1
R       172.29.4.0/25 [120/1] via 172.29.6.2, 00:00:15, Serial0/0/0
R       172.29.4.128/25 [120/1] via 172.29.6.10, 00:00:10, Serial0/0/1
                        [120/1] via 172.29.6.14, 00:00:10, Serial0/1/0
C       172.29.6.0/30 is directly connected, Serial0/0/0
R       172.29.6.4/30 [120/1] via 172.29.6.2, 00:00:15, Serial0/0/0
                      [120/1] via 172.29.6.10, 00:00:10, Serial0/0/1
                      [120/1] via 172.29.6.14, 00:00:10, Serial0/1/0
C       172.29.6.8/30 is directly connected, Serial0/0/1
C       172.29.6.12/30 is directly connected, Serial0/1/0
     209.17.220.0/30 is subnetted, 2 subnets
C       209.17.220.0 is directly connected, Serial0/1/1
R       209.17.220.4 [120/1] via 209.17.220.1, 00:00:16, Serial0/1/1
```

- Enrutamiento en router MEDELLIN2

Figura 9. Verificaciòn con ip route antes de rip en MEDELLIN2

```
MEDELLIN2#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

     172.29.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       172.29.4.0/25 is directly connected, FastEthernet0/0
C       172.29.6.0/30 is directly connected, Serial0/0/0
```

Còdigo de configuraciòn de route rip

MEDELLIN2(config)#route rip

MEDELLIN2(config-router)#version 2

MEDELLIN2(config-router)#network 172.29.6.0

MEDELLIN2(config-router)#network 172.29.6.4

MEDELLIN2(config-router)#no auto-summary

MEDELLIN2(config-router)#exit

Figura 10. Verificaciòn con ip route despuès de rip en MEDELLIN2

```
MEDELLIN2#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

     172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
R       172.29.0.0/24 [120/4] via 172.29.6.1, 00:00:16, Serial0/0/0
R       172.29.1.0/24 [120/4] via 172.29.6.1, 00:00:16, Serial0/0/0
R       172.29.3.0/30 [120/3] via 172.29.6.1, 00:00:16, Serial0/0/0
R       172.29.3.4/30 [120/3] via 172.29.6.1, 00:00:16, Serial0/0/0
R       172.29.3.8/30 [120/3] via 172.29.6.1, 00:00:16, Serial0/0/0
R       172.29.3.12/30 [120/4] via 172.29.6.1, 00:00:16, Serial0/0/0
C       172.29.4.0/25 is directly connected, FastEthernet0/0
R       172.29.4.128/25 [120/1] via 172.29.6.6, 00:00:02, Serial0/0/1
C       172.29.6.0/30 is directly connected, Serial0/0/0
C       172.29.6.4/30 is directly connected, Serial0/0/1
R       172.29.6.8/30 [120/1] via 172.29.6.6, 00:00:02, Serial0/0/1
                      [120/1] via 172.29.6.1, 00:00:16, Serial0/0/0
R       172.29.6.12/30 [120/1] via 172.29.6.1, 00:00:16, Serial0/0/0
                       [120/1] via 172.29.6.6, 00:00:02, Serial0/0/1
     209.17.220.0/30 is subnetted, 2 subnets
R       209.17.220.0 [120/1] via 172.29.6.1, 00:00:16, Serial0/0/0
R       209.17.220.4 [120/2] via 172.29.6.1, 00:00:16, Serial0/0/0
```

- Enrutamiento en router MEDELLIN3

Figura 11. Verificaciòn con ip route antes de rip en MEDELLIN3

```
MEDELLIN3#show ip route
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/0, changed state t
% Incomplete command.
MEDELLIN3#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

     172.29.0.0/16 is variably subnetted, 4 subnets, 2 masks
C       172.29.4.128/25 is directly connected, FastEthernet0/0
C       172.29.6.4/30 is directly connected, Serial0/1/0
C       172.29.6.8/30 is directly connected, Serial0/0/1
C       172.29.6.12/30 is directly connected, Serial0/0/0
```

Còdigo de configuraciòn de route rip

MEDELLIN3(config)#route rip

MEDELLIN3(config-router)#version 2

MEDELLIN3(config-router)#network 172.29.6.4

MEDELLIN3(config-router)#network 172.29.6.8

MEDELLIN3(config-router)#network 172.29.6.12

MEDELLIN3(config-router)#no auto-summary

Figura 12. Verificaciòn con ip route despuès de rip en MEDELLIN3

```
MEDELLIN3#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

     172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
R       172.29.0.0/24 [120/4] via 172.29.6.9, 00:00:29, Serial0/0/1
R       172.29.1.0/24 [120/4] via 172.29.6.9, 00:00:29, Serial0/0/1
                      [120/4] via 172.29.6.13, 00:00:29, Serial0/0/0
R       172.29.3.0/30 [120/3] via 172.29.6.9, 00:00:29, Serial0/0/1
                      [120/3] via 172.29.6.13, 00:00:29, Serial0/0/0
R       172.29.3.4/30 [120/3] via 172.29.6.9, 00:00:29, Serial0/0/1
                      [120/3] via 172.29.6.13, 00:00:29, Serial0/0/0
R       172.29.3.8/30 [120/3] via 172.29.6.9, 00:00:29, Serial0/0/1
                      [120/3] via 172.29.6.13, 00:00:29, Serial0/0/0
R       172.29.3.12/30 [120/4] via 172.29.6.9, 00:00:29, Serial0/0/1
                       [120/4] via 172.29.6.13, 00:00:29, Serial0/0/0
R       172.29.4.0/25 [120/1] via 172.29.6.5, 00:00:06, Serial0/1/0
C       172.29.4.128/25 is directly connected, FastEthernet0/0
R       172.29.6.0/30 [120/1] via 172.29.6.9, 00:00:29, Serial0/0/1
                      [120/1] via 172.29.6.13, 00:00:29, Serial0/0/0
                      [120/1] via 172.29.6.5, 00:00:06, Serial0/1/0
C       172.29.6.4/30 is directly connected, Serial0/1/0
C       172.29.6.8/30 is directly connected, Serial0/0/1
C       172.29.6.12/30 is directly connected, Serial0/0/0
     209.17.220.0/30 is subnetted, 2 subnets
R       209.17.220.0 [120/1] via 172.29.6.9, 00:00:29, Serial0/0/1
R       209.17.220.4 [120/2] via 172.29.6.9, 00:00:29, Serial0/0/1
                     [120/2] via 172.29.6.13, 00:00:29, Serial0/0/0
```

- Enrutamiento en router BOGOTA1

```
C       172.29.3.0/30 is directly connected, Serial0/1/1
C       172.29.3.4/30 is directly connected, Serial0/1/0
C       172.29.3.8/30 is directly connected, Serial0/0/1
C       209.17.220.4 is directly connected, Serial0/0/0
```

Còdigo de configuraciòn de route rip

BOGOTA1(config)#route rip

BOGOTA1(config-router)#version 2

BOGOTA1(config-router)#network 209.17.220.6

BOGOTA1(config-router)#network 172.29.3.9

BOGOTA1(config-router)#network 172.29.3.5

BOGOTA1(config-router)#network 172.29.3.1

BOGOTA1(config-router)#no auto-summary

Figura 13. Verificaciòn con ip route despuès de rip en BOGOTA1

```
BOGOTA1#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

     172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
R       172.29.0.0/24 [120/1] via 172.29.3.2, 00:00:14, Serial0/1/1
                      [120/1] via 172.29.3.6, 00:00:14, Serial0/1/0
R       172.29.1.0/24 [120/1] via 172.29.3.10, 00:00:00, Serial0/0/1
C       172.29.3.0/30 is directly connected, Serial0/1/1
C       172.29.3.4/30 is directly connected, Serial0/1/0
C       172.29.3.8/30 is directly connected, Serial0/0/1
R       172.29.3.12/30 [120/1] via 172.29.3.10, 00:00:00, Serial0/0/1
                       [120/1] via 172.29.3.2, 00:00:14, Serial0/1/1
                       [120/1] via 172.29.3.6, 00:00:14, Serial0/1/0
R       172.29.4.0/25 [120/3] via 209.17.220.5, 00:00:16, Serial0/0/0
R       172.29.4.128/25 [120/3] via 209.17.220.5, 00:00:16, Serial0/0/0
R       172.29.6.0/30 [120/2] via 209.17.220.5, 00:00:16, Serial0/0/0
R       172.29.6.4/30 [120/3] via 209.17.220.5, 00:00:16, Serial0/0/0
R       172.29.6.8/30 [120/2] via 209.17.220.5, 00:00:16, Serial0/0/0
R       172.29.6.12/30 [120/2] via 209.17.220.5, 00:00:16, Serial0/0/0
     209.17.220.0/30 is subnetted, 2 subnets
R       209.17.220.0 [120/1] via 209.17.220.5, 00:00:16, Serial0/0/0
C       209.17.220.4 is directly connected, Serial0/0/0
```

- Enrutamiento en router BOGOTA2

Figura 14. Verificaciòn con ip route antes de rip en BOGOTA2

```
BOGOTA2#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

     172.29.0.0/16 is variably subnetted, 3 subnets, 2 masks
C       172.29.1.0/24 is directly connected, FastEthernet0/0
C       172.29.3.8/30 is directly connected, Serial0/0/0
C       172.29.3.12/30 is directly connected, Serial0/0/1
```

Còdigo de configuraciòn de route rip

BOGOTA2(config)#route rip

BOGOTA2(config-router)#version 2

BOGOTA2(config-router)#network 172.29.3.8

BOGOTA2(config-router)#network 172.29.3.12

BOGOTA2(config-router)#no auto-summary

Figura 15. Verificaciòn con ip route despuès de rip en BOGOTA2

```
BOGOTA2#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

     172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
R       172.29.0.0/24 [120/1] via 172.29.3.14, 00:00:05, Serial0/0/1
C       172.29.1.0/24 is directly connected, FastEthernet0/0
R       172.29.3.0/30 [120/1] via 172.29.3.9, 00:00:15, Serial0/0/0
                      [120/1] via 172.29.3.14, 00:00:05, Serial0/0/1
R       172.29.3.4/30 [120/1] via 172.29.3.9, 00:00:15, Serial0/0/0
                      [120/1] via 172.29.3.14, 00:00:05, Serial0/0/1
C       172.29.3.8/30 is directly connected, Serial0/0/0
C       172.29.3.12/30 is directly connected, Serial0/0/1
R       172.29.4.0/25 [120/4] via 172.29.3.9, 00:00:15, Serial0/0/0
R       172.29.4.128/25 [120/4] via 172.29.3.9, 00:00:15, Serial0/0/0
R       172.29.6.0/30 [120/3] via 172.29.3.9, 00:00:15, Serial0/0/0
R       172.29.6.4/30 [120/4] via 172.29.3.9, 00:00:15, Serial0/0/0
R       172.29.6.8/30 [120/3] via 172.29.3.9, 00:00:15, Serial0/0/0
R       172.29.6.12/30 [120/3] via 172.29.3.9, 00:00:15, Serial0/0/0
     209.17.220.0/30 is subnetted, 2 subnets
R       209.17.220.0 [120/2] via 172.29.3.9, 00:00:15, Serial0/0/0
R       209.17.220.4 [120/1] via 172.29.3.9, 00:00:15, Serial0/0/0
```

- Enrutamiento en router BOGOTA3

Figura 16. Verificaciòn con ip route antes de rip en BOGOTA3

```
BOGOTA3#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

     172.29.0.0/16 is variably subnetted, 4 subnets, 2 masks
C       172.29.0.0/24 is directly connected, FastEthernet0/0
C       172.29.3.0/30 is directly connected, Serial0/0/0
C       172.29.3.4/30 is directly connected, Serial0/0/1
C       172.29.3.12/30 is directly connected, Serial0/1/0
```

Còdigo de configuraciòn de route rip

BOGOTA3(config)#route rip

BOGOTA3(config-router)#version 2

BOGOTA3(config-router)#network 172.29.3.0

BOGOTA3(config-router)#network 172.29.3.4

BOGOTA3(config-router)#network 172.29.3.12

BOGOTA3(config-router)#no auto-summary

Figura 17. Verificaciòn con ip route despuès de rip en BOGOTA3

```
BOGOTA3#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

     172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
C       172.29.0.0/24 is directly connected, FastEthernet0/0
R       172.29.1.0/24 [120/1] via 172.29.3.13, 00:00:14, Serial0/1/0
C       172.29.3.0/30 is directly connected, Serial0/0/0
C       172.29.3.4/30 is directly connected, Serial0/0/1
R       172.29.3.8/30 [120/1] via 172.29.3.1, 00:00:26, Serial0/0/0
                      [120/1] via 172.29.3.5, 00:00:26, Serial0/0/1
                      [120/1] via 172.29.3.13, 00:00:14, Serial0/1/0
C       172.29.3.12/30 is directly connected, Serial0/1/0
R       172.29.4.0/25 [120/4] via 172.29.3.1, 00:00:26, Serial0/0/0
                      [120/4] via 172.29.3.5, 00:00:26, Serial0/0/1
R       172.29.4.128/25 [120/4] via 172.29.3.5, 00:00:26, Serial0/0/1
                        [120/4] via 172.29.3.1, 00:00:26, Serial0/0/0
R       172.29.6.0/30 [120/3] via 172.29.3.1, 00:00:26, Serial0/0/0
                      [120/3] via 172.29.3.5, 00:00:26, Serial0/0/1
R       172.29.6.4/30 [120/4] via 172.29.3.5, 00:00:26, Serial0/0/1
                      [120/4] via 172.29.3.1, 00:00:26, Serial0/0/0
R       172.29.6.8/30 [120/3] via 172.29.3.1, 00:00:26, Serial0/0/0
                      [120/3] via 172.29.3.5, 00:00:26, Serial0/0/1
R       172.29.6.12/30 [120/3] via 172.29.3.5, 00:00:26, Serial0/0/1
                       [120/3] via 172.29.3.1, 00:00:26, Serial0/0/0
     209.17.220.0/30 is subnetted, 2 subnets
R       209.17.220.0 [120/2] via 172.29.3.1, 00:00:26, Serial0/0/0
                     [120/2] via 172.29.3.5, 00:00:26, Serial0/0/1
R       209.17.220.4 [120/1] via 172.29.3.1, 00:00:26, Serial0/0/0
                     [120/1] via 172.29.3.5, 00:00:26, Serial0/0/1
BOGOTA3#
```

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.

- En MEDELLIN1

Enrutamiento ruta por defecto hacia el ISP

MEDELLIN1(config)#ip route 0.0.0.0 0.0.0.0 s0/1/1

Redistribuciòn dentro de las publicaciones de RIP

MEDELLIN1(config)#route rip

MEDELLIN1(config-router)#version 2

MEDELLIN1(config-router)#default-information originate

- En BOGOTA1

Enrutamiento ruta por defecto hacia el ISP

BOGOTA1(config)#ip route 0.0.0.0 0.0.0.0 s0/0/0

Redistribuciòn dentro de las publicaciones de RIP

BOGOTA1(config)#route rip

BOGOTA1(config-router)#version 2

BOGOTA1(config-router)# default-information originate

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.

Se calcula la sumarizacion de cada red

La red Medellìn con dirección ip 172.29.4.0

La red Bogotà con dirección ip 172.29.0.0

Tabla 1. Sumarizaciòn de direcciones

	Direcciòn de binario																Direcciones red
Red Medellin	172	29	0	0	0	0	0	1	0	0	0	0	0	0	0	0	172.29.4.0/25
	172	29	0	0	0	0	0	1	0	0	1	0	0	0	0	0	172.29.4.128/25
	172	29	0	0	0	0	0	1	1	0	0	0	0	0	1	0	172.29.6.4/30
	172	29	0	0	0	0	0	1	1	0	0	0	0	0	1	0	172.29.6.8/30
	172	29	0	0	0	0	0	1	1	0	0	0	0	0	1	1	172.29.6.12/30
	172	29	0	0	0	0	0	1	1	0	0	0	0	0	0	0	172.29.6.0/30
	172	29	0	0	0	0	0	1	0	0	0	0	0	0	0	0	172.29.4.0/22
Red Bogota	172	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	172.29.0.0/24
	172	29	0	0	0	0	0	0	0	1	0	0	0	0	0	0	172.29.1.0/24
	172	29	0	0	0	0	0	0	1	1	0	0	0	0	1	0	172.29.3.4/30
	172	29	0	0	0	0	0	0	1	1	0	0	0	0	1	0	172.29.3.8/30
	172	29	0	0	0	0	0	0	1	1	0	0	0	0	1	1	172.29.3.12/30
	172	29	0	0	0	0	0	0	1	1	0	0	0	0	0	0	172.29.3.0/30
	172	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	172.29.0.0/22

- Ruta estàtica dirigida hacia la red inrterna de MEDELLIN

ISP(config)#ip route 172.29.4.0 255.255.252.0 s0/0/0

- Ruta estàtica dirigida hacia la red inrterna de BOGOTA

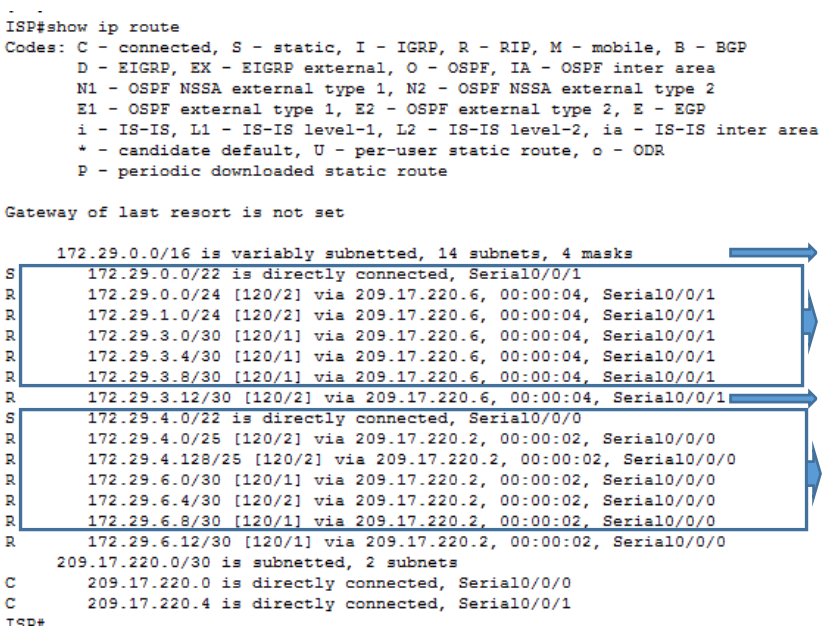
ISP(config)#ip route 172.29.0.0 255.255.252.0 s0/0/1

2.1.3 Tabla de Enrutamiento

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

Verificaciòn tablas de enrutamiento

Figura 18. Tabla de enrutamiento- ISP



Fuente: Comando show ip route al router MEDELLIN1- programa Packet Tracer

Figura 19. Tabla de enrutamiento MEDELLIN1

```
MEDELLIN1#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

     172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
R       172.29.0.0/24 [120/3] via 209.17.220.1, 00:00:22, Serial0/1/1
R       172.29.1.0/24 [120/3] via 209.17.220.1, 00:00:22, Serial0/1/1
R       172.29.3.0/30 [120/2] via 209.17.220.1, 00:00:22, Serial0/1/1
R       172.29.3.4/30 [120/2] via 209.17.220.1, 00:00:22, Serial0/1/1
R       172.29.3.8/30 [120/2] via 209.17.220.1, 00:00:22, Serial0/1/1
R       172.29.3.12/30 [120/3] via 209.17.220.1, 00:00:22, Serial0/1/1
R       172.29.4.0/25 [120/1] via 172.29.6.2, 00:00:00, Serial0/0/0
R       172.29.4.128/25 [120/1] via 172.29.6.14, 00:00:03, Serial0/1/0
                        [120/1] via 172.29.6.10, 00:00:03, Serial0/0/1
C       172.29.6.0/30 is directly connected, Serial0/0/0
R       172.29.6.4/30 [120/1] via 172.29.6.14, 00:00:03, Serial0/1/0
                      [120/1] via 172.29.6.2, 00:00:00, Serial0/0/0
                      [120/1] via 172.29.6.10, 00:00:03, Serial0/0/1
C       172.29.6.8/30 is directly connected, Serial0/0/1
C       172.29.6.12/30 is directly connected, Serial0/1/0
     209.17.220.0/30 is subnetted, 2 subnets
C       209.17.220.0 is directly connected, Serial0/1/1
R       209.17.220.4 [120/1] via 209.17.220.1, 00:00:22, Serial0/1/1
S*   0.0.0.0/0 [1/0] via 209.17.220.4
                is directly connected, Serial0/1/1
MEDELLIN1#
```

Conectado por ruteo estàtico

Estas redes realizan su conexión a través del puerto serial s0/1/1 vìa 209.17.220.1 asociado al router ISP

Conectado por ruteo estàtico

Este grupo de redes realizan su conexión a través del puerto serial s0/0/1 vìa 209.17.220.6 asociado al router

Fuente: 1 Comando show ip route al router MEDELLIN1- programa Packet Tracer

Figura 20. Tabla de enrutamiento MEDELLIN2

```
MEDELLIN2#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 172.29.6.1 to network 0.0.0.0

     172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
R       172.29.0.0/24 [120/4] via 172.29.6.1, 00:00:00, Serial0/0/0
R       172.29.1.0/24 [120/4] via 172.29.6.1, 00:00:00, Serial0/0/0
R       172.29.3.0/30 [120/3] via 172.29.6.1, 00:00:00, Serial0/0/0
R       172.29.3.4/30 [120/3] via 172.29.6.1, 00:00:00, Serial0/0/0
R       172.29.3.8/30 [120/3] via 172.29.6.1, 00:00:00, Serial0/0/0
R       172.29.3.12/30 [120/4] via 172.29.6.1, 00:00:00, Serial0/0/0
C       172.29.4.0/25 is directly connected, FastEthernet0/0
R       172.29.4.128/25 [120/1] via 172.29.6.6, 00:00:00, Serial0/0/1
C       172.29.6.0/30 is directly connected, Serial0/0/0
C       172.29.6.4/30 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, 00:00:00, 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, 00:00:00, Serial0/0/1
     209.17.220.0/30 is subnetted, 2 subnets
R       209.17.220.0 [120/1] via 172.29.6.1, 00:00:00, Serial0/0/0
R       209.17.220.4 [120/2] via 172.29.6.1, 00:00:00, Serial0/0/0
R*   0.0.0.0/0 [120/1] via 172.29.6.1, 00:00:00, Serial0/0/0
```

Fuente: Comando show ip route al router MEDELLIN2- programa Packet Tracer

Figura 21. Tabla de enrutamiento MEDELLIN3

```
MEDELLIN3#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 172.29.6.13 to network 0.0.0.0

     172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
R       172.29.0.0/24 [120/4] via 172.29.6.13, 00:00:19, Serial0/0/0
                      [120/4] via 172.29.6.9, 00:00:19, Serial0/0/1
R       172.29.1.0/24 [120/4] via 172.29.6.13, 00:00:19, Serial0/0/0
                      [120/4] via 172.29.6.9, 00:00:19, Serial0/0/1
R       172.29.3.0/30 [120/3] via 172.29.6.13, 00:00:19, Serial0/0/0
                      [120/3] via 172.29.6.9, 00:00:19, Serial0/0/1
R       172.29.3.4/30 [120/3] via 172.29.6.13, 00:00:19, Serial0/0/0
                      [120/3] via 172.29.6.9, 00:00:19, Serial0/0/1
R       172.29.3.8/30 [120/3] via 172.29.6.13, 00:00:19, Serial0/0/0
                      [120/3] via 172.29.6.9, 00:00:19, Serial0/0/1
R       172.29.3.12/30 [120/4] via 172.29.6.13, 00:00:19, Serial0/0/0
                       [120/4] via 172.29.6.9, 00:00:19, Serial0/0/1
R       172.29.4.0/25 [120/1] via 172.29.6.5, 00:00:12, Serial0/1/0
C       172.29.4.128/25 is directly connected, FastEthernet0/0
R       172.29.6.0/30 [120/1] via 172.29.6.13, 00:00:19, Serial0/0/0
                      [120/1] via 172.29.6.5, 00:00:12, Serial0/1/0
                      [120/1] via 172.29.6.9, 00:00:19, Serial0/0/1
C       172.29.6.4/30 is directly connected, Serial0/1/0
C       172.29.6.8/30 is directly connected, Serial0/0/1
C       172.29.6.12/30 is directly connected, Serial0/0/0
     209.17.220.0/30 is subnetted, 2 subnets
R       209.17.220.0 [120/1] via 172.29.6.13, 00:00:19, Serial0/0/0
                     [120/1] via 172.29.6.9, 00:00:19, Serial0/0/1
R       209.17.220.4 [120/2] via 172.29.6.13, 00:00:19, Serial0/0/0
                     [120/2] via 172.29.6.9, 00:00:19, Serial0/0/1
R*   0.0.0.0/0 [120/1] via 172.29.6.13, 00:00:19, Serial0/0/0
               [120/1] via 172.29.6.9, 00:00:19, Serial0/0/1
```

Fuente: Comando show ip route al router MEDELLIN3- programa Packet Tracer

Figura 22. Tabla de enrutamiento BOGOTA1

```
BOGOTA1#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

     172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
R       172.29.0.0/24 [120/1] via 172.29.3.2, 00:00:23, Serial0/1/1
                      [120/1] via 172.29.3.6, 00:00:23, Serial0/1/0
R       172.29.1.0/24 [120/1] via 172.29.3.10, 00:00:03, Serial0/0/1
C       172.29.3.0/30 is directly connected, Serial0/1/1
C       172.29.3.4/30 is directly connected, Serial0/1/0
C       172.29.3.8/30 is directly connected, Serial0/0/1
R       172.29.3.12/30 [120/1] via 172.29.3.10, 00:00:03, Serial0/0/1
                       [120/1] via 172.29.3.2, 00:00:23, Serial0/1/1
                       [120/1] via 172.29.3.6, 00:00:23, Serial0/1/0
R       172.29.4.0/25 [120/3] via 209.17.220.5, 00:00:09, Serial0/0/0
R       172.29.4.128/25 [120/3] via 209.17.220.5, 00:00:09, Serial0/0/0
R       172.29.6.0/30 [120/2] via 209.17.220.5, 00:00:09, Serial0/0/0
R       172.29.6.4/30 [120/3] via 209.17.220.5, 00:00:09, Serial0/0/0
R       172.29.6.8/30 [120/2] via 209.17.220.5, 00:00:09, Serial0/0/0
R       172.29.6.12/30 [120/2] via 209.17.220.5, 00:00:09, Serial0/0/0
     209.17.220.0/30 is subnetted, 2 subnets
R       209.17.220.0 [120/1] via 209.17.220.5, 00:00:09, Serial0/0/0
C       209.17.220.4 is directly connected, Serial0/0/0
S*   0.0.0.0/0 [1/0] via 209.17.220.4
               is directly connected, Serial0/0/0
```

Fuente: Comando show ip route al router BOGOTA1- programa Packet Tracer

Figura 23. Tabla de enrutamiento BOGOTA2

```
BOGOTA2#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

     172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
R       172.29.0.0/24 [120/1] via 172.29.3.14, 00:00:25, Serial0/0/1
C       172.29.1.0/24 is directly connected, FastEthernet0/0
R       172.29.3.0/30 [120/1] via 172.29.3.9, 00:00:22, Serial0/0/0
                      [120/1] via 172.29.3.14, 00:00:25, Serial0/0/1
R       172.29.3.4/30 [120/1] via 172.29.3.9, 00:00:22, Serial0/0/0
                      [120/1] via 172.29.3.14, 00:00:25, Serial0/0/1
C       172.29.3.8/30 is directly connected, Serial0/0/0
C       172.29.3.12/30 is directly connected, Serial0/0/1
R       172.29.4.0/25 [120/4] via 172.29.3.9, 00:00:22, Serial0/0/0
R       172.29.4.128/25 [120/4] via 172.29.3.9, 00:00:22, Serial0/0/0
R       172.29.6.0/30 [120/3] via 172.29.3.9, 00:00:22, Serial0/0/0
R       172.29.6.4/30 [120/4] via 172.29.3.9, 00:00:22, Serial0/0/0
R       172.29.6.8/30 [120/3] via 172.29.3.9, 00:00:22, Serial0/0/0
R       172.29.6.12/30 [120/3] via 172.29.3.9, 00:00:22, Serial0/0/0
     209.17.220.0/30 is subnetted, 2 subnets
R       209.17.220.0 [120/2] via 172.29.3.9, 00:00:22, Serial0/0/0
R       209.17.220.4 [120/1] via 172.29.3.9, 00:00:22, Serial0/0/0
R*   0.0.0.0/0 [120/1] via 172.29.3.9, 00:00:22, Serial0/0/0
```

Fuente: Comando show ip route al router BOGOTA2- programa Packet Tracer

Figura 24. Tabla de enrutamiento BOGOTA3

```
BOGOTA3#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

     172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
C       172.29.0.0/24 is directly connected, FastEthernet0/0
R       172.29.1.0/24 [120/1] via 172.29.3.13, 00:00:22, Serial0/1/0
C       172.29.3.0/30 is directly connected, Serial0/0/0
C       172.29.3.4/30 is directly connected, Serial0/0/1
R       172.29.3.8/30 [120/1] via 172.29.3.1, 00:00:09, Serial0/0/0
                      [120/1] via 172.29.3.13, 00:00:22, Serial0/1/0
                      [120/1] via 172.29.3.5, 00:00:09, Serial0/0/1
C       172.29.3.12/30 is directly connected, Serial0/1/0
R       172.29.4.0/25 [120/4] via 172.29.3.5, 00:00:09, Serial0/0/1
                      [120/4] via 172.29.3.1, 00:00:09, Serial0/0/0
R       172.29.4.128/25 [120/4] via 172.29.3.5, 00:00:09, Serial0/0/1
                        [120/4] via 172.29.3.1, 00:00:09, Serial0/0/0
R       172.29.6.0/30 [120/3] via 172.29.3.5, 00:00:09, Serial0/0/1
                      [120/3] via 172.29.3.1, 00:00:09, Serial0/0/0
R       172.29.6.4/30 [120/4] via 172.29.3.5, 00:00:09, Serial0/0/1
                      [120/4] via 172.29.3.1, 00:00:09, Serial0/0/0
R       172.29.6.8/30 [120/3] via 172.29.3.5, 00:00:09, Serial0/0/1
                      [120/3] via 172.29.3.1, 00:00:09, Serial0/0/0
R       172.29.6.12/30 [120/3] via 172.29.3.5, 00:00:09, Serial0/0/1
                       [120/3] via 172.29.3.1, 00:00:09, Serial0/0/0
     209.17.220.0/30 is subnetted, 2 subnets
R       209.17.220.0 [120/2] via 172.29.3.1, 00:00:09, Serial0/0/0
                     [120/2] via 172.29.3.5, 00:00:09, Serial0/0/1
R       209.17.220.4 [120/1] via 172.29.3.1, 00:00:09, Serial0/0/0
                     [120/1] via 172.29.3.5, 00:00:09, Serial0/0/1
R*   0.0.0.0/0 [120/1] via 172.29.3.5, 00:00:09, Serial0/0/1
               [120/1] via 172.29.3.1, 00:00:09, Serial0/0/0
```

Fuente: Comando show ip route al router BOGOTA3- programa Packet Tracer

b. 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.

Figura 25. Comparaciòn show ip protocols BOGOTA1 y MEDELLIN1

```
MEDELLIN1#show ip protocols
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 6 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, static
Default version control: send version 2, receive 2
  Interface              Send  Recv  Triggered RIP  Key-chain
  Serial0/1/0            2     2
  Serial0/0/0            2     2
  Serial0/0/1            2     2
  Serial0/1/1            2     2
Automatic network summarization is not in effect
Maximum path: 4
Routing for Networks:
          172.29.0.0
          209.17.220.0
Passive Interface(s):
Routing Information Sources:
          Gateway         Distance      Last Update
          209.17.220.1         120      00:00:10
          172.29.6.2           120      00:00:07
          172.29.6.14          120      00:00:23
          172.29.6.10          120      00:00:23
Distance: (default is 120)
```

```
BOGOTA1#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, static
Default version control: send version 2, receive 2
  Interface              Send  Recv  Triggered RIP  Key-chain
  Serial0/1/0            2     2
  Serial0/0/1            2     2
  Serial0/1/1            2     2
  Serial0/0/0            2     2
Automatic network summarization is not in effect
Maximum path: 4
Routing for Networks:
          172.29.0.0
          209.17.220.0
Passive Interface(s):
Routing Information Sources:
          Gateway         Distance      Last Update
          172.29.3.2           120      00:00:05
          172.29.3.6           120      00:00:05
          172.29.3.10          120      00:00:05
          209.17.220.5         120      00:00:16
Distance: (default is 120)
```

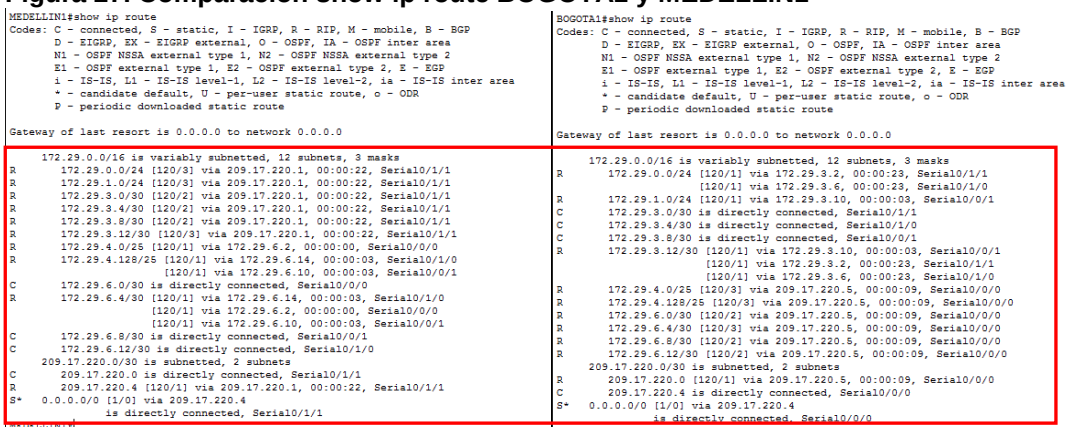
Figura 26. Comparaciòn show ip route BOGOTA1 y MEDELLIN1

```
MEDELLIN1#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

     172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
R       172.29.0.0/24 [120/3] via 209.17.220.1, 00:00:22, Serial0/1/1
R       172.29.1.0/24 [120/3] via 209.17.220.1, 00:00:22, Serial0/1/1
R       172.29.3.0/30 [120/2] via 209.17.220.1, 00:00:22, Serial0/1/1
R       172.29.3.4/30 [120/2] via 209.17.220.1, 00:00:22, Serial0/1/1
R       172.29.3.8/30 [120/2] via 209.17.220.1, 00:00:22, Serial0/1/1
R       172.29.3.12/30 [120/3] via 209.17.220.1, 00:00:22, Serial0/1/1
R       172.29.4.0/25 [120/1] via 172.29.6.2, 00:00:00, Serial0/0/0
R       172.29.4.128/25 [120/1] via 172.29.6.14, 00:00:03, Serial0/1/0
                        [120/1] via 172.29.6.10, 00:00:03, Serial0/0/1
C       172.29.6.0/30 is directly connected, Serial0/0/0
R       172.29.6.4/30 [120/1] via 172.29.6.14, 00:00:03, Serial0/1/0
                      [120/1] via 172.29.6.2, 00:00:00, Serial0/0/0
                      [120/1] via 172.29.6.10, 00:00:03, Serial0/0/1
C       172.29.6.8/30 is directly connected, Serial0/0/1
C       172.29.6.12/30 is directly connected, Serial0/1/0
     209.17.220.0/30 is subnetted, 2 subnets
C       209.17.220.0 is directly connected, Serial0/1/1
R       209.17.220.4 [120/1] via 209.17.220.2, 00:00:22, Serial0/1/1
S*   0.0.0.0/0 [1/0] via 209.17.220.4
          is directly connected, Serial0/1/1
```

```
BOGOTA1#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

     172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
R       172.29.0.0/24 [120/1] via 172.29.3.2, 00:00:23, Serial0/1/1
                      [120/1] via 172.29.3.6, 00:00:23, Serial0/1/0
R       172.29.1.0/24 [120/1] via 172.29.3.10, 00:00:03, Serial0/0/1
C       172.29.3.0/30 is directly connected, Serial0/1/1
C       172.29.3.4/30 is directly connected, Serial0/1/0
C       172.29.3.8/30 is directly connected, Serial0/0/1
R       172.29.3.12/30 [120/1] via 172.29.3.10, 00:00:03, Serial0/0/1
                       [120/1] via 172.29.3.2, 00:00:23, Serial0/1/1
                       [120/1] via 172.29.3.6, 00:00:23, Serial0/1/0
R       172.29.4.0/25 [120/3] via 209.17.220.5, 00:00:09, Serial0/0/0
R       172.29.4.128/25 [120/3] via 209.17.220.5, 00:00:09, Serial0/0/0
R       172.29.6.0/30 [120/2] via 209.17.220.5, 00:00:09, Serial0/0/0
R       172.29.6.4/30 [120/3] via 209.17.220.5, 00:00:09, Serial0/0/0
R       172.29.6.8/30 [120/2] via 209.17.220.5, 00:00:09, Serial0/0/0
R       172.29.6.12/30 [120/2] via 209.17.220.5, 00:00:09, Serial0/0/0
     209.17.220.0/30 is subnetted, 2 subnets
R       209.17.220.0 [120/1] via 209.17.220.5, 00:00:09, Serial0/0/0
C       209.17.220.4 is directly connected, Serial0/0/0
S*   0.0.0.0/0 [1/0] via 209.17.220.4
          is directly connected, Serial0/0/0
```

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

Figura 27. Comparaciòn show ip route BOGOTA1 y MEDELLIN1



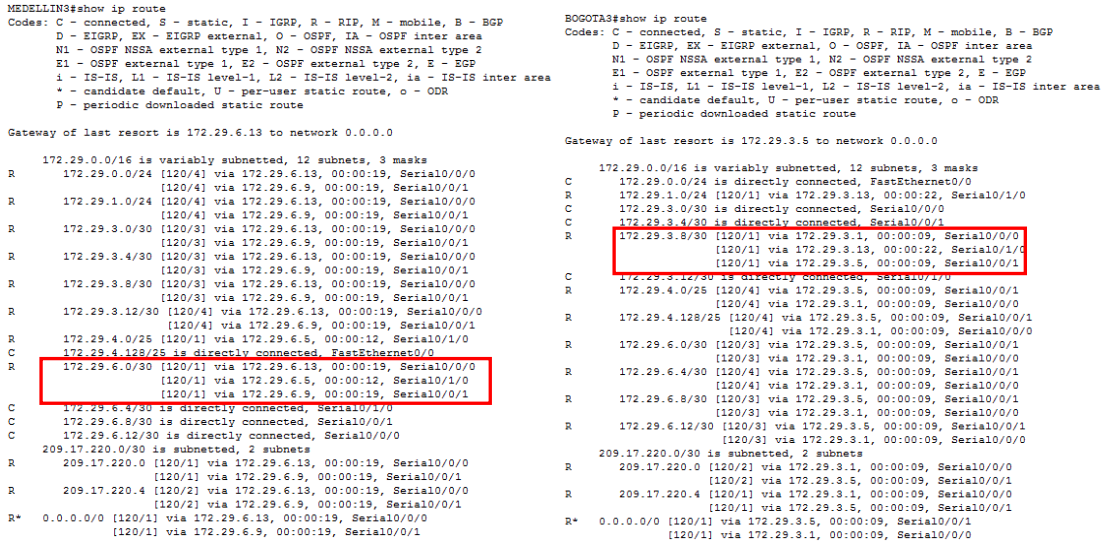
```
MEDELLIN1#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, 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

     172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
R       172.29.0.0/24 [120/3] via 209.17.220.1, 00:00:22, Serial0/1/1
R       172.29.1.0/24 [120/3] via 209.17.220.1, 00:00:22, Serial0/1/1
R       172.29.3.0/30 [120/2] via 209.17.220.1, 00:00:22, Serial0/1/1
R       172.29.3.4/30 [120/2] via 209.17.220.1, 00:00:22, Serial0/1/1
R       172.29.3.8/30 [120/2] via 209.17.220.1, 00:00:22, Serial0/1/1
R       172.29.3.12/30 [120/3] via 209.17.220.1, 00:00:22, Serial0/1/1
R       172.29.4.0/25 [120/1] via 172.29.6.2, 00:00:00, Serial0/0/0
R       172.29.4.128/25 [120/1] via 172.29.6.14, 00:00:03, Serial0/1/0
                        [120/1] via 172.29.6.10, 00:00:03, Serial0/0/1
C       172.29.6.0/30 is directly connected, Serial0/0/0
R       172.29.6.4/30 [120/1] via 172.29.6.14, 00:00:03, Serial0/1/0
                      [120/1] via 172.29.6.2, 00:00:00, Serial0/0/0
                      [120/1] via 172.29.6.10, 00:00:03, Serial0/0/1
C       172.29.6.8/30 is directly connected, Serial0/0/1
C       172.29.6.12/30 is directly connected, Serial0/1/0
     209.17.220.0/30 is subnetted, 2 subnets
C       209.17.220.0 is directly connected, Serial0/1/1
R       209.17.220.4 [120/1] via 209.17.220.1, 00:00:22, Serial0/1/1
S*   0.0.0.0/0 [1/0] via 209.17.220.4
               is directly connected, Serial0/1/1
```

```
BOGOTA1#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

     172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
R       172.29.0.0/24 [120/1] via 172.29.3.2, 00:00:23, Serial0/1/1
                      [120/1] via 172.29.3.6, 00:00:23, Serial0/1/0
R       172.29.1.0/24 [120/1] via 172.29.3.10, 00:00:03, Serial0/0/1
C       172.29.3.0/30 is directly connected, Serial0/1/1
C       172.29.3.4/30 is directly connected, Serial0/1/0
C       172.29.3.8/30 is directly connected, Serial0/0/1
R       172.29.3.12/30 [120/1] via 172.29.3.10, 00:00:03, Serial0/0/1
                       [120/1] via 172.29.3.2, 00:00:23, Serial0/1/1
                       [120/1] via 172.29.3.6, 00:00:23, Serial0/1/0
R       172.29.4.0/25 [120/3] via 209.17.220.5, 00:00:09, Serial0/0/0
R       172.29.4.128/25 [120/3] via 209.17.220.5, 00:00:09, Serial0/0/0
R       172.29.6.0/30 [120/2] via 209.17.220.5, 00:00:09, Serial0/0/0
R       172.29.6.4/30 [120/3] via 209.17.220.5, 00:00:09, Serial0/0/0
R       172.29.6.8/30 [120/2] via 209.17.220.5, 00:00:09, Serial0/0/0
R       172.29.6.12/30 [120/2] via 209.17.220.5, 00:00:09, Serial0/0/0
     209.17.220.0/30 is subnetted, 2 subnets
R       209.17.220.0 [120/1] via 209.17.220.5, 00:00:09, Serial0/0/0
C       209.17.220.4 is directly connected, Serial0/0/0
S*   0.0.0.0/0 [1/0] via 209.17.220.4
               is directly connected, Serial0/0/0
```

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

Las rutas redundantes indican màs de un camino para acceder a la ip destino, los router MEDELLIN3 Y BOGOTA3 cuentan con 3 rutas de salida por ejemplo las señaladas.

Figura 28. Comparaciòn rutas redundantes MEDELLIN3 y BOGOTA3



```
MEDELLIN3#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 172.29.6.13 to network 0.0.0.0

     172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
R       172.29.0.0/24 [120/4] via 172.29.6.13, 00:00:19, Serial0/0/0
                      [120/4] via 172.29.6.9, 00:00:19, Serial0/0/1
R       172.29.1.0/24 [120/4] via 172.29.6.13, 00:00:19, Serial0/0/0
                      [120/4] via 172.29.6.9, 00:00:19, Serial0/0/1
R       172.29.3.0/30 [120/3] via 172.29.6.13, 00:00:19, Serial0/0/0
                      [120/3] via 172.29.6.9, 00:00:19, Serial0/0/1
R       172.29.3.4/30 [120/3] via 172.29.6.13, 00:00:19, Serial0/0/0
                      [120/3] via 172.29.6.9, 00:00:19, Serial0/0/1
R       172.29.3.8/30 [120/3] via 172.29.6.13, 00:00:19, Serial0/0/0
                      [120/3] via 172.29.6.9, 00:00:19, Serial0/0/1
R       172.29.3.12/30 [120/4] via 172.29.6.13, 00:00:19, Serial0/0/0
                       [120/4] via 172.29.6.9, 00:00:19, Serial0/0/1
R       172.29.4.0/25 [120/1] via 172.29.6.5, 00:00:12, Serial0/1/0
C       172.29.4.128/25 is directly connected, FastEthernet0/0
R       172.29.6.0/30 [120/1] via 172.29.6.13, 00:00:19, Serial0/0/0
                      [120/1] via 172.29.6.5, 00:00:12, Serial0/1/0
                      [120/1] via 172.29.6.9, 00:00:19, Serial0/0/1
C       172.29.6.4/30 is directly connected, Serial0/1/0
C       172.29.6.8/30 is directly connected, Serial0/0/1
C       172.29.6.12/30 is directly connected, Serial0/0/0
     209.17.220.0/30 is subnetted, 2 subnets
R       209.17.220.0 [120/1] via 172.29.6.13, 00:00:19, Serial0/0/0
                     [120/1] via 172.29.6.9, 00:00:19, Serial0/0/1
R       209.17.220.4 [120/2] via 172.29.6.13, 00:00:19, Serial0/0/0
                     [120/2] via 172.29.6.9, 00:00:19, Serial0/0/1
R*   0.0.0.0/0 [120/1] via 172.29.6.13, 00:00:19, Serial0/0/0
               [120/1] via 172.29.6.9, 00:00:19, Serial0/0/1
```

```
BOGOTA3#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

     172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
C       172.29.0.0/24 is directly connected, FastEthernet0/0
R       172.29.1.0/24 [120/1] via 172.29.3.13, 00:00:22, Serial1/1/0
C       172.29.3.0/30 is directly connected, Serial0/0/0
C       172.29.3.4/30 is directly connected, Serial0/0/1
R       172.29.3.8/30 [120/1] via 172.29.3.1, 00:00:09, Serial0/0/0
                      [120/1] via 172.29.3.13, 00:00:22, Serial1/1/0
                      [120/1] via 172.29.3.5, 00:00:09, Serial0/0/1
C       172.29.3.12/30 is directly connected, Serial1/1/0
R       172.29.4.0/25 [120/4] via 172.29.3.5, 00:00:09, Serial0/0/1
                      [120/4] via 172.29.3.1, 00:00:09, Serial0/0/0
R       172.29.4.128/25 [120/4] via 172.29.3.5, 00:00:09, Serial0/0/1
                        [120/4] via 172.29.3.1, 00:00:09, Serial0/0/0
R       172.29.6.0/30 [120/3] via 172.29.3.5, 00:00:09, Serial0/0/1
                      [120/3] via 172.29.3.1, 00:00:09, Serial0/0/0
R       172.29.6.4/30 [120/4] via 172.29.3.5, 00:00:09, Serial0/0/1
                      [120/4] via 172.29.3.1, 00:00:09, Serial0/0/0
R       172.29.6.8/30 [120/3] via 172.29.3.5, 00:00:09, Serial0/0/1
                      [120/3] via 172.29.3.1, 00:00:09, Serial0/0/0
R       172.29.6.12/30 [120/3] via 172.29.3.5, 00:00:09, Serial0/0/1
                       [120/3] via 172.29.3.1, 00:00:09, Serial0/0/0
     209.17.220.0/30 is subnetted, 2 subnets
R       209.17.220.0 [120/2] via 172.29.3.1, 00:00:09, Serial0/0/0
                     [120/2] via 172.29.3.5, 00:00:09, Serial0/0/1
R       209.17.220.4 [120/1] via 172.29.3.1, 00:00:09, Serial0/0/0
                     [120/1] via 172.29.3.5, 00:00:09, Serial0/0/1
R*   0.0.0.0/0 [120/1] via 172.29.3.5, 00:00:09, Serial0/0/1
               [120/1] via 172.29.3.1, 00:00:09, Serial0/0/0
```

e. Verificar el balanceo de carga que presentan los routers.

El balanceo de carga se puede evidenciar mediante los datos señalados, estos indican un balanceo de 1, 2 y 3 en la mayoría de los routers.

Figura 29. Balanceo de carga del router ISP

```
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

     172.29.0.0/16 is variably subnetted, 14 subnets, 4 masks
S       172.29.0.0/22 is directly connected, Serial0/0/1
R       172.29.0.0/24 [120/2] via 209.17.220.6, 00:00:04, Serial0/0/1
R       172.29.1.0/24 [120/2] via 209.17.220.6, 00:00:04, Serial0/0/1
R       172.29.3.0/30 [120/1] via 209.17.220.6, 00:00:04, Serial0/0/1
R       172.29.3.4/30 [120/1] via 209.17.220.6, 00:00:04, Serial0/0/1
R       172.29.3.8/30 [120/1] via 209.17.220.6, 00:00:04, Serial0/0/1
R       172.29.3.12/30 [120/2] via 209.17.220.6, 00:00:04, Serial0/0/1
S       172.29.4.0/22 is directly connected, Serial0/0/0
R       172.29.4.0/25 [120/2] via 209.17.220.2, 00:00:02, Serial0/0/0
R       172.29.4.128/25 [120/2] via 209.17.220.2, 00:00:02, Serial0/0/0
R       172.29.6.0/30 [120/1] via 209.17.220.2, 00:00:02, Serial0/0/0
R       172.29.6.4/30 [120/2] via 209.17.220.2, 00:00:02, Serial0/0/0
R       172.29.6.8/30 [120/1] via 209.17.220.2, 00:00:02, Serial0/0/0
R       172.29.6.12/30 [120/1] via 209.17.220.2, 00:00:02, Serial0/0/0
     209.17.220.0/30 is subnetted, 2 subnets
C       209.17.220.0 is directly connected, Serial0/0/0
C       209.17.220.4 is directly connected, Serial0/0/1
ISP#
```

Figura 30. Balanceo de carga del router MEDELLIN1

```
MEDELLIN1#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

     172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
R       172.29.0.0/24 [120/3] via 209.17.220.1, 00:00:22, Serial0/1/1
R       172.29.1.0/24 [120/3] via 209.17.220.1, 00:00:22, Serial0/1/1
R       172.29.3.0/30 [120/2] via 209.17.220.1, 00:00:22, Serial0/1/1
R       172.29.3.4/30 [120/2] via 209.17.220.1, 00:00:22, Serial0/1/1
R       172.29.3.8/30 [120/2] via 209.17.220.1, 00:00:22, Serial0/1/1
R       172.29.3.12/30 [120/3] via 209.17.220.1, 00:00:22, Serial0/1/1
R       172.29.4.0/25 [120/1] via 172.29.6.2, 00:00:00, Serial0/0/0
R       172.29.4.128/25 [120/1] via 172.29.6.14, 00:00:03, Serial0/1/0
                        [120/1] via 172.29.6.10, 00:00:03, Serial0/0/1
C       172.29.6.0/30 is directly connected, Serial0/0/0
R       172.29.6.4/30 [120/1] via 172.29.6.14, 00:00:03, Serial0/1/0
                      [120/1] via 172.29.6.2, 00:00:00, Serial0/0/0
                      [120/1] via 172.29.6.10, 00:00:03, Serial0/0/1
C       172.29.6.8/30 is directly connected, Serial0/0/1
C       172.29.6.12/30 is directly connected, Serial0/1/0
     209.17.220.0/30 is subnetted, 2 subnets
C       209.17.220.0 is directly connected, Serial0/1/1
R       209.17.220.4 [120/1] via 209.17.220.1, 00:00:22, Serial0/1/1
S*   0.0.0.0/0 [1/0] via 209.17.220.4
                 is directly connected, Serial0/1/1
MEDELLIN1#
```

Fuente: 2 Comando show ip route al router MEDELLIN1- programa Packet Tracer

Figura 31. Balanceo de carga del router MEDELLIN2

```
MEDELLIN2#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 172.29.6.1 to network 0.0.0.0

     172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
R       172.29.0.0/24 [120/4] via 172.29.6.1, 00:00:00, Serial0/0/0
R       172.29.1.0/24 [120/4] via 172.29.6.1, 00:00:00, Serial0/0/0
R       172.29.3.0/30 [120/3] via 172.29.6.1, 00:00:00, Serial0/0/0
R       172.29.3.4/30 [120/3] via 172.29.6.1, 00:00:00, Serial0/0/0
R       172.29.3.8/30 [120/3] via 172.29.6.1, 00:00:00, Serial0/0/0
R       172.29.3.12/30 [120/4] via 172.29.6.1, 00:00:00, Serial0/0/0
C       172.29.4.0/25 is directly connected, FastEthernet0/0
R       172.29.4.128/25 [120/1] via 172.29.6.6, 00:00:00, Serial0/0/1
C       172.29.6.0/30 is directly connected, Serial0/0/0
C       172.29.6.4/30 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, 00:00:00, 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, 00:00:00, Serial0/0/1
     209.17.220.0/30 is subnetted, 2 subnets
R       209.17.220.0 [120/1] via 172.29.6.1, 00:00:00, Serial0/0/0
R       209.17.220.4 [120/2] via 172.29.6.1, 00:00:00, Serial0/0/0
R*   0.0.0.0/0 [120/1] via 172.29.6.1, 00:00:00, Serial0/0/0
```

Fuente: 3 Comando show ip route al router MEDELLIN2- programa Packet Tracer

Figura 32. Balanceo de carga del router MEDELLIN3

```
MEDELLIN3#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 172.29.6.13 to network 0.0.0.0

     172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
R       172.29.0.0/24 [120/4] via 172.29.6.13, 00:00:19, Serial0/0/0
                      [120/4] via 172.29.6.9, 00:00:19, Serial0/0/1
R       172.29.1.0/24 [120/4] via 172.29.6.13, 00:00:19, Serial0/0/0
                      [120/4] via 172.29.6.9, 00:00:19, Serial0/0/1
R       172.29.3.0/30 [120/3] via 172.29.6.13, 00:00:19, Serial0/0/0
                      [120/3] via 172.29.6.9, 00:00:19, Serial0/0/1
R       172.29.3.4/30 [120/3] via 172.29.6.13, 00:00:19, Serial0/0/0
                      [120/3] via 172.29.6.9, 00:00:19, Serial0/0/1
R       172.29.3.8/30 [120/3] via 172.29.6.13, 00:00:19, Serial0/0/0
                      [120/3] via 172.29.6.9, 00:00:19, Serial0/0/1
R       172.29.3.12/30 [120/4] via 172.29.6.13, 00:00:19, Serial0/0/0
                       [120/4] via 172.29.6.9, 00:00:19, Serial0/0/1
R       172.29.4.0/25 [120/1] via 172.29.6.5, 00:00:12, Serial0/1/0
C       172.29.4.128/25 is directly connected, FastEthernet0/0
R       172.29.6.0/30 [120/1] via 172.29.6.13, 00:00:19, Serial0/0/0
                      [120/1] via 172.29.6.5, 00:00:12, Serial0/1/0
                      [120/1] via 172.29.6.9, 00:00:19, Serial0/0/1
C       172.29.6.4/30 is directly connected, Serial0/1/0
C       172.29.6.8/30 is directly connected, Serial0/0/1
C       172.29.6.12/30 is directly connected, Serial0/0/0
     209.17.220.0/30 is subnetted, 2 subnets
R       209.17.220.0 [120/1] via 172.29.6.13, 00:00:19, Serial0/0/0
                     [120/1] via 172.29.6.9, 00:00:19, Serial0/0/1
R       209.17.220.4 [120/2] via 172.29.6.13, 00:00:19, Serial0/0/0
                     [120/2] via 172.29.6.9, 00:00:19, Serial0/0/1
R*   0.0.0.0/0 [120/1] via 172.29.6.13, 00:00:19, Serial0/0/0
               [120/1] via 172.29.6.9, 00:00:19, Serial0/0/1
```

Fuente: Comando show ip route al router MEDELLIN3- programa Packet Tracer

Figura 33. Balanceo de carga del router BOGOTA1

```
BOGOTA1#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

     172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
R       172.29.0.0/24 [120/1] via 172.29.3.2, 00:00:23, Serial0/1/1
                      [120/1] via 172.29.3.6, 00:00:23, Serial0/1/0
R       172.29.1.0/24 [120/1] via 172.29.3.10, 00:00:03, Serial0/0/1
C       172.29.3.0/30 is directly connected, Serial0/1/1
C       172.29.3.4/30 is directly connected, Serial0/1/0
C       172.29.3.8/30 is directly connected, Serial0/0/1
R       172.29.3.12/30 [120/1] via 172.29.3.10, 00:00:03, Serial0/0/1
                       [120/1] via 172.29.3.2, 00:00:23, Serial0/1/1
                       [120/1] via 172.29.3.6, 00:00:23, Serial0/1/0
R       172.29.4.0/25 [120/3] via 209.17.220.5, 00:00:09, Serial0/0/0
R       172.29.4.128/25 [120/3] via 209.17.220.5, 00:00:09, Serial0/0/0
R       172.29.6.0/30 [120/2] via 209.17.220.5, 00:00:09, Serial0/0/0
R       172.29.6.4/30 [120/3] via 209.17.220.5, 00:00:09, Serial0/0/0
R       172.29.6.8/30 [120/2] via 209.17.220.5, 00:00:09, Serial0/0/0
R       172.29.6.12/30 [120/2] via 209.17.220.5, 00:00:09, Serial0/0/0
     209.17.220.0/30 is subnetted, 2 subnets
R       209.17.220.0 [120/1] via 209.17.220.5, 00:00:09, Serial0/0/0
C       209.17.220.4 is directly connected, Serial0/0/0
S*   0.0.0.0/0 [1/0] via 209.17.220.4
                 is directly connected, Serial0/0/0
```

Fuente: Comando show ip route al router BOGOTA1- programa Packet Tracer

Figura 34. Balanceo de carga del router BOGOTA2

```
BOGOTA2#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

     172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
R       172.29.0.0/24 [120/1] via 172.29.3.14, 00:00:25, Serial0/0/1
C       172.29.1.0/24 is directly connected, FastEthernet0/0
R       172.29.3.0/30 [120/1] via 172.29.3.9, 00:00:22, Serial0/0/0
                      [120/1] via 172.29.3.14, 00:00:25, Serial0/0/1
R       172.29.3.4/30 [120/1] via 172.29.3.9, 00:00:22, Serial0/0/0
                      [120/1] via 172.29.3.14, 00:00:25, Serial0/0/1
C       172.29.3.8/30 is directly connected, Serial0/0/0
C       172.29.3.12/30 is directly connected, Serial0/0/1
R       172.29.4.0/25 [120/4] via 172.29.3.9, 00:00:22, Serial0/0/0
R       172.29.4.128/25 [120/4] via 172.29.3.9, 00:00:22, Serial0/0/0
R       172.29.6.0/30 [120/3] via 172.29.3.9, 00:00:22, Serial0/0/0
R       172.29.6.4/30 [120/4] via 172.29.3.9, 00:00:22, Serial0/0/0
R       172.29.6.8/30 [120/3] via 172.29.3.9, 00:00:22, Serial0/0/0
R       172.29.6.12/30 [120/3] via 172.29.3.9, 00:00:22, Serial0/0/0
     209.17.220.0/30 is subnetted, 2 subnets
R       209.17.220.0 [120/2] via 172.29.3.9, 00:00:22, Serial0/0/0
R       209.17.220.4 [120/1] via 172.29.3.9, 00:00:22, Serial0/0/0
R*   0.0.0.0/0 [120/1] via 172.29.3.9, 00:00:22, Serial0/0/0
```

Fuente: Comando show ip route al router BOGOTA2- programa Packet Tracer

Figura 35. Balanceo de carga del router BOGOTA3

```
BOGOTA3#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

     172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
C       172.29.0.0/24 is directly connected, FastEthernet0/0
R       172.29.1.0/24 [120/1] via 172.29.3.13, 00:00:22, Serial0/1/0
C       172.29.3.0/30 is directly connected, Serial0/0/0
C       172.29.3.4/30 is directly connected, Serial0/0/1
R       172.29.3.8/30 [120/1] via 172.29.3.1, 00:00:09, Serial0/0/0
                      [120/1] via 172.29.3.13, 00:00:22, Serial0/1/0
                      [120/1] via 172.29.3.5, 00:00:09, Serial0/0/1
C       172.29.3.12/30 is directly connected, Serial0/1/0
R       172.29.4.0/25 [120/4] via 172.29.3.5, 00:00:09, Serial0/0/1
                      [120/4] via 172.29.3.1, 00:00:09, Serial0/0/0
R       172.29.4.128/25 [120/4] via 172.29.3.5, 00:00:09, Serial0/0/1
                        [120/4] via 172.29.3.1, 00:00:09, Serial0/0/0
R       172.29.6.0/30 [120/3] via 172.29.3.5, 00:00:09, Serial0/0/1
                      [120/3] via 172.29.3.1, 00:00:09, Serial0/0/0
R       172.29.6.4/30 [120/4] via 172.29.3.5, 00:00:09, Serial0/0/1
                      [120/4] via 172.29.3.1, 00:00:09, Serial0/0/0
R       172.29.6.8/30 [120/3] via 172.29.3.5, 00:00:09, Serial0/0/1
                      [120/3] via 172.29.3.1, 00:00:09, Serial0/0/0
R       172.29.6.12/30 [120/3] via 172.29.3.5, 00:00:09, Serial0/0/1
                       [120/3] via 172.29.3.1, 00:00:09, Serial0/0/0
     209.17.220.0/30 is subnetted, 2 subnets
R       209.17.220.0 [120/2] via 172.29.3.1, 00:00:09, Serial0/0/0
                     [120/2] via 172.29.3.5, 00:00:09, Serial0/0/1
R       209.17.220.4 [120/1] via 172.29.3.1, 00:00:09, Serial0/0/0
                     [120/1] via 172.29.3.5, 00:00:09, Serial0/0/1
R*    0.0.0.0/0 [120/1] via 172.29.3.5, 00:00:09, Serial0/0/1
                [120/1] via 172.29.3.1, 00:00:09, Serial0/0/0
```

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

Figura 36. Rutas estàticas en ISP

```
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

     172.29.0.0/16 is variably subnetted, 14 subnets, 4 masks
S       172.29.0.0/22 is directly connected, Serial0/0/1
R       172.29.0.0/24 [120/2] via 209.17.220.6, 00:00:04, Serial0/0/1
R       172.29.1.0/24 [120/2] via 209.17.220.6, 00:00:04, Serial0/0/1
R       172.29.3.0/30 [120/1] via 209.17.220.6, 00:00:04, Serial0/0/1
R       172.29.3.4/30 [120/1] via 209.17.220.6, 00:00:04, Serial0/0/1
R       172.29.3.8/30 [120/1] via 209.17.220.6, 00:00:04, Serial0/0/1
R       172.29.3.12/30 [120/2] via 209.17.220.6, 00:00:04, Serial0/0/1
S       172.29.4.0/22 is directly connected, Serial0/0/0
R       172.29.4.0/25 [120/2] via 209.17.220.2, 00:00:02, Serial0/0/0
R       172.29.4.128/25 [120/2] via 209.17.220.2, 00:00:02, Serial0/0/0
R       172.29.6.0/30 [120/1] via 209.17.220.2, 00:00:02, Serial0/0/0
R       172.29.6.4/30 [120/2] via 209.17.220.2, 00:00:02, Serial0/0/0
R       172.29.6.8/30 [120/1] via 209.17.220.2, 00:00:02, Serial0/0/0
R       172.29.6.12/30 [120/1] via 209.17.220.2, 00:00:02, Serial0/0/0
     209.17.220.0/30 is subnetted, 2 subnets
C       209.17.220.0 is directly connected, Serial0/0/0
C       209.17.220.4 is directly connected, Serial0/0/1
ISP#
```

2.1.4 Deshabilitar la propagación del protocolo RIP.

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.

Tabla 2. Interfaces de los Router

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

a. Router ISP

ISP(config)#route rip

ISP(config-router)#passive-interface f0/0

ISP(config-router)#passive-interface f0/1

b. Router MEDELLIN1

MEDELLIN1(config)#route rip

MEDELLIN1(config-router)#passive-interface f0/0

MEDELLIN1(config-router)#passive-interface f0/1

MEDELLIN1(config-router)#passive-interface s0/1/1

c. Router MEDELLIN2

MEDELLIN2(config)#route rip

MEDELLIN2(config-router)#passive-interface f0/0

MEDELLIN2(config-router)#passive-interface f0/1

d. Router MEDELLIN3

MEDELLIN3(config)#route rip

MEDELLIN3(config-router)#passive-interface f0/0

MEDELLIN3(config-router)#passive-interface f0/1

e. Router BOGOTA1

BOGOTA1(config)#route rip

BOGOTA1(config-router)#passive-interface f0/0

BOGOTA1(config-router)#passive-interface f0/1

BOGOTA1 (config-router)#passive-interface s0/0/0

f. Router BOGOTA2

BOGOTA2(config)#route rip

BOGOTA2(config-router)#passive-interface f0/0

BOGOTA2(config-router)#passive-interface f0/1

g. Router BOGOTA3

BOGOTA3(config)#route rip

BOGOTA3(config-router)#passive-interface f0/0

BOGOTA3(config-router)#passive-interface f0/1

2.1.5 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.

Figura 37. Verificaciones del protocolo RIP - Show ip protocols

```
ISP#show ip protocols
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 6 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
  Serial0/0/0           2     2
  Serial0/0/1           2     2
Automatic network summarization is not in effect
Maximum path: 4
Routing for Networks:
          209.17.220.0
Passive Interface(s):
Routing Information Sources:
          Gateway         Distance      Last Update
          209.17.220.6         120      00:00:26
          209.17.220.2         120      00:00:03
Distance: (default is 120)
```

```
MEDELLIN1#show ip protocols
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 6 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, static
Default version control: send version 2, receive 2
  Interface             Send  Recv  Triggered RIP  Key-chain
  Serial0/1/0           2     2
  Serial0/0/0           2     2
  Serial0/0/1           2     2
  Serial0/1/1           2     2
Automatic network summarization is not in effect
Maximum path: 4
Routing for Networks:
          172.29.0.0
          209.17.220.0
Passive Interface(s):
Routing Information Sources:
          Gateway         Distance      Last Update
          209.17.220.1         120      00:00:10
          172.29.6.2           120      00:00:07
          172.29.6.14          120      00:00:23
          172.29.6.10          120      00:00:23
Distance: (default is 120)
```

```
MEDELLIN2#show ip protocols
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 0 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
  Serial0/0/0           2     2
  Serial0/0/1           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
          172.29.6.1           120      00:00:11
          172.29.6.6           120      00:00:11
Distance: (default is 120)
```

```
MEDELLIN3#show ip protocols
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 11 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
  Serial0/1/0           2     2
  Serial0/0/0           2     2
  Serial0/0/1           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
          172.29.6.13          120      00:00:18
          172.29.6.9           120      00:00:18
          172.29.6.5           120      00:00:06
Distance: (default is 120)
```

```
BOGOTA1#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, static
Default version control: send version 2, receive 2
  Interface             Send  Recv  Triggered RIP  Key-chain
  Serial0/1/0           2     2
  Serial0/0/1           2     2
  Serial0/1/1           2     2
  Serial0/0/0           2     2
Automatic network summarization is not in effect
Maximum path: 4
Routing for Networks:
          172.29.0.0
          209.17.220.0
Passive Interface(s):
Routing Information Sources:
          Gateway         Distance      Last Update
          172.29.3.2           120      00:00:05
          172.29.3.6           120      00:00:05
          172.29.3.10          120      00:00:05
          209.17.220.5         120      00:00:16
Distance: (default is 120)
```

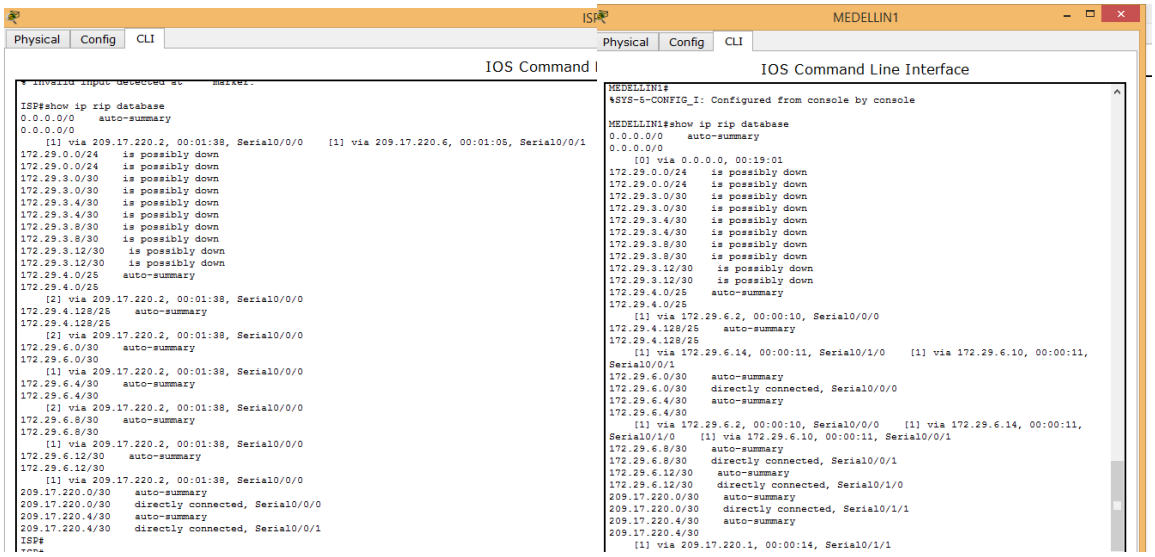
```
BOGOTA2#show ip protocols
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 14 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 2, receive 2
  Interface             Send  Recv  Triggered RIP  Key-chain
  Serial0/0/1           2     2
  Serial0/0/0           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      00:00:26
          172.29.3.14          120      00:00:11
Distance: (default is 120)
```

```
BOGOTA3#show ip protocols
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 6 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
  Serial0/0/0           2     2
  Serial0/1/0           2     2
  Serial0/0/1           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
          172.29.3.5           120      00:00:06
          172.29.3.1           120      00:00:06
          172.29.3.13          120      00:00:20
Distance: (default is 120)
```

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.

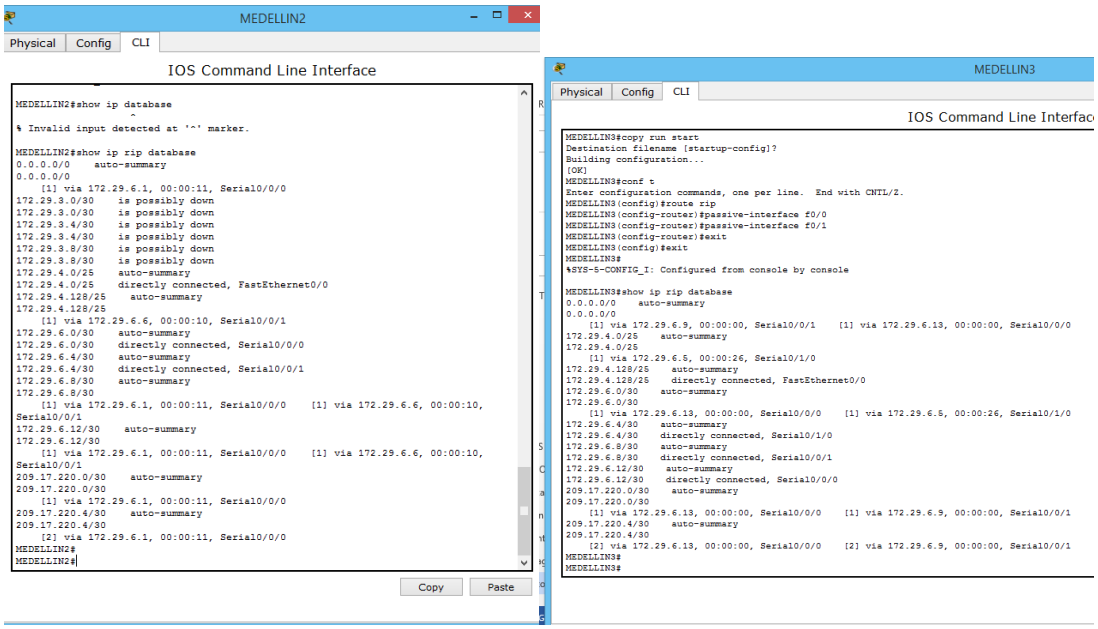
- ISP

MEDELLIN1

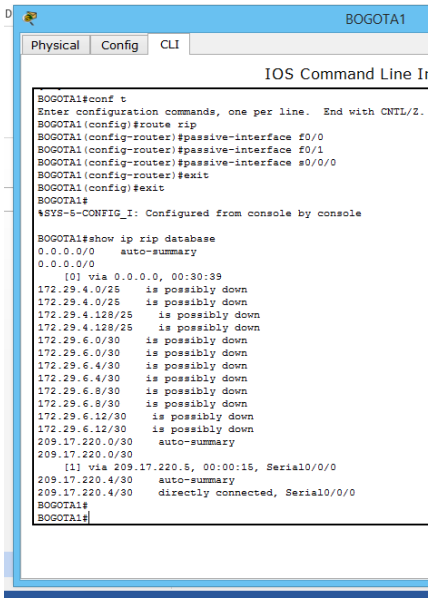


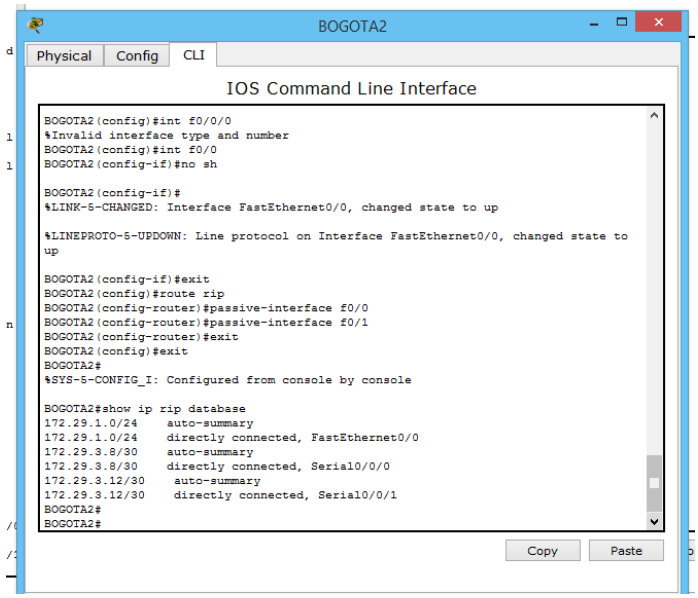
- MEDELLIN2

MEDELLIN3

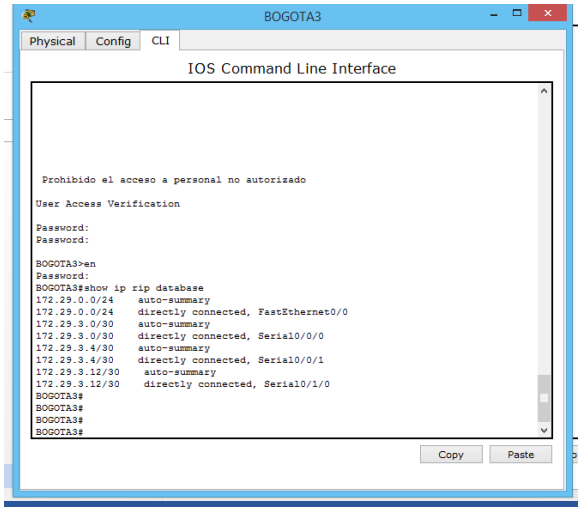


- BOGOTA1 BOGOTA2





- BOGOTA3



2.1.6 Configurar encapsulamiento PPP y autenticación PAP y CHAP.

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

MEDELLIN1(config)#username USER password UNAD2019

MEDELLIN1(config)#int s0/1/1

MEDELLIN1(config-if)#encapsulation ppp
MEDELLIN1(config-if)#ppp authentication pap
MEDELLIN1(config-if)#ppp pap sent-username USER password UNAD2019

ISP(config)#username USER password UNAD2019
ISP(config)#int s0/0/0
ISP(config-if)#encapsulation ppp
ISP(config-if)#ppp authentication pap
ISP(config-if)#ppp pap sent-username USER password UNAD2019

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

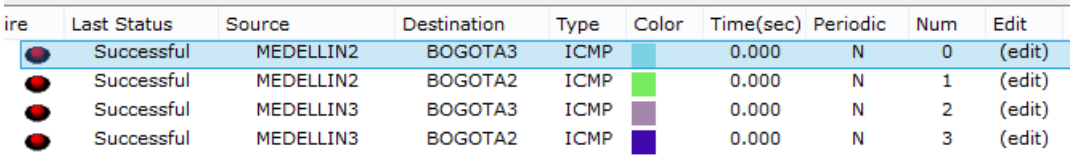
BOGOTA1(config)#username ISP password UNAD2019
BOGOTA1(config)#int s0/0/0
BOGOTA1(config-if)#encapsulation ppp
BOGOTA1(config-if)#ppp authentication chap

ISP(config)#username BOGOTA1 password UNAD2019
ISP(config)#int s0/0/1
ISP(config-if)#encapsulation ppp
ISP(config-if)#ppp authentication chap

2.1.7 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.

Figura 38. Prueba de comunicaciòn entre extremos antes de NAT



ire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit
	Successful	MEDELLIN2	BOGOTA3	ICMP		0.000	N	0	(edit)
	Successful	MEDELLIN2	BOGOTA2	ICMP		0.000	N	1	(edit)
	Successful	MEDELLIN3	BOGOTA3	ICMP		0.000	N	2	(edit)
	Successful	MEDELLIN3	BOGOTA2	ICMP		0.000	N	3	(edit)

b. Después de verificar lo indicado en el paso anterior proceda a configurar el NAT en el router Medellín1.

MEDELLIN1(config)#access-list 1 permit 172.29.4.0 0.0.3.255

MEDELLIN1(config)#ip nat inside source list 1 interface Serial0/1/1 overload

MEDELLIN1(config)#interface S0/1/1

MEDELLIN1(config-if)#ip nat outside

MEDELLIN1(config-if)#interface S0/0/0

MEDELLIN1(config-if)#ip nat inside

MEDELLIN1(config-if)#interface S0/0/1

MEDELLIN1(config-if)#ip nat inside

MEDELLIN1(config-if)#interface S0/1/0

MEDELLIN1(config-if)#ip nat inside

c. 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.

PAT usa un puerto cada vez que hace una conexión y este va cambiando

```
MEDELLIN1#show ip nat statistics
Total translations: 0 (0 static, 0 dynamic, 0 extended)
Outside Interfaces: Serial0/1/1
Inside Interfaces: Serial0/0/0 , Serial0/0/1 , Serial0/1/0
Hits: 4  Misses: 23
Expired translations: 5
```

Figura 39. Translaciòn NAT en MEDELLN1

```
MEDELLIN1#show ip nat translation
Pro  Inside global     Inside local       Outside local      Outside global
icmp 209.17.220.2:10   172.29.6.10:10     172.29.1.1:10      172.29.1.1:10
icmp 209.17.220.2:11   172.29.6.14:11     172.29.1.1:11      172.29.1.1:11
icmp 209.17.220.2:12   172.29.6.10:12     172.29.1.1:12      172.29.1.1:12
icmp 209.17.220.2:13   172.29.6.14:13     172.29.1.1:13      172.29.1.1:13
icmp 209.17.220.2:9    172.29.6.14:9      172.29.1.1:9       172.29.1.1:9
```

Puerto que cambia

d. Proceda a configurar el NAT en el router Bogotá1.

BOGOTA1(config)#access-list 1 permit 172.29.0.0 0.0.3.255

BOGOTA1(config)#ip nat inside source list 1 interface s0/0/0 overload

BOGOTA1(config)#int s0/0/0

BOGOTA1(config-if)#ip nat outside

BOGOTA1(config-if)#int s0/0/1

BOGOTA1(config-if)#ip nat inside

BOGOTA1(config-if)#int s0/1/0

BOGOTA1(config-if)#ip nat inside

BOGOTA1(config-if)#int s0/1/1

BOGOTA1(config-if)#ip nat inside

Se verifica que la conectividad dentro de la misma red.

Figura 40. Conectividad de la red despuès de NAT

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Failed	MEDELLIN2	BOGOTA3	ICMP		0.000	N	0	(edit)	
	Failed	MEDELLIN2	BOGOTA2	ICMP		0.000	N	1	(edit)	
	Failed	MEDELLIN3	BOGOTA3	ICMP		0.000	N	2	(edit)	
	Failed	MEDELLIN3	BOGOTA2	ICMP		0.000	N	3	(edit)	
	Failed	BOGOTA2	MEDELLIN2	ICMP		0.000	N	4	(edit)	
	Failed	BOGOTA2	MEDELLIN3	ICMP		0.000	N	5	(edit)	
	Successful	BOGOTA2	BOGOTA3	ICMP		0.000	N	6	(edit)	
	Successful	BOGOTA2	BOGOTA1	ICMP		0.000	N	7	(edit)	
	Successful	BOGOTA2	ISP	ICMP		0.000	N	8	(edit)	

e. 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.

Figura 41. Translaciòn NAT en BOGOTA1

```
BOGOTA1#show ip nat statistic
Total translations: 5 (0 static, 5 dynamic, 5 extended)
Outside Interfaces: Serial0/0/0
Inside Interfaces: Serial0/0/1 , Serial0/1/0 , Serial0/1/1
Hits: 0  Misses: 17
Expired translations: 0
Dynamic mappings:

BOGOTA1#show ip nat translations
Pro  Inside global     Inside local       Outside local      Outside global
icmp 209.17.220.6:14   172.29.3.10:14     172.29.4.1:14      172.29.4.1:14
icmp 209.17.220.6:15   172.29.3.10:15     172.29.4.1:15      172.29.4.1:15
icmp 209.17.220.6:16   172.29.3.10:16     172.29.4.1:16      172.29.4.1:16
icmp 209.17.220.6:17   172.29.3.10:17     172.29.4.1:17      172.29.4.1:17
icmp 209.17.220.6:18   172.29.3.10:18     172.29.4.1:18      172.29.4.1:18
```

Puerto que cambia

2.1.8 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.

MEDELLIN2 (config)#ip dhcp excluded-address 172.29.4.0 172.29.4.6

MEDELLIN2 (config)#ip dhcp excluded-address 172.29.4.128 172.29.4.133

MEDELLIN2(config)# ip dhcp pool MEDELLIN3

MEDELLIN2(dhcp-config)#network 172.29.4.128 255.255.255.128

MEDELLIN2(dhcp-config)#default-router 172.29.4.129

MEDELLIN2(dhcp-config)#dns-server 1.1.1.1

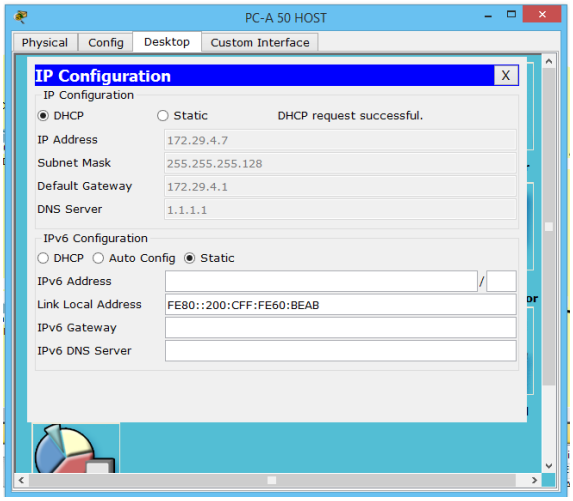
MEDELLIN2(config)# ip dhcp pool MEDELLIN2

MEDELLIN2(dhcp-config)#network 172.29.4.0 255.255.255.128

MEDELLIN2(dhcp-config)#default-router 172.29.4.1

MEDELLIN2(dhcp-config)#dns-server 1.1.1.1

Figura 42. Verificaciòn DHCP en PC-A

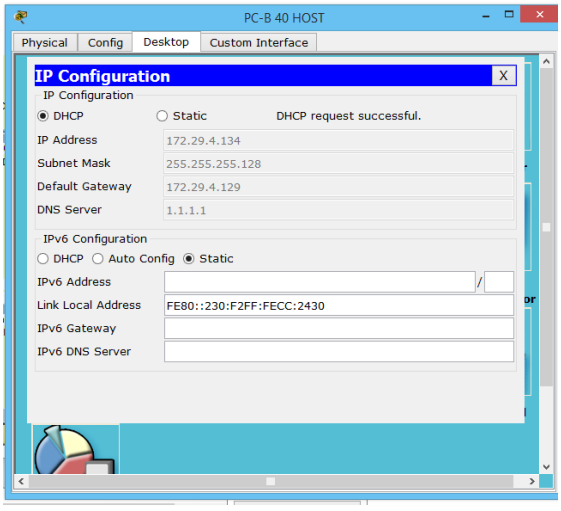


b. El router Medellín3 deberá habilitar el paso de los mensajes broadcast hacia la IP del router Medellín2.

MEDELLIN3(config)#int f0/0

MEDELLIN3(config-if)#ip helper-address 172.29.6.5

Figura 43. Verificaciòn DHCP en PC-B



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

BOGOTA2(config)#ip dhcp excluded-address 172.29.1.1 172.29.1.6

BOGOTA2(config)#ip dhcp excluded-address 172.29.0.1 172.29.0.6

BOGOTA2(config)# ip dhcp pool BOGOTA3

BOGOTA2(dhcp-config)#network 172.29.0.0 255.255.255.0

BOGOTA2(dhcp-config)#default-router 172.29.0.1

BOGOTA2(dhcp-config)#dns-server 1.1.1.1

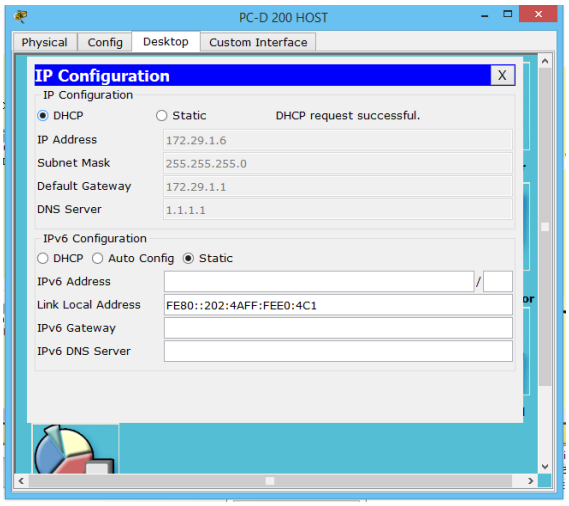
BOGOTA2(config)# ip dhcp pool BOGOTA2

BOGOTA2(dhcp-config)#network 172.29.1.0 255.255.255.0

BOGOTA2(dhcp-config)#default-router 172.29.1.1

BOGOTA2(dhcp-config)#dns-server 1.1.1.1

Figura 44. Verificaciòn DHCP en PC-D

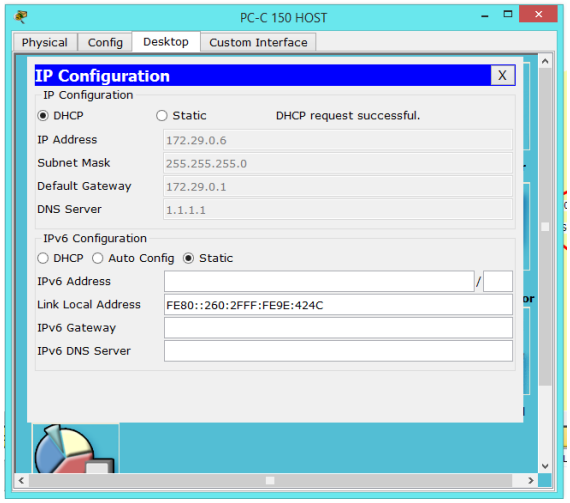


d. Configure el router Bogotá1 para que habilite el paso de los mensajes Broadcast hacia la IP del router Bogotá2.

BOGOTA3(config)#int f0/0

BOGOTA3(config-if)#ip helper-address 172.29.3.13

Figura 45. Verificaciòn DHCP en PC-C

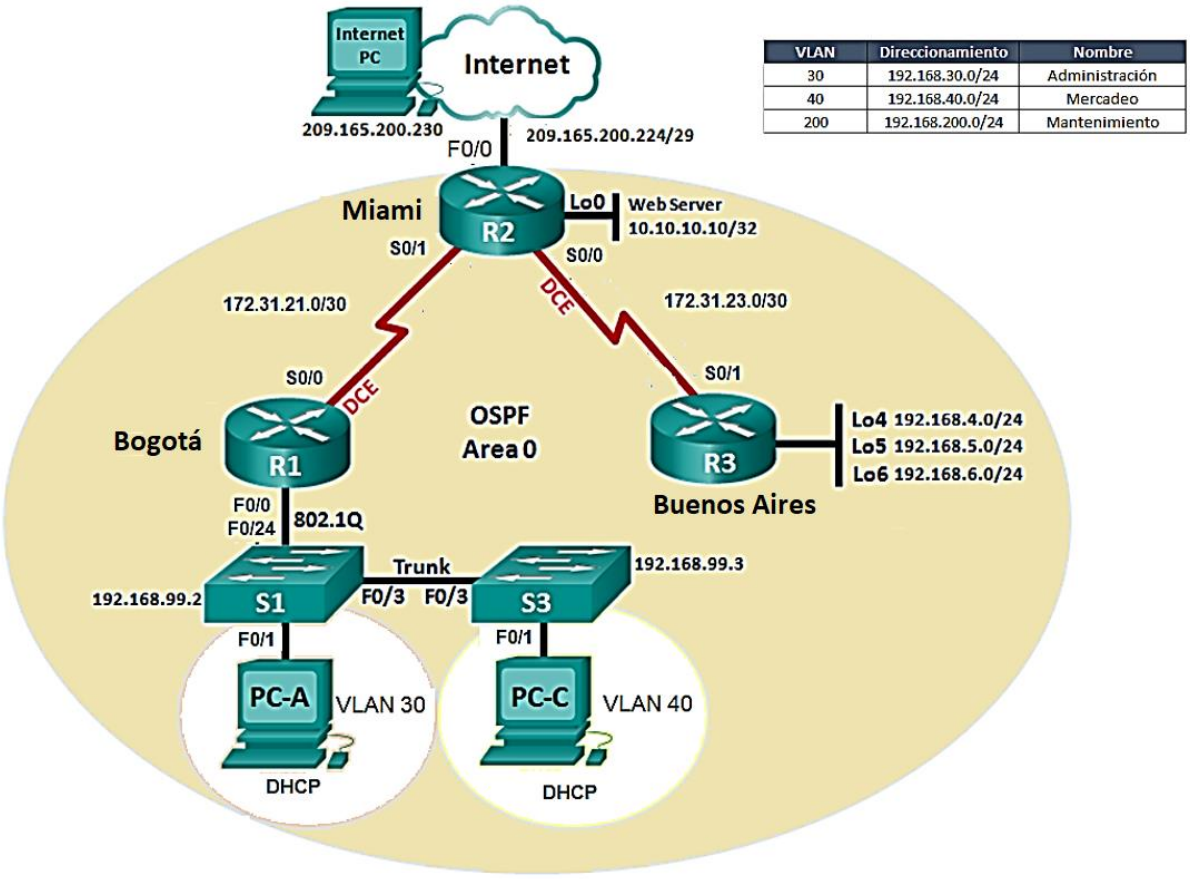


2.2 DESCRIPCIÒN DEL ESCENARIO 2

Descripciòn 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.

Topología

Figura 46. Topología escenario 2



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

2.2.1 Configurar el direccionamiento IP acorde a la topologìa

a. Tablas de direccionamiento

Tabla 3 Direccionamiento IP e interfaz

DISPOSITIVO	INTERFAZ	DIRECCION	MASCARA
Bogota R1	S0/0/0	172.31.21.1	255.255.255.252
	F0/0.30	192.168.30.1	255.255.255.252
	F0/0.40	192.168.40.1	255.255.255.252
	F0/0.200	192.168.200.1	255.255.255.252
Miami R2	S0/0/0	172.31.23.1	255.255.255.252
	S0/0/1	172.31.21.2	255.255.255.252
	F0/0	209.165.200.225	255.255.255.248
	F0/1	10.10.10.1	255.255.255.0
Buenos Aires R3	S0/0/1	172.31.23.2	255.255.255.252
	Lo4	192.168.4.1	255.255.255.0
	Lo5	192.168.5.1	255.255.255.0
	Lo6	192.168.6.1	255.255.255.0
S1	Fa 0/1	VLAN 30	
	Fa 0/3	TRONCAL	
	Fa 0/24	TRONCAL	
S3	Fa 0/1	VLAN 40	
	Fa 0/3	TRONCAL	
PC-A	Fa 0	DHCP	
PC-C	Fa 0	DHCP	
WEB Server	Fa 0	10.10.10.10	255.255.255.0
PC Internet	Fa 0	209.165.200.230	255.255.255.248

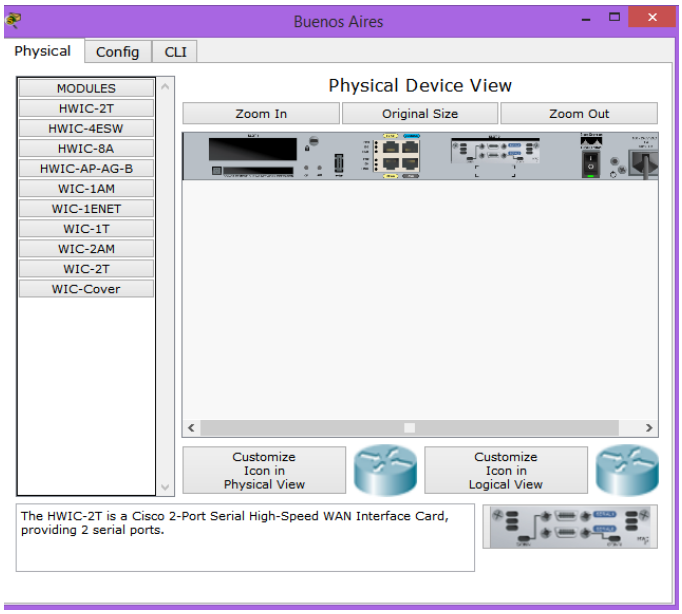
Tabla 4. VLANs

VLAN	EQUIPO	DIRECCIONAMIENTO		NOMBRE
VLAN 30	PC-A	192.168.30.0	255.255.255.0	Administracion
VLAN 40	PC-C	192.168.40.0	255.255.255.128	Mercadeo
VLAN 400		192.168.200.0	255.255.255.192	Mantenimiento

b. Elementos necesarios

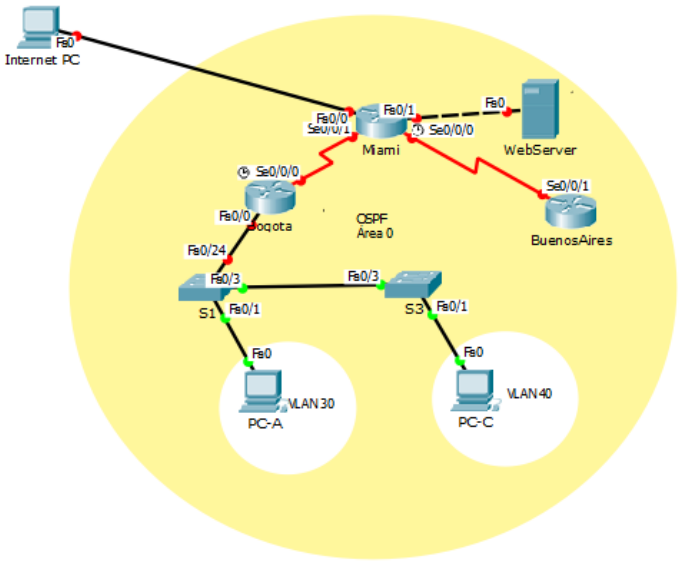
Seleccionar cada uno de los dispositivos necesarios para empezar a construir la topología, en el caso de los Routers; Bogota, Miami y BuenosAires se deberá agregar la tarjeta de comunicación Serial.

Tabla 5. Configuraciòn física de routers, adicion tarjeta de red



2.2.2 Cableado de cada uno de los elementos según puertos indicados

Tabla 6. Topologìa creada



2.2.3 Configuraciòn básica de Internet PC, Web server y host

Figura 48. Configuraciòn IP Internet PC

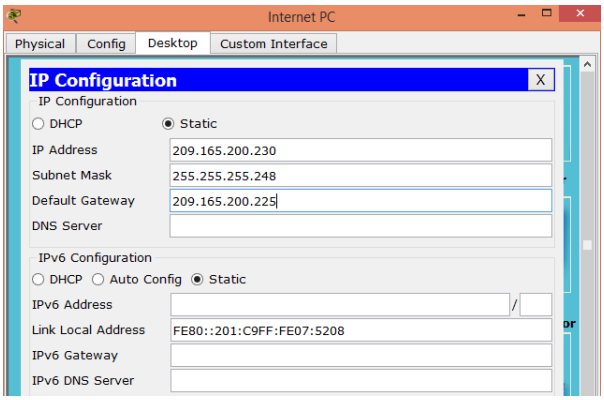


Figura 47. Configuraciòn IP Web Server

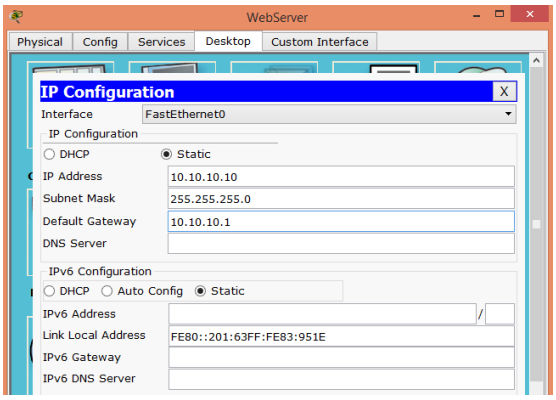


Figura 50. Configuraciòn IP PC-A

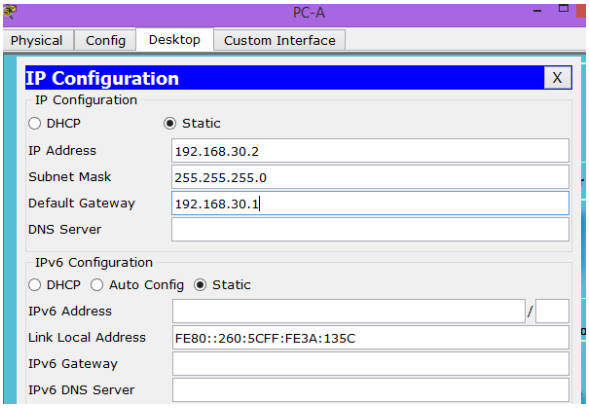
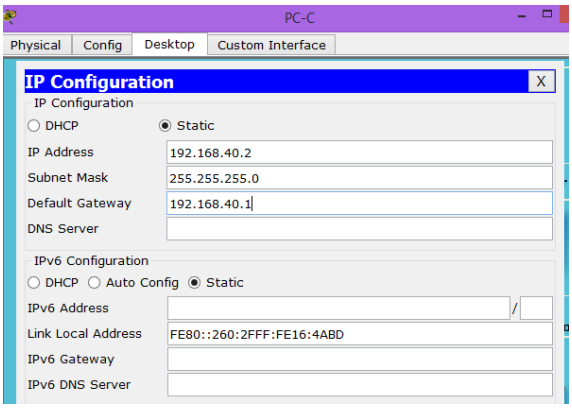


Figura 49. Configuraciòn IP PC-C



2.2.4 Configuraciòn de parámetros básicos de routers y switches :

a. Configuraciòn básica de S1

- Configure los nombres de los dispositivos como se muestra en la topología.
  Switch(config)#hostname S1
- Asigne class como la contraseña del modo EXEC privilegiado.
  S1(config)# enable secret class
- Asigne cisco como la contraseña de consola y la contraseña de vty.
  S1(config)#line vty 0 5

S1(config-line)#password cisco
S1(config-line)#login
S1(config-line)#line console 0
S1(config-line)#password cisco
S1(config-line)#login

- Encripte las contraseñas
  S1(config-line)#service password-encryption
- Mensaje de acceso
  S1(config)#banner motd $Prohibido el acceso a personal no autorizado$
- Copie la configuración en ejecución en la configuración de inicio
  S1#copy running-config startup-config
  Destination filename [startup-config]?
  Building configuration...
  [OK]

b. Configuraciòn básica de S3

- Configure los nombres de los dispositivos como se muestra en la topología.
  Switch(config)#hostname S3
- Asigne class como la contraseña del modo EXEC privilegiado.
  S3(config)# enable secret class
- Asigne cisco como la contraseña de consola y la contraseña de vty.
  S3(config)#line vty 0 5
  S3(config-line)#password cisco
  S3(config-line)#login
  S3(config-line)#line console 0
  S3(config-line)#password cisco
  S3(config-line)#login
- Encripte las contraseñas
  S3(config-line)#service password-encryption
- Mensaje de acceso
  S3(config)#banner motd $Prohibido el acceso a personal no autorizado$

- Copie la configuración en ejecución en la configuración de inicio

  S3#copy running-config startup-config

  Destination filename [startup-config]?

  Building configuration...

  [OK]

c. Configuraciòn de R1 Bogota

- Configure los nombres de los dispositivos como se muestra en la topología.

  Router(config)#hostname Bogota

- Asigne class como la contraseña del modo EXEC privilegiado.

  Bogota (config)# enable secret class

- Asigne cisco como la contraseña de consola y la contraseña de vty.

  Bogota (config)#line vty 0 5

  Bogota (config-line)#password cisco

  Bogota (config-line)#login

  Bogota (config-line)#line console 0

  Bogota (config-line)#password cisco

  Bogota (config-line)#login

- Encripte las contraseñas

  Bogota (config-line)#service password-encryption

- Mensaje de acceso

  Bogota (config)#banner motd $Prohibido el acceso a personal no autorizado$

- Copie la configuración en ejecución en la configuración de inicio

  S1#copy running-config startup-config

  Destination filename [startup-config]?

  Building configuration...

  [OK]

d. Configuraciòn de R2 Miami

- Configure los nombres de los dispositivos como se muestra en la topología.

  Router(config)#hostname Miami

- Asigne class como la contraseña del modo EXEC privilegiado.

  Miami (config)# enable secret class

- Asigne cisco como la contraseña de consola y la contraseña de vty.

  Miami (config)#line vty 0 5

  Miami (config-line)#password cisco

  Miami (config-line)#login

  Miami (config-line)#line console 0

  Miami (config-line)#password cisco

  Miami (config-line)#login

- Encripte las contraseñas

  Miami (config-line)#service password-encryption

- Mensaje de acceso

  Miami (config)#banner motd $Prohibido el acceso a personal no autorizado$

- Copie la configuración en ejecución en la configuración de inicio

  Miami #copy running-config startup-config

  Destination filename [startup-config]?

  Building configuration...

  [OK]

e. Configuraciòn de R3 BuenosAires

- Configure los nombres de los dispositivos como se muestra en la topología.

  Router(config)#hostname BuenosAires

- Asigne class como la contraseña del modo EXEC privilegiado.

  BuenosAires (config)# enable secret class

- Asigne cisco como la contraseña de consola y la contraseña de vty.

  BuenosAires (config)#line vty 0 5

  BuenosAires (config-line)#password cisco

  BuenosAires (config-line)#login

  BuenosAires (config-line)#line console 0

  BuenosAires (config-line)#password cisco

  BuenosAires (config-line)#login

- Encripte las contraseñas

  BuenosAires (config-line)#service password-encryption

- Mensaje de acceso

  BuenosAires (config)#banner motd $Prohibido el acceso a personal no autorizado$

- Copie la configuración en ejecución en la configuración de inicio

  BuenosAires #copy running-config startup-config

  Destination filename [startup-config]?

  Building configuration...

  [OK]

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

Configuraciòn de VLANs en Switches

Tabla 7. Configuraciòn deVLANs en switches

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

a. Se configura en S1:

- Configurar las VLANs correspondientes

  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

- Modo troncal el puerto F0/3 en la VLAN 1

S1(config)#int f0/3
S1(config-if)#switchport mode trunk
S1(config-if)#switchport trunk native vlan 1
S1(config-if)#no sh

- Modo troncal el puerto F0/24 en la VLAN 1
  S1(config)#int f0/24
  S1(config-if)#switchport mode trunk
  S1(config-if)#switchport trunk native vlan 1
  S1(config-if)#no sh
- Modo de acceso
  S1(config-if)#interface range fa0/2, fa0/4-23, g0/1-2
  S1(config-if-range)#switchport mode access
- Asignar el puerto F0/1 a la VLAN 30
  S1(config)#int f0/1
  S1(config-if)#switchport mode access
  S1(config-if)#switchport access vlan 30
  S1(config-if)#interface range fa0/2, fa0/4-23, g0/1-2
- Asignar la dirección 192.168.200.2 a la VLAN Mantenimiento
  S1(config)#int vlan 200
  S1(config-if)#ip address 192.168.200.2 255.255.255.252
  S1(config-if)#ip default-gateway 192.168.200.1
- Copie la configuración en ejecución en la configuración de inicio
  S1 #copy running-config startup-config
  Destination filename [startup-config]?
  Building configuration...
  [OK]

b. Se configura en S3

- Configurar las VLANS correspondientes
  S3(config)#vlan 30
  S3(config-vlan)#name Administracion

S3(config-vlan)#vlan 40

S3(config-vlan)#name Mercadeo

S3(config-vlan)#vlan 200

S3(config-vlan)#name Mantenimiento

- Configurar la dirección 192.168.200.3 a la VLAN Mantenimiento y puerta de enlace predeterminada

  S3(config)#int vlan 200

  S3(config-if)#

  S3(config-if)#ip address 192.168.200.3 255.255.255.252

  S3(config-if)#ip default-gateway 192.168.200.1

- Modo trunk el puerto F0/3 VLAN 1

  S3(config)#int f0/3

  S3(config-if)#switchport mode trunk

  S3(config-if)#switchport trunk native vlan 1

- Modo de acceso

  S3(config-if)#int range f0/2, f0/4-24, g0/1-2

  S3(config-if-range)#switchport mode access

- Asignar el puerto F0/1 a la VLAN 40 y modo de acceso

  S3(config-if)#int f0/1

  S3(config-if)#switchport mode access

  S3(config-if)#switchport access vlan 40

- Apagar los puertos que no se usan

  S3(config)#int range f0/2, f0/4-24, g0/1-2

  S3(config-if-range)#sh

- Copie la configuración en ejecución en la configuración de inicio

  S3 #copy running-config startup-config

Configurar las interfaces en Routers

c. Configuraciòn en Router 1 Bogota

- Configuraciòn de conexión hacia Miami

Bogota(config)#int s0/0/0
Bogota(config-if)#description conexion con Miami
Bogota(config-if)#ip address 172.31.21.1 255.255.255.252
Bogota(config-if)#clock rate 128000
Bogota(config-if)#no sh

- Asignaciòn ruta

  Bogota(config)#ip route 0.0.0.0 0.0.0.0 s0/0/0

d. Configuraciòn en Router 2 Miami

- Configuraciòn conexión hacia Buenos Aires

  Miami(config)#int s0/0/0
  Miami(config-if)#ip address 172.31.23.1 255.255.255.252
  Miami(config-if)#clock rate 128000
  Miami(config-if)#no sh

- Configuraciòn conexión hacia Bogota

  Miami(config)#int s0/0/1
  Miami(config-if)#ip address 172.31.21.1 255.255.255.252
  Miami(config-if)#clock rate 128000
  Miami(config-if)#no sh

- Configuraciòn conexión hacia Internet PC

  Miami(config)#int fa0/0
  Miami(config-if)#ip address 209.165.200.225 255.255.255.248
  Miami(config-if)#no sh

- Conexión a internet

  Miami(config)#ip route 0.0.0.0 0.0.0.0 f0/0

- Configuraciòn conexión hacia Webserver

  Miami(config-if)#int fa0/1
  Miami(config-if)#ip address 10.10.10.1 255.255.255.0
  Miami(config-if)#no sh

e. Configuraciòn en Router 3 BuenosAires

- Configuraciòn conexión hacia Miami

  BuenosAires(config)#int s0/0/1

  BuenosAires(config-if)#ip address 172.31.23.2 255.255.255.252

  BuenosAires(config-if)#no sh

  BuenosAires(config)#ip route 0.0.0.0 0.0.0.0 s0/0/1

- Configuraciòn conexiòn interface Loopback Lo4, lo5 y Lo6

  BuenosAires(config-if)#int lo4

  BuenosAires(config-if)#ip address 192.168.4.1 255.255.255.0

  BuenosAires(config-if)#int lo5

  BuenosAires(config-if)#ip address 192.168.5.1 255.255.255.0

  BuenosAires(config-if)#int lo6

  BuenosAires(config-if)#ip address 192.168.6.1 255.255.255.0

2.2.6 Configuración de seguridad Switch, VLANs, Inter-VLANs Routing

Configurar en Bogota lo siguiente:

a. Configure 802.1Q subinterface .30, descripción de la conexión, asignar VLAN Administración, asignación de la primera dirección viable a esta interface.

   Bogota(config-if)#int f0/0.30

   Bogota(config-subif)#ip address 192.168.30.1 255.255.255.0

   Bogota(config-subif)#encapsulation dot1q 30

b. Configure 802.1Q subinterface .40 descripción de la conexión, asignar VLAN Mercadeo, asignación de la primera dirección viable a esta interface.

   Bogota(config-subif)#int f0/0.40

   Bogota(config-subif)#ip address 192.168.40.1 255.255.255.0

   Bogota(config-subif)#encapsulation dot1q 40

c. Configure 802.1Q subinterface .200 descripción de la conexión, asignar VLAN Mantenimiento, asignación de la primera dirección viable a esta interface. Bogota(config-subif)#int f0/0.200

Bogota(config-subif)#ip address 192.168.200.1 255.255.255.0

Bogota(config-subif)#encapsulation dot1q 200

2.2.7 Configuración OPSFv2

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

OSPFv2 area 0

Tabla 8. Configuraciòn OSPFV2

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

- Realizar la siguiente configuración en Bogota

  Crear un OSPF

  Bogota(config-if-range)#router ospf 1

  Identificar Bogota (R1) con ID 1.1.1.1

  Bogota(config-router)#router-id 1.1.1.1

  Usar las direcciones de red sin clase, asignarlas a todas las redes conectadas directamente al “área 0”

  Bogota(config-router)#network 172.31.21.0 0.0.0.3 area 0

  Bogota(config-router)#network 192.168.30.0 0.0.0.255 area 0

  Bogota(config-router)#network 192.168.40.0 0.0.0.255 area 0

  Bogota(config-router)#network 192.168.200.0 0.0.0.255 area 0

  Configurar todas las interfaces LAN como pasivas

  Bogota(config-router)#passive-interface f0/0.30

  Bogota(config-router)#passive-interface f0/0.40

Bogota(config-router)#passive-interface f0/0.200

Establecer el ancho de banda para los enlaces seriales en 256 Kb/s

Bogota(config)#int s0/0/0

Bogota(config-if)#bandwidth 256

Ajustar el costo en la métrica de S0/0 a 9500

Bogota(config)#int s0/0/0

Bogota(config-if)#ip ospf cost 9500

- Realizar la siguiente configuración en Miami

  Crear un OSPF

  Miami(config)#router ospf 1

  Identificar Miami (R2) con ID 5.5.5.5

  Miami(config-router)#router-id 5.5.5.5

  Usar las direcciones de red sin clase, asignarlas a todas las redes conectadas directamente al “área 0”

  Miami(config-router)#network 172.31.21.0 0.0.0.3 area 0

  Miami(config-router)#network 172.31.23.0 0.0.0.3 area 0

  Miami(config-router)#network 10.10.10.0 0.0.0.255 area 0

  Configurar todas las interfaces LAN como pasivas

  Miami(config-router)#passive-interface f0/1

  Establecer el ancho de banda para los enlaces seriales en 256 Kb/s

  Miami(config)#int s0/0/0

  Miami(config-if)#bandwidth 256

  Miami(config-if)#int s0/0/1

  Miami(config-if)#bandwidth 256

  Ajustar el costo en la métrica de S0/0/0 a 9500

  Miami(config)#int s0/0/0

  Miami(config-if)#ip ospf cost 9500

- Realizar la siguiente configuración en Buenos Aires

  Crear un OSPF

BuenosAires(config)#router ospf 1

Identificar R3 con ID 8.8.8.8

BuenosAires(config-router)#router-id 8.8.8.8

BuenosAires(config-router)#exit

Usar las direcciones de red sin clase, asignarlas a todas las redes conectadas directamente al “área 0”

BuenosAires(config-router)#network 172.31.23.0 0.0.0.3 area 0

BuenosAires(config-router)#network 192.168.4.0 0.0.3.255 area 0

Configurar todas las interfaces LAN como pasivas

BuenosAires(config-router)#passive-interface lo4

BuenosAires(config-router)#passive-interface lo5

BuenosAires(config-router)#passive-interface lo6

Establecer el ancho de banda para los enlaces seriales en 256 Kb/s

BuenosAires(config)#int s0/0/1

BuenosAires(config-if)#bandwidth 256

Ajustar el costo en la métrica de S0/0 a 9500

BuenosAires(config-if)#ip ospf cost 9500

b. Verificar información de OSPF

- Visualizar tablas de enrutamiento y routers conectados por OSPFv2

Miami

Figura 51. Verificaciòn OSPF en router Miami - Show ip ospf neighbor

```
Miami#show ip ospf neighbor


Neighbor ID     Pri   State           Dead Time   Address         Interface
1.1.1.1           0   FULL/  -        00:00:32    172.31.21.1     Serial0/0/1
8.8.8.8           0   FULL/  -        00:00:36    172.31.23.2     Serial0/0/0
```

Bogota

Figura 52. Verificaciòn OSPF en router Bogota - Show ip ospf neighbor

```
Bogota#show ip ospf neighbor


Neighbor ID     Pri   State           Dead Time   Address         Interface
5.5.5.5           0   FULL/  -        00:00:32    172.31.21.1     Serial0/0/0
```

Buenos Aires

Figura 53. Verificaciòn OSPF en router Buenos Aires- Show ip ospf neighbor

```
BuenosAires#show ip ospf neighbor

Neighbor ID     Pri   State           Dead Time   Address         Interface
5.5.5.5           0   FULL/  -        00:00:32    172.31.23.1     Serial0/0/1
BuenosAires#
```

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

Miami

Figura 54. Verificaciòn OSPF en router Miami - Show ip ospf interface

```
Miami#show ip ospf interface

Serial0/0/1 is up, line protocol is up
  Internet address is 172.31.21.1/30, Area 0
  Process ID 1, Router ID 5.5.5.5, 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 00:00:05
  Index 1/1, 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)
FastEthernet0/1 is up, line protocol is up
  Internet address is 10.10.10.1/24, Area 0
  Process ID 1, Router ID 5.5.5.5, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State WAITING, Priority 1
  No designated router on this network
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    No Hellos (Passive interface)
  Index 2/2, 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 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
Serial0/0/0 is up, line protocol is up
  Internet address is 172.31.23.1/30, 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 00:00:04
  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 8.8.8.8
  Suppress hello for 0 neighbor(s)
```

Bogota

Figura 55. Verificaciòn OSPF en router Bogota - Show ip ospf interface

```
Bogota#show ip ospf interface

Serial0/0/0 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: 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 00:00:06
  Index 1/1, 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)
FastEthernet0/0.30 is up, line protocol is up
  Internet address is 192.168.30.1/24, Area 0
  Process ID 1, Router ID 1.1.1.1, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 1.1.1.1, Interface address 192.168.30.1
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    No Hellos (Passive interface)
  Index 2/2, 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 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
FastEthernet0/0.40 is up, line protocol is up
  Internet address is 192.168.40.1/24, Area 0
  Process ID 1, Router ID 1.1.1.1, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 1.1.1.1, Interface address 192.168.40.1
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    No Hellos (Passive interface)
  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 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
FastEthernet0/0.200 is up, line protocol is up
  Internet address is 192.168.200.1/24, Area 0
  Process ID 1, Router ID 1.1.1.1, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 1.1.1.1, Interface address 192.168.200.1
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    No Hellos (Passive interface)
  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 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
```

BuenosAires

Figura 56. Verificaciòn OSPF en router Buenos Aires- Show ip ospf interface

```
BuenosAires#show ip ospf interface

Loopback4 is up, line protocol is up
  Internet address is 192.168.4.1/24, Area 0
  Process ID 1, Router ID 8.8.8.8, Network Type LOOPBACK, Cost: 1
  Loopback interface is treated as a stub Host
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: 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 2/2, 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)
```

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

Miami

Figura 58. Comando show ip protocols Miami

```
Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 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):
    FastEthernet0/1
  Routing Information Sources:
    Gateway         Distance      Last Update
    1.1.1.1              110      00:03:18
    5.5.5.5              110      00:16:28
    8.8.8.8              110      00:16:28
  Distance: (default is 110)
```

Buenos Aires

Figura 57. Comando show ip protocols Buenos Aires

```
BuenosAires#show ip protocols

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 8.8.8.8
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    172.31.23.0 0.0.0.3 area 0
    192.168.4.0 0.0.0.3 area 0
  Passive Interface(s):
    Loopback4
    Loopback5
    Loopback6
  Routing Information Sources:
    Gateway         Distance      Last Update
    1.1.1.1              110      00:26:36
    5.5.5.5              110      00:09:46
    8.8.8.8              110      00:09:46
  Distance: (default is 110)
```

Bogota

Figura 59. Comando show ip protocols Bogota

```
Bogota#show ip protocols

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 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):
    FastEthernet0/0.30
    FastEthernet0/0.40
    FastEthernet0/0.200
  Routing Information Sources:
    Gateway         Distance      Last Update
    1.1.1.1              110      00:12:12
    5.5.5.5              110      00:22:49
    8.8.8.8              110      00:22:49
  Distance: (default is 110)
```

2.2.8 En el Switch 3 deshabilitar DNS lookup

S3(config)#no ip domain lookup

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

a. Se asigna al S1 la dirección ip de la vlan 200

S1(config)#int vlan200

S1(config-if)#ip address 192.168.200.2 255.255.255.0

S1(config-if)#no sh

b. Se asigna al S3 la dirección ip de la vlan 200

S3(config)#int vlan200

S3(config-if)#ip address 192.168.200.3 255.255.255.0

S3(config-if)#no sh

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

• En S1

S1(config)#int range fa0/2, fa0/4-23

S1(config-if-range)#sh

• En S3

S3(config)#int range f0/2, f0/4-24

S3(config-if-range)#sh

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

Bogota(config)#ip dhcp excluded-address 192.168.40.1 192.168.40.30

Bogota(config)#ip dhcp excluded-address 192.168.30.1 192.168.30.30

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

a. Configurar DHCP pool para VLAN 30

Name: ADMINISTRACION

DNS-Server: 10.10.10.11

Domain-Name: ccna-unad.com

Establecer default gateway.

Bogota(config)#ip dhcp pool Administracion

Bogota(dhcp-config)#dns-server 10.10.10.11

Bogota(dhcp-config)#default-router 192.168.30.1

Bogota(dhcp-config)#network 192.168.30.0 255.255.255.0

Bogota(dhcp-config)#ip domain-name ccna-unad.com

b. Configurar DHCP pool para VLAN 40

Name: MERCADEO

DNS-Server: 10.10.10.11

Domain-Name: ccna-unad.com

Establecer default gateway

Bogota(config)#ip dhcp pool Mercadeo

Bogota(dhcp-config)#dns-server 10.10.10.11

Bogota(dhcp-config)#default-router 192.168.40.1

Bogota(dhcp-config)#network 192.168.40.0 255.255.255.0

Bogota(dhcp-config)#ip domain-name ccna-unad.com

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

Miami(config)#ip nat inside source static 10.10.10.10 209.166.200.229

Miami(config)#int f0/0

Miami(config-if)#ip nat outside

Miami(config-if)#int f0/1

Miami(config-if)#ip nat inside

2.2.14 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.

Miami(config)#access-list 1 permit 192.168.30.0 0.0.0.255

Miami(config)#access-list 1 permit 192.168.40.0 0.0.0.255

Miami(config)#access-list 1 permit 192.168.4.0 0.0.3.255

2.2.15 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.

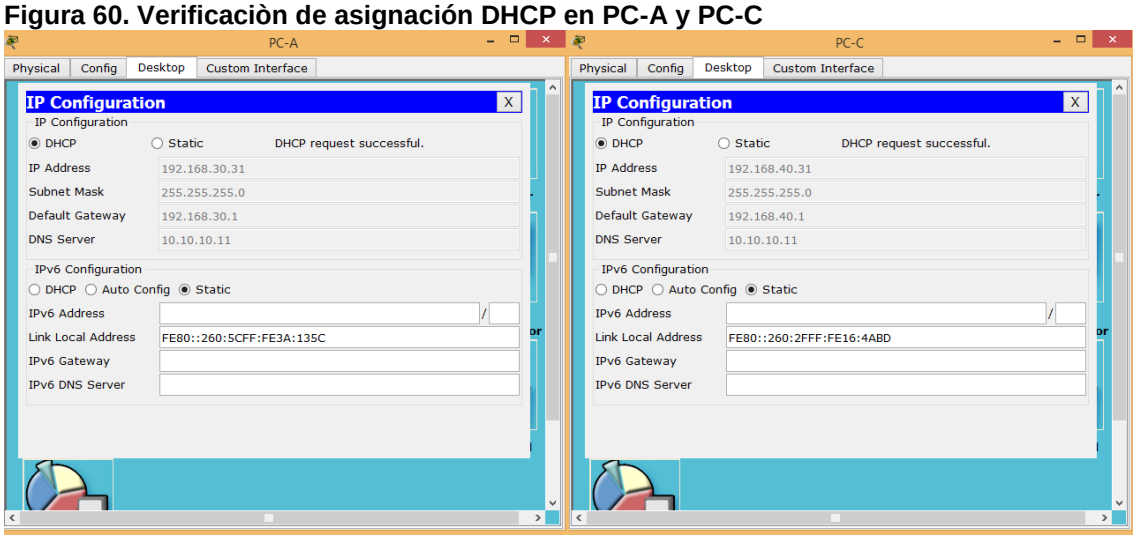
Miami(config)#access-list 101 permit tcp any host 209.165.200.229

Miami(config)#access-list 101 permit icmp any any echo-reply

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

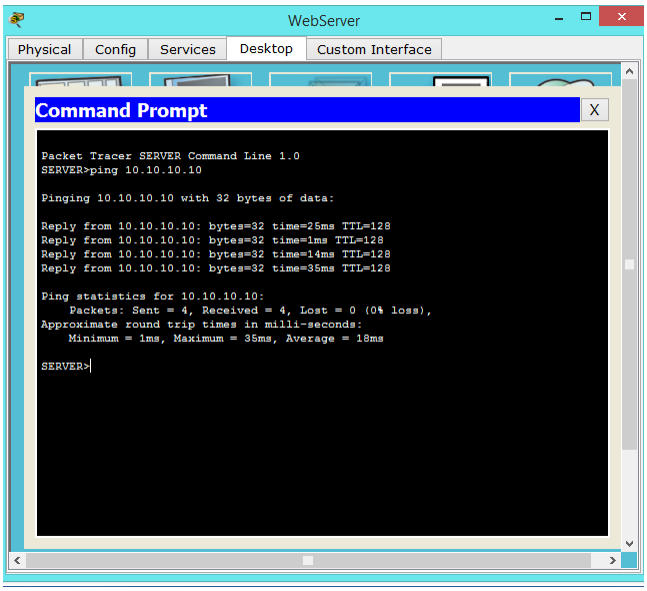
a. Verificaciòn de asignación DHCP en PC-A y PC-C

Figura 60. Verificaciòn de asignación DHCP en PC-A y PC-C



b. Verificaciòn de acceso de Web Server a Internet PC

Figura 61. Verificaciòn de acceso de Web Server a Internet PC



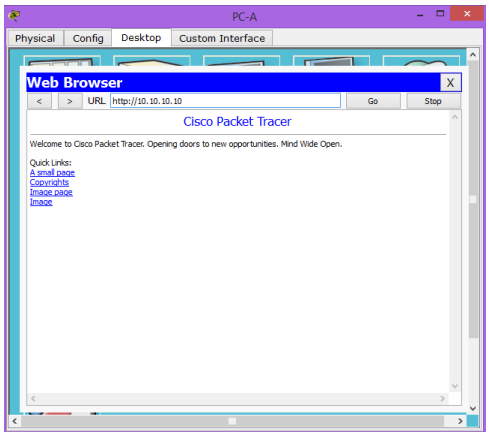
c. Verificaciòn de acceso de R2 a Internet PC y Web Server

Figura 62. Verificaciòn de acceso de R2 a Internet PC y Web Server

```
Miami#ping 209.165.200.230

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.165.200.230, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/2/4 ms

Miami#ping 10.10.10.10

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.10.10, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms
```

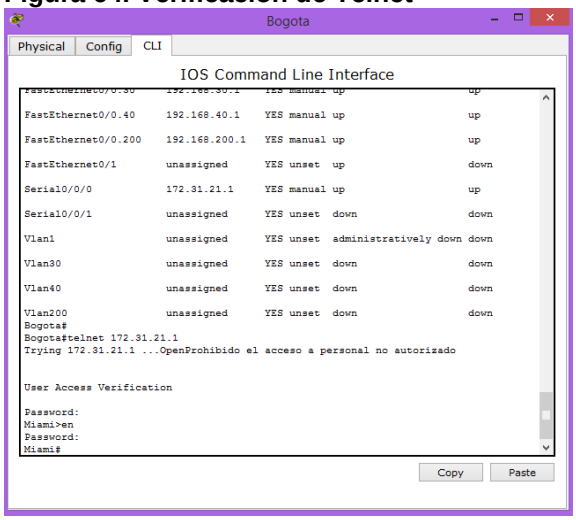
d. Verificación http, Web Browser

Figura 63. Verificación http, Web Browser



e. Verificaciòn de Telnet

Figura 64. Verificaciòn de Telnet



f. Ping de R1 a R2

Figura 65. Ping de R1 a R2

```
Bogota#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 = 1/10/46 ms
```

g. Ping de R3 a R2 y a R1

Figura 66. Ping de R3 a R2 y a R1

```
BuenosAires#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 = 1/16/51 ms

BuenosAires#ping 172.31.21.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.31.21.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/3 ms

BuenosAires#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 = 1/16/51 ms
```

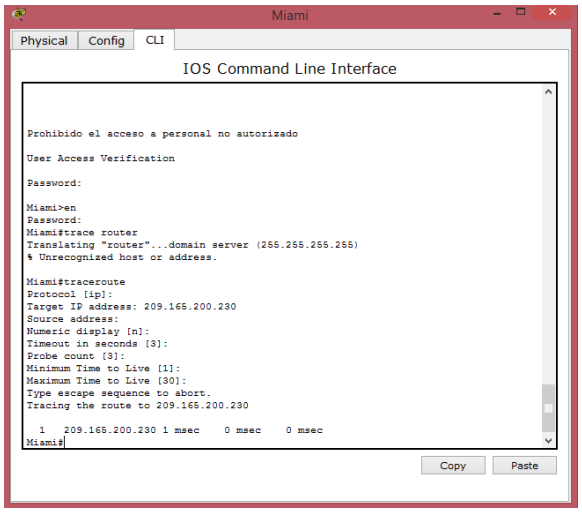
h. Verificaciòn tracert web server a internet pc

Figura 67. Verificaciòn tracert web server a internet pc

```
Packet Tracer SERVER Command Line 1.0
SERVER>tracert 209.165.200.230

Tracing route to 209.165.200.230 over a maximum of 30 hops:

  1    1 ms      0 ms      0 ms      10.10.10.1
  2    0 ms      0 ms      1 ms      209.165.200.230

Trace complete.
```

i. Router 2 a Internet pc

Figura 68. Router 2 a Internet pc



j. Prueba de envìo de paquetes entre equipos

Figura 69. Prueba de envìo de paquetes entre equipos

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	Intern...	WebServer	ICMP		0.000	N	0	(edit)	
	Successful	Intern...	Miami	ICMP		0.000	N	1	(edit)	
	Successful	Intern...	BuenosAires	ICMP		0.000	N	2	(edit)	
	Successful	Intern...	Bogota	ICMP		0.000	N	3	(edit)	
	Successful	Intern...	S3	ICMP		0.000	N	4	(edit)	
	Successful	Intern...	S1	ICMP		0.000	N	5	(edit)	
	Successful	Intern...	PC-C	ICMP		0.000	N	6	(edit)	
	Successful	Intern...	PC-A	ICMP		0.000	N	7	(edit)	

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit
	Successful	WebSe...	Internet PC	ICMP		0.000	N	0	(edit)
	Successful	WebSe...	Miami	ICMP		0.000	N	1	(edit)
	Successful	WebSe...	Bogota	ICMP		0.000	N	2	(edit)
	Successful	WebSe...	BuenosAires	ICMP		0.000	N	3	(edit)
	Successful	WebSe...	S1	ICMP		0.000	N	4	(edit)
	Successful	WebSe...	S3	ICMP		0.000	N	5	(edit)
	Successful	WebSe...	PC-A	ICMP		0.000	N	6	(edit)
	Successful	WebSe...	PC-C	ICMP		0.000	N	7	(edit)

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit
	Successful	PC-A	Internet PC	ICMP		0.000	N	0	(edit)
	Successful	PC-A	WebServer	ICMP		0.000	N	1	(edit)
	Successful	PC-A	PC-C	ICMP		0.000	N	2	(edit)
	Successful	PC-A	Bogota	ICMP		0.000	N	3	(edit)
	Successful	PC-A	Miami	ICMP		0.000	N	4	(edit)
	Successful	PC-A	BuenosAires	ICMP		0.000	N	5	(edit)
	Successful	PC-C	PC-A	ICMP		0.000	N	6	(edit)
	Successful	PC-C	Bogota	ICMP		0.000	N	7	(edit)
	Successful	PC-C	BuenosAires	ICMP		0.000	N	8	(edit)
	Successful	PC-C	Miami	ICMP		0.000	N	9	(edit)
	Successful	PC-C	WebServer	ICMP		0.000	N	10	(edit)
	Successful	PC-C	Internet PC	ICMP		0.000	N	11	(edit)

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit
	Successful	Miami	Internet PC	ICMP		0.000	N	0	(edit)
	Successful	Miami	WebServer	ICMP		0.000	N	1	(edit)
	Successful	Miami	Bogota	ICMP		0.000	N	2	(edit)
	Successful	Miami	BuenosAires	ICMP		0.000	N	3	(edit)

3 CONCLUSIONES

Con el desarrollo de cada uno de los escenarios propuestos y luego de verificar su correcto funcionamiento, se evidencia el nivel de conocimientos adquirido en el presente diplomado de profundización, a través de herramientas como Packet Tracer y la información contenida en cada una de las unidades vistas en la plataforma de CISCO facilitaron brindar una solución a lo solicitado.

El uso de comandos de diagnóstico y visualización como show ip interface, show ip protocols, show running config, show ip route, tracert, ping, fueron de gran utilidad a la hora de verificar la programación realizada en cada uno de los dispositivos y la comunicación entre ellos, solucionando así los errores de conectividad que se presentan con frecuencia al desarrollar este tipo de configuraciones.

La importancia del uso de las redes locales virtuales (VLAN), dentro del proceso de creación de redes evidencia la necesidad de aprendizaje de las mismas ya que estas permiten la creación de diferentes redes de manera lógica haciendo uso de una misma red física; esto disminuye la cantidad de equipos a la hora de diseñar una arquitectura de este tipo con lo que se optimiza el dominio de difusión y finalmente, facilita la administración de la red.

Configuraciones como RIP, OSFP, DHCP, NAT, entre otras utilizadas en cada escenario permiten mejorar eficiencia, que los equipos funcionen adecuadamente, y en general que se realice un buen trabajo como administradores de red.

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