

PRUEBA DE HABILIDADES PRÁCTICAS CCNA

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UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA
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INGENIERÍA DE SISTEMAS
SAN JUAN DE PASTO

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DEDICATORIA

El presente trabajo está dedicado principalmente a Dios, por darme la fuerza para sacar adelante este proceso de superación. A mis padres y hermano, por su amor, sacrificio y la confianza depositada en mí durante todos estos años. A mi esposa y mis hijas por su apoyo incondicional. A todas las personas que me han ayudado y han hecho que este trabajo se realice con éxito, les agradezco infinitamente por ser partícipes en el logro de esta meta cumplida.

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RESUMEN

El presente trabajo permitió el desarrollo de las habilidades y requerimientos necesarios en la implementación de redes mediante la configuración y administración de diferentes dispositivos de red, permitiendo además la solución de problemas de redes LAN y WAN. Para lograr dicho objetivo se plantearon y resolvieron dos escenarios.

El primer escenario propuesto, donde una empresa posee sucursales distribuidas en dos ciudades, para lo cual se configuró e interconectó cada uno de los dispositivos con sus respectivas conexiones físicas y direccionamiento IP. Se implementó RIP como protocolo de enrutamiento, además se habilitó el encapsulamiento PPP y se utilizó NAT en los *routers*. Se configuró el servidor DHCP en un *router* para las dos redes LAN de la topología de cada ciudad, finalmente se comprobó su funcionamiento mediante pruebas de conectividad y los respectivos comandos *show* en los distintos dispositivos de red.

El segundo escenario plantea una empresa que posee tres sucursales distribuidas en tres ciudades donde se configuró e interconectó los dispositivos, implementando las conexiones físicas y direccionamiento IP adecuado. Se configuró el protocolo de enrutamiento OSPFv2 como también tres VLANs, puertos troncales, puertos de acceso, encapsulamiento, Inter-VLAN *Routin*. Se estableció el servidor DHCP en el *router* para las nos redes LAN, además se utilizó NAT, dos listas de acceso de tipo estándar y dos listas de acceso de tipo extendido. Finalmente se comprobó su funcionamiento mediante pruebas de conectividad y los respectivos comandos *show* en los distintos dispositivos de red.

El curso y el desarrollo de los escenarios propuestos, pretende la profundización en el campo emergente de las Redes y Telecomunicaciones, de forma que se desarrollen las competencias necesarias para responder a la demanda creciente de personal especializado.

Palabras clave: Implementación de redes, problemas de red, configuración de dispositivos de red, redes LAN y WAN, direccionamiento IP.

ABSTRACT

The present work allowed the development of the necessary skills and requirements in the implementation of networks by the configuration and administration of different network devices, allowing also the solution of problems of LAN and WAN networks. To achieve this objective, two scenarios were raised and resolved.

The first scenario proposed, where a company has branches distributed in two cities, for which it was configured and interconnected each one of the devices with their respective physical connections and IP addressing. RIP was implemented as routing protocol, and PPP encapsulation was enabled and NAT was used on routers. The DHCP server was configured on a router for the two LAN networks of each city's topology, and its operation was finally verified by connectivity tests and the respective show commands on the various network devices.

The second scenario raises a company that has three branches distributed in three cities where the devices were configured and interconnected, implementing the physical connections and appropriate IP addressing. OSPFv2 routing protocol was configured as well as three VLANs, trunk ports, access ports, encapsulation, Inter-VLAN Routin. The DHCP server was established on the router for LAN networks, in addition NAT was used, two standard type access lists and two extended type access lists. Finally, its operation was verified by means of connectivity tests and the respective show commands on the different network devices.

The course and the development of the scenarios proposed, aims to deepen in the emerging field of networks and telecommunications, so that they develop the necessary competencies to respond to the growing demand of specialized personnel.

Key words: implementation of networks, network problems, configuration of network devices, LAN and WAN networks, IP addressing.

INTRODUCCIÓN

El siguiente trabajo se presenta como resultado de los conocimientos y habilidades adquiridos en el diplomado de profundización cisco (diseño e implementación de soluciones integradas LAN / WAN), por medio de la solución de problemas relacionados con diversos aspectos de redes en los cuales se plantea dos (2) escenarios para su desarrollo en el *software* de simulación de red *Cisco Packet Tracer*.

Las tareas realizadas en cada uno de los escenarios se encuentran acompañados de los procesos de documentación que llevan a la solución, referente a las configuración de cada uno de los dispositivos, la descripción de los pasos y procedimientos para su desarrollo, pruebas de funcionamiento y conectividad.

El diplomado que permitió desarrollar el presente trabajo está compuesto por los módulos de fundamentos de redes y fundamentos de *Routing* y *Switching*, los cuales se componen de diferentes temáticas que permiten adquirir las competencias necesarias para la creación de redes empresariales confiables y escalables mediante la instalación, configuración, control y solución de problemas en los equipos pertenecientes a la red.

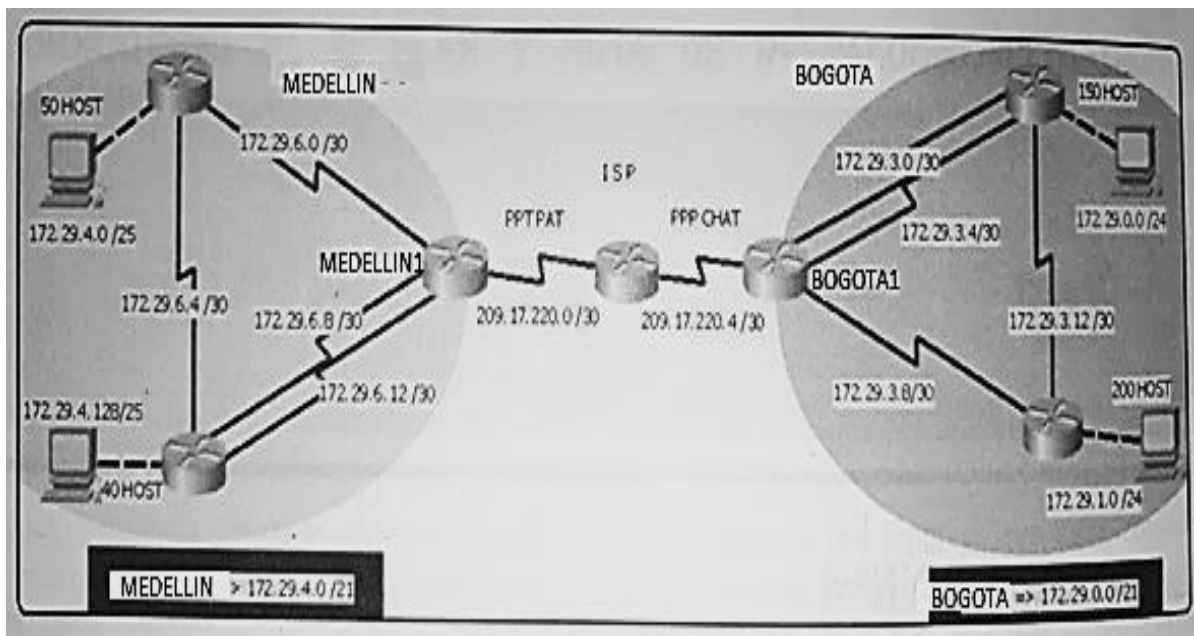
El campo de las redes y telecomunicaciones tiene una demanda creciente, es por ello que el diplomado es de gran importancia profesional permitiendo iniciar y emprender el camino de la especialización en estas áreas de las tecnologías de la información.

1. 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 la red escenario 1



Este escenario plantea el uso de RIP como protocolo de enrutamiento, considerando que se tendrán 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.

Como trabajo inicial se debe realizar lo siguiente.

- Realizar las rutinas de diagnóstico y dejar los equipos listos para su configuración (asignar nombres de equipos, asignar claves de seguridad, etc).
- Realizar la conexión física de los equipos con base en la topología de red

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

Parte 1: Configuración del enrutamiento

- a. Configurar el enrutamiento en la red usando el protocolo RIP versión 2, declare la red principal, desactive la sumarización automática.
- 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.
- c. El router ISP deberá tener una ruta estática dirigida hacia cada red interna de Bogotá y Medellín para el caso se sumerizan las subredes de cada uno a /22.

Parte 2: Tabla de Enrutamiento.

- a. Verificar la tabla de enrutamiento en cada uno de los *routers* para comprobar las redes y sus rutas.
- b. Verificar el balanceo de carga que presentan los *routers*.
- c. Obsérvese en los *routers* Bogotá1 y Medellín1 cierta similitud por su ubicación, por tener dos enlaces de conexión hacia otro *router* y por la ruta por defecto que manejan.
- d. Los *routers* Medellín2 y Bogotá2 también presentan redes conectadas directamente y recibidas mediante RIP.
- e. Las tablas de los *routers* restantes deben permitir visualizar rutas redundantes para el caso de la ruta por defecto.
- f. El router ISP solo debe indicar sus rutas estáticas adicionales a las directamente conectadas.

Parte 3: Deshabilitar la propagación del protocolo RIP.

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

Tabla 1. Interfaces de los *routers* que no necesitan desactivación

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

Parte 4: Verificación del protocolo RIP.

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

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.

Parte 5: Configurar encapsulamiento y autenticación PPP.

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

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

Parte 6: Configuración de PAT.

- a. En la topología, si se activa NAT en cada equipo de salida (Bogotá1 y Medellín1), los *routers* internos de una ciudad no podrán llegar hasta los *routers* internos en el otro extremo, sólo existirá comunicación hasta los *routers* Bogotá1, ISP y Medellín1.
- b. Después de verificar lo indicado en el paso anterior proceda a configurar el NAT en el *router* Medellín1. Compruebe que la traducción de direcciones indique las interfaces de entrada y de salida. Al realizar una prueba de *ping*, la dirección debe ser traducida automáticamente a la dirección de la interfaz serial 0/1/0 del *router* Medellín1, como diferente puerto.
- c. Proceda a configurar el NAT en el *router* Bogotá1. Compruebe que la traducción de direcciones indique las interfaces de entrada y de salida. Al realizar una prueba de *ping*, la dirección debe ser traducida automáticamente a la dirección de la interfaz serial 0/1/0 del *router* Bogotá1, como diferente puerto.

Parte 7: Configuración del servicio DHCP.

- a. Configurar la red Medellín2 y Medellín3 donde el *router* Medellín 2 debe ser el servidor DHCP para ambas redes LAN.
- b. El *router* Medellín3 deberá habilitar el paso de los mensajes broadcast hacia la IP del *router* Medellín2.
- c. Configurar la red Bogotá2 y Bogotá3 donde el *router* Bogotá2 debe ser el servidor DHCP para ambas redes LAN.
- d. Configure el *router* Bogotá1 para que habilite el paso de los mensajes *Broadcast* hacia la IP del *router* Bogotá2.

DESARROLLO

1.2.1 Se procede a realizar las configuraciones básicas y el direccionamiento de los equipos, comenzando con *router* MEDELLIN 1:

ROUTER MEDELLIN1

```
Router>enable
Router#configure terminal
Router(config)#hostname MEDELLIN1
MEDELLIN1(config)#enable secret class
MEDELLIN1(config)#line console 0
```

```

MEDELLIN1(config-line)#password cisco
MEDELLIN1(config-line)#login
MEDELLIN1(config-line)#line vty 0 4
MEDELLIN1(config-line)#password cisco
MEDELLIN1(config-line)#login
MEDELLIN1(config-line)#exit
MEDELLIN1(config)#service password-encryption
MEDELLIN1(config)#banner motd "Solo personal autorizado"
MEDELLIN1(config)#interface serial 0/0/0
MEDELLIN1(config-if)#ip address 209.17.220.2 255.255.255.252
MEDELLIN1(config-if)#description Conexion a ISP
MEDELLIN1(config-if)#no shutdown
MEDELLIN1(config-if)#exit
MEDELLIN1(config)#interface serial 0/0/1
MEDELLIN1(config-if)#ip address 172.29.6.1 255.255.255.252
MEDELLIN1(config-if)#clock rate 2000000
MEDELLIN1(config-if)#description Conexion a MEDELLIN 2
MEDELLIN1(config-if)#no shutdown
MEDELLIN1(config)#interface serial 0/1/0
MEDELLIN1(config-if)#ip address 172.29.6.9 255.255.255.252
MEDELLIN1(config-if)#clock rate 2000000
MEDELLIN1(config-if)#description Conexion a MEDELLIN 3
MEDELLIN1(config-if)#no shutdown
MEDELLIN1(config-if)#exit
MEDELLIN1(config)#interface serial 0/1/1
MEDELLIN1(config-if)#ip address 172.29.6.13 255.255.255.252
MEDELLIN1(config-if)#clock rate 2000000
MEDELLIN1(config-if)#description Conexion a MEDELLIN 3
MEDELLIN1(config-if)#no shutdown

```

Se procede a realizar las configuraciones básicas y el direccionamiento del *router* MEDELLIN 2:

ROUTER MEDELLIN2

```

Router>enable
Router#configure terminal
Router(config)#hostname MEDELLIN2
MEDELLIN2(config)#enable secret class
MEDELLIN2(config)#line console 0
MEDELLIN2(config-line)#password cisco
MEDELLIN2(config-line)#login
MEDELLIN2(config-line)#line vty 0 4
MEDELLIN2(config-line)#password cisco
MEDELLIN2(config-line)#login

```

```

MEDELLIN2(config-line)#exit
MEDELLIN2(config)#service password-encryption
MEDELLIN2(config)#banner motd "Solo personal autorizado"
MEDELLIN2(config)#interface serial 0/0/0
MEDELLIN2(config-if)#ip address 172.29.6.2 255.255.255.252
MEDELLIN2(config-if)#description Conexion a MEDELLIN1
MEDELLIN2(config-if)#no shutdown
MEDELLIN2(config-if)#interface serial 0/0/1
MEDELLIN2(config-if)#ip address 172.29.6.5 255.255.255.252
MEDELLIN2(config-if)#clock rate 2000000
MEDELLIN2(config-if)#no shutdown
MEDELLIN2(config-if)#description Conexion a MEDELLIN3
MEDELLIN2(config-if)#exit
MEDELLIN2(config)#interface gigabitEthernet 0/0
MEDELLIN2(config-if)#ip address 172.29.4.1 255.255.255.128
MEDELLIN2(config-if)#no shutdown

```

Se procede a realizar las configuraciones básicas y el direccionamiento del *router* MEDELLIN 3:

ROUTER MEDELLIN3

```

Router>enable
Router#configure terminal
Router(config)#hostname MEDELLIN3
MEDELLIN3(config)#enable secret class
MEDELLIN3(config)#line console 0
MEDELLIN3(config-line)#password cisco
MEDELLIN3(config-line)#login
MEDELLIN3(config-line)#line vty 0 4
MEDELLIN3(config-line)#password cisco
MEDELLIN3(config-line)#login
MEDELLIN3(config-line)#exit
MEDELLIN3(config)#service password-encryption
MEDELLIN3(config)#banner motd "Solo personal autorizado"
MEDELLIN3(config)#interface serial 0/0/0
MEDELLIN3(config-if)#description Conexion a MEDELLIN 1
MEDELLIN3(config-if)#ip address 172.29.6.10 255.255.255.252
MEDELLIN3(config-if)#no shutdown
MEDELLIN3(config-if)#exit
MEDELLIN3(config)#interface serial 0/0/1
MEDELLIN3(config-if)#description Conexion a MEDELLIN1
MEDELLIN3(config-if)#ip address 172.29.6.14 255.255.255.252
MEDELLIN3(config-if)#no shutdown
MEDELLIN3(config-if)#exit
MEDELLIN3(config)#interface serial 0/1/0

```

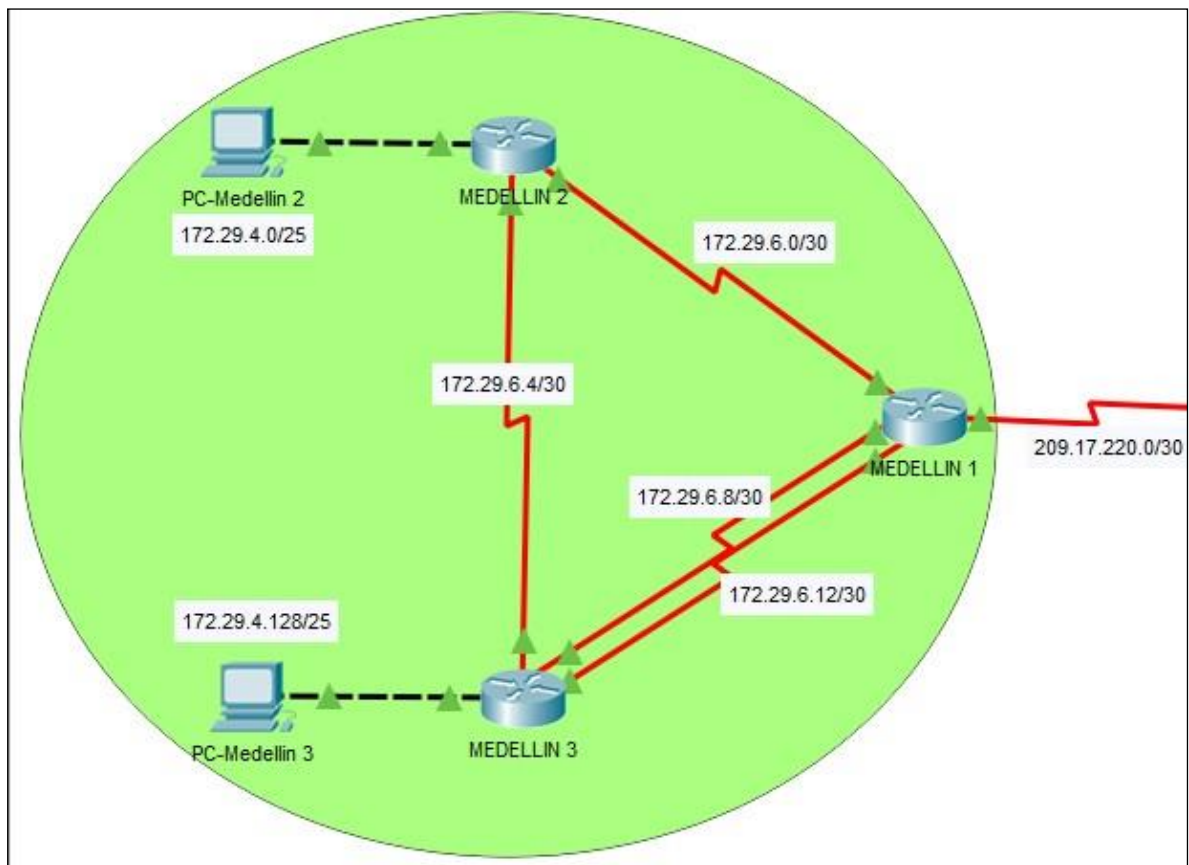
```

MEDELLIN3(config-if)#description Conexion a MEDELLIN2
MEDELLIN3(config-if)#ip address 172.29.6.6 255.255.255.252
MEDELLIN3(config-if)#no shutdown
MEDELLIN3(config-if)#exit
MEDELLIN3(config)#interface gigabitEthernet 0/0
MEDELLIN3(config-if)#description Conexion a LAN
MEDELLIN3(config-if)#ip address 172.29.4.129 255.255.255.128
MEDELLIN3(config-if)#no shutdown

```

Se presenta pantallazo de la topología de la zona MEDELLIN después de realizar las respectivas configuraciones y sus interfaces activas:

Figura 2. Topología zona Medellín



Se procede a realizar las configuraciones básicas y el direccionamiento del *router* BOGOTA 1:

ROUTER BOGOTA1

```

Router>enable
Router#configure terminal

```

```

Router(config)#hostname BOGOTA1
BOGOTA1(config)#enable secret class
BOGOTA1(config)#line console 0
BOGOTA1(config-line)#password cisco
BOGOTA1(config-line)#login
BOGOTA1(config-line)#line vty 0 4
BOGOTA1(config-line)#password cisco
BOGOTA1(config-line)#login
BOGOTA1(config-line)#exit
BOGOTA1(config)#service password-encryption
BOGOTA1(config)#banner motd "Solo personal autorizado"
BOGOTA1(config)#interface serial 0/0/0
BOGOTA1(config-if)#ip address 209.17.220.6 255.255.255.252
BOGOTA1(config-if)#description Conexion a ISP
BOGOTA1(config-if)#no shutdown
BOGOTA1(config-if)#exit
BOGOTA1(config)#interface serial 0/0/1
BOGOTA1(config-if)#ip address 172.29.3.9 255.255.255.252
BOGOTA1(config-if)#description Conexion a BOGOTA 2
BOGOTA1(config-if)#clock rate 2000000
BOGOTA1(config-if)#no shutdown
BOGOTA1(config-if)#exit
BOGOTA1(config)#interface serial 0/1/0
BOGOTA1(config-if)#ip address 172.29.3.1 255.255.255.252
BOGOTA1(config-if)#description Conexion a BOGOTA 3
BOGOTA1(config-if)#clock rate 2000000
BOGOTA1(config-if)#no shutdown
BOGOTA1(config-if)#exit
BOGOTA1(config)#interface serial 0/1/1
BOGOTA1(config-if)#ip address 172.29.3.5 255.255.255.252
BOGOTA1(config-if)#description Conexion a BOGOTA 3
BOGOTA1(config-if)#clock rate 2000000
BOGOTA1(config-if)#no shutdown

```

Se procede a realizar las configuraciones básicas y el direccionamiento del *router* BOGOTA 2:

ROUTER BOGOTA2

```

Router>enable
Router#configure terminal
Router(config)#hostname BOGOTA2
BOGOTA2(config)#enable secret class
BOGOTA2(config)#line console 0
BOGOTA2(config-line)#password cisco
BOGOTA2(config-line)#login

```

```

BOGOTA2(config-line)#line vty 0 4
BOGOTA2(config-line)#password cisco
BOGOTA2(config-line)#login
BOGOTA2(config-line)#exit
BOGOTA2(config)#service password-encryption
BOGOTA2(config)#banner motd "Solo personal autorizado"
BOGOTA2(config)#interface serial 0/0/0
BOGOTA2(config-if)#ip address 172.29.3.10 255.255.255.252
BOGOTA2(config-if)#description Conexion a BOGOTA 1
BOGOTA2(config-if)#no shutdown
BOGOTA2(config)#interface serial 0/0/1
BOGOTA2(config-if)#ip address 172.29.3.13 255.255.255.252
BOGOTA2(config-if)#clock rate 2000000
BOGOTA2(config-if)#description Conexion a BOGOTA 3
BOGOTA2(config-if)#no shutdown
BOGOTA2(config-if)#exit
BOGOTA2(config)#interface gigabitEthernet 0/0
BOGOTA2(config-if)#ip address 172.29.1.1 255.255.255.0
BOGOTA2(config-if)#description Conexion a LAN
BOGOTA2(config-if)#no shutdown

```

Se procede a realizar las configuraciones básicas y el direccionamiento del *router* BOGOTA 3:

ROUTER BOGOTA3

```

Router>enable
Router#configure terminal
Router(config)#hostname BOGOTA3
BOGOTA3(config)#enable secret class
BOGOTA3(config)#line console 0
BOGOTA3(config-line)#password cisco
BOGOTA3(config-line)#line vty 0 4
BOGOTA3(config-line)#login
BOGOTA3(config-line)#password cisco
BOGOTA3(config-line)#login
BOGOTA3(config-line)#exit
BOGOTA3(config)#service password-encryption
BOGOTA3(config)#banner motd "Solo personal autorizado"
BOGOTA3(config)#interface serial 0/0/0
BOGOTA3(config-if)#ip address 172.29.3.2 255.255.255.252
BOGOTA3(config-if)#description Conexion a BOGOTA 1
BOGOTA3(config-if)#no shutdown
BOGOTA3(config-if)#interface serial 0/0/1
BOGOTA3(config-if)#description Conexion a BOGOTA 1
BOGOTA3(config-if)#ip address 172.29.3.6 255.255.255.252

```



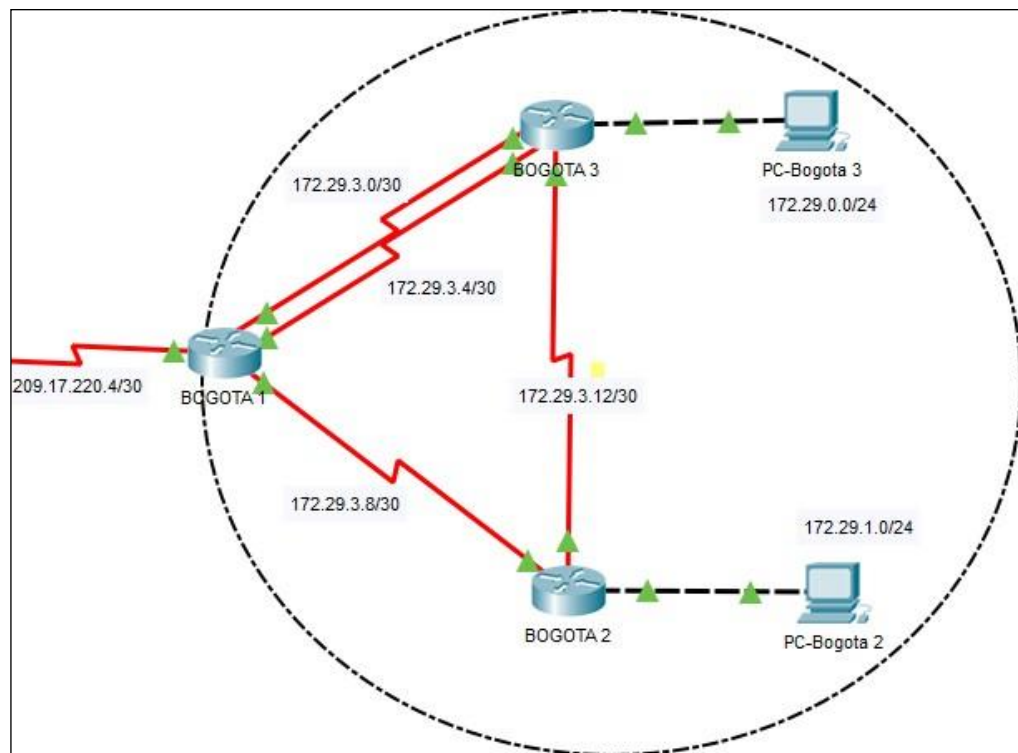
```

BOGOTA3(config-if)#no shutdown
BOGOTA3(config-if)#interface serial 0/1/0
BOGOTA3(config-if)#description Conexion a BOGOTA 2
BOGOTA3(config-if)#ip address 172.29.3.14 255.255.255.252
BOGOTA3(config-if)#no shutdown
BOGOTA3(config-if)#exit
BOGOTA3(config)#interface gigabitEthernet 0/0
BOGOTA3(config-if)#ip address 172.29.0.1 255.255.255.0
BOGOTA3(config-if)#description Conexion a LAN
BOGOTA3(config-if)#no shutdown

```

Se presenta pantallazo de la topología de la zona BOGOTA después de realizar las respectivas configuraciones y sus interfaces activas:

Figura 3. Topología zona Bogotá



Se procede a realizar las configuraciones básicas y el direccionamiento del *router* ISP:

ROUTER ISP

```

Router>enable
Router#configure terminal
Router(config)#hostname ISP

```

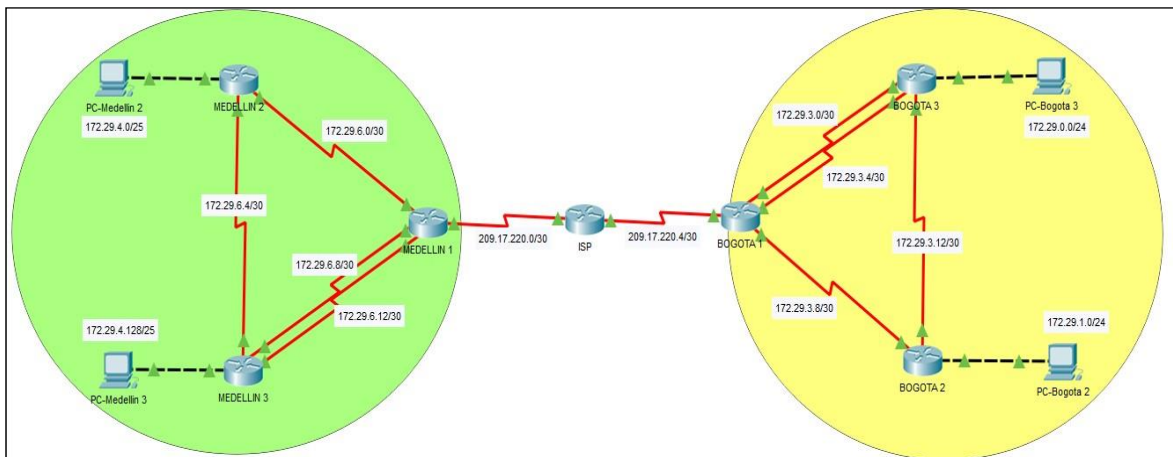
```

ISP(config)#enable secret class
ISP(config)#line console 0
ISP(config-line)#password cisco
ISP(config-line)#login
ISP(config-line)#line vty 0 4
ISP(config-line)#password cisco
ISP(config-line)#login
ISP(config-line)#exit
ISP(config)#service password-encryption
ISP(config)#banner motd "Solo personal autorizado"
ISP(config)#interface serial 0/0/0
ISP(config-if)#ip address 209.17.220.1 255.255.255.252
ISP(config-if)#clock rate 2000000
ISP(config-if)#no shutdown
ISP(config)#interface serial 0/0/1
ISP(config-if)#ip address 209.17.220.5 255.255.255.252
ISP(config-if)#no shutdown
ISP(config-if)#clock rate 2000000

```

Se presenta pantallazo de la topología completa después de realizar las respectivas configuraciones y sus interfaces activas:

Figura 4. Topología de red completa



Se procede a configurar Rip en las dos zonas MEDELLIN y BOGOTA:

ROUTER MEDELLIN1

```


MEDELLIN1(config)#router rip
MEDELLIN1(config-router)#version 2
MEDELLIN1(config-router)#no auto-summary
MEDELLIN1(config-router)#network 172.29.6.0

```

```
MEDELLIN1(config-router)#network 172.29.8.0
MEDELLIN1(config-router)#network 172.29.12.0
```

Se ejecuta el comando **show ip rip database** para mirar el contenido de la base de datos RIP del router:

Figura 5. Comando *show ip rip database* en *router* Medellin1



```
MEDELLIN1#show ip rip database
172.29.6.0/30    auto-summary
172.29.6.0/30    directly connected, Serial0/0/1
172.29.6.8/30    auto-summary
172.29.6.8/30    directly connected, Serial0/1/0
172.29.6.12/30   auto-summary
172.29.6.12/30   directly connected, Serial0/1/1
MEDELLIN1#
```

ROUTER MEDELLIN2

```
MEDELLIN2(config)#router rip
MEDELLIN2(config-router)#version 2
MEDELLIN2(config-router)#no auto-summary
MEDELLIN2(config-router)#network 172.29.4.0
MEDELLIN2(config-router)#network 172.29.6.0
MEDELLIN2(config-router)#network 172.29.6.4
MEDELLIN2(config-router)#
```

Se ejecuta el comando **show ip rip database** para mirar el contenido de la base de datos RIP del *router*:

Figura 6. Comando *show ip rip database* en *router* Medellin2



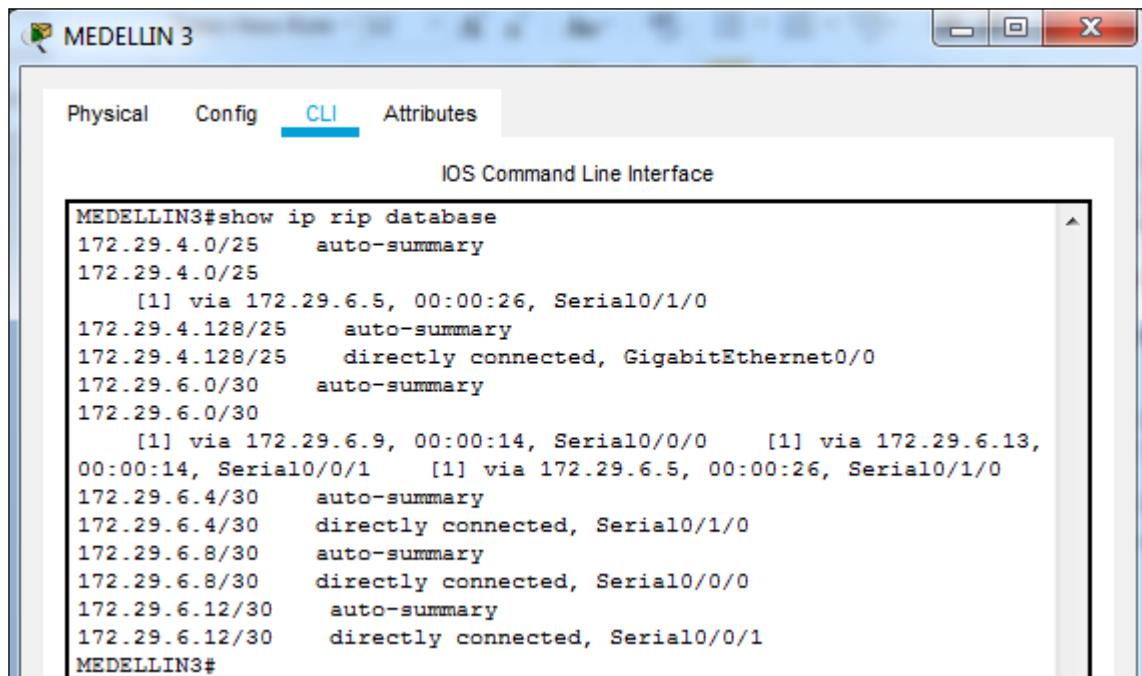
```
MEDELLIN2#show ip rip database
172.29.4.0/25    auto-summary
172.29.4.0/25    directly connected, GigabitEthernet0/0
172.29.6.0/30    auto-summary
172.29.6.0/30    directly connected, Serial0/0/0
172.29.6.4/30    auto-summary
172.29.6.4/30    directly connected, Serial0/0/1
172.29.6.8/30    auto-summary
172.29.6.8/30
[1] via 172.29.6.1, 00:00:11, Serial0/0/0
172.29.6.12/30   auto-summary
172.29.6.12/30
[1] via 172.29.6.1, 00:00:11, Serial0/0/0
MEDELLIN2#
```

ROUTER MEDELLIN3

```
MEDELLIN3(config)#router rip
MEDELLIN3(config-router)#version 2
MEDELLIN3(config-router)#no auto-summary
MEDELLIN3(config-router)#network 172.29.4.128
MEDELLIN3(config-router)#network 172.29.6.4
MEDELLIN3(config-router)#network 172.29.6.8
MEDELLIN3(config-router)#network 172.29.6.12
```

Se ejecuta el comando **show ip rip database** para mirar el contenido de la base de datos RIP del *router*.

Figura 7. Comando *show ip rip database* en *router* Medellin3



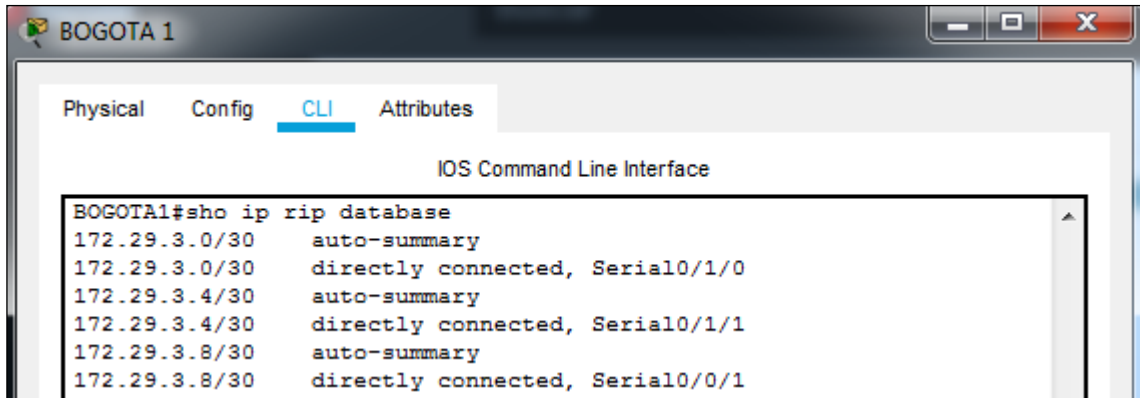
```
MEDELLIN3#show ip rip database
172.29.4.0/25    auto-summary
172.29.4.0/25
    [1] via 172.29.6.5, 00:00:26, Serial0/1/0
172.29.4.128/25 auto-summary
172.29.4.128/25 directly connected, GigabitEthernet0/0
172.29.6.0/30   auto-summary
172.29.6.0/30
    [1] via 172.29.6.9, 00:00:14, Serial0/0/0    [1] via 172.29.6.13,
00:00:14, Serial0/0/1    [1] via 172.29.6.5, 00:00:26, Serial0/1/0
172.29.6.4/30   auto-summary
172.29.6.4/30   directly connected, Serial0/1/0
172.29.6.8/30   auto-summary
172.29.6.8/30   directly connected, Serial0/0/0
172.29.6.12/30  auto-summary
172.29.6.12/30  directly connected, Serial0/0/1
MEDELLIN3#
```

ROUTER BOGOTA1

```
BOGOTA1(config)#router rip
BOGOTA1(config-router)#version 2
BOGOTA1(config-router)#no auto-summary
BOGOTA1(config-router)#network 172.29.3.0
BOGOTA1(config-router)#network 172.29.3.4
BOGOTA1(config-router)#network 172.29.3.8
BOGOTA1(config-router)#
```

Se ejecuta el comando **show ip rip database** para mirar el contenido de la base de datos RIP del *router*.

Figura 8. Comando *show ip rip database* en *router Bogota1*



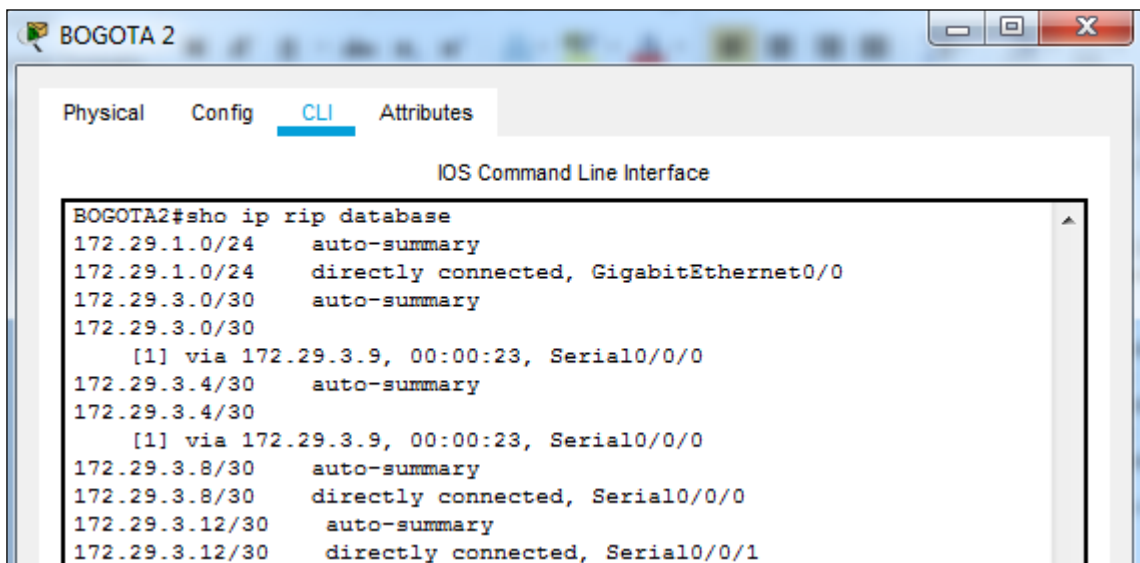
```
BOGOTA1#sho ip rip database
172.29.3.0/30    auto-summary
172.29.3.0/30    directly connected, Serial0/1/0
172.29.3.4/30    auto-summary
172.29.3.4/30    directly connected, Serial0/1/1
172.29.3.8/30    auto-summary
172.29.3.8/30    directly connected, Serial0/0/1
```

ROUTER BOGOTA2

```
BOGOTA2(config)#router rip
BOGOTA2(config-router)#version 2
BOGOTA2(config-router)#no auto-summary
BOGOTA2(config-router)#network 172.29.1.0
BOGOTA2(config-router)#network 172.29.3.8
BOGOTA2(config-router)#network 172.29.3.12
BOGOTA2(config-router)#
```

Se ejecuta el comando **show ip rip database** para mirar el contenido de la base de datos RIP del *router*.

Figura 9. Comando *show ip rip database* en *router Bogota2*



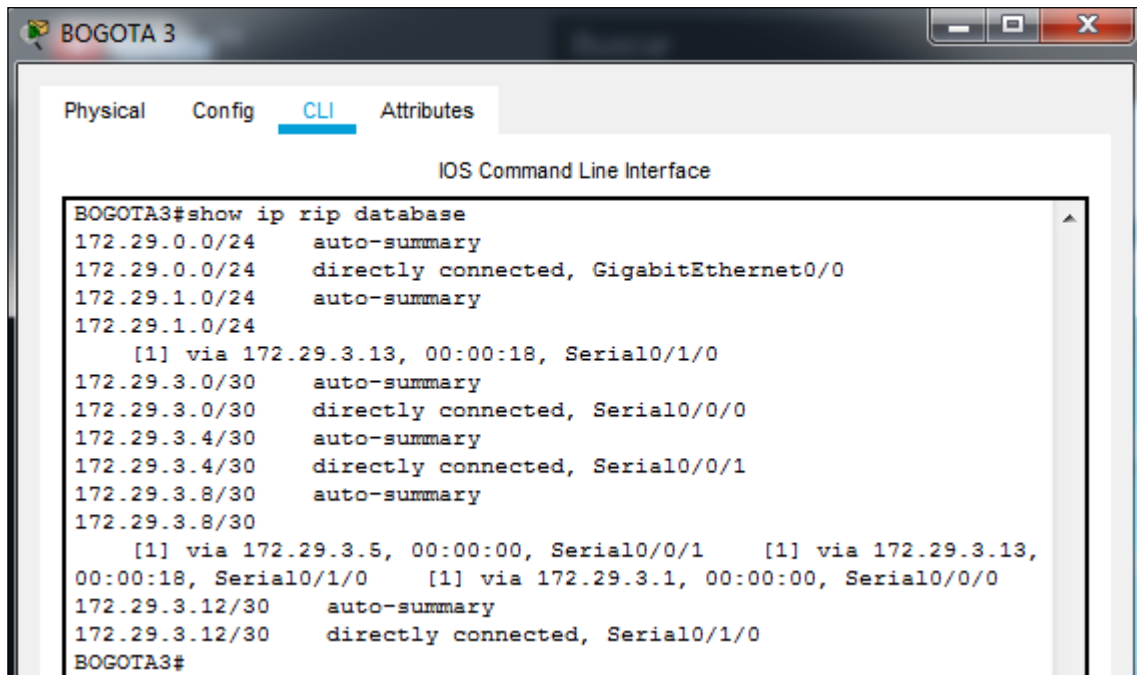
```
BOGOTA2#sho ip rip database
172.29.1.0/24    auto-summary
172.29.1.0/24    directly connected, GigabitEthernet0/0
172.29.3.0/30    auto-summary
172.29.3.0/30
   [1] via 172.29.3.9, 00:00:23, Serial0/0/0
172.29.3.4/30    auto-summary
172.29.3.4/30
   [1] via 172.29.3.9, 00:00:23, Serial0/0/0
172.29.3.8/30    auto-summary
172.29.3.8/30    directly connected, Serial0/0/0
172.29.3.12/30   auto-summary
172.29.3.12/30   directly connected, Serial0/0/1
```

ROUTER BOGOTA3

```
BOGOTA3(config)#router rip
BOGOTA3(config-router)#version 2
BOGOTA3(config-router)#no auto-summary
BOGOTA3(config-router)#network 172.29.0.0
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)#
```

Se ejecuta el comando **show ip rip database** para mirar el contenido de la base de datos RIP del *router*.

Figura 10. Comando *show ip rip database* en *router Bogota3*



```
BOGOTA3#show ip rip database
172.29.0.0/24    auto-summary
172.29.0.0/24    directly connected, GigabitEthernet0/0
172.29.1.0/24    auto-summary
172.29.1.0/24
    [1] via 172.29.3.13, 00:00:18, Serial0/1/0
172.29.3.0/30    auto-summary
172.29.3.0/30    directly connected, Serial0/0/0
172.29.3.4/30    auto-summary
172.29.3.4/30    directly connected, Serial0/0/1
172.29.3.8/30    auto-summary
172.29.3.8/30
    [1] via 172.29.3.5, 00:00:00, Serial0/0/1    [1] via 172.29.3.13,
00:00:18, Serial0/1/0    [1] via 172.29.3.1, 00:00:00, Serial0/0/0
172.29.3.12/30    auto-summary
172.29.3.12/30    directly connected, Serial0/1/0
BOGOTA3#
```

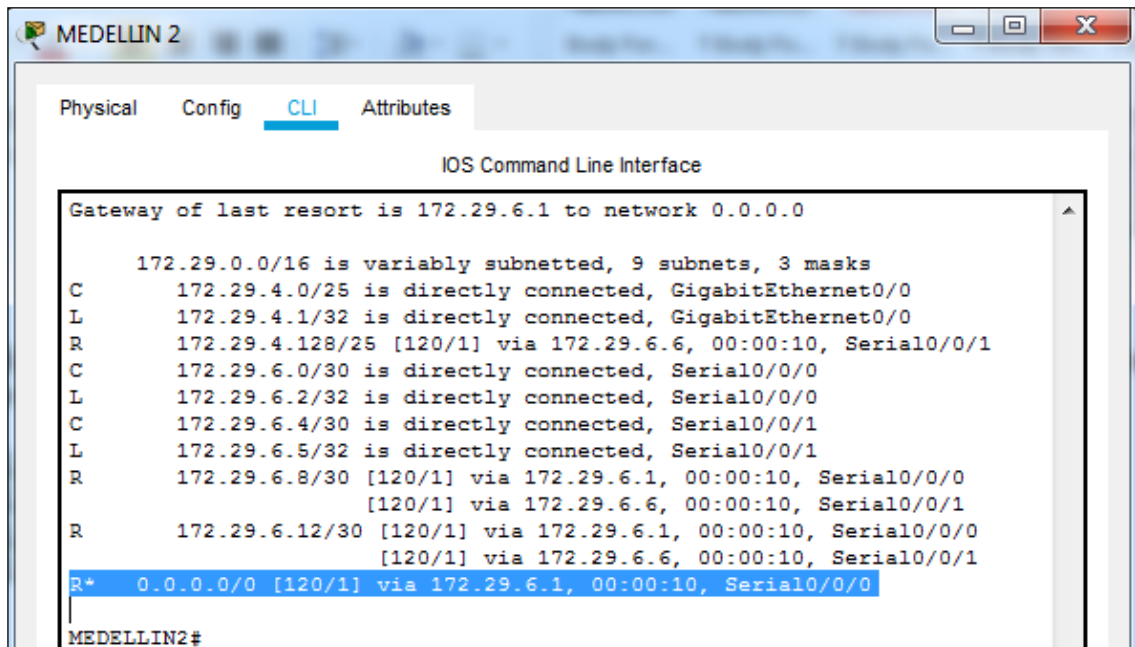
Se configura una ruta por defecto en los *routers* MEDELLIN1 Y BOGOTA1 y se redistribuye dentro de las publicaciones RIP:

ROUTER MEDELLIN1

```
MEDELLIN1(config)#ip route 0.0.0.0 0.0.0.0 209.17.220.1
MEDELLIN1(config)#router rip
MEDELLIN1(config-router)#default-information originate
MEDELLIN1(config-router)#
```

Se comprueba en MEDELLIN 2 Y MEDELLIN3 mediante comando **show ip route**:

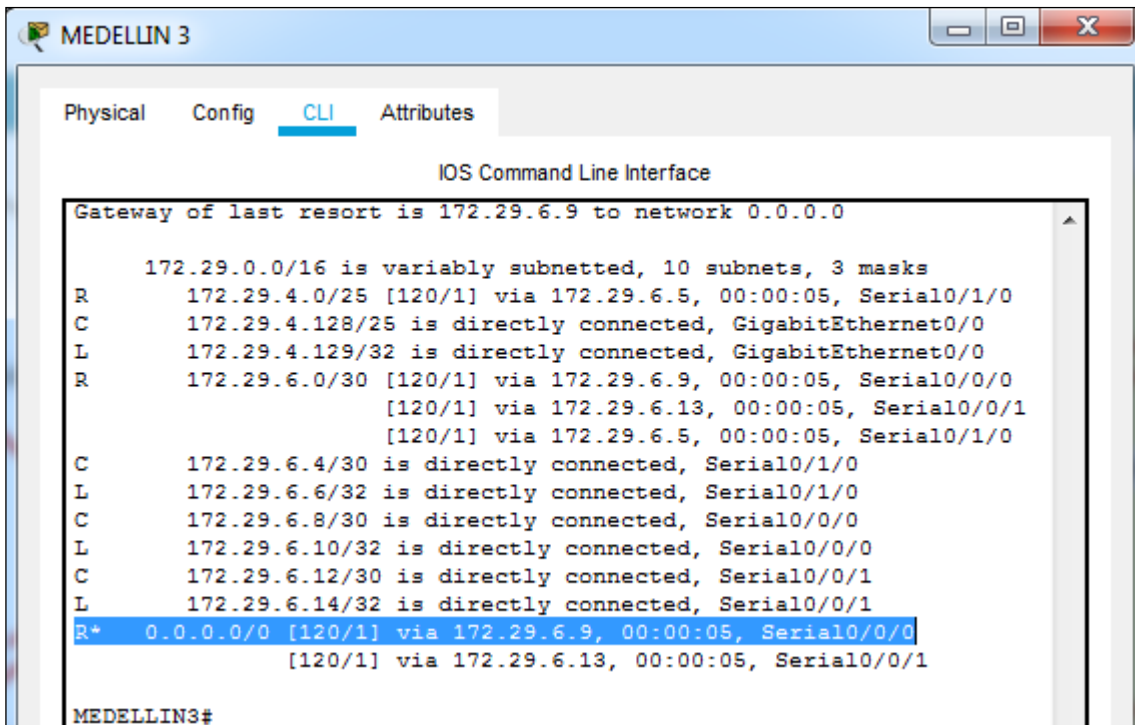
Figura 11. Comando *show ip route* en routerMedellin2



```
MEDELLIN 2
Physical Config CLI Attributes
IOS Command Line Interface
Gateway of last resort is 172.29.6.1 to network 0.0.0.0

  172.29.0.0/16 is variably subnetted, 9 subnets, 3 masks
C    172.29.4.0/25 is directly connected, GigabitEthernet0/0
L    172.29.4.1/32 is directly connected, GigabitEthernet0/0
R    172.29.4.128/25 [120/1] via 172.29.6.6, 00:00:10, Serial0/0/1
C    172.29.6.0/30 is directly connected, Serial0/0/0
L    172.29.6.2/32 is directly connected, Serial0/0/0
C    172.29.6.4/30 is directly connected, Serial0/0/1
L    172.29.6.5/32 is directly connected, Serial0/0/1
R    172.29.6.8/30 [120/1] via 172.29.6.1, 00:00:10, Serial0/0/0
      [120/1] via 172.29.6.6, 00:00:10, Serial0/0/1
R    172.29.6.12/30 [120/1] via 172.29.6.1, 00:00:10, Serial0/0/0
      [120/1] via 172.29.6.6, 00:00:10, Serial0/0/1
R*  0.0.0.0/0 [120/1] via 172.29.6.1, 00:00:10, Serial0/0/0
MEDELLIN2#
```

Figura 12. Comando *show ip route* en routerMedellin3



```
MEDELLIN 3
Physical Config CLI Attributes
IOS Command Line Interface
Gateway of last resort is 172.29.6.9 to network 0.0.0.0

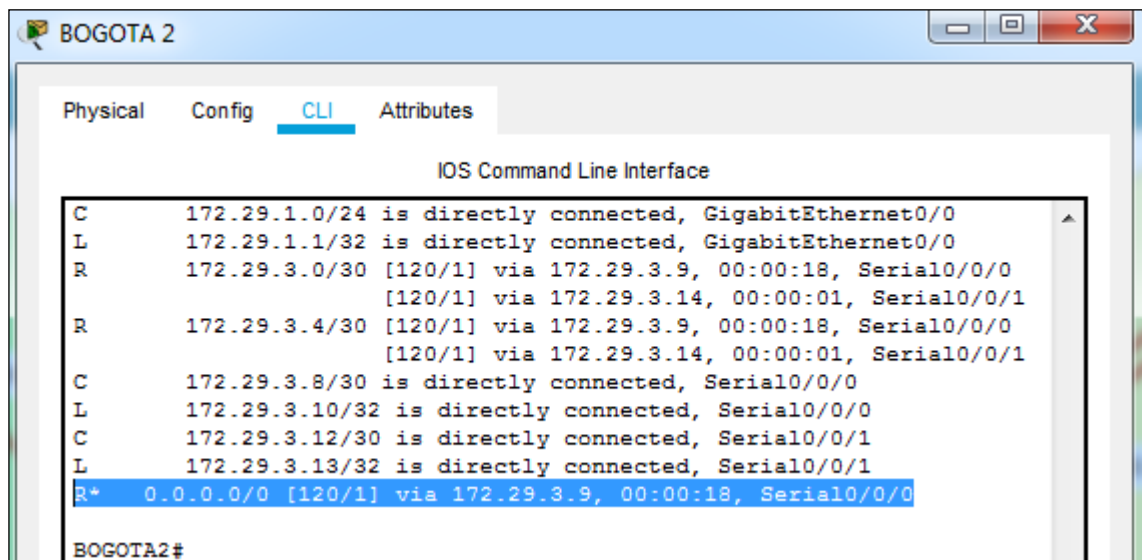
  172.29.0.0/16 is variably subnetted, 10 subnets, 3 masks
R    172.29.4.0/25 [120/1] via 172.29.6.5, 00:00:05, Serial0/1/0
C    172.29.4.128/25 is directly connected, GigabitEthernet0/0
L    172.29.4.129/32 is directly connected, GigabitEthernet0/0
R    172.29.6.0/30 [120/1] via 172.29.6.9, 00:00:05, Serial0/0/0
      [120/1] via 172.29.6.13, 00:00:05, Serial0/0/1
      [120/1] via 172.29.6.5, 00:00:05, Serial0/1/0
C    172.29.6.4/30 is directly connected, Serial0/1/0
L    172.29.6.6/32 is directly connected, Serial0/1/0
C    172.29.6.8/30 is directly connected, Serial0/0/0
L    172.29.6.10/32 is directly connected, Serial0/0/0
C    172.29.6.12/30 is directly connected, Serial0/0/1
L    172.29.6.14/32 is directly connected, Serial0/0/1
R*  0.0.0.0/0 [120/1] via 172.29.6.9, 00:00:05, Serial0/0/0
      [120/1] via 172.29.6.13, 00:00:05, Serial0/0/1
MEDELLIN3#
```

ROUTER BOGOTA1

```
BOGOTA1(config)#ip route 0.0.0.0 0.0.0.0 209.17.220.5
BOGOTA1(config)#router rip
BOGOTA1(config-router)#default-information originate
BOGOTA1(config-router)#
```

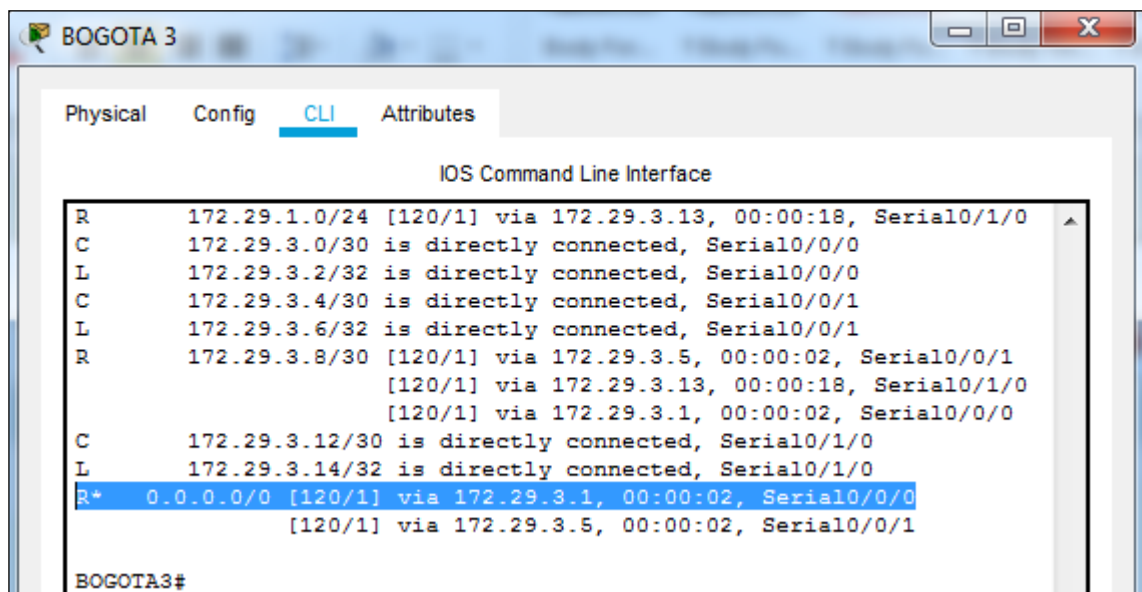
Se comprueba en BOGOTA2 Y BOGOTA3 mediante comando **show ip route**:

Figura 13. Comando *show ip route* en router Bogota2



```
BOGOTA 2
Physical Config CLI Attributes
IOS Command Line Interface
C 172.29.1.0/24 is directly connected, GigabitEthernet0/0
L 172.29.1.1/32 is directly connected, GigabitEthernet0/0
R 172.29.3.0/30 [120/1] via 172.29.3.9, 00:00:18, Serial0/0/0
[120/1] via 172.29.3.14, 00:00:01, Serial0/0/1
R 172.29.3.4/30 [120/1] via 172.29.3.9, 00:00:18, Serial0/0/0
[120/1] via 172.29.3.14, 00:00:01, Serial0/0/1
C 172.29.3.8/30 is directly connected, Serial0/0/0
L 172.29.3.10/32 is directly connected, Serial0/0/0
C 172.29.3.12/30 is directly connected, Serial0/0/1
L 172.29.3.13/32 is directly connected, Serial0/0/1
R* 0.0.0.0/0 [120/1] via 172.29.3.9, 00:00:18, Serial0/0/0
BOGOTA2#
```

Figura 14. Comando *show ip route* en router Bogota3



```
BOGOTA 3
Physical Config CLI Attributes
IOS Command Line Interface
R 172.29.1.0/24 [120/1] via 172.29.3.13, 00:00:18, Serial0/1/0
C 172.29.3.0/30 is directly connected, Serial0/0/0
L 172.29.3.2/32 is directly connected, Serial0/0/0
C 172.29.3.4/30 is directly connected, Serial0/0/1
L 172.29.3.6/32 is directly connected, Serial0/0/1
R 172.29.3.8/30 [120/1] via 172.29.3.5, 00:00:02, Serial0/0/1
[120/1] via 172.29.3.13, 00:00:18, Serial0/1/0
[120/1] via 172.29.3.1, 00:00:02, Serial0/0/0
C 172.29.3.12/30 is directly connected, Serial0/1/0
L 172.29.3.14/32 is directly connected, Serial0/1/0
R* 0.0.0.0/0 [120/1] via 172.29.3.1, 00:00:02, Serial0/0/0
[120/1] via 172.29.3.5, 00:00:02, Serial0/0/1
BOGOTA3#
```

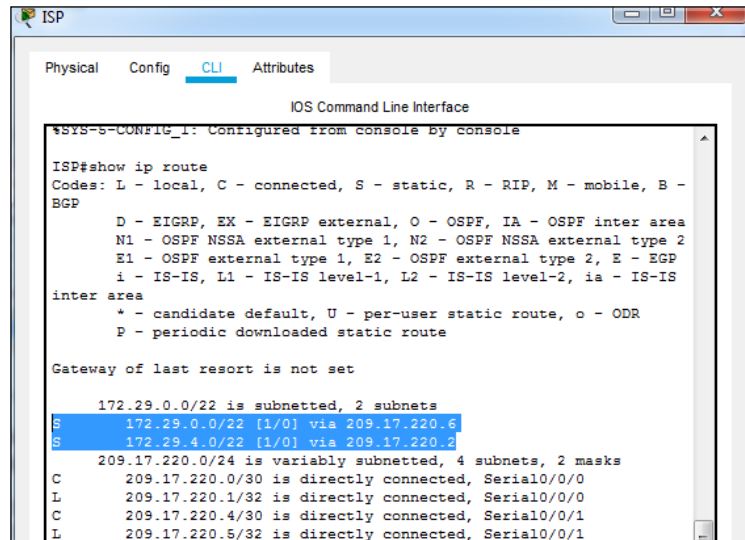

Se configura una ruta estática en el *router* ISP dirigida hacia cada red interna de las zonas BOGOTÁ y MEDELLÍN, en las cuales las subredes se sumarizan a /22:

ROUTER ISP

```
ISP(config)#ip route 172.29.4.0 255.255.252.0 209.17.220.2
```

```
ISP(config)#ip route 172.29.0.0 255.255.252.0 209.17.220.6
```

Figura 15. Comando *show ip route* en *router* ISP



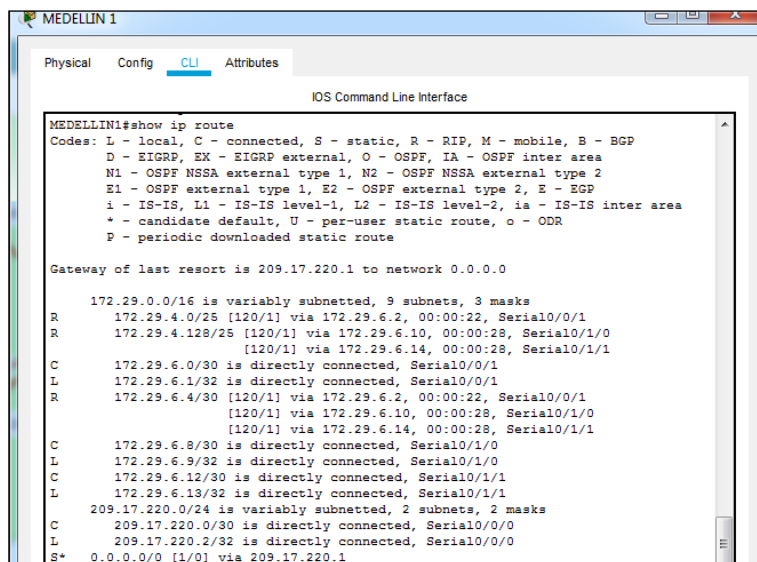
```
ISP
Physical Config CLI Attributes
IOS Command Line Interface
%SYS-S-CONFIG_1: Configured from console by console
ISP#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

172.29.0.0/22 is subnetted, 2 subnets
S    172.29.0.0/22 [1/0] via 209.17.220.6
S    172.29.4.0/22 [1/0] via 209.17.220.2
209.17.220.0/24 is variably subnetted, 4 subnets, 2 masks
C    209.17.220.0/30 is directly connected, Serial0/0/0
L    209.17.220.1/32 is directly connected, Serial0/0/0
C    209.17.220.4/30 is directly connected, Serial0/0/1
L    209.17.220.5/32 is directly connected, Serial0/0/1
```

Se verifica la tabla de enrutamiento en cada uno de los *routers* para comprobar las redes y sus rutas:

Figura 16. Comando *show ip route* en *router* Medellín1



```
MEDELLIN1
Physical Config CLI Attributes
IOS Command Line Interface
MEDELLIN1#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is 209.17.220.1 to network 0.0.0.0

172.29.0.0/16 is variably subnetted, 9 subnets, 3 masks
R    172.29.4.0/25 [120/1] via 172.29.6.2, 00:00:22, Serial0/0/1
R    172.29.4.128/25 [120/1] via 172.29.6.10, 00:00:28, Serial0/1/0
    [120/1] via 172.29.6.14, 00:00:28, Serial0/1/1
C    172.29.6.0/30 is directly connected, Serial0/0/1
L    172.29.6.1/32 is directly connected, Serial0/0/1
R    172.29.6.4/30 [120/1] via 172.29.6.2, 00:00:22, Serial0/0/1
    [120/1] via 172.29.6.10, 00:00:28, Serial0/1/0
    [120/1] via 172.29.6.14, 00:00:28, Serial0/1/1
C    172.29.6.8/30 is directly connected, Serial0/1/0
L    172.29.6.9/32 is directly connected, Serial0/1/0
C    172.29.6.12/30 is directly connected, Serial0/1/1
L    172.29.6.13/32 is directly connected, Serial0/1/1
209.17.220.0/24 is variably subnetted, 2 subnets, 2 masks
C    209.17.220.0/30 is directly connected, Serial0/0/0
L    209.17.220.2/32 is directly connected, Serial0/0/0
S*  0.0.0.0/0 [1/0] via 209.17.220.1
```

Figura 17. Comando *show ip route* en routerMedellín2

```

MEDELLIN 2
Physical Config CLI Attributes
IOS Command Line Interface
MEDELLIN2#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is 172.29.6.1 to network 0.0.0.0

172.29.0.0/16 is variably subnetted, 9 subnets, 3 masks
C    172.29.4.0/25 is directly connected, GigabitEthernet0/0
L    172.29.4.1/32 is directly connected, GigabitEthernet0/0
R    172.29.4.128/25 [120/1] via 172.29.6.6, 00:00:17, Serial0/0/1
C    172.29.6.0/30 is directly connected, Serial0/0/0
L    172.29.6.2/32 is directly connected, Serial0/0/0
C    172.29.6.4/30 is directly connected, Serial0/0/1
L    172.29.6.5/32 is directly connected, Serial0/0/1
R    172.29.6.8/30 [120/1] via 172.29.6.1, 00:00:21, Serial0/0/0
    [120/1] via 172.29.6.6, 00:00:17, Serial0/0/1
R    172.29.6.12/30 [120/1] via 172.29.6.1, 00:00:21, Serial0/0/0
    [120/1] via 172.29.6.6, 00:00:17, Serial0/0/1
R*  0.0.0.0/0 [120/1] via 172.29.6.1, 00:00:21, Serial0/0/0
    
```

Figura 18. Comando *show ip route* en routerMedellín3

```

MEDELLIN 3
Physical Config CLI Attributes
IOS Command Line Interface
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is 172.29.6.9 to network 0.0.0.0

172.29.0.0/16 is variably subnetted, 10 subnets, 3 masks
R    172.29.4.0/25 [120/1] via 172.29.6.5, 00:00:01, Serial0/1/0
C    172.29.4.128/25 is directly connected, GigabitEthernet0/0
L    172.29.4.129/32 is directly connected, GigabitEthernet0/0
R    172.29.6.0/30 [120/1] via 172.29.6.9, 00:00:07, Serial0/0/0
    [120/1] via 172.29.6.13, 00:00:07, Serial0/0/1
    [120/1] via 172.29.6.5, 00:00:01, Serial0/1/0
C    172.29.6.4/30 is directly connected, Serial0/1/0
L    172.29.6.6/32 is directly connected, Serial0/1/0
C    172.29.6.8/30 is directly connected, Serial0/0/0
L    172.29.6.10/32 is directly connected, Serial0/0/0
C    172.29.6.12/30 is directly connected, Serial0/0/1
L    172.29.6.14/32 is directly connected, Serial0/0/1
R*  0.0.0.0/0 [120/1] via 172.29.6.9, 00:00:07, Serial0/0/0
    [120/1] via 172.29.6.13, 00:00:07, Serial0/0/1
    
```

Figura 19. Comando *show ip route* en *router Bogota1*

```

BOGOTA 1
Physical Config CLI Attributes
IOS Command Line Interface
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is 209.17.220.5 to network 0.0.0.0

    172.29.0.0/16 is variably subnetted, 9 subnets, 3 masks
R   172.29.0.0/24 [120/1] via 172.29.3.6, 00:00:11, Serial0/1/1
    [120/1] via 172.29.3.2, 00:00:11, Serial0/1/0
R   172.29.1.0/24 [120/1] via 172.29.3.10, 00:00:21, Serial0/0/1
C   172.29.3.0/30 is directly connected, Serial0/1/0
L   172.29.3.1/32 is directly connected, Serial0/1/0
C   172.29.3.4/30 is directly connected, Serial0/1/1
L   172.29.3.5/32 is directly connected, Serial0/1/1
C   172.29.3.8/30 is directly connected, Serial0/0/1
L   172.29.3.9/32 is directly connected, Serial0/0/1
R   172.29.3.12/30 [120/1] via 172.29.3.10, 00:00:21, Serial0/0/1
    [120/1] via 172.29.3.6, 00:00:11, Serial0/1/1
    [120/1] via 172.29.3.2, 00:00:11, Serial0/1/0
    209.17.220.0/24 is variably subnetted, 2 subnets, 2 masks
C   209.17.220.4/30 is directly connected, Serial0/0/0
L   209.17.220.6/32 is directly connected, Serial0/0/0
S*  0.0.0.0/0 [1/0] via 209.17.220.5
    
```

Figura 20. Comando *show ip route* en *router Bogota2*

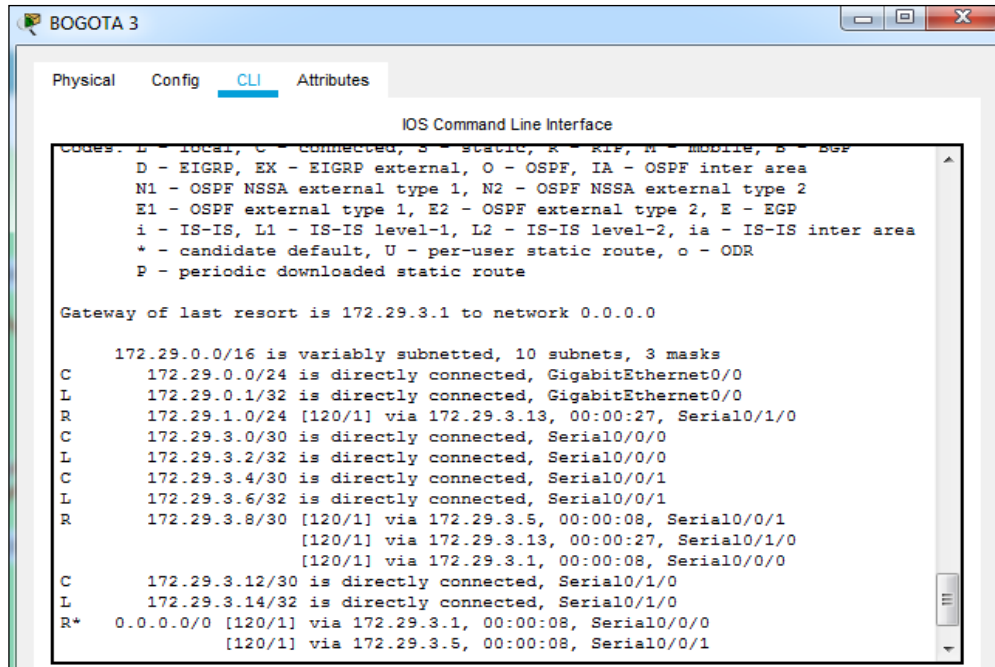
```

BOGOTA 2
Physical Config CLI Attributes
IOS Command Line Interface
BOGOTA2#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is 172.29.3.9 to network 0.0.0.0

    172.29.0.0/16 is variably subnetted, 9 subnets, 3 masks
R   172.29.0.0/24 [120/1] via 172.29.3.14, 00:00:03, Serial0/0/1
C   172.29.1.0/24 is directly connected, GigabitEthernet0/0
L   172.29.1.1/32 is directly connected, GigabitEthernet0/0
R   172.29.3.0/30 [120/1] via 172.29.3.9, 00:00:20, Serial0/0/0
    [120/1] via 172.29.3.14, 00:00:03, Serial0/0/1
R   172.29.3.4/30 [120/1] via 172.29.3.9, 00:00:20, Serial0/0/0
    [120/1] via 172.29.3.14, 00:00:03, Serial0/0/1
C   172.29.3.8/30 is directly connected, Serial0/0/0
L   172.29.3.10/32 is directly connected, Serial0/0/0
C   172.29.3.12/30 is directly connected, Serial0/0/1
L   172.29.3.13/32 is directly connected, Serial0/0/1
R*  0.0.0.0/0 [120/1] via 172.29.3.9, 00:00:20, Serial0/0/0
    
```

Figura 21. Comando *show ip route* en *router Bogota3*



```
BOGOTA 3
Physical Config CLI Attributes

IOS Command Line Interface

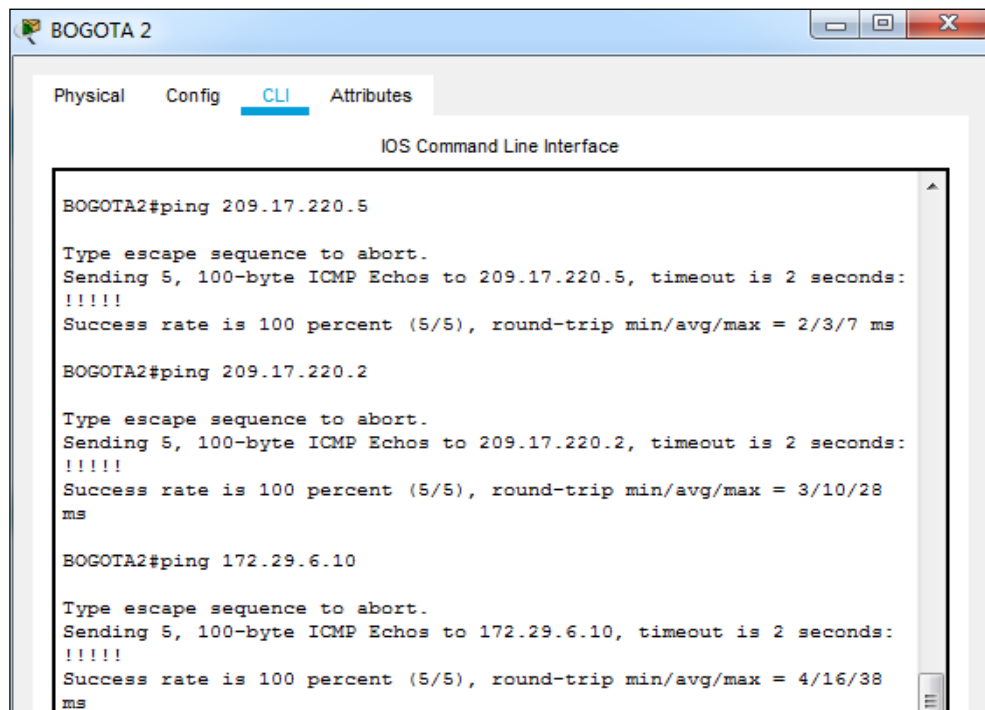
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is 172.29.3.1 to network 0.0.0.0

172.29.0.0/16 is variably subnetted, 10 subnets, 3 masks
C 172.29.0.0/24 is directly connected, GigabitEthernet0/0
L 172.29.0.1/32 is directly connected, GigabitEthernet0/0
R 172.29.1.0/24 [120/1] via 172.29.3.13, 00:00:27, Serial0/1/0
C 172.29.3.0/30 is directly connected, Serial0/0/0
L 172.29.3.2/32 is directly connected, Serial0/0/0
C 172.29.3.4/30 is directly connected, Serial0/0/1
L 172.29.3.6/32 is directly connected, Serial0/0/1
R 172.29.3.8/30 [120/1] via 172.29.3.5, 00:00:08, Serial0/0/1
[120/1] via 172.29.3.13, 00:00:27, Serial0/1/0
[120/1] via 172.29.3.1, 00:00:08, Serial0/0/0
C 172.29.3.12/30 is directly connected, Serial0/1/0
L 172.29.3.14/32 is directly connected, Serial0/1/0
R* 0.0.0.0/0 [120/1] via 172.29.3.1, 00:00:08, Serial0/0/0
[120/1] via 172.29.3.5, 00:00:08, Serial0/0/1
```

Se realiza prueba de conectividad de extremo a extremo:

Figura 22. Comando *ping* en *router Bogota2*



```
BOGOTA 2
Physical Config CLI Attributes

IOS Command Line Interface

BOGOTA2#ping 209.17.220.5

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.17.220.5, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 2/3/7 ms

BOGOTA2#ping 209.17.220.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.17.220.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 3/10/28
ms

BOGOTA2#ping 172.29.6.10

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.29.6.10, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/16/38
ms
```

Se verifica el balanceo de carga y rutas redundantes:

Figura 23. Comando *show ip route* en *router* Medellin3

```
MEDELLIN 3
Physical Config CLI Attributes
IOS Command Line Interface
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS
inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is 172.29.6.9 to network 0.0.0.0

172.29.0.0/16 is variably subnetted, 10 subnets, 3 masks
R 172.29.4.0/25 [120/1] via 172.29.6.5, 00:00:21, Serial0/1/0
C 172.29.4.128/25 is directly connected, GigabitEthernet0/0
L 172.29.4.129/32 is directly connected, GigabitEthernet0/0
R 172.29.6.0/30 [120/1] via 172.29.6.9, 00:00:03, Serial0/0/0
[120/1] via 172.29.6.13, 00:00:03, Serial0/0/1
[120/1] via 172.29.6.5, 00:00:21, Serial0/1/0
C 172.29.6.4/30 is directly connected, Serial0/1/0
L 172.29.6.6/32 is directly connected, Serial0/1/0
C 172.29.6.8/30 is directly connected, Serial0/0/0
L 172.29.6.10/32 is directly connected, Serial0/0/0
C 172.29.6.12/30 is directly connected, Serial0/0/1
L 172.29.6.14/32 is directly connected, Serial0/0/1
R* 0.0.0.0/0 [120/1] via 172.29.6.9, 00:00:03, Serial0/0/0
[120/1] via 172.29.6.13, 00:00:03, Serial0/0/1
```

Figura 24. Comando *show ip route* en *router* Bogota3

```
BOGOTA 3
Physical Config CLI Attributes
IOS Command Line Interface
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS
inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is 172.29.3.1 to network 0.0.0.0

172.29.0.0/16 is variably subnetted, 10 subnets, 3 masks
C 172.29.0.0/24 is directly connected, GigabitEthernet0/0
L 172.29.0.1/32 is directly connected, GigabitEthernet0/0
R 172.29.1.0/24 [120/1] via 172.29.3.13, 00:00:19, Serial0/1/0
C 172.29.3.0/30 is directly connected, Serial0/0/0
L 172.29.3.2/32 is directly connected, Serial0/0/0
C 172.29.3.4/30 is directly connected, Serial0/0/1
L 172.29.3.6/32 is directly connected, Serial0/0/1
R 172.29.3.8/30 [120/1] via 172.29.3.5, 00:00:13, Serial0/0/1
[120/1] via 172.29.3.13, 00:00:19, Serial0/1/0
[120/1] via 172.29.3.1, 00:00:13, Serial0/0/0
C 172.29.3.12/30 is directly connected, Serial0/1/0
L 172.29.3.14/32 is directly connected, Serial0/1/0
R* 0.0.0.0/0 [120/1] via 172.29.3.1, 00:00:13, Serial0/0/0
[120/1] via 172.29.3.5, 00:00:13, Serial0/0/1
```

Se realiza la configuración de autenticación PAT en el enlace MEDELLIN1 con el ISP:

ROUTER ISP

```
ISP(config)#username MEDELLIN1 password cisco
ISP(config)#interface serial 0/0/0
ISP(config-if)#encapsulation ppp
ISP(config-if)#ppp authentication pap
ISP(config-if)#ppp pap sent-username ISP password cisco
```

ROUTER MEDELLIN1

```
MEDELLIN1(config)#username ISP password cisco
MEDELLIN1(config)#interface serial 0/0/0
MEDELLIN1(config-if)#encapsulation ppp
MEDELLIN1(config-if)#ppp authentication pap
MEDELLIN1(config-if)#ppp pap sent-username MEDELLIN1 password cisco
```

Figura 25. Comando *ping* desde *router* ISP

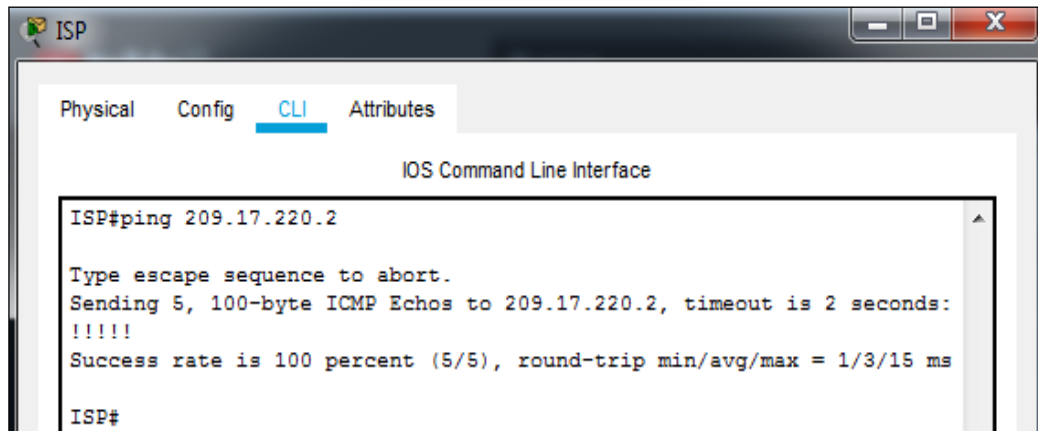
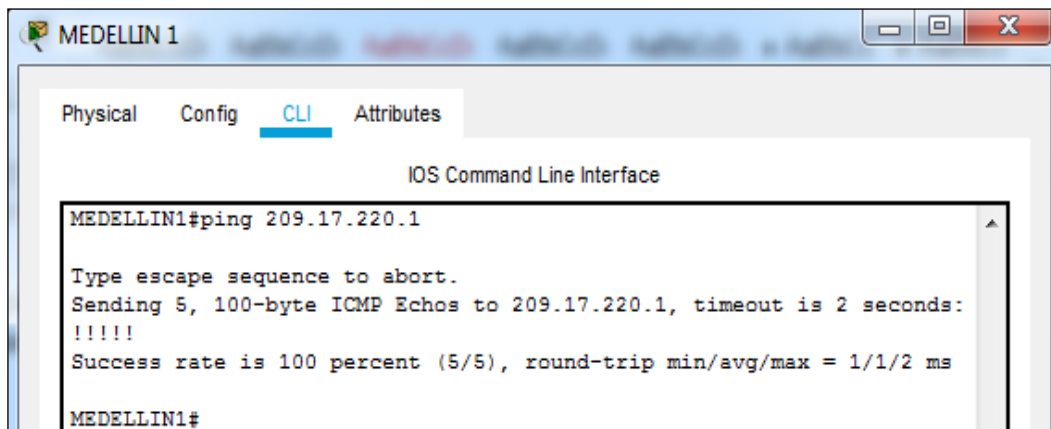


Figura 26. Comando *ping* desde *router* Medellin1



Se realiza la configuración de autenticación CHAP en el enlace BOGOTA1 con el ISP:

ROUTER ISP

```
ISP(config)#username BOGOTA1 password cisco
ISP(config)#interface serial 0/0/1
ISP(config-if)#encapsulation ppp
ISP(config-if)#ppp authentication chap
```

Figura 27. Comando *ping* desde *router* Bogota1

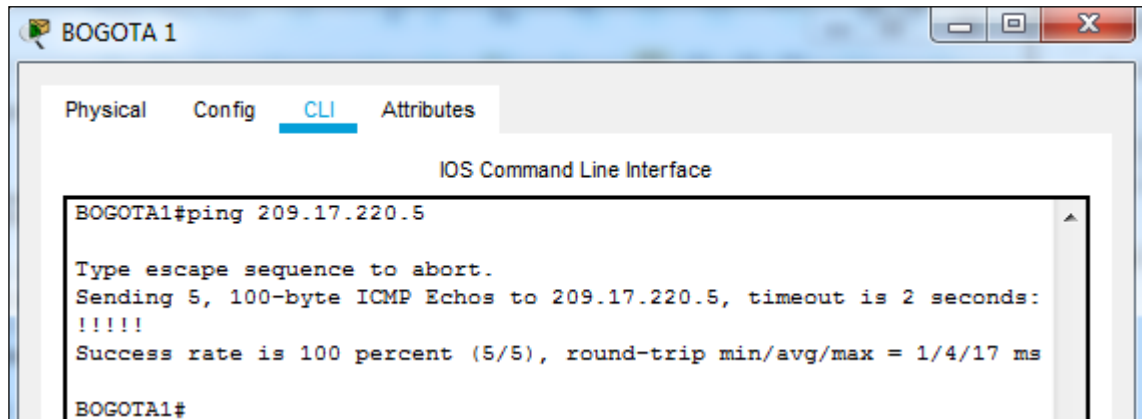
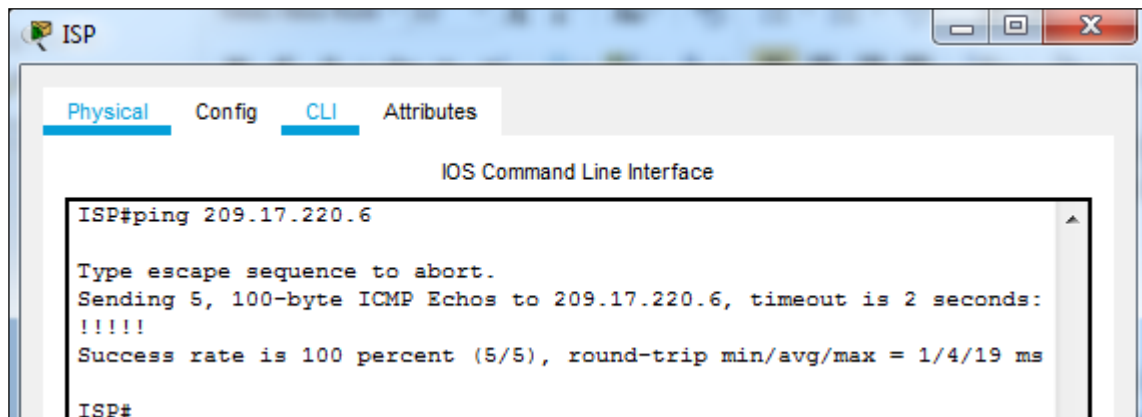


Figura 28. Comando *ping* desde *router* ISP



Se configura MEDELLÍN2 como servidor DHCP para las redes LAN de MEDELLÍN2 y MEDELLÍN3, para lo cual además se habilitó en el *router* MEDELLÍN3 el paso de los mensajes *broadcast* hacia la IP del *router* Medellín2:

ROUTER MEDELLIN2

```
MEDELLIN2(config)#ip dhcp excluded-address 172.29.4.1 172.29.4.6
MEDELLIN2(config)#ip dhcp excluded-address 172.29.4.129 172.29.4.134
```

```

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)#exit
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

```

ROUTER MEDELLIN3

```

MEDELLIN3(config)#interface gigabitEthernet 0/0
MEDELLIN3(config-if)#ip helper-address 172.29.6.5

```

Se habilita DHCP en los PCs de las dos redes comprobando que reciben direccionamiento IP y se hace *ping* de PC a PC:

Figura 29. Habilitar DHCP en PC-Medellin2

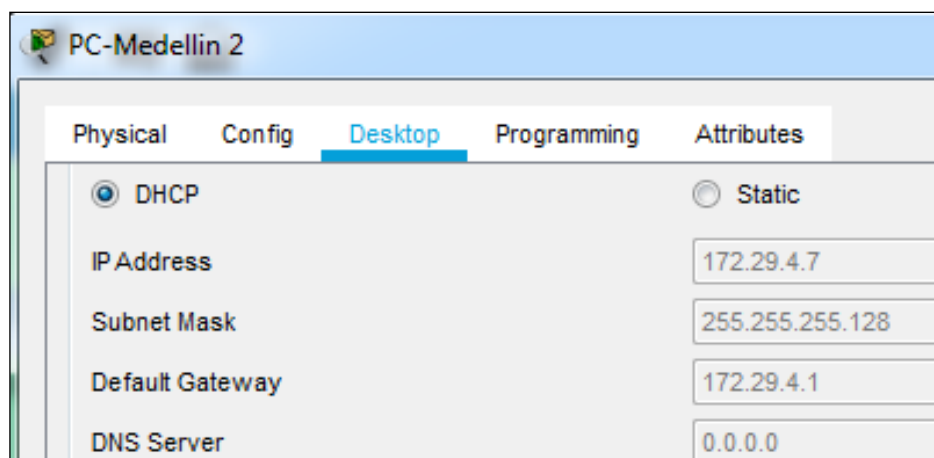


Figura 30. Habilitar DHCP en PC-Medellin3

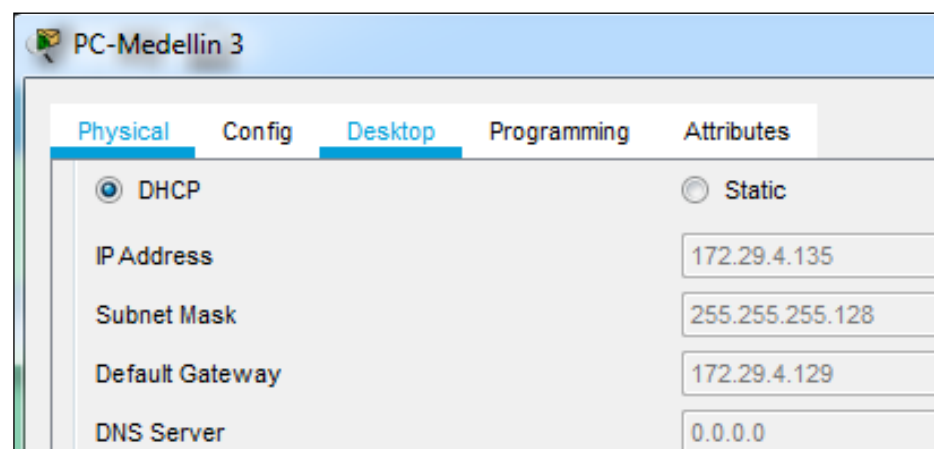
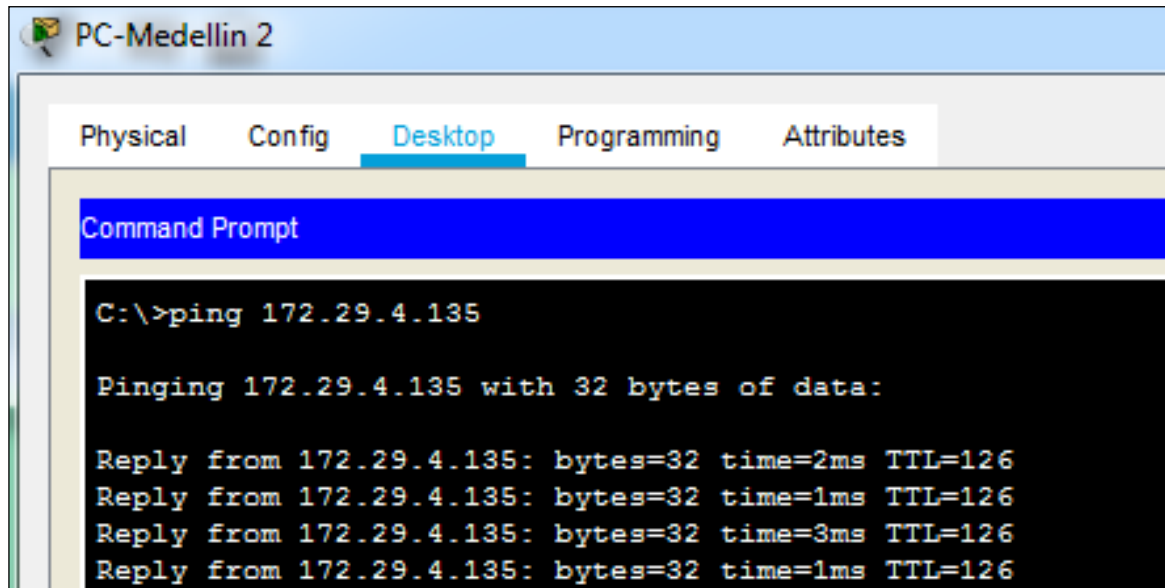


Figura 31. Comando ping desde PC-Medellin2



Se configura BOGOTA2 como servidor DHCP para las redes LAN de BOGOTA2 y BOGOTA3, para lo cual además se habilitó en el *router* BOGOTA3 el paso de los mensajes *broadcast* hacia la IP del *router* BOGOTA2:

ROUTER BOGOTA2

```
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 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)#exit
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
```

ROUTER BOGOTA3

```
BOGOTA3(config)#interface gigabitEthernet 0/0
BOGOTA3(config-if)#ip helper-address 172.29.3.13
```

Se habilita DHCP en los PCs de las dos redes comprobando que reciben direccionamiento IP y se hace *ping* de PC a PC:

Figura 32. Habilitar DHCP en PC-Bogota2

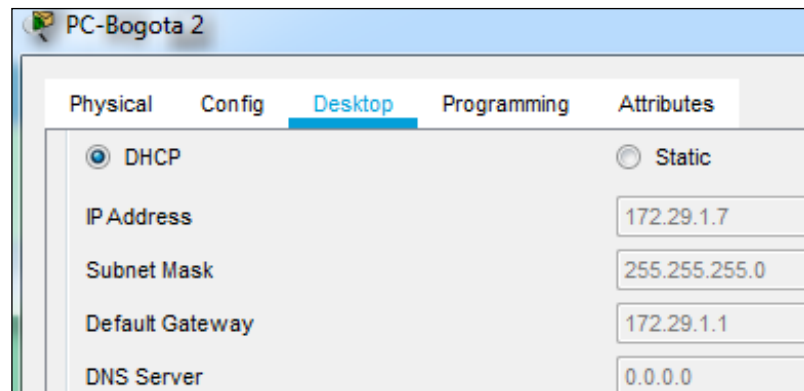


Figura 33. Habilitar DHCP en PC-Bogota3

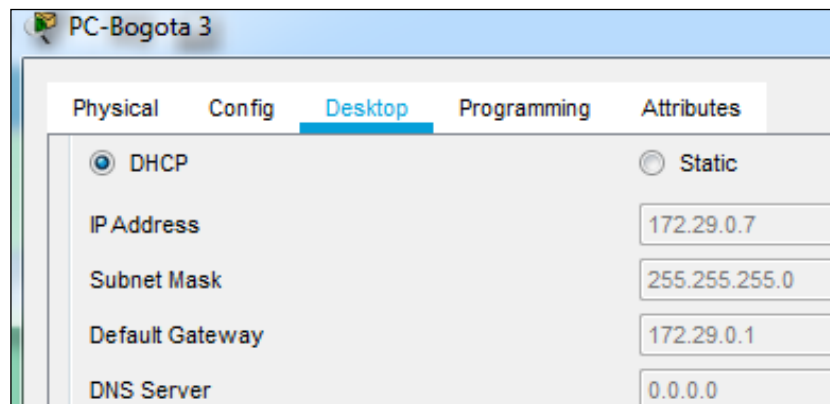
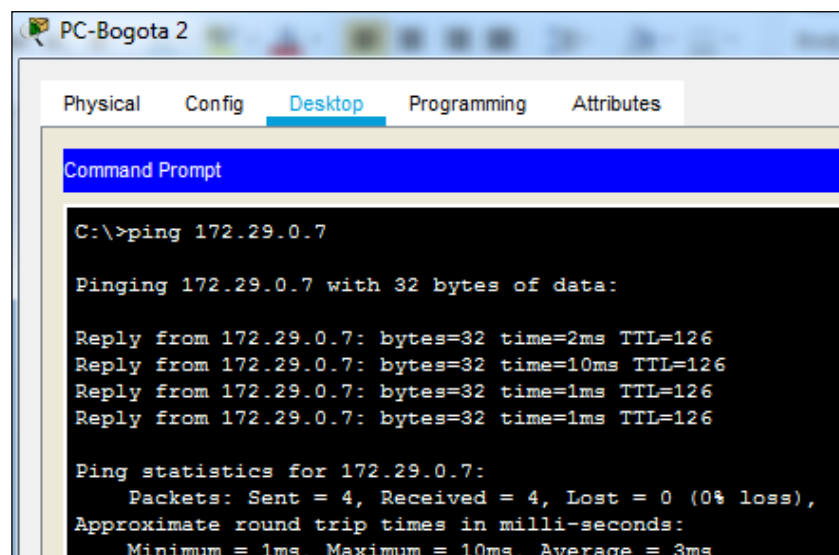
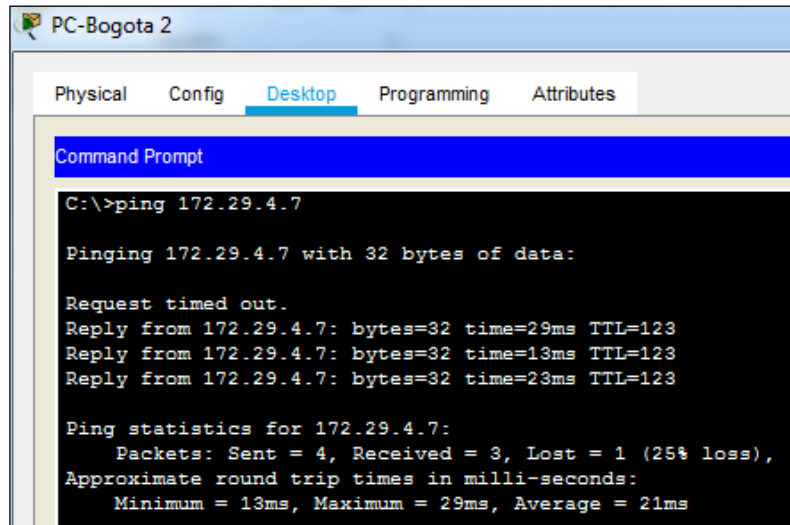


Figura 34. Comando *ping* desde PC-Bogota2



Se realiza *ping* exitoso desde PC BOGOTA2 a PC MEDELLIN1:

Figura 35. Comando *ping* desde PC-Bogota2



```
PC-Bogota 2
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 172.29.4.7

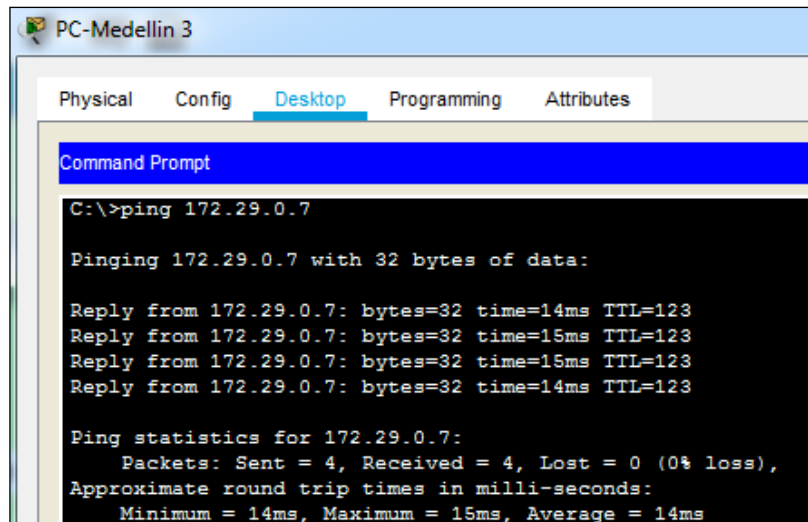
Pinging 172.29.4.7 with 32 bytes of data:

Request timed out.
Reply from 172.29.4.7: bytes=32 time=29ms TTL=123
Reply from 172.29.4.7: bytes=32 time=13ms TTL=123
Reply from 172.29.4.7: bytes=32 time=23ms TTL=123

Ping statistics for 172.29.4.7:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 13ms, Maximum = 29ms, Average = 21ms
```

Se realiza *ping* exitoso desde PC MEDELLIN3 a PC BOGOTA3:

Figura 36. Comando *ping* desde PC-Medellin3



```
PC-Medellin 3
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 172.29.0.7

Pinging 172.29.0.7 with 32 bytes of data:

Reply from 172.29.0.7: bytes=32 time=14ms TTL=123
Reply from 172.29.0.7: bytes=32 time=15ms TTL=123
Reply from 172.29.0.7: bytes=32 time=15ms TTL=123
Reply from 172.29.0.7: bytes=32 time=14ms TTL=123

Ping statistics for 172.29.0.7:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 14ms, Maximum = 15ms, Average = 14ms
```

Se procede a configurar PAT mediante NAT en el *router* MEDELLÍN1 indicando las interfaces de entrada y de salida:

ROUTER MEDELLIN1

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

```
MEDELLIN1(config)#ip nat inside source list 1 interface serial 0/0/0 overload
```

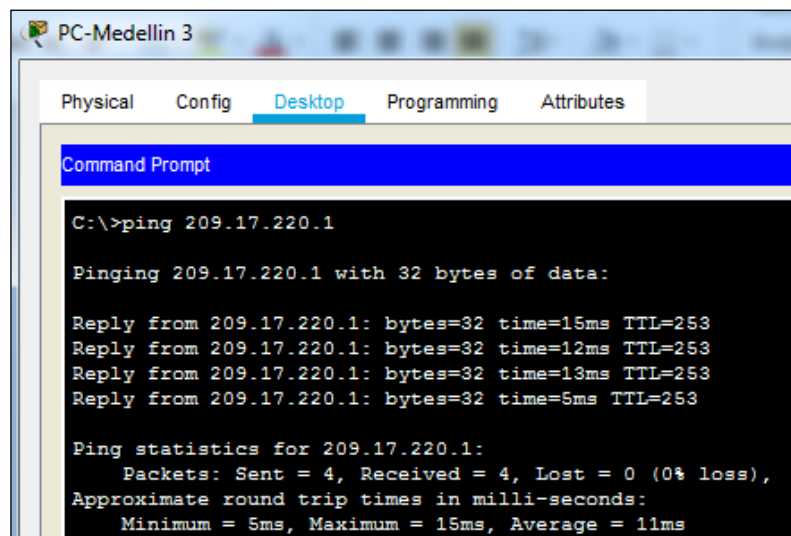
```

MEDELLIN1(config)#interface serial 0/0/0
MEDELLIN1(config-if)#ip nat outside
MEDELLIN1(config-if)#interface serial 0/0/1
MEDELLIN1(config-if)#ip nat inside
MEDELLIN1(config-if)#interface serial 0/1/0
MEDELLIN1(config-if)#ip nat inside
MEDELLIN1(config-if)#interface serial 0/1/1
MEDELLIN1(config-if)#ip nat inside

```

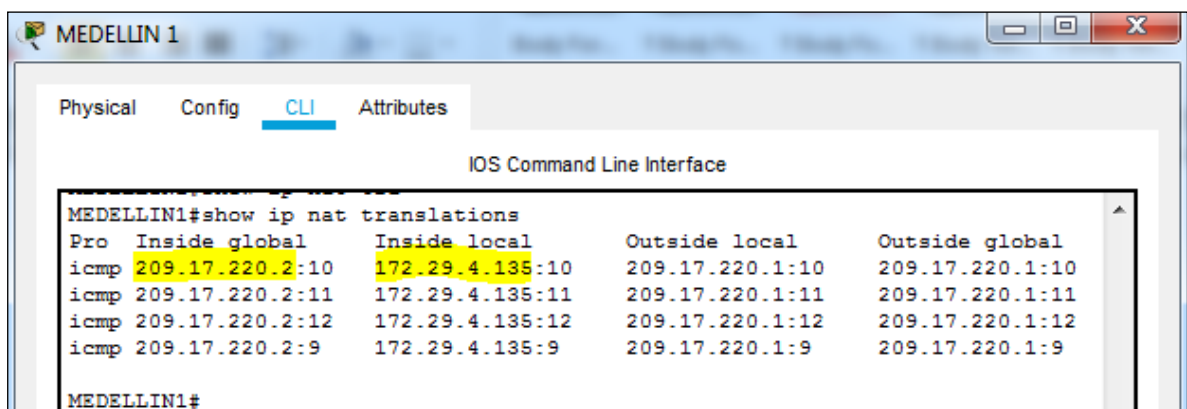
Se realiza *ping* desde el PC MEDELLIN3 hasta el *router* ISP:

Figura 37. Comando *ping* desde PC-Medellin3



Se ejecuta el comando ***show ip nat translations*** observando que la IP de PC MEDELLIN3 se traduce a la IP de MEDELLIN1:

Figura 38. Comando *show ip nat translations* desde *router* Medellin1



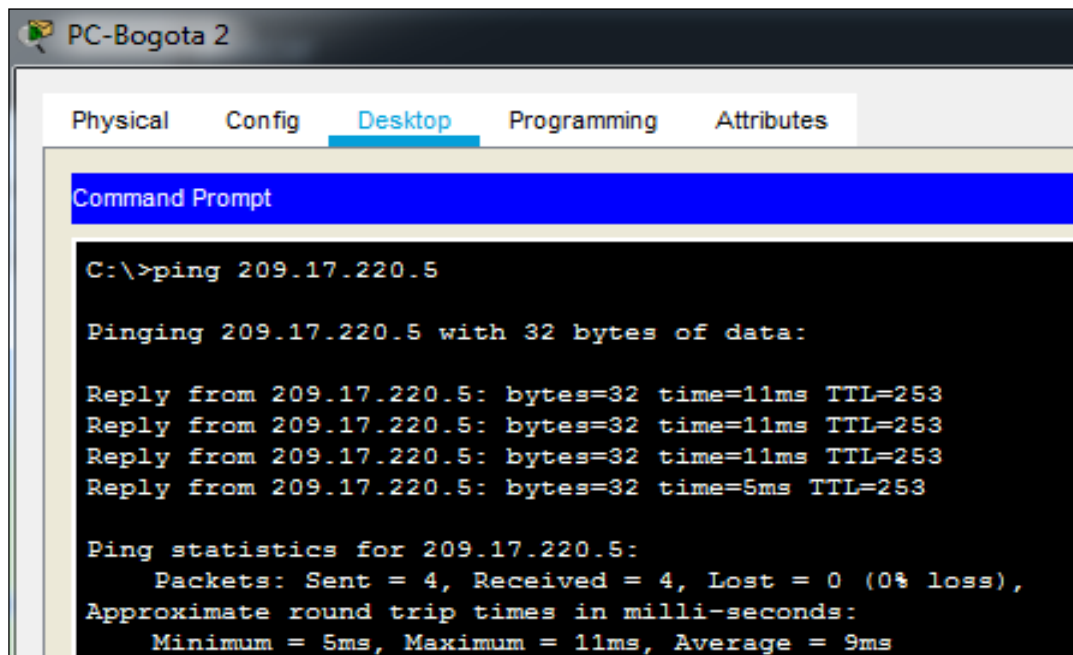
Proceda a configurar PAT mediante NAT en el *router* BOGOTA1 indicando las interfaces de entrada y de salida:

ROUTER BOGOTA1

```
BOGOTA1(config)#access-list 1 permit 172.29.0.0 0.0.3.255
BOGOTA1(config)#ip nat inside source list 1 interface serial 0/0/0 overload
BOGOTA1(config)#interface serial 0/0/0
BOGOTA1(config-if)#ip nat outside
BOGOTA1(config-if)#interface serial 0/0/1
BOGOTA1(config-if)#ip nat inside
BOGOTA1(config-if)#interface serial 0/1/0
BOGOTA1(config-if)#ip nat inside
BOGOTA1(config-if)#interface serial 0/1/1
BOGOTA1(config-if)#ip nat inside
```

Se realiza *ping* desde el PC BOGOTA2 hasta el *router* ISP:

Figura 39. Comando *ping* desde PC-Bogota2



The screenshot shows a window titled "PC-Bogota 2" with a "Command Prompt" tab selected. The terminal output is as follows:

```
C:\>ping 209.17.220.5

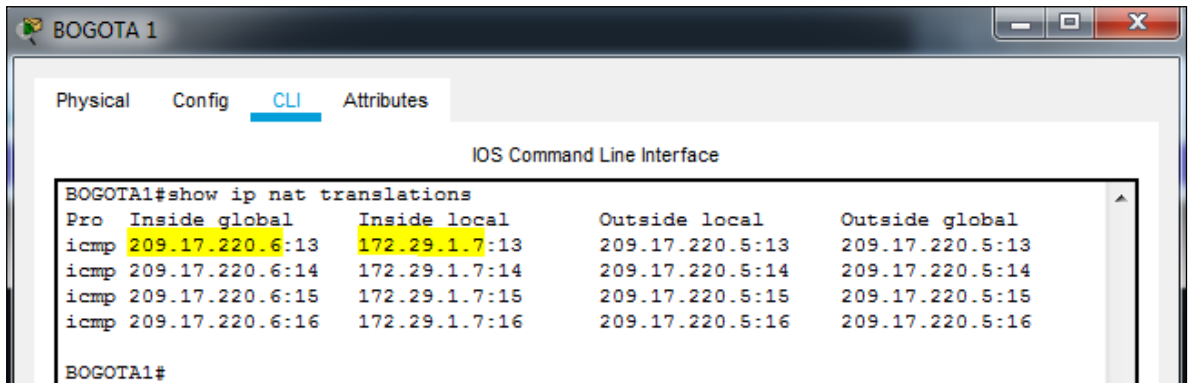
Pinging 209.17.220.5 with 32 bytes of data:

Reply from 209.17.220.5: bytes=32 time=11ms TTL=253
Reply from 209.17.220.5: bytes=32 time=11ms TTL=253
Reply from 209.17.220.5: bytes=32 time=11ms TTL=253
Reply from 209.17.220.5: bytes=32 time=5ms TTL=253

Ping statistics for 209.17.220.5:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 5ms, Maximum = 11ms, Average = 9ms
```

Se ejecuta el comando *show ip nat translations* observando que la IP de PC BOGOTA2 se traduce a la IP de BOGOTA1:

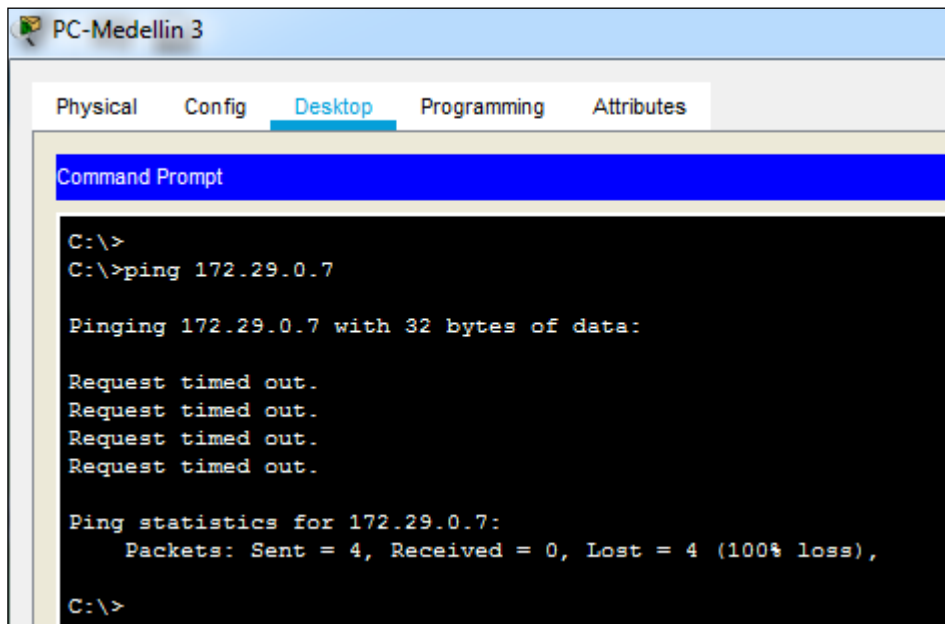
Figura 40. Comando `show ip nat translations` desde *router Bogota1*



```
BOGOTA1#show ip nat translations
Pro  Inside global  Inside local  Outside local  Outside global
icmp 209.17.220.6:13 172.29.1.7:13 209.17.220.5:13 209.17.220.5:13
icmp 209.17.220.6:14 172.29.1.7:14 209.17.220.5:14 209.17.220.5:14
icmp 209.17.220.6:15 172.29.1.7:15 209.17.220.5:15 209.17.220.5:15
icmp 209.17.220.6:16 172.29.1.7:16 209.17.220.5:16 209.17.220.5:16
BOGOTA1#
```

Se realiza *ping* desde PC MEDELLIN3 a PC BOGOTA3 el cual falla como es esperado, debido a la configuración realizada anteriormente con NAT y PAT:

Figura 41. Comando *ping* desde PC-Medellin3



```
PC-Medellin 3
Physical  Config  Desktop  Programming  Attributes
Command Prompt
C:\>
C:\>ping 172.29.0.7

Pinging 172.29.0.7 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 172.29.0.7:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>
```

Se presenta el contenido del archivo de configuración activo en todos los dispositivos mediante el comando ***show running-config***:

ROUTER ISP

```
ISP#show running-config
Building configuration...
Current configuration : 1235 bytes
!
```

```
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname ISP
!
enable secret 5 $1$mERr$9cTjUIEqNGurQiFU.ZeCi1
!
no ip cef
no ipv6 cef
!
username BOGOTA1 password 7 0822455D0A16
username MEDELLIN1 password 7 0822455D0A16
!
license udi pid CISCO1941/K9 sn FTX152422SP-
!
spanning-tree mode pvst
!
interface GigabitEthernet0/0
no ip address
duplex auto
speed auto
shutdown
!
interface GigabitEthernet0/1
no ip address
duplex auto
speed auto
shutdown
!
interface Serial0/0/0
ip address 209.17.220.1 255.255.255.252
encapsulation ppp
ppp authentication pap
ppp pap sent-username ISP password 0 cisco
clock rate 2000000
!
interface Serial0/0/1
ip address 209.17.220.5 255.255.255.252
encapsulation ppp
ppp authentication chap
clock rate 2000000
!
interface Vlan1
```

```
no ip address
shutdown
!
ip classless
ip route 172.29.4.0 255.255.252.0 209.17.220.2
ip route 172.29.0.0 255.255.252.0 209.17.220.6
!
ip flow-export version 9
!
banner motd ^CSolo personal autorizado^C
!
line con 0
password 7 0822455D0A16
login
!
line aux 0
!
line vty 0 4
password 7 0822455D0A16
login
!
end
ISP#
```

ROUTER MEDELLIN1

```
MEDELLIN1#show running-config
Building configuration...
Current configuration : 1631 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname MEDELLIN1
!
enable secret 5 $1$mERr$9cTjUIEqNGurQiFU.ZeCi1
!
no ip cef
no ipv6 cef
!
username ISP password 7 0822455D0A16
!
license udi pid CISCO1941/K9 sn FTX15240XQT-
!
```



```
spanning-tree mode pvst
!  
interface GigabitEthernet0/0  
no ip address  
duplex auto  
speed auto  
shutdown  
!  
interface GigabitEthernet0/1  
no ip address  
duplex auto  
speed auto  
shutdown  
!  
interface Serial0/0/0  
description Conexion a ISP  
ip address 209.17.220.2 255.255.255.252  
encapsulation ppp  
ppp authentication pap  
ppp pap sent-username MEDELLIN1 password 0 cisco  
ip nat outside  
!  
interface Serial0/0/1  
description Conexion a MEDELLIN 2  
ip address 172.29.6.1 255.255.255.252  
ip nat inside  
clock rate 2000000  
!  
interface Serial0/1/0  
description Conexion a MEDELLIN 3  
ip address 172.29.6.9 255.255.255.252  
ip nat inside  
clock rate 2000000  
!  
interface Serial0/1/1  
description Conexion a MEDELLIN 3  
ip address 172.29.6.13 255.255.255.252  
ip nat inside  
clock rate 2000000  
!  
interface Vlan1  
no ip address  
shutdown  
!  
router rip
```

```

version 2
network 172.29.0.0
default-information originate
no auto-summary
!
ip nat inside source list 1 interface Serial0/0/0 overload
ip classless
ip route 0.0.0.0 0.0.0.0 209.17.220.1
!
ip flow-export version 9
!
access-list 1 permit 172.29.4.0 0.0.3.255
!
banner motd ^CSolo personal autorizado^C
!
line con 0
password 7 0822455D0A16
login
!
line aux 0
!
line vty 0 4
password 7 0822455D0A16
login
!
end
MEDELLIN1#

```

ROUTER MEDELLIN2

```

MEDELLIN2#show running-config
Building configuration...
Current configuration : 1321 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname MEDELLIN2
!
enable secret 5 $1$mERr$9cTjUIEqNGurQiFU.ZeCi1
!
ip dhcp excluded-address 172.29.4.1 172.29.4.6
ip dhcp excluded-address 172.29.4.129 172.29.4.134
!

```

```

ip dhcp pool MEDELLIN2
 network 172.29.4.0 255.255.255.128
 default-router 172.29.4.1
ip dhcp pool MEDELLIN3
 network 172.29.4.128 255.255.255.128
 default-router 172.29.4.129
!
no ip cef
no ipv6 cef
!
license udi pid CISCO1941/K9 sn FTX152481BM-
!
spanning-tree mode pvst
!
interface GigabitEthernet0/0
 ip address 172.29.4.1 255.255.255.128
 duplex auto
 speed auto
!
interface GigabitEthernet0/1
 no ip address
 duplex auto
 speed auto
 shutdown
!
interface Serial0/0/0
 description Conexion a MEDELLIN1
 ip address 172.29.6.2 255.255.255.252
!
interface Serial0/0/1
 description Conexion a MEDELLIN3
 ip address 172.29.6.5 255.255.255.252
 clock rate 2000000
!
interface Vlan1
 no ip address
 shutdown
!
router rip
 version 2
 network 172.29.0.0
 no auto-summary
!
ip classless
!

```

```
ip flow-export version 9
!
banner motd ^CSolo personal autorizado^C
!
line con 0
password 7 0822455D0A16
login
!
line aux 0
!
line vty 0 4
password 7 0822455D0A16
login
!
end
MEDELLIN2#
```

ROUTER MEDELLIN3

```
MEDELLIN3#show running-config
Building configuration...
Current configuration : 1256 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname MEDELLIN3
!
enable secret 5 $1$mERr$9cTjUIEqNGurQiFU.ZeCi1
!
no ip cef
no ipv6 cef
!
license udi pid CISCO1941/K9 sn FTX1524AN0Z-
!
spanning-tree mode pvst
!
interface GigabitEthernet0/0
description Conexion a LAN
ip address 172.29.4.129 255.255.255.128
ip helper-address 172.29.6.5
duplex auto
speed auto
!
```

```

interface GigabitEthernet0/1
  no ip address
  duplex auto
  speed auto
  shutdown
!
interface Serial0/0/0
  description Conexion a MEDELLIN 1
  ip address 172.29.6.10 255.255.255.252
!
interface Serial0/0/1
  description Conexion a MEDELLIN1
  ip address 172.29.6.14 255.255.255.252
!
interface Serial0/1/0
  description Conexion a MEDELLIN2
  ip address 172.29.6.6 255.255.255.252
!
interface Serial0/1/1
  no ip address
  clock rate 2000000
  shutdown
!
interface Vlan1
  no ip address
  shutdown
!
router rip
  version 2
  network 172.29.0.0
  no auto-summary
!
ip classless
!
ip flow-export version 9
!
banner motd ^CSolo personal autorizado^C
!
line con 0
  password 7 0822455D0A16
  login
!
line aux 0
!
line vty 0 4

```

```
password 7 0822455D0A16
login
!
end
MEDELLIN3#
```

ROUTER BOGOTA1

```
BOGOTA1#show running-config
Building configuration...
Current configuration : 1573 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname BOGOTA1
!
enable secret 5 $1$mERr$9cTjUIEqNGurQiFU.ZeCi1
!
no ip cef
no ipv6 cef
!
username ISP password 7 0822455D0A16
!
license udi pid CISCO1941/K9 sn FTX1524TG3I-
!
spanning-tree mode pvst
!
interface GigabitEthernet0/0
no ip address
duplex auto
speed auto
shutdown
!
interface GigabitEthernet0/1
no ip address
duplex auto
speed auto
shutdown
!
interface Serial0/0/0
description Conexion a ISP
ip address 209.17.220.6 255.255.255.252
encapsulation ppp
```

```

ppp authentication chap
ip nat outside
!
interface Serial0/0/1
description Conexion a BOGOTA 2
ip address 172.29.3.9 255.255.255.252
ip nat inside
clock rate 2000000
!
interface Serial0/1/0
description Conexion a BOGOTA 3
ip address 172.29.3.1 255.255.255.252
ip nat inside
clock rate 2000000
!
interface Serial0/1/1
description Conexion a BOGOTA 3
ip address 172.29.3.5 255.255.255.252
ip nat inside
clock rate 2000000
!
interface Vlan1
no ip address
shutdown
!
router rip
version 2
network 172.29.0.0
default-information originate
no auto-summary
!
ip nat inside source list 1 interface Serial0/0/0 overload
ip classless
ip route 0.0.0.0 0.0.0.0 209.17.220.5
!
ip flow-export version 9
!
access-list 1 permit 172.29.0.0 0.0.3.255
!
banner motd ^CSolo personal autorizado^C
!
line con 0
password 7 0822455D0A16
login
!

```

```
line aux 0
!  
line vty 0 4  
password 7 0822455D0A16  
login  
!  
end  
BOGOTA1#
```

ROUTER BOGOTA2

```
BOGOTA2#show running-config  
Building configuration..  
Current configuration : 1329 bytes  
!  
version 15.1  
no service timestamps log datetime msec  
no service timestamps debug datetime msec  
service password-encryption  
!  
hostname BOGOTA2  
!  
enable secret 5 $1$mERr$9cTjUIEqNGurQiFU.ZeCi1  
!  
ip dhcp excluded-address 172.29.1.1 172.29.1.6  
ip dhcp excluded-address 172.29.0.1 172.29.0.6  
!  
ip dhcp pool BOGOTA2  
network 172.29.1.0 255.255.255.0  
default-router 172.29.1.1  
ip dhcp pool BOGOTA3  
network 172.29.0.0 255.255.255.0  
default-router 172.29.0.1  
!  
no ip cef  
no ipv6 cef  
!  
license udi pid CISCO1941/K9 sn FTX15241MZE-  
!  
spanning-tree mode pvst  
!  
interface GigabitEthernet0/0  
description Conexion a LAN  
ip address 172.29.1.1 255.255.255.0  
duplex auto  
speed auto
```



```

!
interface GigabitEthernet0/1
no ip address
duplex auto
speed auto
shutdown
!
interface Serial0/0/0
description Conexion a BOGOTA 1
ip address 172.29.3.10 255.255.255.252
!
interface Serial0/0/1
description Conexion a BOGOTA 3
ip address 172.29.3.13 255.255.255.252
clock rate 2000000
!
interface Vlan1
no ip address
shutdown
!
router rip
version 2
network 172.29.0.0
no auto-summary
!
ip classless
!
ip flow-export version 9
!
banner motd ^CSolo personal autorizado^C
!
line con 0
password 7 0822455D0A16
login
!
line aux 0
!
line vty 0 4
password 7 0822455D0A16
login
!
end
BOGOTA2#

```

ROUTER BOGOTA3

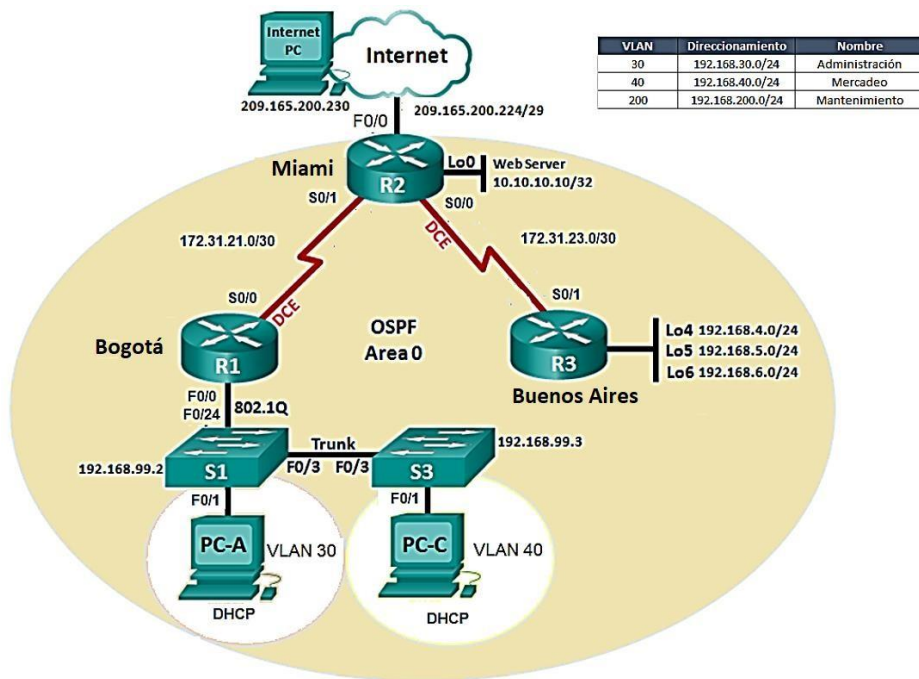
```
BOGOTA3#show running-config
Building configuration...
Current configuration : 1246 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname BOGOTA3
!
enable secret 5 $1$mERr$9cTjUIEqNGurQiFU.ZeCi1
!
no ip cef
no ipv6 cef
!
license udi pid CISCO1941/K9 sn FTX152411EE-
!
spanning-tree mode pvst
!
interface GigabitEthernet0/0
description Conexion a LAN
ip address 172.29.0.1 255.255.255.0
ip helper-address 172.29.3.13
duplex auto
speed auto
!
interface GigabitEthernet0/1
no ip address
duplex auto
speed auto
shutdown
!
interface Serial0/0/0
description Conexion a BOGOTA 1
ip address 172.29.3.2 255.255.255.252
!
interface Serial0/0/1
description Conexion a BOGOTA 1
ip address 172.29.3.6 255.255.255.252
!
interface Serial0/1/0
description Conexion a BOGOTA 2
ip address 172.29.3.14 255.255.255.252
```

```
!  
interface Serial0/1/1  
no ip address  
clock rate 2000000  
shutdown  
!  
interface Vlan1  
no ip address  
shutdown  
!  
router rip  
version 2  
network 172.29.0.0  
no auto-summary  
!  
ip classless  
!  
ip flow-export version 9  
!  
banner motd ^CSolo personal autorizado^C  
!  
line con 0  
password 7 0822455D0A16  
login  
!  
line aux 0  
!  
line vty 0 4  
password 7 0822455D0A16  
login  
!  
end  
BOGOTA3#
```

2. ESCENARIO 2

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

Figura 42. Topología de red escenario 2



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

Tabla 2. Direccionamiento IP de los dispositivos

Dispositivo	Interfaz	Dirección IP	Máscara de subred	Gateway predeterminado
R1	G0/1	192.168.99.1	255.255.255.0	N/A
	S0/0/0	172.31.21.1	255.255.255.252	N/A
R2	S0/0/1	172.31.21.2	255.255.255.252	N/A
	S/0/0/0	172.31.23.1	255.255.255.252	N/A
	Lo0	10.10.10.10	255.255.255.252	N/A
	G0/0	209.165.200.224	255.255.255.248	
R3	S0/0/1	172.31.23.2	255.255.255.252	N/A

Tabla 2. (Continuación)

	Lo4	192.168.4.1	255.255.255.0	N/A
	Lo5	192.168.5.1	255.255.255.0	N/A
	Lo6	192.168.6.1	255.255.255.0	N/A
PC-A	NIC	DHCP	DHCP	DHCP
PC-C	NIC	DHCP	DHCP	DHCP
PC INTERNET	NIC	209.165.200.230	255.255.255.248	209.165.200.255

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

Tabla 3. OSPFv2 área 0

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

Verificar información de OSPF

- Visualizar tablas de enrutamiento y *routers* conectados por OSPFv2
 - Visualizar lista resumida de interfaces por OSPF en donde se ilustre el costo de cada interface
 - Visualizar el OSPF *Process ID*, *Router ID*, *Address summarizations*, *Routing Networks*, and *passive interfaces* configuradas en cada *router*.
3. Configurar VLANs, Puertos troncales, puertos de acceso, encapsulamiento, Inter-VLAN *Routing* y Seguridad en *switches* acorde a topología de red.
 4. En el *switch* 3 deshabilitar DNS *lookup*
 5. Asignar direcciones IP a los *switches* acorde a los lineamientos.
 6. Desactivar todas las interfaces que no sean utilizadas en el esquema de red.
 7. Implement DHCP and NAT for IPv4

8. Configurar R1 como servidor DHCP para las VLANs 30 y 40.
9. Reservar las primeras 30 direcciones IP de las VLAN 30 y 40 para configuraciones estáticas.

Tabla 4. Interfaces de los *routers* que no necesitan desactivación

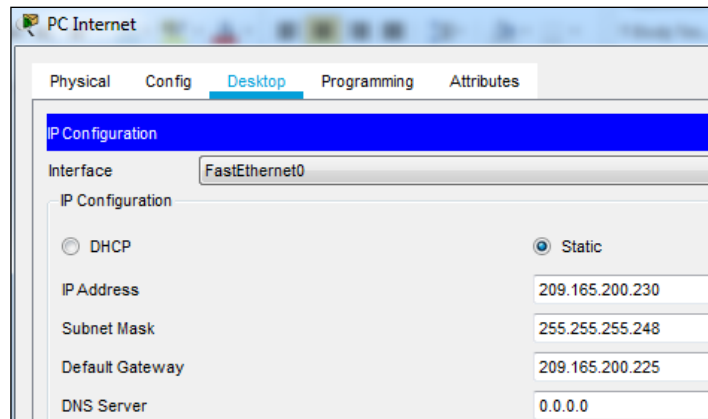
Configurar DHCP pool para VLAN 30	Name: ADMINISTRACION DNS-Server: 10.10.10.11 Domain-Name: ccna-unad.com Establecer default gateway.
Configurar DHCP pool para VLAN 40	Name: MERCADEO DNS-Server: 10.10.10.11 Domain-Name: ccna-unad.com Establecer default gateway.

10. Configurar NAT en R2 para permitir que los host puedan salir a internet
11. Configurar al menos dos listas de acceso de tipo estándar a su criterio en para restringir o permitir tráfico desde R1 o R3 hacia R2.
12. Configurar al menos dos listas de acceso de tipo extendido o nombradas a su criterio en para restringir o permitir tráfico desde R1 o R3 hacia R2.
13. Verificar procesos de comunicación y redireccionamiento de tráfico en los *routers* mediante el uso de *Ping* y *Traceroute*.

DESARROLLO

Se configura direccionamiento de la PC Internet:

Figura 43. Habilitar DHCP en PC Internet



Se realiza las configuraciones básicas al *router* R1, configuración de la interfaz serial y la ruta por defecto

ROUTER 1 BOGOTA

```
Router>enable
Router#configure terminal
Router(config)#hostname BOGOTA
BOGOTA(config)#no ip domain-lookup
BOGOTA(config)#enable secret class
BOGOTA(config)#line console 0
BOGOTA(config-line)#password cisco
BOGOTA(config-line)#login
BOGOTA(config-line)#exit
BOGOTA(config)#line vty 0 4
BOGOTA(config-line)#password cisco
BOGOTA(config-line)#login
BOGOTA(config-line)#exit
BOGOTA(config)#service password-encryption
BOGOTA(config)#banner motd "Solo personal autorizado"
BOGOTA(config)#interface serial 0/0/0
BOGOTA(config-if)#description Conexion a R2 MIAMI
BOGOTA(config-if)#ip address 172.31.21.1 255.255.255.252
BOGOTA(config-if)#clock rate 128000
BOGOTA(config-if)#no shutdown
BOGOTA(config-if)#exit
BOGOTA(config)#ip route 0.0.0.0 0.0.0.0 s0/0/0
```

Se realiza las configuraciones básicas al *router* R2, configuración de las interfaces seriales, LAN y la ruta por defecto:

ROUTER 2 MIAMI

```
Router>enable
Router#configure terminal
Router(config)#hostname MIAMI
MIAMI(config)#no ip domain-lookup
MIAMI(config)#enable secret class
MIAMI(config)#line console 0
MIAMI(config-line)#password cisco
MIAMI(config-line)#login
MIAMI(config-line)#line vty 0 4
MIAMI(config-line)#password cisco
MIAMI(config-line)#login
MIAMI(config-line)#exit
MIAMI(config)#service password-encryption
MIAMI(config)#banner motd "Solo personal autorizado"
```

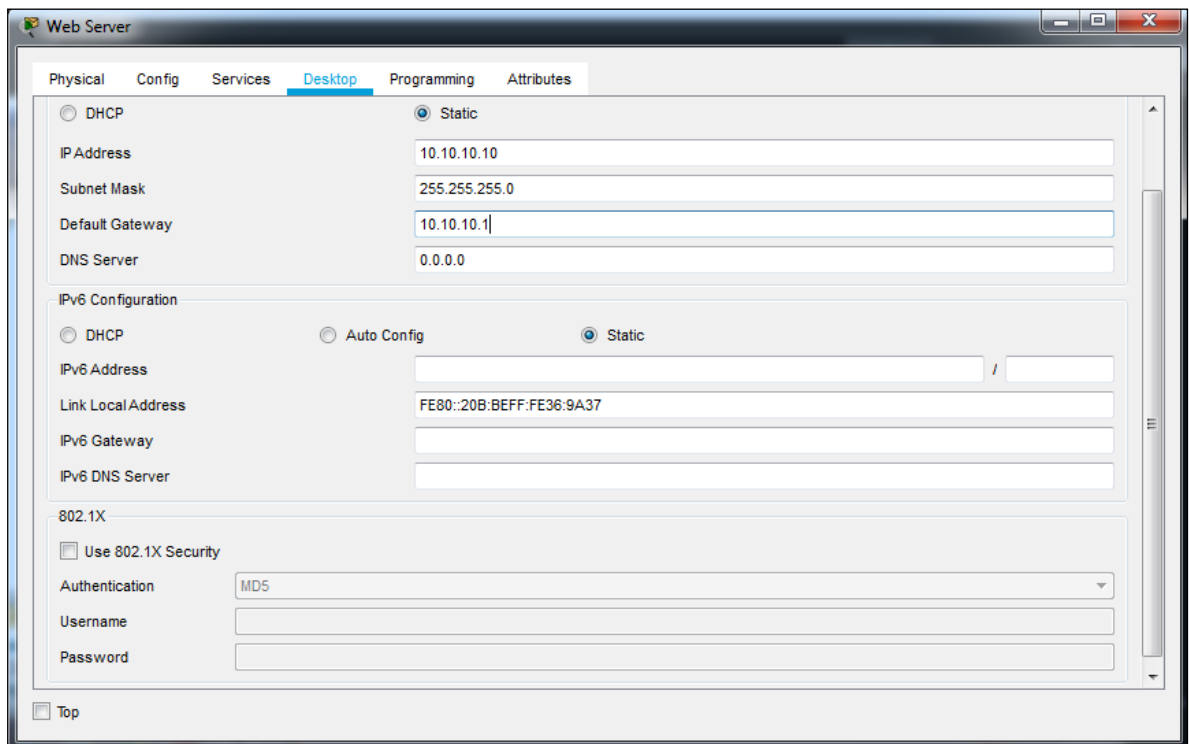
```

MIAMI(config)#interface serial 0/0/1
MIAMI(config-if)#description Conexion a R1 BOGOTA
MIAMI(config-if)#ip address 172.31.21.2 255.255.255.252
MIAMI(config-if)#no shutdown
MIAMI(config-if)#interface serial 0/0/0
MIAMI(config-if)#description Conexion a R3 BUENOS AIRES
MIAMI(config-if)#ip address 172.31.23.1 255.255.255.252
MIAMI(config-if)#no shutdown
MIAMI(config-if)#exit
MIAMI(config)#interface gigabitEthernet 0/0
MIAMI(config-if)#description Conexion a Internet
MIAMI(config-if)#ip address 209.165.200.225 255.255.255.248
MIAMI(config-if)#no shutdown
MIAMI(config-if)#exit
MIAMI(config)#interface gigabitEthernet 0/1
MIAMI(config-if)#ip address 10.10.10.1 255.255.255.0
MIAMI(config-if)#no shutdown
MIAMI(config-if)#description Conexion a WEB SERVER
MIAMI(config)#ip route 0.0.0.0 0.0.0.0 gigabitEthernet 0/0

```

Se realiza las configuraciones IP al servidor web:

Figura 44. Configuración IP de *Web Server*



Se realiza las configuraciones básicas al *router* R3, configuración de las interfaces serial, *loopback* y la ruta por defecto:

ROUTER 3 BUENOS AIRES

```
Router>enable
Router#configure terminal
Router(config)#hostname BUENOS_AIRES
BUENOS_AIRES(config)#no ip domain-lookup
BUENOS_AIRES(config)#enable secret class
BUENOS_AIRES(config)#line console 0
BUENOS_AIRES(config-line)#password cisco
BUENOS_AIRES(config-line)#login
BUENOS_AIRES(config-line)#line vty 0 4
BUENOS_AIRES(config-line)#password cisco
BUENOS_AIRES(config-line)#login
BUENOS_AIRES(config-line)#exit
BUENOS_AIRES(config)#service password-encryption
BUENOS_AIRES(config)#banner motd "Solo personal autorizado"
BUENOS_AIRES(config)#interface Serial 0/0/1
BUENOS_AIRES(config-if)#Description Conexion a R2 MIAMI
BUENOS_AIRES(config-if)#ip address 172.31.23.2 255.255.255.252
BUENOS_AIRES(config-if)#exit
BUENOS_AIRES(config)#interface loopback 4
BUENOS_AIRES(config-if)#ip address 192.168.4.1 255.255.255.0
BUENOS_AIRES(config-if)#no shutdown
BUENOS_AIRES(config-if)#interface loopback 5
BUENOS_AIRES(config-if)#ip address 192.168.5.1 255.255.255.0
BUENOS_AIRES(config-if)#no shutdown
BUENOS_AIRES(config-if)#interface loopback 6
BUENOS_AIRES(config-if)#ip address 192.168.6.1 255.255.255.0
BUENOS_AIRES(config-if)#no shutdown
BUENOS_AIRES(config-if)#exit
BUENOS_AIRES(config)#ip route 0.0.0.0 0.0.0.0 serial 0/0/1
```

Se realiza las configuraciones básicas al *switch* S1:

SWITCH S1

```
Switch>enable
Switch#configure terminal
Switch(config)#hostname S1
S1(config)#no ip domain-lookup
S1(config)#enable secret class
S1(config)#line console 0
S1(config-line)#password cisco
S1(config-line)#login
```

```
S1(config-line)#line vty 0 4
S1(config-line)#password cisco
S1(config-line)#login
S1(config-line)#exit
S1(config)#service password-encryption
S1(config)#banner motd "Solo personal autorizado"
```

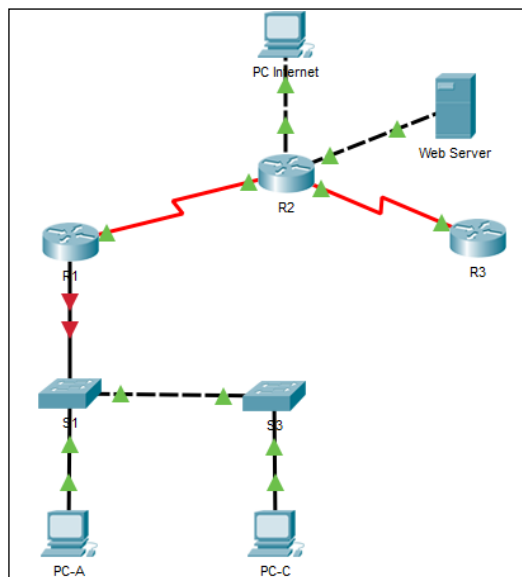
Se realiza las configuraciones básicas al *switch* S3:

SWITCH S3

```
Switch>enable
Switch#configure terminal
Switch(config)#hostname S3
S3(config)#no ip domain-lookup
S3(config)#enable secret class
S3(config)#line console 0
S3(config-line)#password cisco
S3(config-line)#login
S3(config-line)#line vty 0 4
S3(config-line)#password cisco
S3(config-line)#login
S3(config-line)#exit
S3(config)#service password-encryption
S3(config)#banner motd "Solo personal autorizado"
```

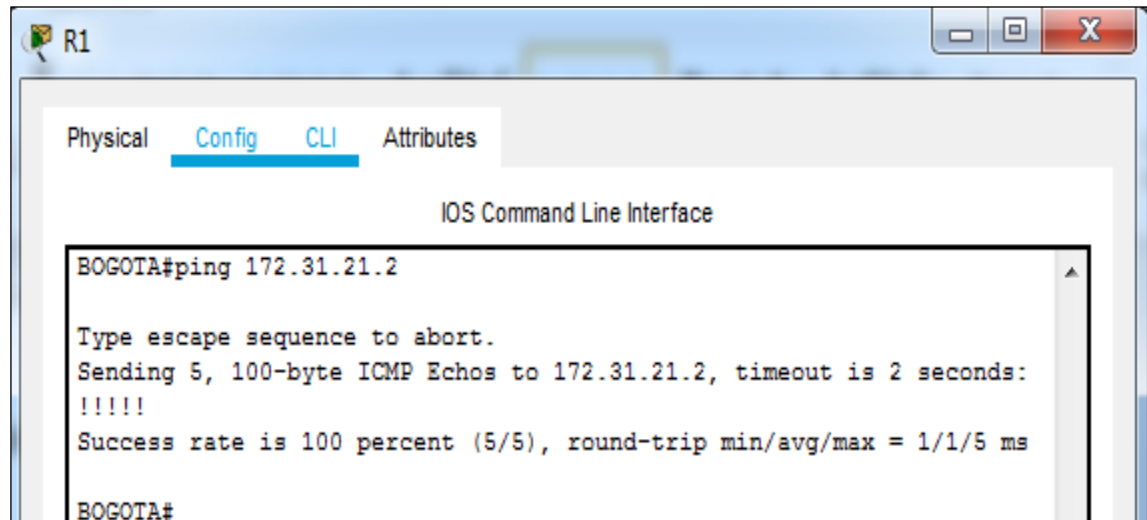
Se presenta la topología realizada hasta el momento:

Figura 45. Topología de red



Se realiza la comprobación de conectividad exitosa de R1 (BOGOTA) a R2 (MIAMI):

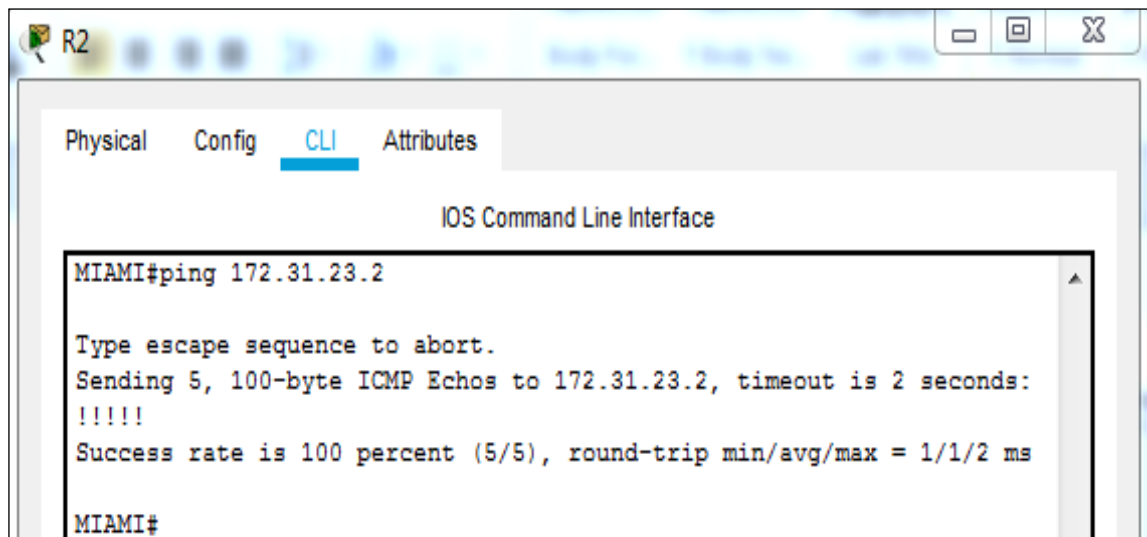
Figura 46. Ping desde *router* R1



```
R1
Physical Config CLI Attributes
IOS Command Line Interface
BOGOTA#ping 172.31.21.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.31.21.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/5 ms
BOGOTA#
```

Se realiza la comprobación de conectividad exitosa de R2 (MIAMI) a R3 (BUENOS AIRES):

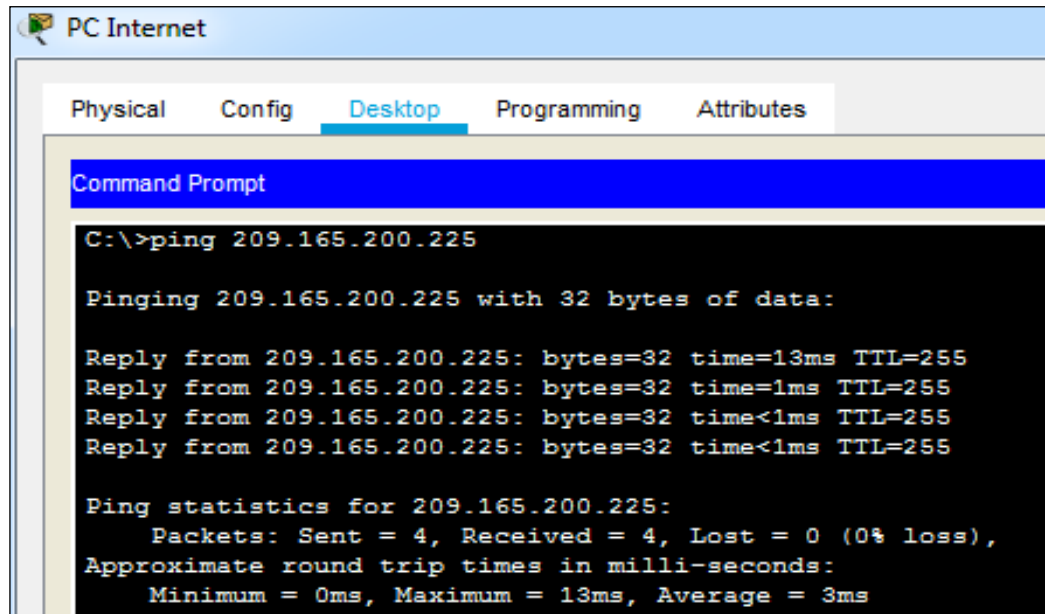
Figura 47. Ping desde *router* R2



```
R2
Physical Config CLI Attributes
IOS Command Line Interface
MIAMI#ping 172.31.23.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.31.23.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/2 ms
MIAMI#
```

Se realiza la comprobación de conectividad exitosa de PC Internet a su puerta de enlace:

Figura 48. *Ping desde PC Internet*



```
PC Internet
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 209.165.200.225

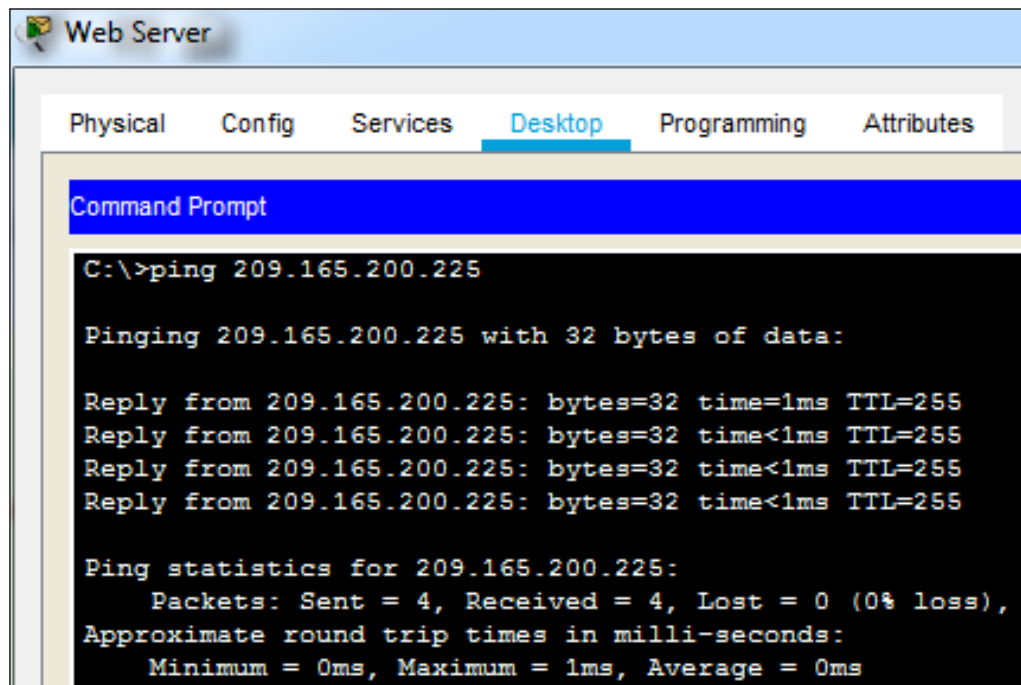
Pinging 209.165.200.225 with 32 bytes of data:

Reply from 209.165.200.225: bytes=32 time=13ms TTL=255
Reply from 209.165.200.225: bytes=32 time=1ms TTL=255
Reply from 209.165.200.225: bytes=32 time<1ms TTL=255
Reply from 209.165.200.225: bytes=32 time<1ms TTL=255

Ping statistics for 209.165.200.225:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 13ms, Average = 3ms
```

Se realiza la comprobación de conectividad exitosa del servidor web a la puerta de enlace de PC Internet:

Figura 49. *Ping desde Web Server*



```
Web Server
Physical Config Services Desktop Programming Attributes
Command Prompt
C:\>ping 209.165.200.225

Pinging 209.165.200.225 with 32 bytes of data:

Reply from 209.165.200.225: bytes=32 time=1ms TTL=255
Reply from 209.165.200.225: bytes=32 time<1ms TTL=255
Reply from 209.165.200.225: bytes=32 time<1ms TTL=255
Reply from 209.165.200.225: bytes=32 time<1ms TTL=255

Ping statistics for 209.165.200.225:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

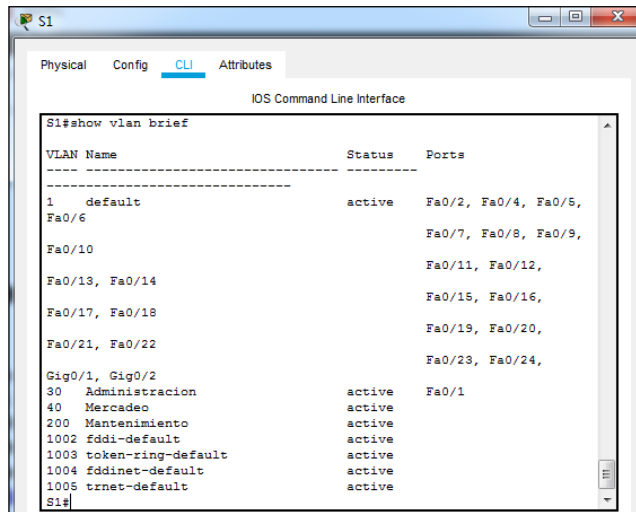
Se crea VLANs, puertos troncales, puertos de acceso, Inter-VLAN *Routing* en el *switch* S1:

SWITCH S1

```
S1(config)#vlan 30
S1(config-vlan)#name Administracion
S1(config-vlan)#exit
S1(config)#vlan 40
S1(config-vlan)#name Mercadeo
S1(config-vlan)#exit
S1(config)#vlan 200
S1(config-vlan)#name Mantenimiento
S1(config-vlan)#exit
S1(config)#interface vlan 200
S1(config-if)#ip address 192.168.99.2 255.255.255.0
S1(config-if)#no shutdown
S1(config-if)#exit
S1(config)#ip default-gateway 192.168.99.1
S1(config)#interface fastEthernet 0/3
S1(config-if)#switchport mode trunk
S1(config-if)#switchport trunk native vlan 1
S1(config-if)#exit
S1(config)#interface range f0/1-2, f0/4-23, g0/1-2
S1(config-if-range)#switchport mode access
S1(config-if-range)#exit
S1(config)#interface range f0/2, f0/4-23, g0/1-2
S1(config-if-range)#shutdown
S1(config-if-range)#exit
S1(config)#interface fastEthernet 0/1
S1(config-if)#switchport mode access
S1(config-if)#switchport access vlan 30
S1(config)#interface fastEthernet 0/24
S1(config-if)#switchport mode trunk
S1(config-if)#switchport trunk native vlan 1
```

Se ejecuta el comando **show vlan brief** en el *switch* con el cual se puede determinar el tipo de asignación y pertenencia de VLAN para todos los puertos del *switch*:

Figura 50. Comando *show vlan brief* en switch S1



```
S1#show vlan brief
```

VLAN Name	Status	Ports
1 default	active	Fa0/2, Fa0/4, Fa0/5, Fa0/6, Fa0/7, Fa0/8, Fa0/9, Fa0/10, Fa0/11, Fa0/12, Fa0/13, Fa0/14, Fa0/15, Fa0/16, Fa0/17, Fa0/18, Fa0/19, Fa0/20, Fa0/21, Fa0/22, Fa0/23, Fa0/24, Gig0/1, Gig0/2
30 Administracion	active	Fa0/1
40 Mercadeo	active	
200 Mantenimiento	active	
1002 fddi-default	active	
1003 token-ring-default	active	
1004 fddinet-default	active	
1005 trnet-default	active	

Se crea VLANs, puertos troncales, puertos de acceso, Inter-VLAN *Routing* en el *switch* S3:

SWITCH S3

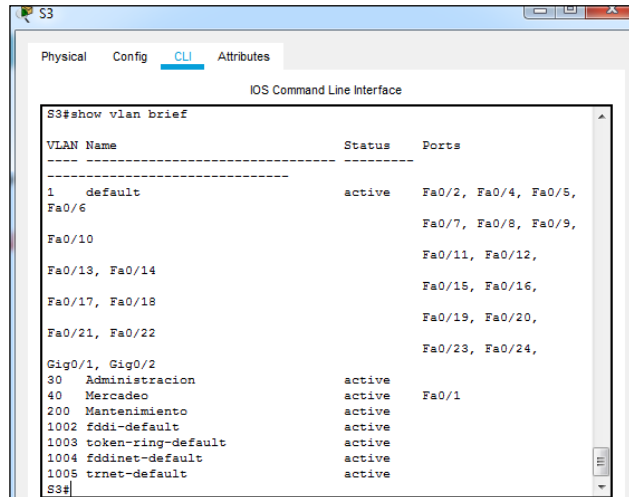
```
S3(config)#vlan 30
S3(config-vlan)#name Administracion
S3(config-vlan)#exit
S3(config)#vlan 40
S3(config-vlan)#name Mercadeo
S3(config-vlan)#exit
S3(config)#vlan 200
S3(config-vlan)#name Mantenimiento
S3(config-vlan)#exit
S3(config)#interface vlan 200
S3(config-if)#ip address 192.168.99.3 255.255.255.0
S3(config-if)#no shutdown
S3(config-if)#exit
S3(config)#ip default-gateway 192.168.99.1
S3(config)#interface f0/3
S3(config-if)#switchport mode trunk
S3(config-if)#switchport trunk native vlan 1
S3(config-if)#exit
S3(config)#interface range f0/1-2, f0/4-24, g0/1-2
S3(config-if-range)#switchport mode access
S3(config-if-range)#exit
S3(config)#interface range f0/2, f0/4-24, g0/1-2
S3(config-if-range)#shutdown
S3(config-if-range)#exit
```

```

S3(config)#interface fastEthernet 0/1
S3(config-if)#switchport mode access
S3(config-if)#switchport access vlan 40

```

Figura 51. Comando *show vlan brief* en switch S3



Se realiza encapsulamiento en el *router 1* (BOGOTA):

ROUTER 1 BOGOTA

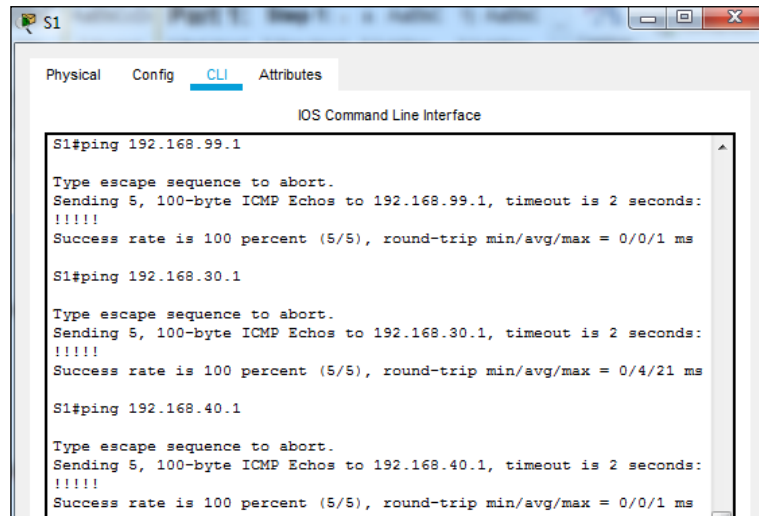
```

BOGOTA(config)#interface gigabitEthernet 0/0.30
BOGOTA(config-subif)#description LAN Administracion
BOGOTA(config-subif)#encapsulation dot1Q 30
BOGOTA(config-subif)#ip address 192.168.30.1 255.255.255.0
BOGOTA(config-subif)#exit
BOGOTA(config)#interface gigabitEthernet 0/0.40
BOGOTA(config-subif)#description LAN Mercadeo
BOGOTA(config-subif)#encapsulation dot1Q 40
BOGOTA(config-subif)#ip address 192.168.40.1 255.255.255.0
BOGOTA(config-subif)#exit
BOGOTA(config)#interface gigabitEthernet 0/0.200
BOGOTA(config-subif)#encapsulation dot1Q 200
BOGOTA(config-subif)#ip address 192.168.99.1 255.255.255.0
BOGOTA(config-subif)#description LAN Mantenimiento
BOGOTA(config-subif)#exit
BOGOTA(config)#interface gigabitEthernet 0/0
BOGOTA(config-if)#no shutdown

```

Se comprueba la conectividad de las configuraciones realizadas anteriormente obteniéndose un resultado exitoso:

Figura 52. Comando *ping* desde *switch* S1

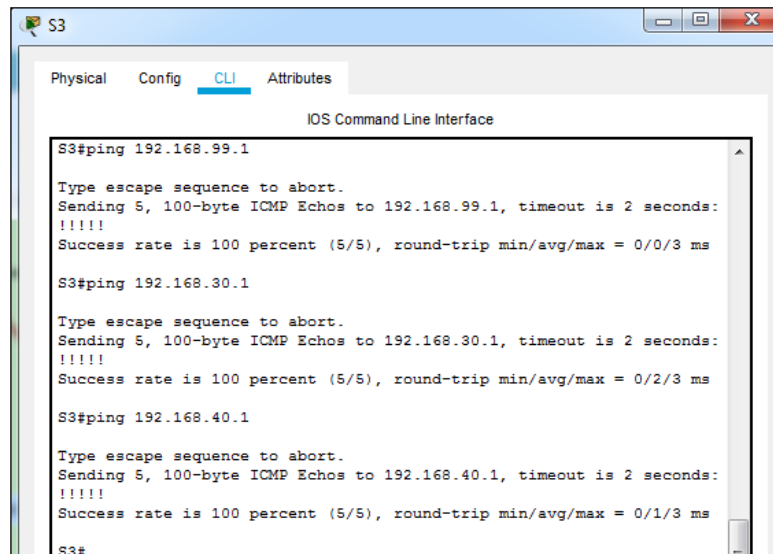


```
S1#ping 192.168.99.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.99.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms

S1#ping 192.168.30.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.30.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/4/21 ms

S1#ping 192.168.40.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.40.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms
```

Figura 53. Comando *ping* desde *switch* S3



```
S3#ping 192.168.99.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.99.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/3 ms

S3#ping 192.168.30.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.30.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/2/3 ms

S3#ping 192.168.40.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.40.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/1/3 ms

S3#
```

Se configura el protocolo de enrutamiento OSPFv2 en *router* 1 (BOGOTA):

ROUTER 1 BOGOTA

```
BOGOTA#configure terminal
BOGOTA(config)#router ospf 1
BOGOTA(config-router)#router-id 1.1.1.1
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
BOGOTA(config-router)#passive-interface gigabitEthernet 0/0.30
BOGOTA(config-router)#passive-interface gigabitEthernet 0/0.40
BOGOTA(config-router)#passive-interface gigabitEthernet 0/0.200
BOGOTA(config-router)#auto-cost reference-bandwidth 100
BOGOTA(config-router)#exit
BOGOTA(config)#interface serial 0/0/0
BOGOTA(config-if)#bandwidth 256
BOGOTA(config-if)#ip ospf cost 9500
```

Se configura el protocolo de enrutamiento OSPFv2 en *router 2* (MIAMI):

ROUTER 2 MIAMI

```
MIAMI(config)#router ospf 1
MIAMI(config-router)#router-id 5.5.5.5
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
MIAMI(config-router)#passive-interface g0/0
MIAMI(config-router)#passive-interface g0/1
MIAMI(config-router)#auto-cost reference-bandwidth 100
MIAMI(config-router)#exit
MIAMI(config)#interface serial 0/0/1
MIAMI(config-if)#bandwidth 256
MIAMI(config-if)#ip ospf cost 9500
MIAMI(config-if)#interface serial 0/0/0
MIAMI(config-if)#ip ospf cost 9500
```

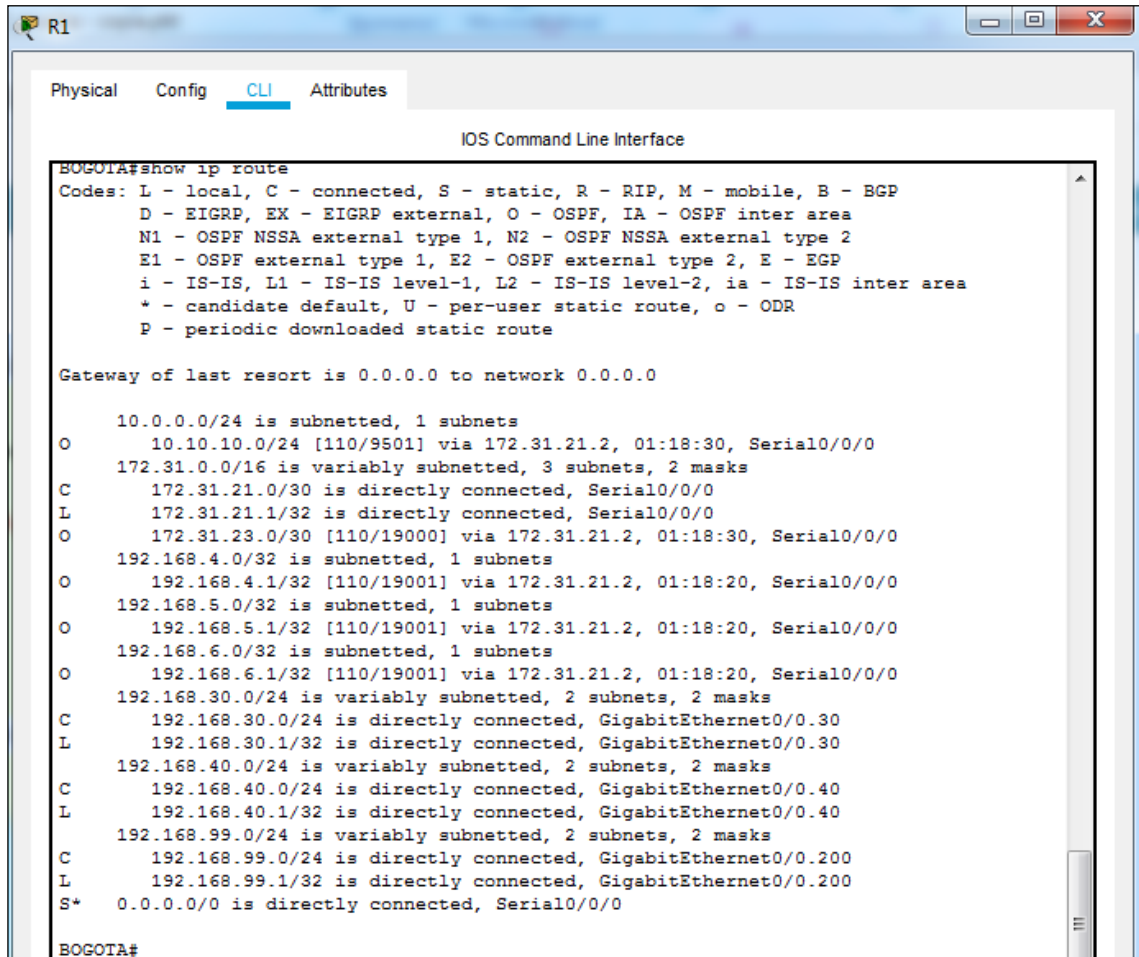
Se configura el protocolo de enrutamiento OSPFv2 en *router 3* (BUENOS_AIRES):

ROUTER 3 BUENOS AIRES

```
BUENOS_AIRES(config)#router ospf 1
BUENOS_AIRES(config-router)#router-id 8.8.8.8
BUENOS_AIRES(config-router)#network 172.31.23.0 0.0.0.3 area 0
BUENOS_AIRES(config-router)#network 192.168.4.0 0.0.3.255 area 0
BUENOS_AIRES(config-router)#passive-interface loopback 4
BUENOS_AIRES(config-router)#passive-interface loopback 5
BUENOS_AIRES(config-router)#passive-interface loopback 6
BUENOS_AIRES(config-router)#auto-cost reference-bandwidth 100
BUENOS_AIRES(config-router)#exit
BUENOS_AIRES(config)#interface serial 0/0/1
BUENOS_AIRES(config-if)#bandwidth 256
BUENOS_AIRES(config-if)#ip ospf cost 9500
```

Se visualiza las tablas de enrutamiento y *routers* conectados por OSPFv2 mediante los comandos **show ip route** y **show ip ospf neighbor**, en todos los *routers*.

Figura 54. Comando **show ip route** desde *router* R1



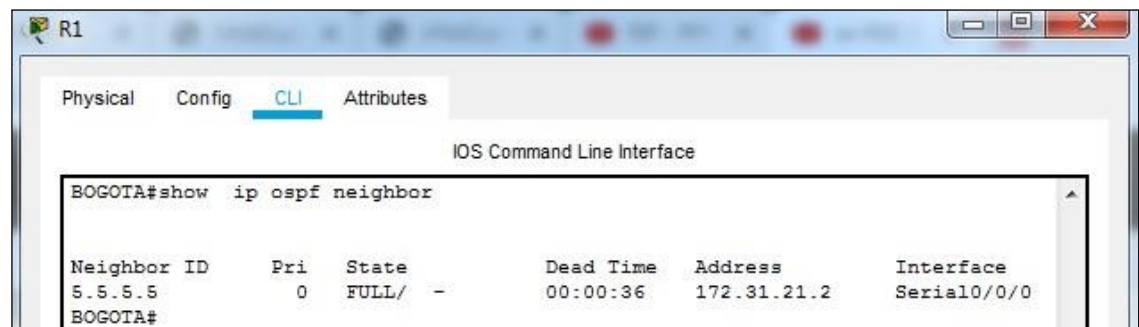
```
BOGOTA#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is 0.0.0.0 to network 0.0.0.0

10.0.0.0/24 is subnetted, 1 subnets
O    10.10.10.0/24 [110/9501] via 172.31.21.2, 01:18:30, Serial0/0/0
172.31.0.0/16 is variably subnetted, 3 subnets, 2 masks
C    172.31.21.0/30 is directly connected, Serial0/0/0
L    172.31.21.1/32 is directly connected, Serial0/0/0
O    172.31.23.0/30 [110/19000] via 172.31.21.2, 01:18:30, Serial0/0/0
192.168.4.0/32 is subnetted, 1 subnets
O    192.168.4.1/32 [110/19001] via 172.31.21.2, 01:18:20, Serial0/0/0
192.168.5.0/32 is subnetted, 1 subnets
O    192.168.5.1/32 [110/19001] via 172.31.21.2, 01:18:20, Serial0/0/0
192.168.6.0/32 is subnetted, 1 subnets
O    192.168.6.1/32 [110/19001] via 172.31.21.2, 01:18:20, Serial0/0/0
192.168.30.0/24 is variably subnetted, 2 subnets, 2 masks
C    192.168.30.0/24 is directly connected, GigabitEthernet0/0.30
L    192.168.30.1/32 is directly connected, GigabitEthernet0/0.30
192.168.40.0/24 is variably subnetted, 2 subnets, 2 masks
C    192.168.40.0/24 is directly connected, GigabitEthernet0/0.40
L    192.168.40.1/32 is directly connected, GigabitEthernet0/0.40
192.168.99.0/24 is variably subnetted, 2 subnets, 2 masks
C    192.168.99.0/24 is directly connected, GigabitEthernet0/0.200
L    192.168.99.1/32 is directly connected, GigabitEthernet0/0.200
S*   0.0.0.0/0 is directly connected, Serial0/0/0

BOGOTA#
```

Figura 55. Comando **show ip ospf neighbor** desde *router* R1



```
BOGOTA#show ip ospf neighbor

Neighbor ID    Pri   State           Dead Time   Address        Interface
5.5.5.5        0     FULL/ -         00:00:36   172.31.21.2   Serial0/0/0

BOGOTA#
```

Figura 56. Comando *show ip route* desde *router R2*

```

R2
Physical Config CLI Attributes
IOS Command Line Interface
MIAMI#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is 0.0.0.0 to network 0.0.0.0

10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 10.10.10.0/24 is directly connected, GigabitEthernet0/1
L 10.10.10.1/32 is directly connected, GigabitEthernet0/1
172.31.0.0/16 is variably subnetted, 4 subnets, 2 masks
C 172.31.21.0/30 is directly connected, Serial0/0/1
L 172.31.21.2/32 is directly connected, Serial0/0/1
C 172.31.23.0/30 is directly connected, Serial0/0/0
L 172.31.23.1/32 is directly connected, Serial0/0/0
192.168.4.0/32 is subnetted, 1 subnets
O 192.168.4.1/32 [110/9501] via 172.31.23.2, 01:21:11, Serial0/0/0
192.168.5.0/32 is subnetted, 1 subnets
O 192.168.5.1/32 [110/9501] via 172.31.23.2, 01:21:11, Serial0/0/0
192.168.6.0/32 is subnetted, 1 subnets
O 192.168.6.1/32 [110/9501] via 172.31.23.2, 01:21:11, Serial0/0/0
192.168.30.0/24 [110/9501] via 172.31.21.1, 01:21:11, Serial0/0/1
192.168.40.0/24 [110/9501] via 172.31.21.1, 01:21:11, Serial0/0/1
209.165.200.0/24 is variably subnetted, 2 subnets, 2 masks
C 209.165.200.224/29 is directly connected, GigabitEthernet0/0
L 209.165.200.225/32 is directly connected, GigabitEthernet0/0
S* 0.0.0.0/0 is directly connected, GigabitEthernet0/0
    
```

Figura 57. Comando *show ip ospf neighbor* desde *router R2*

```

R2
Physical Config CLI Attributes
IOS Command Line Interface
MIAMI#show ip ospf neighbor

Neighbor ID      Pri   State           Dead Time   Address      Interface
8.8.8.8          0     FULL/ -         00:00:30   172.31.23.2  Serial0/0/0
1.1.1.1          0     FULL/ -         00:00:31   172.31.21.1  Serial0/0/1
MIAMI#
    
```

Figura 58. Comando `show ip route` desde *router* R3

```

BUENOS_AIRES#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is 0.0.0.0 to network 0.0.0.0

10.0.0.0/24 is subnetted, 1 subnets
O    10.10.10.0/24 [110/9501] via 172.31.23.1, 01:22:56, Serial10/0/1
172.31.0.0/16 is variably subnetted, 3 subnets, 2 masks
O    172.31.21.0/30 [110/19000] via 172.31.23.1, 01:22:56, Serial10/0/1
C    172.31.23.0/30 is directly connected, Serial10/0/1
L    172.31.23.2/32 is directly connected, Serial10/0/1
192.168.4.0/24 is variably subnetted, 2 subnets, 2 masks
C    192.168.4.0/24 is directly connected, Loopback4
L    192.168.4.1/32 is directly connected, Loopback4
192.168.5.0/24 is variably subnetted, 2 subnets, 2 masks
C    192.168.5.0/24 is directly connected, Loopback5
L    192.168.5.1/32 is directly connected, Loopback5
192.168.6.0/24 is variably subnetted, 2 subnets, 2 masks
C    192.168.6.0/24 is directly connected, Loopback6
L    192.168.6.1/32 is directly connected, Loopback6
O    192.168.30.0/24 [110/19001] via 172.31.23.1, 01:22:56, Serial10/0/1
O    192.168.40.0/24 [110/19001] via 172.31.23.1, 01:22:56, Serial10/0/1
S*   0.0.0.0/0 is directly connected, Serial10/0/1

BUENOS_AIRES#
    
```

Figura 59. Comando `show ip ospf neighbor` desde *router* R3

```

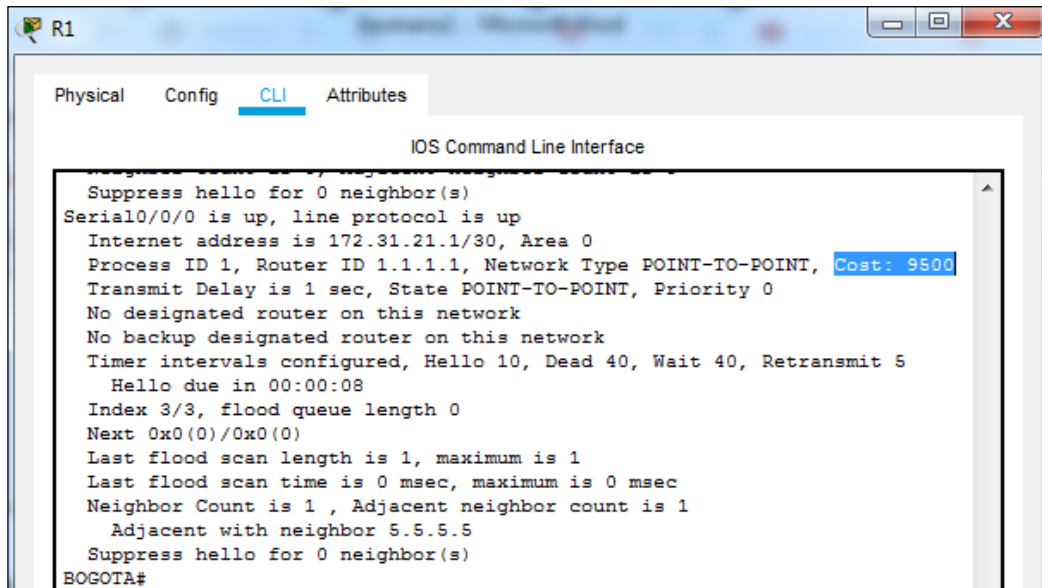
BUENOS_AIRES#show ip ospf neighbor

Neighbor ID    Pri   State           Dead Time   Address        Interface
5.5.5.5        0     FULL/-          00:00:34   172.31.23.1   Serial10/0/1

BUENOS_AIRES#
    
```

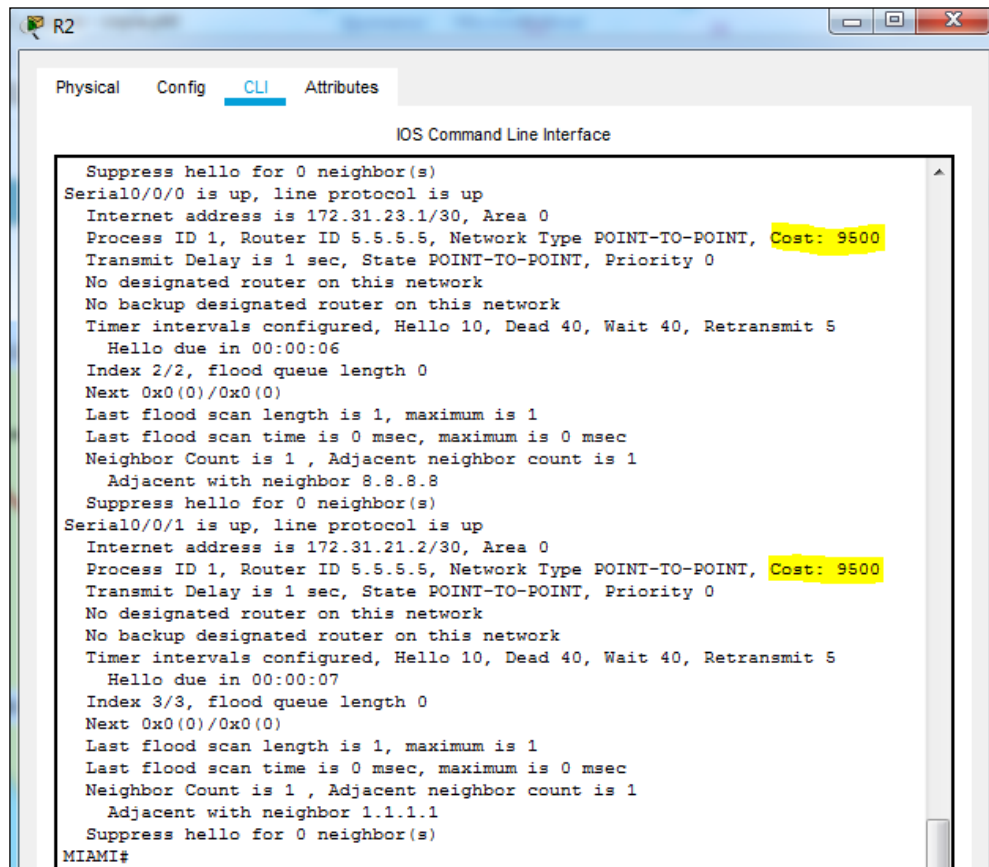
Se visualiza la lista resumida de interfaces por OSPF en la cual se identifica el costo de cada interface mediante el comando `show ip ospf interface`:

Figura 60. Comando `show ip ospf interface` desde *routerR1*



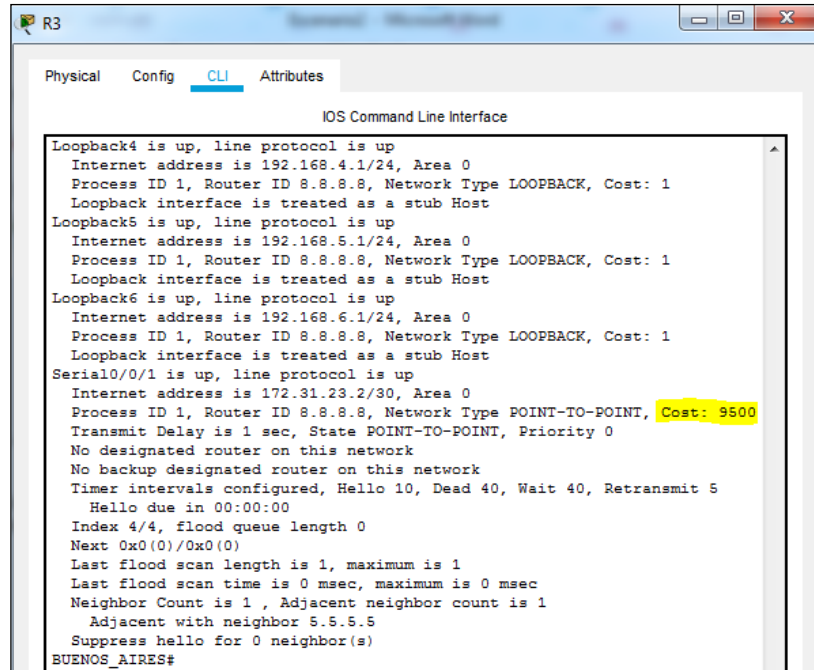
```
R1
Physical Config CLI Attributes
IOS Command Line Interface
Suppress hello for 0 neighbor(s)
Serial0/0/0 is up, line protocol is up
Internet address is 172.31.21.1/30, Area 0
Process ID 1, Router ID 1.1.1.1, Network Type POINT-TO-POINT, Cost: 9500
Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 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 00:00:08
Index 3/3, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 1, Adjacent neighbor count is 1
Adjacent with neighbor 5.5.5.5
Suppress hello for 0 neighbor(s)
BOGOTA#
```

Figura 61. Comando `show ip ospf interface` desde *routerR2*



```
R2
Physical Config CLI Attributes
IOS Command Line Interface
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 00:00:06
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 8.8.8.8
Suppress hello for 0 neighbor(s)
Serial0/0/1 is up, line protocol is up
Internet address is 172.31.21.2/30, Area 0
Process ID 1, Router ID 5.5.5.5, Network Type POINT-TO-POINT, Cost: 9500
Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
No designated router on this network
No backup designated router on this network
Timer intervals configured, Hello 10, Dead 40, Retransmit 5
Hello due in 00:00:07
Index 3/3, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 1, Adjacent neighbor count is 1
Adjacent with neighbor 1.1.1.1
Suppress hello for 0 neighbor(s)
MIAMI#
```

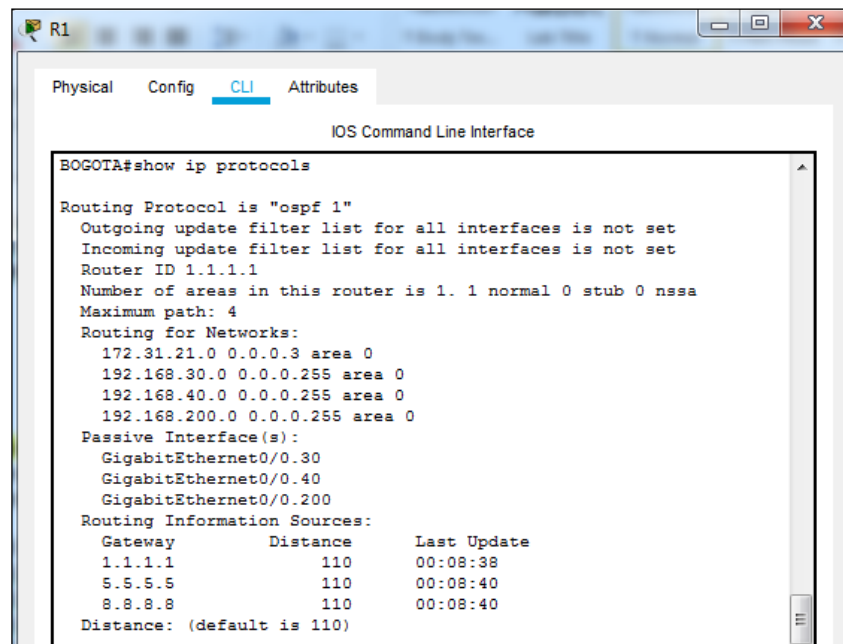
Figura 62. Comando `show ip ospf interface` desde *router* R3



```
R3
Physical Config CLI Attributes
IOS Command Line 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
Loopback5 is up, line protocol is up
Internet address is 192.168.5.1/24, Area 0
Process ID 1, Router ID 8.8.8.8, Network Type LOOPBACK, Cost: 1
Loopback interface is treated as a stub Host
Loopback6 is up, line protocol is up
Internet address is 192.168.6.1/24, 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 00:00:00
Index 4/4, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 1, Adjacent neighbor count is 1
Adjacent with neighbor 5.5.5.5
Suppress hello for 0 neighbor(s)
BUENOS_AIRES#
```

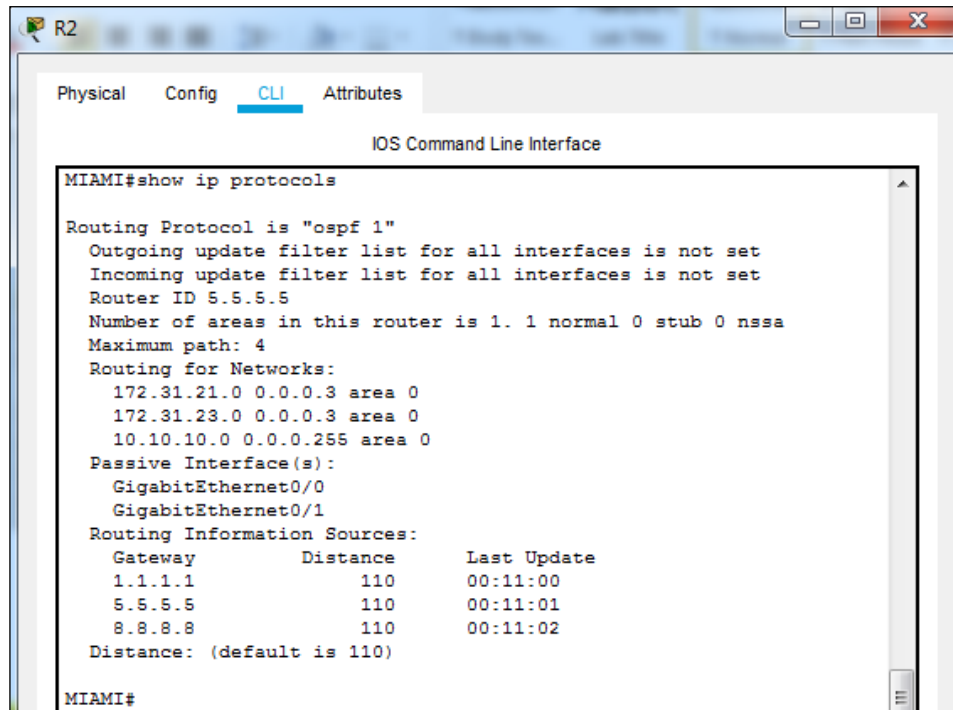
Se visualiza OSPF *Process ID*, *Router ID*, *Address summarizations*, *Routing Networks*, and *passive interfaces* configuradas en cada *router*, mediante el commando **`show ip protocols`**:

Figura 63. Comando `show ip protocols` desde *router* R1



```
R1
Physical Config CLI Attributes
IOS Command Line Interface
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):
 GigabitEthernet0/0.30
 GigabitEthernet0/0.40
 GigabitEthernet0/0.200
Routing Information Sources:
 Gateway Distance Last Update
 1.1.1.1 110 00:08:38
 5.5.5.5 110 00:08:40
 8.8.8.8 110 00:08:40
Distance: (default is 110)
```

Figura 64. Comando `show ip protocols` desde *router*R2

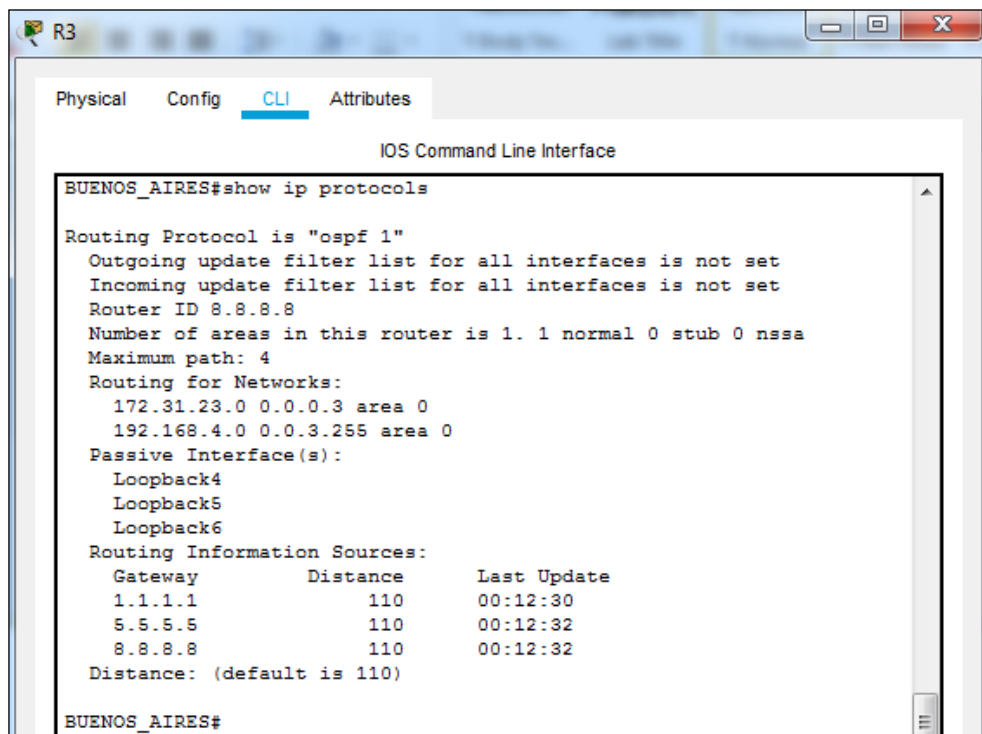


```
MIAMI#show ip protocols

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 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):
    GigabitEthernet0/0
    GigabitEthernet0/1
  Routing Information Sources:
    Gateway         Distance      Last Update
    1.1.1.1          110          00:11:00
    5.5.5.5          110          00:11:01
    8.8.8.8          110          00:11:02
  Distance: (default is 110)

MIAMI#
```

Figura 65. Comando `show ip protocols` desde *router*R3



```
BUENOS_AIRES#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 0.0.3.255 area 0
  Passive Interface(s):
    Loopback4
    Loopback5
    Loopback6
  Routing Information Sources:
    Gateway         Distance      Last Update
    1.1.1.1          110          00:12:30
    5.5.5.5          110          00:12:32
    8.8.8.8          110          00:12:32
  Distance: (default is 110)

BUENOS_AIRES#
```

Se configura *router* R1 (BOGOTA) como servidor DHCP para las VLAN 30 y 40, se reserva las primeras 30 direcciones IP de las VLAN 30 y 40 para configuraciones estáticas:

ROUTER 1 BOGOTA

```
BOGOTA# configure terminal
BOGOTA(config)#ip dhcp excluded-address 192.168.30.1 192.168.30.30
BOGOTA(config)#ip dhcp excluded-address 192.168.40.1 192.168.40.30
BOGOTA(config)#ip dhcp pool ADMINISTRACION
BOGOTA(dhcp-config)#dns-server 10.10.10.11
BOGOTA(dhcp-config)#domain-name ccna-unad.com
BOGOTA(dhcp-config)#default-router 192.168.30.1
BOGOTA(dhcp-config)#network 192.168.30.0 255.255.255.0
BOGOTA(dhcp-config)#exit
BOGOTA(config)#ip dhcp pool MERCADEO
BOGOTA(dhcp-config)#dns-server 10.10.10.11
BOGOTA(dhcp-config)#domain-name ccna-unad.com
BOGOTA(dhcp-config)#default-router 192.168.40.1
BOGOTA(dhcp-config)#network 192.168.40.0 255.255.255.0
BOGOTA(dhcp-config)#
```

Se configura NAT estático en R2 (MIAMI):

ROUTER 2 MIAMI

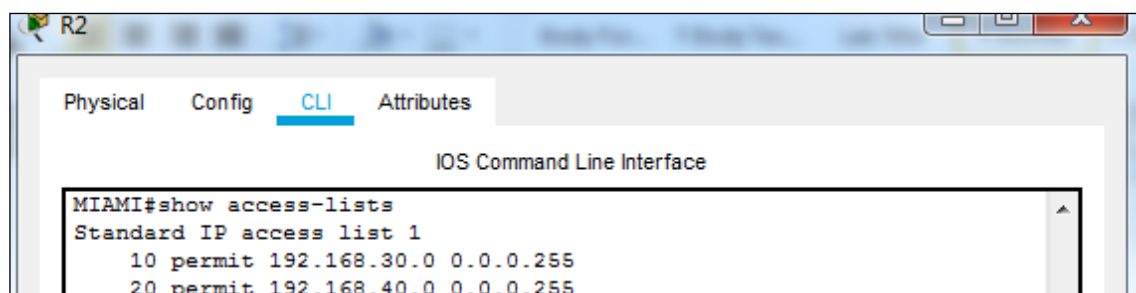
```
MIAMI(config)#ip nat inside source static 10.10.10.10 209.165.200.228
MIAMI(config)#interface gigabitEthernet 0/0
MIAMI(config-if)#interface gigabitEthernet 0/1
MIAMI(config-if)#ip nat inside
```

Se configura dos listas de acceso de tipo estándar:

ROUTER 2 MIAMI

```
MIAMI(config)#access-list 1 permit 192.168.30.0 0.0.0.255
MIAMI(config)#access-list 20 permit 192.168.40.0 0.0.0.255
```

Figura 66. Comando *show access-lists* desde *router* R2



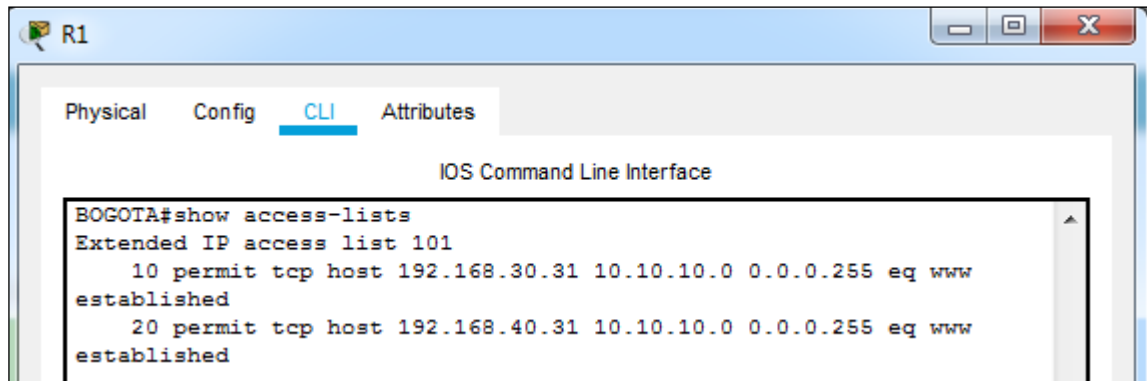
```
R2
Physical Config CLI Attributes
IOS Command Line Interface
MIAMI#show access-lists
Standard IP access list 1
 10 permit 192.168.30.0 0.0.0.255
 20 permit 192.168.40.0 0.0.0.255
```


Se configura dos listas de acceso de tipo extendido:

ROUTER 1 BOGOTA

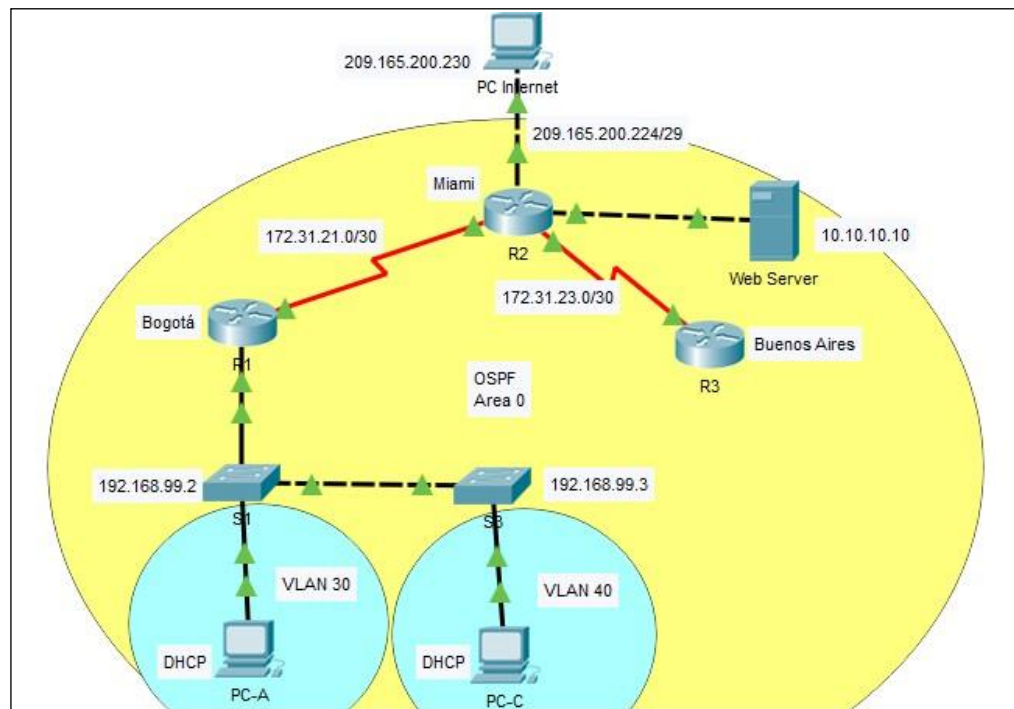
```
BOGOTA(config)#access-list 101 permit tcp host 192.168.30.31 10.10.10.0  
0.0.0.255 eq 80 established  
BOGOTA(config)#access-list 101 permit tcp host 192.168.40.31 10.10.10.0  
0.0.0.255 eq 80 established
```

Figura 67. Comando *show access-lists* desde *router R1*



Se presenta la topología después de realizar todas las configuraciones requeridas:

Figura 68. Topología de red



Se presenta el contenido del archivo de configuración activo en todos los dispositivos mediante el comando **show running-config**:

ROUTER 1 BOGOTA

```
BOGOTA#show running-config
Building configuration...
Current configuration : 2298 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname BOGOTA
!
enable secret 5 $1$mERr$9cTjUIEqNGurQiFU.ZeCi1
!
ip dhcp excluded-address 192.168.30.1 192.168.30.30
ip dhcp excluded-address 192.168.40.1 192.168.40.30
!
ip dhcp pool ADMINISTRACION
network 192.168.30.0 255.255.255.0
default-router 192.168.30.1
dns-server 10.10.10.11
domain-name ccna-unad.com
ip dhcp pool MERCADEO
network 192.168.40.0 255.255.255.0
default-router 192.168.40.1
dns-server 10.10.10.11
domain-name ccna-unad.com
!
no ip cef
no ipv6 cef
!
license udi pid CISCO1941/K9 sn FTX1524XK6S-
!
no ip domain-lookup
!
spanning-tree mode pvst
!
interface GigabitEthernet0/0
no ip address
duplex auto
speed auto
!
```

```
interface GigabitEthernet0/0.30
description LAN Administracion
encapsulation dot1Q 30
ip address 192.168.30.1 255.255.255.0
!
interface GigabitEthernet0/0.40
description LAN Mercadeo
encapsulation dot1Q 40
ip address 192.168.40.1 255.255.255.0
!
interface GigabitEthernet0/0.200
description LAN Mantenimiento
encapsulation dot1Q 200
ip address 192.168.99.1 255.255.255.0
!
interface GigabitEthernet0/1
no ip address
duplex auto
speed auto
shutdown
!
interface Serial0/0/0
description Conexion a R2 MIAMI
bandwidth 256
ip address 172.31.21.1 255.255.255.252
ip ospf cost 9500
clock rate 128000
!
interface Serial0/0/1
no ip address
clock rate 2000000
shutdown
!
interface Vlan1
no ip address
shutdown
!
router ospf 1
router-id 1.1.1.1
log-adjacency-changes
passive-interface GigabitEthernet0/0.30
passive-interface GigabitEthernet0/0.40
passive-interface GigabitEthernet0/0.200
network 172.31.21.0 0.0.0.3 area 0
network 192.168.30.0 0.0.0.255 area 0
```

```

network 192.168.40.0 0.0.0.255 area 0
network 192.168.200.0 0.0.0.255 area 0
!
ip classless
ip route 0.0.0.0 0.0.0.0 Serial0/0/0
!
ip flow-export version 9
!
access-list 101 permit tcp host 192.168.30.31 10.10.10.0 0.0.0.255 eq www
established
access-list 101 permit tcp host 192.168.40.31 10.10.10.0 0.0.0.255 eq www
established
!
banner motd ^CSolo personal autorizado^C
!
line con 0
password 7 0822455D0A16
login
!
line aux 0
!
line vty 0 4
password 7 0822455D0A16
login
!
end
BOGOTA#

```

ROUTER 2 MIAMI

```

MIAMI#show running-config
Building configuration...
Current configuration : 1687 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname MIAMI
!
enable secret 5 $1$mERr$9cTjUIEqNGurQiFU.ZeCi1
!
no ip cef
no ipv6 cef
!

```

```

username usuarioweb privilege 15 secret 5
$1$mERr$hX5rVt7rPNoS4wqbXKX7m0
!
!
license udi pid CISCO1941/K9 sn FTX1524QCHH-
!
no ip domain-lookup
!
spanning-tree mode pvst
!
interface GigabitEthernet0/0
description Conexion a Internet
ip address 209.165.200.225 255.255.255.248
ip nat outside
duplex auto
speed auto
!
interface GigabitEthernet0/1
description Conexion a WEB SERVER
ip address 10.10.10.1 255.255.255.0
ip nat inside
duplex auto
speed auto
!
interface Serial0/0/0
description Conexion a R3 BUENOS AIRES
ip address 172.31.23.1 255.255.255.252
ip ospf cost 9500
clock rate 2000000
!
interface Serial0/0/1
description Conexion a R1 BOGOTA
bandwidth 256
ip address 172.31.21.2 255.255.255.252
ip ospf cost 9500
!
interface Vlan1
no ip address
shutdown
!
router ospf 1
router-id 5.5.5.5
log-adjacency-changes
passive-interface GigabitEthernet0/0
passive-interface GigabitEthernet0/1

```

```

network 172.31.21.0 0.0.0.3 area 0
network 172.31.23.0 0.0.0.3 area 0
network 10.10.10.0 0.0.0.255 area 0
!
ip nat inside source static 10.10.10.10 209.165.200.228
ip classless
ip route 0.0.0.0 0.0.0.0 GigabitEthernet0/0
!
ip flow-export version 9
!
access-list 1 permit 192.168.30.0 0.0.0.255
access-list 1 permit 192.168.40.0 0.0.0.255
!
banner motd ^CSolo personal autorizado^C
!
line con 0
password 7 0822455D0A16
login
!
line aux 0
!
line vty 0 4
password 7 0822455D0A16
login
!
end
MIAMI#

```

ROUTER 3 BUENOS_AIRES

```

BUENOS_AIRES#show running-config
Building configuration...
Current configuration : 1418 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname BUENOS_AIRES
!
enable secret 5 $1$mERr$9cTjUIEqNGurQiFU.ZeCi1
!
no ip cef
no ipv6 cef
!

```

```
license udi pid CISCO1941/K9 sn FTX1524Z2AD-
!  
no ip domain-lookup  
!  
spanning-tree mode pvst  
!  
interface Loopback4  
ip address 192.168.4.1 255.255.255.0  
!  
interface Loopback5  
ip address 192.168.5.1 255.255.255.0  
!  
interface Loopback6  
ip address 192.168.6.1 255.255.255.0  
!  
interface GigabitEthernet0/0  
no ip address  
duplex auto  
speed auto  
shutdown  
!  
interface GigabitEthernet0/1  
no ip address  
duplex auto  
speed auto  
shutdown  
!  
interface Serial0/0/0  
no ip address  
clock rate 2000000  
shutdown  
!  
interface Serial0/0/1  
description Conexion a R2 MIAMI  
bandwidth 256  
ip address 172.31.23.2 255.255.255.252  
ip ospf cost 9500  
!  
interface Vlan1  
no ip address  
shutdown  
!  
router ospf 1  
router-id 8.8.8.8  
log-adjacency-changes
```

```

passive-interface Loopback4
passive-interface Loopback5
passive-interface Loopback6
network 172.31.23.0 0.0.0.3 area 0
network 192.168.4.0 0.0.3.255 area 0
!
ip classless
ip route 0.0.0.0 0.0.0.0 Serial0/0/1
!
ip flow-export version 9
!
banner motd ^CSolo personal autorizado^C
!
line con 0
password 7 0822455D0A16
login
!
line aux 0
!
line vty 0 4
password 7 0822455D0A16
login
!
end
BUENOS_AIRES#

```

SWITCH 1 S1

```

S1#show running-config
Building configuration...
Current configuration : 2236 bytes
!
version 12.2
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname S1
!
enable secret 5 $1$mERr$9cTjUIEqNGurQiFU.ZeCi1
!
no ip domain-lookup
!
spanning-tree mode pvst
spanning-tree extend system-id
!

```



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

```
shutdown
!  
interface FastEthernet0/13  
switchport mode access  
shutdown  
!  
interface FastEthernet0/14  
switchport mode access  
shutdown  
!  
interface FastEthernet0/15  
switchport mode access  
shutdown  
!  
interface FastEthernet0/16  
switchport mode access  
shutdown  
!  
interface FastEthernet0/17  
switchport mode access  
shutdown  
!  
interface FastEthernet0/18  
switchport mode access  
shutdown  
!  
interface FastEthernet0/19  
switchport mode access  
shutdown  
!  
interface FastEthernet0/20  
switchport mode access  
shutdown  
!  
interface FastEthernet0/21  
switchport mode access  
shutdown  
!  
interface FastEthernet0/22  
switchport mode access  
shutdown  
!  
interface FastEthernet0/23  
switchport mode access  
shutdown
```

```

!
interface FastEthernet0/24
switchport mode trunk
!
interface GigabitEthernet0/1
switchport mode access
shutdown
!
interface GigabitEthernet0/2
switchport mode access
shutdown
!
interface Vlan1
no ip address
shutdown
!
interface Vlan200
mac-address 0050.0fb2.3c01
ip address 192.168.99.2 255.255.255.0
!
ip default-gateway 192.168.99.1
!
banner motd ^CSolo personal autorizado^C
!
line con 0
password 7 0822455D0A16
login
!
line vty 0 4
password 7 0822455D0A16
login
line vty 5 15
login
!
end
S1#

```

SWITCH 3 S3

```

S3#show running-config
Building configuration...
Current configuration : 2247 bytes
!
version 12.2
no service timestamps log datetime msec
no service timestamps debug datetime msec

```

```
service password-encryption
!
hostname S3
!
enable secret 5 $1$mERr$9cTjUIEqNGurQiFU.ZeCi1
!
no ip domain-lookup
!
spanning-tree mode pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
switchport access vlan 40
switchport mode access
!
interface FastEthernet0/2
switchport mode access
shutdown
!
interface FastEthernet0/3
switchport mode trunk
!
interface FastEthernet0/4
switchport mode access
shutdown
!
interface FastEthernet0/5
switchport mode access
shutdown
!
interface FastEthernet0/6
switchport mode access
shutdown
!
interface FastEthernet0/7
switchport mode access
shutdown
!
interface FastEthernet0/8
switchport mode access
shutdown
!
interface FastEthernet0/9
switchport mode access
shutdown
```

```
!  
interface FastEthernet0/10  
switchport mode access  
shutdown  
!  
interface FastEthernet0/11  
switchport mode access  
shutdown  
!  
interface FastEthernet0/12  
switchport mode access  
shutdown  
!  
interface FastEthernet0/13  
switchport mode access  
shutdown  
!  
interface FastEthernet0/14  
switchport mode access  
shutdown  
!  
interface FastEthernet0/15  
switchport mode access  
shutdown  
!  
interface FastEthernet0/16  
switchport mode access  
shutdown  
!  
interface FastEthernet0/17  
switchport mode access  
shutdown  
!  
interface FastEthernet0/18  
switchport mode access  
shutdown  
!  
interface FastEthernet0/19  
switchport mode access  
shutdown  
!  
interface FastEthernet0/20  
switchport mode access  
shutdown  
!
```

```
interface FastEthernet0/21
switchport mode access
shutdown
!
interface FastEthernet0/22
switchport mode access
shutdown
!
interface FastEthernet0/23
switchport mode access
shutdown
!
interface FastEthernet0/24
switchport mode access
shutdown
!
interface GigabitEthernet0/1
switchport mode access
shutdown
!
interface GigabitEthernet0/2
switchport mode access
shutdown
!
interface Vlan1
no ip address
shutdown
!
interface Vlan200
mac-address 0001.4281.8d01
ip address 192.168.99.3 255.255.255.0
!
ip default-gateway 192.168.99.1
!
banner motd ^CSolo personal autorizado^C
!
line con 0
password 7 0822455D0A16
login
!
line vty 0 4
password 7 0822455D0A16
login
line vty 5 15
login
```

```
!  
end  
S3#
```

Se presenta las pruebas de conectividad realizadas a los equipos comenzando por la entrega de direccionamiento mediante DHCP a los PC-A y PC-C:

Figura 69. Habilitar DHCP en PC-A

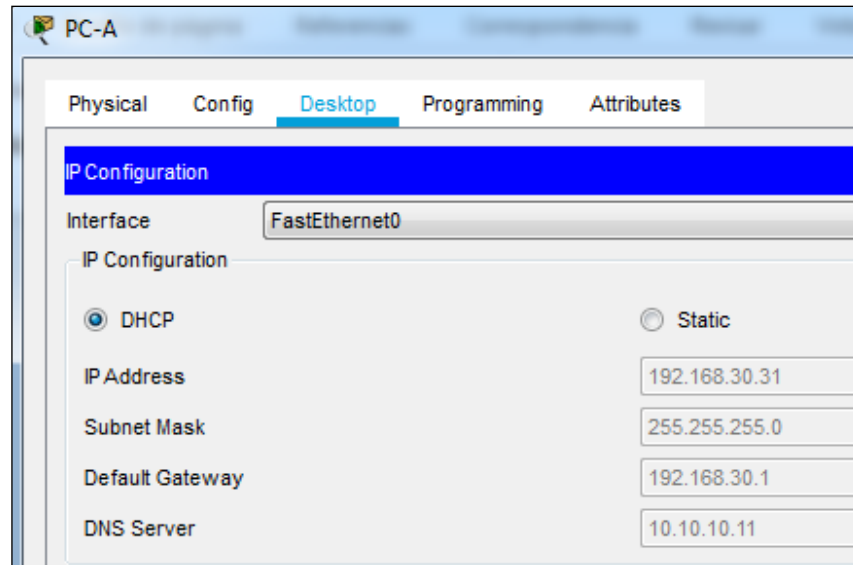
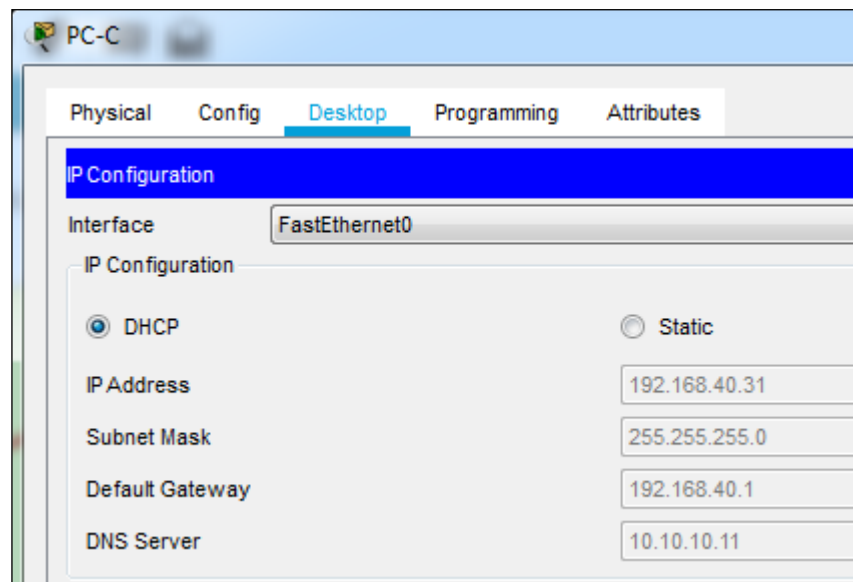
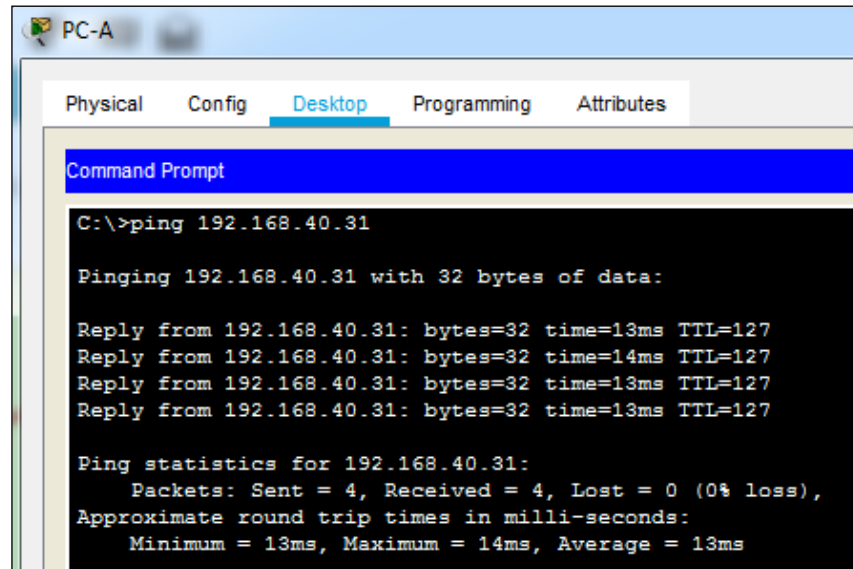


Figura 70. Habilitar DHCP en PC-C



Se realiza un *ping* de PC-1 a PC-3:

Figura 71. Comando *ping* desde PC-A



Se realiza prueba mediante navegador web hacia el servidor web, desde PC-A y PC-C:

Figura 72. Prueba en navegador web desde PC-A

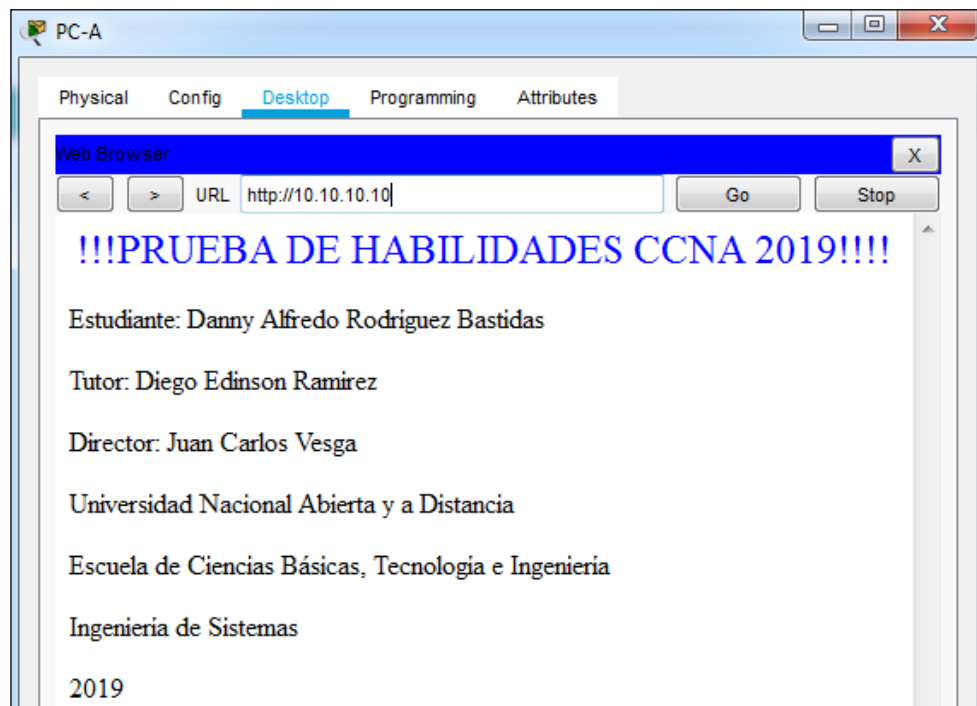
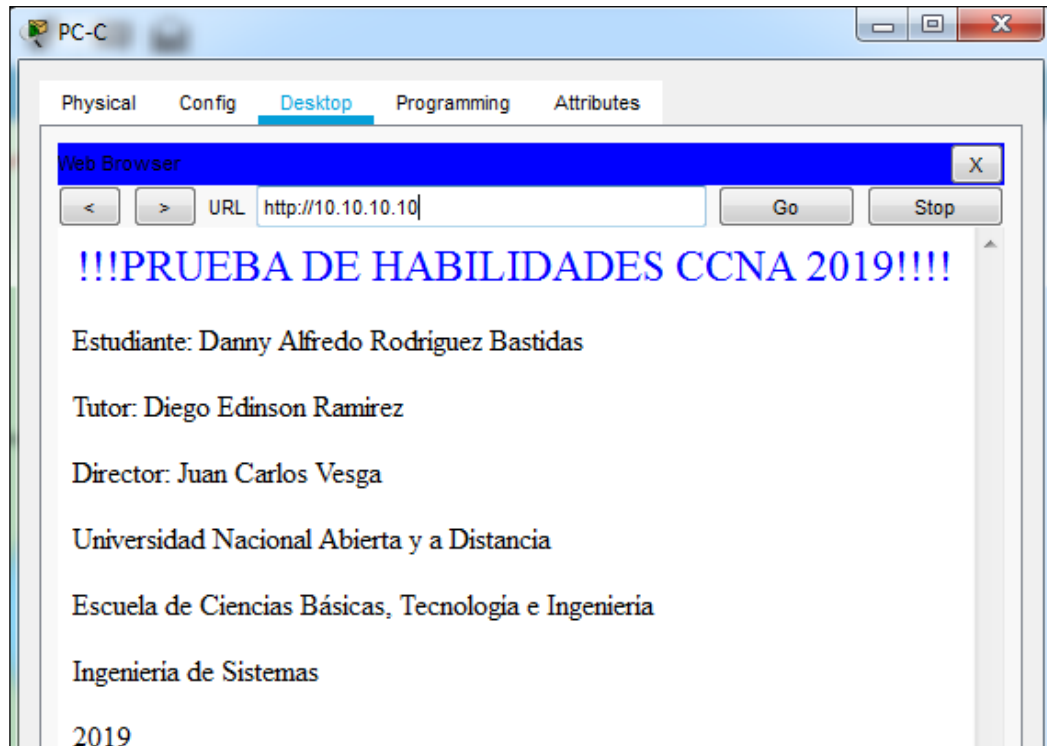


Figura 73. Prueba en navegador web desde PC-C



Se realiza *ping* desde PC-A a la interfaz de los 3 *routers*

Figura 74. Comando *ping* desde PC-A

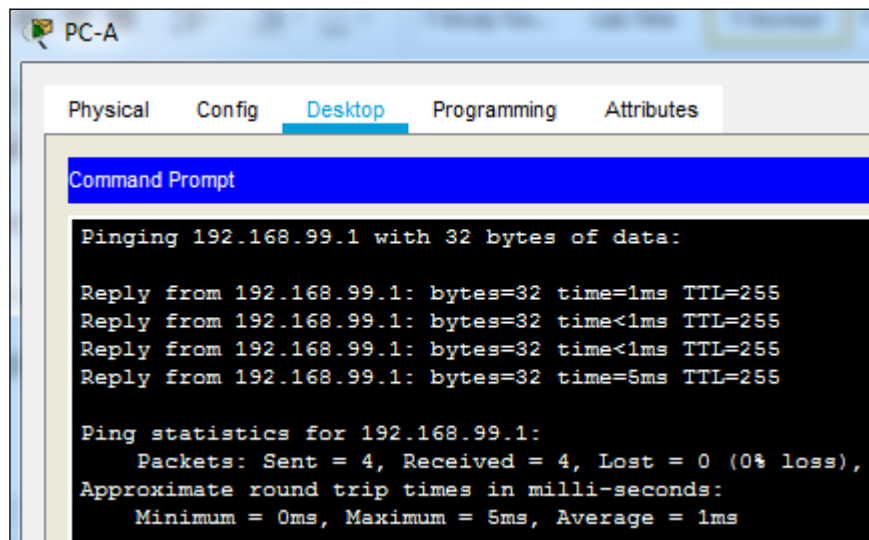
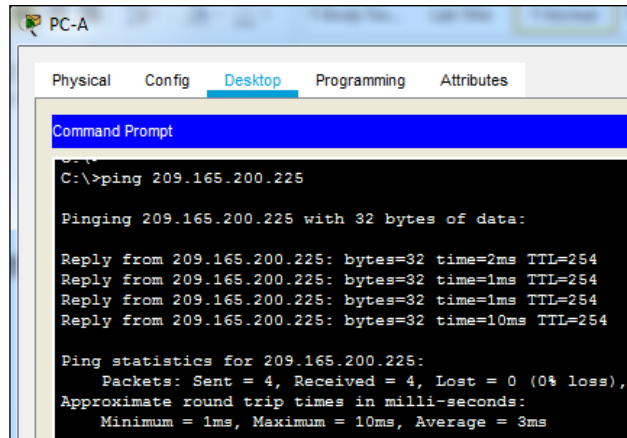


Figura 75. Comando *ping* desde PC-A



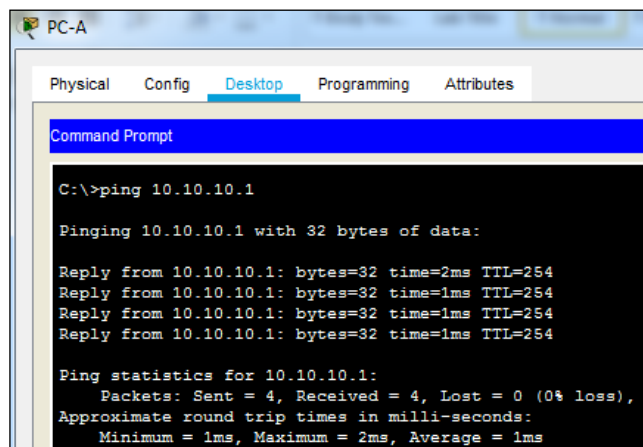
```
PC-A
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 209.165.200.225

Pinging 209.165.200.225 with 32 bytes of data:

Reply from 209.165.200.225: bytes=32 time=2ms TTL=254
Reply from 209.165.200.225: bytes=32 time=1ms TTL=254
Reply from 209.165.200.225: bytes=32 time=1ms TTL=254
Reply from 209.165.200.225: bytes=32 time=10ms TTL=254

Ping statistics for 209.165.200.225:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 10ms, Average = 3ms
```

Figura 76. Comando *ping* desde PC-A



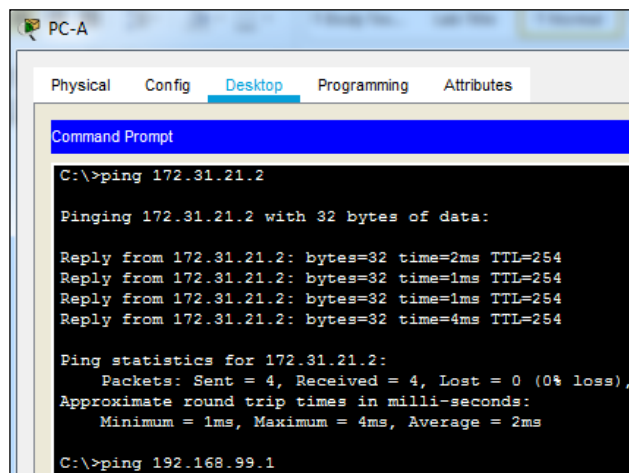
```
PC-A
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 10.10.10.1

Pinging 10.10.10.1 with 32 bytes of data:

Reply from 10.10.10.1: bytes=32 time=2ms TTL=254
Reply from 10.10.10.1: bytes=32 time=1ms TTL=254
Reply from 10.10.10.1: bytes=32 time=1ms TTL=254
Reply from 10.10.10.1: bytes=32 time=1ms TTL=254

Ping statistics for 10.10.10.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 2ms, Average = 1ms
```

Figura 77. Comando *ping* desde PC-A



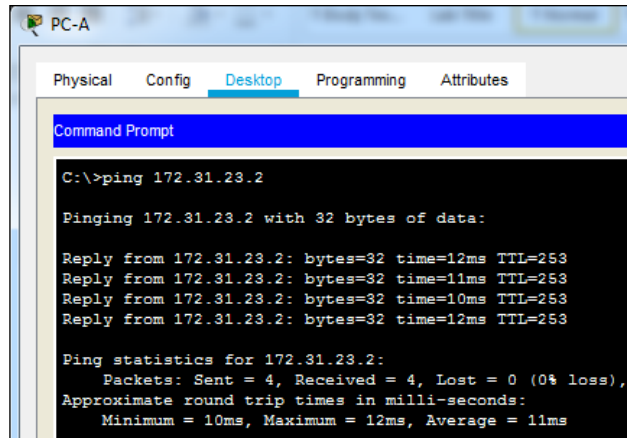
```
PC-A
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 172.31.21.2

Pinging 172.31.21.2 with 32 bytes of data:

Reply from 172.31.21.2: bytes=32 time=2ms TTL=254
Reply from 172.31.21.2: bytes=32 time=1ms TTL=254
Reply from 172.31.21.2: bytes=32 time=1ms TTL=254
Reply from 172.31.21.2: bytes=32 time=4ms TTL=254

Ping statistics for 172.31.21.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 4ms, Average = 2ms
C:\>ping 192.168.99.1
```

Figura 78. Comando *ping* desde PC-A



```
PC-A
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 172.31.23.2

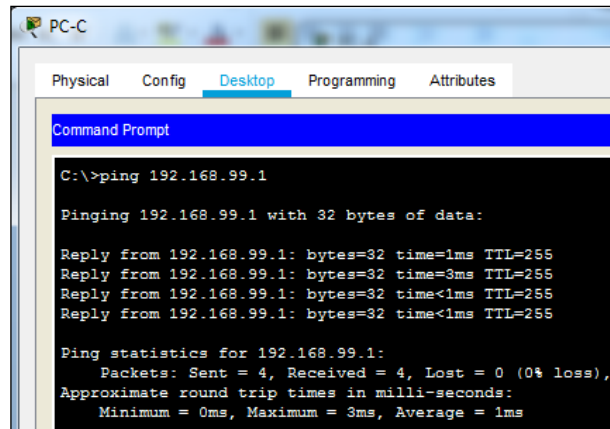
Pinging 172.31.23.2 with 32 bytes of data:

Reply from 172.31.23.2: bytes=32 time=12ms TTL=253
Reply from 172.31.23.2: bytes=32 time=11ms TTL=253
Reply from 172.31.23.2: bytes=32 time=10ms TTL=253
Reply from 172.31.23.2: bytes=32 time=12ms TTL=253

Ping statistics for 172.31.23.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 10ms, Maximum = 12ms, Average = 11ms
```

Se realiza *ping* desde PC-C a la interfaz de los 3 *routers*

Figura 79. Comando *ping* desde PC-C



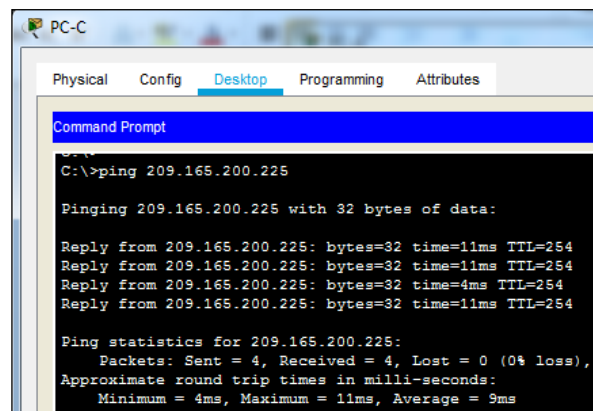
```
PC-C
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 192.168.99.1

Pinging 192.168.99.1 with 32 bytes of data:

Reply from 192.168.99.1: bytes=32 time=1ms TTL=255
Reply from 192.168.99.1: bytes=32 time=3ms TTL=255
Reply from 192.168.99.1: bytes=32 time<1ms TTL=255
Reply from 192.168.99.1: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.99.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 3ms, Average = 1ms
```

Figura 80. Comando *ping* desde PC-C



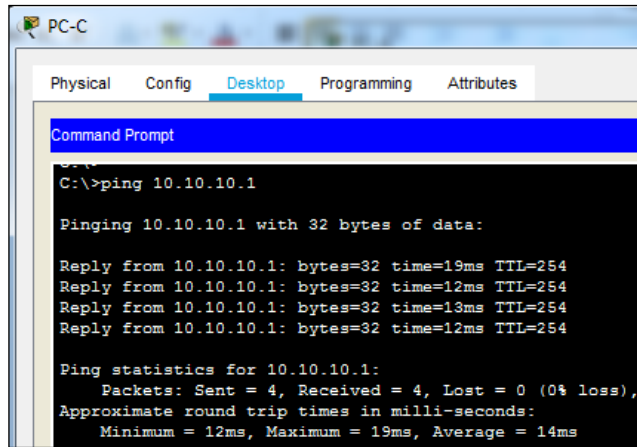
```
PC-C
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 209.165.200.225

Pinging 209.165.200.225 with 32 bytes of data:

Reply from 209.165.200.225: bytes=32 time=11ms TTL=254
Reply from 209.165.200.225: bytes=32 time=11ms TTL=254
Reply from 209.165.200.225: bytes=32 time=4ms TTL=254
Reply from 209.165.200.225: bytes=32 time=11ms TTL=254

Ping statistics for 209.165.200.225:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 4ms, Maximum = 11ms, Average = 9ms
```

Figura 81. Comando *ping* desde PC-C



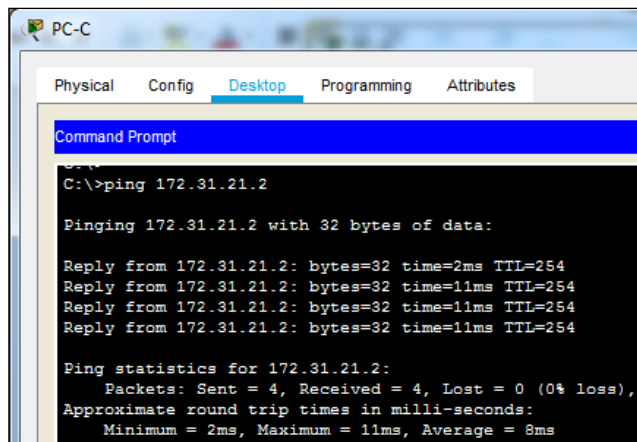
```
PC-C
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 10.10.10.1

Pinging 10.10.10.1 with 32 bytes of data:

Reply from 10.10.10.1: bytes=32 time=19ms TTL=254
Reply from 10.10.10.1: bytes=32 time=12ms TTL=254
Reply from 10.10.10.1: bytes=32 time=13ms TTL=254
Reply from 10.10.10.1: bytes=32 time=12ms TTL=254

Ping statistics for 10.10.10.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 12ms, Maximum = 19ms, Average = 14ms
```

Figura 82. Comando *ping* desde PC-C



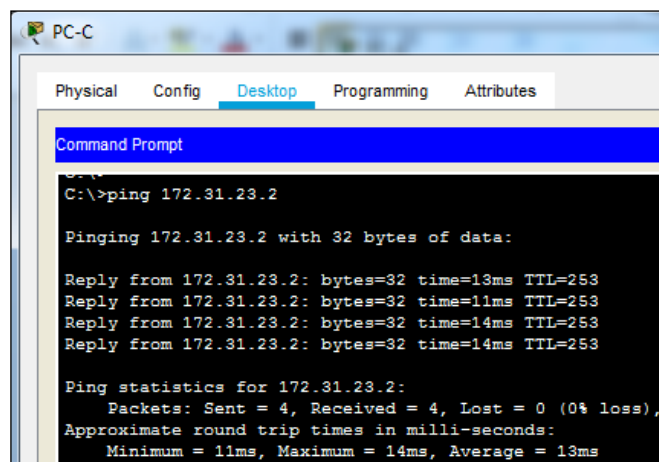
```
PC-C
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 172.31.21.2

Pinging 172.31.21.2 with 32 bytes of data:

Reply from 172.31.21.2: bytes=32 time=2ms TTL=254
Reply from 172.31.21.2: bytes=32 time=11ms TTL=254
Reply from 172.31.21.2: bytes=32 time=11ms TTL=254
Reply from 172.31.21.2: bytes=32 time=11ms TTL=254

Ping statistics for 172.31.21.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 11ms, Average = 8ms
```

Figura 83. Comando *ping* desde PC-C



```
PC-C
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 172.31.23.2

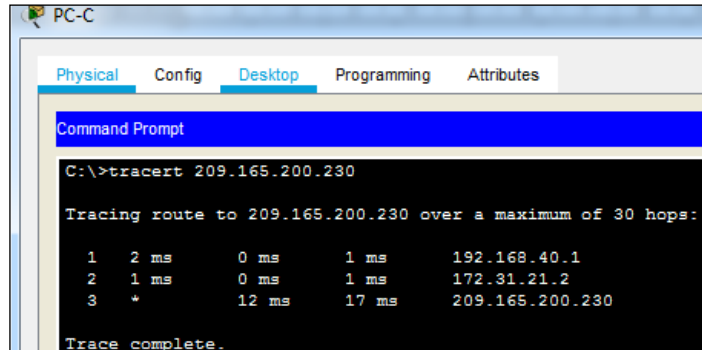
Pinging 172.31.23.2 with 32 bytes of data:

Reply from 172.31.23.2: bytes=32 time=13ms TTL=253
Reply from 172.31.23.2: bytes=32 time=11ms TTL=253
Reply from 172.31.23.2: bytes=32 time=14ms TTL=253
Reply from 172.31.23.2: bytes=32 time=14ms TTL=253

Ping statistics for 172.31.23.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 11ms, Maximum = 14ms, Average = 13ms
```

Se ejecuta el comando **tracert** desde PC-C hasta PC Internet:

Figura 84. Comando **tracert** desde PC-C



```
PC-C
Physical Config Desktop Programming Attributes
Command Prompt
C:\>tracert 209.165.200.230

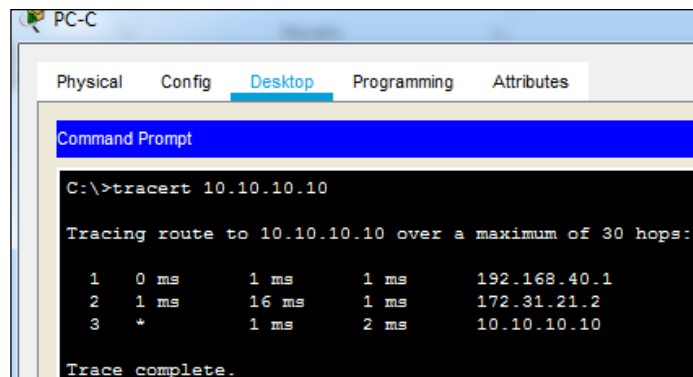
Tracing route to 209.165.200.230 over a maximum of 30 hops:

  1  2 ms    0 ms    1 ms    192.168.40.1
  2  1 ms    0 ms    1 ms    172.31.21.2
  3  *        12 ms   17 ms   209.165.200.230

Trace complete.
```

Se ejecuta el comando **tracert** desde PC-C hasta *Web server*:

Figura 85. Comando **tracert** desde PC-C



```
PC-C
Physical Config Desktop Programming Attributes
Command Prompt
C:\>tracert 10.10.10.10

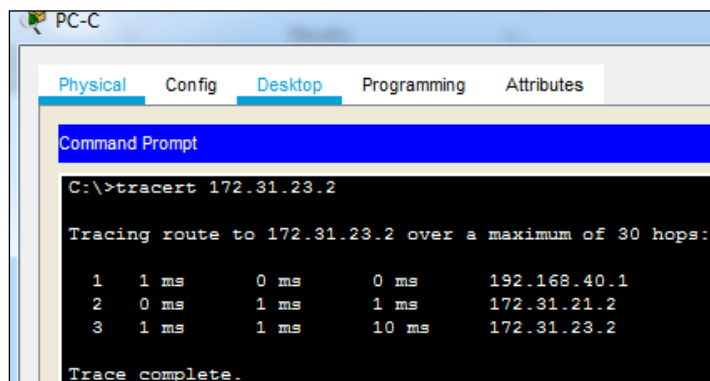
Tracing route to 10.10.10.10 over a maximum of 30 hops:

  1  0 ms    1 ms    1 ms    192.168.40.1
  2  1 ms   16 ms    1 ms    172.31.21.2
  3  *        1 ms    2 ms    10.10.10.10

Trace complete.
```

Se ejecuta el comando **tracert** desde PC-C hasta el *router* R3 BUENOS AIRES y las *loopback*:

Figura 86. Comando **tracert** desde PC-C



```
PC-C
Physical Config Desktop Programming Attributes
Command Prompt
C:\>tracert 172.31.23.2

Tracing route to 172.31.23.2 over a maximum of 30 hops:

  1  1 ms    0 ms    0 ms    192.168.40.1
  2  0 ms    1 ms    1 ms    172.31.21.2
  3  1 ms    1 ms   10 ms    172.31.23.2

Trace complete.
```

Figura 87. Comando *tracert* desde PC-C

```
PC-C
Physical Config Desktop Programming Attributes
Command Prompt
C:\>tracert 192.168.4.1

Tracing route to 192.168.4.1 over a maximum of 30 hops:

  0  0 ms    0 ms    0 ms    192.168.40.1
  1  2 ms    1 ms    1 ms    172.31.21.2
  2  1 ms    11 ms   1 ms    192.168.4.1

Trace complete.

C:\>tracert 192.168.5.1

Tracing route to 192.168.5.1 over a maximum of 30 hops:

  0  1 ms    0 ms    15 ms   192.168.40.1
  1  16 ms   12 ms   10 ms   172.31.21.2
  2  12 ms   15 ms   14 ms   192.168.5.1

Trace complete.

C:\>tracert 192.168.6.1

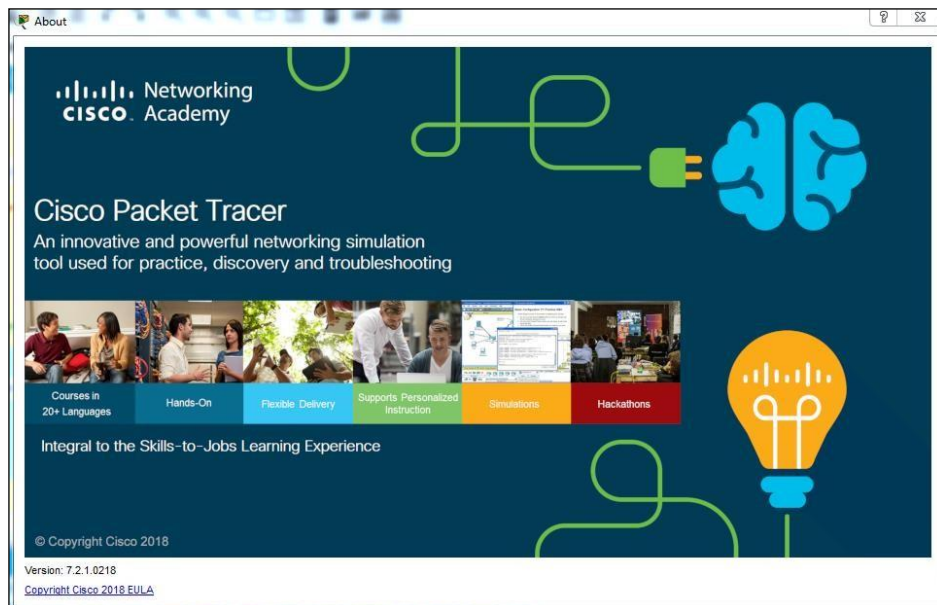
Tracing route to 192.168.6.1 over a maximum of 30 hops:

  0  1 ms    0 ms    11 ms   192.168.40.1
  1  11 ms   13 ms   11 ms   172.31.21.2
  2  13 ms   15 ms   13 ms   192.168.6.1

Trace complete.
```

Los escenarios desarrollados anteriormente se realizaron en el programa *Cisco Packet Tracer* versión 7.2.1.0218

Figura 88. Imagen *Packet Tracer* versión 7.2.1.0218



CONCLUSIONES

- El presente trabajo permitió desarrollar las habilidades necesarias para configurar y administrar diferentes dispositivos de red orientados al diseño de redes escalables y de conmutación.
- Se adquirió el dominio en el uso de comandos con el fin de configurar y verificar operaciones básicas de enrutamiento de Gateway interior.
- El desarrollo de las actividades permitió afianzar los conocimientos requeridos para el diseño de redes escalables mediante el uso de tecnologías y protocolos de conmutación como los usos de las VLANs y encapsulamiento por 802.1q.
- Se logró conocer la importancia de establecer niveles de seguridad básicos, a través de criterios y políticas de seguridad empleadas en diferentes escenarios de red, con el objetivo de proteger la integridad de la información ante cualquier tipo de ataque.
- Mediante las actividades desarrolladas se adquirió la habilidad para identificar y resolver problemas de configuración, conectividad y enrutamiento bajo el uso de herramientas y comandos de administración del IOS en contextos LAN y WAN.
- Se adquirió las destrezas necesarias en el uso de herramientas de simulación como *Cisco Packet Tracer* con el propósito de recrear escenarios LAN/WAN a fin de realizar análisis sobre el comportamiento de los diferentes dispositivos, protocolos y métricas de enrutamiento.
- Se implementaron configuraciones con el uso de comandos de configuración avanzada en routers, implementando RIP, OSPF y enrutamiento con el fin de plantear e implementar soluciones de red y conectividad escalables, mediante el uso de los principios de enrutamiento y conmutación de paquetes en ambientes LAN y WAN.
- Las actividades permitieron aplicar los conceptos y bases teóricos sobre la arquitectura TCP/IP, el modelo OSI, como también el uso de recursos en función de los protocolos y servicios de la capa física como soporte de las comunicaciones.

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