

DIPLOMADO DE PROFUNDIZACIÓN CISCO
DISEÑO E IMPLEMENTACIÓN DE REDES INTEGRADAS LAN / WAN

LADY MARCELA CADENA PRIETO

UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA UNAD
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INGENIERÍA DE SISTEMAS
FUSAGASUGÁ
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Informe Prueba de Habilidades Prácticas CCNA
Para optar al título de
Ingeniero de Sistemas

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Glosario

Direccionamiento IP: La dirección IP es el identificador del dispositivo dentro de una red y debe ser único dentro de los límites de dicha red. El uso, formato, tipos y demás características del direccionamiento IP están incluidos en lo que se conoce como protocolo IP (Internet Protocol).

Enrutamiento RIP: Es un protocolo de enrutamiento del tipo vector distancia. Los protocolos de enrutamiento vector distancia calculan la mejor ruta para encaminar los paquetes IP hacia su destino correspondiente utilizando como métrica el número de saltos (Hop Count).

Enrutamiento estático: Es un método manual que requiere que el administrador indique explícitamente en cada equipo las redes que puede alcanzar y por qué camino hacerlo.

Balanceo de carga y redundancia: Este tipo de configuración tiene la ventaja de que si se cae un proveedor todo el tráfico sea redirigido por el ISP activo, o si ambos funcionan correctamente dividir todas las conexiones salientes por ambos servicios.

Protocolo de encapsulamiento PPP: Es un método para encapsular datagramas a través de enlaces seriales PPP, el cual utiliza un control de enlace de datos de alto nivel (hdlc).

DHCP: El protocolo de configuración dinámica de host (en inglés: Dynamic Host Configuration Protocol, también conocido por sus siglas de DHCP) es un protocolo de red de tipo cliente/servidor mediante el cual un servidor DHCP asigna dinámicamente una dirección IP y otros parámetros de configuración de red a cada dispositivo en una red para que puedan comunicarse con otras redes IP.

Protocolo de enrutamiento OSPF: Open Shortest Path First (OSPF), Primer Camino Más Corto, es un protocolo de red para encaminamiento jerárquico de pasarela interior o Interior Gateway Protocol (IGP), que usa el algoritmo Dijkstra, para calcular la ruta más corta entre dos nodos.

Vlan: Es un acrónimo que deriva de una expresión inglesa: virtual LAN. Esa expresión, por su parte, alude a una sigla ya que LAN significa Local Area Network. De este modo, podemos afirmar que la idea de VLAN refiere a una red de área local (lo que conocemos como LAN) de carácter virtual.

Nat: Network Address Translation (Traducción de direcciones de red). Este sistema hace que redes de ordenadores utilicen un rango de direcciones especiales (Ips privadas) y se conecten a internet usando una única dirección IP (IP pública).

Resumen

La evolución de la tecnología y el uso de medios de comunicación, ha conllevado a que diariamente se estructuren diferentes herramientas, con el fin de garantizar que los usuarios puedan acceder a todos los servicios que las tecnologías de la información y la comunicación brindan actualmente.

Aun así ningún dispositivo o medio tendría tanto beneficio, si no existieran las redes. Es por esto que en el presente informe se da a conocer cómo un especialista debería configurar una serie de equipos, para garantizar que una red transmita información de un punto a otro.

Aquí se podrá evidenciar cuál es el procedimiento para configurar las condiciones básicas y direccionamiento de un switch y router, el enrutamiento RIP y estático, el balanceo de carga, el protocolo RIP, la configuración de un servidor DHCP, entre otros conceptos que son necesarios para el funcionamiento de una red de datos.

Introducción

Teniendo en cuenta que una red es definida como un sistema a través del cual se comparte recursos e información, gracias a un conjunto de hardware y software que sirve como medio para la transferencia de datos, es importante conocer cuáles son los tipos de redes que existen y el alcance de las mismas.

Entre las redes más comunes están la red LAN y WAN siendo estas una red de área local y red de área amplia, respectivamente. Para poder configurar cualquiera de éstas dos redes es necesario acceder a los dispositivos usando una serie de comandos, que permiten no solo ingresar al software de los equipos, sino modificar su funcionamiento a partir de este. En toda red, se requiere configurar las NIC de los equipos, los switches, los routers, los servidores y cualquier otro elemento que componga la infraestructura, principalmente en cuanto al direccionamiento IP el cuál se constituye en uno de los elementos más importantes para establecer la comunicación.

Dicha configuración estará basada en los niveles que conformen la topología, las capas de acceso a la red, volumen de usuarios, cantidad de conexiones, flujo de datos y demás necesidades de acuerdo a la demanda del servicio.

Objetivos

Objetivo General

- Configurar cada uno de los escenarios propuestos, para lograr la transferencia de información en el entorno de red, poniendo en práctica los módulos vistos en el diseño e implementación de redes integradas Lan y Wan.

Objetivos específicos

- Efectuar la configuración de alistamiento para cada dispositivo.
- Realizar la conexión física de los equipos de acuerdo a la topología de red.
- Crear la tabla de enrutamiento de cada uno de los escenarios propuestos
- Configurar el enrutamiento en cada uno de los dispositivos que conforman la infraestructura de red
- Aplicar los diferentes protocolos de red de acuerdo a lo solicitado
- Establecer rutas estáticas y/o dinámicas de acuerdo al Proveedor de servicios de Internet.
- Configurar la autenticación PAT
- Especificar las características del servicio DHCP y configurar los dispositivos de acuerdo a lo requerido.
- Verificar la comunicación entre los dispositivos.

Evaluación – Prueba de habilidades prácticas CCNA

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

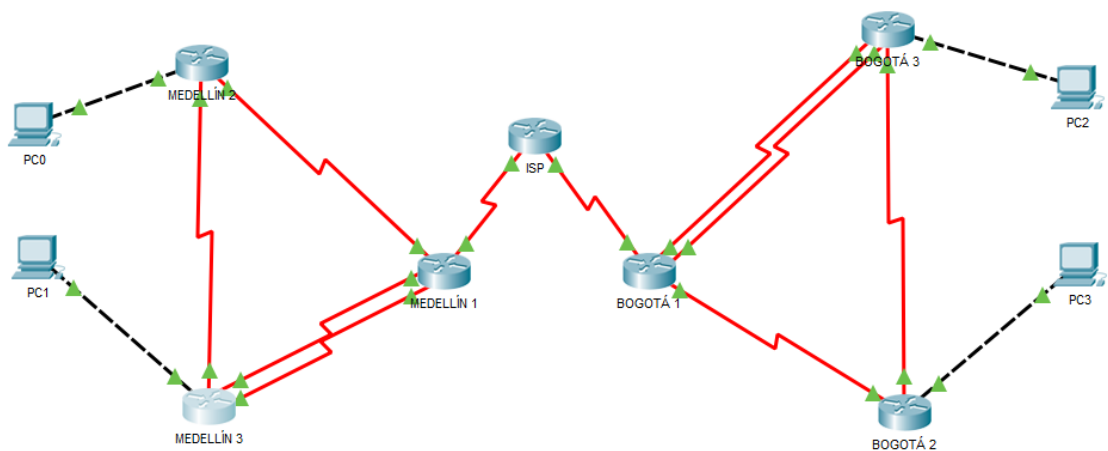
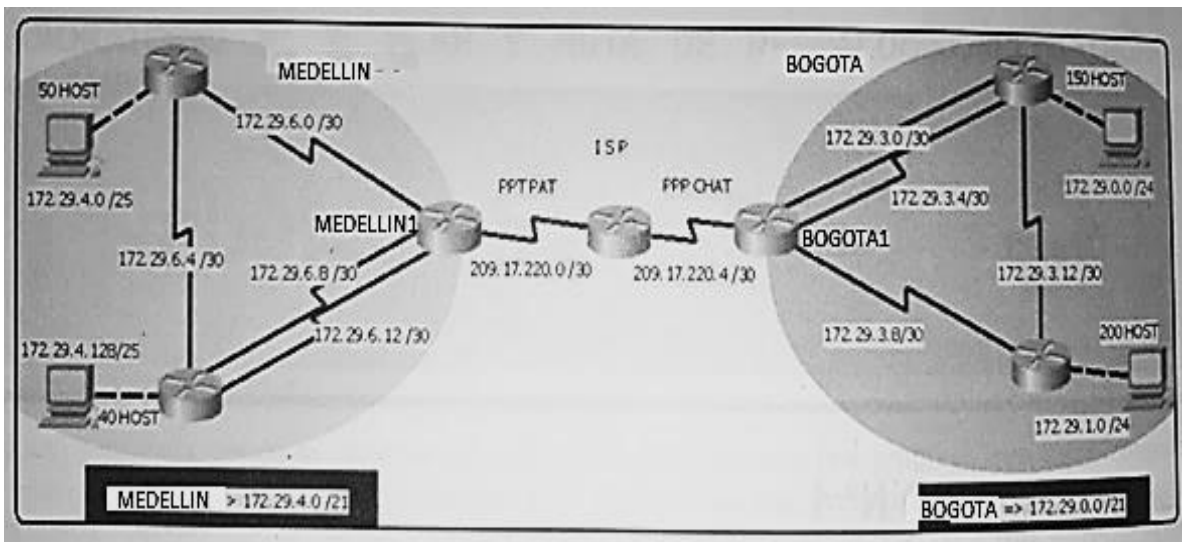


Gráfico No. 1: Topología
Fuente: Elaboración propia

1. Configuración Inicial

1.1. Configuración Router Isp

```
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#no ip domain-lookup
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)#exit
ISP(config)#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 #
Enter TEXT message. End with the character '#'.
**** Servicio Restringido - Solo se permite acceso a personal autorizado **** #
ISP(config)#exit
ISP#
%SYS-5-CONFIG_I: Configured from console by console
ISP#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
ISP#
ISP#exit
```

1.2. Configuración Router Medellin 1

```
MEDELLIN_1>enable
Password:
MEDELLIN_1#config t
Enter configuration commands, one per line. End with CNTL/Z.
MEDELLIN_1(config)#no ip domain-lookup
MEDELLIN_1(config)#hostname MEDELLIN_1
MEDELLIN_1(config)#enable secret class
MEDELLIN_1(config)#line console 0
MEDELLIN_1(config-line)#password cisco
MEDELLIN_1(config-line)#login
```

```

MEDELLIN_1(config-line)#exit
MEDELLIN_1(config)#line vty 0 4
MEDELLIN_1(config-line)#password cisco
MEDELLIN_1(config-line)#login
MEDELLIN_1(config-line)#exit
MEDELLIN_1(config)#service password-encryption
MEDELLIN_1(config)#banner motd #
Enter TEXT message. End with the character '#'.
**** Servicio Restringido - Solo se permite acceso a personal autorizado **** #
MEDELLIN_1(config)#exit
MEDELLIN_1#
%SYS-5-CONFIG_I: Configured from console by console
MEDELLIN_1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
MEDELLIN_1#exit

```

1.3. Configuración Router Medellin 2

```

Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#no ip domain-lookup
Router(config)#hostname MEDELLIN_2
MEDELLIN_2(config)#enable secret class
MEDELLIN_2(config)#line console 0
MEDELLIN_2(config-line)#password cisco
MEDELLIN_2(config-line)#login
MEDELLIN_2(config-line)#exit
MEDELLIN_2(config)#line vty 0 4
MEDELLIN_2(config-line)#password cisco
MEDELLIN_2(config-line)#login
MEDELLIN_2(config-line)#exit
MEDELLIN_2(config)#service password-encryption
MEDELLIN_2(config)#banner motd #
Enter TEXT message. End with the character '#'.
*** Servicio Restringido - Solo se permite acceso a personal autorizado **** #
MEDELLIN_2(config)#exit
MEDELLIN_2#
%SYS-5-CONFIG_I: Configured from console by console
MEDELLIN_2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...

```

```
[OK]
MEDELLIN_2#exit
```

1.4. Configuración Router Medellín 3

```
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#no ip domain-lookup
Router(config)#hostname MEDELLIN_3
MEDELLIN_3(config)#enable secret class
MEDELLIN_3(config)#line console 0
MEDELLIN_3(config-line)#password cisco
MEDELLIN_3(config-line)#login
MEDELLIN_3(config-line)#exit
MEDELLIN_3(config)#line vty 0 4
MEDELLIN_3(config-line)#password cisco
MEDELLIN_3(config-line)#login
MEDELLIN_3(config-line)#exit
MEDELLIN_3(config)#service password-encryption
MEDELLIN_3(config)#banner motd #
Enter TEXT message. End with the character '#'.
**** Servicio restringido - Solo se permite acceso a personal autorizado **** #
MEDELLIN_3(config)#exit
MEDELLIN_3#
%SYS-5-CONFIG_I: Configured from console by console
MEDELLIN_3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
MEDELLIN_3#exit
```

1.5. Configuración Router Bogotá 1

```
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#no ip domain-lookup
Router(config)#hostname BOGOTA_1
BOGOTA_1(config)#enable secret class
BOGOTA_1(config)#line console 0
BOGOTA_1(config-line)#password cisco
BOGOTA_1(config-line)#login
```

```

BOGOTA_1(config-line)#exit
BOGOTA_1(config)#line vty 0 4
BOGOTA_1(config-line)#password cisco
BOGOTA_1(config-line)#login
BOGOTA_1(config-line)#exit
BOGOTA_1(config)#service password-encryption
BOGOTA_1(config)#banner motd #
Enter TEXT message. End with the character '#'.
**** Servicio restringido - Solo se permite acceso a personal autorizado **** #
BOGOTA_1(config)#exit
BOGOTA_1#
%SYS-5-CONFIG_I: Configured from console by console
BOGOTA_1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BOGOTA_1#exit

```

1.6. Configuración Router Bogotá 2

```

Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#no ip domain-lookup
Router(config)#hostname BOGOTA_2
BOGOTA_2(config)#enable secret class
BOGOTA_2(config)#line console 0
BOGOTA_2(config-line)#password cisco
BOGOTA_2(config-line)#login
BOGOTA_2(config-line)#exit
BOGOTA_2(config)#line vty 0 4
BOGOTA_2(config-line)#password cisco
BOGOTA_2(config-line)#login
BOGOTA_2(config-line)#exit
BOGOTA_2(config)#service password-encryption
BOGOTA_2(config)#banner motd #
Enter TEXT message. End with the character '#'.
**** Servicio restringido - solo se permite acceso a personal autorizado **** #
BOGOTA_2(config)#exit
BOGOTA_2#
%SYS-5-CONFIG_I: Configured from console by console
BOGOTA_2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...

```



```
[OK]
BOGOTA_2#exit
```

1.7. Configuración Router Bogotá 3

```
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#no ip domain-lookup
Router(config)#hostname BOGOTA_3
BOGOTA_3(config)#enable secret class
BOGOTA_3(config)#line console 0
BOGOTA_3(config-line)#password cisco
BOGOTA_3(config-line)#login
BOGOTA_3(config-line)#exit
BOGOTA_3(config)#line vty 0 4
BOGOTA_3(config-line)#password cisco
BOGOTA_3(config-line)#login
BOGOTA_3(config-line)#exit
BOGOTA_3(config)#service password-encryption
BOGOTA_3(config)#banner motd #
Enter TEXT message. End with the character '#'.
**** Servicio restringido - Solo se permite acceso a personal autorizado **** #
BOGOTA_3(config)#exit
BOGOTA_3#
%SYS-5-CONFIG_I: Configured from console by console
BOGOTA_3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BOGOTA_3#exit
```

2. CONFIGURACIÓN DIRECCIONAMIENTO IP

2.1. Direccionamiento Router Isp

```
ISP>enable
Password:
ISP#config t
Enter configuration commands, one per line. End with CNTL/Z.
ISP(config)#int s0/0/0
ISP(config-if)#ip address 209.17.220.1 255.255.255.252
ISP(config-if)#clock rate 2000000
```

```

ISP(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down
ISP(config-if)#int s0/0/1
ISP(config-if)#ip address 209.17.220.5 255.255.255.252
ISP(config-if)#clock rate 2000000
ISP(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to down
ISP(config-if)#end
ISP#
%SYS-5-CONFIG_I: Configured from console by console
ISP#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
ISP#exit

```

2.2. Direcccionamiento Router Bogotá 1

```

BOGOTA_1>enable
Password:
BOGOTA_1#config t
Enter configuration commands, one per line. End with CNTL/Z.
BOGOTA_1(config)#int s0/0/0
BOGOTA_1(config-if)#ip address 209.17.220.6 255.255.255.252
BOGOTA_1(config-if)#no shutdown
BOGOTA_1(config-if)#no shutdown
BOGOTA_1(config-if)#int s0/0/1
BOGOTA_1(config-if)#ip address 172.29.3.9 255.255.255.252
BOGOTA_1(config-if)#clock rate 2000000
BOGOTA_1(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to down
BOGOTA_1(config-if)#int s0/1/0
BOGOTA_1(config-if)#ip address 172.29.3.1 255.255.255.252
BOGOTA_1(config-if)#clock rate 2000000
BOGOTA_1(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to down
BOGOTA_1(config-if)#int s0/1/1
BOGOTA_1(config-if)#ip address 172.29.3.5 255.255.255.252
BOGOTA_1(config-if)#clock rate 2000000
BOGOTA_1(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/1/1, changed state to down
BOGOTA_1(config-if)#end
BOGOTA_1#
%SYS-5-CONFIG_I: Configured from console by console

```

```
BOGOTA_1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BOGOTA_1#exit
```

2.3. Direcccionamiento Router Bogotá 2

```
BOGOTA_2>enable
Password:
BOGOTA_2#config t
Enter configuration commands, one per line. End with CNTL/Z.
BOGOTA_2(config)#int s0/0/0
BOGOTA_2(config-if)#ip address 172.29.3.10 255.255.255.252
BOGOTA_2(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down
BOGOTA_2(config-if)#int s0/0/1
BOGOTA_2(config-if)#ip address 172.29.3.13 255.255.255.252
BOGOTA_2(config-if)#clock rate 2000000
BOGOTA_2(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to down
BOGOTA_2(config-if)#int g0/0
BOGOTA_2(config-if)#ip address 172.29.1.1 255.255.255.0
BOGOTA_2(config-if)#no shutdown
BOGOTA_2(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up
BOGOTA_2(config-if)#end
BOGOTA_2#
%SYS-5-CONFIG_I: Configured from console by console
BOGOTA_2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BOGOTA_2#exit
```

2.4. Direcccionamiento Router Bogotá 3

```
BOGOTA_3>enable
Password:
Password:
BOGOTA_3#config t
Enter configuration commands, one per line. End with CNTL/Z.
BOGOTA_3(config)#int s0/0/0
```

```

BOGOTA_3(config-if)#ip address 172.29.3.2 255.255.255.252
BOGOTA_3(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down
BOGOTA_3(config-if)#int s0/0/1
BOGOTA_3(config-if)#ip address 172.29.3.6 255.255.255.252
BOGOTA_3(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to down
BOGOTA_3(config-if)#int s0/1/0
BOGOTA_3(config-if)#ip address 172.29.3.14 255.255.255.252
BOGOTA_3(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to down
BOGOTA_3(config-if)#int g0/0
BOGOTA_3(config-if)#ip address 172.29.0.1 255.255.255.0
BOGOTA_3(config-if)#no shutdown
BOGOTA_3(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up
BOGOTA_3(config-if)#end
BOGOTA_3#
%SYS-5-CONFIG_I: Configured from console by console
BOGOTA_3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BOGOTA_3#exit

```

2.5. Direcccionamiento Router Medellín 1

```

MEDELLIN_1>enable
Password:
MEDELLIN_1#config t
Enter configuration commands, one per line. End with CNTL/Z.
MEDELLIN_1(config)#int s0/0/0
MEDELLIN_1(config-if)#ip address 209.17.220.2 255.255.255.252
MEDELLIN_1(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down
MEDELLIN_1(config-if)#int s0/0/1
MEDELLIN_1(config-if)#ip address 172.29.6.1 255.255.255.252
MEDELLIN_1(config-if)#clock rate 2000000
MEDELLIN_1(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to down
MEDELLIN_1(config-if)#int s0/1/0
MEDELLIN_1(config-if)#ip address 172.29.6.9 255.255.255.252
MEDELLIN_1(config-if)#clock rate 2000000
MEDELLIN_1(config-if)#no shutdown

```

```

%LINK-5-CHANGED: Interface Serial0/1/0, changed state to down
MEDELLIN_1(config-if)#int s0/1/1
MEDELLIN_1(config-if)#ip address 172.29.6.13 255.255.255.252
MEDELLIN_1(config-if)#clock rate 2000000
MEDELLIN_1(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/1/1, changed state to down
MEDELLIN_1(config-if)#end
MEDELLIN_1#
%SYS-5-CONFIG_I: Configured from console by console
MEDELLIN_1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
MEDELLIN_1#exit

```

2.6. Direcccionamiento Router Medellín 2

```

MEDELLIN_2>enable
Password:
MEDELLIN_2#config t
Enter configuration commands, one per line. End with CNTL/Z.
MEDELLIN_2(config)#int s0/0/0
MEDELLIN_2(config-if)#ip address 172.29.6.2 255.255.255.252
MEDELLIN_2(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down
MEDELLIN_2(config-if)#int s0/0/1
MEDELLIN_2(config-if)#ip address 172.29.6.5 255.255.255.252
MEDELLIN_2(config-if)#clock rate 2000000
MEDELLIN_2(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to down
MEDELLIN_2(config-if)#int g0/0
MEDELLIN_2(config-if)#ip address 172.29.4.1 255.255.255.128
MEDELLIN_2(config-if)#no shutdown
MEDELLIN_2(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up
MEDELLIN_2(config-if)#end
MEDELLIN_2#
%SYS-5-CONFIG_I: Configured from console by console
MEDELLIN_2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
MEDELLIN_2#exit

```

2.7. Direcccionamiento Router Medellín 3

```
MEDELLIN_3>enable
Password:
MEDELLIN_3#config t
Enter configuration commands, one per line. End with CNTL/Z.
MEDELLIN_3(config)#int s0/0/0
MEDELLIN_3(config-if)#ip address 172.29.6.10 255.255.255.252
MEDELLIN_3(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down
MEDELLIN_3(config-if)#int s0/0/1
MEDELLIN_3(config-if)#ip address 172.29.6.14 255.255.255.252
MEDELLIN_3(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to down
MEDELLIN_3(config-if)#int s0/1/0
MEDELLIN_3(config-if)#ip address 172.29.6.6 255.255.255.252
MEDELLIN_3(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to down
MEDELLIN_3(config-if)#int g0/0
MEDELLIN_3(config-if)#ip address 172.29.4.129 255.255.255.128
MEDELLIN_3(config-if)#no shutdown
MEDELLIN_3(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up
MEDELLIN_3(config-if)#end
MEDELLIN_3#
%SYS-5-CONFIG_I: Configured from console by console
MEDELLIN_3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
MEDELLIN_3#exit
```

3. Configuración del enrutamiento

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

3.1.1. Enrutamiento Rip Versión 2 - Bogotá 1

```
BOGOTA_1>enable
Password:
BOGOTA_1#config t
Enter configuration commands, one per line. End with CNTL/Z.
```

```

BOGOTA_1(config)#router rip
BOGOTA_1(config-router)#version 2
BOGOTA_1(config-router)#no auto-summary
BOGOTA_1(config-router)#do show ip route connected
C 172.29.3.0/30 is directly connected, Serial0/1/0
C 172.29.3.4/30 is directly connected, Serial0/1/1
C 172.29.3.8/30 is directly connected, Serial0/0/1
C 209.17.220.4/30 is directly connected, Serial0/0/0
BOGOTA_1(config-router)#network 172.29.3.0
BOGOTA_1(config-router)#network 172.29.3.4
BOGOTA_1(config-router)#network 172.29.3.8
BOGOTA_1(config-router)#passive-interface s0/0/0
BOGOTA_1(config-router)#end
BOGOTA_1#
%SYS-5-CONFIG_I: Configured from console by console
BOGOTA_1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BOGOTA_1#exit

```

3.1.2. Enrutamiento Rip Versión 2 - Bogotá 2

```

BOGOTA_2>enable
Password:
BOGOTA_2#config t
Enter configuration commands, one per line. End with CNTL/Z.
BOGOTA_2(config)#router rip
BOGOTA_2(config-router)#version 2
BOGOTA_2(config-router)#no auto-summary
BOGOTA_2(config-router)#do show ip route connected
C 172.29.3.8/30 is directly connected, Serial0/0/0
C 172.29.3.12/30 is directly connected, Serial0/0/1
BOGOTA_2(config-router)#network 172.29.1.0
BOGOTA_2(config-router)#network 172.29.3.8
BOGOTA_2(config-router)#network 172.29.3.12
BOGOTA_2(config-router)#passive-interface g0/0
BOGOTA_2(config-router)#end
BOGOTA_2#
%SYS-5-CONFIG_I: Configured from console by console
BOGOTA_2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]

```

BOGOTA_2#exit

3.1.3. Enrutamiento Rip Versión 2 - Bogotá 3

```
BOGOTA_3>enable
Password:
BOGOTA_3#config t
Enter configuration commands, one per line. End with CNTL/Z.
BOGOTA_3(config)#router rip
BOGOTA_3(config-router)#version 2
BOGOTA_3(config-router)#no auto-summary
BOGOTA_3(config-router)#do show ip route connected
C 172.29.3.0/30 is directly connected, Serial0/0/0
C 172.29.3.4/30 is directly connected, Serial0/0/1
C 172.29.3.12/30 is directly connected, Serial0/1/0
BOGOTA_3(config-router)#network 172.29.0.0
BOGOTA_3(config-router)#network 172.29.3.0
BOGOTA_3(config-router)#network 172.29.3.4
BOGOTA_3(config-router)#network 172.29.3.12
BOGOTA_3(config-router)#passive-interface g0/0
BOGOTA_3(config-router)#end
BOGOTA_3#
%SYS-5-CONFIG_I: Configured from console by console
BOGOTA_3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BOGOTA_3#exit
```

3.1.4. Enrutamiento Rip Versión 2 – Medellín 1

```
MEDELLIN_1>enable
Password:
MEDELLIN_1#config t
Enter configuration commands, one per line. End with CNTL/Z.
MEDELLIN_1(config)#router rip
MEDELLIN_1(config-router)#version 2
MEDELLIN_1(config-router)#no auto-summary
MEDELLIN_1(config-router)#do show ip route connected
C 172.29.6.0/30 is directly connected, Serial0/0/1
C 172.29.6.8/30 is directly connected, Serial0/1/0
C 172.29.6.12/30 is directly connected, Serial0/1/1
C 209.17.220.0/30 is directly connected, Serial0/0/0
```



```
MEDELLIN_1(config-router)#network 172.29.4.0
MEDELLIN_1(config-router)#network 172.29.6.0
MEDELLIN_1(config-router)#network 172.29.6.4
MEDELLIN_1(config-router)#passive-interface g0/0
MEDELLIN_1(config-router)#end
MEDELLIN_1#
%SYS-5-CONFIG_I: Configured from console by console
MEDELLIN_1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
MEDELLIN_1#exit
```

3.1.5. Enrutamiento Rip Versión 2 – Medellín 2

```
MEDELLIN_2>enable
Password:
MEDELLIN_2#config t
Enter configuration commands, one per line. End with CNTL/Z.
MEDELLIN_2(config)#router rip
MEDELLIN_2(config-router)#version 2
MEDELLIN_2(config-router)#no auto-summary
MEDELLIN_2(config-router)#do show ip route connected
C 172.29.6.0/30 is directly connected, Serial0/0/0
C 172.29.6.4/30 is directly connected, Serial0/0/1
MEDELLIN_2(config-router)#network 172.29.4.0
MEDELLIN_2(config-router)#network 172.29.6.0
MEDELLIN_2(config-router)#network 172.29.6.4
MEDELLIN_2(config-router)#passive-interface g0/0
MEDELLIN_2(config-router)#end
MEDELLIN_2#
%SYS-5-CONFIG_I: Configured from console by console
MEDELLIN_2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
MEDELLIN_2#exit
```

3.1.6. Enrutamiento Rip Versión 2 – Medellín 3

```
MEDELLIN_3>enable
Password:
MEDELLIN_3#config t
```

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

```
MEDELLIN_3(config)#router rip
MEDELLIN_3(config-router)#version 2
MEDELLIN_3(config-router)#no auto-summary
MEDELLIN_3(config-router)#do show ip route connected
C 172.29.6.4/30 is directly connected, Serial0/1/0
C 172.29.6.8/30 is directly connected, Serial0/0/0
C 172.29.6.12/30 is directly connected, Serial0/0/1
```

```
MEDELLIN_3(config-router)#network 172.29.4.128
MEDELLIN_3(config-router)#network 172.29.6.4
MEDELLIN_3(config-router)#network 172.29.6.8
MEDELLIN_3(config-router)#network 172.29.6.12
MEDELLIN_3(config-router)#passive-interface g0/0
MEDELLIN_3(config-router)#end
MEDELLIN_3#
%SYS-5-CONFIG_I: Configured from console by console
```

```
MEDELLIN_3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
MEDELLIN_3#exit
```

3.2. 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.

3.2.1. Bogotá 1

```
BOGOTA_1>enable
Password:
BOGOTA_1#config t
Enter configuration commands, one per line. End with CNTL/Z.
BOGOTA_1(config)#ip route 0.0.0.0 0.0.0.0 209.17.220.5
BOGOTA_1(config)#router rip
BOGOTA_1(config-router)#default-information originate
BOGOTA_1(config-router)#end
BOGOTA_1#
%SYS-5-CONFIG_I: Configured from console by console
BOGOTA_1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
```

BOGOTA_1#exit

```
BOGOTA_1>enable
Password:
BOGOTA_1#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 209.17.220.5 to network 0.0.0.0

172.29.0.0/16 is variably subnetted, 7 subnets, 3 masks
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, 00:00:04, Serial0/0/1
    120/1 via 172.29.3.2, 00:00:25, Serial0/1/0
    120/1 via 172.29.3.6, 00:00:25, Serial0/1/1
209.17.220.0/24 is variably subnetted, 2 subnets, 2 masks
C    209.17.220.4/30 is directly connected, Serial0/0/0
--More--
```

Gráfico No. 2: Diagnostico de enrutamiento IP Router Bogota

Fuente: Elaboración propia

3.2.2. Medellín 1

MEDELLIN_1>enable

Password:

MEDELLIN_1#config t

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

MEDELLIN_1(config)#ip route 0.0.0.0 0.0.0.0 209.17.220.1

MEDELLIN_1(config)#router rip

MEDELLIN_1(config-router)#default-information originate

MEDELLIN_1(config-router)#end

MEDELLIN_1#

%SYS-5-CONFIG_I: Configured from console by console

MEDELLIN_1#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

MEDELLIN_1#exit

```
MEDELLIN_1>enable
Password:
MEDELLIN_1#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, 6 subnets, 2 masks
C    172.29.6.0/30 is directly connected, Serial0/0/1
L    172.29.6.1/32 is directly connected, Serial0/0/1
C    172.29.6.8/30 is directly connected, Serial0/1/0
L    172.29.6.9/32 is directly connected, Serial0/1/0
C    172.29.6.12/30 is directly connected, Serial0/1/1
L    172.29.6.13/32 is directly connected, Serial0/1/1
C    209.17.220.0/24 is variably subnetted, 2 subnets, 2 masks
L    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
```

Gráfico No. 3: Diagnostico de enrutamiento IP Router Medellín 1

Fuente: Elaboración propia.

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

La sumariación de rutas las cuales se conocen como superredes o supernetting buscan reducir significativamente las entradas en la tabla de enrutamiento, resumiendo la informaci3n de direccinamiento en un solo bloque ip¹.

Tabla No. 1: Tabla de Sumarizaci3n Bogot3

IP/SUB RED	DIRECCIONES EN BINARIO			
172.29.0.0/24	1 0 1 0 1 1 0 0	0 0 0 1 1 1 0 1	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0
172.29.1.0/24	1 0 1 0 1 1 0 0	0 0 0 1 1 1 0 1	0 0 0 0 0 0 0 1	0 0 0 0 0 0 0 0
172.29.3.12/30	1 0 1 0 1 1 0 0	0 0 0 1 1 1 0 1	0 0 0 0 0 0 1 1	0 0 0 0 1 1 0 0
172.29.3.8/30	1 0 1 0 1 1 0 0	0 0 0 1 1 1 0 1	0 0 0 0 0 0 1 1	0 0 0 0 1 0 0 0
172.29.3.4/30	1 0 1 0 1 1 0 0	0 0 0 1 1 1 0 1	0 0 0 0 0 0 1 1	0 0 0 0 0 1 0 0
172.29.3.0/30	1 0 1 0 1 1 0 0	0 0 0 1 1 1 0 1	0 0 0 0 0 0 1 1	0 0 0 0 0 0 0 0
172.29.0.0/22	1 0 1 0 1 1 0 0	0 0 0 1 1 1 0 1	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0

POSICI3N DE BITS COM3NES EN AMBAS SUBREDES

Tabla No. 1: Tabla de sumariaci3n Bogot3

Fuente: Elaboraci3n propia

Tabla No. 2: Tabla de Sumarizaci3n Medell3n

IP/SUB RED	DIRECCIONES EN BINARIO			
172.29.4.0/25	1 0 1 0 1 1 0 0	0 0 0 1 1 1 0 1	0 0 0 0 0 1 0 0	0 0 0 0 0 0 0 0
172.29.4.128/25	1 0 1 0 1 1 0 0	0 0 0 1 1 1 0 1	0 0 0 0 0 1 0 0	1 0 0 0 0 0 0 0
172.29.6.4/30	1 0 1 0 1 1 0 0	0 0 0 1 1 1 0 1	0 0 0 0 0 1 1 0	0 0 0 0 0 1 0 0
172.29.6.0/30	1 0 1 0 1 1 0 0	0 0 0 1 1 1 0 1	0 0 0 0 0 1 1 0	0 0 0 0 0 0 0 0
172.29.6.8/30	1 0 1 0 1 1 0 0	0 0 0 1 1 1 0 1	0 0 0 0 0 1 1 0	0 0 0 0 1 0 0 0
172.29.6.12/30	1 0 1 0 1 1 0 0	0 0 0 1 1 1 0 1	0 0 0 0 0 1 1 0	0 0 0 0 1 1 0 0
172.29.4.0/22	1 0 1 0 1 1 0 0	0 0 0 1 1 1 0 1	0 0 0 0 0 1 0 0	0 0 0 0 0 0 0 0

POSICI3N DE BITS COM3NES EN AMBAS SUBREDES

Tabla No. 2: Tabla de sumariaci3n Medell3n

Fuente: Elaboraci3n propia

¹ Colomes, Paulo (2010). Sumariaci3n de rutas (superredes o supernetting) y rutas por defecto (default routes). Redescisco.net. <http://www.redescisco.net/sitio/2010/06/26/sumariacion-de-rutas-superredes-o-supernetting-y-rutas-por-defecto-default-routes/>

3.3.1. Enrutamiento Estático Isp

```
ISP>enable
Password:
ISP#config t
Enter configuration commands, one per line. End with CNTL/Z.
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
ISP(config)#end
ISP#
%SYS-5-CONFIG_I: Configured from console by console
ISP#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
ISP#exit
```

3.4. Tabla de Enrutamiento.

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

Tabla No. 3: Tabla de enrutamiento

DISPOSITIVO	INTERFAZ	DIRECCIÓN IP	MÁSCARA DE SUBRED
ISP	S 0/0/0	209.17.220.1	255.255.255.252
	S 0/0/1	209.17.220.5	255.255.255.252
BOGOTÁ 1	S 0/0/0	209.17.220.6	255.255.255.252
	S 0/0/1	172.29.3.9	255.255.255.252
	S 0/1/0	172.29.3.1	255.255.255.252
	S 0/1/1	172.29.3.5	255.255.255.252
BOGOTÁ 2	S 0/0/0	172.29.3.10	255.255.255.252
	S 0/0/1	172.29.3.13	255.255.255.252
	G 0/0	172.29.1.1	255.255.255.0
BOGOTÁ 3	S 0/0/0	172.29.3.2	255.255.255.252
	S 0/0/1	172.29.3.6	255.255.255.252
	S 0/1/0	172.29.3.14	255.255.255.252
	G 0/0	172.29.0.1	255.255.255.0
MEDELLÍN 1	S 0/0/0	209.17.220.2	255.255.255.252
	S 0/0/1	172.29.6.1	255.255.255.252
	S 0/1/0	172.29.6.9	255.255.255.252
	S 0/1/1	172.29.6.13	255.255.255.252

MEDELLÍN 2	S 0/0/0	172.29.6.2	255.255.255.252
	S 0/0/1	172.29.6.5	255.255.255.252
	G 0/0	172.29.4.1	255.255.255.128
MEDELLÍN 3	S 0/0/0	172.29.6.10	255.255.255.252
	S 0/0/1	172.29.6.14	255.255.255.252
	S 0/1/0	172.29.6.6	255.255.255.252
	G 0/0	172.29.4.129	255.255.255.128
PC0 (50 HOST)	NIC	DHCP	DHCP
PC1 (40 HOST)	NIC	DHCP	DHCP
PC2 (150 HOST)	NIC	DHCP	DHCP
PC3 (200 HOST)	NIC	DHCP	DHCP

Tabla No. 3: Tabla de enrutamiento

Fuente: Elaboración propia

3.4.2. Diagnostico de enrutamiento

Router Bogotá 1

```

BOGOTA_1#enable
Password:
BOGOTA_1#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 209.17.220.5 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 172.29.3.2, 00:00:08, Serial0/1/0
   [120/1] via 172.29.3.6, 00:00:08, Serial0/1/1
R 172.29.1.0/24 [120/1] via 172.29.3.10, 00:00:08, Serial0/0/1
C 172.29.3.0/30 is directly connected, Serial0/1/0
C 172.29.3.1/32 is directly connected, Serial0/1/0
L 172.29.3.4/30 is directly connected, Serial0/1/1
L 172.29.3.8/30 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, 00:00:08, Serial0/0/1
   [120/1] via 172.29.3.2, 00:00:08, Serial0/1/0
--More--

```

Grafico No. 4: Diagnostico de enrutamiento Bogotá 1

Fuente: Elaboración propia

Router Bogotá 2

```

BOGOTA_2#enable
Password:
BOGOTA_2#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, 00:00:15, Serial0/0/1
C 172.29.1.0/24 is directly connected, GigabitEthernet0/0
L 172.29.1.0/30 is directly connected, GigabitEthernet0/0
R 172.29.3.0/30 [120/1] via 172.29.3.9, 00:00:21, Serial0/0/0
   [120/1] via 172.29.3.14, 00:00:15, Serial0/0/1
R 172.29.3.4/30 [120/1] via 172.29.3.9, 00:00:21, Serial0/0/0
   [120/1] via 172.29.3.14, 00:00:15, 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
--More--

```

Grafico No. 5: Diagnostico de enrutamiento Bogotá 2

Fuente: Elaboración propia

Router Bogotá 3

```
BOGOTA_3#enable
Password:
BOGOTA_3#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 172.29.3.1 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, 00:00:05, 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 172.29.3.1, 00:00:05, Serial0/0/0
    [120/1] via 172.29.3.5, 00:00:05, Serial0/0/1
    [120/1] via 172.29.3.13, 00:00:05, Serial0/1/0
C    172.29.3.12/30 is directly connected, Serial0/1/0
--More--
```

Grafico No. 6: Diagnostico de enrutamiento Bogotá 3

Fuente: Elaboración propia

Router Medellín 1

```
MEDELLIN_1#enable
Password:
MEDELLIN_1#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, 6 subnets, 2 masks
C    172.29.6.0/30 is directly connected, Serial0/0/1
L    172.29.6.1/32 is directly connected, Serial0/0/1
C    172.29.6.8/30 is directly connected, Serial0/1/0
L    172.29.6.9/32 is directly connected, Serial0/1/0
C    172.29.6.12/30 is directly connected, Serial0/1/1
L    172.29.6.13/32 is directly connected, Serial0/1/1
C    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
MEDELLIN_1#
```

Grafico No. 7: Diagnostico de enrutamiento Medellín 1

Fuente: Elaboración propia

Router Medellín 2

```
MEDELLIN_2#enable
Password:
MEDELLIN_2#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

172.29.0.0/16 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    172.29.6.6/32 is directly connected, Serial0/0/1
R    172.29.6.8/30 [120/1] via 172.29.6.6, 00:00:17, Serial0/0/1
R    172.29.6.12/30 [120/1] via 172.29.6.6, 00:00:17, Serial0/0/1
MEDELLIN_2#
```

Grafico No. 8: Diagnostico de enrutamiento Medellín 2

Fuente: Elaboración propia

Router Medellín 3

```
MEDELLIN_3#enable
Password:
MEDELLIN_3#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

172.29.0.0/16 is variably subnetted, 10 subnets, 3 masks
R    172.29.4.0/25 [120/1] via 172.29.6.8, 00:00:25, Serial0/1/0
C    172.29.4.129/25 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 172.29.6.8, 00:00:25, 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

MEDELLIN_3#
```

Gráfico No. 9: Diagnostico de enrutamiento Medellín 3

Fuente: Elaboración propia

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

3.5.1. Balanceo de Carga y Redundancia en Bogotá 3 – Bogotá 1 / 3 Respectivamente

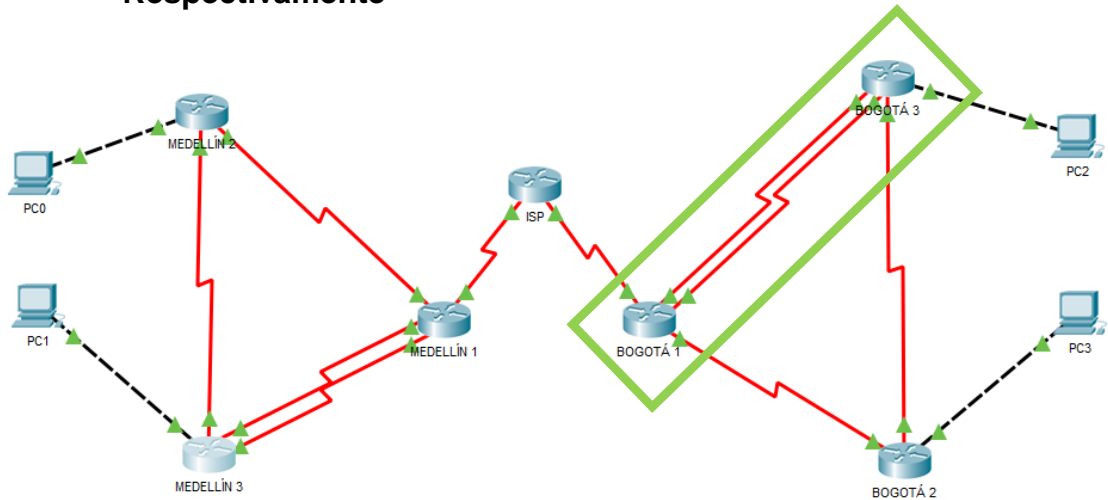


Gráfico No. 10: Balanceo de carga y redundancia Bogotá 3

Fuente: Elaboración propia


```

BOGOTA_3#enable
Password:
BOGOTA_3#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 172.29.3.1 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, 00:00:05, Serial0/1/0
C    172.29.3.0/30 is directly connected, Serial0/0/0
C    172.29.3.2/32 is directly connected, Serial0/0/0
L    172.29.3.4/30 is directly connected, Serial0/0/1
L    172.29.3.6/32 is directly connected, Serial0/0/3
R    172.29.3.8/30 [120/1] via 172.29.3.1, 00:00:05, Serial0/0/0
    [120/1] via 172.29.3.5, 00:00:05, Serial0/0/1
    [120/1] via 172.29.3.13, 00:00:05, Serial0/1/0
C    172.29.3.12/30 is directly connected, Serial0/1/0
--More--

```

Gráfico No. 11: Diagnostico de enrutamiento Bogotá 3

Fuente: Elaboración propia

3.5.2. Balanceo de Carga y Redundancia Medellín 3 – Medellín 1 / 3 Respectivamente

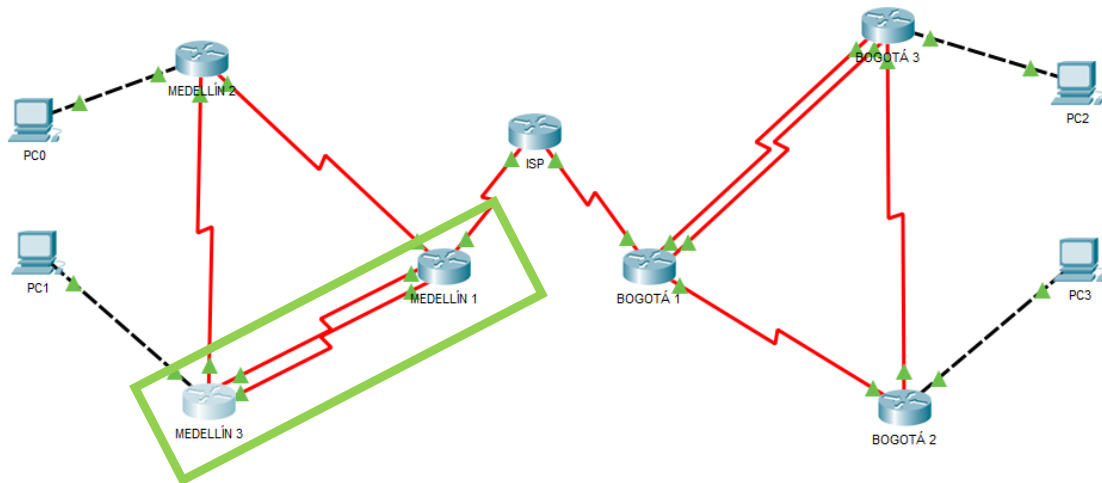


Gráfico No. 12: Balanceo de carga y redundancia Medellín 3

Fuente: Elaboración propia

```

MEDELLIN_3#enable
Password:
MEDELLIN_3#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

172.29.0.0/16 is variably subnetted, 10 subnets, 3 masks
R    172.29.4.0/25 [120/1] via 172.29.6.5, 00:00:15, Serial0/1/0
C    172.29.4.128/25 is directly connected, GigabitEthernet0/0
L    172.29.4.129/32 is directly connected, GigabitEthernet0/0
R    172.29.6.0/30 [120/1] via 172.29.6.5, 00:00:15, 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

```

Gráfico No. 13: Diagnostico de enrutamiento Medellín 3

Fuente: Elaboración propia

- 3.6. 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.
- 3.7. Los routers Medellín2 y Bogotá2 también presentan redes conectadas directamente y recibidas mediante RIP.
- 3.8. Las tablas de los routers restantes deben permitir visualizar rutas redundantes para el caso de la ruta por defecto.
- 3.9. El router ISP solo debe indicar sus rutas estáticas adicionales a las directamente conectadas.

```

ISP>enable
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, 3 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   209.17.220.8/32 is directly connected, Serial0/0/1

```

Grafico No. 14: Diagnostico de enrutamiento ISP

Fuente: Elaboración propia

4. Deshabilitar la propagación del protocolo RIP.

4.1. 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.

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

Tabla No. 4: Interfaces a desactivar de cada Router

Fuente: Universidad Nacional Abierta y a Distancia. Unad

4.2. Verificación del protocolo RIP.

4.2.1. 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.

4.2.2. 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.

5. Configurar encapsulamiento y autenticación PPP.

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

Medellín 1

```
MEDELLIN_1>enable
Password:
MEDELLIN_1#config t
Enter configuration commands, one per line. End with CNTL/Z.
MEDELLIN_1(config)#username ISP password cisco
MEDELLIN_1(config)#int s0/0/0
MEDELLIN_1(config-if)#encapsulation ppp
MEDELLIN_1(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state
to down
MEDELLIN_1(config-if)#ppp pap sent-username MEDELLIN_1 password cisco
MEDELLIN_1(config-if)#end
MEDELLIN_1#
%SYS-5-CONFIG_I: Configured from console by console
MEDELLIN_1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
MEDELLIN_1#exit
```

Isp

```
ISP>enable
Password:
ISP#config t
Enter configuration commands, one per line. End with CNTL/Z.
ISP(config)#username MEDELLIN_1 password cisco
ISP(config)#int s0/0/0
```

```

ISP(config-if)#encapsulation ppp
ISP(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state
to up
ISP(config-if)#ppp pap sent-username ISP password cisco
ISP(config-if)#end
ISP#
%SYS-5-CONFIG_I: Configured from console by console
ISP#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
ISP#exit

```

```

MEDELLIN_1>ping 209.17.220.1

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

```

Grafico No. 14: Prueba de diagnostico Ping Medellín 1 - ISP
Fuente: Elaboración propia

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

Bogotá 1

```

BOGOTA_1>enable
Password:
BOGOTA_1#config t
Enter configuration commands, one per line. End with CNTL/Z.
BOGOTA_1(config)#username ISP password cisco
BOGOTA_1(config)#int s0/0/0
BOGOTA_1(config-if)#encapsulation ppp
BOGOTA_1(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state
to down
BOGOTA_1(config-if)#ppp authentication chap
BOGOTA_1(config-if)#end
BOGOTA_1#
%SYS-5-CONFIG_I: Configured from console by console
BOGOTA_1#copy running-config startup-config
Destination filename [startup-config]?

```

Building configuration...

[OK]

BOGOTA_1#exit

Isp

ISP>enable

Password:

ISP#config t

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

ISP(config)#username BOGOTA_1 password cisco

ISP(config)#int s0/0/1

ISP(config-if)#encapsulation ppp

ISP(config-if)#ppp authentication chap

ISP(config-if)#end

ISP#

%SYS-5-CONFIG_I: Configured from console by console

ISP#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

ISP#exit

```
ISP>ping 209.17.220.6

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.17.220.6, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/8 ms

ISP>
```

Grafico No. 15: Prueba de diagnostico Ping ISP – Bogotá 1

Fuente: Elaboración propia

6. Configuración de PAT.

6.1. 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.

6.2. Después de verificar lo indicado en el paso anterior proceda a configurar el NAT en el router Medellín1. Compruebe que la traducción de direcciones indique las interfaces de entrada y de salida. Al realizar una prueba de ping, la dirección debe ser traducida automáticamente

a la dirección de la interfaz serial 0/1/0 del router Medellín1, cómo diferente puerto.

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

Bogotá 1

```
BOGOTA_1>enable
Password:
BOGOTA_1#config t
Enter configuration commands, one per line. End with CNTL/Z.
BOGOTA_1(config)#ip nat inside source list 1 interface s0/0/0 overload
BOGOTA_1(config)#access-list 1 permit 172.29.0.0 0.0.3.255
BOGOTA_1(config)#int s0/0/0
BOGOTA_1(config-if)#ip nat outside
BOGOTA_1(config-if)#int s0/0/1
BOGOTA_1(config-if)#ip nat inside
BOGOTA_1(config-if)#int s0/1/0
BOGOTA_1(config-if)#ip nat inside
BOGOTA_1(config-if)#int s0/1/1
BOGOTA_1(config-if)#ip nat inside
BOGOTA_1(config-if)#end
BOGOTA_1#
%SYS-5-CONFIG_I: Configured from console by console
BOGOTA_1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BOGOTA_1#exit
```

Medellín 1

```
MEDELLIN_1>enable
Password:
MEDELLIN_1#config t
Enter configuration commands, one per line. End with CNTL/Z.
MEDELLIN_1(config)#ip nat inside source list 1 interface s0/0/0 overload
MEDELLIN_1(config)#access-list 1 permit 172.29.4.0 0.0.3.255
MEDELLIN_1(config)#int s0/0/0
MEDELLIN_1(config-if)#ip nat outside
MEDELLIN_1(config-if)#int s0/0/1
```

```

MEDELLIN_1(config-if)#ip nat inside
MEDELLIN_1(config-if)#int s0/1/0
MEDELLIN_1(config-if)#ip nat inside
MEDELLIN_1(config-if)#int s0/1/1
MEDELLIN_1(config-if)#ip nat inside
MEDELLIN_1(config-if)#end
MEDELLIN_1#
%SYS-5-CONFIG_I: Configured from console by console
MEDELLIN_1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
MEDELLIN_1#exit

```

7. Configuración del servicio DHCP.

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

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

DHCP en Medellín 2

```

MEDELLIN_2>enable
Password:
MEDELLIN_2#config t
Enter configuration commands, one per line. End with CNTL/Z.
MEDELLIN_2(config)#ip dhcp excluded-address 172.29.4.1 172.29.4.5
MEDELLIN_2(config)#ip dhcp excluded-address 172.29.4.129 172.29.4.133
MEDELLIN_2(config)#ip dhcp pool MEDELLIN_2
MEDELLIN_2(dhcp-config)#network 172.29.4.0 255.255.255.128
MEDELLIN_2(dhcp-config)#default-router 172.29.4.1
MEDELLIN_2(dhcp-config)#dns-server 8.8.8.2
MEDELLIN_2(dhcp-config)#exit
MEDELLIN_2(config)#ip dhcp pool MEDELLIN_3
MEDELLIN_2(dhcp-config)#network 172.29.4.128 255.255.255.128
MEDELLIN_2(dhcp-config)#default-router 172.29.4.129
MEDELLIN_2(dhcp-config)#dns-server 8.8.8.2
MEDELLIN_2(dhcp-config)#exit
MEDELLIN_2(config)#end
MEDELLIN_2#
%SYS-5-CONFIG_I: Configured from console by console
MEDELLIN_2#copy running-config startup-config
Destination filename [startup-config]?

```

Building configuration...

[OK]

MEDELLIN_2#exit

Configuración Router Medellín 3

MEDELLIN_3>enable

Password:

MEDELLIN_3#config t

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

MEDELLIN_3(config)#int g0/0

MEDELLIN_3(config-if)#ip helper-address 172.29.6.5

MEDELLIN_3(config-if)#end

MEDELLIN_3#

%SYS-5-CONFIG_I: Configured from console by console

MEDELLIN_3#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

MEDELLIN_3#exit

Dhcp en Pc0

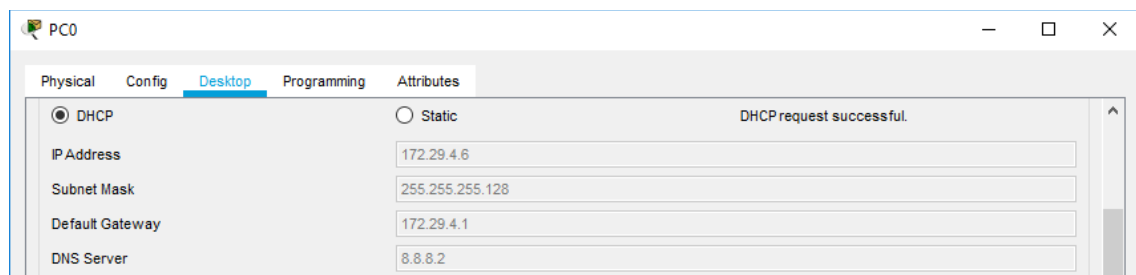


Grafico No. 16: Configuración DHCP PC0

Fuente: Elaboración propia

DHCP en Pc1

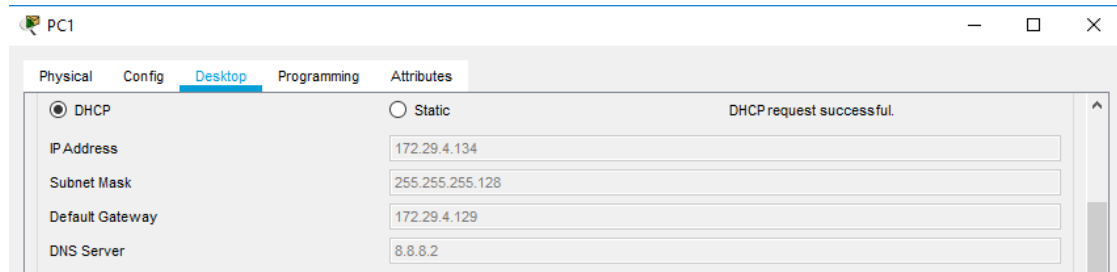


Grafico No. 17: Configuración DHCP PC1

Fuente: Elaboración propia

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

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

Configuración Router Bogotá 2

```
BOGOTA_2>enable
Password:
BOGOTA_2#config t
Enter configuration commands, one per line. End with CNTL/Z.
BOGOTA_2(config)#ip dhcp excluded-address 172.29.1.1 172.29.1.5
BOGOTA_2(config)#ip dhcp excluded-address 172.29.0.1 172.29.0.5
BOGOTA_2(config)#ip dhcp pool BOGOTA_2
BOGOTA_2(dhcp-config)#network 172.29.1.0 255.255.255.0
BOGOTA_2(dhcp-config)#default-router 172.29.1.1
BOGOTA_2(dhcp-config)#dns-server 8.8.8.2
BOGOTA_2(dhcp-config)#ip dhcp pool BOGOTA_3
BOGOTA_2(dhcp-config)#network 172.29.0.0 255.255.255.0
BOGOTA_2(dhcp-config)#default-router 172.29.0.1
BOGOTA_2(dhcp-config)#dns-server 8.8.8.2
BOGOTA_2(dhcp-config)#end
BOGOTA_2#
%SYS-5-CONFIG_I: Configured from console by console
BOGOTA_2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BOGOTA_2#exit
```

Configuración Router Bogotá 3

```
BOGOTA_3>enable
Password:
BOGOTA_3#config t
Enter configuration commands, one per line. End with CNTL/Z.
BOGOTA_3(config)#int g0/0
BOGOTA_3(config-if)#ip helper-address 172.29.3.13
BOGOTA_3(config-if)#end
BOGOTA_3#
%SYS-5-CONFIG_I: Configured from console by console
BOGOTA_3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
```

[OK]
BOGOTA_3#exit

DHCP en Pc2

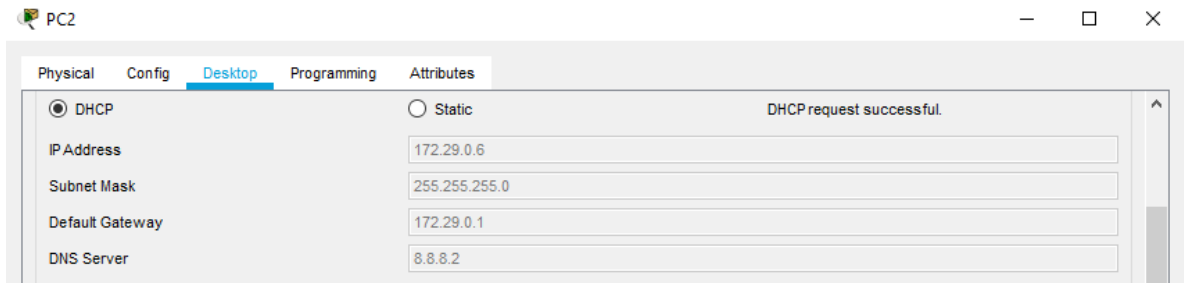


Grafico No. 18: Configuración DHCP PC2

Fuente: Elaboración propia

DHCP en Pc3

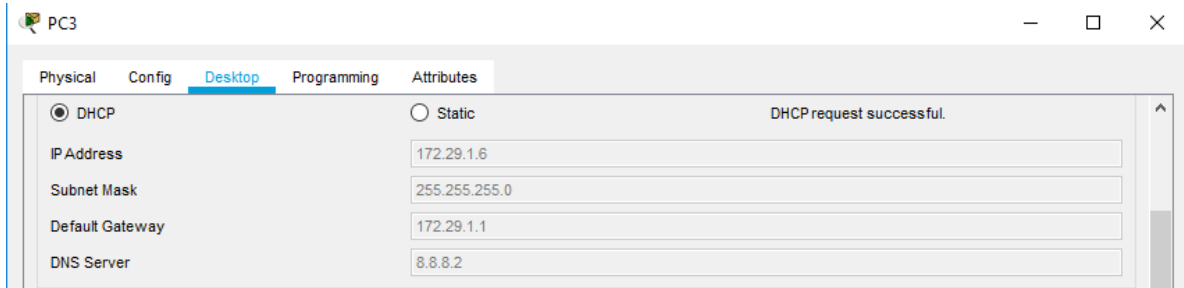


Grafico No. 19: Configuración DHCP PC3

Fuente: Elaboración propia

Verificación Conectividad de Pc2 Y Pc3

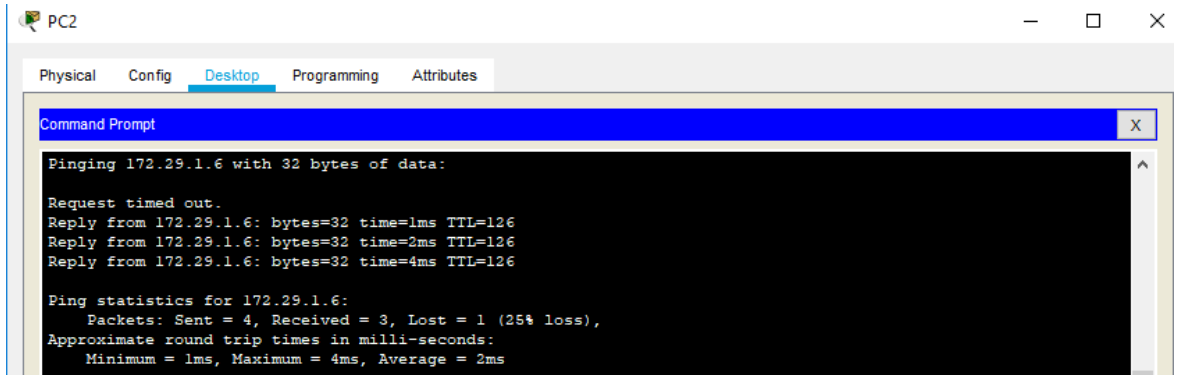
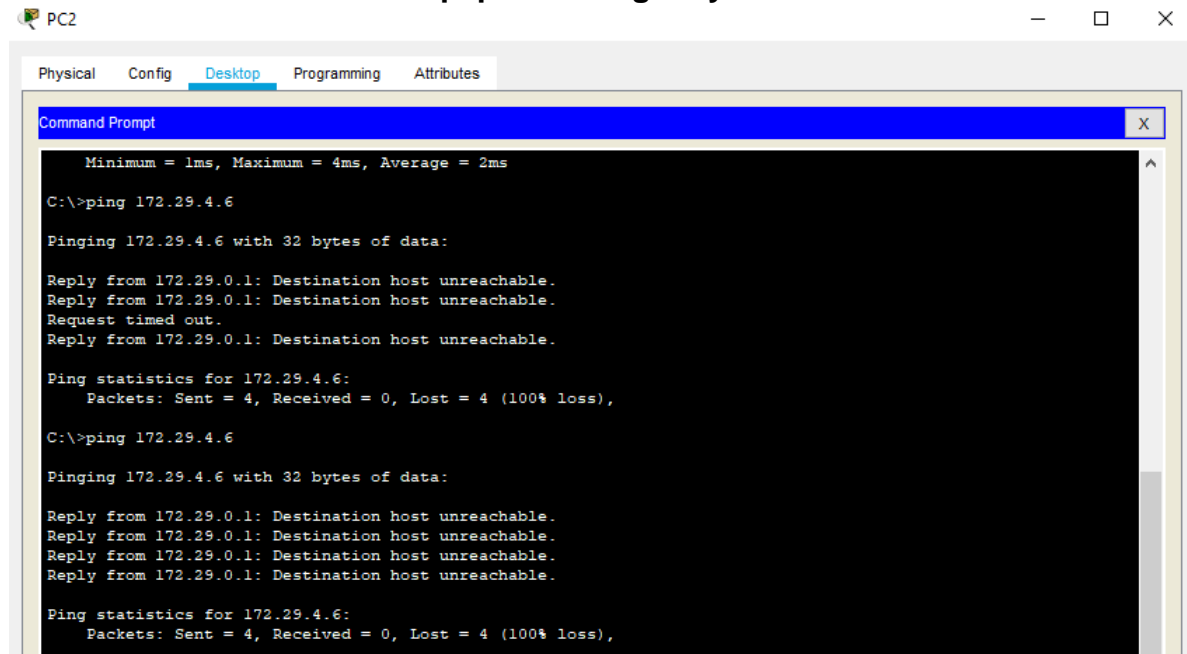


Grafico No. 20: Prueba diagnóstico ping PC2 – PC3

Fuente: Elaboración propia

Comprobación de conexión extremo a extremo luego de haber restringido la comunicación entre los equipos de Bogotá y Medellín



```
Minimum = 1ms, Maximum = 4ms, Average = 2ms
C:\>ping 172.29.4.6

Pinging 172.29.4.6 with 32 bytes of data:

Reply from 172.29.0.1: Destination host unreachable.
Reply from 172.29.0.1: Destination host unreachable.
Request timed out.
Reply from 172.29.0.1: Destination host unreachable.

Ping statistics for 172.29.4.6:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 172.29.4.6

Pinging 172.29.4.6 with 32 bytes of data:

Reply from 172.29.0.1: Destination host unreachable.
Reply from 172.29.0.1: Destination host unreachable.
Reply from 172.29.0.1: Destination host unreachable.
Reply from 172.29.0.1: Destination host unreachable.

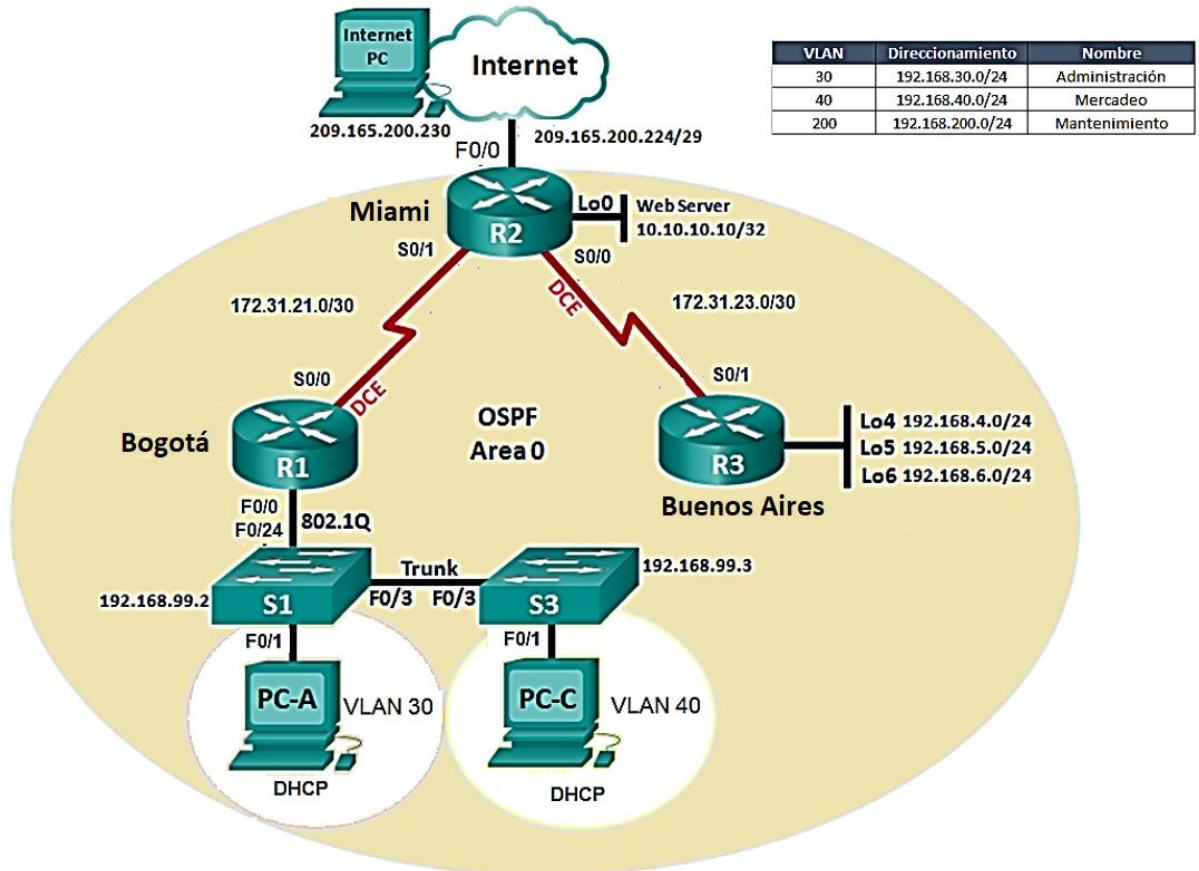
Ping statistics for 172.29.4.6:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

Grafico No. 21: Prueba diagnóstico ping Extremo – Extremo

Fuente: Elaboración propia

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.



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

8.1. Configuración Inicial

Router R1

```
Router>enable
Router#config t
```

```
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#no ip domain-lookup
Router(config)#hostname R1
R1(config)#enable secret class
R1(config)#line console 0
R1(config-line)#password cisco
R1(config-line)#login
R1(config-line)#exit
R1(config)#line vty 0 4
R1(config-line)#password cisco
R1(config-line)#login
R1(config-line)#exit
R1(config)#service password-encryption
R1(config)#banner motd #
Enter TEXT message. End with the character '#'.
*** Servicio restringido - Solo se permite acceso a personal autorizado*** #
R1(config)#exit
R1#
%SYS-5-CONFIG_I: Configured from console by console

R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R1#exit
```

Router R2

```
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#no ip domain-lookup
Router(config)#hostname R2
R2(config)#enable secret class
R2(config)#line console 0
R2(config-line)#password cisco
R2(config-line)#login
R2(config-line)#exit
R2(config)#line vty 0 4
R2(config-line)#password cisco
R2(config-line)#login
R2(config-line)#exit
R2(config)#service password-encryption
R2(config)#banner motd #
```

```
Enter TEXT message. End with the character '#'.
*** Servicio restringido - Solo se permite acceso a personal autorizado **** #
R2(config)#exit
R2#
%SYS-5-CONFIG_I: Configured from console by console
R2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R2#exit
```

Router R3

```
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#no ip domain-lookup
Router(config)#hostname R3
R3(config)#enable secret class
R3(config)#line console 0
R3(config-line)#password cisco
R3(config-line)#login
R3(config-line)#exit
R3(config)#line vty 0 4
R3(config-line)#password cisco
R3(config-line)#login
R3(config-line)#exit
R3(config)#service password-encryption
R3(config)#banner motd #
Enter TEXT message. End with the character '#'.
*** Servicio restringido - Solo se permite acceso a personal autorizado *** #
R3(config)#exit
R3#
%SYS-5-CONFIG_I: Configured from console by console
R3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R3#exit
```

Switch S1

```
Switch>enable
Switch#config t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#no ip domain-lookup
Switch(config)#hostname S1
S1(config)#enable secret class
S1(config)#line console 0
S1(config-line)#password cisco
S1(config-line)#login
S1(config-line)#exit
S1(config)#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 #
Enter TEXT message. End with the character '#'.
**** Servicio restringido - Solo se permite acceso a personal autorizado **** #
S1(config)#exit
S1#
%SYS-5-CONFIG_I: Configured from console by console
S1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
S1#exit
```

Switch S3

```
Switch>enable
Switch#config t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#no ip domain-lookup
Switch(config)#hostname S3
S3(config)#enable secret class
S3(config)#line console 0
S3(config-line)#password cisco
S3(config-line)#login
S3(config-line)#exit
S3(config)#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 #
Enter TEXT message. End with the character '#'.
*** Servicio Restringido - Solo se permite acceso a personal autorizado *** #
S3(config)#exit
S3#
%SYS-5-CONFIG_I: Configured from console by console
S3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
S3#exit

```

Tabla de direccionamiento IP

DISP.	INTER	DIRECCIÓN IP	MÁSCARA DE SUBRED	GATEWAY
R1	S 0/0/0	172.31.21.1	255.255.255.252	
	G 0/0	192.168.99.1	255.255.255.0	
R2	S 0/0/0	172.31.23.1	255.255.255.252	
	S 0/0/1	172.31.21.2	255.255.255.252	
	G 0/0	10.10.10.1	255.255.255.252	
	G 0/1	209.165.200.225	255.255.255.252	
	Lo 0	10.10.10.10	255.255.255.255	
R3	S 0/0/0	172.31.23.2	255.255.255.252	
	Lo 4	192.168.4.1	255.255.255.0	
	Lo 5	192.168.5.1	255.255.255.0	
	Lo 6	192.168.6.1	255.255.255.0	
S1	G 0/0	192.168.99.2	255.255.255.0	
S3	G 0/0	192.168.99.3	255.255.255.0	
PC – A	NIC	DHCP		
PC – C	NIC	DHCP		
PC – INT	NIC	209.165.200.230	255.255.255.248	209.168.200.225

Tabla No. 5: Tabla de direccionamiento IP

Fuente: Elaboración propia

8.2. Direccionamiento IP

Router R1

```

R1>enable
Password:
R1#config t

```



```

Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#interface s0/0/0
R1(config-if)#description connection to MIAMI
R1(config-if)#clock rate 2000000
R1(config-if)#ip address 172.31.21.1 255.255.255.252
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#interface G0/0
R1(config-if)#ip address 192.168.99.1 255.255.255.0
R1(config-if)#no shutdown
R1(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up
R1(config-if)#exit
R1(config)#ip route 0.0.0.0 0.0.0.0 s0/0/0
%Default route without gateway, if not a point-to-point interface, may impact
performance
R1(config)#end
R1#
%SYS-5-CONFIG_I: Configured from console by console
R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R1#exit

```

Router R2

```

R2>enable
Password:
R2#config t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#interface s0/0/0
R2(config-if)#description connection to BOGOTA
R2(config-if)#ip address 172.31.23.1 255.255.255.252
R2(config-if)#clock rate 2000000
R2(config-if)#no shutdown
R2(config-if)#exit
R2(config)#interface s0/0/1
R2(config-if)#description connection to BUENOS AIRES
R2(config-if)#no clock rate
R2(config-if)#ip address 172.31.21.2 255.255.255.252
R2(config-if)#no shutdown
R2(config-if)#exit
R2(config)#interface g0/0

```

```

R2(config-if)#description connection to INTERNET PC
R2(config-if)#ip address 10.10.10.1 255.255.255.252
R2(config-if)#no shutdown
R2(config-if)#exit
R2(config)#interface g0/1
R2(config-if)#description connection to WEB SERVER
R2(config-if)#ip address 209.165.200.225 255.255.255.252
R2(config-if)#no shutdown
R2(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up
R2(config-if)#exit
R2(config)#int loopback 0
R2(config-if)#ip address 10.10.10.10 255.255.255.255
R2(config-if)#description web server simulado
R2(config-if)#exit
R2(config)#ip route 0.0.0.0 0.0.0.0 g0/1
%Default route without gateway, if not a point-to-point interface, may impact
performance
R2(config)#exit
R2#
%SYS-5-CONFIG_I: Configured from console by console
R2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R2#exit

```

Router R3

```

R3>enable
Password:
R3#config t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#interface s0/0/0
R3(config-if)#description connection to MIAMI
R3(config-if)#no clock rate
R3(config-if)#ip address 172.31.23.2 255.255.255.252
R3(config-if)#exit
R3(config)#int loopback 4
R3(config-if)#
%LINK-5-CHANGED: Interface Loopback4, changed state to up

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

```

```

R3(config-if)#ip address 192.168.4.1 255.255.255.0
R3(config-if)#exit
R3(config)#int loopback 5
R3(config-if)#
%LINK-5-CHANGED: Interface Loopback5, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback5, changed state
to up
R3(config-if)#ip address 192.168.5.1 255.255.255.0
R3(config-if)#exit
R3(config)#int loopback 6
R3(config-if)#
%LINK-5-CHANGED: Interface Loopback6, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback6, changed state
to up
R3(config-if)#ip address 192.168.6.1 255.255.255.0
R3(config-if)#exit
R3(config)#ip route 0.0.0.0 0.0.0.0 s0/0/0
%Default route without gateway, if not a point-to-point interface, may impact
performance
R3(config)#end
R3#
%SYS-5-CONFIG_I: Configured from console by console
R3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R3#exit

```

Pc – Internet

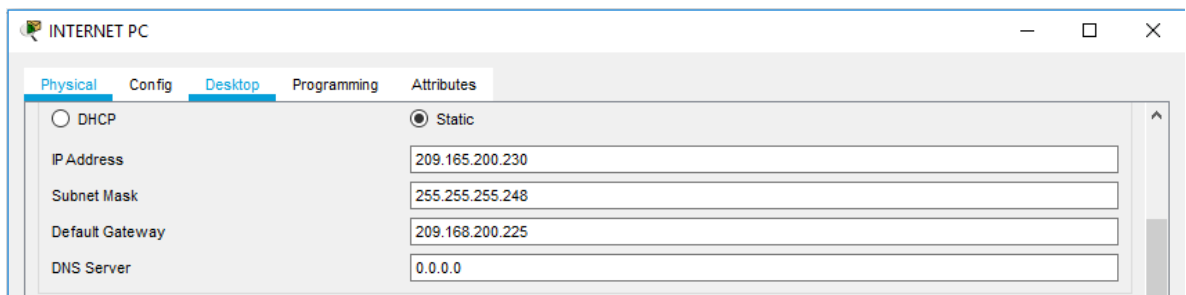


Grafico No. 22: Direccionamiento IP PC – Internet

Fuente: Elaboración propia

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

OSPFv2 area 0

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

Tabla No. 6: Tabla de Configuración OSPF v2 area 0

Fuente: Universidad Nacional Abierta y a Distancia UNAD

9.1. Enrutamiento OSPFv2

Router R1

```
R1>enable
Password:
R1#config t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#router ospf 1
R1(config-router)#router-id 1.1.1.1
R1(config-router)#network 172.31.21.0 0.0.0.3 area 0
R1(config-router)#network 172.31.23.0 0.0.0.3 area 0
R1(config-router)#network 10.10.10.0 0.0.0.255 area 0
R1(config-router)#do write
Building configuration...
[OK]
R1(config-router)#passive-interface g0/0
R1(config-router)#exit
R1(config)#interface s0/0/0
R1(config-if)#bandwidth 256
R1(config-if)#ip ospf cost 9600
R1(config-if)#end
R1#
%SYS-5-CONFIG_I: Configured from console by console
R1#copy running-config startup-config
```

```
Destination filename [startup-config]?  
Building configuration...  
[OK]  
R1#exit
```

Router R2

```
R2>enable  
Password:  
R2#config t  
Enter configuration commands, one per line. End with CNTL/Z.  
R2(config)#router ospf 1  
R2(config-router)#router-id 5.5.5.5  
R2(config-router)#network 172.31.21.0 0.0.0.3 area 0  
R2(config-router)#network 172.31.23.0 0.0.0.3 area 0  
R2(config-router)#network 10.10.10.0 0.0.0.255 area 0  
R2(config-router)#passive-interface g0/1  
R2(config-router)#exit  
R2(config)#interface s0/0/0  
R2(config-if)#bandwidth 256  
R2(config-if)#ip ospf cost 9500  
R2(config-if)#end  
R2#  
%SYS-5-CONFIG_I: Configured from console by console  
R2#copy running-config startup-config  
Destination filename [startup-config]?  
Building configuration...  
[OK]  
R2#exit
```

Router R3

```
R3>enable  
Password:  
R3#config t  
Enter configuration commands, one per line. End with CNTL/Z.  
R3(config)#router ospf 1  
R3(config-router)#router-id 8.8.8.8  
R3(config-router)#network 172.31.23.0 0.0.0.3 area 0  
R3(config-router)#network 192.168.4.0 0.0.3.255 area 0  
R3(config-router)#passive-interface lo4  
R3(config-router)#passive-interface lo5  
R3(config-router)#passive-interface lo6
```

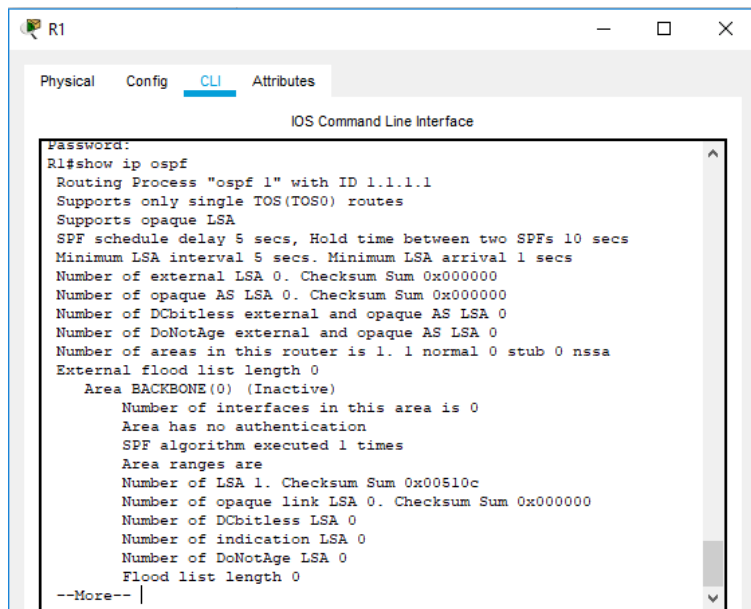
```

R3(config-router)#exit
R3(config)#interface s0/0/0
R3(config-if)#bandwidth 256
R3(config-if)#ip ospf cost 9500
R3(config-if)#end
R3#
%SYS-5-CONFIG_I: Configured from console by console
R3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R3#exit

```

9.2. Verificación de información de OSPF en cada router

Router R1



```

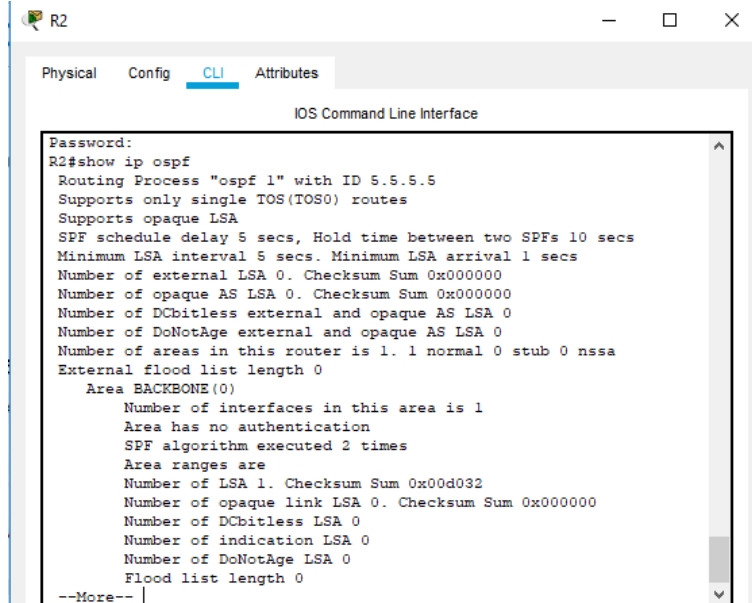
R1
Physical Config CLI Attributes
IOS Command Line Interface
Password:
R1#show ip ospf
Routing Process "ospf 1" with ID 1.1.1.1
Supports only single TOS(TOS0) routes
Supports opaque LSA
SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs
Number of external LSA 0. Checksum Sum 0x000000
Number of opaque AS LSA 0. Checksum Sum 0x000000
Number of DCbitless external and opaque AS LSA 0
Number of DoNotAge external and opaque AS LSA 0
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
External flood list length 0
Area BACKBONE(0) (Inactive)
Number of interfaces in this area is 0
Area has no authentication
SPF algorithm executed 1 times
Area ranges are
Number of LSA 1. Checksum Sum 0x00510c
Number of opaque link LSA 0. Checksum Sum 0x000000
Number of DCbitless LSA 0
Number of indication LSA 0
Number of DoNotAge LSA 0
Flood list length 0
--More--

```

Grafico No. 23: Prueba de configuración OSPF Router 1

Fuente: Elaboración propia

Router R2



```

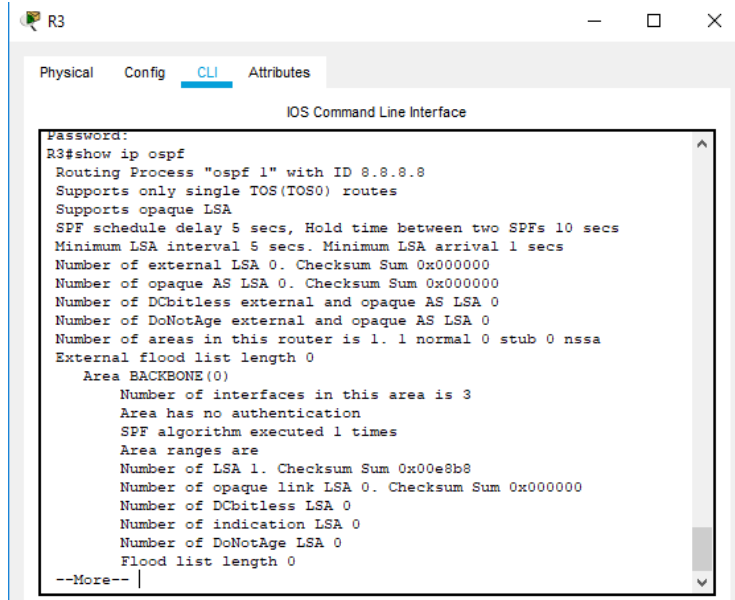
R2
Physical Config CLI Attributes
IOS Command Line Interface
Password:
R2#show ip ospf
Routing Process "ospf 1" with ID 5.5.5.5
Supports only single TOS(TOS0) routes
Supports opaque LSA
SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs
Number of external LSA 0. Checksum Sum 0x000000
Number of opaque AS LSA 0. Checksum Sum 0x000000
Number of DCbitless external and opaque AS LSA 0
Number of DoNotAge external and opaque AS LSA 0
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
External flood list length 0
  Area BACKBONE(0)
    Number of interfaces in this area is 1
    Area has no authentication
    SPF algorithm executed 2 times
    Area ranges are
    Number of LSA 1. Checksum Sum 0x00d032
    Number of opaque link LSA 0. Checksum Sum 0x000000
    Number of DCbitless LSA 0
    Number of indication LSA 0
    Number of DoNotAge LSA 0
    Flood list length 0
--More--

```

Grafico No. 24: Prueba de configuración OSPF Router 2

Fuente: Elaboración propia

Router R3



```

R3
Physical Config CLI Attributes
IOS Command Line Interface
Password:
R3#show ip ospf
Routing Process "ospf 1" with ID 8.8.8.8
Supports only single TOS(TOS0) routes
Supports opaque LSA
SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs
Number of external LSA 0. Checksum Sum 0x000000
Number of opaque AS LSA 0. Checksum Sum 0x000000
Number of DCbitless external and opaque AS LSA 0
Number of DoNotAge external and opaque AS LSA 0
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
External flood list length 0
  Area BACKBONE(0)
    Number of interfaces in this area is 3
    Area has no authentication
    SPF algorithm executed 1 times
    Area ranges are
    Number of LSA 1. Checksum Sum 0x00e8b8
    Number of opaque link LSA 0. Checksum Sum 0x000000
    Number of DCbitless LSA 0
    Number of indication LSA 0
    Number of DoNotAge LSA 0
    Flood list length 0
--More--

```

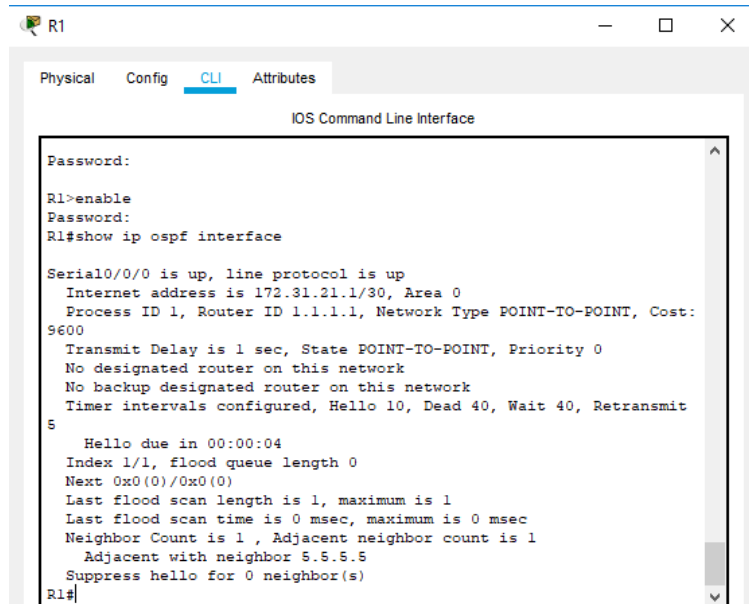
Grafico No. 25: Prueba de configuración OSPF Router 3

Fuente: Elaboración propia

9.3. Visualizar tablas de enrutamiento y routers conectados por OSPFv2

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

Router R1



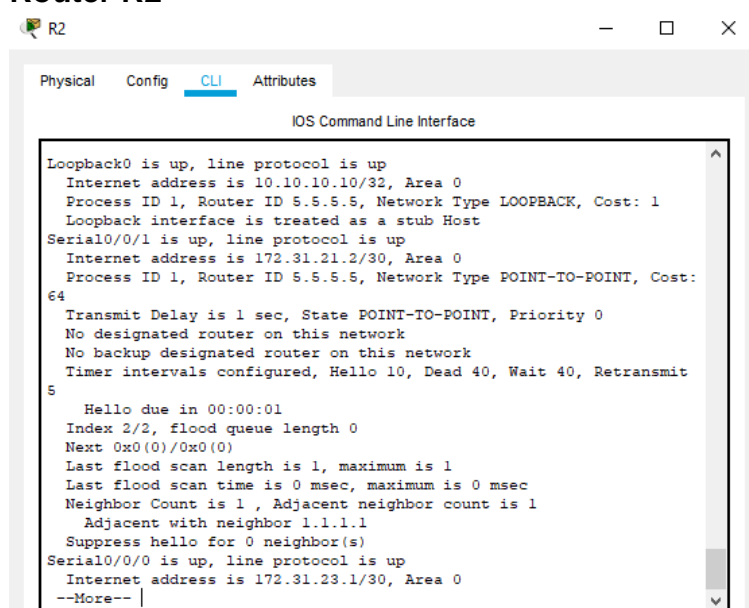
```
R1
Physical Config CLI Attributes
IOS Command Line Interface
Password:
R1>enable
Password:
R1#show ip ospf interface

Serial0/0/0 is up, line protocol is up
 Internet address is 172.31.21.1/30, Area 0
  Process ID 1, Router ID 1.1.1.1, Network Type POINT-TO-POINT, Cost:
9600
  Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
  No designated router on this network
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit
  5
    Hello due in 00:00:04
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1 , Adjacent neighbor count is 1
    Adjacent with neighbor 5.5.5.5
  Suppress hello for 0 neighbor(s)
R1#
```

Grafico No. 26: Tabla de enrutamiento OSPF Router R1

Fuente: Elaboración propia

Router R2

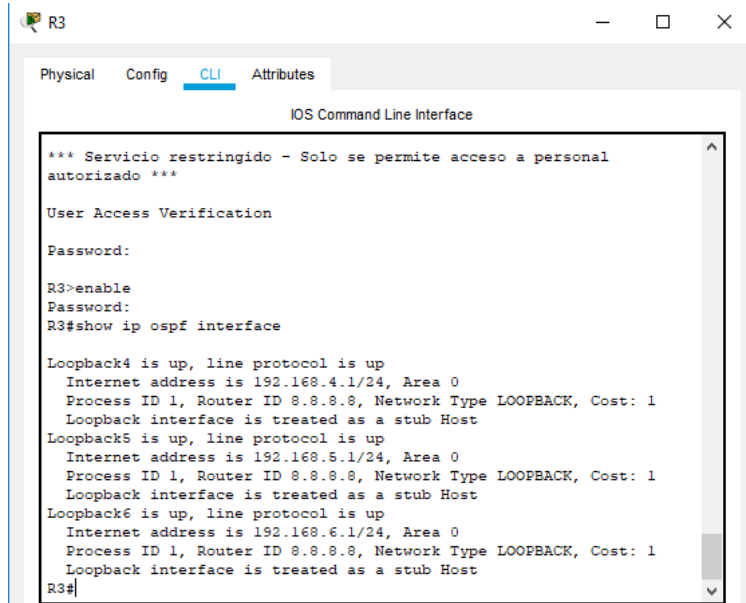


```
R2
Physical Config CLI Attributes
IOS Command Line Interface
Loopback0 is up, line protocol is up
 Internet address is 10.10.10.10/32, Area 0
  Process ID 1, Router ID 5.5.5.5, Network Type LOOPBACK, Cost: 1
  Loopback interface is treated as a stub Host
Serial0/0/1 is up, line protocol is up
 Internet address is 172.31.21.2/30, Area 0
  Process ID 1, Router ID 5.5.5.5, Network Type POINT-TO-POINT, Cost:
64
  Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
  No designated router on this network
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit
  5
    Hello due in 00:00:01
  Index 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 1.1.1.1
  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
--More--
```

Grafico No. 27: Tabla de enrutamiento OSPF Router R2

Fuente: Elaboración propia

Router R3



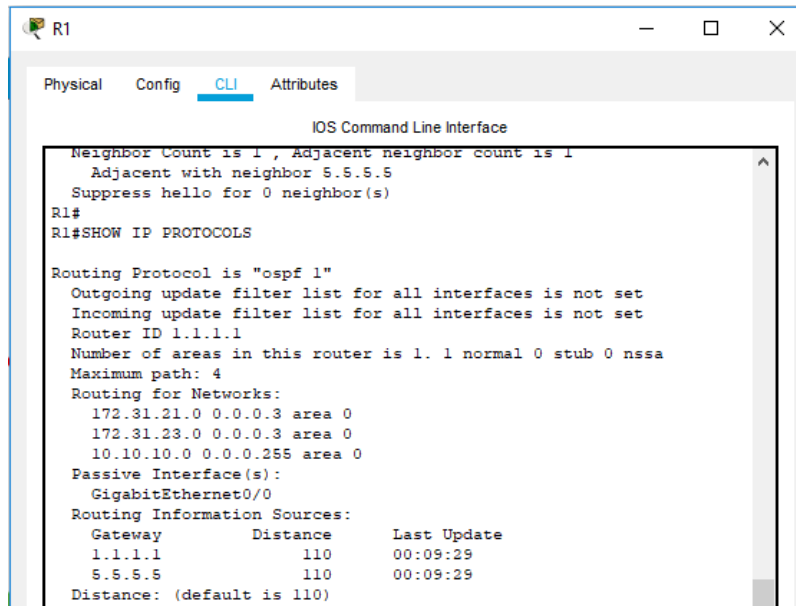
```
R3
Physical Config CLI Attributes
IOS Command Line Interface
*** Servicio restringido - Solo se permite acceso a personal
autorizado ***
User Access Verification
Password:
R3>enable
Password:
R3#show ip ospf interface
Loopback4 is up, line protocol is up
 Internet address is 192.168.4.1/24, Area 0
 Process ID 1, Router ID 8.8.8.8, Network Type LOOPBACK, Cost: 1
 Loopback interface is treated as a stub Host
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
R3#
```

Grafico No. 28: Tabla de enrutamiento OSPF Router R3

Fuente: Elaboración propia

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

ROUTER R1

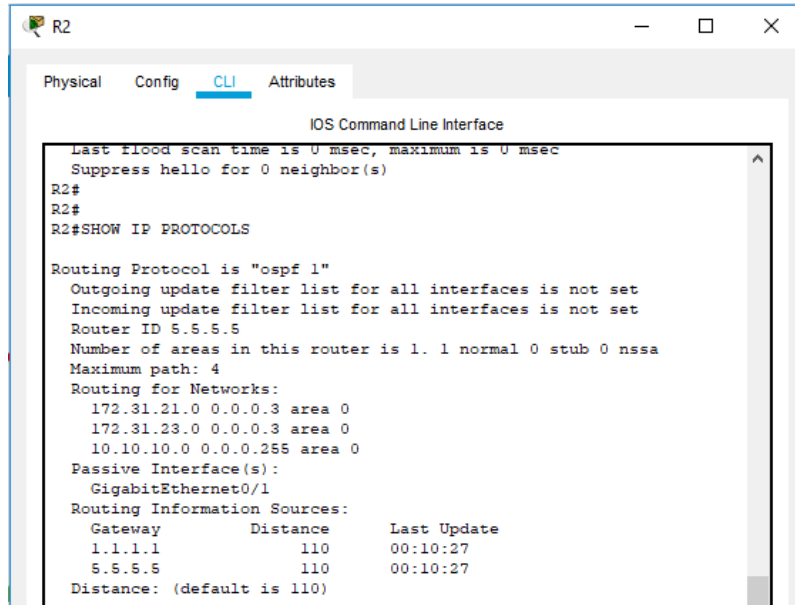


```
R1
Physical Config CLI Attributes
IOS Command Line Interface
Neighbor Count is 1, Adjacent neighbor count is 1
Adjacent with neighbor 5.5.5.5
Suppress hello for 0 neighbor(s)
R1#
R1#SHOW IP PROTOCOLS
Routing Protocol is "ospf 1"
Outgoing update filter list for all interfaces is not set
Incoming update 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
 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
Routing Information Sources:
 Gateway Distance Last Update
 1.1.1.1 110 00:09:29
 5.5.5.5 110 00:09:29
Distance: (default is 110)
```

Grafico No. 29: Tabla de Protocolos OSPF Router R1

Fuente: Elaboración propia

Router R2

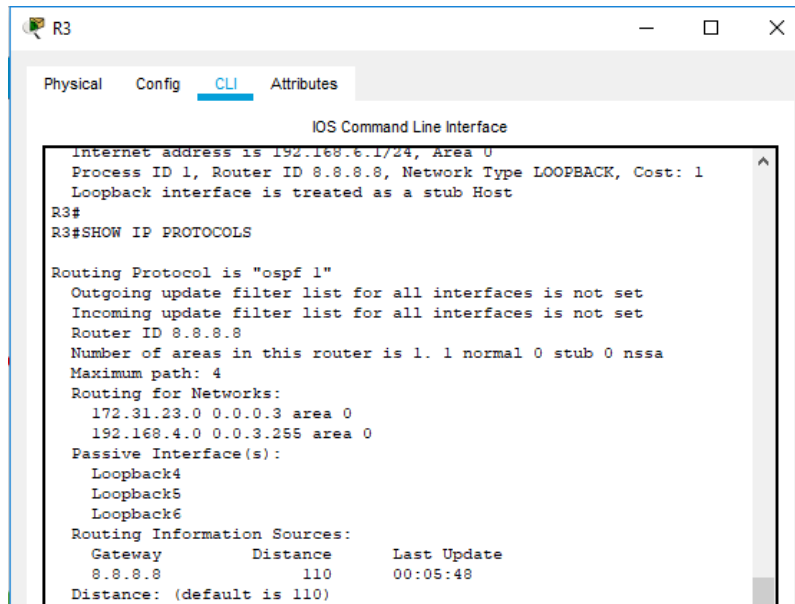


```
R2
Physical Config CLI Attributes
IOS Command Line Interface
Last flood scan time is 0 msec, maximum is 0 msec
Suppress hello for 0 neighbor(s)
R2#
R2#
R2#SHOW IP PROTOCOLS

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):
    GigabitEthernet0/1
  Routing Information Sources:
    Gateway         Distance      Last Update
    1.1.1.1          110          00:10:27
    5.5.5.5          110          00:10:27
  Distance: (default is 110)
```

Grafico No. 30: Tabla de Protocolos OSPF Router R2
Fuente: Elaboración propia

Router R3



```
R3
Physical Config CLI Attributes
IOS Command Line Interface
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
R3#
R3#SHOW IP PROTOCOLS

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 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
    8.8.8.8          110          00:05:48
  Distance: (default is 110)
```

Grafico No. 31: Tabla de Protocolos OSPF Router R3
Fuente: Elaboración propia

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

Vlan´S Switch S1

```
S1>enable
Password:
S1#config t
Enter configuration commands, one per line. End with CNTL/Z.
S1(config)#vlan 30
S1(config-vlan)#name ADMINISTRATION
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)#end
S1#
%SYS-5-CONFIG_I: Configured from console by console
S1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
S1#exit
```

Vlan´S Switch S3

```
S3>enable
Password:
S3#config t
Enter configuration commands, one per line. End with CNTL/Z.
S3(config)#vlan 30
S3(config-vlan)#name ADMINISTRATION
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)#end
```

```
S3#
%SYS-5-CONFIG_I: Configured from console by console
S3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
S3#exit
```

9.7. En el Switch 3 deshabilitar DNS lookup

```
S3>enable
Password:
S3#config t
Enter configuration commands, one per line. End with CNTL/Z.
S3(config)#no ip domain-lookup
S3(config)#end
S3#
%SYS-5-CONFIG_I: Configured from console by console
S3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
S3#exit
```

9.8. Configuración de puertos troncales

Switch S1

```
S1>enable
Password:
S1#config t
Enter configuration commands, one per line. End with CNTL/Z.
S1(config)#int f0/3
S1(config-if)#switchport mode trunk
S1(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed
state to down
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed
state to up
S1(config-if)#switchport trunk native vlan 1
S1(config-if)#int f0/24
S1(config-if)#switchport mode trunk
S1(config-if)#
```

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/24, changed state to down
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/24, changed state to up
S1(config-if)#switchport trunk native vlan 1
S1(config-if)#no shutdown
S1(config-if)#int range fa0/1-2, fa0/4-24
S1(config-if-range)#switchport mode access
S1(config-if-range)#int f0/1
S1(config-if)#switchport mode access
S1(config-if)#switchport access vlan 30
S1(config-if)#int range fa0/1-2, fa0/4-24
S1(config-if-range)#shutdown
%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/4, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/5, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/6, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/7, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/8, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/9, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/10, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/11, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/12, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/13, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/14, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/15, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/16, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/17, changed state to administratively down

```
%LINK-5-CHANGED: Interface FastEthernet0/18, changed state to
administratively down
%LINK-5-CHANGED: Interface FastEthernet0/19, changed state to
administratively down
%LINK-5-CHANGED: Interface FastEthernet0/20, changed state to
administratively down
%LINK-5-CHANGED: Interface FastEthernet0/21, changed state to
administratively down
%LINK-5-CHANGED: Interface FastEthernet0/22, changed state to
administratively down
%LINK-5-CHANGED: Interface FastEthernet0/23, changed state to
administratively down
S1(config-if-range)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to administratively
down
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed
state to down
%LINK-5-CHANGED: Interface FastEthernet0/24, changed state to
administratively down
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/24, changed
state to down
S1(config-if-range)#int vlan 200
S1(config-if)#
%LINK-5-CHANGED: Interface Vlan200, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan200, changed state to
up
S1(config-if)#ip address 192.168.99.2 255.255.255.0
S1(config-if)#end
S1#
%SYS-5-CONFIG_I: Configured from console by console
S1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
S1#exit
```

Switch S3

```
S3>enable
Password:
S3#config t
Enter configuration commands, one per line. End with CNTL/Z.
S3(config)#int f0/3
S3(config-if)#switchport mode trunk
```

```
S3(config-if)#switchport trunk native vlan 1
S3(config-if)#int range fa0/1-2, fa0/4-24
S3(config-if-range)#switchport mode access
S3(config-if-range)#int f0/1
S3(config-if)#switchport mode access
S3(config-if)#switchport access vlan 40
S3(config-if)#int range fa0/1-2, fa0/4-24
S3(config-if-range)#shutdown
%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to administratively
down
%LINK-5-CHANGED: Interface FastEthernet0/4, changed state to administratively
down
%LINK-5-CHANGED: Interface FastEthernet0/5, changed state to administratively
down
%LINK-5-CHANGED: Interface FastEthernet0/6, changed state to administratively
down
%LINK-5-CHANGED: Interface FastEthernet0/7, changed state to administratively
down
%LINK-5-CHANGED: Interface FastEthernet0/8, changed state to administratively
down
%LINK-5-CHANGED: Interface FastEthernet0/9, changed state to administratively
down
%LINK-5-CHANGED: Interface FastEthernet0/10, changed state to
administratively down
%LINK-5-CHANGED: Interface FastEthernet0/11, changed state to
administratively down
%LINK-5-CHANGED: Interface FastEthernet0/12, changed state to
administratively down
%LINK-5-CHANGED: Interface FastEthernet0/13, changed state to
administratively down
%LINK-5-CHANGED: Interface FastEthernet0/14, changed state to
administratively down
%LINK-5-CHANGED: Interface FastEthernet0/15, changed state to
administratively down
%LINK-5-CHANGED: Interface FastEthernet0/16, changed state to
administratively down
%LINK-5-CHANGED: Interface FastEthernet0/17, changed state to
administratively down
%LINK-5-CHANGED: Interface FastEthernet0/18, changed state to
administratively down
%LINK-5-CHANGED: Interface FastEthernet0/19, changed state to
administratively down
%LINK-5-CHANGED: Interface FastEthernet0/20, changed state to
administratively down
```

```

%LINK-5-CHANGED: Interface FastEthernet0/21, changed state to
administratively down
%LINK-5-CHANGED: Interface FastEthernet0/22, changed state to
administratively down
%LINK-5-CHANGED: Interface FastEthernet0/23, changed state to
administratively down
%LINK-5-CHANGED: Interface FastEthernet0/24, changed state to
administratively down
S3(config-if-range)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to administratively
down
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed
state to down
S3(config-if-range)#int vlan 200
S3(config-if)#
%LINK-5-CHANGED: Interface Vlan200, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan200, changed state to
up
S3(config-if)#ip address 192.168.99.3 255.255.255.0
S3(config-if)#ip default-gateway 192.168.99.1
S3(config)#end
S3#
%SYS-5-CONFIG_I: Configured from console by console
S3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
S3#exit

```

9.9. Configuración de Encapsulación

Router R1

```

R1#enable
R1#config t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#int g0/0
R1(config-if)#int g0/0.1
R1(config-subif)#encapsulation dot1Q 40
R1(config-subif)#ip address 192.168.40.1 255.255.255.128
R1(config-subif)#do write
Building configuration...
[OK]
R1(config-subif)#exit

```



```

R1(config)#int g0/0.2
R1(config-subif)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0.2, changed state to up
R1(config-subif)#encapsulation dot1Q 30
R1(config-subif)#ip address 192.168.30.1 255.255.255.128
R1(config-subif)#do write
Building configuration...
[OK]
R1(config-subif)#exit
R1(config)#exit
R1#
%SYS-5-CONFIG_I: Configured from console by console
R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R1#exit

```

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

10.1. Direcccionamiento ip

Switch S1

```

S1>enable
Password:
S1#config t
Enter configuration commands, one per line. End with CNTL/Z.
S1(config)#interface vlan 30
S1(config-if)#
%LINK-5-CHANGED: Interface Vlan30, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan30, changed state to
up
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)#end
S1#
%SYS-5-CONFIG_I: Configured from console by console
S1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]

```

```
S1#  
S1#exit
```

Switch s3

```
S3>enable  
Password:  
S3#config t  
Enter configuration commands, one per line. End with CNTL/Z.  
S3(config)#int 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)#end  
S3#  
%SYS-5-CONFIG_I: Configured from console by console  
S3#copy running-config startup-config  
Destination filename [startup-config]?  
Building configuration...  
[OK]  
S3#exit
```

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

Interfaces desactivas en switch s1

```
S1>enable  
Password:  
S1#config t  
Enter configuration commands, one per line. End with CNTL/Z.  
S1(config)#int range fa0/2, fa0/4-23  
S1(config-if-range)#shutdown  
S1(config-if-range)#exit  
S1(config)#exit  
S1#  
%SYS-5-CONFIG_I: Configured from console by console  
S1#copy running-config startup-config  
Destination filename [startup-config]?  
Building configuration...  
[OK]  
S1#exit
```

Interfaces desactivadas en switch s3

```
S3>enable
Password:
S3#config t
Enter configuration commands, one per line. End with CNTL/Z.
S3(config)#int range fa0/2, fa0/4-23
S3(config-if-range)#shutdown
S3(config-if-range)#exit
S3(config)#exit
S3#
%SYS-5-CONFIG_I: Configured from console by console
S3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
S3#exit
```

10.3. Implementar DHCP y NAT para IPv4

Router R2 – Miami

```
R2>enable
Password:
R2#config t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#user webuser privilege 15 secret cisco54321
R2(config)#ip nat inside source static 10.10.10.10 209.165.200.229
R2(config)#int g0/0
R2(config-if)#ip nat outside
R2(config-if)#exit
R2(config)#int g0/1
R2(config-if)#ip nat inside
R2(config-if)#exit
R2(config)#access-list 1 permit 192.168.30.0 0.0.0.255
R2(config)#access-list 1 permit 192.168.40.0 0.0.0.255
R2(config)#access-list 1 permit 192.168.4.0 0.0.3.255
R2(config)#ip nat pool Internet 209.165.200.225 209.165.200.229 netmask
255.255.255.248
R2(config)#end
R2#
%SYS-5-CONFIG_I: Configured from console by console
R2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
```

[OK]
R2#exit

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

Router R1 – Bogotá

```
R1>enable
Password:
R1#config t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#ip dhcp pool ADMINISTRACION
R1(dhcp-config)#dns-server 10.10.10.11
R1(dhcp-config)#default-router 192.168.30.1
R1(dhcp-config)#network 192.168.30.0 255.255.255.0
R1(dhcp-config)#ip dhcp pool MERCADEO
R1(dhcp-config)#dns-server 10.10.10.11
R1(dhcp-config)#default-router 192.168.40.1
R1(dhcp-config)#network 192.168.40.0 255.255.255.0
R1(dhcp-config)#end
R1#
%SYS-5-CONFIG_I: Configured from console by console
R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R1#exit
```

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

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

Tabla No. 7: Tabla de Configuración DHCP

Fuente: Universidad Nacional Abierta y a Distancia UNAD

DHCP Router R1

```
R1>enable
Password:
R1#config t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#ip dhcp excluded-address 192.168.30.1 192.168.30.30
R1(config)#ip dhcp excluded-address 192.168.30.1 192.168.40.30
R1(config)#end
R1#
%SYS-5-CONFIG_I: Configured from console by console
R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R1#exit
```

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

```
R2>enable
Password:
R2#config t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#interface g0/0
R2(config-if)#ip nat outside
R2(config-if)#exit
R2(config)#interface g0/1
R2(config-if)#ip nat inside
R2(config-if)#end
R2#
%SYS-5-CONFIG_I: Configured from console by console
R2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R2#exit
```

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

```
R2>enable
Password:
R2#config t
```

```
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#ip nat pool INTERNET 209.165.200.225 209.165.200.229 netmask
255.255.255.248
R2(config)#ip access-list standard ADMINISTRADOR
R2(config-std-nacl)#permit host 172.31.21.1
R2(config-std-nacl)#exit
R2(config)#line vty 0 4
R2(config-line)#access-class ADMINISTRADOR in
R2(config-line)#end
R2#
%SYS-5-CONFIG_I: Configured from console by console
R2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R2#exit
```

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

```
R2>enable
Password:
R2#config t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#access-list 100 permit tcp any host 209.165.200.229 eq www
R2(config)#access-list 100 permit icmp any any echo-reply
R2(config)#end
R2#
%SYS-5-CONFIG_I: Configured from console by console
R2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R2#exit
```

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

```
R1>ping 209.165.200.225

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.165.200.225, timeout is 2
seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/8 ms

R1>
```

Grafico No. 32: Prueba diagnóstico Ping R1 – R2

Fuente: Elaboración propia

```
R2>ping 209.165.200.230

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.165.200.230, timeout is 2
seconds:
!..!
Success rate is 60 percent (3/5), round-trip min/avg/max = 0/0/1 ms

R2>
```

Grafico No. 33: Prueba diagnóstico Ping R2 – Pc Internet

Fuente: Elaboración propia

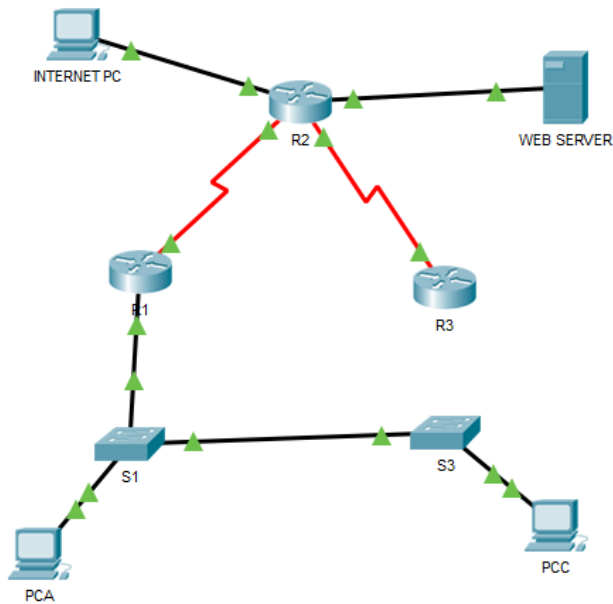


Grafico No. 34: Topología en funcionamiento escenario 2

Fuente: Elaboración propia

Conclusiones

El diseño e implementación de redes Lan y Wan, requiere de unos conocimientos previos que permitan configurar aspectos básicos como la asignación de trazados IP que bien pueden estar basadas en el protocolo Ipv4 o Ipv6.

Además de tener una tabla de enrutamiento que me permite asignar las direcciones IP a cada interfaz, es necesario configurar otros aspectos tanto de menor como de mayor relevancia para que toda la infraestructura de datos pueda funcionar.

Uno de los aspectos que aunque no se crea importante, constituye la seguridad de configuración de la red, es el alistamiento inicial; a través de éste se asignan contraseñas de seguridad para el ingreso a la configuración del dispositivo (router o switch), procurando de ésta manera que el mismo no sea vulnerable a ningún tercero.

Adicional existe otro tipo de disposiciones de mayor relevancia, que ajustan aspectos específicos de la red procurando siempre cumplir con la demanda de usuarios, flujo de información, seguridad, estabilidad, y demás requisitos exigidos por la organización.

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