

**PRUEBA DE HABILIDADES PRACTICAS CCNA
DIPLOMADO DE PROFUNDIZACION CISCO - DISEÑO E
IMPLEMENTACION DE SOLUCIONES INTEGRADAS
LAN/WAN**

**PRESENTADO POR:
DAVID BURBANO MARTÍNEZ**

**UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA
ESCUELA DE CIENCIAS BÁSICAS, TECNOLOGÍA E INGENIERÍA
PROGRAMA DE INGENIERÍA ELECTRÓNICA
COLOMBIA
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**TRABAJO DE GRADO PRESENTADO PARA OBTENER EL
TÍTULO DE INGENIERO ELECTRÓNICO**

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Nota de aceptación:

Firma del presidente del jurado

Firma del jurado

Firma del jurado

San Juan de Pasto, 31 de mayo de 2019

DEDICATORIA

Este trabajo es dedicado principalmente a Dios por la sabiduría y el entendimiento brindado en esta etapa, también al proceso de aprendizaje realizado en la universidad nacional abierta y a distancia donde ha sido una parte fundamental de mi vida capacitarme y explorar nuevos conocimientos para formarme como un excelente profesional.

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En esta oportunidad agradezco a todos los formadores académicos que hicieron parte de este proceso de aprendizaje y a todas las personas que me apoyaron para poder llegar a esta instancia intelectual en donde se comprendió cada etapa de estudio para establecer un propósito de solución.

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INTRODUCCIÓN

En el presente trabajo se encuentra el desarrollo de la Prueba De Habilidades Practicas CCNA como son los dos escenarios propuestos en la siguiente actividad. Se pone en práctica los conceptos y tecnologías fundamentales en redes, tales como Protocolos de enrutamiento RIP, listas de control de acceso (ACL), DHCP, Servicios NAT y PAT. Para lograr un óptimo desarrollo del curso, se emplea la herramienta de simulación de Cisco (Packet Tracer) con la cual se desarrollan las actividades prácticas del curso, esta ayuda a todo el proceso de configuración y creación de la topología establecida en la actividad. Se registra la configuración de cada uno de los dispositivos, la descripción detallada del paso a paso de cada una de las etapas realizadas durante su desarrollo, aplicando los conceptos teóricos estudiados en dicha unidad.

1 OBJETIVOS

1.1 Objetivo General

Comprender y aplicar los conocimientos prácticos o teóricos adquiridos en el curso de CCNA, con el desarrollo aplicativo para cada actividad practica propuesta en el entorno estableciendo una solución a cada escenario.

1.2 Objetivos Específicos

- Configurar ACLs ROUTERS para establecer el protocolo OSPF y dinámica de host. Verificar la funcionalidad de ACL.
- Configurar la topología, direccionamiento IP, protocolos de enrutamiento especificada en el escenario objeto de la prueba.
- Realizar el direccionamiento IP de cada uno de los equipos que conforman la red.
- Establecer el diseño del esquema para cada componente práctico propuesto.

2 Solución al escenario 1

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

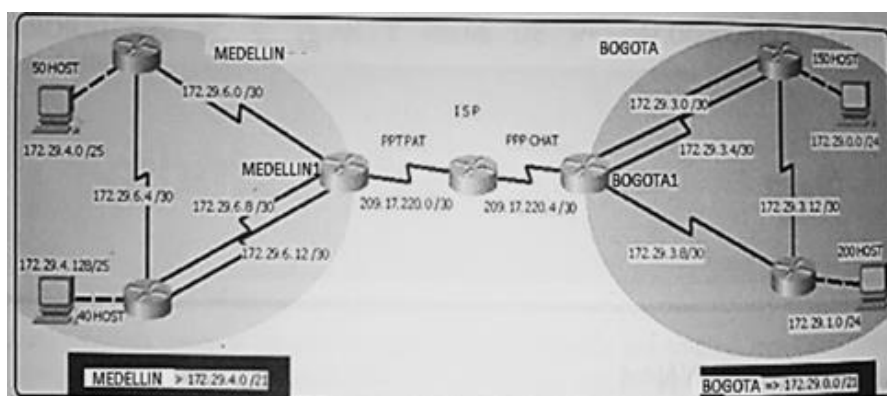


Figura 1. Topología escenario 1

Este escenario plantea el uso de RIP como protocolo de enrutamiento, considerando que se tendrán rutas por defecto redistribuidas; asimismo, habilitar el encapsulamiento PPP y su autenticación, los routers Bogota2 y medellin2 proporcionan el servicio DHCP a su propia red LAN y a los routers 3 de cada ciudad, debe configurar PPP en los enlaces hacia el ISP, con autenticación y debe habilitar NAT de sobrecarga en los routers Bogota1 y medellin1.

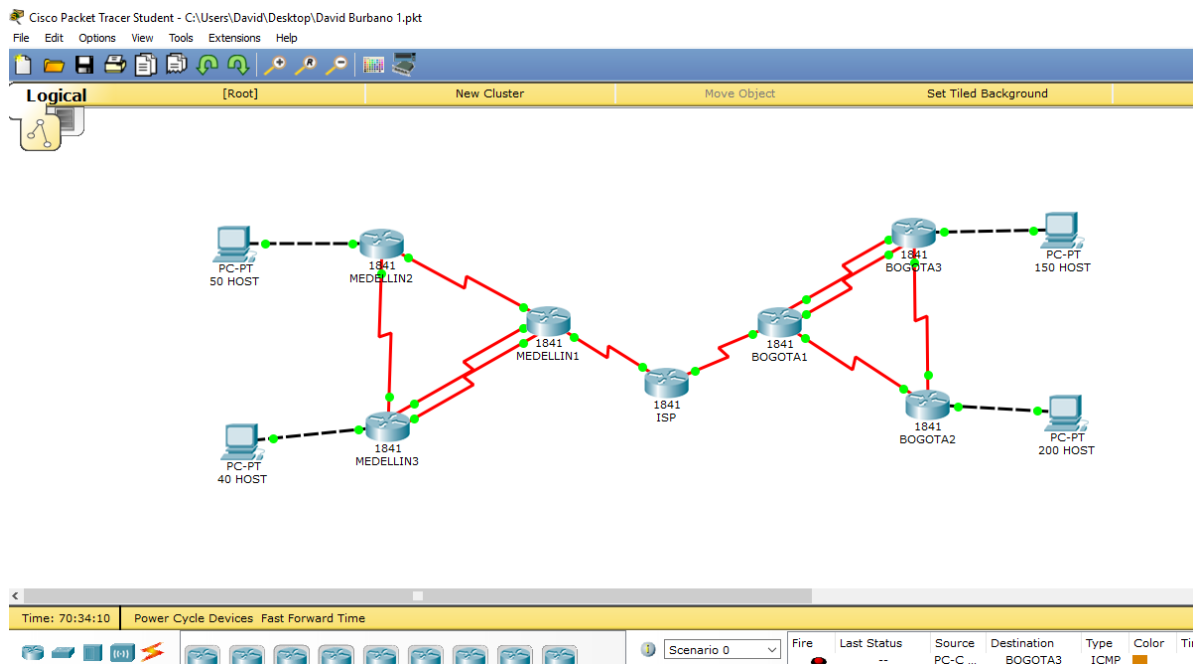


Figura 2. Topología y conectividad

Solución escenario 1

2.1 Procedimientos de análisis y configuración en cada Router

Router ISP

```
Router>enable
```

```
Router#config t
```

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

```
Router(config)#hostname ISP
```

```
ISP(config)#no ip domain-lookup
```

```
ISP(config)#line console 0
```

```
ISP(config-line)#password red
```

```
ISP(config-line)#login
```

```
ISP(config-line)#line vty 0 15
```

```
ISP(config-line)#password red
```

```
ISP(config-line)#login
```

```
ISP(config-line)#exit
```

Router MEDELLIN1

```
Router>enable
Router#config t
Router(config)#hostname MEDELLIN1
MEDELLIN1(config)#no ip domain-lookup
MEDELLIN1(config)#line console 0
MEDELLIN1(config-line)#password red
MEDELLIN1(config-line)#login
MEDELLIN1(config-line)#line vty 0 15
MEDELLIN1(config-line)#password red
MEDELLIN1(config-line)#login
MEDELLIN1(config-line)#exit
```

Router MEDELLIN2

```
Router>enable
Router#config t
Router(config)#hostname MEDELLIN2
MEDELLIN2(config)#no ip domain-lookup
MEDELLIN2(config)#line console 0
MEDELLIN2(config-line)#password red
MEDELLIN2(config-line)#login
MEDELLIN2(config-line)#line vty 0 15
MEDELLIN2(config-line)#password red
MEDELLIN2(config-line)#login
MEDELLIN2(config-line)#exit
```

Router MEDELLIN3

```
Router>enable
Router#config t
Router(config)#hostname MEDELLIN3
MEDELLIN3(config)#no ip domain-lookup
MEDELLIN3(config)#line console 0
MEDELLIN3(config-line)#password red
MEDELLIN3(config-line)#login
MEDELLIN3(config-line)#line vty 0 15
MEDELLIN3(config-line)#password red
MEDELLIN3(config-line)#login
MEDELLIN3(config-line)#exit
```

Router BOGOTA1

```
Router>enable
Router#config t
Router(config)#hostname BOGOTA1
BOGOTA1(config)#no ip domain-lookup
BOGOTA1(config)#line console 0
BOGOTA1(config-line)#password red
BOGOTA1(config-line)#login
BOGOTA1(config-line)#line vty 0 15
BOGOTA1(config-line)#password red
BOGOTA1(config-line)#login
BOGOTA1(config-line)#enable secret class
```

Router BOGOTA2

```
Router>enable
Router#config t
Router(config)#hostname BOGOTA2
BOGOTA2(config)#no ip domain-lookup
BOGOTA2(config)#line console 0
BOGOTA2(config-line)#password red
BOGOTA2(config-line)#login
BOGOTA2(config-line)#line vty 0 15
BOGOTA2(config-line)#password red
BOGOTA2(config-line)#login
BOGOTA2(config-line)#enable secret class
```

Router BOGOTA3

```
Router>enable
Router#config t
Router(config)#hostname BOGOTA3
BOGOTA3(config)#no ip domain-lookup
BOGOTA3(config)#line console 0
BOGOTA3(config-line)#password red
BOGOTA3(config-line)#login
BOGOTA3(config-line)#line vty 0 15
BOGOTA3(config-line)#password red
BOGOTA3(config-line)#login
BOGOTA3(config-line)#enable secret class
```

2.1.1 Configuración direccionamiento IP

Configuración IP IPS

```
ISP(config)#int s0/0/0
ISP(config-if)#description conexion con MEDELLIN1
ISP(config-if)#ip address 209.17.220.1255.255.255.252
ISP(config-if)#clock rate 128000
ISP(config-if)#no shutdown
ISP(config-if)#int s0/0/1
ISP(config-if)#description conexion con BOGOTA1
ISP(config-if)#ip address 209.17.220.5 255.255.255.252
ISP(config-if)#clock rate 128000
ISP(config-if)#no shutdown
```

Configuración IP MEDELLIN 1

```
MEDELLIN1(config)#int s0/0/0
MEDELLIN1(config-if)#description Conexion hacia MEDELLIN2
MEDELLIN1(config-if)#ip address 172.29.6.1 255.255.255.252
MEDELLIN1(config-if)#clock rate 128000
MEDELLIN1(config-if)#no shutdown
MEDELLIN1(config-if)#int s0/0/1
MEDELLIN1(config-if)#description Conexion1 hacia MEDELLIN3
MEDELLIN1(config-if)#ip address 172.29.6.9 255.255.255.252
MEDELLIN1(config-if)#clock rate 128000
MEDELLIN1(config-if)#no shutdown
MEDELLIN1(config-if)#int s0/1/0
MEDELLIN1(config-if)#description Conexion2 hacia MEDELLIN3
MEDELLIN1(config-if)#ip address 172.29.6.13 255.255.255.252
MEDELLIN1(config-if)#clock rate 128000
MEDELLIN1(config-if)#no shutdown
MEDELLIN1(config-if)#int s0/1/1
MEDELLIN1(config-if)#description Conexion hacia ISP MEDELLIN1(config-if)#ip address
209.17.220.2 255.255.255.252
MEDELLIN1(config-if)#clock rate 128000
MEDELLIN1(config-if)#no shutdown
```

Configuración IP MEDELLIN 2

```
MEDELLIN2(config)#int s0/0/0
MEDELLIN2(config-if)#description Conexion con MEDELLIN1
MEDELLIN2(config-if)#ip address 172.29.6.2 255.255.255.252
MEDELLIN2(config-if)#clock rate 128000
```



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

Configuración IP MEDELLIN3

```
MEDELLIN3(config)#int s0/0/0
MEDELLIN3(config-if)#description Conexion2 hacia MEDELLIN1
MEDELLIN3(config-if)#ip address 172.29.6.14 255.255.255.252
MEDELLIN3(config-if)#clock rate 128000
MEDELLIN3(config-if)#no shutdown
MEDELLIN3(config-if)#int s0/0/1
MEDELLIN3(config-if)#description Conexion1 hacia MEDELLIN1
MEDELLIN3(config-if)#ip address 172.29.6.10 255.255.255.252
MEDELLIN3(config-if)#clock rate 128000
MEDELLIN3(config-if)#no shutdown
MEDELLIN3(config-if)#int s0/1/0
MEDELLIN3(config-if)#description Conexion hacia MEDELLIN2
MEDELLIN3(config-if)#ip address 172.29.6.6 255.255.255.252
MEDELLIN3(config-if)#clock rate 128000
MEDELLIN3(config-if)#no shutdown
MEDELLIN3(config-if)#int f0/0
MEDELLIN3(config-if)#description Conexion hacia hosts
MEDELLIN3(config-if)#ip address 172.29.4.129 255.255.255.128
MEDELLIN3(config-if)#no shutdown
```

Configuración IP BOGOTA1

```
BOGOTA1(config)#int s0/0/0
BOGOTA1(config-if)#description Conexion con ISP
BOGOTA1(config-if)#ip address 209.17.220.6 255.255.255.252
BOGOTA1(config-if)#clock rate 128000
BOGOTA1(config-if)#no shutdown
BOGOTA1(config-if)#int s0/0/1
BOGOTA1(config-if)#description Conexion con BOGOTA2
BOGOTA1(config-if)#ip address 172.29.3.9 255.255.255.252
BOGOTA1(config-if)#clock rate 128000
BOGOTA1(config-if)#no shutdown
```

```
BOGOTA1(config-if)#int s0/1/0
BOGOTA1(config-if)#description Conexion1 con BOGOTA2
BOGOTA1(config-if)#ip address 172.29.3.5 255.255.255.252
BOGOTA1(config-if)#clock rate 128000
BOGOTA1(config-if)#no shutdown
BOGOTA1(config-if)#int s0/1/1
BOGOTA1(config-if)#description Conexion2 con BOGOTA2
BOGOTA1(config-if)#ip address 172.29.3.1 255.255.255.252
BOGOTA1(config-if)#clock rate 128000
BOGOTA1(config-if)#no shutdown
```

Configuración IP BOGOTA2

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

Configuración IP BOGOTA3

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

```
BOGOTA3(config-if)#description Conexion hacia BOGOTA2
BOGOTA3(config-if)#ip address 172.29.3.14 255.255.255.252
BOGOTA3(config-if)#clock rate 128000
BOGOTA3(config-if)#no shutdown
BOGOTA3(config-if)#int f0/0
BOGOTA3(config-if)#description Conexion hacia hosts
BOGOTA3(config-if)#ip address 172.29.0.1 255.255.255.0
BOGOTA3(config-if)#no shutdown
```

2.1.2 Configuración del enrutamiento establecido

Enrutamiento en router ISP

Código de configuración de route rip
ISP(config)#route rip

```
ISP(config-router)#version 2
ISP(config-router)#network 209.17.220.0
ISP(config-router)#network 209.17.220.4
ISP(config-router)#no auto-summary
```

Enrutamiento en router MEDELLIN1

Código de configuración de route rip
MEDELLIN1(config)#route rip
MEDELLIN1(config-router)#version 2
MEDELLIN1(config-router)#network 172.29.6.0
MEDELLIN1(config-router)#network 172.29.6.8
MEDELLIN1(config-router)#network 172.29.6.12
MEDELLIN1(config-router)#network 209.17.220.0
MEDELLIN1(config-router)#no auto-summary

Enrutamiento en router MEDELLIN2

Código de configuración de route rip
MEDELLIN2(config)#route rip
MEDELLIN2(config-router)#version 2
MEDELLIN2(config-router)#network 172.29.6.0
MEDELLIN2(config-router)#network 172.29.6.4
MEDELLIN2(config-router)#no auto-summary
MEDELLIN2(config-router)#exit

Enrutamiento en router MEDELLIN3

```
Còdigo de configuraciòn de route rip
MEDELLIN3(config)#route      rip
MEDELLIN3(config-router)#version 2
MEDELLIN3(config-router)#network 172.29.6.4
MEDELLIN3(config-router)#network 172.29.6.8
MEDELLIN3(config-router)#network 172.29.6.12
MEDELLIN3(config-router)#no auto-summary
```

Enrutamiento en router BOGOTA1

```
Còdigo de configuraciòn de route rip
BOGOTA1(config)#route      rip
BOGOTA1(config-router)#version 2
BOGOTA1(config-router)#network 209.17.220.6
BOGOTA1(config-router)#network 172.29.3.9
BOGOTA1(config-router)#network 172.29.3.5
BOGOTA1(config-router)#network 172.29.3.1
BOGOTA1(config-router)#no auto-summary
```

Enrutamiento en router BOGOTA2

```
Còdigo de configuraciòn de route rip
BOGOTA2(config)#route      rip
BOGOTA2(config-router)#version 2
BOGOTA2(config-router)#network 172.29.3.8
BOGOTA2(config-router)#network 172.29.3.12
BOGOTA2(config-router)#no auto-summary
```

Enrutamiento en router BOGOTA3

```
Còdigo de configuraciòn de route rip
BOGOTA3(config)#route      rip
BOGOTA3(config-router)#version 2
BOGOTA3(config-router)#network 172.29.3.0
BOGOTA3(config-router)#network 172.29.3.4
BOGOTA3(config-router)#network 172.29.3.12
BOGOTA3(config-router)#no auto-summary
```

- 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.

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

Redistribución dentro de las publicaciones de RIP

```
MEDELLIN1(config)#route rip
```

```
MEDELLIN1(config-router)#version 2
```

```
MEDELLIN1(config-router)#default-information originate
```

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

Redistribución dentro de las publicaciones de RIP

```
BOGOTA1(config)#route rip
```

```
BOGOTA1(config-router)#version 2
```

```
BOGOTA1(config-router)# default-information originate
```

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

Se calcula la sumarización de cada red:

La red Medellín con dirección ip
172.29.4.0 La red Bogotá con dirección
ip 172.29.0.0

- Ruta estática dirigida hacia la red interna de MEDELLIN

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

- Ruta estática dirigida hacia la red interna de BOGOTA

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

2.1.3 Valores de Enrutamiento

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

Comprobación de enrutamiento teniendo como resultado la variación de los puertos serial que están unificados al mismo router.

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

Gateway of last resort is not set

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

Figura 3. Enrutamiento ISP

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

Gateway of last resort is 0.0.0.0 to network 0.0.0.0

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

Figura 4. Enrutamiento MEDELLIN1

```

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

Gateway of last resort is 172.29.6.1 to network 0.0.0.0

172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
R 172.29.0.0/24 [120/4] via 172.29.6.1, 00:00:00, Serial0/0/0
R 172.29.1.0/24 [120/4] via 172.29.6.1, 00:00:00, Serial0/0/0
R 172.29.3.0/30 [120/3] via 172.29.6.1, 00:00:00, Serial0/0/0
R 172.29.3.4/30 [120/3] via 172.29.6.1, 00:00:00, Serial0/0/0
R 172.29.3.8/30 [120/3] via 172.29.6.1, 00:00:00, Serial0/0/0
R 172.29.3.12/30 [120/4] via 172.29.6.1, 00:00:00, Serial0/0/0
C 172.29.4.0/25 is directly connected, FastEthernet0/0
R 172.29.4.128/25 [120/1] via 172.29.6.6, 00:00:00, Serial0/0/1
C 172.29.6.0/30 is directly connected, Serial0/0/0
C 172.29.6.4/30 is directly connected, Serial0/0/1
R 172.29.6.8/30 [120/1] via 172.29.6.1, 00:00:00, Serial0/0/0
[120/1] via 172.29.6.6, 00:00:00, Serial0/0/1
R 172.29.6.12/30 [120/1] via 172.29.6.1, 00:00:00, Serial0/0/0
[120/1] via 172.29.6.6, 00:00:00, Serial0/0/1
209.17.220.0/30 is subnetted, 2 subnets
R 209.17.220.0 [120/1] via 172.29.6.1, 00:00:00, Serial0/0/0
R 209.17.220.4 [120/2] via 172.29.6.1, 00:00:00, Serial0/0/0
R* 0.0.0.0/0 [120/1] via 172.29.6.1, 00:00:00, Serial0/0/0

```

Figura 5. Enrutamiento MEDELLIN2

```

MEDELLIN3#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is 172.29.6.13 to network 0.0.0.0

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

```

Figura 6. Enrutamiento MEDELLIN3

```

BOGOTA1#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is 0.0.0.0 to network 0.0.0.0

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

```

Figura 7. Enrutamiento BOGOTA1

```

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

Gateway of last resort is 172.29.3.9 to network 0.0.0.0

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

```

Figura 8. Enrutamiento BOGOTA2


```

BOGOTA3#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is 172.29.3.5 to network 0.0.0.0

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

```

Figura 9. Enrutamiento BOGOTA3

- 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.

```

Routing for Networks:
172.29.0.0
209.17.220.0

```

Figura 10. Similitud de routers

```

Gateway of last resort is 0.0.0.0 to network 0.0.0.0

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

```

Figura 11. Comparación de protocolos

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

```

Gateway of last resort is 0.0.0.0 to network 0.0.0.0

    172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
R       172.29.0.0/24 [120/3] via 209.17.220.1, 00:00:22, Serial0/1/1
R       172.29.1.0/24 [120/3] via 209.17.220.1, 00:00:22, Serial0/1/1
R       172.29.3.0/30 [120/2] via 209.17.220.1, 00:00:22, Serial0/1/1
R       172.29.3.4/30 [120/2] via 209.17.220.1, 00:00:22, Serial0/1/1
R       172.29.3.8/30 [120/2] via 209.17.220.1, 00:00:22, Serial0/1/1
R       172.29.3.12/30 [120/3] via 209.17.220.1, 00:00:22, Serial0/1/1
R       172.29.4.0/25 [120/1] via 172.29.6.2, 00:00:00, Serial0/0/0
R       172.29.4.128/25 [120/1] via 172.29.6.14, 00:00:03, Serial0/1/0
        [120/1] via 172.29.6.10, 00:00:03, Serial0/0/1
C       172.29.6.0/30 is directly connected, Serial0/0/0
R       172.29.6.4/30 [120/1] via 172.29.6.14, 00:00:03, Serial0/1/0
        [120/1] via 172.29.6.2, 00:00:00, Serial0/0/0
        [120/1] via 172.29.6.10, 00:00:03, Serial0/0/1
C       172.29.6.8/30 is directly connected, Serial0/0/1
C       172.29.6.12/30 is directly connected, Serial0/1/0
    209.17.220.0/30 is subnetted, 2 subnets
C       209.17.220.0 is directly connected, Serial0/1/1
R       209.17.220.4 [120/1] via 209.17.220.1, 00:00:22, Serial0/1/1
S*    0.0.0.0/0 [1/0] via 209.17.220.4
        is directly connected, Serial0/1/1
MEDELLIN2#

```

Figura 12. Comparación protocolos

- Las tablas de los routers restantes deben permitir visualizar rutas redundantes para el caso de la ruta por defecto.
- Las rutas redundantes indican más de un camino para acceder a la ip destino, los router MEDELLIN3 Y BOGOTA3 cuentan con 3 rutas de salida por ejemplo las señaladas.

```

172.29.3.8/30 [120/1] via 172.29.3.1, 00:00:09, Serial0/0/0
        [120/1] via 172.29.3.13, 00:00:22, Serial0/1/0
        [120/1] via 172.29.3.5, 00:00:09, Serial0/0/1

```

- Verificar el balanceo de carga que muestran los routers.
- Este balanceo de carga se observa en cada dato establecidos datos señalados proporcionado balance en cada router.

```

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

```

Figura 13. Balanceo router ISP

```

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

```

Figura 14. Balanceo router MEDELLIN1

```

172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
R 172.29.0.0/24 [120/4] via 172.29.6.1, 00:00:00, Serial0/0/0
R 172.29.1.0/24 [120/4] via 172.29.6.1, 00:00:00, Serial0/0/0
R 172.29.3.0/30 [120/3] via 172.29.6.1, 00:00:00, Serial0/0/0
R 172.29.3.4/30 [120/3] via 172.29.6.1, 00:00:00, Serial0/0/0
R 172.29.3.8/30 [120/3] via 172.29.6.1, 00:00:00, Serial0/0/0
R 172.29.3.12/30 [120/4] via 172.29.6.1, 00:00:00, Serial0/0/0
C 172.29.4.0/25 is directly connected, FastEthernet0/0
R 172.29.4.128/25 [120/1] via 172.29.6.6, 00:00:00, Serial0/0/1
C 172.29.6.0/30 is directly connected, Serial0/0/0
C 172.29.6.4/30 is directly connected, Serial0/0/1
R 172.29.6.8/30 [120/1] via 172.29.6.1, 00:00:00, Serial0/0/0
[120/1] via 172.29.6.6, 00:00:00, Serial0/0/1
R 172.29.6.12/30 [120/1] via 172.29.6.1, 00:00:00, Serial0/0/0
[120/1] via 172.29.6.6, 00:00:00, Serial0/0/1
209.17.220.0/30 is subnetted, 2 subnets
R 209.17.220.0 [120/1] via 172.29.6.1, 00:00:00, Serial0/0/0
R 209.17.220.4 [120/2] via 172.29.6.1, 00:00:00, Serial0/0/0
R* 0.0.0.0/0 [120/1] via 172.29.6.1, 00:00:00, Serial0/0/0

```

Figura 15. Balanceo router MEDELLIN2

```

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

```

Figura 16. Balanceo router MEDELLIN3

```

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

```

Figura 17. Balanceo router BOGOTA1

```

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

```

Figura 18. Balanceo router BOGOTA2

```

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

```

Figura 19. Balanceo router BOGOTA3

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

```

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

```

Figura 20. Rutas ISP

2.1.4 Suspender la expansión del protocolo RIP

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

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 requiere

Tabla 1. Router - Interfaz

```
ISP(config)#route rip
```

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

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

```
MEDELLIN1(config)#route rip
```

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

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

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

```
MEDELLIN2(config)#route rip
```

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

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

```
MEDELLIN3(config)#route rip
```

```

MEDELLIN3(config-router)#passive-interface f0/0
MEDELLIN3(config-router)#passive-interface f0/1
BOGOTA1(config)#route rip
BOGOTA1(config-router)#passive-interface f0/0
BOGOTA1(config-router)#passive-interface f0/1
BOGOTA1 (config-router)#passive-interface s0/0/0
BOGOTA2(config)#route rip
BOGOTA2(config-router)#passive-interface f0/0
BOGOTA2(config-router)#passive-interface f0/1
BOGOTA3(config)#route rip
BOGOTA3(config-router)#passive-interface f0/0
BOGOTA3(config-router)#passive-interface f0/1

```

2.1.5 Observación del protocolo RIP

- 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.

Verificación de cada protocolo RIP

```

MEDELLIN2#sh ip protocol Routing
Protocol is "rip"
Sending updates every 30 seconds, next due in 15 seconds Invalid after
180 seconds, hold down 180, flushed after 240 Outgoing update filter
list for all interfaces is not set Incoming update filter list for all interfaces
is not set Redistributing: rip
Default version control: send version 2, receive 2 Interface
Send Recv Triggered RIP Key-chain Serial0/0/1 2 2
Serial0/0/0 2 2
Automatic network summarization is not in effect Maximum
path: 4
Routing for Networks:
172.29.0.0
192.29.6.0
Passive Interface(s):
GigabitEthernet0/0

```

Routing Information Sources:
Gateway Distance Last Update 172.29.6.2 120
00:00:11
172.29.6.6 120 00:00:07
Distance: (default is 120)

MEDELLIN3#sh ip protocol Routing
Protocol is "rip"
Sending updates every 30 seconds, next due in 21 seconds Invalid after
180 seconds, hold down 180, flushed after 240 Outgoing update filter
list for all interfaces is not set Incoming update filter list for all interfaces
is not set Redistributing: rip
Default version control: send version 2, receive 2 Interface
Send Recv Triggered RIP Key-chain GigabitEthernet0/1 2 2
Serial0/0/1 2 2
Serial0/0/0 2 2
Automatic network summarization is not in effect Maximum
path: 4

Routing for Networks:

172.29.0.0
192.29.3.0
192.29.6.0
192.168.6.0
Passive Interface(s):
GigabitEthernet0/0
Routing Information Sources:
Gateway Distance Last Update
172.29.6.14 120 00:00:09
172.29.6.5 120 00:00:08
Distance: (default is 120)

MEDELLIN1#sh ip protocol Routing
Protocol is "rip"
Sending updates every 30 seconds, next due in 25 seconds Invalid after
180 seconds, hold down 180, flushed after 240 Outgoing update filter
list for all interfaces is not set Incoming update filter list for all interfaces
is not set Redistributing: rip
Default version control: send version 2, receive 2 Interface
Send Recv Triggered RIP Key-chain Serial0/1/0 2 2
Serial0/0/0 2 2
Serial0/0/1 2 2
Automatic network summarization is not in effect Maximum


```
path: 4
Routing for Networks:
172.29.0.0
192.168.6.0
209.17.220.0
Passive Interface(s):
GigabitEthernet0/1
Routing Information Sources:
Gateway    Distance    Last    Update
209.17.220.2 120 00:00:00
172.29.6.1 120 00:00:25
172.29.6.9 120 00:00:21
172.29.6.13 120 00:00:21
Distance: (default is 120) ISP#sho ip
route protocol
Translating "protocol"...domain server (255.255.255.255)
% Invalid input detected ISP#sho ip
protocol Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 25 seconds Invalid after
180 seconds, hold down 180, flushed after 240 Outgoing update filter
list for all interfaces is not set
```

```
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 2, receive 2 Interface
Send Recv Triggered RIP Key-chain Serial0/0/1 2 2
Serial0/0/0 2 2
Automatic network summarization is not in effect Maximum
path: 4
Routing for Networks:
209.17.220.0
Passive Interface(s):
Routing Information Sources:
Gateway Distance Last Update 209.17.220.6 120
00:00:13
209.17.220.1 120 00:00:01
Distance: (default is 120)
```

```
BOGOTA1#sh ip protocol Routing
Protocol is "rip"
Sending updates every 30 seconds, next due in 22 seconds Invalid after
180 seconds, hold down 180, flushed after 240 Outgoing update filter
```

```
list for all interfaces is not set Incoming update filter list for all interfaces
is not set Redistributing: rip
Default version control: send version 2, receive 2 Interface
Send Recv Triggered RIP Key-chain Serial0/0/1 2 2
Serial0/1/0 2 2
Serial0/0/0 2 2
Automatic network summarization is not in effect Maximum
path: 4
Routing for Networks: 172.29.0.0
192.29.3.0
209.17.220.0
209.168.220.0
Passive          Interface(s):
GigabitEthernet0/0
Routing Information Sources: Gateway Distance
Last Update 172.29.3.2 120 00:00:12
172.29.3.6 120 00:00:12
172.29.3.10 120 00:00:20
209.17.220.5 120 00:00:20
Distance: (default is 120)
```

```
BOGOTA2#sh ip protocol Routing
Protocol is "rip"
```

```
Sending updates every 30 seconds, next due in 19 seconds Invalid after
180 seconds, hold down 180, flushed after 240 Outgoing update filter
list for all interfaces is not set Incoming update filter list for all interfaces
is not set Redistributing: rip
Default version control: send version 2, receive 2 Interface
Send Recv Triggered RIP Key-chain Serial0/0/1 2 2
Serial0/0/0 2 2
Automatic network summarization is not in effect Maximum
path: 4
Routing for Networks:
172.29.0.0
192.29.3.0
Passive Interface(s):
GigabitEthernet0/0
Routing Information Sources:
Gateway    Distance    Last    Update
172.29.3.14 120 00:00:28
172.29.3.9 120 00:00:20
Distance: (default is 120)
```

```

BOGOTA3#sh ip protocol Routing
Protocol is "rip"
Sending updates every 30 seconds, next due in 10 seconds Invalid after
180 seconds, hold down 180, flushed after 240 Outgoing update filter
list for all interfaces is not set Incoming update filter list for all interfaces
is not set Redistributing: rip
Default version control: send version 2, receive 2 Interface
Send Recv Triggered RIP Key-chain GigabitEthernet0/1 2 2
Serial0/0/1 2 2
Serial0/0/0 2 2
Automatic network summarization is not in effect Maximum
path: 4
Routing for Networks: 172.29.0.0
Passive Interface(s):
GigabitEthernet0/0
Routing Information Sources: Gateway
Distance Last Update 172.29.3.13 120
00:00:00
172.29.3.5 120 00:00:14
Distance: (default is 120)

```

- 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.

2.1.6 Analisis de cada router

ISP

```

172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
R 172.29.0.0/24 [120/2] via 209.17.220.6, 00:00:10, Serial0/0/1 R
172.29.1.0/24 [120/2] via 209.17.220.6, 00:00:10, Serial0/0/1 R
172.29.3.0/30 [120/1] via 209.17.220.6, 00:00:10, Serial0/0/1 R
172.29.3.4/30 [120/1] via 209.17.220.6, 00:00:10, Serial0/0/1 R
172.29.3.8/30 [120/1] via 209.17.220.6, 00:00:10, Serial0/0/1 R
172.29.3.12/30 [120/2] via 209.17.220.6, 00:00:10, Serial0/0/1 R
172.29.4.0/25 [120/2] via 209.17.220.1, 00:00:16, Serial0/0/0
R 172.29.4.128/25 [120/2] via 209.17.220.1, 00:00:16, Serial0/0/0 R
172.29.6.0/30 [120/1] via 209.17.220.1, 00:00:16, Serial0/0/0
R 172.29.6.4/30 [120/2] via 209.17.220.1, 00:00:16, Serial0/0/0 R
172.29.6.8/30 [120/1] via 209.17.220.1, 00:00:16, Serial0/0/0 R
172.29.6.12/30 [120/1] via 209.17.220.1, 00:00:16, Serial0/0/0
209.17.220.0/24 is variably subnetted, 4 subnets, 2 masks C
209.17.220.0/30 is directly connected, Serial0/0/0

```

L 209.17.220.2/32 is directly connected, Serial0/0/0 C
209.17.220.4/30 is directly connected, Serial0/0/1 L
209.17.220.5/32 is directly connected, Serial0/0/1

Medellin1

172.29.0.0/16 is variably subnetted, 13 subnets, 4 masks
R 172.29.0.0/24 [120/3] via 209.17.220.2, 00:00:10, Serial0/1/0 R
172.29.1.0/24 [120/3] via 209.17.220.2, 00:00:10, Serial0/1/0 R
172.29.3.0/30 [120/2] via 209.17.220.2, 00:00:10, Serial0/1/0 R
172.29.3.4/30 [120/2] via 209.17.220.2, 00:00:10, Serial0/1/0 R
172.29.3.8/30 [120/2] via 209.17.220.2, 00:00:10, Serial0/1/0 R
172.29.3.12/30 [120/3] via 209.17.220.2, 00:00:10, Serial0/1/0 R
172.29.4.0/25 [120/1] via 172.29.6.1, 00:00:07, Serial0/0/1
R 172.29.4.128/25 [120/1] via 172.29.6.13, 00:00:15, Serial0/0/0
C 172.29.6.0/30 is directly connected, Serial0/0/1 L
172.29.6.2/32 is directly connected, Serial0/0/1
R 172.29.6.4/30 [120/1] via 172.29.6.1, 00:00:07, Serial0/0/1 [120/1] via
172.29.6.13, 00:00:15, Serial0/0/0
C 172.29.6.12/30 is directly connected, Serial0/0/0 L
172.29.6.14/32 is directly connected, Serial0/0/0
209.17.220.0/24 is variably subnetted, 3 subnets, 2 masks C
209.17.220.0/30 is directly connected, Serial0/1/0
L 209.17.220.1/32 is directly connected, Serial0/1/0
R 209.17.220.4/30 [120/1] via 209.17.220.2, 00:00:10, Serial0/1/0

Medellin2

172.29.0.0/16 is variably subnetted, 15 subnets, 4 masks
R 172.29.0.0/24 [120/4] via 172.29.6.2, 00:00:21, Serial0/0/1 R
172.29.1.0/24 [120/4] via 172.29.6.2, 00:00:21, Serial0/0/1 R
172.29.3.0/30 [120/3] via 172.29.6.2, 00:00:21, Serial0/0/1 R
172.29.3.4/30 [120/3] via 172.29.6.2, 00:00:21, Serial0/0/1 R
172.29.3.8/30 [120/3] via 172.29.6.2, 00:00:21, Serial0/0/1 R
172.29.3.12/30 [120/4] via 172.29.6.2, 00:00:21, Serial0/0/1
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, 00:00:12, Serial0/0/0
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
172.29.6.4/30 is directly connected, Serial0/0/0 L
172.29.6.5/32 is directly connected, Serial0/0/0
R 172.29.6.8/30 [120/1] via 172.29.6.6, 00:00:12, Serial0/0/0 [120/1] via
172.29.6.2, 00:00:21, Serial0/0/1
R 172.29.6.12/30 [120/1] via 172.29.6.6, 00:00:12, Serial0/0/0 [120/1] via

172.29.6.2, 00:00:21, Serial0/0/1
209.17.220.0/30 is subnetted, 2 subnets
R 209.17.220.0/30 [120/1] via 172.29.6.2, 00:00:21, Serial0/0/1
R 209.17.220.4/30 [120/2] via 172.29.6.2, 00:00:21, Serial0/0/1

Medellin3

172.29.0.0/16 is variably subnetted, 14 subnets, 4 masks
R 172.29.0.0/24 [120/4] via 172.29.6.14, 00:00:15, Serial0/0/1 R
172.29.1.0/24 [120/4] via 172.29.6.14, 00:00:15, Serial0/0/1 R
172.29.3.0/30 [120/3] via 172.29.6.14, 00:00:15, Serial0/0/1 R
172.29.3.4/30 [120/3] via 172.29.6.14, 00:00:15, Serial0/0/1 R
172.29.3.8/30 [120/3] via 172.29.6.14, 00:00:15, Serial0/0/1 R
172.29.3.12/30 [120/4] via 172.29.6.14, 00:00:15, Serial0/0/1 R
172.29.4.0/25 [120/1] via 172.29.6.5, 00:00:23, Serial0/0/0
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, 00:00:23, Serial0/0/0 [120/1] via
172.29.6.14, 00:00:15, Serial0/0/1
C 172.29.6.4/30 is directly connected, Serial0/0/0 L
172.29.6.6/32 is directly connected, Serial0/0/0 C
172.29.6.12/30 is directly connected, Serial0/0/1 L
172.29.6.13/32 is directly connected, Serial0/0/1
209.17.220.0/30 is subnetted, 2 subnets
R 209.17.220.0/30 [120/1] via 172.29.6.14, 00:00:15, Serial0/0/1 R
209.17.220.4/30 [120/2] via 172.29.6.14, 00:00:15, Serial0/0/1

Bogota1

172.29.0.0/16 is variably subnetted, 13 subnets, 4 masks
R 172.29.0.0/24 [120/1] via 172.29.3.6, 00:00:16, Serial0/1/0
C 172.29.3.4/30 is directly connected, Serial0/1/0 L
172.29.3.5/32 is directly connected, Serial0/1/0 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 172.29.3.6, 00:00:16, Serial0/1/0 [120/1] via
172.29.3.10, 00:00:07, Serial0/0/1
R 172.29.4.0/25 [120/3] via 209.17.220.5, 00:00:14, Serial0/0/0
R 172.29.4.128/25 [120/3] via 209.17.220.5, 00:00:14, Serial0/0/0 R
172.29.6.0/30 [120/2] via 209.17.220.5, 00:00:14, Serial0/0/0
R 172.29.6.4/30 [120/3] via 209.17.220.5, 00:00:14, Serial0/0/0 R
172.29.6.8/30 [120/2] via 209.17.220.5, 00:00:14, Serial0/0/0 R

172.29.6.12/30 [120/2] via 209.17.220.5, 00:00:14, Serial0/0/0
209.17.220.0/24 is variably subnetted, 3 subnets, 2 masks
R 209.17.220.0/30 [120/1] via 209.17.220.5, 00:00:14, Serial0/0/0
C 209.17.220.4/30 is directly connected, Serial0/0/0 L
209.17.220.6/32 is directly connected, Serial0/0/0

Bogota2

172.29.0.0/16 is variably subnetted, 15 subnets, 4 masks
R 172.29.0.0/24 [120/1] via 172.29.3.14, 00:00:01, Serial0/0/1
C 172.29.1.0/24 is directly connected, GigabitEthernet0/0 L
172.29.1.1/32 is directly connected, GigabitEthernet0/0
R 172.29.3.0/30 [120/1] via 172.29.3.9, 00:00:11, Serial0/0/0 [120/1] via
172.29.3.14, 00:00:01, Serial0/0/1
R 172.29.3.4/30 [120/1] via 172.29.3.9, 00:00:11, Serial0/0/0 [120/1] via
172.29.3.14, 00:00:01, Serial0/0/1
C 172.29.3.8/30 is directly connected, Serial0/0/0 L
172.29.3.10/32 is directly connected, Serial0/0/0 C
172.29.3.12/30 is directly connected, Serial0/0/1 L
172.29.3.13/32 is directly connected, Serial0/0/1
R 172.29.4.0/25 [120/4] via 172.29.3.9, 00:00:11, Serial0/0/0
R 172.29.4.128/25 [120/4] via 172.29.3.9, 00:00:11, Serial0/0/0 R
172.29.6.0/30 [120/3] via 172.29.3.9, 00:00:11, Serial0/0/0
R 172.29.6.4/30 [120/4] via 172.29.3.9, 00:00:11, Serial0/0/0 R
172.29.6.8/30 [120/3] via 172.29.3.9, 00:00:11, Serial0/0/0 R
172.29.6.12/30 [120/3] via 172.29.3.9, 00:00:11, Serial0/0/0
209.17.220.0/30 is subnetted, 2 subnets
R 209.17.220.0/30 [120/2] via 172.29.3.9, 00:00:11, Serial0/0/0 R
209.17.220.4/30 [120/1] via 172.29.3.9, 00:00:11, Serial0/0/0

Bogota3

172.29.0.0/16 is variably subnetted, 14 subnets, 4 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, 00:00:10, Serial0/0/1
C 172.29.3.4/30 is directly connected, Serial0/0/0 L
172.29.3.6/32 is directly connected, Serial0/0/0
R 172.29.3.8/30 [120/1] via 172.29.3.5, 00:00:27, Serial0/0/0 [120/1] via
172.29.3.13, 00:00:10, Serial0/0/1
C 172.29.3.12/30 is directly connected, Serial0/0/1 L

```

172.29.3.14/32 is directly connected, Serial0/0/1
R 172.29.4.0/25 [120/4] via 172.29.3.5, 00:00:27, Serial0/0/0
R 172.29.4.128/25 [120/4] via 172.29.3.5, 00:00:27, Serial0/0/0 R
172.29.6.0/30 [120/3] via 172.29.3.5, 00:00:27, Serial0/0/0
R 172.29.6.4/30 [120/4] via 172.29.3.5, 00:00:27, Serial0/0/0 R
172.29.6.8/30 [120/3] via 172.29.3.5, 00:00:27, Serial0/0/0 R
172.29.6.12/30 [120/3] via 172.29.3.5, 00:00:27, Serial0/0/0
209.17.220.0 /30 is subnetted, 2 subnets
R 209.17.220.0/30 [120/2] via 172.29.3.5, 00:00:27, Serial0/0/0 R
209.17.220.4/30 [120/1] via 172.29.3.5, 00:00:27, Serial0/0/0

```

2.1.7 Configuración de PPP y autenticación PAP y CHAP

- Medellín1 con ISP se configura con autenticación PAP.

```

MEDELLIN1(config)#username USER password unadavid
MEDELLIN1(config)#int s0/1/1

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

ISP(config)#username USER password unadavid
ISP(config)#int s0/0/0

ISP(config-if)#encapsulation ppp
ISP(config-if)#ppp authentication pap
ISP(config-if)#ppp pap sent-username USER password unadavid

```

- Bogotá1 con ISP se configura con autenticación CHAP.

```

BOGOTA1(config)#username ISP password unadavid
BOGOTA1(config)#int s0/0/0

BOGOTA1(config-if)#encapsulation ppp
BOGOTA1(config-if)#ppp authentication chap

ISP(config)#username BOGOTA1 password unadavid

```

```
ISP(config)#int s0/0/1
ISP(config-if)#encapsulation ppp
ISP(config-if)#ppp authentication chap
```

2.1.8 Configuración de PAT

- se activa NAT en cada salida como es Bogotá1 y Medellín1, los routers internos de un lugar no llegan hasta los routers internos en el otro lado, la comunicación se daría hasta los routers Bogotá1, ISP y Medellín1.
- Configuración de NAT en el router Medellín1.

```
MEDELLIN1(config)#access-list 1 permit 172.29.4.0 0.0.3.255
MEDELLIN1(config)#ip nat inside source list 1 interface Serial0/1/1 overload
MEDELLIN1(config)#interface S0/1/1
MEDELLIN1(config-if)#ip nat outside
MEDELLIN1(config-if)#interface S0/0/0
MEDELLIN1(config-if)#ip nat inside
MEDELLIN1(config-if)#interface S0/0/1
MEDELLIN1(config-if)#ip nat inside
MEDELLIN1(config-if)#interface S0/1/0
MEDELLIN1(config-if)#ip nat inside
```

- Compruebe que la traducción de direcciones indique las interfaces de entrada y de salida. Al realizar una prueba de ping, la dirección debe ser traducida automáticamente a la dirección de la interfaz serial 0/1/0 del router Medellín1, cómo diferente puerto.

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

Figura 21. Marcha de NAT en MEDELLN1

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

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


Proceda a configurar el NAT en el router Bogotá1.

```
BOGOTA1 (config)#access-list 1 permit 172.29.0.0 0.0.3.255
BOGOTA1(config)#ip nat inside source list 1 interface s0/0/0 overload
BOGOTA1(config)#int s0/0/0
BOGOTA1(config-if)#ip nat outside
BOGOTA1(config-if)#int s0/0/1
BOGOTA1(config-if)#ip nat inside
BOGOTA1(config-if)#int s0/1/0
BOGOTA1(config-if)#ip nat inside
BOGOTA1(config-if)#int s0/1/1
BOGOTA1(config-if)#ip nat inside
```

- 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.

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

Figura 22 . Marcha de NAT en BOGOTA1

2.1.9 Configuración del servicio DHCP.

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

Figura 23. Configuración del servicio

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

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

```

MEDELLIN2 (config)#ip dhcp excluded-address 172.29.4.0 172.29.4.6
MEDELLIN2 (config)#ip dhcp excluded-address 172.29.4.128 172.29.4.133
MEDELLIN2(config)# ip dhcp pool MEDELLIN3
MEDELLIN2(dhcp-config)#network 172.29.4.128 255.255.255.128
MEDELLIN2(dhcp-config)#default-router 172.29.4.129
MEDELLIN2(dhcp-config)#dns-server 1.1.1.1
MEDELLIN2(config)# ip dhcp pool MEDELLIN2
MEDELLIN2(dhcp-config)#network 172.29.4.0 255.255.255.128
MEDELLIN2(dhcp-config)#default-router 172.29.4.1
MEDELLIN2(dhcp-config)#dns-server 1.1.1.1

```

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

The screenshot shows a network configuration window titled "IP Configuration". Under the "IP Configuration" section, the "DHCP" radio button is selected, and a message "DHCP request successful." is displayed. The configuration fields are as follows:

IP Address	172.29.4.134
Subnet Mask	255.255.255.128
Default Gateway	172.29.4.129
DNS Server	1.1.1.1

Below this, the "IPv6 Configuration" section is visible, with the "Static" radio button selected. The fields are:

IPv6 Address	
Link Local Address	FE80::230:F2FF:FECC:2430
IPv6 Gateway	
IPv6 DNS Server	

Figura 24. Comprobación DHCP en PC-B

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

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

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

```
172.29.0.6 BOGOTA2(config)# ip dhcp pool BOGOTA3
```

```
BOGOTA2(dhcp-config)#network 172.29.0.0 255.255.255.0
```

```
BOGOTA2(dhcp-config)#default-router 172.29.0.1
```

```
BOGOTA2(dhcp-config)#dns-server 1.1.1.1
```

```
BOGOTA2(config)# ip dhcp pool BOGOTA2
```

```
BOGOTA2(dhcp-config)#network 172.29.1.0
```

```
255.255.255.0
```

```
BOGOTA2(dhcp-config)#default-router 172.29.1.1
```

```
BOGOTA2(dhcp-config)#dns-server 1.1.1.1
```

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

```
BOGOTA3(config)#int f0/0
```

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

2.2 Solución al escenario 2

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

Topología de red

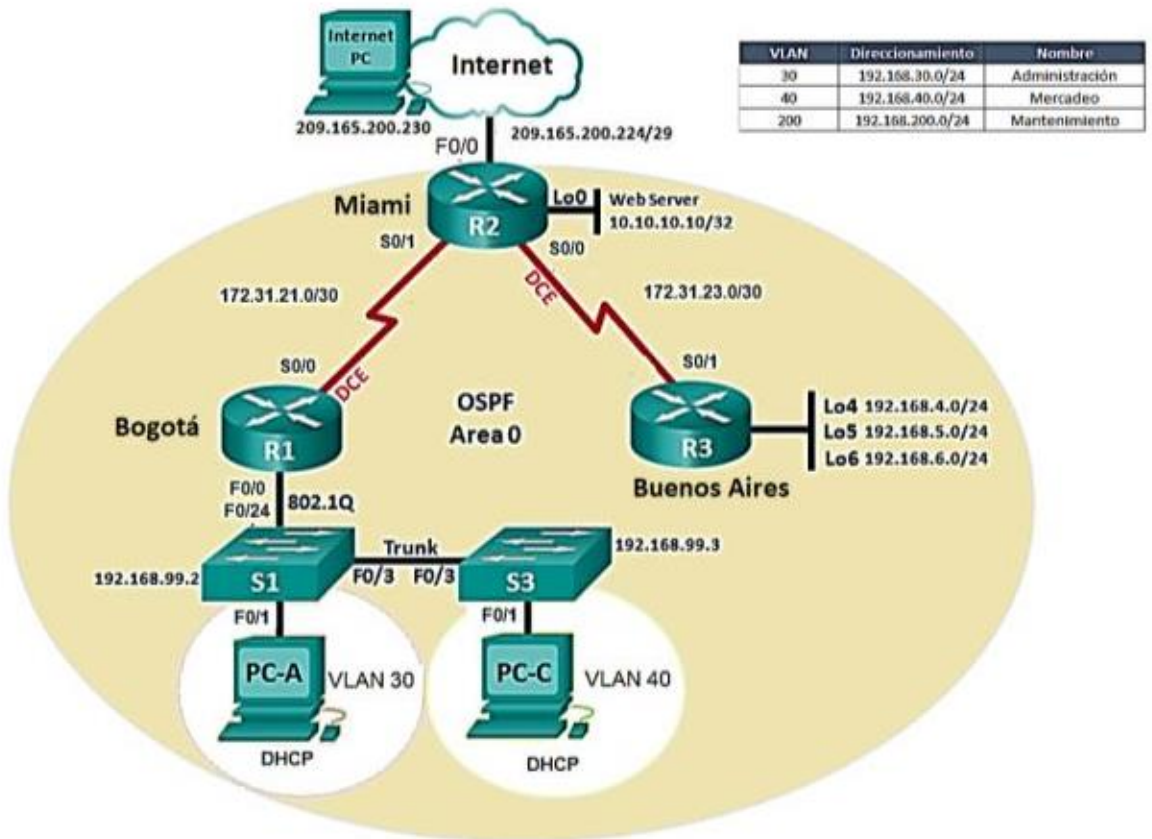


Figura 25. Topología escenario 2

2.3 Configurar el direccionamiento IP

Acorde con la topología de red para cada uno de los dispositivos que forman parte del escenario:

- En este escenario se realiza la siguiente conexión utilizando cada router y dando solución al problema planteado.
- Se identifica los siguientes puertos de conexión R1-S1-S3-PC-A-PC-C y la configuración puertos de enlace serial routers.

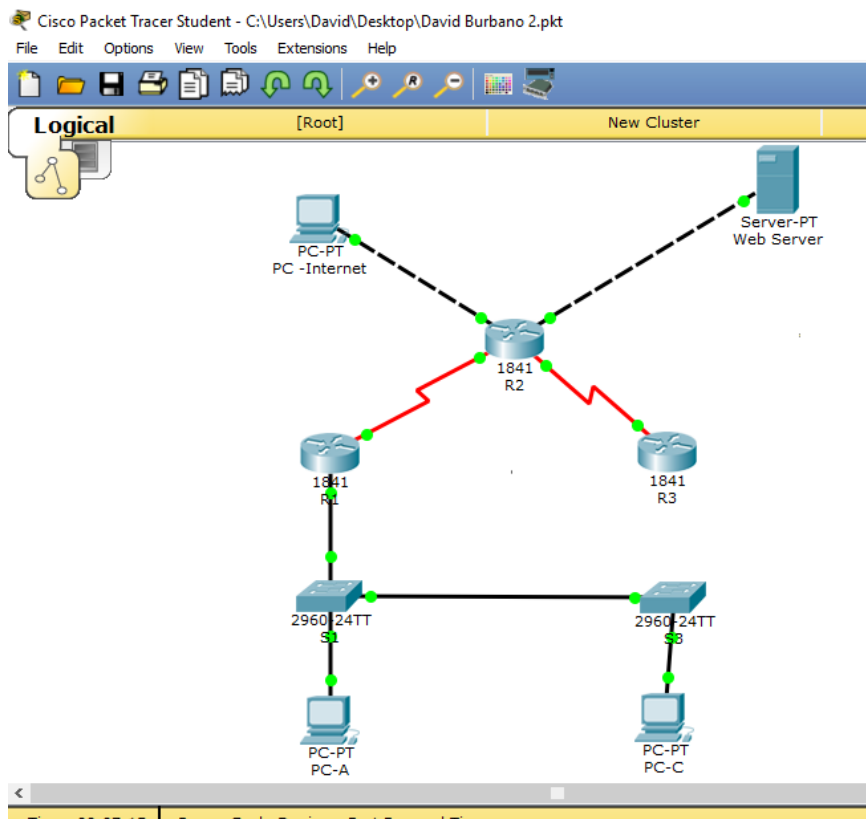


Figura 26. Topología packet Tracer

2. 3.1 Configuración PC de internet y Web server

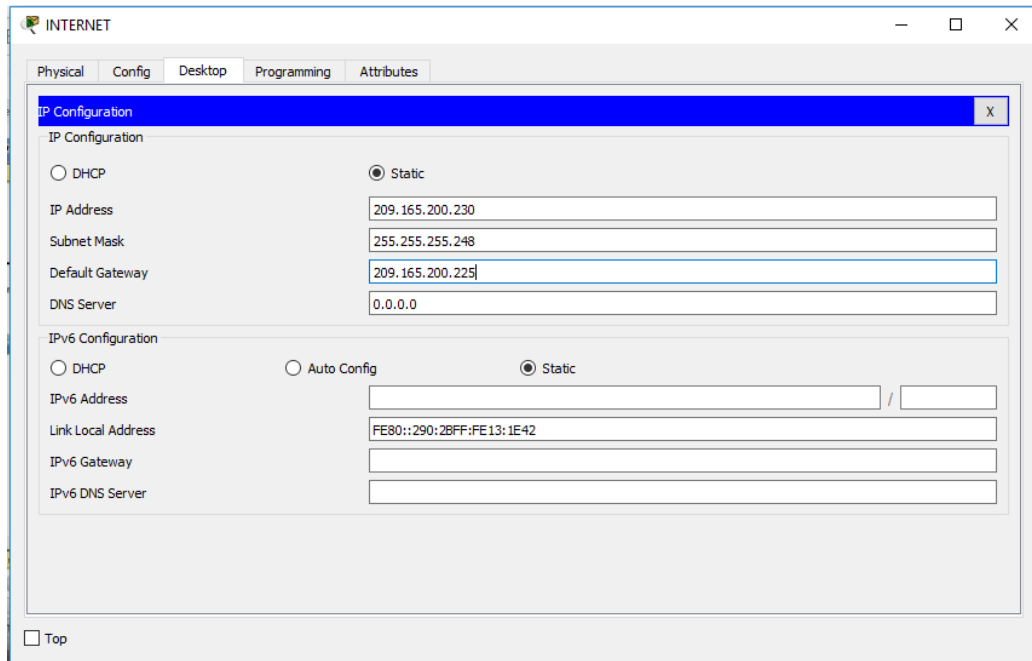


Figura 27. Configuración PC de internet

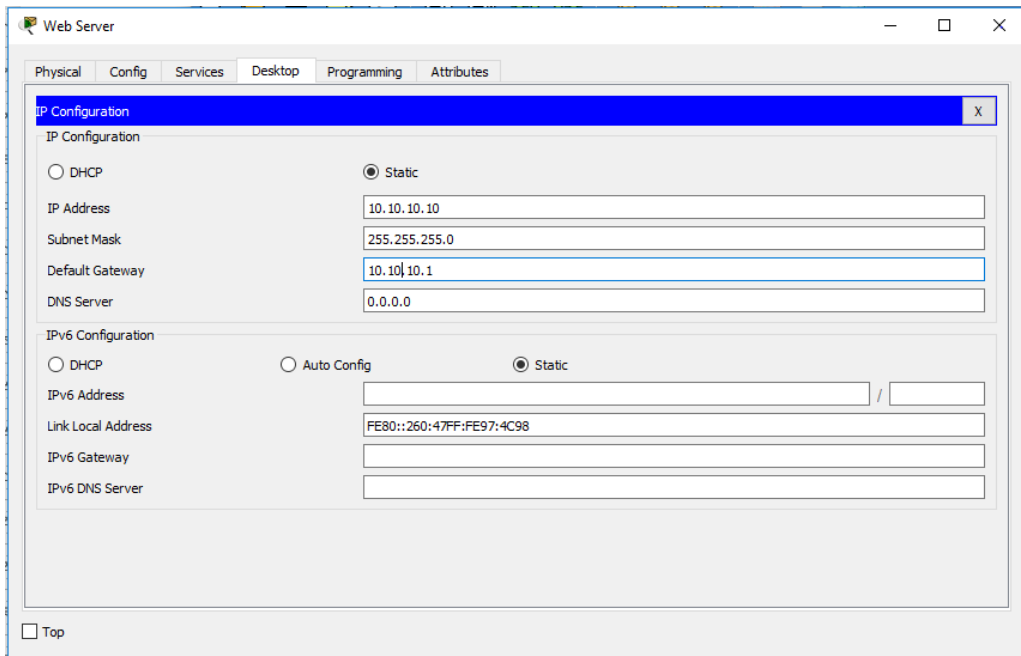


Figura 28. Configuración web server

- Conexión de puertos fast Ethernet PC internet y Web server
- Puertos conexión R1-S1-S3-PC-A-PC-
- Configuración puertos enlace serial routers

2. 3.2 Configuración de router R1, R2 Y R3

Configuración Router R1:

```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#host R1
R1(config)#int s2/0
R1(config-if)#description connection to R2
R1(config-if)#ip add 172.31.21.1 255.255.255.252
R1(config-if)#clock rate 256000
R1(config-if)#no shut
%LINK-5-CHANGED: Interface Serial2/0, changed state to down
R1(config-if)#exit
R1(config)#ip route 0.0.0.0 0.0.0.0 s2/0
```

Configuración Router R2

```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#host R2
R2(config)#int s3/0
R2(config-if)#descrip connection to R1
R2(config-if)#ip add 172.31.21.2 255.255.255.252
R2(config-if)#no shut
R2(config-if)#
%LINK-5-CHANGED: Interface Serial3/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to up
R2(config-if)#int s2/0
R2(config-if)#descrip connection to R3
```

```

R2(config-if)#ip add 172.31.23.1 255.255.255.252
R2(config-if)#clock rate 256000
R2(config-if)#no shut
%LINK-5-CHANGED: Interface Serial2/0, changed state to down
R2(config-if)#
R2(config-if)#int f0/0
R2(config-if)#descrip internet
R2(config-if)#ip add 209.165.200.225 255.255.255.248
R2(config-if)#no shut
R2(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
R2(config-if)#int f1/0
R2(config-if)#ip add 10.10.10.1 255.255.255.0
R2(config-if)#no shut
R2(config-if)#
%LINK-5-CHANGED: Interface FastEthernet1/0, changed state to up
R2(config-if)#description connection to web server
R2(config-if)#exit
R2(config)#ip route 0.0.0.0 0.0.0.0 f0/0
R2(config)#

```

Configuración Router R3

```

Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#host R3
R3(config)#int s3/0
R3(config-if)#description connection to R2
R3(config-if)#ip add 172.31.23.2 255.255.252.252
Bad mask 0xFFFFCFC for address 172.31.23.2
R3(config-if)#ip add 172.31.23.2 255.255.255.252
R3(config-if)#no shut
R3(config-if)#int lo4
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 add 192.168.4.1 255.255.255.0
R3(config-if)#no shut
R3(config-if)#int lo5
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 add 192.168.5.1 255.255.255.0
R3(config-if)#no shut
R3(config-if)#int lo6
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 add 192.168.6.1 255.255.255.0
R3(config-if)#exit
R3(config)#ip route 0.0.0.0 0.0.0.0 s3/0
R3(config)#
R3#
%SYS-5-CONFIG_I: Configured from console by console
```

2. 3.3 Configuración de switch 1, 2 Y 3

Configuración Switch 1

```
Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#no ip domain-lookup
Switch(config)#no ip domain-lookup
Switch(config)#host S1
S1(config)#
S1#
%SYS-5-CONFIG_I: Configured from console by console
```

Configuración Switch 3

```
Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#no ip domain-lookup
Switch(config)#no ip domain-lookup
Switch(config)#host S3
S3(config)#
S1#
%SYS-5-CONFIG_I: Configured from console by console
```

2. 3.4 Tabla protocolo de enrutamiento

- **Configurar el protocolo de enrutamiento OSPFv2 bajo los siguientes criterios:**

OSPFv2 area 0

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

Tabla 2.configuracion protocolo de enrutamiento

Configuración en R1:

```
R1>en
Password:
R1#conf 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 192.168.30.0 0.0.0.255 area 0
R1(config-router)#network 192.168.40.0 0.0.0.255 area 0
R1(config-router)#network 192.168.200.0 0.0.0.255 area 0
R1(config-router)#passive-interface f0/0.30
R1(config-router)#passive-interface f0/0.40
R1(config-router)#passive-interface f0/0.200
R1(config-router)#exit
R1(config)#
%LINK-5-CHANGED: Interface Serial2/0, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to
down

%LINK-5-CHANGED: Interface Serial2/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to
up
```

```
R1(config)#int s2/0
R1(config-if)#bandwidth 256
R1(config-if)#ip ospf cost 9500
R1(config-if)#
```

Configuración en R2:

```
R2>en
Password:
R2#conf 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)#
03:50:39: %OSPF-5-ADJCHG: Process 1, Nbr 1.1.1.1 on Serial3/0 from LOADING
to FULL, Loading Done
R2(config-router)#network 172.31.23.0 0.0.0.3 area 0
R2(config-router)#network 172.31.23.0 0.0.0.3 area 0
R2(config-router)#
R2(config-router)#network 172.31.21.0 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 f0/0
R2(config-router)#int s2/0
R2(config-if)#bandwidth 256
R2(config-if)#int s3/0
R2(config-if)#bandwidth 256
R2(config-if)#int s2/0
R2(config-if)#ip ospf cost 9500
```

Configuración R3:

```
R3>en
Password:
R3#conf 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)#
04:05:10: %OSPF-5-ADJCHG: Process 1, Nbr 5.5.5.5 on Serial3/0 from LOADING
to FULL, Loading Done
```

```
R3(config-router)#network 192.168.4.0 0.0.0.255 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 s3/0
R3(config-if)#bandwidth 256
```

2. 3.5 Verificación de OSPF

Visualizar tablas de enrutamiento y routers conectados por OSPFv2:

```
R2#show ip ospf neighbor
Neighbor ID Pri State Dead Time Address Interface
8.8.8.8 0 FULL/ - 00:00:37 172.31.23.2 Serial2/0
1.1.1.1 0 FULL/ - 00:00:35 172.31.21.1 Serial3/0
```

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

```
Serial3/0 is up, line protocol is up
Internet address is 172.31.21.2/30, Area 0
Process ID 1, Router ID 5.5.5.5, Network Type POINT-TO-POINT, Cost: 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 00:00:07
Index 1/1, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 1 , Adjacent neighbor count is 1
Adjacent with neighbor 1.1.1.1
Suppress hello for 0 neighbor(s)
Serial2/0 is up, line protocol is up
Internet address is 172.31.23.1/30, Area 0
Process ID 1, Router ID 5.5.5.5, Network Type POINT-TO-POINT, Cost: 7500
Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
No designated router on this network
No backup designated router on this network
```

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

```
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):  
FastEthernet0/0  
Routing Information Sources:  
Gateway Distance Last Update  
1.1.1.1 110 00:20:43  
5.5.5.5 110 00:06:15  
8.8.8.8 110 00:03:50  
Distance: (default is 110)
```

2. 3.6 Configuración de seguridad

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

Configuración seguridad en el router R1:

```
R1>en  
R1#conf t  
Enter configuration commands, one per line. End with CNTL/Z.  
R1(config)#enable secret class  
R1(config)#line con 0  
R1(config-line)#pass cisco  
R1(config-line)#login
```

```
R1(config-line)#line vty 0 4
R1(config-line)#pass cisco
R1(config-line)#login
R1(config-line)#exit
R1(config)#service pass
R1(config)#service password-encryption
R1(config)#banner motd $unauthorized access is prohibited!$
```

Configuración seguridad en el router R2:

```
R2>en
R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#enable secret class
R2(config)#line con 0
R2(config-line)#pass cisco
R2(config-line)#login
R2(config-line)#line vty 0 4
R2(config-line)#pass cisco
R2(config-line)#login
R2(config-line)#exit
R2(config)#service
% Incomplete command.
R2(config)#service password-encryption
R2(config)#banner motd #unauthorized access is prohibited!#
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]
```

Configuración seguridad en el router R3:

```
R3>en
R3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#enable secret class
R3(config)#line con 0
R3(config-line)#pass cisco
```

```
R3(config-line)#login
R3(config-line)#exit
R3(config)#service password-encryption
R3(config)#banner motd &unauthotized Acess is prohibited!&
R3(config)#exit
```

Configuración seguridad S1:

```
S1>en
S1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
S1(config)#enable secret class
S1(config)#line con 0
S1(config-line)#pass cisco
S1(config-line)#login
S1(config-line)#line vty 0 4
S1(config-line)#pass cisco
S1(config-line)#login
S1(config-line)#service password-encryption
S1(config)#banner motd "unauthorized access is prohibited!"
S1(config)#no ip domain-lookup
```

Configuración seguridad S3:

```
S2(config)#host S3
S3(config)#no ip domain-lookup
```

```
S3(config)#enable secret class
S3(config)#line con 0
S3(config-line)#pass cisco
S3(config-line)#login
S3(config-line)#line vty 0 4
S3(config-line)#pass cisco
S3(config-line)#login
S3(config-line)#exit
S3(config)#service password-encryption
S3(config)#banner motd %unauthorized acces is probited!%
S3(config)#exit
S3#
```

2. 3.7 Configuración vlan

Configuración vlan S1:

```
en
conf term
hostname S1
no ip domain-lookup
vlan 30
name Administratcion
vlan 40
name Mercadeo
vlan 200
name Mantenimiento
exit
int vlan 200
ip address 192.168.200.2 255.255.255.0
no shut
exit
ip default-gateway 192.168.200.1
interface f0/3
switchport mode trunk
switchport trunk native vlan 1
interface f0/24
switchport mode trunk
switchport trunk native vlan 1
interface range fa0/1-2, fa0/4-23, GigabitEthernet0/1-2
switchport mode access
interface fa0/1
switchport mode access
switchport access vlan 30
interface range fa0/2, fa0/4-23, GigabitEthernet0/1-2

shutdown
```

Configuración vlan s3:

```
en
conf term
hostname S3
no ip domain-lookup
vlan 30
name Administratcion
vlan 40
```



```
name Mercadeo
vlan 200
name Mantenimiento
exit
int vlan 200
ip address 192.168.200.3 255.255.255.0
no shut
exit
ip default-gateway 192.168.200.1
interface f0/3
switchport mode trunk
switchport trunk native vlan 1
interface range fa0/1-2, fa0/4-24, GigabitEthernet0/1-2
switchport mode access
interface fa0/1
switchport mode access
switchport access vlan 40
interface range fa0/2, fa0/4-24, GigabitEthernet0/1-2
shutdown
```

En el Switch 3 deshabilitar DNS lookup

Configuración S3:

```
S3>en
S3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
S3(config)#no ip domain-lookup
S3(config-line)#exit
```

2.3.8 direcciones IP a los switch

Asignar direcciones IP a los Switches acorde a los lineamientos.

Configuración S1:

```
en
conf term
int vlan 200
ip address 192.168.200.2 255.255.255.0
no shut
exit
```

```
ip default-gateway 192.168.200.1
```

Configuración S3:

```
en
conf term
int vlan 200
ip address 192.168.200.3 255.255.255.0
no shut
exit
ip default-gateway 192.168.200.1
```

2.3.9 Desactivación de las interfaces

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

Configuración S1:

```
en
conf term
interface range fa0/1-2, fa0/4-23, GigabitEthernet0/1-2
switchport mode access
interface fa0/1
switchport mode access
switchport access vlan 30
interface range fa0/2, fa0/4-23, GigabitEthernet0/1-2
shutdown
```

Configuración S3:

```
en
conf term
interface range fa0/1-2, fa0/4-24, GigabitEthernet0/1-2
switchport mode access
interface fa0/1
switchport mode access
switchport access vlan 40
interface range fa0/2, fa0/4-24, GigabitEthernet0/1-2
shutdown
```

2.3.10 Implemente DHCP

- **Implemente DHCP and NAT for IPv4 y Configure R1 como servidor DHCP para las VLANs 30 y 40**

Configuración R1:

```
R1#conf t
R1(config)#ip dhcp pool ADMINISTRACION
R1(dhcp-config)#dns-server 10.10.10.11
R1(dhcp-config)#domain-name ccna-unad.com
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)#domain-name ccna-unad.com
R1(dhcp-config)#default-router 192.168.40.1
R1(dhcp-config)#network 192.168.40.0 255.255.255.0
R1(dhcp-config)#
```

- **Reservar las primeras 30 direcciones IP de las VLAN 30 y 40 para Configuraciones estáticas.**

Configuración R1:

```
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#ip dhcp excluded-address 192.168.31.1 192.168.31.30
R1(config)#ip dhcp excluded-address 192.168.31.1 192.168.31.30
R1(config)#no ip dhcp excluded-address 192.168.31.1 192.168.31.30
R1(config)#ip dhcp excluded-address 192.168.30.1 192.168.30.30
R1(config)#ip dhcp excluded-address 192.168.40.1 192.168.40.30
R1(config)#ip dhcp pool ADMINISTRACION
R1(dhcp-config)#dns-server 10.10.10.11
R1(dhcp-config)#domain-name ccna-unad.com
^
% Invalid input detected at '^' marker.
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)#domain-name ccna-unad.com
^
% Invalid input detected at '^' marker.
R1(dhcp-config)#default-router 192.168.40.1
R1(dhcp-config)#network 192.168.40.0 255.255.255.0
R1(dhcp-config)#
```

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

Configuración R2:

```
R2>en
Password:
R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#access-list 1 permit 192.168.30.1 0.0.0.255
R2(config)#access-list 1 permit 192.168.40.1 0.0.0.255
R2(config)#no access-list 1 permit 192.168.30.1 0.0.0.255
R2(config)#no access-list 1 permit 192.168.40.1 0.0.0.255
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 209.165.200.225 209.165.200.228 netmask
255.255.255.248
R2(config)#ip nat inside source list 1 pool INTERNET
R2(config)#ip nat inside source static 10.10.10.10 209.165.200.229
```

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

Configuración acces list tipo estándar y extendido R2:

```
R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#access-list 101 permit tcp any host 209.165.200.229 eq www
R2(config)#access-list 101 permit icmp any any echo-reply
```

```
R2(config)#int fo/0
^
% Invalid input detected at '^' marker.
R2(config)#int f0/0
R2(config-if)#ip ac
% Incomplete command.
R2(config-if)#ip access-group 101 in
R2(config-if)#int s3/0
R2(config-if)#ip access-group 101 out
R2(config-if)#int s2/0
R2(config-if)#ip access-group 101 out
R2(config-if)#int f1/0
R2(config-if)#ip access-group 101 out
```

Verificación de conectividad de la red:

2.3.11 COMANDO PING:

```
R1>
R1>en
Password:
R1#ping 172.31.21.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.31.21.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/17/79 ms

R2>en
Password:
R2#ping 172.31.23.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.31.23.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/4/14 ms
```

- **PC Internet, Web Server:**

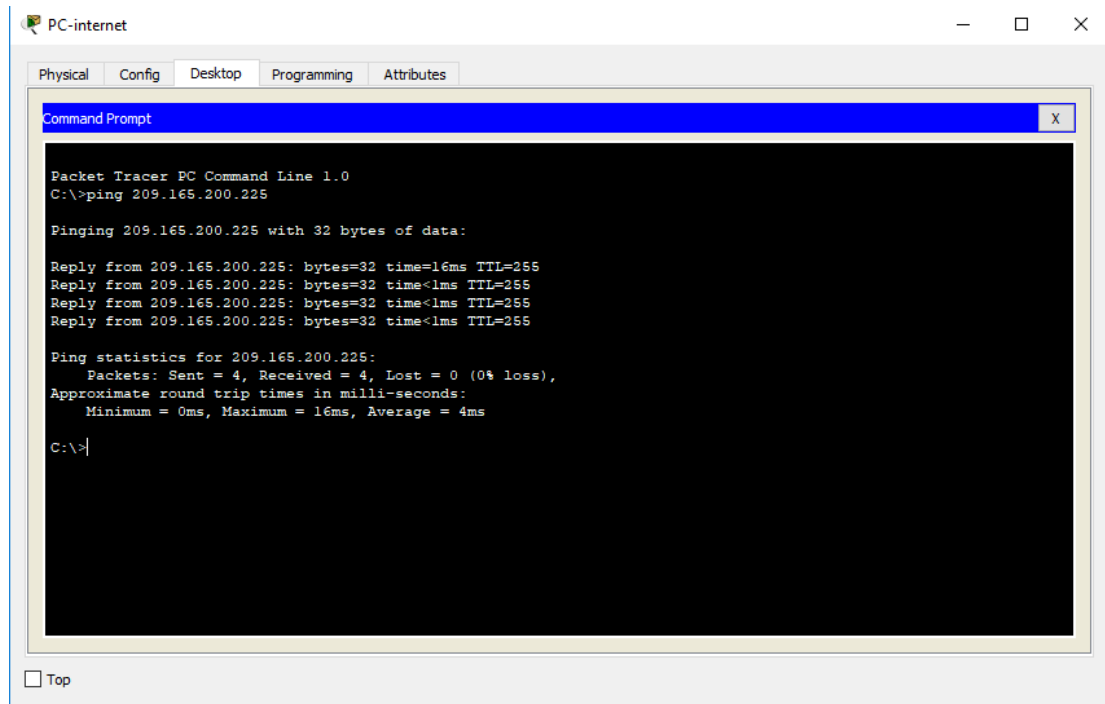


Figura 29. Ping PC internet

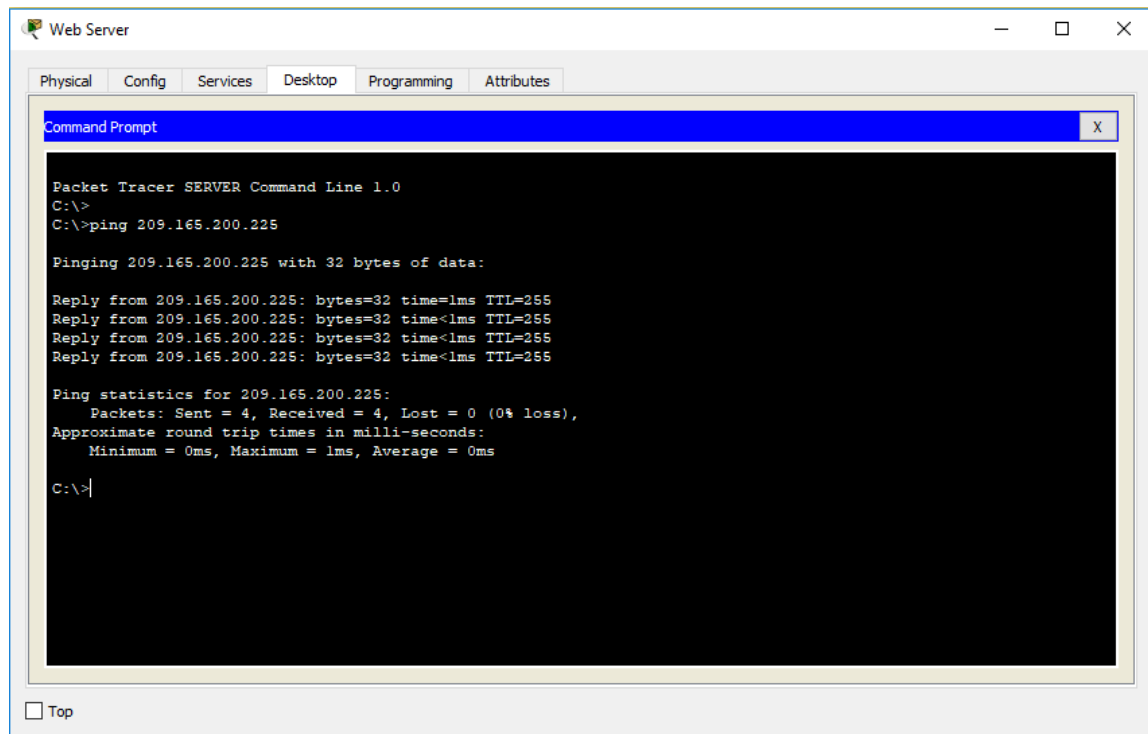


Figura 30. Ping PC server

2.3.12 PING A LA VLAN

Ping a las Vlan de S1

```
S1>en
Password:
S1#ping 192.168.200.1
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 192.168.200.1, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/0/1 ms
```

```
S1#ping 192.168.40.1
```

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

```
S1#ping 192.168.30.1
```

```
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.30.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms
```

Ping a las Vlan de S3:

```
S3>en
Password:
S3#ping 192.168.200.1
```

```
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.200.1, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/2/4 ms
```

```
S3#ping 192.168.40.1
```

```
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.40.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/2/7 ms
```

```
S3#ping 192.168.30.1
```

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.30.1, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/3 ms

- Imagen de la PC-A con la asignación ip Dinámica a partir del segmento de red disponible acuerdo la configuración de reserva de IP estática:

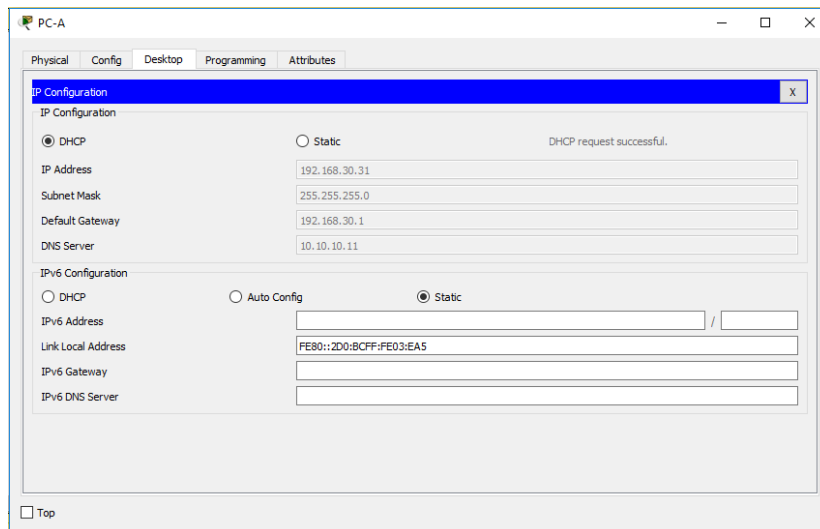


Figura 31. IP dinámica PC-A

- Imagen de la PC-C con la asignación ip Dinámica a partir del segmento de red disponible acuerdo la configuración de reserva de IP estática:

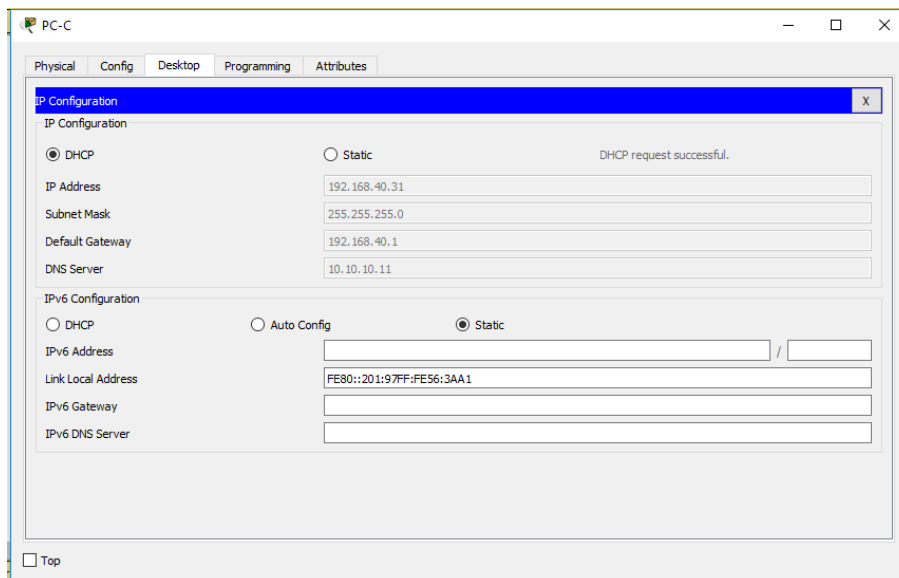
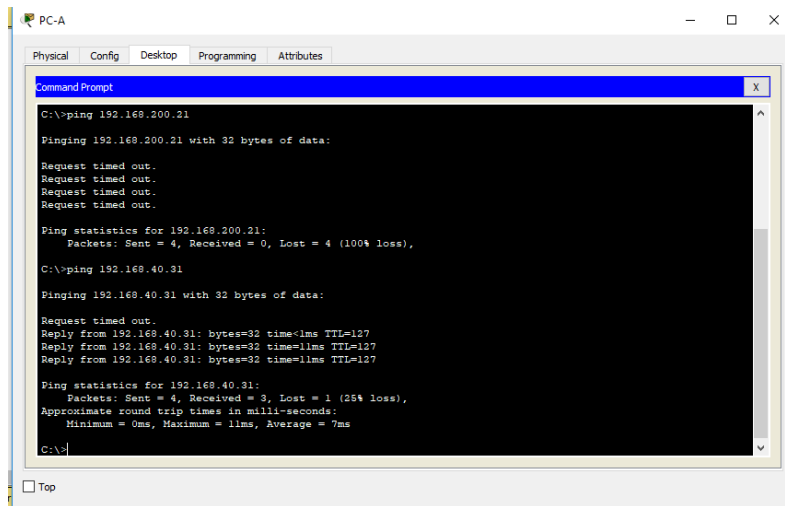


Figura 32. IP dinámica PC-C

Realización del Ping del PC-A al PC-C, descripción



```
PC-A
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 192.168.200.21
Pinging 192.168.200.21 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.200.21:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 192.168.40.31
Pinging 192.168.40.31 with 32 bytes of data:
Request timed out.
Reply from 192.168.40.31: bytes=32 time=1ms TTL=127
Reply from 192.168.40.31: bytes=32 time=1ms TTL=127
Reply from 192.168.40.31: bytes=32 time=1ms TTL=127

Ping statistics for 192.168.40.31:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 7ms
C:\>
```

Figura 33. Ping PC-A - PC-C

Acceso al Web server desde el pc de internet

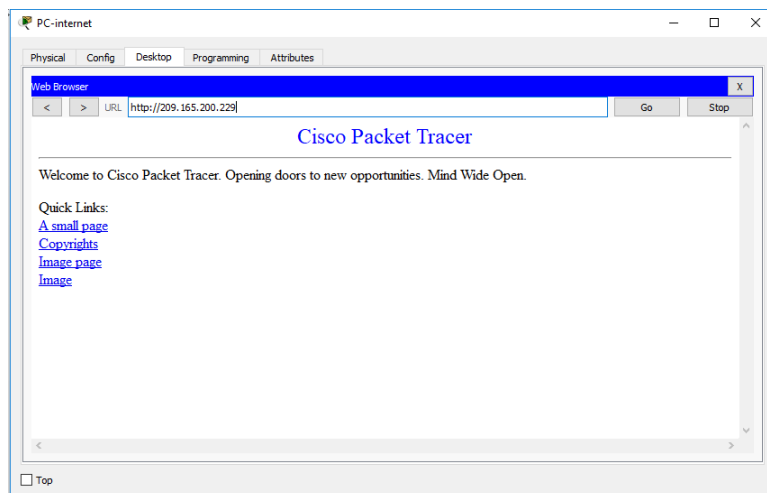
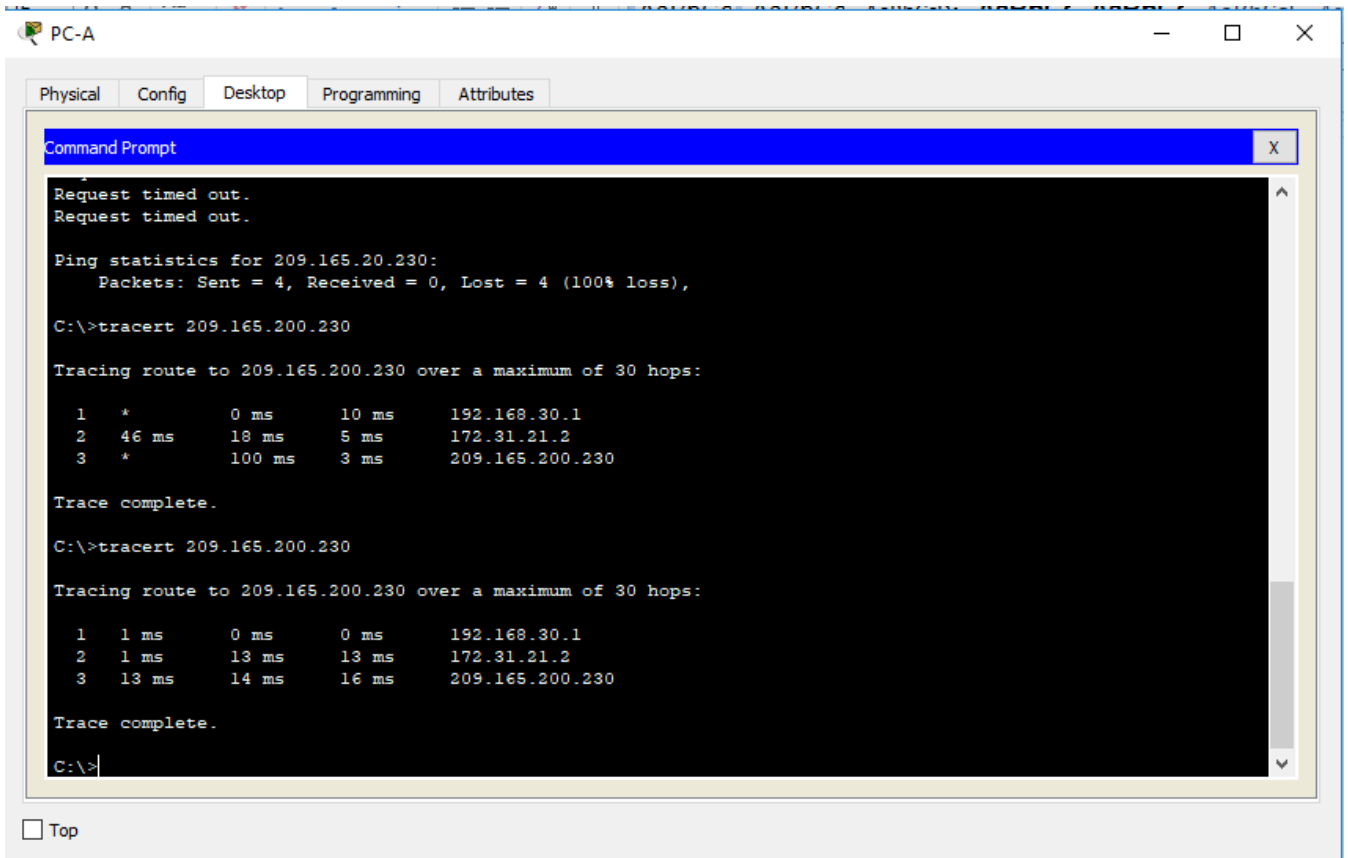


Figura 34. Acceso Web Server

2.3.13 Verificación comando Tracert:

Tracert del PC-A al PC Internet:



The screenshot shows a Windows desktop environment for PC-A. The desktop has tabs for Physical, Config, Desktop, Programming, and Attributes. A Command Prompt window is open, displaying the results of a ping and a tracert command. The ping command shows a 100% loss of packets. The first tracert command shows a route with three hops, with the third hop being the destination. The second tracert command shows a successful route with three hops, with the third hop being the destination.

```
Request timed out.
Request timed out.

Ping statistics for 209.165.20.230:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>tracert 209.165.200.230

Tracing route to 209.165.200.230 over a maximum of 30 hops:

  0  *         0 ms      10 ms     192.168.30.1
  1  46 ms     18 ms     5 ms      172.31.21.2
  2  *         100 ms    3 ms      209.165.200.230

Trace complete.

C:\>tracert 209.165.200.230

Tracing route to 209.165.200.230 over a maximum of 30 hops:

  0  1 ms      0 ms      0 ms      192.168.30.1
  1  1 ms      13 ms     13 ms     172.31.21.2
  2  13 ms     14 ms     16 ms     209.165.200.230

Trace complete.

C:\>
```

Figura 35. PC-A al PC Internet

Tracert del PC-A al Web Server:

```

PC-A
Physical Config Desktop Programming Attributes
Command Prompt
Trace complete.
C:\>tracert 10.10.10.10
Tracing route to 10.10.10.10 over a maximum of 30 hops:
  0  ms      0  ms      3  ms      192.168.30.1
  1  13 ms     11 ms     13 ms     172.31.21.2
  2  6  ms     16 ms     4  ms     172.31.21.2
  3  18 ms     10 ms     6  ms     172.31.21.2
  4  15 ms     15 ms     11 ms    172.31.21.2
  5  13 ms     12 ms     0  ms     172.31.21.2
  6  17 ms     13 ms     4  ms     172.31.21.2
  7  14 ms     12 ms     13 ms    172.31.21.2
  8  14 ms     15 ms     14 ms    172.31.21.2
  9  17 ms     19 ms     2  ms     172.31.21.2
 10  6  ms     11 ms     3  ms     172.31.21.2
 11  14 ms     12 ms     13 ms    172.31.21.2
 12  14 ms     14 ms     12 ms    172.31.21.2
 13  3  ms     13 ms     13 ms    172.31.21.2
 14  15 ms     15 ms     1  ms     172.31.21.2
 15  3  ms     15 ms     15 ms    172.31.21.2
 16  20 ms     15 ms     14 ms    172.31.21.2
 17  3  ms     12 ms     0  ms     172.31.21.2
 18  3  ms     14 ms     0  ms     172.31.21.2
 19  15 ms     5  ms     12 ms    172.31.21.2
 20  17 ms     19 ms     4  ms     172.31.21.2
 21  1  ms     12 ms     13 ms    172.31.21.2
 22  3  ms     12 ms     15 ms    172.31.21.2
 23  0  ms     12 ms     16 ms    172.31.21.2
 24  15 ms     14 ms     15 ms    172.31.21.2
 25  1  ms     15 ms     17 ms    172.31.21.2
 26  4  ms     13 ms     0  ms     172.31.21.2
 27  2  ms     15 ms     16 ms    172.31.21.2
 28  0  ms     15 ms     28 ms    172.31.21.2
 29  16 ms     0  ms     15 ms    172.31.21.2
 30
Trace complete.
C:\>
 Top
  
```

Figura 36. PC-A al Web Server

Tracert del PC-C a la Lo4 en R3:

```

PC-internet
Physical Config Desktop Programming Attributes
Command Prompt
Subnet Mask.....: 255.255.255.248
Default Gateway.....: 209.165.200.225
C:\>tracert 192.168.4.1
Tracing route to 192.168.4.1 over a maximum of 30 hops:
  0  ms      0  ms      0  ms      209.165.200.225
  1  0  ms      0  ms      0  ms      209.165.200.225
  2  0  ms      0  ms      0  ms      209.165.200.225
  3  0  ms      0  ms      0  ms      209.165.200.225
  4  0  ms      0  ms      0  ms      209.165.200.225
  5  0  ms      0  ms      0  ms      209.165.200.225
  6  0  ms      0  ms      0  ms      209.165.200.225
  7  0  ms      0  ms      0  ms      209.165.200.225
  8  0  ms      0  ms      0  ms      209.165.200.225
  9  0  ms      0  ms      0  ms      209.165.200.225
 10  0  ms      0  ms      0  ms      209.165.200.225
 11  0  ms      0  ms      0  ms      209.165.200.225
 12  0  ms      0  ms      0  ms      209.165.200.225
 13  0  ms      0  ms      0  ms      209.165.200.225
 14  0  ms      0  ms      0  ms      209.165.200.225
 15  0  ms      0  ms      0  ms      209.165.200.225
 16  0  ms      0  ms      0  ms      209.165.200.225
 17  0  ms      0  ms      0  ms      209.165.200.225
 18  0  ms      0  ms      0  ms      209.165.200.225
 19  0  ms      8  ms      24 ms     209.165.200.225
 20  0  ms      0  ms      0  ms      209.165.200.225
 21  0  ms      0  ms      0  ms      209.165.200.225
 22  0  ms      3  ms      0  ms      209.165.200.225
 23  0  ms      0  ms      0  ms      209.165.200.225
 24  0  ms      0  ms      0  ms      209.165.200.225
 25  0  ms      0  ms      0  ms      209.165.200.225
 26  0  ms      0  ms      0  ms      209.165.200.225
 27  0  ms      0  ms      0  ms      209.165.200.225
 28  0  ms      0  ms      0  ms      209.165.200.225
 29  0  ms      0  ms      0  ms      209.165.200.225
 30  0  ms      0  ms      0  ms      209.165.200.225
Trace complete.
C:\>
 Top
  
```

Figura 37. Tracert del PC-C a la Lo4 en R3

3 CONCLUSIONES

- En conclusión se dio buen manejo en cuanto listas ACL IP donde pueden filtrar el tráfico de la red, y los tipos de ACL, también la configuración en los dispositivos Cisco.
- Teniendo en cuenta el protocolo OSPF es un protocolo que gestiona un sistema autónomo (AS) en áreas. Dichas áreas son grupos lógicos de routers cuya información se puede resumir para el resto de la red.
- Asimilamos de manera eficaz DHCP que aprueba realizar una administración más simple de la red, evitando posibles conflictos y malas configuraciones en los Hosts de dicho proceso.
- Mediante la configuración de las listas de acceso, permite o deniega el acceso de hosts a algunos recursos ofrecidos en red. También se puede decir que configura exitosamente la topología de red sugerida en la prueba de habilidades, aplicando los conocimientos y habilidades adquiridas en el curso Cisco.
- Se fortalecieron los conceptos teóricos con el desarrollo de los ejercicios prácticos con ayuda de la herramienta de simulación de Cisco Packet Tracer.

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