

PRUEBA DE HABILIDADES PRACTICAS CCNA

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UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA UNAD  
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## INTRODUCCIÓN

El ingenio y la innovación del ser humano no conocen límites. El desarrollo social, científico y tecnológico es hoy una consecuencia de aquella característica humana, esta nos permite evolucionar en diferentes aspectos de la sociedad. Para aprovechar esta condición del hombre, se plantea la ingeniería como una herramienta que aporta a la solución de problemas.

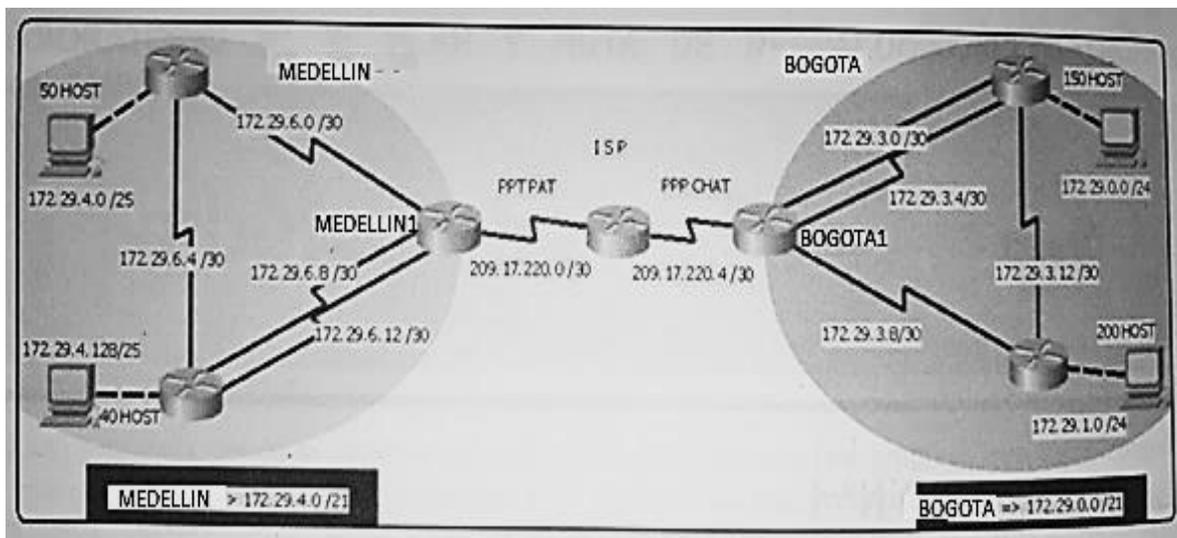
Actualmente la tecnología es un pilar fundamental dentro de nuestra sociedad. Dentro de los procesos tecnológicos es objeto de estudio la lógica, la computación, la informática y las telecomunicaciones, que buscan el diseño, optimización y creación de la forma en que nos comunicamos, actuamos e incluso laboramos. Es allí donde las telecomunicaciones se convierten en una herramienta para la competitividad global con visión socio humanística

El fin de este trabajo es demostrar las habilidades adquiridas en este diplomado de profundización del campo emergente de las Redes y Telecomunicaciones exponiendo la capacidad de responder a la demanda creciente en el área de las Tecnologías de la Información.

## ESCENARIOS PROPUESTOS

### 1. ESCENARIO 1

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



Gráfica 1

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

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

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

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

## Desarrollo:

### 1. Rutinas de diagnóstico

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

A continuación, los comandos utilizados en cada uno de los dispositivos de los 2 escenarios planteados:

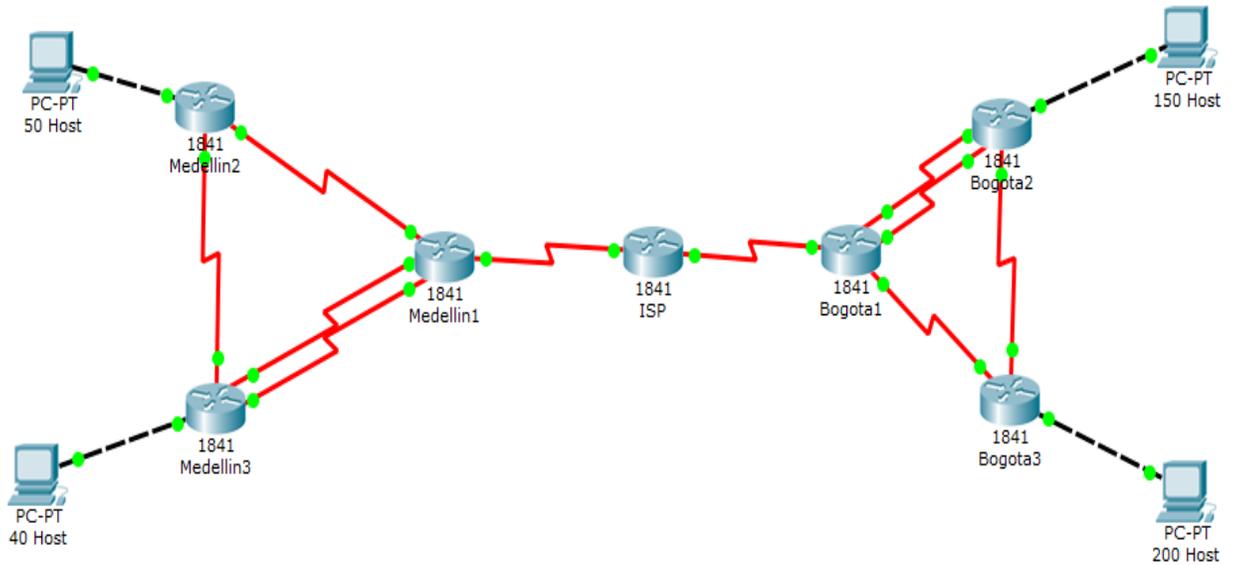
```
hostname S1
!
enable secret 5 $1$mERr$q.MA2tj.WFptzvbifq/1i.
!
line con 0
password cisco
logging synchronous
login
!
line vty 0 4
password cisco
login
line vty 5 15
login
!
banner motd ^CPRUEBA DE HABILIDADES CCNA JESSICA HERRERA^C
!
```

Modo Exec Usuario: cisco

Modo Exec Privilegiado: cisco1

## 2. Conexión física

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



Gráfica 2 Topología Escenario 1

## 3. Configuración lógica:

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

### Parte 1: Configuración del enrutamiento

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

```

Medellin1#sh ip rip database
0.0.0.0/0    auto-summary
0.0.0.0/0
    [1] via 209.17.220.2, 00:37:31, Serial0/1/1
172.29.4.0/25    auto-summary
172.29.4.0/25
    [1] via 172.29.6.2, 00:00:28, Serial0/0/0
172.29.4.128/25    auto-summary
172.29.4.128/25
    [1] via 172.29.6.10, 00:00:17, Serial0/0/1    [1] via 172.29.6.14, 00:00:17,
Serial0/1/0
172.29.6.0/30    auto-summary
172.29.6.0/30    directly connected, Serial0/0/0
172.29.6.4/30    auto-summary
172.29.6.4/30
    [1] via 172.29.6.10, 00:00:17, Serial0/0/1    [1] via 172.29.6.2, 00:00:28,
Serial0/0/0    [1] via 172.29.6.14, 00:00:17, Serial0/1/0
172.29.6.8/30    auto-summary
172.29.6.8/30    directly connected, Serial0/0/1
172.29.6.12/30    auto-summary
172.29.6.12/30    directly connected, Serial0/1/0
Medellin1#

```

*Gráfica 3 sh ip rip database Medellin1*

```

Medellin2#sh ip rip database ?
<cr>
Medellin2#sh ip rip database
0.0.0.0/0    auto-summary
0.0.0.0/0
    [1] via 172.29.6.1, 00:00:10, Serial0/0/0
172.29.4.0/25    auto-summary
172.29.4.0/25    directly connected, FastEthernet0/0
172.29.4.128/25    auto-summary
172.29.4.128/25
    [1] via 172.29.6.6, 00:00:10, Serial0/1/1
172.29.6.0/30    auto-summary
172.29.6.0/30    directly connected, Serial0/0/0
172.29.6.4/30    auto-summary
172.29.6.4/30    directly connected, Serial0/1/1
172.29.6.8/30    auto-summary
172.29.6.8/30
    [1] via 172.29.6.6, 00:00:10, Serial0/1/1    [1] via 172.29.6.1, 00:00:10,
Serial0/0/0
172.29.6.12/30    auto-summary
172.29.6.12/30
    [1] via 172.29.6.6, 00:00:10, Serial0/1/1    [1] via 172.29.6.1, 00:00:10,
Serial0/0/0

```

*Gráfica 4 sh ip rip database Medellin2*

```

Medellin3#sh ip rip database
0.0.0.0/0    auto-summary
0.0.0.0/0
    [1] via 172.29.6.9, 00:00:15, Serial0/0/1    [1] via 172.29.6.13, 00:00:15,
Serial0/1/0
172.29.4.0/25    auto-summary
172.29.4.0/25
    [1] via 172.29.6.5, 00:00:17, Serial0/1/1
172.29.4.128/25    auto-summary
172.29.4.128/25    directly connected, FastEthernet0/0
172.29.6.0/30    auto-summary
172.29.6.0/30
    [1] via 172.29.6.5, 00:00:17, Serial0/1/1    [1] via 172.29.6.9, 00:00:15,
Serial0/0/1    [1] via 172.29.6.13, 00:00:15, Serial0/1/0
172.29.6.4/30    auto-summary
172.29.6.4/30    directly connected, Serial0/1/1
172.29.6.8/30    auto-summary
172.29.6.8/30    directly connected, Serial0/0/1
172.29.6.12/30    auto-summary
172.29.6.12/30    directly connected, Serial0/1/0
Medellin3#

```

Gráfica 5 sh ip rip database Medellin3

```

Bogota1#sh ip rip database
0.0.0.0/0    auto-summary
0.0.0.0/0
    [1] via 209.17.220.5, 00:42:59, Serial0/1/1
172.29.0.0/24    auto-summary
172.29.0.0/24
    [1] via 172.29.3.2, 00:00:29, Serial0/0/0    [1] via 172.29.3.5, 00:00:29,
Serial0/0/1
172.29.1.0/24    auto-summary
172.29.1.0/24
    [1] via 172.29.3.10, 00:00:20, Serial0/1/0
172.29.3.0/30    auto-summary
172.29.3.0/30    directly connected, Serial0/0/0
172.29.3.4/30    auto-summary
172.29.3.4/30    directly connected, Serial0/0/1
172.29.3.8/30    auto-summary
172.29.3.8/30    directly connected, Serial0/1/0
172.29.3.12/30    auto-summary
172.29.3.12/30
    [1] via 172.29.3.2, 00:00:29, Serial0/0/0    [1] via 172.29.3.5, 00:00:29,
Serial0/0/1    [1] via 172.29.3.10, 00:00:20, Serial0/1/0
Bogota1#

```

Gráfica 6 sh ip rip database Bogota1

```

Bogota2#sh ip rip database
0.0.0.0/0    auto-summary
0.0.0.0/0
    [1] via 172.29.3.1, 00:00:15, Serial0/0/0    [1] via 172.29.3.6, 00:00:15,
Serial0/0/1
172.29.0.0/24    auto-summary
172.29.0.0/24    directly connected, FastEthernet0/0
172.29.1.0/24    auto-summary
172.29.1.0/24
    [1] via 172.29.3.14, 00:00:12, Serial0/1/0
172.29.3.0/30    auto-summary
172.29.3.0/30    directly connected, Serial0/0/0
172.29.3.4/30    auto-summary
172.29.3.4/30    directly connected, Serial0/0/1
172.29.3.8/30    auto-summary
172.29.3.8/30
    [1] via 172.29.3.1, 00:00:15, Serial0/0/0    [1] via 172.29.3.6, 00:00:15,
Serial0/0/1    [1] via 172.29.3.14, 00:00:12, Serial0/1/0
172.29.3.12/30    auto-summary
172.29.3.12/30    directly connected, Serial0/1/0
Bogota2#

```

---

*Gráfica 7 sh ip rip database Bogota2*

```

Bogota3#sh ip rip database
0.0.0.0/0    auto-summary
0.0.0.0/0
    [1] via 172.29.3.9, 00:00:09, Serial0/1/0
172.29.0.0/24    auto-summary
172.29.0.0/24
    [1] via 172.29.3.13, 00:00:07, Serial0/0/1
172.29.1.0/24    auto-summary
172.29.1.0/24    directly connected, FastEthernet0/0
172.29.3.0/30    auto-summary
172.29.3.0/30
    [1] via 172.29.3.13, 00:00:07, Serial0/0/1    [1] via 172.29.3.9, 00:00:09,
Serial0/1/0
172.29.3.4/30    auto-summary
172.29.3.4/30
    [1] via 172.29.3.13, 00:00:07, Serial0/0/1    [1] via 172.29.3.9, 00:00:09,
Serial0/1/0
172.29.3.8/30    auto-summary
172.29.3.8/30    directly connected, Serial0/1/0
172.29.3.12/30    auto-summary
172.29.3.12/30    directly connected, Serial0/0/1
Bogota3#

```

---

*Gráfica 8 sh ip rip database Bogota3*

- b. Los routers Bogota1 y Medellín deberán añadir a su configuración de enrutamiento una ruta por defecto hacia el ISP y, a su vez, redistribuirla dentro de las publicaciones de RIP.

```

Bogota1#sh ip route sta
S* 0.0.0.0/0 [1/0] via 209.17.220.5
Bogota1#
Bogota1#sh ip route rip
172.29.0.0/16 is variably subnetted, 6 subnets, 2 masks
R 172.29.0.0/24 [120/1] via 172.29.3.5, 00:00:02, Serial0/0/1
[120/1] via 172.29.3.2, 00:00:02, Serial0/0/0
R 172.29.1.0/24 [120/1] via 172.29.3.10, 00:00:08, Serial0/1/0
R 172.29.3.12/30 [120/1] via 172.29.3.5, 00:00:02, Serial0/0/1
[120/1] via 172.29.3.2, 00:00:02, Serial0/0/0
[120/1] via 172.29.3.10, 00:00:08, Serial0/1/0
209.17.220.0/24 is variably subnetted, 2 subnets, 2 masks

```

*Gráfica 9 Rutas Bogota1*

```

Medellin1#sh ip route static
S* 0.0.0.0/0 [1/0] via 209.17.220.2
Medellin1#
Medellin1#sh ip route rip
172.29.0.0/16 is variably subnetted, 6 subnets, 2 masks
R 172.29.4.0/25 [120/1] via 172.29.6.2, 00:00:06, Serial0/0/0
R 172.29.4.128/25 [120/1] via 172.29.6.10, 00:00:14, Serial0/0/1
[120/1] via 172.29.6.14, 00:00:14, Serial0/1/0
R 172.29.6.4/30 [120/1] via 172.29.6.2, 00:00:06, Serial0/0/0
[120/1] via 172.29.6.10, 00:00:14, Serial0/0/1
[120/1] via 172.29.6.14, 00:00:14, Serial0/1/0
209.17.220.0/24 is variably subnetted, 2 subnets, 2 masks
Medellin1#

```

*Gráfica 10 Rutas Medellin1*

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

```

ISP#sh ip route static
172.29.0.0/22 is subnetted, 2 subnets
S 172.29.0.0 [1/0] via 209.17.220.6
S 172.29.4.0 [1/0] via 209.17.220.1

```

*Gráfica 11 Ruta estática ISP*

## Parte 2: Tabla de Enrutamiento.

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

```

Medellin1#sh 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 209.17.220.2 to network 0.0.0.0

```

      172.29.0.0/16 is variably subnetted, 6 subnets, 2 masks
R       172.29.4.0/25 [120/1] via 172.29.6.2, 00:00:26, Serial0/0/0
R       172.29.4.128/25 [120/1] via 172.29.6.10, 00:00:22, Serial0/0/1
          [120/1] via 172.29.6.14, 00:00:22, Serial0/1/0
C       172.29.6.0/30 is directly connected, Serial0/0/0
R       172.29.6.4/30 [120/1] via 172.29.6.10, 00:00:22, Serial0/0/1
          [120/1] via 172.29.6.2, 00:00:26, Serial0/0/0
          [120/1] via 172.29.6.14, 00:00:22, Serial0/1/0
C       172.29.6.8/30 is directly connected, Serial0/0/1
C       172.29.6.12/30 is directly connected, Serial0/1/0
      209.17.220.0/24 is variably subnetted, 2 subnets, 2 masks
C       209.17.220.0/30 is directly connected, Serial0/1/1
C       209.17.220.2/32 is directly connected, Serial0/1/1
S*    0.0.0.0/0 [1/0] via 209.17.220.2

```

*Gráfica 12 sh ip route Medellin1*

```

Medellin2#sh 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, 6 subnets, 2 masks
C       172.29.4.0/25 is directly connected, FastEthernet0/0
R       172.29.4.128/25 [120/1] via 172.29.6.6, 00:00:03, Serial0/1/1
C       172.29.6.0/30 is directly connected, Serial0/0/0
C       172.29.6.4/30 is directly connected, Serial0/1/1
R       172.29.6.8/30 [120/1] via 172.29.6.6, 00:00:03, Serial0/1/1
          [120/1] via 172.29.6.1, 00:00:22, Serial0/0/0
R       172.29.6.12/30 [120/1] via 172.29.6.1, 00:00:22, Serial0/0/0
          [120/1] via 172.29.6.6, 00:00:03, Serial0/1/1
R*    0.0.0.0/0 [120/1] via 172.29.6.1, 00:00:22, Serial0/0/0

```

*Gráfica 13 sh ip route Medellin2*

```

Medellin3#sh 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 172.29.6.9 to network 0.0.0.0

```

      172.29.0.0/16 is variably subnetted, 6 subnets, 2 masks
R       172.29.4.0/25 [120/1] via 172.29.6.5, 00:00:03, Serial0/1/1
C       172.29.4.128/25 is directly connected, FastEthernet0/0
R       172.29.6.0/30 [120/1] via 172.29.6.9, 00:00:08, Serial0/0/1
          [120/1] via 172.29.6.5, 00:00:03, Serial0/1/1
          [120/1] via 172.29.6.13, 00:00:08, Serial0/1/0
C       172.29.6.4/30 is directly connected, Serial0/1/1
C       172.29.6.8/30 is directly connected, Serial0/0/1
C       172.29.6.12/30 is directly connected, Serial0/1/0
R*    0.0.0.0/0 [120/1] via 172.29.6.9, 00:00:08, Serial0/0/1
          [120/1] via 172.29.6.13, 00:00:08, Serial0/1/0

```

*Gráfica 14 sh ip route Medellin3*

```

ISP#sh 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

```

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

```

*Gráfica 15 sh ip route ISP*

```

Bogota1#sh 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 209.17.220.5 to network 0.0.0.0

```

      172.29.0.0/16 is variably subnetted, 6 subnets, 2 masks
R       172.29.0.0/24 [120/1] via 172.29.3.2, 00:00:07, Serial0/0/0
        [120/1] via 172.29.3.5, 00:00:07, Serial0/0/1
R       172.29.1.0/24 [120/1] via 172.29.3.10, 00:00:19, 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
C       172.29.3.8/30 is directly connected, Serial0/1/0
R       172.29.3.12/30 [120/1] via 172.29.3.10, 00:00:19, Serial0/1/0
        [120/1] via 172.29.3.5, 00:00:07, Serial0/0/1
        [120/1] via 172.29.3.2, 00:00:07, Serial0/0/0
      209.17.220.0/24 is variably subnetted, 2 subnets, 2 masks
C       209.17.220.4/30 is directly connected, Serial0/1/1
C       209.17.220.5/32 is directly connected, Serial0/1/1
S*    0.0.0.0/0 [1/0] via 209.17.220.5

```

*Gráfica 16 sh ip route Bogota1*

```

Bogota2#sh 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 172.29.3.1 to network 0.0.0.0

```

      172.29.0.0/16 is variably subnetted, 6 subnets, 2 masks
C       172.29.0.0/24 is directly connected, FastEthernet0/0
R       172.29.1.0/24 [120/1] via 172.29.3.14, 00:00:15, 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, 00:00:03, Serial0/0/0
        [120/1] via 172.29.3.6, 00:00:03, Serial0/0/1
        [120/1] via 172.29.3.14, 00:00:15, Serial0/1/0
C       172.29.3.12/30 is directly connected, Serial0/1/0
R*    0.0.0.0/0 [120/1] via 172.29.3.1, 00:00:03, Serial0/0/0
        [120/1] via 172.29.3.6, 00:00:03, Serial0/0/1

```

*Gráfica 17 sh ip route Bogota2*

```

Bogota3#sh 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, 6 subnets, 2 masks
R    172.29.0.0/24 [120/1] via 172.29.3.13, 00:00:04, 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, 00:00:06, Serial0/1/0
      [120/1] via 172.29.3.13, 00:00:04, Serial0/0/1
R    172.29.3.4/30 [120/1] via 172.29.3.9, 00:00:06, Serial0/1/0
      [120/1] via 172.29.3.13, 00:00:04, Serial0/0/1
C    172.29.3.8/30 is directly connected, Serial0/1/0
C    172.29.3.12/30 is directly connected, Serial0/0/1
R*  0.0.0.0/0 [120/1] via 172.29.3.9, 00:00:06, Serial0/1/0

```

Gráfica 18 sh ip route Bogota3

- b. Verificar el balanceo de carga que presentan los routers.

```

R*  0.0.0.0/0 [120/1] via 172.29.3.1, 00:00:18, Serial0/0/0
      [120/1] via 172.29.3.6, 00:00:18, Serial0/0/1

```

Bogota2#

Gráfica 19 balanceo de carga Bogota2

```

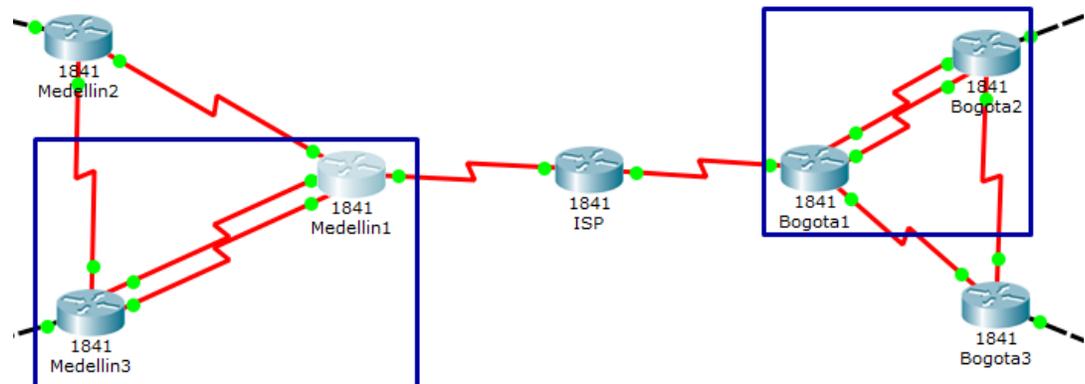
R*  0.0.0.0/0 [120/1] via 172.29.6.9, 00:00:13, Serial0/0/1
      [120/1] via 172.29.6.13, 00:00:13, Serial0/1/0

```

Medellin3#

Gráfica 20 balanceo de carga Medellin3

- c. Obsérvese en los routers Bogotá1 y Medellín1 cierta similitud por su ubicación, por tener dos enlaces de conexión hacia otro router y por la ruta por defecto que manejan.



Gráfica 21 Similitud de conexiones

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

Para el detalle se anexan los archivos de configuración de los equipos.

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

Para el detalle se anexan los archivos de configuración de los equipos.

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

```
Medellin1#show ip protocols
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 2 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip, static
Default version control: send version 2, receive 2
  Interface          Send Recv Triggered RIP Key-chain
  Serial0/1/0         2     2
  Serial0/0/0         2     2
  Serial0/0/1         2     2
Automatic network summarization is not in effect
Maximum path: 4
Routing for Networks:
  172.29.0.0
Passive Interface(s):
  FastEthernet0/0
  FastEthernet0/1
  Serial0/1/1
Routing Information Sources:
  Gateway            Distance      Last Update
  172.29.6.2         120          00:00:00
  172.29.6.10        120          00:00:16
  172.29.6.14        120          00:00:16
Distance: (default is 120)
Medellin1#
```

Gráfica 22 Proceso de protocolo RIP Medellín1

```

Bogota1#sh ip protocols
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 12 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip, static
Default version control: send version 2, receive 2
Interface          Send  Recv  Triggered RIP  Key-chain
Serial0/1/0         2     2
Serial0/0/0         2     2
Serial0/0/1         2     2
Automatic network summarization is not in effect
Maximum path: 4
Routing for Networks:
 172.29.0.0
Passive Interface(s):
  FastEthernet0/0
  FastEthernet0/1
  Serial0/1/1
Routing Information Sources:
  Gateway          Distance      Last Update
 172.29.3.2        120           00:00:21
 172.29.3.5        120           00:00:21
 172.29.3.10       120           00:00:27
Distance: (default is 120)

```

*Gráfica 23 Proceso de protocolo RIP Bogota1*

### **Parte 3: Deshabilitar la propagación del protocolo RIP.**

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

Comando utilizado para deshabilitar la propagación por las interfaces:

```

router rip
version 2
redistribute static
passive-interface FastEthernet0/0
passive-interface FastEthernet0/1
passive-interface Serial0/1/1
network 172.29.0.0
no auto-summary
!

```

#### Parte 4: Verificación del protocolo RIP.

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

```
Bogota1#sh ip interface s 0/1/1
Serial0/1/1 is up, line protocol is up (connected)
 Internet address is 209.17.220.6/30
 Broadcast address is 255.255.255.255
 Address determined by setup command
 MTU is 1500
 Helper address is not set
 Directed broadcast forwarding is disabled
 Outgoing access list is not set
 Inbound access list is not set
 Proxy ARP is enabled
 Security level is default
 Split horizon is enabled
 ICMP redirects are always sent
 ICMP unreachable are always sent
 ICMP mask replies are never sent
 IP fast switching is disabled
 IP fast switching on the same interface is disabled
 IP Flow switching is disabled
 IP Fast switching turbo vector
 IP multicast fast switching is disabled
 IP multicast distributed fast switching is disabled
 Router Discovery is disabled
 IP output packet accounting is disabled
 IP access violation accounting is disabled
 TCP/IP header compression is disabled
 RTP/IP header compression is disabled
 Probe proxy name replies are disabled
 Policy routing is disabled
 Network address translation is disabled
 WCCP Redirect outbound is disabled
 WCCP Redirect exclude is disabled
 BGP Policy Mapping is disabled
Bogota1#
```

*Gráfica 24 Interface Bogota - >ISP*

```

Medellin1#sh ip inter s 0/1/1
Serial0/1/1 is up, line protocol is up (connected)
 Internet address is 209.17.220.1/30
 Broadcast address is 255.255.255.255
 Address determined by setup command
 MTU is 1500
 Helper address is not set
 Directed broadcast forwarding is disabled
 Outgoing access list is not set
 Inbound access list is not set
 Proxy ARP is enabled
 Security level is default
 Split horizon is enabled
 ICMP redirects are always sent
 ICMP unreachable are always sent
 ICMP mask replies are never sent
 IP fast switching is disabled
 IP fast switching on the same interface is disabled
 IP Flow switching is disabled
 IP Fast switching turbo vector
 IP multicast fast switching is disabled
 IP multicast distributed fast switching is disabled
 Router Discovery is disabled
 IP output packet accounting is disabled
 IP access violation accounting is disabled
 TCP/IP header compression is disabled
 RTP/IP header compression is disabled
 Probe proxy name replies are disabled
 Policy routing is disabled
 Network address translation is disabled
 WCCP Redirect outbound is disabled
 WCCP Redirect exclude is disabled
 BGP Policy Mapping is disabled
Medellin1#

```

Gráfica 25 Interface Medellin - > ISP

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

Rutas y direccionamiento				
Router	Red	Puerto	Direccion IP	Conectado con
Bogota 1	172.29.3.0/30	s 0/0/0	172.29.3.1/30	Bogota 2
	172.29.3.4/30	s 0/0/1	172.29.3.6/30	
	172.29.3.8/30	s 0/1/0	172.29.3.9/30	Bogota 3
	209.17.220.4/30	s 0/1/1	209.17.220.6/30	ISP
Bogota 2	172.29.0.0/24	F 0/0	172.29.0.1/24	PC
	172.29.3.0/30	s 0/0/0	172.29.3.2/30	Bogota 1
	172.29.3.4/30	s 0/0/1	172.29.3.5/30	

	172.29.3.12/30	s 0/1/0	172.29.3.13/30	Bogota 3
Bogota 3	172.29.1.0/24	F 0/0	172.29.1.1/24	PC
	172.29.3.12/30	s 0/0/1	172.29.3.14/30	Bogota 2
	172.29.3.8/30	s 0/1/0	172.29.3.10/30	Bogota 1
ISP	209.17.220.4/30	s 0/0/1	209.17.220.5/30	Bogota 1
	209.17.220.0/30	s 0/1/1	209.17.220.2/30	Medellin 1
Medellin 1	172.29.6.0/30	s 0/0/0	172.29.6.1/30	Medellin 2
	172.29.6.8/30	s 0/0/1	172.29.6.9/30	Medellin 3
	172.29.6.12/30	s 0/1/0	172.29.6.13/30	
	209.17.220.0/30	s 0/1/1	209.17.220.1/30	ISP
Medellin 2	172.29.4.0/25	F 0/0	172.29.4.1/25	PC
	172.29.6.0/30	s 0/0/0	172.29.6.2/30	Medellin 1
	172.29.6.4/30	s 0/1/1	172.29.6.5/30	Medellin 3
Medellin 3	172.29.4.128/25	F 0/0	172.29.4.129/25	PC
	172.29.6.8/30	s 0/0/1	172.29.6.10/30	Medellin 1
	172.29.6.12/30	s 0/1/0	172.29.6.14/30	
	172.29.6.4/30	s 0/1/1	172.29.6.6/30	Medellin 2

Tabla 1 Direccionamiento IP

Para el detalle se anexan los archivos de configuración de los equipos.

### Parte 5: Configurar encapsulamiento y autenticación PPP.

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

```
interface Serial0/1/1
ip address 209.17.220.1 255.255.255.252
encapsulation ppp
ip nat outside
clock rate 2000000
!
```

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

```
interface Serial0/1/1
ip address 209.17.220.6 255.255.255.252
encapsulation ppp
ppp authentication chap
ip nat outside
clock rate 2000000
!
```

## Parte 6: Configuración de PAT.

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

```
Medellin1#sh ip nat translations
Pro  Inside global      Inside local      Outside local     Outside global
icmp 209.17.220.1:1    172.29.4.130:1   209.17.220.5:1   209.17.220.5:1
icmp 209.17.220.1:2    172.29.4.130:2   172.29.3.5:2     172.29.3.5:2

Medellin1#sh ip nat sta
Total translations: 2 (0 static, 2 dynamic, 2 extended)
Outside Interfaces: Serial0/1/1
Inside Interfaces: Serial0/0/0 , Serial0/0/1 , Serial0/1/0
Hits: 2 Misses: 9
Expired translations: 0
Dynamic mappings:
Medellin1#
```

*Gráfica 26 Estadística y traducción NAT Medellín1*

```
Bogotal#sh ip nat trans
Bogotal#
Bogotal#sh ip nat trans
Pro  Inside global      Inside local      Outside local     Outside global
icmp 209.17.220.6:4    172.29.1.2:4     209.17.220.5:4   209.17.220.5:4

Bogotal#sh ip nat sta
Total translations: 1 (0 static, 1 dynamic, 1 extended)
Outside Interfaces: Serial0/1/1
Inside Interfaces: Serial0/0/0 , Serial0/0/1 , Serial0/1/0
Hits: 3 Misses: 10
Expired translations: 3
Dynamic mappings:
Bogotal#
```

*Gráfica 27 Estadística y traducción NAT Bogota1*

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

### **Bogota1**

```
access-list 10 permit 172.29.0.0 0.0.0.255
access-list 10 permit 172.29.1.0 0.0.0.255
ip nat inside source list 10 interface serial 0/1/1 overload
!
interface Serial0/0/0
ip nat inside
!
interface Serial0/0/1
ip nat inside
!
interface Serial0/1/0
ip nat inside
!
interface Serial0/1/1
ip nat outside
!
```

---

### **Medellin1**

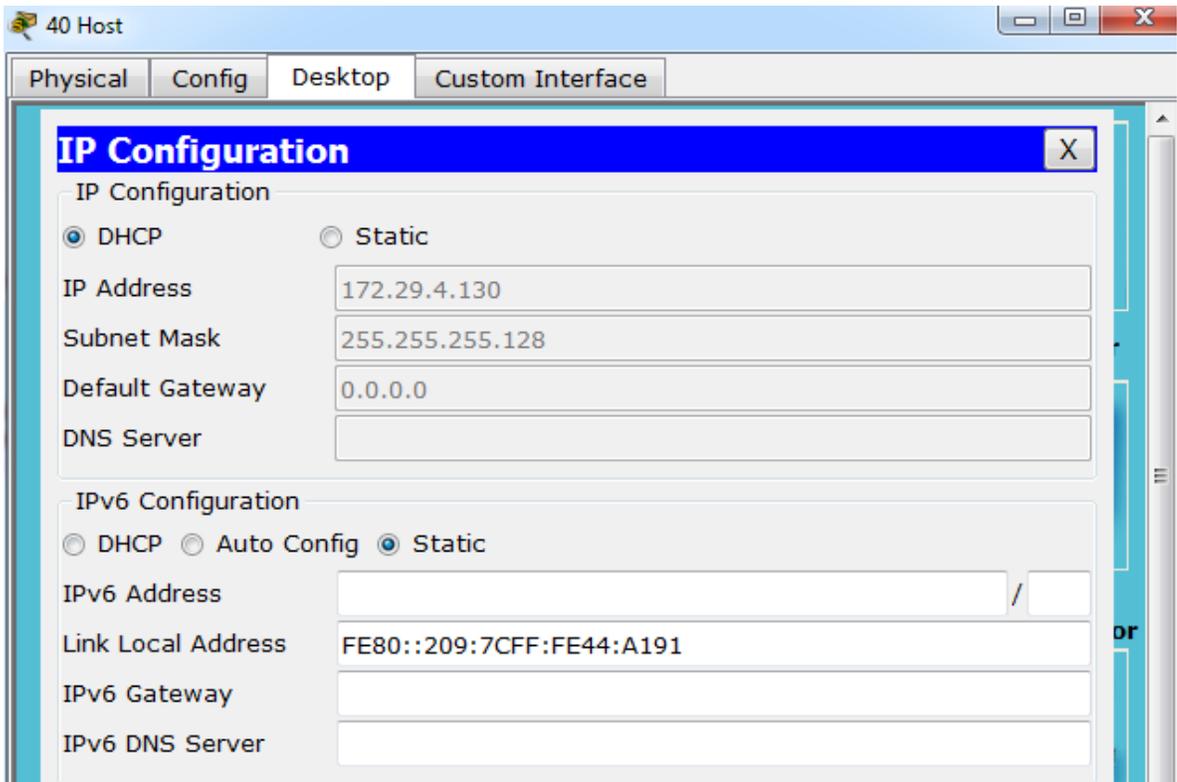
```
access-list 10 permit 172.29.4.128 0.0.0.127
access-list 10 permit 172.29.4 0.0.0.127
ip nat inside source list 10 interface serial 0/1/1 overload
!
interface Serial0/0/0
ip nat inside
!
interface Serial0/0/1
ip nat inside
!
interface Serial0/1/0
ip nat inside
!
interface Serial0/1/1
ip nat outside
!
```

### **Parte 7: Configuración del servicio DHCP.**

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

## Medellin2

```
ip dhcp excluded-address 172.29.4.1
ip dhcp excluded-address 172.29.4.129
!
ip dhcp pool LAN1
network 172.29.4.0 255.255.255.128
ip dhcp pool LAN2
network 172.29.4.128 255.255.255.128
!
```



Gráfica 28 Asignación DHCP Medellín

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

## Medellin3

```
interface FastEthernet0/0
ip address 172.29.4.129 255.255.255.128
ip helper-address 172.29.6.5
duplex auto
speed auto
!
```

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

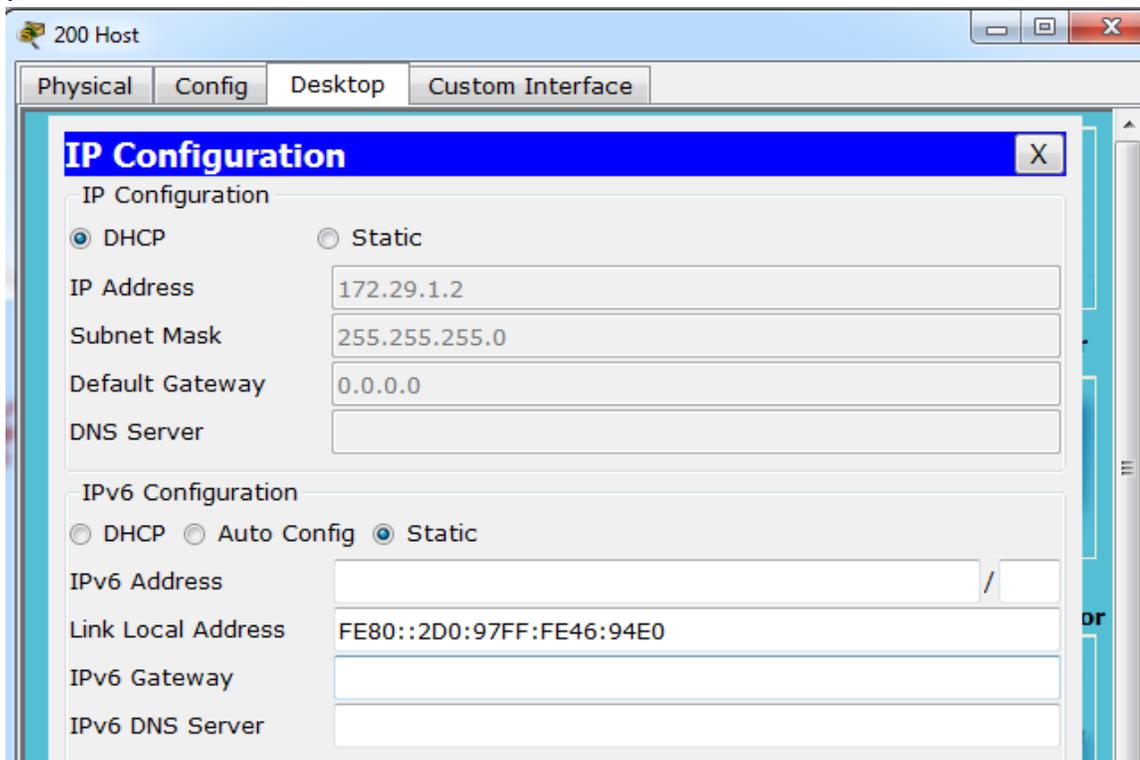
### **Bogota2**

```
ip dhcp excluded-address 172.29.0.1
ip dhcp excluded-address 172.29.1.1
!
ip dhcp pool LAN2
 network 172.29.0.0 255.255.255.0
ip dhcp pool LAN1
 network 172.29.1.0 255.255.255.0
!
```

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

### **Bogota1**

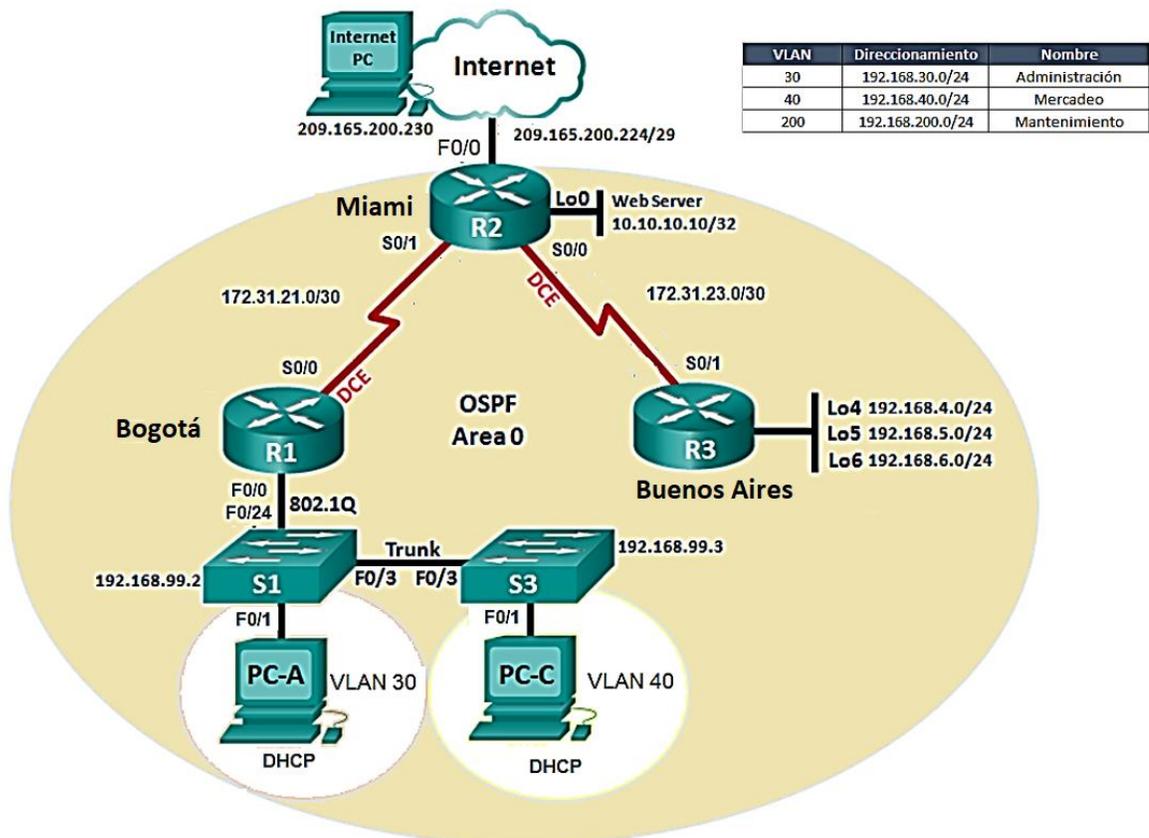
```
interface Serial0/0/0
ip address 172.29.3.1 255.255.255.252
ip helper-address 172.29.3.2
ip nat inside
clock rate 2000000
!
```



Gráfica 29 Asignación DHCP Bogotá

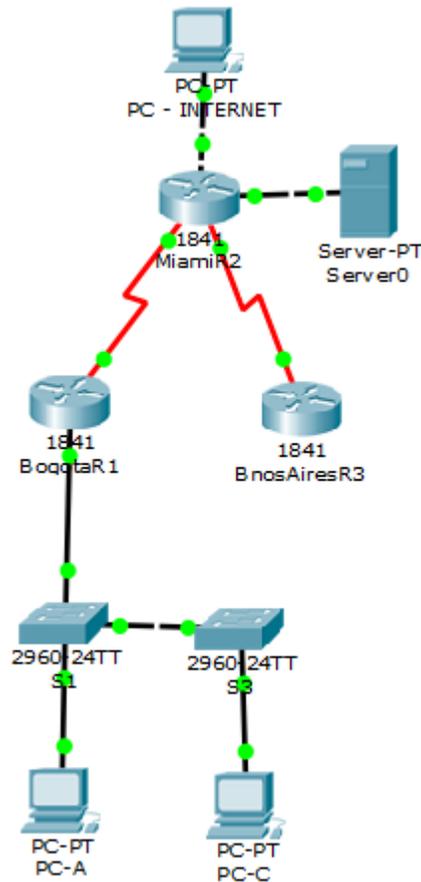
## 2. ESCENARIO 2

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.



Gráfica 30 Escenario 2

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



Gráfica 31 Topología de red

Configurar el protocolo de enrutamiento OSPFv2 bajo los siguientes criterios:

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 Parámetros OSPF

### Verificar información de OSPF

- Visualizar tablas de enrutamiento y routers conectados por OSPFv2

```
BogotaR1#sh ip ospf neighbor
```

Neighbor ID	Pri	State	Dead Time	Address	Interface
5.5.5.5	0	FULL/ -	00:00:39	172.31.21.1	Serial0/0/0

```
BogotaR1#sh ip route OSPF
```

```

10.0.0.0/24 is subnetted, 1 subnets
O    10.10.10.0 [110/9501] via 172.31.21.1, 00:25:11, Serial0/0/0
172.31.0.0/30 is subnetted, 2 subnets
O    172.31.23.0 [110/19000] via 172.31.21.1, 00:25:11, Serial0/0/0
192.168.4.0/32 is subnetted, 1 subnets
O    192.168.4.1 [110/19001] via 172.31.21.1, 00:25:11, Serial0/0/0
192.168.5.0/32 is subnetted, 1 subnets
O    192.168.5.1 [110/19001] via 172.31.21.1, 00:25:11, Serial0/0/0
192.168.6.0/32 is subnetted, 1 subnets
O    192.168.6.1 [110/19001] via 172.31.21.1, 00:25:11, Serial0/0/0
BogotaR1#
```

Gráfica 32 Enrutamiento R1

```
MiamiR2#sh ip ospf neighbor
```

Neighbor ID	Pri	State	Dead Time	Address	Interface
8.8.8.8	0	FULL/ -	00:00:33	172.31.23.2	Serial0/0/0
1.1.1.1	0	FULL/ -	00:00:36	172.31.21.2	Serial0/0/1

```
MiamiR2#
```

```
MiamiR2#sh ip route ospf
```

```

192.168.4.0/32 is subnetted, 1 subnets
O    192.168.4.1 [110/9501] via 172.31.23.2, 00:26:32, Serial0/0/0
192.168.5.0/32 is subnetted, 1 subnets
O    192.168.5.1 [110/9501] via 172.31.23.2, 00:26:32, Serial0/0/0
192.168.6.0/32 is subnetted, 1 subnets
O    192.168.6.1 [110/9501] via 172.31.23.2, 00:26:32, Serial0/0/0
O    192.168.30.0 [110/391] via 172.31.21.2, 00:26:32, Serial0/0/1
O    192.168.40.0 [110/391] via 172.31.21.2, 00:26:32, Serial0/0/1
O    192.168.200.0 [110/391] via 172.31.21.2, 00:26:32, Serial0/0/1
MiamiR2#
```

Gráfica 33 Enrutamiento R2

```
BnosAiresR3#sh ip ospf neighbor
```

Neighbor ID	Pri	State	Dead Time	Address	Interface
5.5.5.5	0	FULL/ -	00:00:35	172.31.23.1	Serial0/0/1

```
BnosAiresR3#
```

```
BnosAiresR3#sh ip route ospf
```

```

10.0.0.0/24 is subnetted, 1 subnets
O    10.10.10.0 [110/391] via 172.31.23.1, 00:27:22, Serial0/0/1
172.31.0.0/30 is subnetted, 2 subnets
O    172.31.21.0 [110/780] via 172.31.23.1, 00:27:22, Serial0/0/1
O    192.168.30.0 [110/781] via 172.31.23.1, 00:27:12, Serial0/0/1
O    192.168.40.0 [110/781] via 172.31.23.1, 00:27:12, Serial0/0/1
O    192.168.200.0 [110/781] via 172.31.23.1, 00:27:12, Serial0/0/1
BnosAiresR3#
```

Gráfica 34 Enrutamiento R3

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

```

BnosAiresR3#sh ip ospf interface

Loopback4 is up, line protocol is up
  Internet address is 192.168.4.1/24, Area 0
  Process ID 1, Router ID 8.8.8.8, Network Type LOOPBACK, Cost: 1
  Loopback interface is treated as a stub Host
Loopback5 is up, line protocol is up
  Internet address is 192.168.5.1/24, Area 0
  Process ID 1, Router ID 8.8.8.8, Network Type LOOPBACK, Cost: 1
  Loopback interface is treated as a stub Host
Loopback6 is up, line protocol is up
  Internet address is 192.168.6.1/24, Area 0
  Process ID 1, Router ID 8.8.8.8, Network Type LOOPBACK, Cost: 1
  Loopback interface is treated as a stub Host
Serial0/0/1 is up, line protocol is up
  Internet address is 172.31.23.2/30, Area 0
  Process ID 1, Router ID 8.8.8.8, Network Type POINT-TO-POINT, Cost: 390
  Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
  No designated router on this network
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:01
  Index 4/4, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1 , Adjacent neighbor count is 1
    Adjacent with neighbor 5.5.5.5
  Suppress hello for 0 neighbor(s)

```

*Gráfica 35 Interface OSPF R3*

```

-----
Serial0/0/0 is up, line protocol is up
Internet address is 172.31.23.1/30, Area 0
Process ID 1, Router ID 5.5.5.5, Network Type POINT-TO-POINT, Cost: 9500
Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
No designated router on this network
No backup designated router on this network
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
  Hello due in 00:00:00
Index 2/2, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 1 , Adjacent neighbor count is 1
  Adjacent with neighbor 8.8.8.8
  Suppress hello for 0 neighbor(s)
Serial0/0/1 is up, line protocol is up
Internet address is 172.31.21.1/30, Area 0
Process ID 1, Router ID 5.5.5.5, Network Type POINT-TO-POINT, Cost: 390
Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
No designated router on this network
No backup designated router on this network
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
  Hello due in 00:00:09
Index 3/3, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 1 , Adjacent neighbor count is 1
  Adjacent with neighbor 1.1.1.1
  Suppress hello for 0 neighbor(s)
MiamiR2#

```

*Gráfica 36 Interface OSPF R2*

```
BogotaR1#sh ip ospf interface
```

```
FastEthernet0/0.30 is up, line protocol is up
  Internet address is 192.168.30.1/24, Area 0
  Process ID 1, Router ID 1.1.1.1, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 1.1.1.1, Interface address 192.168.30.1
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    No Hellos (Passive interface)
  Index 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 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
FastEthernet0/0.40 is up, line protocol is up
  Internet address is 192.168.40.1/24, Area 0
  Process ID 1, Router ID 1.1.1.1, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 1.1.1.1, Interface address 192.168.40.1
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    No Hellos (Passive interface)
  Index 2/2, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
```

*Gráfica 37 interface OSPF R1*

```

FastEthernet0/0.200 is up, line protocol is up
  Internet address is 192.168.200.1/24, Area 0
  Process ID 1, Router ID 1.1.1.1, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 1.1.1.1, Interface address 192.168.200.1
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    No Hellos (Passive interface)
  Index 3/3, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
Serial0/0/0 is up, line protocol is up
  Internet address is 172.31.21.2/30, Area 0
  Process ID 1, Router ID 1.1.1.1, Network Type POINT-TO-POINT, Cost: 9500
  Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
  No designated router on this network
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:00
  Index 4/4, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1 , Adjacent neighbor count is 1
    Adjacent with neighbor 5.5.5.5
  Suppress hello for 0 neighbor(s)
BogotaR1#

```

---

*Gráfica 38 Interface OSPF R1*

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

```
BogotaR1#sh ip protocols
```

```
Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 1.1.1.1
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    172.31.21.0 0.0.0.3 area 0
    192.168.30.0 0.0.0.255 area 0
    192.168.40.0 0.0.0.255 area 0
    192.168.200.0 0.0.0.255 area 0
  Passive Interface(s):
    FastEthernet0/0.30
    FastEthernet0/0.40
    FastEthernet0/0.200
  Routing Information Sources:
    Gateway         Distance      Last Update
    1.1.1.1          110          00:20:53
    5.5.5.5          110          00:20:53
    8.8.8.8          110          00:20:53
  Distance: (default is 110)
```

*Gráfica 39 sh ip protocol OSPF R1*

```
MiamiR2#sh 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          00:22:24
    5.5.5.5          110          00:22:24
    8.8.8.8          110          00:22:24
  Distance: (default is 110)
```

*Gráfica 40 sh ip protocol OSPF R2*

```

- -
BnosAiresR3#sh ip protocols

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 8.8.8.8
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    172.31.23.0 0.0.0.3 area 0
    192.168.4.0 0.0.3.255 area 0
  Passive Interface(s):
    Loopback4
    Loopback5
    Loopback6
  Routing Information Sources:
    Gateway         Distance      Last Update
    1.1.1.1          110          00:22:59
    5.5.5.5          110          00:22:59
    8.8.8.8          110          00:22:59
  Distance: (default is 110)

```

*Gráfica 41 sh ip protocol OSPF R3*

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

Para el detalle se anexan los archivos de configuración de los equipos.

En el Switch 3 deshabilitar DNS lookup

```

!
no ip domain-lookup
!

```

Asignar direcciones IP a los Switches acorde a los lineamientos.

```

S3
!
interface Vlan40
ip address 192.168.40.2 255.255.255.0
!
ip default-gateway 192.168.40.1
-----

```

```

S1
!
interface Vlan30
ip address 192.168.30.2 255.255.255.0
!

```

```
ip default-gateway 192.168.30.1
```

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

Para el detalle se anexan los archivos de configuración de los equipos.

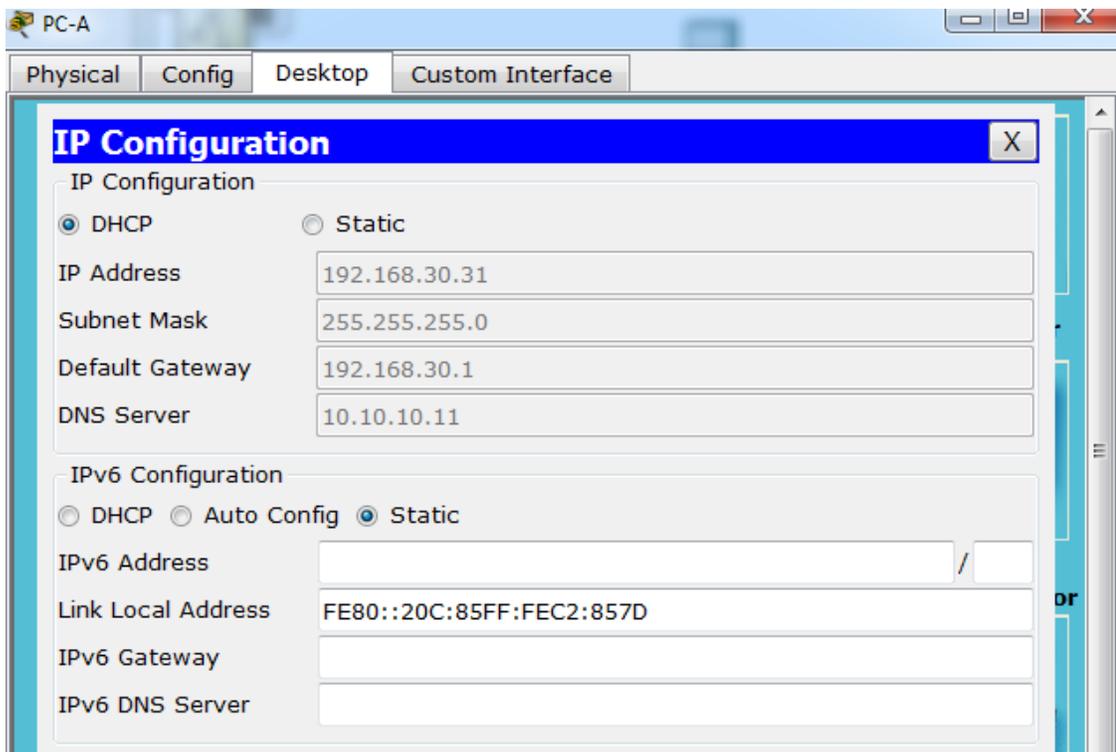
Implement DHCP and NAT for IPv4

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

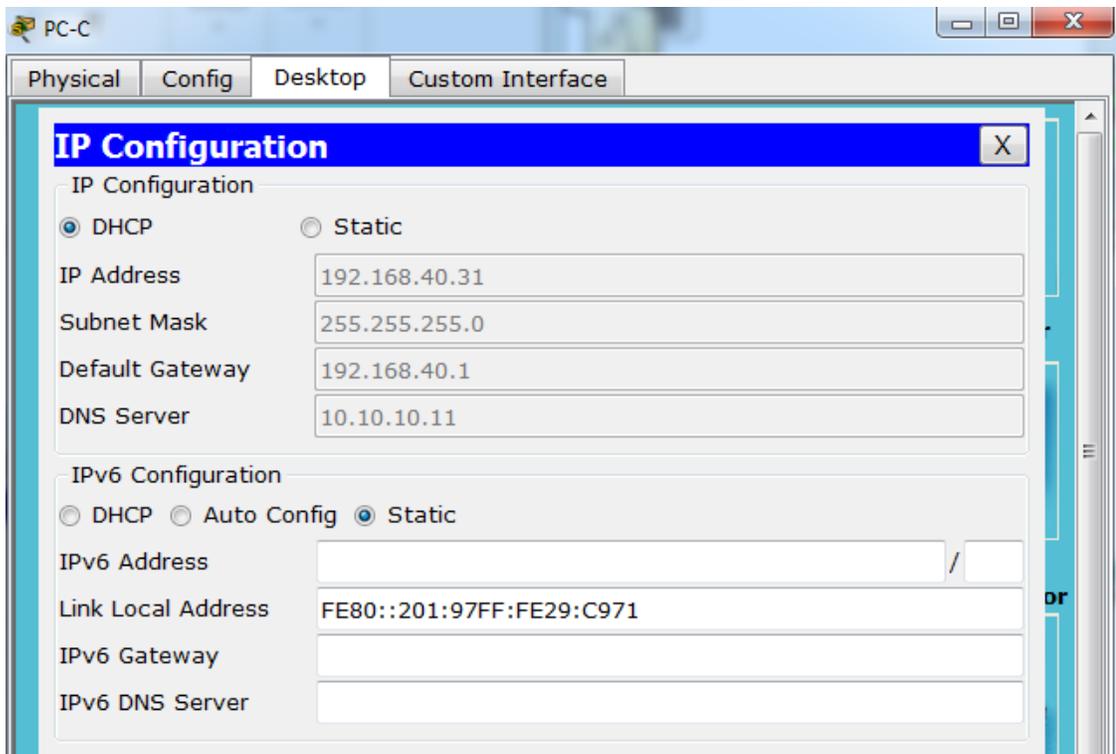
Reservar las primeras 30 direcciones IP de las VLAN 30 y 40 para configuraciones estáticas.

## R1

```
!  
ip dhcp excluded-address 192.168.30.1 192.168.30.30  
ip dhcp excluded-address 192.168.40.1 192.168.40.30  
!  
ip dhcp pool ADMINISTRACION  
network 192.168.30.0 255.255.255.0  
default-router 192.168.30.1  
dns-server 10.10.10.11  
ip dhcp pool MERCADEO  
network 192.168.40.0 255.255.255.0  
default-router 192.168.40.1  
dns-server 10.10.10.11  
!
```



Gráfica 42 Asignación DHCP PC-A



Gráfica 43 Asignación DHCP PC-C

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

## R1

```
!  
ip nat pool INTERNET 209.165.200.225 209.165.200.228 netmask  
255.255.255.248  
ip nat inside source list 10 pool INTERNET  
ip nat inside source static 10.10.10.10 209.165.200.229  
!  
interface FastEthernet0/0  
ip nat outside  
!  
interface FastEthernet0/1  
ip nat inside  
!  
interface Serial0/0/0  
ip nat inside  
!  
interface Serial0/0/1  
ip nat inside  
!  
MiamiR2#sh ip nat statistics  
Total translations: 2 (1 static, 1 dynamic, 1 extended)  
Outside Interfaces: FastEthernet0/0  
Inside Interfaces: FastEthernet0/1 , Serial0/0/0 , Serial0/0/1  
Hits: 2 Misses: 7  
Expired translations: 1  
Dynamic mappings:  
-- Inside Source  
access-list 10 pool INTERNET refCount 0  
  pool INTERNET: netmask 255.255.255.248  
    start 209.165.200.225 end 209.165.200.228  
    type generic, total addresses 4 , allocated 0 (0%), misses 0  
MiamiR2#  
MiamiR2#sh ip nat trans  
Pro  Inside global      Inside local      Outside local     Outside global  
icmp 209.165.200.229:2 10.10.10.10:2    209.165.200.230:2 209.165.200.230:2  
---  209.165.200.229   10.10.10.10     ---              ---
```

Gráfica 44 Estadísticas NAT

```

MiamiR2#sh ip nat translations
Pro  Inside global      Inside local      Outside local      Outside global
---  209.165.200.229    10.10.10.10      ---              ---
tcp  209.165.200.225:1025192.168.30.31:1025 209.165.200.229:80 209.165.200.229:80
tcp  209.165.200.225:1026192.168.30.31:1026 209.165.200.229:80 209.165.200.229:80
tcp  209.165.200.225:1027192.168.30.31:1027 209.165.200.229:80 209.165.200.229:80
tcp  209.165.200.225:1028192.168.30.31:1028 209.165.200.229:80 209.165.200.229:80
tcp  209.165.200.225:1029192.168.30.31:1029 209.165.200.229:80 209.165.200.229:80
tcp  209.165.200.225:1030192.168.30.31:1030 209.165.200.229:80 209.165.200.229:80
tcp  209.165.200.225:1031192.168.30.31:1031 209.165.200.229:80 209.165.200.229:80
tcp  209.165.200.225:1032192.168.30.31:1032 209.165.200.229:80 209.165.200.229:80

```

*Gráfica 45 Traducciones NAT*

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

ACL estándar para restringir el acceso telnet

```

!
ip access-list standard ADMIN
permit host 172.31.21.2
ip access-list standard ADMIN2
permit host 172.31.23.2

```

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

ACL extendida para permitir tráfico tcp a cualquier host

```
access-list 100 permit tcp any host 209.165.200.229 eq www
```

ACL extendida para permitir solo las respuestas ICMP

```
access-list 100 permit icmp any any echo-reply
```

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

```

PC>ping 172.31.21.1

Pinging 172.31.21.1 with 32 bytes of data:

Reply from 172.31.21.1: bytes=32 time=5ms TTL=254
Reply from 172.31.21.1: bytes=32 time=5ms TTL=254
Reply from 172.31.21.1: bytes=32 time=4ms TTL=254
Reply from 172.31.21.1: bytes=32 time=6ms TTL=254

Ping statistics for 172.31.21.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 4ms, Maximum = 6ms, Average = 5ms

```

*Gráfica 46 Ping PC-C a R2*

```

BnosAiresR3#ping 209.165.200.230

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.165.200.230, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/4/12 ms

```

*Gráfica 47 Ping R3 a PC-Internet*

```

SERVER>ping 209.165.200.230

Pinging 209.165.200.230 with 32 bytes of data:

Reply from 209.165.200.230: bytes=32 time=0ms TTL=127

Ping statistics for 209.165.200.230:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

SERVER>tracert 209.165.200.230

Tracing route to 209.165.200.230 over a maximum of 30 hops:

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

Trace complete.

```

*Gráfica 48 Ping - Tracert Server a PC-Internet*

```
PC>tracert 172.31.21.1

Tracing route to 172.31.21.1 over a maximum of 30 hops:

  0  0 ms    0 ms    0 ms    192.168.40.1
  1  0 ms    1 ms    1 ms    172.31.21.1

Trace complete.

PC>
```

Gráfica 49 Tracert PC-A a R2

```
BogotaR1#traceroute 192.168.40.31
Type escape sequence to abort.
Tracing the route to 192.168.40.31

 0  192.168.40.31  1 msec  0 msec  0 msec
BogotaR1#
BogotaR1#ping 192.168.40.31

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.40.31, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms

BogotaR1#
```

Gráfica 50 Ping - Tracert R1 a PC-C

## CONCLUSIONES

En cuanto a lo abordado con anterioridad, se refleja la importancia de una correcta planificación de administración de red antes de su implementación, para así minimizar el margen de error al momento de llevarla a la práctica. Existen muchos aspectos a tener en cuenta, tales como: el direccionamiento IP, la topología, los diferentes protocolos de enrutamiento y de servicios, es allí donde deriva el éxito o el error al momento de realizar las respectivas pruebas de funcionamiento.

Es imprescindible conocer la lógica de los protocolos a implementar, con OSPFv2 por ejemplo se debe crear el proceso de OSPF desde la configuración global con el comando "router ospf", después se deben configurar los rangos de red mediante "network área", todas las interfaces que se incluyan mediante ese comando estarán participando en esa área de OSPF.

Las políticas son claves en la seguridad pues deniegan o restringen los diferentes servicios o funcionamientos. Una forma óptima de administrar una red es utilizar protocolos dinámicos pues permiten una escalabilidad mayor, un menor esfuerzo para su gestión y la actualización, con lo que mitigan la probabilidad de fallas, sin embargo, se debe tener en cuenta los recursos físicos con los que se implementan pues le exigen en mayor medida a los equipos. El uso de los comandos de verificación es vital para un buen diagnóstico de errores.

En pequeños ambientes simulados como el packet tracer se puede percibir la exigencia y la ilimitación de las telecomunicaciones las cuales a diario evolucionan para convertirse en una herramienta para la competitividad global con visión socio humanística.

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## ANEXOS

Anexo A. Packet tracet escenario 1

Anexo B. Script escenario 1

Anexo C. Packet tracet escenario 2

Anexo D. Script escenario 2

[https://drive.google.com/open?id=1Muvx7k8\\_xuvtbEAfPB5Tai9zXKJGy18K](https://drive.google.com/open?id=1Muvx7k8_xuvtbEAfPB5Tai9zXKJGy18K)