SOLUCIÓN DE ESTUDIOS DE CASO BAJO EL USO DE TECNOLOGÍA CISCO.

Presentado por:

JULIÁN GUTIÉRREZ c.c 1152444628

Asesor:

JUAN CARLOS VESGA

Universidad nacional abierta y a distancia (UNAD)
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Tabla de contenido

1. INTRODUCCIÓN

Este documento contiene el desarrollo de diferentes ejercicios, escenarios, en los cuales se implementan todos los conocimientos adquiridos en el Diplomado de Profundización CCNP tales como: protocolos de enrutamiento dinámico de interior de gateway (OSPF, EIGRP) y de exterior de gateway(BGP), y protocolos implementados en switches (VLAN, VTPy DTP); cada ejercicio resuelto presenta un desarrollo detallado que permitirá observar los diferentes componentes requeridos por cada situación propuesta por la actividad.

2. DESARROLLO DE LOS TRES ESCENARIOS

En este enlace:
https://drive.google.com/drive/folders/1DZNkkGzrERyZDcdncN4733HqoaH6NQ0z?usp=sharing se encuentra el desarrollo de los tres escenarios en packet tracer(escenarios 1 y 3) en gns3(escenario 2).

2.1 Escenario 1

En la ilustración 1 se muestra la topología del escenario 1, en la cual se asigna el direccionamiento IP, se configuran dos protocolos de enrutamiento dinámico (OSPF y EIGRP), y se realiza la redistribución de ambos protocolos de enrutamiento para que sea posible la conectividad entre todos los dispositivos; todo lo anterior según las condiciones requeridas por la actividad.

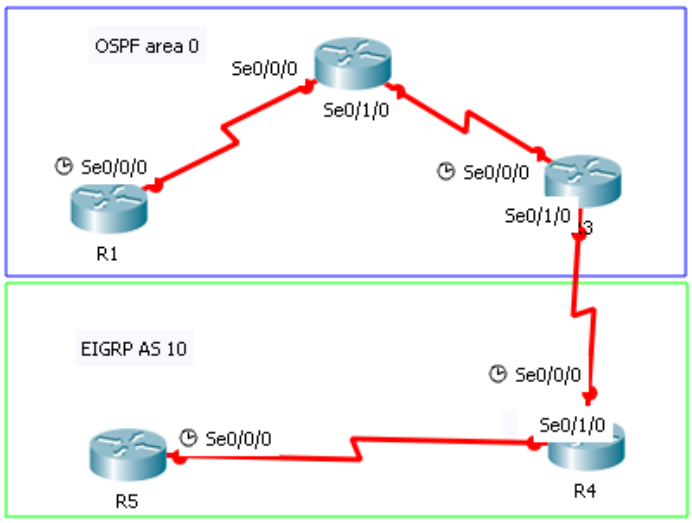

Ilustración 1. Topología escenario 1

A continuación, se describe paso a paso el desarrollo de este ejercicio

Paso 1: Asignación de direccionamiento IP y configuración de los dispositivos básica activos de red.

Como configuración básica, inicial, a los dispositivos se le asocio el nombre como se muestra en la ilustración 1, también se configuro el banner , se habilito el cifrado de contraseñas, entre otras. ellos

DISPOSITIVO	CONFIGURACIÓN INICIAL
R1	Router(config)#hostname R1 R1(config)#banner motd "Acceso restringido, solo personal autorizado" R1(config)#line con 0 R1(config-line)#logging synchronous R1(config-line)#exit R1(config)#service password-encryption R1(config)#no ip domain-lookup
R2	Router(config)#hostname R2 R2(config)#banner motd "Acceso restringido, solo personal autorizado" R2(config)#line con 0 R2(config-line)#logging synchronous R2(config-line)#exit R2(config)#service password-encryption R2(config)#no ip domain-lookup
R3	Router(config)#hostname R3 R3(config)#banner motd "Acceso restringido, solo personal autorizado" R3(config)#line con 0 R3(config-line)#logging synchronous R3(config-line)#exit R3(config)#service password-encryption R3(config)#no ip domain-lookup
R4	Router(config)#hostname R4 R4(config)#banner motd "Acceso restringido, solo personal autorizado" R4(config)#line con 0 R4(config-line)#logging synchronous R4(config-line)#exit R4(config)#service password-encryption R4(config)#no ip domain-lookup
R5	Router(config)#hostname R5 R5(config)#banner motd "Acceso restringido, solo personal autorizado" R5(config)#line con 0 R5(config-line)#logging synchronous R5(config-line)#exit R5(config)#service password-encryption R5(config)#no ip domain-lookup

Tabla 1. Configucación inicial escenario 1

En este paso se asigno el direccionamiento IP a los cinco router como se muestra en la siguiente tabla:

Dispositivo	Interfaz	Dirección IP
R1	s0/0/0	10.103.12.1/24

	Loopback0	10.1.0.1/24
	Loopback1	10.1.1.1/24
	Loopback2	10.1.2.1/24
	Loopback3	10.1.3.1/24
R2	s0/0/0	10.103.12.2/24
	s0/1/0	10.103.23.1/24
R3	s0/0/0	10.103.23.2/24
	s0/1/0	172.29.34.1/24
R4	s0/0/0	172.29.34.2/24
	s0/1/0	172.29.45.1/24
R5	s0/0/0	172.29.45.2/24
	Loopback0	172.5.0.1/24
	Loopback1	172.5.1.1/24
	Loopback2	172.5.2.1/24
	Loopback3	172.5.3.1/24

Para implementar el direccionamiento IP acorde con la tabla anterior se ejecutaron los siguientes comandos

R1(config)#interface s0/0/0 R1(config-if)#ip add 10.103.12.1 255.255.255.0 R1(config-if)#clock rate 64000 R1(config-if)#no shutdown R1(config-if)#exit R1(config)#interface loopback 0 R1(config-if)#ip add 10.1.0.1 255.255.255.0 R1(config-if)#exit R1(config)#interface loopback 1 R1(config-if)#ip add 10.1.1.1 255.255.255.0 R1(config-if)#exit R1(config)#interface loopback 2 R1(config-if)#ip add 10.1.2.1 255.255.255.0 R1(config-if)#exit R1(config)#interface loopback 3 R1(config-if)#ip add 10.1.3.1 255.255.255.0 R1(config-if)#exit	R2(config)#interface s0/0/0 R2(config-if)#ip add 10.103.12.2 255.255.255.0 R2(config-if)#no shutdown R2(config-if)#exit R2(config)#interface s0/1/0 R2(config-if)#ip add 10.103.23.1 255.255.255.0 R2(config-if)#no shutdown
R3(config)#interface s0/0/0 R3(config-if)#ip add 10.103.12.2 255.255.255.0 R3(config-if)#clock rate 64000 R3(config-if)#no shutdown R3(config-if)#exit R3(config)#interface s0/1/0 R3(config-if)#ip add 172.29.34.1 255.255.255.0 R3(config-if)#no shutdown	R4(config)#interface s0/0/0 R4(config-if)#ip add 172.29.34.2 255.255.255.0 R4(config-if)#clock rate 64000 R4(config-if)#no shutdown R4(config-if)#interface s0/1/0 R4(config-if)#ip add 172.29.45.1 255.255.255.0 R4(config-if)#no shutdown
R5(config)#interface s0/0/0 R5(config-if)#ip add 172.29.45.2 255.255.255.0 R5(config-if)#clock rate 64000 R5(config-if)#no shutdown	

```
R5(config-if)#exit
R5(config)#interface loopback 0
R5(config-if)#ip add 172.5.0.1 255.255.255.0
R5(config-if)#exit
R5(config)#interface loopback 1
R5(config-if)#ip add 172.5.1.1 255.255.255.0
R5(config-if)#exit
R5(config)#interface loopback 2
R5(config-if)#ip add 172.5.2.1 255.255.255.0
R5(config-if)#exit
R5(config)#interface loopback 3
R5(config-if)#ip add 172.5.3.1 255.255.255.0
R5(config-if)#exit
```

Paso 2: Configuración de Protocolos de enrutamiento

Se configuraron los protocolos de enrutamiento OSPF y EIGRP de acuerdo a las redes que cada dispositivo tienen directamente conectadas (CISCO, 2010).

- **Configuración R1**

```
R1#sh ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     10.0.0.0/8 is variably subnetted, 10 subnets, 2 masks
C       10.1.0.0/24 is directly connected, Loopback0
L       10.1.0.1/32 is directly connected, Loopback0
C       10.1.1.0/24 is directly connected, Loopback1
L       10.1.1.1/32 is directly connected, Loopback1
C       10.1.2.0/24 is directly connected, Loopback2
L       10.1.2.1/32 is directly connected, Loopback2
C       10.1.3.0/24 is directly connected, Loopback3
L       10.1.3.1/32 is directly connected, Loopback3
C       10.103.12.0/24 is directly connected, Serial0/0/0
L       10.103.12.1/32 is directly connected, Serial0/0/0
```

```
R1(config)#router ospf 1
R1(config-router)#network 10.1.0.0 0.0.0.255 area 0
R1(config-router)#network 10.1.1.0 0.0.0.255 area 0
R1(config-router)#network 10.1.2.0 0.0.0.255 area 0
R1(config-router)#network 10.1.3.0 0.0.0.255 area 0
R1(config-router)#network 10.103.12.0 0.0.0.255 area 0
```

- **Configuración R2**

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

Gateway of last resort is not set

     10.0.0.0/8 is variably subnetted, 4 subnets, 2 masks
C       10.103.12.0/24 is directly connected, Serial0/0/0
L       10.103.12.2/32 is directly connected, Serial0/0/0
C       10.103.23.0/24 is directly connected, Serial0/1/0
L       10.103.23.1/32 is directly connected, Serial0/1/0
```

R2(config)#router ospf 1
R2(config-router)#network 10.103.12.0 0.0.0.255 area 0
R2(config-router)#network 10.103.12.0 0.0.0.255 area 0
R2(config-router)#network 10.103.23.0 0.0.0.255 area 0

- **Configuración R3**

```
R3(config)#do sh ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       10.103.23.0/24 is directly connected, Serial0/0/0
L       10.103.23.2/32 is directly connected, Serial0/0/0
     172.29.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       172.29.34.0/24 is directly connected, Serial0/1/0
L       172.29.34.1/32 is directly connected, Serial0/1/0
```

R3(config)#router ospf 1
R3(config-router)#network 10.103.23.0 0.0.0.255 area 0
R3(config-router)#exit
R3(config)#router eigrp 10
R3(config-router)#network 172.29.34.0 0.0.0.255

- **Configuración R4**

```
R4(config-router)#do sh ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     172.29.0.0/16 is variably subnetted, 4 subnets, 2 masks
C       172.29.34.0/24 is directly connected, Serial0/0/0
L       172.29.34.2/32 is directly connected, Serial0/0/0
C       172.29.45.0/24 is directly connected, Serial0/1/0
L       172.29.45.1/32 is directly connected, Serial0/1/0
```

R4(config)#router eigrp 10

R4(config-router)#network 172.29.34.0 0.0.0.255
R4(config-router)#network 172.29.45.0 0.0.0.255

- **Configuración R5**

```
R5#sh ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     172.5.0.0/16 is variably subnetted, 8 subnets, 2 masks
C       172.5.0.0/24 is directly connected, Loopback0
L       172.5.0.1/32 is directly connected, Loopback0
C       172.5.1.0/24 is directly connected, Loopback1
L       172.5.1.1/32 is directly connected, Loopback1
C       172.5.2.0/24 is directly connected, Loopback2
L       172.5.2.1/32 is directly connected, Loopback2
C       172.5.3.0/24 is directly connected, Loopback3
L       172.5.3.1/32 is directly connected, Loopback3
     172.29.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       172.29.45.0/24 is directly connected, Serial0/0/0
L       172.29.45.2/32 is directly connected, Serial0/0/0
```

R5(config)#router eigrp 10
R5(config-router)#network 172.5.0.0 0.0.0.255
R5(config-router)#network 172.5.1.0 0.0.0.255
R5(config-router)#network 172.5.2.0 0.0.0.255
R5(config-router)#network 172.5.3.0 0.0.0.255
R5(config-router)#network 172.29.45.0 0.0.0.255

Paso 3: Redistribución de protocolos de enrutamiento dinámico

Antes de realizar la redistribución se verificaron las tablas de enrutamiento de cada router y se pudo observar que no hay conocimiento total de toda la topología de la red

```
R1#sh ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     10.0.0.0/8 is variably subnetted, 11 subnets, 2 masks
C       10.1.0.0/24 is directly connected, Loopback0
L       10.1.0.1/32 is directly connected, Loopback0
C       10.1.1.0/24 is directly connected, Loopback1
L       10.1.1.1/32 is directly connected, Loopback1
C       10.1.2.0/24 is directly connected, Loopback2
L       10.1.2.1/32 is directly connected, Loopback2
C       10.1.3.0/24 is directly connected, Loopback3
L       10.1.3.1/32 is directly connected, Loopback3
C       10.103.12.0/24 is directly connected, Serial0/0/0
L       10.103.12.1/32 is directly connected, Serial0/0/0
O       10.103.23.0/24 [110/128] via 10.103.12.2, 02:32:08, Serial0/0/0
```

Ilustración 2. Tabla de enrutamiento R1 antes de la redistribución

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

Gateway of last resort is not set

     10.0.0.0/8 is variably subnetted, 8 subnets, 2 masks
O       10.1.0.1/32 [110/65] via 10.103.12.1, 02:33:12, Serial0/0/0
O       10.1.1.1/32 [110/65] via 10.103.12.1, 02:33:12, Serial0/0/0
O       10.1.2.1/32 [110/65] via 10.103.12.1, 02:33:12, Serial0/0/0
O       10.1.3.1/32 [110/65] via 10.103.12.1, 02:33:12, Serial0/0/0
C       10.103.12.0/24 is directly connected, Serial0/0/0
L       10.103.12.2/32 is directly connected, Serial0/0/0
C       10.103.23.0/24 is directly connected, Serial0/1/0
L       10.103.23.1/32 is directly connected, Serial0/1/0
```

Ilustración 3. Tabla de enrutamiento R2 antes de la redistribución.

```
R3#sh ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     10.0.0.0/8 is variably subnetted, 7 subnets, 2 masks
O       10.1.0.1/32 [110/129] via 10.103.23.1, 02:00:39, Serial0/0/0
O       10.1.1.1/32 [110/129] via 10.103.23.1, 02:00:39, Serial0/0/0
O       10.1.2.1/32 [110/129] via 10.103.23.1, 02:00:39, Serial0/0/0
O       10.1.3.1/32 [110/129] via 10.103.23.1, 02:00:39, Serial0/0/0
O       10.103.12.0/24 [110/128] via 10.103.23.1, 02:00:39, Serial0/0/0
C       10.103.23.0/24 is directly connected, Serial0/0/0
L       10.103.23.2/32 is directly connected, Serial0/0/0
     172.5.0.0/24 is subnetted, 4 subnets
D       172.5.0.0/24 [90/2809856] via 172.29.34.2, 01:39:06, Serial0/1/0
D       172.5.1.0/24 [90/2809856] via 172.29.34.2, 01:39:06, Serial0/1/0
D       172.5.2.0/24 [90/2809856] via 172.29.34.2, 01:39:06, Serial0/1/0
D       172.5.3.0/24 [90/2809856] via 172.29.34.2, 01:39:06, Serial0/1/0
     172.29.0.0/16 is variably subnetted, 3 subnets, 2 masks
C       172.29.34.0/24 is directly connected, Serial0/1/0
L       172.29.34.1/32 is directly connected, Serial0/1/0
D       172.29.45.0/24 [90/2681856] via 172.29.34.2, 01:43:47, Serial0/1/0
```

Ilustración 4. Tabla de enrutamiento R3 antes de la redistribución

```
R4#sh ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     172.5.0.0/24 is subnetted, 4 subnets
D       172.5.0.0/24 [90/2297856] via 172.29.45.2, 01:39:56, Serial0/1/0
D       172.5.1.0/24 [90/2297856] via 172.29.45.2, 01:39:56, Serial0/1/0
D       172.5.2.0/24 [90/2297856] via 172.29.45.2, 01:39:56, Serial0/1/0
D       172.5.3.0/24 [90/2297856] via 172.29.45.2, 01:39:56, Serial0/1/0
     172.29.0.0/16 is variably subnetted, 4 subnets, 2 masks
C       172.29.34.0/24 is directly connected, Serial0/0/0
L       172.29.34.2/32 is directly connected, Serial0/0/0
C       172.29.45.0/24 is directly connected, Serial0/1/0
L       172.29.45.1/32 is directly connected, Serial0/1/0
```

Ilustración 5. Tabla de enrutamiento R4 antes de la redistribución

```
R5#sh ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     172.5.0.0/16 is variably subnetted, 8 subnets, 2 masks
C       172.5.0.0/24 is directly connected, Loopback0
L       172.5.0.1/32 is directly connected, Loopback0
C       172.5.1.0/24 is directly connected, Loopback1
L       172.5.1.1/32 is directly connected, Loopback1
C       172.5.2.0/24 is directly connected, Loopback2
L       172.5.2.1/32 is directly connected, Loopback2
C       172.5.3.0/24 is directly connected, Loopback3
L       172.5.3.1/32 is directly connected, Loopback3
     172.29.0.0/16 is variably subnetted, 3 subnets, 2 masks
D       172.29.34.0/24 [90/2681856] via 172.29.45.1, 01:40:59, Serial0/0/0
C       172.29.45.0/24 is directly connected, Serial0/0/0
L       172.29.45.2/32 is directly connected, Serial0/0/0
```

Ilustración 6. Tabla de enrutamiento R5 antes de la redistribución

Para que haya conectividad entre todos los dispositivos es necesario hacer la redistribución de EIRGR en OSPF y viceversa, para ello en el R3 que es el que tiene configurados los dos protocolos de enrutamiento se lleva a cabo la redistribución como se muestra en los siguientes comandos, acordes con los requerimientos de la actividad:

R3(config)#router ospf 1
R3(config-router)#redistribute eigrp 10 metric 50000 subnets
R3(config-router)#exit
R3(config)#router eigrp 10
R3(config-router)#redistribute ospf 1 metric 1544 2000 255 1 1500

```
R1#sh ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     10.0.0.0/8 is variably subnetted, 11 subnets, 2 masks
C       10.1.0.0/24 is directly connected, Loopback0
L       10.1.0.1/32 is directly connected, Loopback0
C       10.1.1.0/24 is directly connected, Loopback1
L       10.1.1.1/32 is directly connected, Loopback1
C       10.1.2.0/24 is directly connected, Loopback2
L       10.1.2.1/32 is directly connected, Loopback2
C       10.1.3.0/24 is directly connected, Loopback3
L       10.1.3.1/32 is directly connected, Loopback3
C       10.103.12.0/24 is directly connected, Serial0/0/0
L       10.103.12.1/32 is directly connected, Serial0/0/0
O       10.103.23.0/24 [110/128] via 10.103.12.2, 03:00:12, Serial0/0/0
     172.5.0.0/24 is subnetted, 4 subnets
O E2    172.5.0.0/24 [110/50000] via 10.103.12.2, 00:19:01, Serial0/0/0
O E2    172.5.1.0/24 [110/50000] via 10.103.12.2, 00:19:01, Serial0/0/0
O E2    172.5.2.0/24 [110/50000] via 10.103.12.2, 00:19:01, Serial0/0/0
O E2    172.5.3.0/24 [110/50000] via 10.103.12.2, 00:19:01, Serial0/0/0
     172.29.0.0/24 is subnetted, 2 subnets
O E2    172.29.34.0/24 [110/50000] via 10.103.12.2, 00:19:01, Serial0/0/0
O E2    172.29.45.0/24 [110/50000] via 10.103.12.2, 00:19:01, Serial0/0/0
```

Ilustración 7. Tabla de enrutamiento R1 después de la redistribución

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

Gateway of last resort is not set

     10.0.0.0/8 is variably subnetted, 8 subnets, 2 masks
O       10.1.0.1/32 [110/65] via 10.103.12.1, 03:01:51, Serial0/0/0
O       10.1.1.1/32 [110/65] via 10.103.12.1, 03:01:51, Serial0/0/0
O       10.1.2.1/32 [110/65] via 10.103.12.1, 03:01:51, Serial0/0/0
O       10.1.3.1/32 [110/65] via 10.103.12.1, 03:01:51, Serial0/0/0
C       10.103.12.0/24 is directly connected, Serial0/0/0
L       10.103.12.2/32 is directly connected, Serial0/0/0
C       10.103.23.0/24 is directly connected, Serial0/1/0
L       10.103.23.1/32 is directly connected, Serial0/1/0
     172.5.0.0/24 is subnetted, 4 subnets
O E2    172.5.0.0/24 [110/50000] via 10.103.23.2, 00:20:29, Serial0/1/0
O E2    172.5.1.0/24 [110/50000] via 10.103.23.2, 00:20:29, Serial0/1/0
O E2    172.5.2.0/24 [110/50000] via 10.103.23.2, 00:20:29, Serial0/1/0
O E2    172.5.3.0/24 [110/50000] via 10.103.23.2, 00:20:29, Serial0/1/0
     172.29.0.0/24 is subnetted, 2 subnets
O E2    172.29.34.0/24 [110/50000] via 10.103.23.2, 00:20:29, Serial0/1/0
O E2    172.29.45.0/24 [110/50000] via 10.103.23.2, 00:20:29, Serial0/1/0
```

Ilustración 8. Tabla de enrutamiento R2 después de la redistribución

```
R3#sh ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     10.0.0.0/8 is variably subnetted, 7 subnets, 2 masks
O       10.1.0.1/32 [110/129] via 10.103.23.1, 02:29:00, Serial0/0/0
O       10.1.1.1/32 [110/129] via 10.103.23.1, 02:29:00, Serial0/0/0
O       10.1.2.1/32 [110/129] via 10.103.23.1, 02:29:00, Serial0/0/0
O       10.1.3.1/32 [110/129] via 10.103.23.1, 02:29:00, Serial0/0/0
O       10.103.12.0/24 [110/128] via 10.103.23.1, 02:29:00, Serial0/0/0
C       10.103.23.0/24 is directly connected, Serial0/0/0
L       10.103.23.2/32 is directly connected, Serial0/0/0
     172.5.0.0/24 is subnetted, 4 subnets
D       172.5.0.0/24 [90/2809856] via 172.29.34.2, 02:07:27, Serial0/1/0
D       172.5.1.0/24 [90/2809856] via 172.29.34.2, 02:07:27, Serial0/1/0
D       172.5.2.0/24 [90/2809856] via 172.29.34.2, 02:07:27, Serial0/1/0
D       172.5.3.0/24 [90/2809856] via 172.29.34.2, 02:07:27, Serial0/1/0
     172.29.0.0/16 is variably subnetted, 3 subnets, 2 masks
C       172.29.34.0/24 is directly connected, Serial0/1/0
L       172.29.34.1/32 is directly connected, Serial0/1/0
D       172.29.45.0/24 [90/2681856] via 172.29.34.2, 02:12:08, Serial0/1/0
```

Ilustración 9. Tabla de enrutamiento R3 después de la redistribución

```
R4#sh ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     10.0.0.0/8 is variably subnetted, 6 subnets, 2 masks
D EX    10.1.0.1/32 [170/2681856] via 172.29.34.1, 00:16:28, Serial0/0/0
D EX    10.1.1.1/32 [170/2681856] via 172.29.34.1, 00:16:28, Serial0/0/0
D EX    10.1.2.1/32 [170/2681856] via 172.29.34.1, 00:16:28, Serial0/0/0
D EX    10.1.3.1/32 [170/2681856] via 172.29.34.1, 00:16:28, Serial0/0/0
D EX    10.103.12.0/24 [170/2681856] via 172.29.34.1, 00:16:28, Serial0/0/0
D EX    10.103.23.0/24 [170/2681856] via 172.29.34.1, 00:16:28, Serial0/0/0
     172.5.0.0/24 is subnetted, 4 subnets
D       172.5.0.0/24 [90/2297856] via 172.29.45.2, 02:08:35, Serial0/1/0
D       172.5.1.0/24 [90/2297856] via 172.29.45.2, 02:08:35, Serial0/1/0
D       172.5.2.0/24 [90/2297856] via 172.29.45.2, 02:08:35, Serial0/1/0
D       172.5.3.0/24 [90/2297856] via 172.29.45.2, 02:08:35, Serial0/1/0
     172.29.0.0/16 is variably subnetted, 4 subnets, 2 masks
C       172.29.34.0/24 is directly connected, Serial0/0/0
L       172.29.34.2/32 is directly connected, Serial0/0/0
C       172.29.45.0/24 is directly connected, Serial0/1/0
L       172.29.45.1/32 is directly connected, Serial0/1/0
```

Ilustración 2. Tabla de enrutamiento R4 después de la redistribución

```
R5#sh ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     10.0.0.0/8 is variably subnetted, 6 subnets, 2 masks
D EX    10.1.0.1/32 [170/3193856] via 172.29.45.1, 00:01:25, Serial0/0/0
D EX    10.1.1.1/32 [170/3193856] via 172.29.45.1, 00:01:25, Serial0/0/0
D EX    10.1.2.1/32 [170/3193856] via 172.29.45.1, 00:01:25, Serial0/0/0
D EX    10.1.3.1/32 [170/3193856] via 172.29.45.1, 00:01:25, Serial0/0/0
D EX    10.103.12.0/24 [170/3193856] via 172.29.45.1, 00:01:25, Serial0/0/0
D EX    10.103.23.0/24 [170/3193856] via 172.29.45.1, 00:01:25, Serial0/0/0
     172.5.0.0/16 is variably subnetted, 8 subnets, 2 masks
C       172.5.0.0/24 is directly connected, Loopback0
L       172.5.0.1/32 is directly connected, Loopback0
C       172.5.1.0/24 is directly connected, Loopback1
L       172.5.1.1/32 is directly connected, Loopback1
C       172.5.2.0/24 is directly connected, Loopback2
L       172.5.2.1/32 is directly connected, Loopback2
C       172.5.3.0/24 is directly connected, Loopback3
L       172.5.3.1/32 is directly connected, Loopback3
     172.29.0.0/16 is variably subnetted, 3 subnets, 2 masks
D       172.29.34.0/24 [90/26818560] via 172.29.45.1, 01:53:33, Serial0/0/0
C       172.29.45.0/24 is directly connected, Serial0/0/0
L       172.29.45.2/32 is directly connected, Serial0/0/0
```

Ilustración 3. Tabla de enrutamiento R5 después de la redistribución

Se puede observar que la tabla de enrutamiento cambia en todos los router a excepción del router R3 en el que la tabla de enrutamiento no cambio debido a que este es el router que hace la redistribución.

Ahora mediante una prueba de conectividad (ping) entre el router R1 y las interfaces loopback del router R5, y el router R5 y las interfaces loopback del router R1 se puede comprobar que hay conocimiento total y conectividad total entre todos los dispositivos de la topología

```
R1#ping 172.5.0.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.5.0.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/7/16 ms

R1#ping 172.5.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.5.1.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/10/36 ms

R1#ping 172.5.2.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.5.2.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/12/36 ms

R1#ping 172.5.3.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.5.3.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/11/21 ms
```

Ilustración 11. Prueba conectividad interfaces Loopback R5

```
R5#ping 10.1.0.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.0.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/12/17 ms

R5#ping 10.1.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.1.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/13/34 ms

R5#ping 10.1.2.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.2.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/14/28 ms

R5#ping 10.1.3.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.3.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 5/16/33 ms
```

Ilustración 12. Prueba conectividad interfaces Loopback R1

2.2 Escenario 2

En la ilustración 13 se muestra la topología del escenario 2, en la cual se asigna el direccionamiento IP, y se configura BGP como protocolo de enrutamiento.

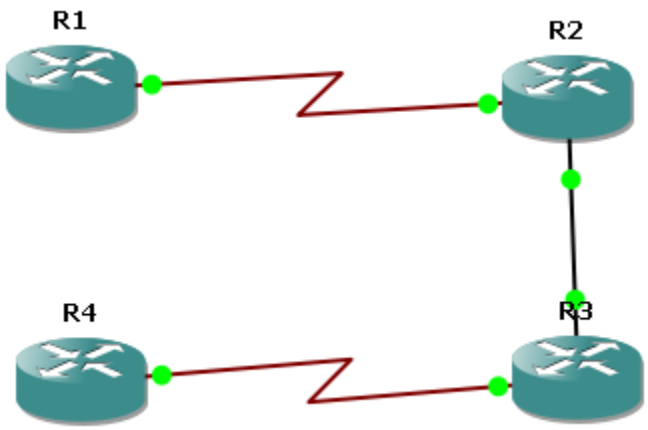

Ilustración 13. Escenario 2

Paso 1: Asignación de direccionamiento IP

Se configura el direccionamiento IP para cada una de las interfaces de los routers R1, R2, R3 y R4 de acuerdo con los requerimientos de la actividad con los siguientes comandos:

R1(config)#int s1/1

```
R1(config-if)#ip add 192.1.12.1 255.255.255.0
R1(config-if)#clock rate 64000
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#interface loopback 0
R1(config-if)#ip add 1.1.1.1 255.0.0.0
R1(config-if)#exit
R1(config)#interface loopback 1
R1(config-if)#ip add 11.1.0.1 255.255.0.0
R1(config-if)#exit

R2(config)#int s1/1
R2(config-if)#ip add 192.1.23.2 255.255.255.0
R2(config-if)#no sh
R2(config-if)#exit
R2(config )#int f0/0
R2(config-if)#ip add 192.1.12.2 255.255.255.0
R2(config-if)#no sh
R2(config)#int loopback 0
R2(config-if)#ip add 2.2.2.2 255.0.0.0
R2(config-if)#exit
R2(config)#int loopback 1
R2(config-if)#ip add 12.1.0.1 255.255.0.0
R2(config-if)#exit

R3(config)#int s1/1
R3(config-if)#ip add 192.1.34.3 255.255.255.0
R3(config-if)#clock rate 64000
R3(config-if)#no sh
R3(config-if)#exit
R3(config)#int f0/0
R3(config-if)#ip add 192.168.23.3 255.255.255.0
R3(config-if)#no sh
R3(config-if)#exit
R3(config)#int lo
R3(config)#int loopback 0
R3(config-if)#ip add 3.3.3.3 255.0.0.0
R3(config-if)#exit
R3(config)#int loopback 1
R3(config-if)#ip add 13.1.0.1 255.255.0.0
R3(config-if)#exit

R4(config)#int s1/1
R4(config-if)#ip add 192.1.34.4 255.255.255.0
R4(config-if)#no sh
R4(config-if)#exit
R4(config)#int loopback 0
R4(config-if)#ip add 4.4.4.4 255.0.0.0
```

```
R4(config-if)#exit
R4(config)#int loopback 1
R4(config-if)#ip add 14.1.0.1 255.255.0.0
R4(config-if)#exit
```

Paso 2: Configuración de BGP

Se configura el protocolo EBGP (cisco, 2006) de acuerdo con las características de la topología y los requerimientos de la actividad, teniendo en cuenta las interfaces loopback asociadas con cada router (cisco, 2008) .

- **Configuración R1 (AS 1)**

En R1 se configura como vecino la conexión serial con R2 y las interfaces loopback de R2

```
R1(config)#router bgp 1
R1(config-router)#neighbor 192.1.12.2 remote-as 2
R1(config-router)#neighbor 2.2.2.2 remote-as 2
R1(config-router)#neighbor 2.2.2.2 ebgp-multihop 2
R1(config-router)#neighbor 2.2.2.2 update-source loopback 0
R1(config-router)#neighbor 12.1.0.1 remote-as 2
R1(config-router)#neighbor 12.1.0.1 ebgp-multihop 2
R1(config-router)#neighbor 12.1.0.1 update-source loopback 1
```

Es necesario configurar también en el protocolo las redes que R1 tiene directamente conectadas, que en este caso serían las redes de las interfaces loopback.

```
R1(config)#router bgp 1
R1(config-router)#network 11.1.0.0 mask 255.255.0.0
R1(config-router)#network 1.0.0.0 mask 255.0.0.0
```

- **Configuración R2 (AS 2)**

En R2 se configura como vecino la conexión serial con R1 y las interfaces loopback de R1

```
R2(config)#router bgp 2
R2(config-router)#neighbor 192.1.12.1 remote-as 1
R2(config-router)#neighbor 1.1.1.1 remote-as 1
R2(config-router)#neighbor 1.1.1.1 ebgp-multihop 2
R2(config-router)#neighbor 1.1.1.1 update-source loopback 0
R2(config-router)#neighbor 11.1.0.1 remote-as 1
R2(config-router)#neighbor 11.1.0.1 ebgp-multihop 2
R2(config-router)#neighbor 11.1.0.1 update-source loopback 1
```

Al igual en R2 se configura como vecino la conexión fastEthernet con R3 y las interfaces loopback de R3.

```
R2(config)#router bgp 2
R2(config-router)#neighbor 192.1.23.3 remote-as 3
R2(config-router)#neighbor 3.3.3.3 ebgp-multihop 2
R2(config-router)#neighbor 3.3.3.3 update-source loopback 0
```

```
R2(config-router)#neighbor 13.1.0.1 remote-as 3
R2(config-router)#neighbor 13.1.0.1 ebgp-multihop 2
R2(config-router)#neighbor 13.1.0.1 update-source loopback 1
```

Es necesario configurar también en el protocolo las redes que R2 tiene directamente conectadas, que en este caso serian las redes de las interfaces loopback.

```
R2(config)#router bgp 2
R2(config-router)#network 2.0.0.0 mask 255.0.0.0
R2(config-router)#network 12.1.0.0 mask 255.255.0.0
```

- **Configuración R3 (AS 3)**

En R3 se configura como vecino la conexión fastEthernet con R2 y las interfaces loopback de R2

```
R3(config)#router bgp 3
R3(config-router)#neighbor 192.1.23.2 remote-as 2
R3(config-router)#neighbor 2.2.2.2 remote-as 2
R3(config-router)#neighbor 2.2.2.2 ebgp-multihop 2
R3(config-router)#neighbor 2.2.2.2 update-source loopback 0
R3(config-router)#neighbor 12.1.0.1 remote-as 2
R3(config-router)#neighbor 12.1.0.1 ebgp-multihop 2
R3(config-router)#neighbor 12.1.0.1 update-source loopback 1
```

Al igual en R3 se configura como vecino la conexión serial con R4 y las interfaces loopback de R4.

```
R3(config)#router bgp 3
R3(config-router)#neighbor 192.1.34.4 remote-as 4
R3(config-router)#neighbor 4.4.4.4 remote-as 4
R3(config-router)#neighbor 4.4.4.4 ebgp-multihop 2
R3(config-router)#neighbor 4.4.4.4 update-source loopback 0
R3(config-router)#neighbor 14.1.0.1 remote-as 4
R3(config-router)#neighbor 14.1.0.1 ebgp-multihop 2
R3(config-router)#neighbor 14.1.0.1 update-source loopback 1
```

Es necesario configurar también en el protocolo las redes que R3 tiene directamente conectadas, que en este caso serian las redes de las interfaces loopback

```
R3(config)#router bgp 3
R3(config-router)#network 3.0.0.0 mask 255.0.0.0
R3(config-router)#network 13.1.0.0 mask 255.255.0.0
```

- **Configuración R4 (AS 4)**

En R4 se configura como vecino la conexión serial con R3 y las interfaces loopback de R3.

```
R4(config)#router bgp 4
R4(config-router)#neighbor 192.1.34.3 remote-as 3
R4(config-router)#neighbor 3.3.3.3 remote-as 3
R4(config-router)#neighbor 3.3.3.3 ebgp-multihop 2
R4(config-router)#neighbor 3.3.3.3 update-source loopback 0
R4(config-router)#neighbor 13.1.0.1 remote-as 3
R4(config-router)#neighbor 13.1.0.1 ebgp-multihop 2
R4(config-router)#neighbor 13.1.0.1 update-source loopback 1
```

Es necesario configurar también en el protocolo las redes que R4 tiene directamente conectadas, que en este caso serian las redes de las interfaces loopback
R4(config)#router bgp 4
R4(config-router)#network 4.0.0.0 mask 255.0.0.0
R4(config-router)#network 14.1.0.0 mask 255.255.0.0

Paso 3: Verificación de tablas de enrutamiento

Se verifican las tablas de enrutamiento para corroborar que haya un conocimiento total entre todos los dispositivos pertenecientes a la topología.

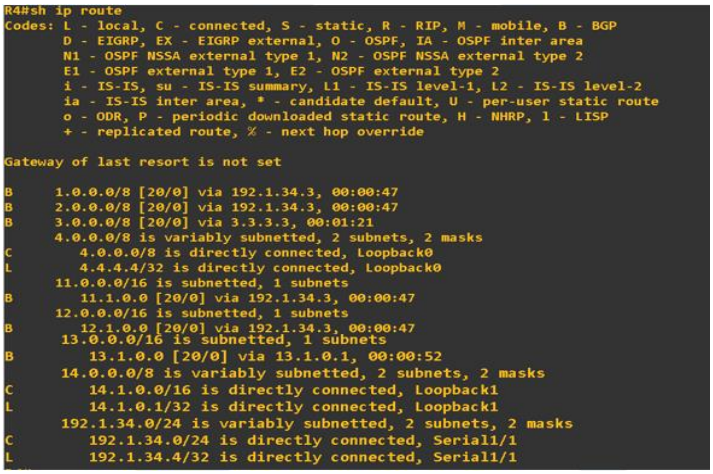

Ilustración 14. Tabla de enrutamiento R4

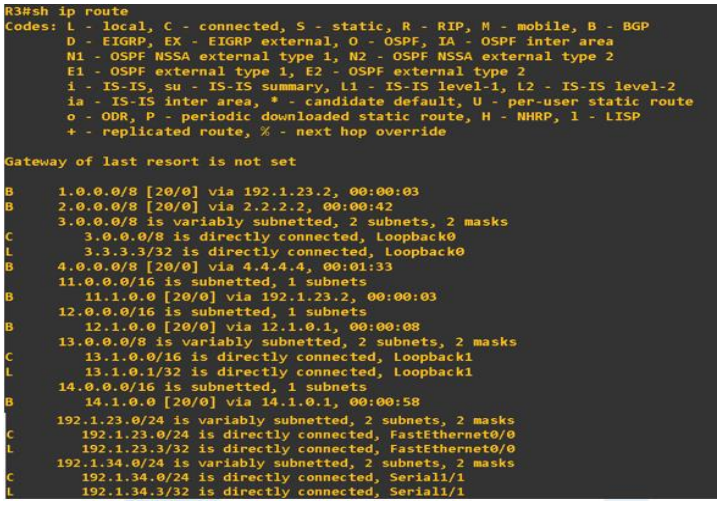

Ilustración 15. Tabla de enrutamiento R3

```
R2#sh ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, 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, H - NHRP, l - LISP
       + - replicated route, % - next hop override

Gateway of last resort is not set

B     1.0.0.0/8 [20/0] via 1.1.1.1, 00:02:16
      2.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        2.0.0.0/8 is directly connected, Loopback0
L        2.2.2.2/32 is directly connected, Loopback0
B     3.0.0.0/8 [20/0] via 3.3.3.3, 00:01:11
B     4.0.0.0/8 [20/0] via 192.1.23.3, 00:00:02
      11.0.0.0/16 is subnetted, 1 subnets
B        11.1.0.0 [20/0] via 11.1.0.1, 00:01:11
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.1.0.0/16 is directly connected, Loopback1
L        12.1.0.1/32 is directly connected, Loopback1
      13.0.0.0/16 is subnetted, 1 subnets
B        13.1.0.0 [20/0] via 13.1.0.1, 00:00:30
      14.0.0.0/16 is subnetted, 1 subnets
B        14.1.0.0 [20/0] via 192.1.23.3, 00:00:02
      192.1.12.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.1.12.0/24 is directly connected, Serial1/1
L        192.1.12.2/32 is directly connected, Serial1/1
      192.1.23.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.1.23.0/24 is directly connected, FastEthernet0/0
L        192.1.23.2/32 is directly connected, FastEthernet0/0
```

Ilustración 106. Tabla de enrutamiento R2

```
R1#sh ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, 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, H - NHRP, l - LISP
       + - replicated route, % - next hop override

Gateway of last resort is not set

      1.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        1.0.0.0/8 is directly connected, Loopback0
L        1.1.1.1/32 is directly connected, Loopback0
B     2.0.0.0/8 [20/0] via 2.2.2.2, 00:02:07
B     3.0.0.0/8 [20/0] via 192.1.12.2, 00:00:55
B     4.0.0.0/8 [20/0] via 192.1.12.2, 00:00:55
      11.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        11.1.0.0/16 is directly connected, Loopback1
L        11.1.0.1/32 is directly connected, Loopback1
      12.0.0.0/16 is subnetted, 1 subnets
B        12.1.0.0 [20/0] via 12.1.0.1, 00:01:00
      13.0.0.0/16 is subnetted, 1 subnets
B        13.1.0.0 [20/0] via 192.1.12.2, 00:00:55
      14.0.0.0/16 is subnetted, 1 subnets
B        14.1.0.0 [20/0] via 192.1.12.2, 00:00:55
      192.1.12.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.1.12.0/24 is directly connected, Serial1/1
L        192.1.12.1/32 is directly connected, Serial1/1
```

Ilustración 17. Ilustración 14. Tabla de enrutamiento R1

2.3 Escenario 3

En la ilustración 18 se muestra la topología propuesta para el escenario 3, en la cual se implementaran VLAN, el protocolo VTP y DTP así como la asignación de VLAN a los puertos de cada switch según los requerimientos de la actividad.

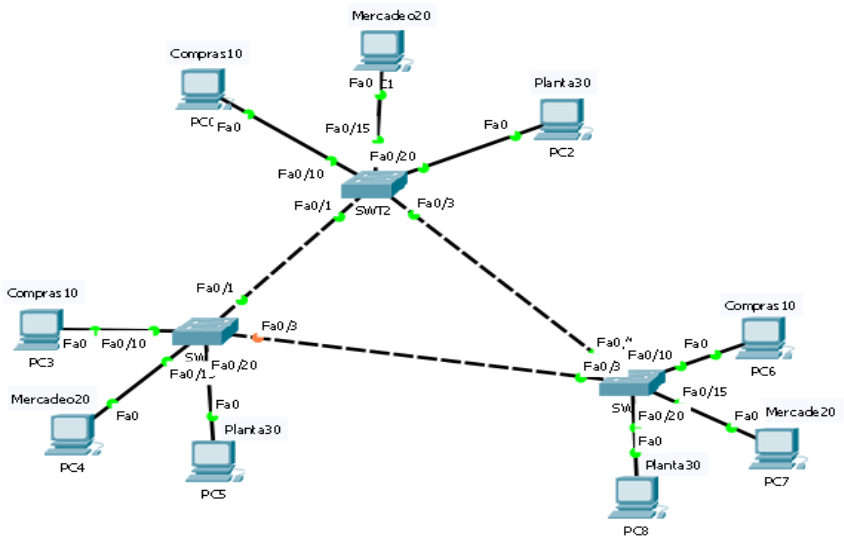

Ilustración 18. Escenario 3

Paso 1: Asignación de puertos troncales

Para que pueda ser funcional el protocolo VTP, el cual se creara en el paso 2, es necesarito primero designar los puertos troncales, de las cuales el enlace entre SWT1-SWT2 se configuran como Dynamic desirable (Galindo, 2017) .

- **Configuración SWT1**

STW1(config)#interface fa0/1
STW1(config-if)#switchport mode dynamic desirable
STW1(config-if)#exit
STW1(config)#interface fa0/3
STW1(config-if)#switchport mode trunk

```
STW1#show interfaces trunk
Port        Mode         Encapsulation  Status        Native vlan
Fa0/1       on           802.1q         trunking      1
Fa0/3       on           802.1q         trunking      1

Port        Vlans allowed on trunk
Fa0/1       1-1005
Fa0/3       1-1005

Port        Vlans allowed and active in management domain
Fa0/1       1
Fa0/3       1

Port        Vlans in spanning tree forwarding state and not
pruned
Fa0/1       1
Fa0/3       none
```

Ilustración 19. Interfaces Troncales SWT1

- **Configuración SWT2**

SWT2(config)#interface fa0/1
SWT2(config-if)#switchport mode dynamic desirable

SWT2(config)#interface fa0/3
SWT2(config-if)#switchport mode trunk

```
SWT2#show interfaces trunk
Port        Mode         Encapsulation  Status        Native vlan
Fa0/1       on           802.1q         trunking      1
Fa0/3       on           802.1q         trunking      1

Port        Vlans allowed on trunk
Fa0/1       1-1005
Fa0/3       1-1005

Port        Vlans allowed and active in management domain
Fa0/1       1
Fa0/3       1

Port        Vlans in spanning tree forwarding state and not
pruned
Fa0/1       1
Fa0/3       1
```

Ilustración 20. Interfaces Troncales SWT2

- **Configuración SWT3**

SWT 3(config)#interface fa0/1
SWT 3 (config-if)#switchport mode trunk
SWT 3 (config-if)#exit
SWT 3 (config)#interface fa0/3
SWT 3 (config-if)#switchport mode trunk

```
SWT3#show interfaces trunk
Port        Mode         Encapsulation  Status        Native vlan
Fa0/1       on           802.1q         trunking      1
Fa0/3       on           802.1q         trunking      1

Port        Vlans allowed on trunk
Fa0/1       1-1005
Fa0/3       1-1005

Port        Vlans allowed and active in management domain
Fa0/1       1
Fa0/3       1

Port        Vlans in spanning tree forwarding state and not
pruned
Fa0/1       1
Fa0/3       1
```

Ilustración 21. Interfaces Troncales SWT3

Paso 2: Configuración protocolo VTP

Se crea el dominio VTP con el SWT2 como servidor y los switches SWT1 y SWT3 como clientes; todos los anteriores con dominio CCNP y contraseña cisco

- **Configuración SWT1**

STW1(config)#vtp domain CCNP
STW1(config)#vtp password cisco

STW1(config)#vtp mode client

```
STW1#sh vtp status
VTP Version                     : 2
Configuration Revision          : 0
Maximum VLANs supported locally : 255
Number of existing VLANs        : 5
VTP Operating Mode              : Client
VTP Domain Name                 : CCNP
VTP Pruning Mode                : Disabled
VTP V2 Mode                     : Disabled
VTP Traps Generation            : Disabled
MD5 digest                      : 0xDA 0xBF 0x42 0x0D 0x90 0xBC
0xBE 0x41
Configuration last modified by 0.0.0.0 at 0-0-00 00:00:00
```

Ilustración 22. Configuración VTP SWT1

- **Configuración SWT2**

SWT2(config)#vtp domain CCNP
SWT2(config)#vtp password cisco
SWT2(config)#vtp mode server

```
SWT2#show vtp status
VTP Version                     : 2
Configuration Revision          : 0
Maximum VLANs supported locally : 255
Number of existing VLANs        : 5
VTP Operating Mode              : Server
VTP Domain Name                 : CCNP
VTP Pruning Mode                : Disabled
VTP V2 Mode                     : Disabled
VTP Traps Generation            : Disabled
MD5 digest                      : 0xDA 0xBF 0x42 0x0D 0x90 0xBC
0xBE 0x41
Configuration last modified by 0.0.0.0 at 0-0-00 00:00:00
Local updater ID is 0.0.0.0 (no valid interface found)
```

Ilustración 23. Configuración VTP SWT2

- **Configuración SWT3**

SWT3(config)#vtp domain CCNP
SWT3(config)#vtp password cisco
SWT3(config)#vtp mode client

```
SWT3#show vtp status
VTP Version                     : 2
Configuration Revision          : 0
Maximum VLANs supported locally : 255
Number of existing VLANs        : 5
VTP Operating Mode              : Client
VTP Domain Name                 : CCNP
VTP Pruning Mode                : Disabled
VTP V2 Mode                     : Disabled
VTP Traps Generation            : Disabled
MD5 digest                      : 0xDA 0xBF 0x42 0x0D 0x90 0xBC
0xBE 0x41
Configuration last modified by 0.0.0.0 at 0-0-00 00:00:00
```

Ilustración 24. Configuración VTP SWT3

Paso 3: Creación de VLAN en el servidor VTP

Es necesario crear las tres VLAN solicitadas por la actividad en el switch SWT2 el cual fue designado como servidor VTP.

```
SWT2(config)#VLAN 10
SWT2(config-vlan)#name Compras
SWT2(config-vlan)#VLAN 20
SWT2(config-vlan)#name Mercadeo
SWT2(config-vlan)#VLAN 30
SWT2(config-vlan)#name Planta
SWT2(config-vlan)#VLAN 99
SWT2(config-vlan)#name Admon
```

```
SWT2#show vlan brief

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

Ilustración 25. Verificación VLAN SWT1

```
STW1#show vlan brief

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

Ilustración 26. Verificación VLAN SWT2

```
SWT3#show vlan brief

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

Ilustración 27. Verificación VLAN SWT3

Paso 4: Asignación de VLAN a puertos y creación de interfaces VLAN

Después de crear las VLAN en el servidor y que estas hayan sido propagadas hacia los clientes por las interfaces troncales, se asocian estas a los puertos requeridos por la actividad.

- **Configuración SWT1**

```
STW1(config)#interface fa0/10
STW1(config-if)#switchport mode access
STW1(config-if)#switchport access vlan 10
STW1(config-if)#exit
STW1(config)#interface fa0/15
STW1(config-if)#switchport mode access
STW1(config-if)#switchport access vlan 20
STW1(config-if)#exit
STW1(config)#interface fa0/20
STW1(config-if)#switchport mode access
STW1(config-if)#switchport access vlan 30
```

```
STW1#show vlan brief

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

Ilustración 28. Verificación VLAN SWT3

STW1(config)#interface vlan 99
STW1(config-if)#ip add 190.108.99.1 255.255.255.0
STW1(config-if)#exit

- **Configuración SWT2**

SWT2(config)#interface fa0/10
SWT2(config-if)#switchport mode access
SWT2(config-if)#switchport access vlan 10
SWT2(config-if)#exit
SWT2(config)#interface fa0/15
SWT2(config-if)#switchport mode access
SWT2(config-if)#switchport access vlan 20
SWT2(config-if)#exit
SWT2(config)#interface fa0/20
SWT2(config-if)#switchport access vlan 30

```
SWT2#show vlan brief

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

Ilustración 29. Verificación VLAN asociadas a puertos SWT2

SWT2(config)#interface vlan 99
SWT2(config-if)#ip add 190.108.99.2 255.255.255.0

- **Configuración SWT3**

SWT3(config)#interface fa0/10

SWT3(config-if)#switchport mode access
SWT3(config-if)#switchport access vlan 10
SWT3(config-if)#exit
SWT3(config)#interface fa0/20
SWT3(config-if)#switchport access vlan 30
SWT3(config-if)#switchport mode access
SWT3(config-if)#interface fa0/15
SWT3(config-if)#switchport mode access
SWT3(config-if)#switchport access vlan 20
SWT3(config-if)#exit

```
SWT3#show vlan brief

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

Ilustración 30. Verificación VLAN asociadas a puertos SWT3

SWT3(config)#interface vlan 99
SWT3(config-if)#ip add 190.108.99.3 255.255.255.0

Paso 5: Verificación de conectividad

Se elaboran pruebas de conectividad entre los computadores pertenecientes a la misma VLAN.

Pruebas de conectividad exitosas
Únicamente se puede comprobar conectividad entre usuarios pertenecientes a la misma VLAN ya que el switch capa 2, utilizado para este ejercicio, no está en la capacidad de comunicar VLAN diferentes, para ello es necesario un dispositivo capa 3 que pueda unir estas.

- Ping desde el PC VLAN 10 SWT1 a los pc de la misma VLAN de los demás switches

```
Packet Tracer PC Command Line 1.0
C:\>ipconfig

FastEthernet0 Connection:(default port)

   Link-local IPv6 Address.....: FE80::201:43FF:FE88:1130
   IP Address.....: 190.108.10.1
   Subnet Mask.....: 255.255.255.0
   Default Gateway.....: 0.0.0.0

C:\>ping 190.108.10.2

Pinging 190.108.10.2 with 32 bytes of data:

Reply from 190.108.10.2: bytes=32 time=43ms TTL=128
Reply from 190.108.10.2: bytes=32 time<1ms TTL=128
Reply from 190.108.10.2: bytes=32 time<1ms TTL=128
Reply from 190.108.10.2: bytes=32 time<1ms TTL=128

Ping statistics for 190.108.10.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 43ms, Average = 10ms

C:\>ping 190.108.10.3

Pinging 190.108.10.3 with 32 bytes of data:

Reply from 190.108.10.3: bytes=32 time<1ms TTL=128
Reply from 190.108.10.3: bytes=32 time<1ms TTL=128
Reply from 190.108.10.3: bytes=32 time<1ms TTL=128
Reply from 190.108.10.3: bytes=32 time<1ms TTL=128

Ping statistics for 190.108.10.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Ilustración 31. Prueba de conectividad exitosa PC VLAN 10

- Ping desde el PC VLAN 20 SWT2 a los pc de la misma VLAN de los demás switches

```
C:\>ipconfig

FastEthernet0 Connection:(default port)

   Link-local IPv6 Address.....: FE80::206:2AFF:FEBD:CA6E
   IP Address.....: 190.108.20.2
   Subnet Mask.....: 255.255.255.0
   Default Gateway.....: 0.0.0.0

C:\>ping 190.108.20.1

Pinging 190.108.20.1 with 32 bytes of data:

Reply from 190.108.20.1: bytes=32 time=1ms TTL=128
Reply from 190.108.20.1: bytes=32 time=1ms TTL=128
Reply from 190.108.20.1: bytes=32 time<1ms TTL=128
Reply from 190.108.20.1: bytes=32 time<1ms TTL=128

Ping statistics for 190.108.20.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 190.108.20.3

Pinging 190.108.20.3 with 32 bytes of data:

Reply from 190.108.20.3: bytes=32 time<1ms TTL=128
Reply from 190.108.20.3: bytes=32 time<1ms TTL=128
Reply from 190.108.20.3: bytes=32 time<1ms TTL=128
Reply from 190.108.20.3: bytes=32 time=1ms TTL=128

Ping statistics for 190.108.20.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

Ilustración 32. Prueba de conectividad exitosa PC VLAN 40

- Ping desde el PC VLAN 30 SWT3 a los pc de la misma VLAN de los demás switches

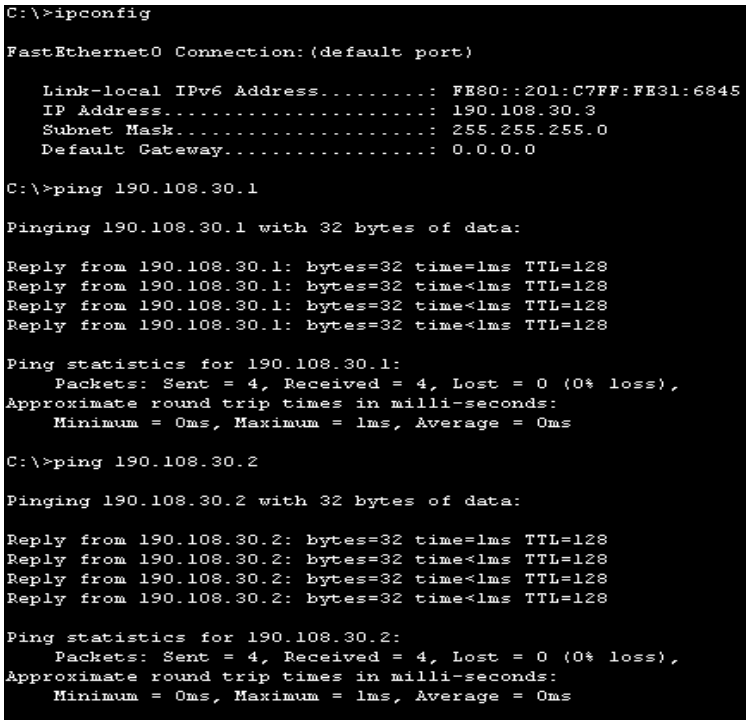

Ilustración 33. Prueba de conectividad exitosa PC VLAN 30

3. CONCLUSIONES

- Con el desarrollo de esta prueba se pudo practicar diferentes temas vistos durante el curso como lo son protocolos de enrutamiento de interior de Gateway y de exterior de Gateway, protocolo VTP y DTP, así como la creación y asignación de VLAN; todo lo anterior asociados con switching.
- Para que dos protocolos de enrutamiento dinámicos puedan compartir información de la tabla de enrutamiento es necesario que uno de los routers de la topología sea el que tenga configurado ambos protocolos y además de esto se aplique la redistribución pertinente dentro de cada protocolo.
- Se puedo corroborar la teoría de VLAN la cual permite una segmentación virtual de la red haciendo que se separen los dominios de broadcast e impidiendo que dispositivos de una VLAN se puedan con otra VLAN diferente solo por medio de dispositivos capa dos.

4. REFERENCIAS BIBLIOGRAFICAS

cisco. (2006). Sample Configuration for iBGP and eBGP With or Without a Loopback Address. Retrieved from https://www.cisco.com/c/en/us/support/docs/ip/border-gateway-protocol-bgp/13751-23.html

cisco. (2008). Casos Prácticos de BGP. Retrieved from https://www.cisco.com/c/es_mx/support/docs/ip/border-gateway-protocol-bgp/26634-bgp-toc.html

CISCO. (2010). Redistribución de protocolos de ruteo.

Galindo, M. (2017). Protocolos VTP y DTP. Retrieved from http://vtpdtp.blogspot.com/