

EVALUACIÓN – PRUEBA DE HABILIDADES PRÁCTICAS CCNA

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RESUMEN

El presente trabajo realizamos la prueba de habilidades prácticas para la evaluación de Diplomado de profundización CCNA con el fin de evaluar las competencias desarrolladas en el transcurso del curso, haciendo uso de la herramienta Cisco Packet Tracer y elaborando un informe final que contenga la evidencia de la configuración de cada dispositivo con sus respectivas pruebas.

ABSTRACT

The present work is the test of practical skills for the evaluation of CCNA deepening Diploma in order to assess the skills developed during the course, using the Cisco Packet Tracer tool and preparing a final report containing the evidence of the configuration of each device with their respective tests.

1. INTRODUCCIÓN

En el presente trabajo se desarrollaran dos escenarios con el fin de evaluar los conocimientos y competencias adquiridas en el Diplomado de profundización CCNA.

Teniendo en cuenta que como Ingeniero de sistemas y la importancia que las redes tienen en la actualidad, para las empresas es de mucha importancia contar con personal capacitado que garantice el buen funcionamiento de la red y la seguridad.

El desarrollo de estos escenarios se hará a través de la herramienta Cisco Packet Tracer donde aplicaremos lo aprendido, configurando cada Router, Switches y Equipo de la red para cumplir cada uno de los puntos solicitados en la guía.

2. OBJETIVOS

2.1 OBJETIVO GENERAL

Solucionar los 2 escenarios planteados con el fin de evaluar nuestras competencias

2.2 OBJETIVOS ESPECÍFICOS

- Diseñar los escenarios propuestos en la herramienta Cisco Packet Tracer
- Configurar los Router
- Configurar los Switches
- Segmentar las redes
- Asignar las direcciones IP a los dispositivos
- Verificar funcionamiento

3. DESARROLLO DEL PROYECTO

3.1 Escenario 1

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

Topología de red

Los requerimientos solicitados son los siguientes:

Parte 1: Para el direccionamiento IP debe definirse una dirección de acuerdo con el número de hosts requeridos.

Parte 2: Considerar la asignación de los parámetros básicos y la detección de vecinos directamente conectados.

Parte 3: La red y subred establecidas deberán tener una interconexión total, todos los hosts deberán ser visibles y poder comunicarse entre ellos sin restricciones.

Parte 4: Implementar la seguridad en la red, se debe restringir el acceso y comunicación entre hosts de acuerdo con los requerimientos del administrador de red.

Parte 5: Comprobación total de los dispositivos y su funcionamiento en la red.

Parte 6: Configuración final.

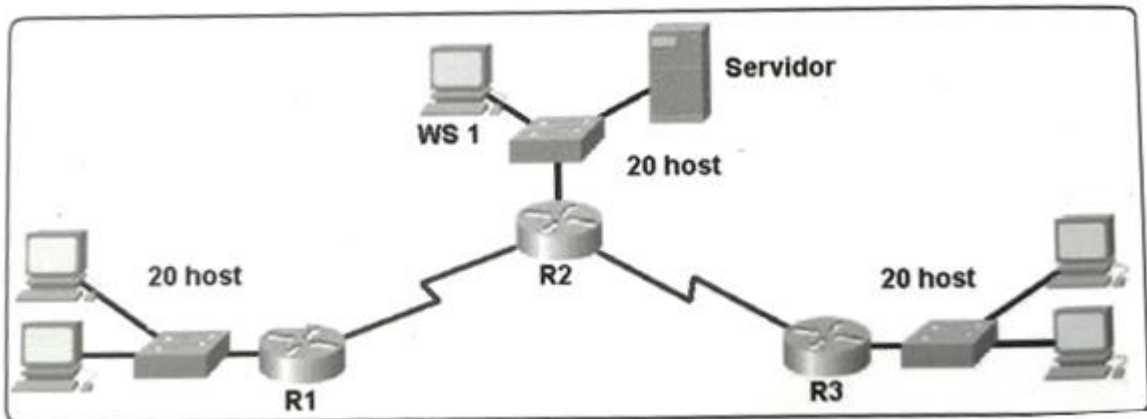


Figura 1: Topología escenario 1

Desarrollo

Como trabajo inicial se debe realizar lo siguiente.

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

- **Configuración inicial Router Medellin**

```
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname Medellin
Medellin(config)#no ip domain-lookup
Medellin(config)#
Medellin(config)#line console 0
Medellin(config-line)#password cisco
Medellin(config-line)#logging synchronous
Medellin(config-line)#login
Medellin(config-line)#exit
Medellin(config)#line vty 0 4
Medellin(config-line)#password cisco
Medellin(config-line)#exit
Medellin(config)#enable secret class
Medellin(config)#
Medellin(config)#banner motd $ Acceso solo personal autorizado $
Medellin(config)#
Medellin(config)#service password-encryptio
```

- **Configuración inicial Router Bogota**

```
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname Bogota
Bogota(config)#no ip domain-lookup
Bogota(config)#
Bogota(config)#line console 0
Bogota(config-line)#password cisco
Bogota(config-line)#logging synchronous
Bogota(config-line)#login
Bogota(config-line)#exit
Bogota(config)#line vty 0 4
Bogota(config-line)#password cisco
Bogota(config-line)#exit
```

```
Bogota(config)#enable secret class
Bogota(config)#
Bogota(config)#banner motd $ Acceso solo personal autorizado $
Bogota(config)#
Bogota(config)#service password-encryption
```

- **Configuración inicial Router Cali**

```
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname Cali
Cali(config)#no ip domain-lookup
Cali(config)#
Cali(config)#line console 0
Cali(config-line)#password cisco
Cali(config-line)#logging synchronous
Cali(config-line)#login
Cali(config-line)#exit
Cali(config)#line vty 0 4
Cali(config-line)#password cisco
Cali(config-line)#exit
Cali(config)#enable secret class
Cali(config)#
Cali(config)#banner motd $ Acceso solo personal autorizado $
Cali(config)#
Cali(config)#service password-encryption
```

- **Configuración inicial SW1**

```
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname SW1
SW1(config)#line console 0
SW1(config-line)#password cisco
SW1(config-line)#logging synchronous
SW1(config-line)#login
SW1(config-line)#exit
SW1(config)#line vty 0 4
SW1(config-line)#password cisco
SW1(config-line)#exit
SW1(config)#enable secret class
SW1(config)#
SW1(config)#banner motd $ Acceso solo personal autorizado $
```

```
SW1(config)#  
SW1(config)#service password-encryption
```

- **Configuración inicial SW2**

```
Switch#conf t  
Enter configuration commands, one per line. End with CNTL/Z.  
Switch(config)#hostname SW2  
SW2(config)#line console 0  
SW2(config-line)#password cisco  
SW2(config-line)#logging synchronous  
SW2(config-line)#login  
SW2(config-line)#exit  
SW2(config)#line vty 0 4  
SW2(config-line)#password cisco  
SW2(config-line)#exit  
SW2(config)#enable secret class  
SW2(config)#  
SW2(config)#banner motd $ Acceso solo personal autorizado $  
SW2(config)#  
SW2(config)#service password-encryption
```

- **Configuración inicial SW3**

```
Switch#conf t  
Enter configuration commands, one per line. End with CNTL/Z.  
Switch(config)#hostname SW3  
SW3(config)#line console 0  
SW3(config-line)#password cisco  
SW3(config-line)#logging synchronous  
SW3(config-line)#login  
SW3(config-line)#exit  
SW3(config)#line vty 0 4  
SW3(config-line)#password cisco  
SW3(config-line)#exit  
SW3(config)#enable secret class  
SW3(config)#  
SW3(config)#banner motd $ Acceso solo personal autorizado $  
SW3(config)#  
SW3(config)#service password-encryption
```

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

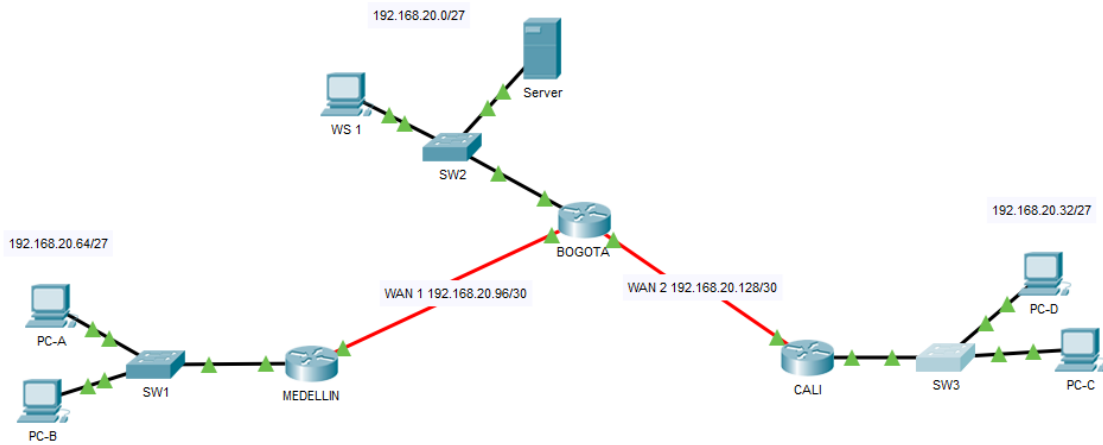


Figura 2: Topología de red

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

3.1.1 Parte 1: Asignación de direcciones IP

- Se debe dividir (subnetear) la red creando una segmentación en ocho partes, para permitir crecimiento futuro de la red corporativa.

Dirección de red: 192.168.20.0/24

Mascara: 255.255.255.0

Binario: 11111111.11111111.11111111.00000000

- ❖ **Segmentación:** Se requiere segmentar en 8 partes la red

$$2^3 = 8$$

Se encienden 3 bits que corresponde al numero usado para elevado en la formula anterior

Binario: 11111111.11111111.11111111.111 00000

Red

Host

Mascara: 255.255.255.224

Dirección de Red: 192.168.20.0/27

❖ **Determinamos los saltos de red**

$$\frac{256}{224} \text{ Los saltos serán de } 32$$

❖ **Cantidad de Host por subred**

$$2^m - 2 = H$$

$$2^5 - 2 = H$$

$$2 \times 2 \times 2 \times 2 \times 2 = 32 - 2 = 30 \text{ Host}$$

Nota: para los enlaces WAN la red quedara con base 30 ya que solo requiere 2 direcciones utilizables.

❖ **Definición Subredes**

<p><u>SUBRED 1</u> Network: 192.168.20.0/27 HostMin: 192.168.20.1 HostMax:192.168.20.30 Broadcast:192.168.20.31</p>	<p><u>SUBRED 5</u> Network: 192.168.20.128/27 HostMin: 192.168.20.129 HostMax:192.168.20.158 Broadcast:192.168.20.159</p>
<p><u>SUBRED 2</u> Network: 192.168.20.32/27 HostMin: 192.168.20.33 HostMax:192.168.20.62 Broadcast:192.168.20.63</p>	<p><u>SUBRED 6</u> Network: 192.168.20.160/27 HostMin: 192.168.20.161 HostMax:192.168.20.190 Broadcast:192.168.20.191</p>
<p><u>SUBRED 3</u> Network: 192.168.20.64/27 HostMin: 192.168.20.65 HostMax:192.168.20.94 Broadcast:192.168.20.95</p>	<p><u>SUBRED 7</u> Network: 192.168.20.192/27 HostMin: 192.168.20.193 HostMax:192.168.20.222 Broadcast:192.168.20.223</p>
<p><u>SUBRED 4</u> Network: 192.168.20.96/27 HostMin: 192.168.20.97 HostMax:192.168.20.126</p>	<p><u>SUBRED 8</u> Network: 192.168.20.224/27 HostMin: 192.168.20.225 HostMax:192.168.20.254</p>

Broadcast:192.168.20.127	Broadcast:192.168.20.255
--------------------------	--------------------------

Tabla 1: Segmentación de red

b. Asignar una dirección IP a la red

❖ **Subredes necesarias para la topología**

192.168.20.0/24

# hosts	65536	32768	16384	8192	4096	2048	1024	512	256	128	64	32	16	8	4	2	2 ^N
bits	128	64	32	16	8	4	2	1	128	64	32	16	8	4	2	1	2 ^{N-1}
# hosts	65534	32766	16382	8190	4094	2046	1022	510	254	126	62	30	14	6	2	0	(2 ^N)-2
# bit	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	N bit
192	168	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0
192	168	0	0	0	1	0	1	0	0	0	0	1	1	1	1	1	1
192	168	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0
192	168	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0	0
192	168	0	0	0	1	0	1	0	0	0	1	0	1	1	1	1	1
192	168	0	0	0	1	0	1	0	0	0	1	1	0	0	0	0	0
192	168	0	0	0	1	0	1	0	0	0	1	1	0	0	0	0	1
192	168	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0
192	168	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	1

Figura 3: Subredes necesarias

	IP Subred	Primera IP Utilizable	Ultima IP Utilizable	Dirección Broadcast
BOGOTA	192.168.20.0/27	192.168.1.1/27	192.168.1.30/27	192.168.1.31/27
CALI	192.168.20.32/27	192.168.20.33/27	192.168.20.62/27	192.168.20.63/27
MEDELLIN	192.168.20.64/27	192.168.20.65/27	192.168.20.94/27	192.168.20.95/27
WAN 1	192.168.20.96/30	192.168.20.97/30	192.168.20.98/30	192.168.20.99/30
WAN 2	192.168.20.128/30	192.168.20.129/30	192.168.20.130/30	192.168.20.131/30

Figura 4: Asignación de IPs

3.1.2 Parte 2: Configuración Básica.

a. Completar la siguiente tabla con la configuración básica de los routers, teniendo en cuenta las subredes diseñadas.

	R1	R2	R3
Nombre de Host	MEDELLIN	BOGOTA	CALI
Dirección de Ip en interfaz Serial 0/0/0	192.168.20.98	192.168.20.97	---

Dirección de Ip en interfaz Serial 0/0/1	---	192.168.20.129	192.168.20.130
Dirección de Ip en interfaz Gi 0/0	192.168.20.65	192.168.20.1	192.168.20.33
Protocolo de enrutamiento	Eigrp	Eigrp	Eigrp
Sistema Autónomo	200	200	200
Afirmaciones de red	192.168.20.0	192.168.20.0	192.168.20.0

Tabla 2: Asignación de IP a dispositivos

❖ **Configuración interfaces Router Medellin**

```

Medellin#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Medellin(config)#inter Gi0/0
Medellin(config-if)#description LAN Medellin
Medellin(config-if)#ip add 192.168.20.65 255.255.255.224
Medellin(config-if)#no shutdown
Medellin(config-if)#
Medellin(config-if)#inter S0/0/0
Medellin(config-if)#description Enlace con Bogota
Medellin(config-if)#clock rate 128000
Medellin(config-if)#bandwidth 128
Medellin(config-if)#ip add 192.168.20.98 255.255.255.252
Medellin(config-if)#no shutdown

```

❖ **Configuración interfaces Router Bogota**

```

Bogota#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Bogota(config)#inter Gi0/0
Bogota(config-if)#description LAN Bogota
Bogota(config-if)#ip add 192.168.20.1 255.255.255.224
Bogota(config-if)#no shutdown
Bogota(config-if)#
Bogota(config-if)#inter S0/0/0
Bogota(config-if)#description Enlace con Medellin
Bogota(config-if)#bandwidth 128
Bogota(config-if)#ip add 192.168.20.97 255.255.255.252
Bogota(config-if)#no shutdown
Bogota(config-if)#
Bogota(config-if)#inter S0/0/1
Bogota(config-if)#description Enlace con Cali
Bogota(config-if)#clock rate 128000
Bogota(config-if)#bandwidth 128
Bogota(config-if)#ip add 192.168.20.129 255.255.255.252

```



```
Bogota(config-if)#no shutdown
```

❖ **Configuración interfaces Router Cali**

```
Cali#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Cali(config)#inter Gi0/0
Cali(config-if)#description LAN Cali
Cali(config-if)#ip add 192.168.20.33 255.255.255.224
Cali(config-if)#no shutdown
Cali(config-if)#
Cali(config-if)#inter S0/0/1
Cali(config-if)#description Enlace con Bogota
Cali(config-if)#bandwidth 128
Cali(config-if)#ip add 192.168.20.130 255.255.255.252
Cali(config-if)#no shutdown
```

- b. Después de cargada la configuración en los dispositivos, verificar la tabla de enrutamiento en cada uno de los routers para comprobar las redes y sus rutas.

❖ **Tabla de enrutamiento Router Medellin**

```
Medellin#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
```

```
192.168.20.0/24 is variably subnetted, 7 subnets, 3 masks
S 192.168.20.0/27 [1/0] via 192.168.20.97
C 192.168.20.64/27 is directly connected, GigabitEthernet0/0
L 192.168.20.65/32 is directly connected, GigabitEthernet0/0
C 192.168.20.96/30 is directly connected, Serial0/0/0
L 192.168.20.98/32 is directly connected, Serial0/0/0
```

❖ **Tabla de enrutamiento Router Bogota**

```
Bogota#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

192.168.20.0/24 is variably subnetted, 8 subnets, 3 masks
C 192.168.20.0/27 is directly connected, GigabitEthernet0/0
L 192.168.20.1/32 is directly connected, GigabitEthernet0/0
C 192.168.20.96/30 is directly connected, Serial0/0/0
L 192.168.20.97/32 is directly connected, Serial0/0/0
C 192.168.20.128/30 is directly connected, Serial0/0/1
L 192.168.20.129/32 is directly connected, Serial0/0/1

❖ **Tabla de enrutamiento Router Cali**

Cali#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

192.168.20.0/24 is variably subnetted, 7 subnets, 3 masks
C 192.168.20.32/27 is directly connected, GigabitEthernet0/0
L 192.168.20.33/32 is directly connected, GigabitEthernet0/0
C 192.168.20.128/30 is directly connected, Serial0/0/1
L 192.168.20.130/32 is directly connected, Serial0/0/1

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

❖ **Balanceo Carga Router Medellin**

Medellin#sh ip route 192.168.20.97

Routing entry for 192.168.20.96/30

Known via "connected", distance 0, metric 0 (connected, via interface)

Redistributing via eigrp 100

Routing Descriptor Blocks:

* directly connected, via Serial0/0/0

Route metric is 0, traffic share count is 1

❖ **Balanceo Carga Router Bogota**

```
Bogota#sh ip route 192.168.20.98
Routing entry for 192.168.20.96/30
Known via "connected", distance 0, metric 0 (connected, via interface)
Redistributing via eigrp 100
Routing Descriptor Blocks:
* directly connected, via Serial0/0/0
Route metric is 0, traffic share count is 1
```

```
Bogota#sh ip route 192.168.20.130
Routing entry for 192.168.20.128/30
Known via "connected", distance 0, metric 0 (connected, via interface)
Redistributing via eigrp 100
Routing Descriptor Blocks:
* directly connected, via Serial0/0/1
Route metric is 0, traffic share count is 1
```

❖ **Balanceo Carga Router Cali**

```
Cali#sh ip route 192.168.20.129
Routing entry for 192.168.20.128/30
Known via "connected", distance 0, metric 0 (connected, via interface)
Redistributing via eigrp 100
Routing Descriptor Blocks:
* directly connected, via Serial0/0/1
Route metric is 0, traffic share count is 1
```

d. Realizar un diagnóstico de vecinos usando el comando cdp.

❖ **Vecinos Router Medellin**

```
Medellin#sh cdp neighbors
Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge
S - Switch, H - Host, I - IGMP, r - Repeater, P - Phone
Device ID Local Infrfce Holdtme Capability Platform Port ID
SW1 Gig 0/0 140 S 2960 Fas 0/1
Bogota Ser 0/0/0 139 R C1900 Ser 0/0/0
```

❖ **Vecinos Router Bogota**

```
Bogota#sh cdp neighbors
Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge
S - Switch, H - Host, I - IGMP, r - Repeater, P - Phone
Device ID Local Infrfce Holdtme Capability Platform Port ID
Medellin Ser 0/0/0 170 R C1900 Ser 0/0/0
Cali Ser 0/0/1 170 R C1900 Ser 0/0/1
```

SW2 Gig 0/0 170 S 2960 Fas 0/1

❖ **Vecinos Router Cali**

Cali#sh cdp neighbors

Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge

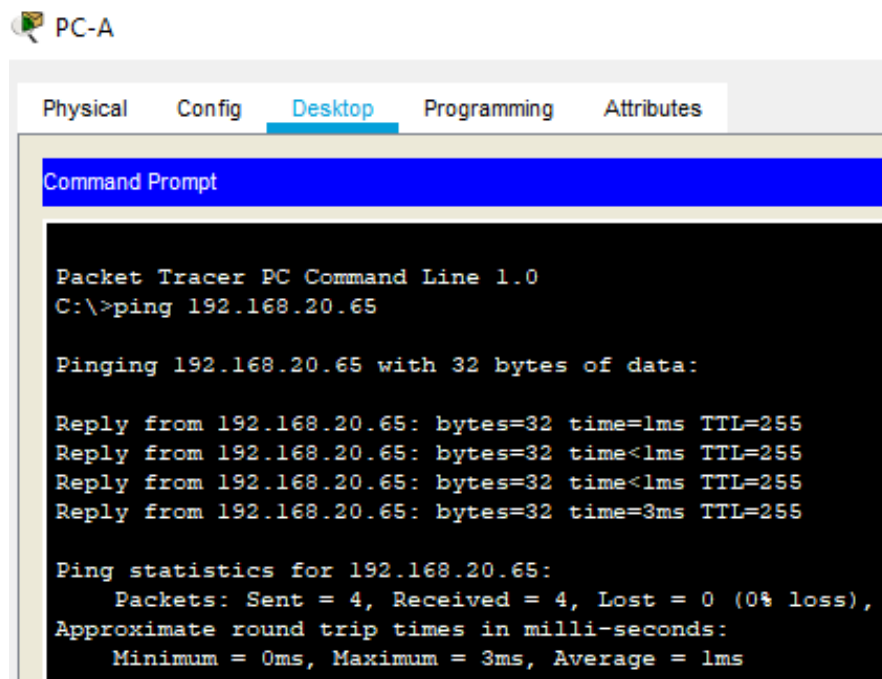
S - Switch, H - Host, I - IGMP, r - Repeater, P - Phone

Device ID Local Infrfce Holdtme Capability Platform Port ID

SW3 Gig 0/0 146 S 2960 Fas 0/1

Bogota Ser 0/0/1 146 R C1900 Ser 0/0/1

- e. Realizar una prueba de conectividad en cada tramo de la ruta usando Ping.



The image shows a Packet Tracer PC Command Prompt window for PC-A. The window has tabs for Physical, Config, Desktop (selected), Programming, and Attributes. The Command Prompt displays the following text:

```
Packet Tracer PC Command Line 1.0
C:\>ping 192.168.20.65

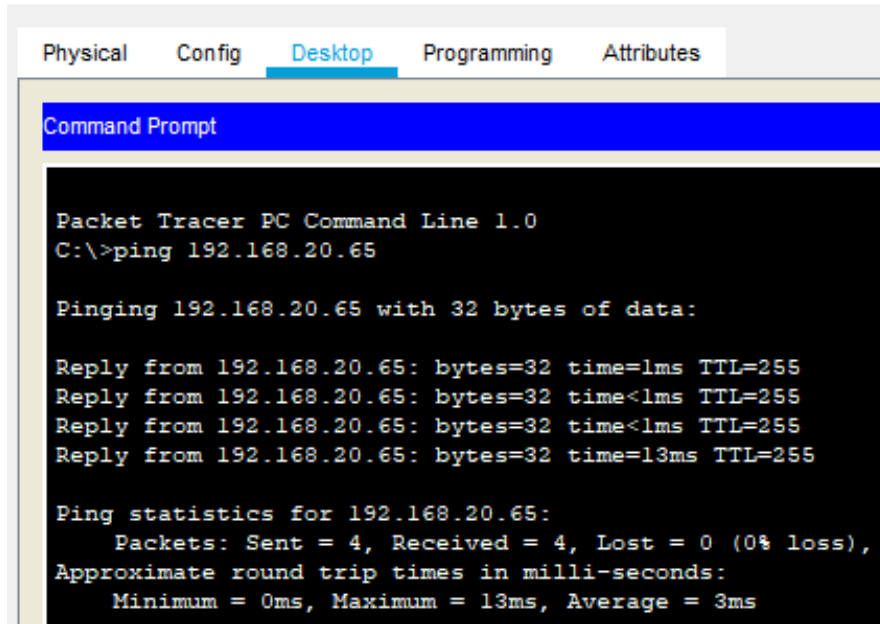
Pinging 192.168.20.65 with 32 bytes of data:

Reply from 192.168.20.65: bytes=32 time=1ms TTL=255
Reply from 192.168.20.65: bytes=32 time<1ms TTL=255
Reply from 192.168.20.65: bytes=32 time<1ms TTL=255
Reply from 192.168.20.65: bytes=32 time=3ms TTL=255

Ping statistics for 192.168.20.65:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 3ms, Average = 1ms
```

Figura 5: Ping de PC-A a Router Medellin Interfaz Gi0/0

PC-B



```
Physical  Config  Desktop  Programming  Attributes

Command Prompt

Packet Tracer PC Command Line 1.0
C:\>ping 192.168.20.65

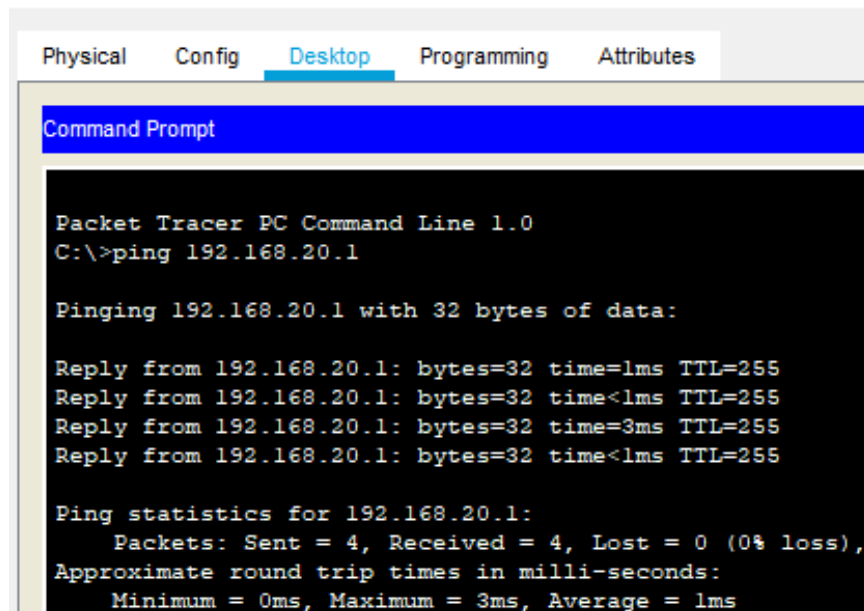
Pinging 192.168.20.65 with 32 bytes of data:

Reply from 192.168.20.65: bytes=32 time=1ms TTL=255
Reply from 192.168.20.65: bytes=32 time<1ms TTL=255
Reply from 192.168.20.65: bytes=32 time<1ms TTL=255
Reply from 192.168.20.65: bytes=32 time=13ms TTL=255

Ping statistics for 192.168.20.65:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 13ms, Average = 3ms
```

Figura 6: Ping de PCB a Router Medellin Interfaz Gi0/0

WS 1



```
Physical  Config  Desktop  Programming  Attributes

Command Prompt

Packet Tracer PC Command Line 1.0
C:\>ping 192.168.20.1

Pinging 192.168.20.1 with 32 bytes of data:

Reply from 192.168.20.1: bytes=32 time=1ms TTL=255
Reply from 192.168.20.1: bytes=32 time<1ms TTL=255
Reply from 192.168.20.1: bytes=32 time=3ms TTL=255
Reply from 192.168.20.1: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.20.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 3ms, Average = 1ms
```

Figura 7: Ping de WS1 a Router Bogota Interfaz Gi0/0

Server

Physical Config Services Desktop Programming Attributes

Command Prompt

```
Packet Tracer SERVER Command Line 1.0
C:\>ping 192.168.20.1

Pinging 192.168.20.1 with 32 bytes of data:

Reply from 192.168.20.1: bytes=32 time<1ms TTL=255
Reply from 192.168.20.1: bytes=32 time<1ms TTL=255
Reply from 192.168.20.1: bytes=32 time=12ms TTL=255
Reply from 192.168.20.1: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.20.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 12ms, Average = 3ms
```

Figura 8: Ping de Servidor a Router Bogota Interfaz Gi0/0

PC-D

Physical Config Desktop Programming Attributes

Command Prompt

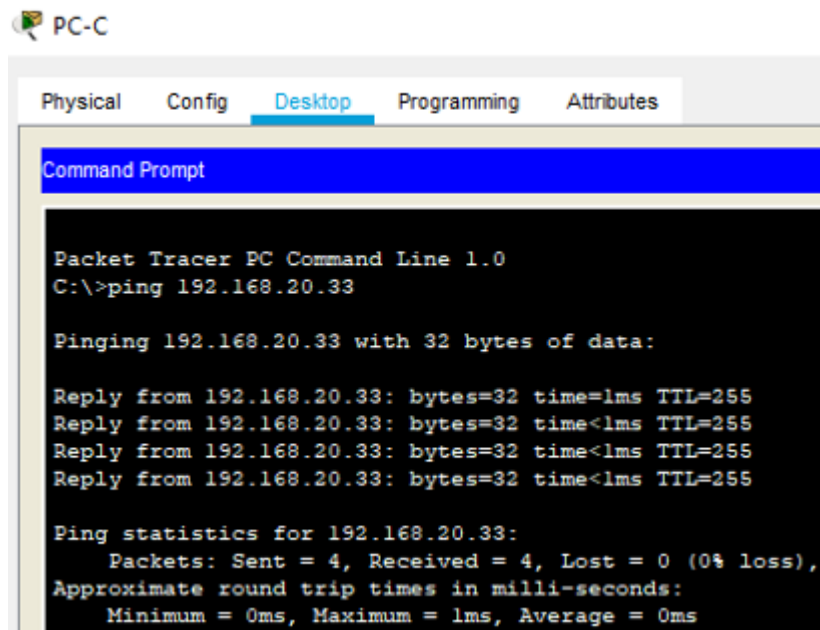
```
Packet Tracer PC Command Line 1.0
C:\>ping 192.168.20.33

Pinging 192.168.20.33 with 32 bytes of data:

Reply from 192.168.20.33: bytes=32 time=1ms TTL=255
Reply from 192.168.20.33: bytes=32 time<1ms TTL=255
Reply from 192.168.20.33: bytes=32 time<1ms TTL=255
Reply from 192.168.20.33: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.20.33:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

Figura 9: Ping de PC-D a Router Cali Interfaz Gi0/0



```
PC-C
Physical Config Desktop Programming Attributes
Command Prompt
Packet Tracer PC Command Line 1.0
C:\>ping 192.168.20.33

Pinging 192.168.20.33 with 32 bytes of data:

Reply from 192.168.20.33: bytes=32 time=1ms TTL=255
Reply from 192.168.20.33: bytes=32 time<1ms TTL=255
Reply from 192.168.20.33: bytes=32 time<1ms TTL=255
Reply from 192.168.20.33: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.20.33:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

Figura 10: Ping de PC-C a Router Cali Interfaz Gi0/0

3.1.3 Parte 3: Configuración de Enrutamiento.

a. Asignar el protocolo de enrutamiento EIGRP a los routers considerando el direccionamiento diseñado.

❖ **Enrutamiento EIGRP Router Medellín**

```
Medellin#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Medellin(config)#router eigrp 100
Medellin(config-router)#no auto-summary
Medellin(config-router)#network 192.168.20.64
Medellin(config-router)#network 192.168.20.96
```

❖ **Enrutamiento EIGRP Router Bogota**

```
Bogota#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Bogota(config)#router eigrp 100
Bogota(config-router)#no auto-summary
Bogota(config-router)#network 192.168.20.0
Bogota(config-router)#
%DUAL-5-NBRCHANGE: IP-EIGRP 100: Neighbor 192.168.20.98
(Serial0/0/0) is up: new adjacency
Bogota(config-router)#network 192.168.20.128
```

```
Bogota(config-router)#network 192.168.20.96
```

❖ **Enrutamiento EIGRP Router Cali**

```
Cali#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Cali(config)#router eigrp 100
Cali(config-router)#network 192.168.20.32
Cali(config-router)#
%DUAL-5-NBRCHANGE: IP-EIGRP 100: Neighbor 192.168.20.129
(Serial0/0/1) is up: new adjacency
Cali(config-router)#network 192.168.20.33
Cali(config-router)#network 192.168.20.128
```

b. Verificar si existe vecindad con los routers configurados con EIGRP.

❖ **Vecinos EIGRP Router Medellín**

```
Medellin#sh ip eigrp neighbors
IP-EIGRP neighbors for process 100
H Address Interface Hold Uptime SRTT RTO Q Seq
(sec) (ms) Cnt Num
0 192.168.20.97 Se0/0/0 14 00:31:39 40 1000 0 5
```

❖ **Vecinos EIGRP Router Bogota**

```
Bogota#sh ip eigrp neighbors
IP-EIGRP neighbors for process 100
H Address Interface Hold Uptime SRTT RTO Q Seq
(sec) (ms) Cnt Num
0 192.168.20.98 Se0/0/0 10 00:33:21 40 1000 0 7
1 192.168.20.130 Se0/0/1 12 00:32:09 40 1000 0 7
```

❖ **Vecinos EIGRP Router Cali**

```
Cali#sh ip eigrp neighbors
IP-EIGRP neighbors for process 100
H Address Interface Hold Uptime SRTT RTO Q Seq
(sec) (ms) Cnt Num
0 192.168.20.129 Se0/0/1 12 00:31:40 40 1000 0 6
```

c. Realizar la comprobación de las tablas de enrutamiento en cada uno de los routers para verificar cada una de las rutas establecidas.

❖ **Tabla enrutamiento EIGRP Router Medellín**

```
Medellin#sh ip route eigrp
192.168.20.0/24 is variably subnetted, 7 subnets, 3 masks
D 192.168.20.128/30 [90/21024000] via 192.168.20.97, 00:28:14, Serial0/0/0
```


Medellin#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

192.168.20.0/24 is variably subnetted, 7 subnets, 3 masks

S 192.168.20.0/27 [1/0] via 192.168.20.97

S 192.168.20.32/27 [1/0] via 192.168.20.130

C 192.168.20.64/27 is directly connected, GigabitEthernet0/0

L 192.168.20.65/32 is directly connected, GigabitEthernet0/0

C 192.168.20.96/30 is directly connected, Serial0/0/0

L 192.168.20.98/32 is directly connected, Serial0/0/0

D 192.168.20.128/30 [90/21024000] via 192.168.20.97, 00:39:12, Serial0/0/

❖ **Tabla enrutamiento EIGRP Router Bogota**

Bogota#sh ip route eigrp

192.168.20.0/24 is variably subnetted, 8 subnets, 3 masks

D 192.168.20.32/27 [90/20514560] via 192.168.20.130, 00:19:48, Serial0/0/1

D 192.168.20.64/27 [90/20514560] via 192.168.20.98, 00:21:00, Serial0/0/0

Bogota#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

192.168.20.0/24 is variably subnetted, 8 subnets, 3 masks

C 192.168.20.0/27 is directly connected, GigabitEthernet0/0

L 192.168.20.1/32 is directly connected, GigabitEthernet0/0

D 192.168.20.32/27 [90/20514560] via 192.168.20.130, 00:36:34, Serial0/0/1

D 192.168.20.64/27 [90/20514560] via 192.168.20.98, 00:37:46, Serial0/0/0

C 192.168.20.96/30 is directly connected, Serial0/0/0

L 192.168.20.97/32 is directly connected, Serial0/0/0

C 192.168.20.128/30 is directly connected, Serial0/0/1

L 192.168.20.129/32 is directly connected, Serial0/0/1

❖ **Tabla enrutamiento EIGRP Router Cali**

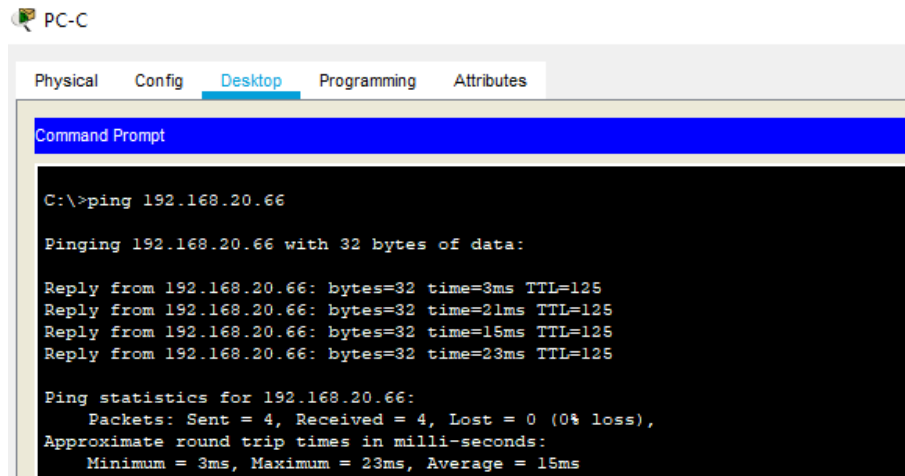
Cali#sh ip route eigrp

```

192.168.20.0/24 is variably subnetted, 7 subnets, 3 masks
D 192.168.20.0/27 [90/20514560] via 192.168.20.129, 00:24:39, Serial0/0/1
D 192.168.20.64/27 [90/21026560] via 192.168.20.129, 00:24:39, Serial0/0/1
D 192.168.20.96/30 [90/21024000] via 192.168.20.129, 00:24:39, Serial0/0/1
Cali#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
192.168.20.0/24 is variably subnetted, 7 subnets, 3 masks
D 192.168.20.0/27 [90/20514560] via 192.168.20.129, 00:37:20, Serial0/0/1
C 192.168.20.32/27 is directly connected, GigabitEthernet0/0
L 192.168.20.33/32 is directly connected, GigabitEthernet0/0
D 192.168.20.64/27 [90/21026560] via 192.168.20.129, 00:37:20, Serial0/0/1
D 192.168.20.96/30 [90/21024000] via 192.168.20.129, 00:37:20, Serial0/0/1
C 192.168.20.128/30 is directly connected, Serial0/0/1
L 192.168.20.130/32 is directly connected, Serial0/0/1

```

- d. Realizar un diagnóstico para comprobar que cada uno de los puntos de la red se puedan ver y tengan conectividad entre sí. Realizar esta prueba desde un host de la red LAN del router CALI, primero a la red de MEDELLIN y luego al servidor.

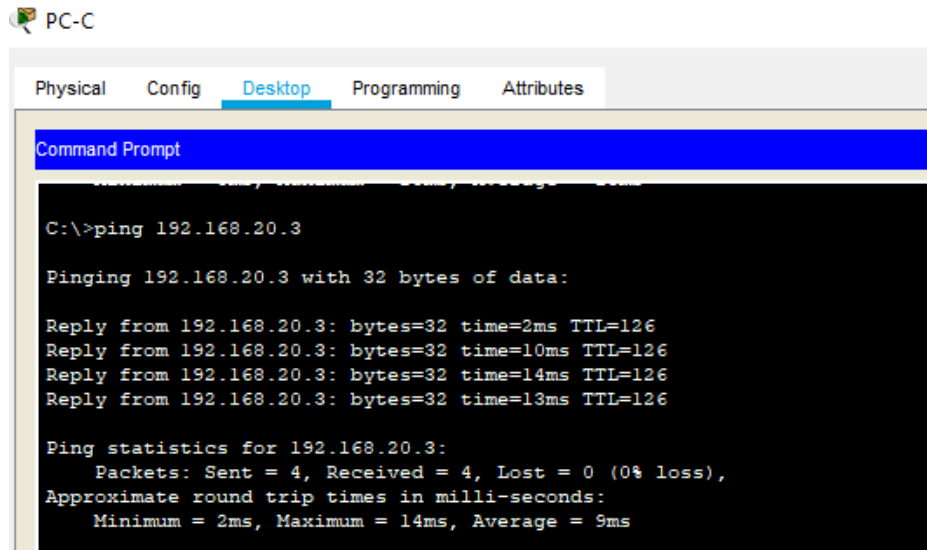


```

PC-C
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 192.168.20.66
Pinging 192.168.20.66 with 32 bytes of data:
Reply from 192.168.20.66: bytes=32 time=3ms TTL=125
Reply from 192.168.20.66: bytes=32 time=21ms TTL=125
Reply from 192.168.20.66: bytes=32 time=15ms TTL=125
Reply from 192.168.20.66: bytes=32 time=23ms TTL=125
Ping statistics for 192.168.20.66:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 3ms, Maximum = 23ms, Average = 15ms

```

Figura 11: Ping desde PC-C LAN Cali a PC-A LAN Medellin



The image shows a screenshot of a PC-C desktop environment. The desktop has a taskbar with icons for 'Physical', 'Config', 'Desktop', 'Programming', and 'Attributes'. The 'Desktop' icon is selected. A Command Prompt window is open, displaying the following text:

```
C:\>ping 192.168.20.3

Pinging 192.168.20.3 with 32 bytes of data:

Reply from 192.168.20.3: bytes=32 time=2ms TTL=126
Reply from 192.168.20.3: bytes=32 time=10ms TTL=126
Reply from 192.168.20.3: bytes=32 time=14ms TTL=126
Reply from 192.168.20.3: bytes=32 time=13ms TTL=126

Ping statistics for 192.168.20.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 14ms, Average = 9ms
```

Figura 12: Ping desde PC-C LAN Cali a Servidor LAN Bogota

3.1.4 Parte 4: Configuración de las listas de Control de Acceso

En este momento cualquier usuario de la red tiene acceso a todos sus dispositivos y estaciones de trabajo. El jefe de redes le solicita implementar seguridad en la red. Para esta labor se decide configurar listas de control de acceso (ACL) a los routers.

Las condiciones para crear las ACL son las siguientes:

- a. Cada router debe estar habilitado para establecer conexiones Telnet con los demás routers y tener acceso a cualquier dispositivo en la red.

```

Acceso solo personal autorizado

User Access Verification

Password:

Medellin>enable
Password:
Medellin#telnet 192.168.20.97
Trying 192.168.20.97 ...Open Acceso solo personal autorizado

User Access Verification

Password:
Bogota>enable
Password:
Bogota#exit

[Connection to 192.168.20.97 closed by foreign host]
Medellin#telnet 192.168.20.130
Trying 192.168.20.130 ...Open Acceso solo personal autorizado

User Access Verification

Password:
Cali>enable
Password:
Cali#exit

[Connection to 192.168.20.130 closed by foreign host]

```

Figura 13: Prueba telnet desde Router Medellin a Bogota y Cali

```

Acceso solo personal autorizado

User Access Verification

Password:

Bogota>enable
Password:
Bogota#telnet 192.168.20.98
Trying 192.168.20.98 ...Open Acceso solo personal autorizado

User Access Verification

Password:
Medellin>enable
Password:
Medellin#exit

[Connection to 192.168.20.98 closed by foreign host]
Bogota#telnet 192.168.20.130
Trying 192.168.20.130 ...Open Acceso solo personal autorizado

User Access Verification

Password:
Cali>enable
Password:
Cali#exit

[Connection to 192.168.20.130 closed by foreign host]
Bogota#

```

Figura 14: Prueba telnet desde Router Bogota a Medellin y Cali

```

Acceso solo personal autorizado

User Access Verification

Password:

Cali>enable
Password:
Cali#telnet 192.168.20.129
Trying 192.168.20.129 ...Open Acceso solo personal autorizado

User Access Verification

Password:
Bogota>enable
Password:
Bogota#exit

[Connection to 192.168.20.129 closed by foreign host]
Cali#telnet 192.168.20.98
Trying 192.168.20.98 ...Open Acceso solo personal autorizado

User Access Verification

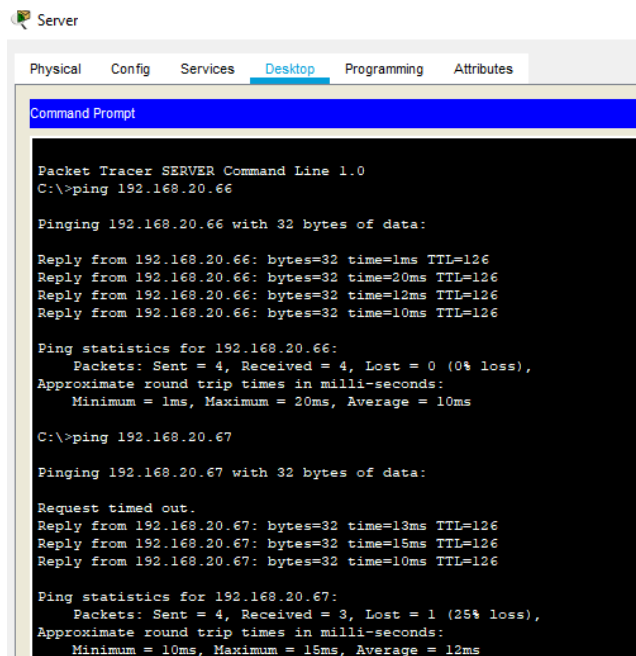
Password:
Medellin>enable
Password:
Medellin#exit

[Connection to 192.168.20.98 closed by foreign host]

```

Figura 15: Prueba telnet desde Router Cali a Medellin y Bogota

- b. El equipo WS1 y el servidor se encuentran en la subred de administración. Solo el servidor de la subred de administración debe tener acceso a cualquier otro dispositivo en cualquier parte de la red.



```

Server
Physical Config Services Desktop Programming Attributes
Command Prompt
Packet Tracer SERVER Command Line 1.0
C:\>ping 192.168.20.66

Pinging 192.168.20.66 with 32 bytes of data:

Reply from 192.168.20.66: bytes=32 time=1ms TTL=126
Reply from 192.168.20.66: bytes=32 time=20ms TTL=126
Reply from 192.168.20.66: bytes=32 time=12ms TTL=126
Reply from 192.168.20.66: bytes=32 time=10ms TTL=126

Ping statistics for 192.168.20.66:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 20ms, Average = 10ms

C:\>ping 192.168.20.67

Pinging 192.168.20.67 with 32 bytes of data:

Request timed out.
Reply from 192.168.20.67: bytes=32 time=13ms TTL=126
Reply from 192.168.20.67: bytes=32 time=15ms TTL=126
Reply from 192.168.20.67: bytes=32 time=10ms TTL=126

Ping statistics for 192.168.20.67:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 10ms, Maximum = 15ms, Average = 12ms

```

Figura 16: Acceso del servidor a equipos LAN Medellin

```
C:\>ping 192.168.20.35

Pinging 192.168.20.35 with 32 bytes of data:

Reply from 192.168.20.35: bytes=32 time=1ms TTL=126
Reply from 192.168.20.35: bytes=32 time=12ms TTL=126
Reply from 192.168.20.35: bytes=32 time=10ms TTL=126
Reply from 192.168.20.35: bytes=32 time=4ms TTL=126

Ping statistics for 192.168.20.35:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 12ms, Average = 6ms

C:\>ping 192.168.20.34

Pinging 192.168.20.34 with 32 bytes of data:

Reply from 192.168.20.34: bytes=32 time=2ms TTL=126
Reply from 192.168.20.34: bytes=32 time=12ms TTL=126
Reply from 192.168.20.34: bytes=32 time=8ms TTL=126
Reply from 192.168.20.34: bytes=32 time=16ms TTL=126

Ping statistics for 192.168.20.34:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 16ms, Average = 9ms

C:\>
```

Figura 17: Acceso del servidor a equipos LAN Cali

```
WS1
Physical Config Desktop Programming Attributes
Command Prompt

Packet Tracer PC Command Line 1.0
C:\>ping 192.168.20.66

Pinging 192.168.20.66 with 32 bytes of data:

Reply from 192.168.20.1: Destination host unreachable.
Reply from 192.168.20.1: Destination host unreachable.
Reply from 192.168.20.1: Destination host unreachable.
Reply from 192.168.20.1: Destination host unreachable.

Ping statistics for 192.168.20.66:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 192.168.20.67

Pinging 192.168.20.67 with 32 bytes of data:

Reply from 192.168.20.1: Destination host unreachable.
Reply from 192.168.20.1: Destination host unreachable.
Reply from 192.168.20.1: Destination host unreachable.
Reply from 192.168.20.1: Destination host unreachable.

Ping statistics for 192.168.20.67:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

Figura 18: Acceso fallido de WS1 a equipos LAN Medellin

The screenshot shows a Windows Command Prompt window titled 'WS 1' with tabs for 'Physical', 'Config', 'Desktop', 'Programming', and 'Attributes'. The 'Desktop' tab is active. The command prompt displays the following text:

```
Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>ping 192.168.20.34
Pinging 192.168.20.34 with 32 bytes of data:
Reply from 192.168.20.1: Destination host unreachable.
Reply from 192.168.20.1: Destination host unreachable.
Reply from 192.168.20.1: Destination host unreachable.
Reply from 192.168.20.1: Destination host unreachable.
Ping statistics for 192.168.20.34:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>ping 192.168.20.35
Pinging 192.168.20.35 with 32 bytes of data:
Reply from 192.168.20.1: Destination host unreachable.
Reply from 192.168.20.1: Destination host unreachable.
Reply from 192.168.20.1: Destination host unreachable.
Reply from 192.168.20.1: Destination host unreachable.
Ping statistics for 192.168.20.35:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

Figura 19: Acceso fallido de WS1 a equipos LAN Cali

c. Las estaciones de trabajo en las LAN de MEDELLIN y CALI no deben tener acceso a ningún dispositivo fuera de su subred, excepto para interconectar con el servidor.

❖ **Configuración ACL Router Medellin**

```
Medellin#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Medellin(config)#acc
Medellin(config)#access-list 2 permit host 192.168.20.3
Medellin(config)#access-list 2 deny host 192.168.20.32
Medellin(config)#inter gi0/0
Medellin(config-if)#ip access-group 2 out
```

❖ **Configuración ACL Router Bogota**

```
Bogota#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Bogota(config)#acc
Bogota(config)#access-list 1 permit host 192.168.20.3
Bogota(config)#access-list 1 deny host 192.168.20.64
Bogota(config)#access-list 1 deny host 192.168.20.32
Bogota(config)#inter gi0/0
Bogota(config-if)#ip access-group 1 in
```

❖ **Configuración ACL Router Cali**

```
Cali#conf t
```

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

```
Cali(config)#acc  
Cali(config)#access-list 3 permit host 192.168.20.3  
Cali(config)#access-list 3 deny host 192.168.20.64  
Cali(config)#inter gi0/0  
Cali(config-if)#ip access-group 3 out
```

3.1.5 Parte 5: Comprobación de la red instalada.

- a. Se debe probar que la configuración de las listas de acceso fue exitosa.

```
Medellin#sh access-lists  
Standard IP access list 2  
 10 permit host 192.168.20.3 (24 match(es))  
 20 deny host 192.168.20.32  
Medellin#
```

Figura 20: Access lists Router Medellin

```
Bogota#sh access-lists  
Standard IP access list 1  
 10 permit host 192.168.20.3 (43 match(es))  
 20 deny host 192.168.20.32  
 30 deny host 192.168.20.64  
Bogota#
```

Figura 21: Access lists Router Bogota

```
Cali#sh access-lists  
Standard IP access list 3  
 10 permit host 192.168.20.3 (12 match(es))  
 20 deny host 192.168.20.64  
Cali#
```

Figura 22: Access lists Router Cali

- b. Comprobar y Completar la siguiente tabla de condiciones de prueba para confirmar el óptimo funcionamiento de la red.

	ORIGEN	DESTINO	RESULTADO
TELNET	Router MEDELLIN	Router CALI	OK
	WS_1	Router BOGOTA	NULL
	Servidor	Router CALI	OK
	Servidor	Router MEDELLIN	OK
TELNET	LAN del Router MEDELLIN	Router CALI	NULL

	LAN del Router CALI	Router CALI	OK
	LAN del Router MEDELLIN	Router MEDELLIN	OK
	LAN del Router CALI	Router MEDELLIN	NULL
PING	LAN del Router CALI	WS_1	NULL
	LAN del Router MEDELLIN	WS_1	NULL
	LAN del Router MEDELLIN	LAN del Router CALI	NULL
PING	LAN del Router CALI	Servidor	OK
	LAN del Router MEDELLIN	Servidor	OK
	Servidor	LAN del Router MEDELLIN	OK
	Servidor	LAN del Router CALI	OK
	Router CALI	LAN del Router MEDELLIN	OK
	Router MEDELLIN	LAN del Router CALI	OK

Tabla 3: Resultados de conexión

Evidencias pruebas de conexión Telnet y Ping

```

Medellin#telnet 192.168.20.130
Trying 192.168.20.130 ...Open Acceso solo personal autorizado

User Access Verification

Password:
Cali>en
Password:
Cali#

```

Figura 23: Telnet Router Medellin a Router Cali

WS 1

```

Physical  Config  Desktop  Programming  Attributes
Command Prompt
C:\>telnet 192.168.20.1
Trying 192.168.20.1 ...
% Connection timed out; remote host not responding
C:\>telnet 192.168.20.97
Trying 192.168.20.97 ...
% Connection timed out; remote host not responding
C:\>telnet 192.168.20.129
Trying 192.168.20.129 ...
% Connection timed out; remote host not responding
C:\>

```

Figura 24: Telnet WS 1 a Router Bogota

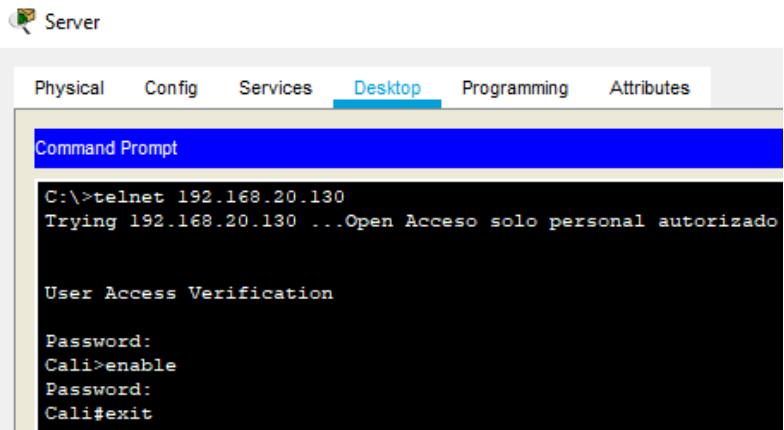


Figura 25: Telnet servidor a Router Cali

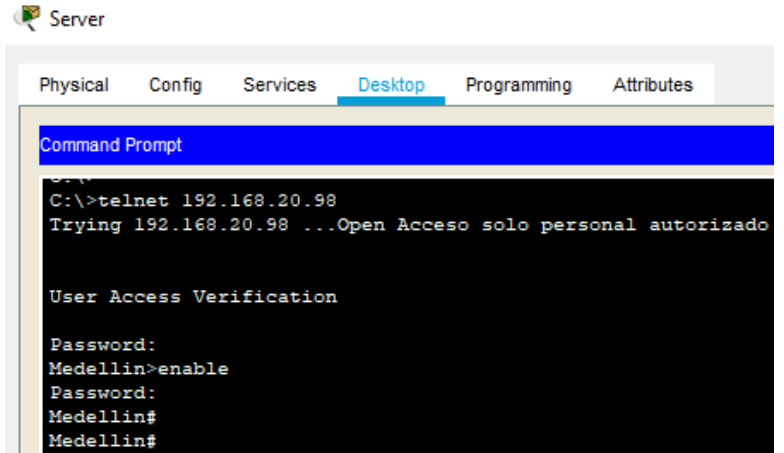


Figura 26: Telnet servidor a Router Medellin

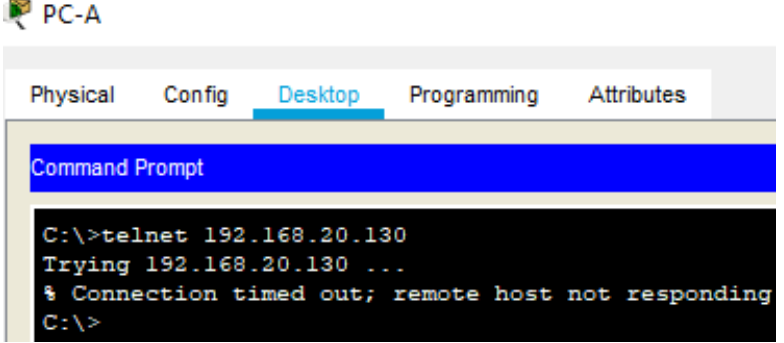


Figura 27: Telnet LAN Router Medellin (PC-A) a Router Cali

PC-D

```
Physical  Config  Desktop  Programming  Attributes
Command Prompt
C:\>telnet 192.168.20.33
Trying 192.168.20.33 ...Open Acceso solo personal autorizado

User Access Verification

Password:
Cali>enable
Password:
Cali#
Cali#
```

Figura 28: Telnet LAN Router Cali (PC-D) a Router Cali

PC-A

```
Physical  Config  Desktop  Programming  Attributes
Command Prompt
C:\>telnet 192.168.20.65
Trying 192.168.20.65 ...Open Acceso solo personal autorizado

User Access Verification

Password:
Medellin>enable
Password:
Medellin#
Medellin#
```

Figura 29: Telnet LAN Router Medellin (PC-A) a Router Medellin

PC-D

```
Physical  Config  Desktop  Programming  Attributes
Command Prompt
C:\>ping 192.168.20.2

Pinging 192.168.20.2 with 32 bytes of data:

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

Ping statistics for 192.168.20.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
```

Figura 30: Ping LAN Router Cali (PC-D) a WS 1

```
PC-B
Physical Config Desktop Programming Attributes
Command Prompt
Packet Tracer PC Command Line 1.0
C:\>ping 192.168.20.2

Pinging 192.168.20.2 with 32 bytes of data:

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

Ping statistics for 192.168.20.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss)
```

Figura 31: Ping LAN Router Medellin (PC-B) a WS 1

```
PC-B
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 192.168.20.33

Pinging 192.168.20.33 with 32 bytes of data:

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

Ping statistics for 192.168.20.33:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss)
```

Figura 32: Ping LAN Router Medellin (PC-B) a LAN Router Cali

```
PC-C
Physical Config Desktop Programming Attributes
Command Prompt
Packet Tracer PC Command Line 1.0
C:\>ping 192.168.20.3

Pinging 192.168.20.3 with 32 bytes of data:

Reply from 192.168.20.3: bytes=32 time=2ms TTL=126
Reply from 192.168.20.3: bytes=32 time=1ms TTL=126
Reply from 192.168.20.3: bytes=32 time=10ms TTL=126
Reply from 192.168.20.3: bytes=32 time=14ms TTL=126

Ping statistics for 192.168.20.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 14ms, Average = 6ms
```

Figura 33: Ping LAN Router Cali (PC-C) a servidor

PC-B

Physical Config **Desktop** Programming Attributes

Command Prompt

```
C:\>ping 192.168.20.3

Pinging 192.168.20.3 with 32 bytes of data:

Reply from 192.168.20.3: bytes=32 time=1ms TTL=126
Reply from 192.168.20.3: bytes=32 time=12ms TTL=126
Reply from 192.168.20.3: bytes=32 time=16ms TTL=126
Reply from 192.168.20.3: bytes=32 time=14ms TTL=126

Ping statistics for 192.168.20.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss)
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 16ms, Average = 10ms
```

Figura 34: Ping LAN Router Medellin (PC-B) a servidor

Server

Physical Config Services **Desktop** Programming Attributes

Command Prompt

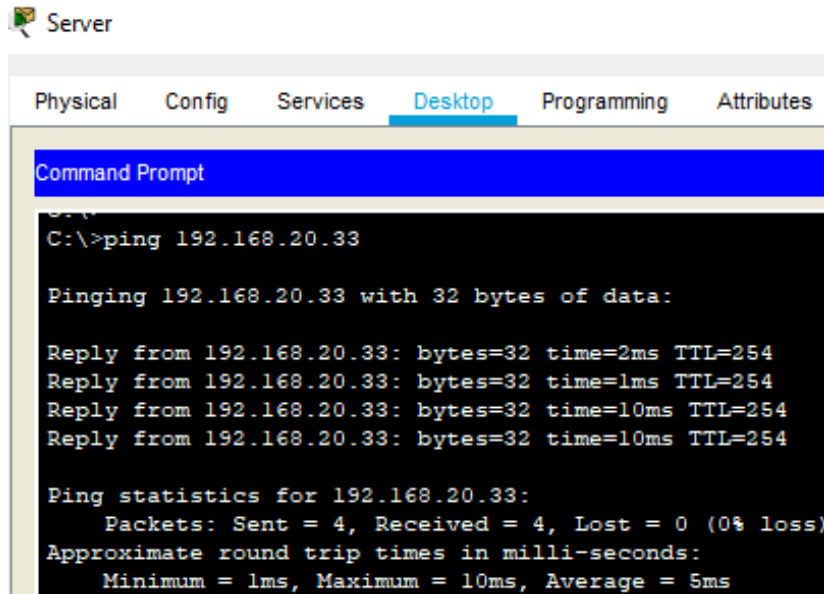
```
C:\>ping 192.168.20.65

Pinging 192.168.20.65 with 32 bytes of data:

Reply from 192.168.20.65: bytes=32 time=1ms TTL=254
Reply from 192.168.20.65: bytes=32 time=13ms TTL=254
Reply from 192.168.20.65: bytes=32 time=10ms TTL=254
Reply from 192.168.20.65: bytes=32 time=10ms TTL=254

Ping statistics for 192.168.20.65:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 13ms, Average = 8ms
```

Figura 35: Ping servidor a LAN Router Medellin



```
Server
Physical Config Services Desktop Programming Attributes
Command Prompt
C:\>ping 192.168.20.33

Pinging 192.168.20.33 with 32 bytes of data:

Reply from 192.168.20.33: bytes=32 time=2ms TTL=254
Reply from 192.168.20.33: bytes=32 time=1ms TTL=254
Reply from 192.168.20.33: bytes=32 time=10ms TTL=254
Reply from 192.168.20.33: bytes=32 time=10ms TTL=254

Ping statistics for 192.168.20.33:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss)
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 10ms, Average = 5ms
```

Figura 36: Ping servidor a LAN Router Cali

```
Cali#ping 192.168.20.65

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.20.65, timeout is 2
seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 2/3/9 ms

Cali#
```

Figura 37: Ping Router Cali a LAN Router Medellin

```
Medellin#ping 192.168.20.33

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.20.33, timeout is 2
seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 2/3/10 ms

Medellin#
```

Figura 38: Ping Router Medellin a LAN Router Cali

3.2 Escenario 2

Una empresa tiene la conexión a internet en una red Ethernet, lo cual deben adaptarlo para facilitar que sus routers y las redes que incluyen puedan, por esa vía, conectarse a internet, pero empleando las direcciones de la red LAN original.

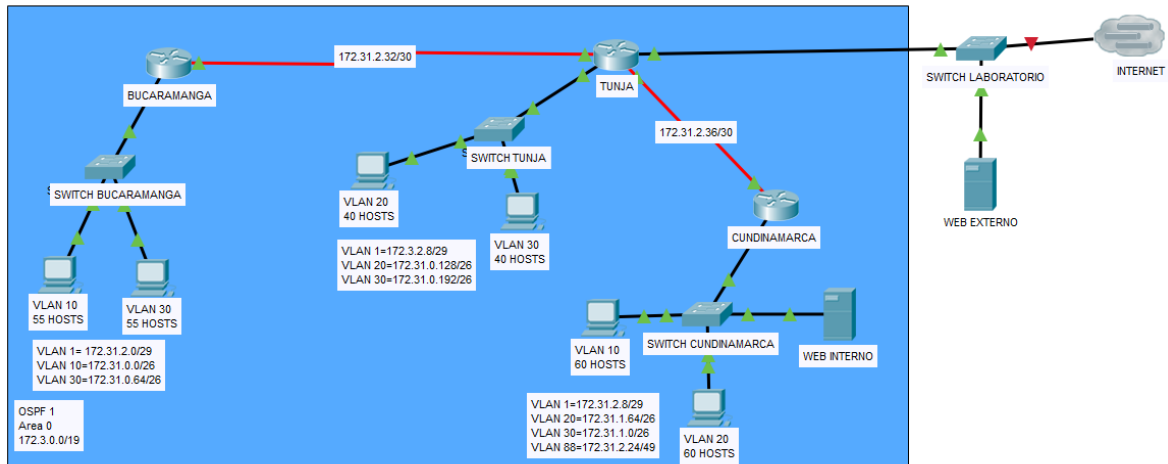


Figura 39: Topología Escenario 2

Desarrollo

Los siguientes son los requerimientos necesarios:

3.2.1 Configuración Inicial Routers

Todos los routers deberán tener lo siguiente

- Configuración básica.
- Autenticación local con AAA.
- Cifrado de contraseñas.
- Un máximo de internos para acceder al router.
- Máximo tiempo de acceso al detectar ataques.
- Establezca un servidor TFTP y almacene todos los archivos necesarios de los routers.

Configuración básica, cifrado de contraseñas y configuración direcciones IP

❖ Router Bucaramanga

```

Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname Bucaramanga
Bucaramanga(config)#line console 0
Bucaramanga(config-line)#password cisco
Bucaramanga(config-line)#logging synchronous
Bucaramanga(config-line)#login
Bucaramanga(config-line)#exit
Bucaramanga(config)#line vty 0 4
Bucaramanga(config-line)#password cisco
Bucaramanga(config-line)#logging synchronous
Bucaramanga(config-line)#exit
Bucaramanga(config)#enable secret class
Bucaramanga(config)#
Bucaramanga(config)#no ip domain-lookup
Bucaramanga(config)#
Bucaramanga(config)#banner motd $ Acceso solo personal autorizado $
Bucaramanga(config)#
Bucaramanga(config)#service password-encryption

Bucaramanga(config)#
Bucaramanga(config)#inter s0/0/0
Bucaramanga(config-if)#description Enlace a Router Tunja
Bucaramanga(config-if)#ip add 172.31.2.34 255.255.255.252
Bucaramanga(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down
Bucaramanga(config-if)#inter Gi0/0
Bucaramanga(config-if)#description LAN Bucaramanga
Bucaramanga(config-if)#ip add 172.31.2.1 255.255.255.248
Bucaramanga(config-if)#no shutdown

```

❖ Router Tunja

```

Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname Tunja
Tunja(config)#line console 0
Tunja(config-line)#password cisco
Tunja(config-line)#logging synchronous
Tunja(config-line)#login
Tunja(config-line)#exit
Tunja(config)#line vty 0 4
Tunja(config-line)#password cisco
Tunja(config-line)#logging synchronous
Tunja(config-line)#exit
Tunja(config)#enable secret class

```



```
Tunja(config)#  
Tunja(config)#banner motd $ Acceso solo personal autorizado $  
Tunja(config)#  
Tunja(config)#service password-encryption
```

```
Tunja(config)#inter s0/0/0  
Tunja(config-if)#description Enlace con Router Bucaramanga  
Tunja(config-if)#ip add 172.31.2.33 255.255.255.252  
Tunja(config-if)#no shutdown  
Tunja(config-if)#  
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up  
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed  
state to up  
Tunja(config-if)#  
Tunja(config-if)#inter s0/0/1  
Tunja(config-if)#description Enlace con Router Cundinamarca  
Tunja(config-if)#ip add 172.31.2.37 255.255.255.252  
Tunja(config-if)#no shutdown  
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to down  
Tunja(config-if)#  
Tunja(config-if)#inter Gi0/0  
Tunja(config-if)#description LAN Tunja  
Tunja(config-if)#ip add 172.3.2.9 255.255.255.248  
Tunja(config-if)#no shutdown  
Tunja(config-if)#  
Tunja(config-if)#inter Gi0/1  
Tunja(config-if)#description Enlace SW Laboratorio  
Tunja(config-if)#ip add 209.17.220.1 255.255.255.0  
Tunja(config-if)#no shutdown  
Tunja(config-if)#  
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up  
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1,  
changed state to up
```

❖ Router Cundinamarca

```
Router#conf t  
Enter configuration commands, one per line. End with CNTL/Z.  
Router(config)#hostname Cundinamarca  
Cundinamarca(config)#no ip domain-lookup  
Cundinamarca(config)#  
Cundinamarca(config)#line console 0  
Cundinamarca(config-line)#password cisco  
Cundinamarca(config-line)#logging synchronous
```

```

Cundinamarca(config-line)#login
Cundinamarca(config-line)#exit
Cundinamarca(config)#line vty 0 4
Cundinamarca(config-line)#password cisco
Cundinamarca(config-line)#logging synchronous
Cundinamarca(config-line)#login
Cundinamarca(config-line)#exit
Cundinamarca(config)#enable secret class
Cundinamarca(config)#
Cundinamarca(config)#banner motd $ Acceso solo personal autorizado $
Cundinamarca(config)#
Cundinamarca(config)#service password-encryption

Cundinamarca(config)#int s0/0/1
Cundinamarca(config-if)#description Enlace con Router Tunja
Cundinamarca(config-if)#ip add 172.31.2.38 255.255.255.252
Cundinamarca(config-if)#no shutdown
Cundinamarca(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to up
Cundinamarca(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/1, changed
state to up
Cundinamarca(config-if)#int Gi0/0
Cundinamarca(config-if)#description LAN Cundinamarca
Cundinamarca(config-if)#ip add 172.31.2.9 255.255.255.248
Cundinamarca(config-if)#no shutdown
Cundinamarca(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0,
changed state to up

```

Autenticación local con AAA

❖ Router Bucaramanga

```

Bucaramanga#config t
Enter configuration commands, one per line. End with CNTL/Z.
Bucaramanga(config)#aaa new-model
Bucaramanga(config)#username admin secret cisco
Bucaramanga(config)#aaa authentication login default local
Bucaramanga(config)#aaa authentication login default enable
Bucaramanga(config)#enable secret class
Bucaramanga(config)#aaa authentication login console local
Bucaramanga(config)#line console 0
Bucaramanga(config-line)#login authentication console

```

```
Bucaramanga(config-line)#exit
Bucaramanga(config)#aaa authentication login vty local
Bucaramanga(config)#line vty 0 4
Bucaramanga(config-line)#password cisco
Bucaramanga(config-line)#login authentication vty
Bucaramanga(config-line)#end
```

❖ Router Tunja

```
Tunja#config t
Enter configuration commands, one per line. End with CNTL/Z.
Tunja(config)#aaa new-model
Tunja(config)#username admin secret cisco
Tunja(config)#aaa authentication login default local
Tunja(config)#aaa authentication login default enable
Tunja(config)#enable secret class
Tunja(config)#aaa authentication login console local
Tunja(config)#line console 0
Tunja(config-line)#login authentication console
Tunja(config-line)#exit
Tunja(config)#aaa authentication login vty local
Tunja(config)#line vty 0 4
Tunja(config-line)#password cisco
Tunja(config-line)#login authentication vty
Tunja(config-line)#end
```

❖ Router Cundinamarca

```
Cundinamarca#config t
Enter configuration commands, one per line. End with CNTL/Z.
Cundinamarca(config)#aaa new-model
Cundinamarca(config)#username admin secret cisco
Cundinamarca(config)#aaa authentication login default local
Cundinamarca(config)#aaa authentication login default enable
Cundinamarca(config)#enable secret class
Cundinamarca(config)#aaa authentication login console local
Cundinamarca(config)#line console 0
Cundinamarca(config-line)#login authentication console
Cundinamarca(config-line)#exit
Cundinamarca(config)#aaa authentication login vty local
Cundinamarca(config)#line vty 0 4
Cundinamarca(config-line)#password cisco
Cundinamarca(config-line)#login authentication vty
Cundinamarca(config-line)#end
```

Máximo de internos para acceder al router y máximo tiempo de acceso al detectar ataques

❖ Router Bucaramanga

```
Bucaramanga#conf t
```

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

```
Bucaramanga(config)#ip domain name Bucaramanga.NET
```

```
Bucaramanga(config)#crypto key generate rsa
```

```
The name for the keys will be: Bucaramanga.Bucaramanga.NET
```

```
Choose the size of the key modulus in the range of 360 to 2048 for your  
General Purpose Keys. Choosing a key modulus greater than 512 may take  
a few minutes.
```

```
How many bits in the modulus [512]: 512
```

```
% Generating 512 bit RSA keys, keys will be non-exportable...[OK]
```

```
Bucaramanga(config)#ip ssh authen
```

```
Bucaramanga(config)#ip ssh authentication-retries 3
```

```
Bucaramanga(config)#ip ssh time-out 60
```

```
Bucaramanga(config)#
```

```
Bucaramanga(config)#line vty 0 4
```

```
Bucaramanga(config-line)#transport input ssh
```

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

```
Bucaramanga(config)#end
```

```
Bucaramanga#
```

```
Bucaramanga#sh ip ssh
```

```
SSH Enabled - version 1.5
```

```
Authentication timeout: 60 secs; Authentication retries: 3
```

```
Bucaramanga#
```

```
Bucaramanga(config)#login block-for 20 attempts 3 within 60
```

```
Bucaramanga(config)#do wri
```

```
Building configuration...
```

```
[OK]
```

❖ Router Tunja

```
Tunja#conf t
```

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

```
Tunja(config)#ip domain name Tunja.NET
```

```
Tunja(config)#crypto key generate rsa
```

```
The name for the keys will be: Tunja.Tunja.NET
```

```
Choose the size of the key modulus in the range of 360 to 2048 for your
```

General Purpose Keys. Choosing a key modulus greater than 512 may take a few minutes.

```
How many bits in the modulus [512]: 512
% Generating 512 bit RSA keys, keys will be non-exportable...[OK]
```

```
Tunja(config)#ip ssh authentication-retries 3
Tunja(config)#ip ssh time-out 60
Tunja(config)#line vty 0 4
Tunja(config-line)#transport input ssh
Tunja(config-line)#exit
Tunja(config)#end
Tunja#sh ip ssh
SSH Enabled - version 1.5
Authentication timeout: 60 secs; Authentication retries: 3
Tunja#
```

```
Tunja(config)#login block-for 20 attempts 3 within 60
Tunja(config)#do wri
Building configuration...
[OK]
```

❖ Router Cundinamarca

```
Cundinamarca#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Cundinamarca(config)#ip domain name Cundinamarca.NET
Cundinamarca(config)#crypto key generate rsa
The name for the keys will be: Cundinamarca.Cundinamarca.NET
Choose the size of the key modulus in the range of 360 to 2048 for your
General Purpose Keys. Choosing a key modulus greater than 512 may take
a few minutes.
```

```
How many bits in the modulus [512]: 512
% Generating 512 bit RSA keys, keys will be non-exportable...[OK]
```

```
Cundinamarca(config)#ip ssh authentication-retries 3
Cundinamarca(config)#ip ssh time-out 60
Cundinamarca(config)#line vty 0 4
Cundinamarca(config-line)#transport input ssh
Cundinamarca(config-line)#exit
Cundinamarca(config)#end
Cundinamarca#sh ip ssh
SSH Enabled - version 1.5
Authentication timeout: 60 secs; Authentication retries: 3
```

Cundinamarca#

```
Cundinamarca(config)#login block-for 20 attempts 3 within 60
Cundinamarca(config)#do wri
Building configuration...
[OK]
```

Establezca un servidor TFTP y almacene todos los archivos necesarios de los routers

Para el almacenamiento de los archivos de configuración de los routers en el servidor con el servicio TFTP que en mi caso es el servidor WEB INTERNO

❖ Router Bucaramanga

```
Bucaramanga#copy startup-config tftp:
Address or name of remote host []? 172.31.2.10
Destination filename [Bucaramanga-config]?
```

```
Writing startup-config...!!
[OK - 1682 bytes]
```

```
1682 bytes copied in 0.011 secs (152909 bytes/sec)
Bucaramanga#
```

❖ Router Tunja

```
Tunja#copy startup-config tftp:
Address or name of remote host []? 172.31.2.10
Destination filename [Tunja-config]?
```

```
Writing startup-config...!!
[OK - 1661 bytes]
```

```
1661 bytes copied in 0.001 secs (1661000 bytes/sec)
Tunja#
```

❖ Router Cundinamarca

```
Cundinamarca#copy startup-config tftp:
Address or name of remote host []? 172.31.2.10
Destination filename [Cundinamarca-config]?
```

```
Writing startup-config....!!
[OK - 1570 bytes]
```

1570 bytes copied in 3.072 secs (511 bytes/sec)
Cundinamarca#

Y validamos que los archivos de configuración estén almacenados en el servidor:

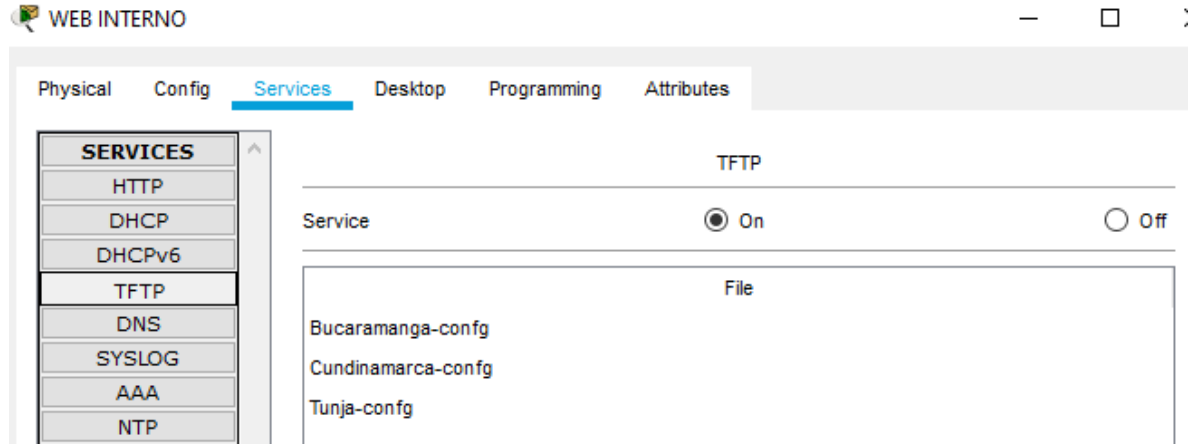


Figura 40: Verificación servidor TFTP

3.2.2 Servicio DHCP

El DHCP deberá proporcionar solo direcciones a los hosts de Bucaramanga y Cundinamarca

Configuración Helper address

❖ Router Bucaramanga

```
Bucaramanga#config t
Enter configuration commands, one per line. End with CNTL/Z.
Bucaramanga(config)#int g0/0
Bucaramanga(config-if)#ip helper-address 172.31.2.33
Bucaramanga(config-if)#int g0/0.10
Bucaramanga(config-subif)#ip helper-address 172.31.2.33
Bucaramanga(config-subif)#int g0/0.30
Bucaramanga(config-subif)#ip helper-address 172.31.2.33
Bucaramanga(config-subif)#exit
Bucaramanga(config)#int g0/0.10
Bucaramanga(config-subif)#encapsulation dot1q 10
Bucaramanga(config-subif)#ip address 172.31.0.1 255.255.255.248
Bucaramanga(config-subif)#int g0/0.30
Bucaramanga(config-subif)#encapsulation dot1q 30
Bucaramanga(config-subif)#ip address 172.31.0.65 255.255.255.248
%LINK-5-CHANGED: Interface GigabitEthernet0/0.10, changed state to up
```

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.10, changed state to up

%LINK-5-CHANGED: Interface GigabitEthernet0/0.30, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.30, changed state to up

Bucaramanga(config-subif)#ip address 172.31.0.65 255.255.255.248
Bucaramanga(config-subif)#

❖ **Router Cundinamarca**

Cundinamarca#conf t

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

Cundinamarca(config)#int g0/0

Cundinamarca(config-if)#ip helper-address 172.31.2.37

Cundinamarca(config-if)#int g0/0.20

Cundinamarca(config-subif)#ip helper-address 172.31.2.37

Cundinamarca(config-subif)#int g0/0.30

Cundinamarca(config-subif)#ip helper-address 172.31.2.37

Cundinamarca(config-subif)#int g0/0.88

Cundinamarca(config-subif)#ip helper-address 172.31.2.37

Cundinamarca(config-subif)#exit

Cundinamarca(config)#int g0/0.20

Cundinamarca(config-subif)#encapsulation dot1q 20

Cundinamarca(config-subif)#ip address 172.31.1.65 255.255.255.192

Cundinamarca(config-subif)#int g0/0.30

Cundinamarca(config-subif)#encapsulation dot1q 30

Cundinamarca(config-subif)#ip address 172.31.1.1 255.255.255.192

Cundinamarca(config-subif)#int g0/0.88

Cundinamarca(config-subif)#encapsulation dot1q 88

Cundinamarca(config-subif)#ip address 172.31.2.25 255.255.255.248

%LINK-5-CHANGED: Interface GigabitEthernet0/0.20, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.20, changed state to up

%LINK-5-CHANGED: Interface GigabitEthernet0/0.30, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.30, changed state to up

%LINK-5-CHANGED: Interface GigabitEthernet0/0.88, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.88,
changed state to up

Cundinamarca(config-subif)#ip address 172.31.2.25 255.255.255.248
Cundinamarca(config-subif)#

❖ Router Tunja

```
Tunja#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Tunja(config)#ip dhcp pool VLAN10_Bucaramanga
Tunja(dhcp-config)#network 172.31.0.0 255.255.255.192
Tunja(dhcp-config)#default-router 172.31.2.1
Tunja(dhcp-config)#exit
Tunja(config)#
Tunja(config)#ip dhcp pool VLAN30_Bucaramanga
Tunja(dhcp-config)#network 172.31.0.64 255.255.255.192
Tunja(dhcp-config)#default-router 172.31.2.1
Tunja(dhcp-config)#exit
Tunja(config)#ip dhcp pool VLAN20_Cundinamarca
Tunja(dhcp-config)#network 172.31.1.64 255.255.255.192
Tunja(dhcp-config)#default-router 172.31.2.9
Tunja(dhcp-config)#exit
Tunja(config)#
Tunja(config)#ip dhcp pool VLAN30_Cundinamarca
Tunja(dhcp-config)#network 172.31.1.0 255.255.255.192
Tunja(dhcp-config)#default-router 172.31.2.9
Tunja(dhcp-config)#exit
Tunja(config)#ip dhcp pool VLAN88_Cundinamarca
Tunja(dhcp-config)#network 172.31.2.24 255.255.255.248
Tunja(dhcp-config)#default-router 172.31.2.9
Tunja(dhcp-config)#exit
Tunja(config)#ip route 172.31.0.0 255.255.255.0 172.31.2.34
Tunja(config)#ip route 172.31.0.64 255.255.255.248 172.31.2.34
Tunja(config)#ip route 172.31.1.0 255.255.255.0 172.31.2.38
Tunja(config)#ip route 172.31.1.64 255.255.255.248 172.31.2.38

Tunja(config)#do wri
Building configuration...
[OK]
Tunja(config)#exit
```

3.2.3 Web server con NAT estático

El web server deberá tener NAT estático y el resto de los equipos de la topología emplearan NAT de sobrecarga (PAT).

❖ Router Tunja

```
Tunja#config t
Enter configuration commands, one per line. End with CNTL/Z.
Tunja(config)#access-list 1 permit 172.31.2.0 0.0.0.255
Tunja(config)#access-list 1 permit 172.31.0.0 0.0.0.255
Tunja(config)#access-list 1 permit 172.31.0.64 0.0.0.255
Tunja(config)#access-list 1 permit 172.31.0.128 0.0.0.255
Tunja(config)#access-list 1 permit 172.31.0.192 0.0.0.255
Tunja(config)#access-list 1 permit 172.31.1.64 0.0.0.255
Tunja(config)#access-list 1 permit 172.31.1.0 0.0.0.255
Tunja(config)#access-list 1 permit 172.31.2.9 0.0.0.255
Tunja(config)#access-list 1 permit 172.3.2.9 0.0.0.255
Tunja(config)#ip nat inside source list 1 int g0/1 overload
Tunja(config)#int s0/0/0
Tunja(config-if)#ip nat inside
Tunja(config-if)#int s0/0/1
Tunja(config-if)#ip nat inside
Tunja(config-if)#int g0/1
Tunja(config-if)#ip nat outside
Tunja(config-if)#exit
Tunja(config)#router rip
Tunja(config-router)#version 2
Tunja(config-router)#network 172.31.2.0
Tunja(config-router)#network 209.17.220.0
Tunja(config-router)#exit
```

❖ Router Bucaramanga

```
Bucaramanga#config t
Enter configuration commands, one per line. End with CNTL/Z.
Bucaramanga(config)#ip route 209.17.220.0 255.255.255.0 172.31.2.33
Bucaramanga(config)#ip route 172.31.1.0 255.255.255.192 172.31.2.37
Bucaramanga(config)#ip route 172.31.1.64 255.255.255.192 172.31.2.37
```

❖ Router Cundinamarca

```
Cundinamarca#config t
Enter configuration commands, one per line. End with CNTL/Z.
Cundinamarca(config)#ip route 172.31.0.64 255.255.255.192 172.31.2.34
Cundinamarca(config)#ip route 209.17.220.0 255.255.255.0 172.31.2.37
Cundinamarca(config)#ip route 172.31.0.0 255.255.255.192 172.31.2.34
```

3.2.4 Enrutamiento OSPF con autenticación

El enrutamiento deberá tener autenticación.

❖ Router Tunja

```
Tunja#config t
```

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

```
Tunja(config)#router ospf 1
```

```
Tunja(config-router)#network 172.31.2.32 0.0.0.255 area 0
```

```
Tunja(config-router)#network 172.3.2.9 0.0.0.3 area 0
```

```
Tunja(config-router)#network 172.31.2.26 0.0.0.3 area 0
```

```
Tunja(config-router)#end
```

```
Tunja#config t
```

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

```
Tunja(config)#int s0/0/1
```

```
Tunja(config-if)#ip ospf mes
```

```
% Incomplete command.
```

```
Tunja(config-if)#ip ospf message-digest-key 1 md5 cisco
```

```
Tunja(config-if)#ip ospf authentication mes
```

```
Tunja(config-if)#ip ospf authentication message-digest
```

```
00:08:23: %OSPF-5-ADJCHG: Process 1, Nbr 172.31.2.38 on Serial0/0/1 from  
LOADING to FULL, Loading Done
```

```
Tunja(config-if)#ip ospf authentication message-digest
```

```
Tunja(config-if)#end
```

```
Tunja#
```

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

```
Tunja#sh ip ospf nei
```

```
Neighbor ID Pri State Dead Time Address Interface
```

```
172.31.2.34 0 FULL/ - 00:00:32 172.31.2.34 Serial0/0/0
```

```
172.31.2.38 0 FULL/ - 00:00:36 172.31.2.38 Serial0/0/1
```

```
Tunja#conf t
```

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

```
Tunja(config)#int s0/0/0
```

```
Tunja(config-if)#ip ospf message-digest-key 1 md5 cisco
```

```
Tunja(config-if)#ip ospf authentication mes
```

```
Tunja(config-if)#ip ospf authentication message-digest
```

```
Tunja(config-if)#end
```

```
Tunja#
```

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

```
Tunja#sh ip ospf nei
```

```
Neighbor ID Pri State Dead Time Address Interface
172.31.2.34 0 FULL/ - 00:00:38 172.31.2.34 Serial0/0/0
172.31.2.38 0 FULL/ - 00:00:32 172.31.2.38 Serial0/0/1
```

❖ Router Bucaramanga

```
Bucaramanga#config t
Enter configuration commands, one per line. End with CNTL/Z.
Bucaramanga(config)#router ospf 1
Bucaramanga(config-router)#network 172.31.2.0 0.0.0.255 area 0
Bucaramanga(config-router)#network 172.31.2.32 0.0.0.3 area 0
Bucaramanga(config-router)#
00:03:07: %OSPF-5-ADJCHG: Process 1, Nbr 209.17.220.1 on Serial0/0/0
from LOADING to FULL, Loading Done
Bucaramanga(config-router)#end
Bucaramanga#
%SYS-5-CONFIG_I: Configured from console by console
```

```
Bucaramanga#sh ip ospf neighbor
Neighbor ID Pri State Dead Time Address Interface
209.17.220.1 0 FULL/ - 00:00:35 172.31.2.33 Serial0/0/0
Bucaramanga#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Bucaramanga(config)#int s0/0/0
Bucaramanga(config-if)#ip ospf message-digest-key 1 md5 cisco
Bucaramanga(config-if)#ip ospf authentication mes
Bucaramanga(config-if)#ip ospf authentication message-digest
Bucaramanga(config-if)#end
Bucaramanga#
%SYS-5-CONFIG_I: Configured from console by console
Bucaramanga#sh ip ospf neighbor
Neighbor ID Pri State Dead Time Address Interface
209.17.220.1 0 FULL/ - 00:00:37 172.31.2.33 Serial0/0/0
Bucaramanga#
```

❖ Router Cundinamarca

```
Cundinamarca#config t
Enter configuration commands, one per line. End with CNTL/Z.
Cundinamarca(config)#router ospf 1
Cundinamarca(config-router)#network 172.31.2.36 0.0.0.255 area 0
Cundinamarca(config-router)#network 172.31.2.8 0.0.0.3 area 0
Cundinamarca(config-router)#
```

```

00:04:27: %OSPF-5-ADJCHG: Process 1, Nbr 209.17.220.1 on Serial0/0/1
from LOADING to FULL, Loading Done
Cundinamarca(config-router)#end
Cundinamarca#
%SYS-5-CONFIG_I: Configured from console by console
Cundinamarca#sh ip ospf nei
Neighbor ID Pri State Dead Time Address Interface
209.17.220.1 0 FULL/ - 00:00:33 172.31.2.37 Serial0/0/1
Cundinamarca#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Cundinamarca(config)#int s0/0/1
Cundinamarca(config-if)#ip ospf mes
Cundinamarca(config-if)#ip ospf message-digest-key 1 md5 cisco
Cundinamarca(config-if)#ip ospf authentication mes
Cundinamarca(config-if)#ip ospf authentication message-digest
Cundinamarca(config-if)#end
Cundinamarca#
%SYS-5-CONFIG_I: Configured from console by console
Cundinamarca#sh ip ospf nei
Neighbor ID Pri State Dead Time Address Interface
209.17.220.1 0 FULL/ - 00:00:20 172.31.2.37 Serial0/0/1
Cundinamarca#
00:06:37: %OSPF-5-ADJCHG: Process 1, Nbr 209.17.220.1 on Serial0/0/1
from FULL to DOWN, Neighbor Down: Dead timer expired

00:06:37: %OSPF-5-ADJCHG: Process 1, Nbr 209.17.220.1 on Serial0/0/1
from FULL to DOWN, Neighbor Down: Interface down or detached

Cundinamarca#sh ip ospf nei

Cundinamarca#
00:08:23: %OSPF-5-ADJCHG: Process 1, Nbr 209.17.220.1 on Serial0/0/1
from LOADING to FULL, Loading Done

Cundinamarca#sh ip ospf nei
Neighbor ID Pri State Dead Time Address Interface
209.17.220.1 0 FULL/ - 00:00:39 172.31.2.37 Serial0/0/1
Cundinamarca#

```

3.2.5 Listas de control de acceso

- Los hosts de VLAN 20 en Cundinamarca no acceden a internet, solo a la red interna de Tunja.

- Los hosts de VLAN 10 en Cundinamarca si acceden a internet y no a la red interna de Tunja.
- Los hosts de VLAN 30 en Tunja solo acceden a servidores web y ftp de internet.
- Los hosts de VLAN 20 en Tunja solo acceden a la VLAN 20 de Cundinamarca y VLAN 10 de Bucaramanga.
- Los hosts de VLAN 30 de Bucaramanga acceden a internet y a cualquier equipo de VLAN 10.
- Los hosts de VLAN 10 en Bucaramanga acceden a la red de Cundinamarca (VLAN 20) y Tunja (VLAN 20), no internet.
- Los hosts de una VLAN no pueden acceder a los de otra VLAN en una ciudad.
- Solo los hosts de las VLAN administrativas y de la VLAN de servidores tienen acceso a los routers e internet.

3.2.6 VLSM

Utilizar la dirección 172.31.0.0 /18 para el direccionamiento.

4. CONCLUSIONES

Después de desarrollar cada uno de los escenarios planteados en esta actividad final se puede evidenciar todos los conocimientos adquiridos ya que se logró configurar cada uno de los dispositivos con los comandos aprendidos y las validaciones para demostrar que las configuraciones quedaron correctamente aplicadas.

5. BIBLIOGRAFÍA

CISCO. (2014). OSPF de una sola área. Principios de Enrutamiento y Conmutación. Recuperado de <https://static-course-assets.s3.amazonaws.com/RSE50ES/module8/index.html#8.0.1.1>

CISCO. (2014). Listas de control de acceso. Principios de Enrutamiento y Conmutación. Recuperado de <https://static-course-assets.s3.amazonaws.com/RSE50ES/module9/index.html#9.0.1.1>

CISCO. (2014). DHCP. Principios de Enrutamiento y Conmutación. Recuperado de <https://static-course-assets.s3.amazonaws.com/RSE50ES/module10/index.html#10.0.1.1>

CISCO. (2014). Asignación de direcciones IP. Fundamentos de Networking. Recuperado de <https://static-course-assets.s3.amazonaws.com/ITN50ES/module8/index.html#8.0.1.1>

CISCO. (2014). SubNetting. Fundamentos de Networking. Recuperado de <https://static-course-assets.s3.amazonaws.com/ITN50ES/module9/index.html#9.0.1.1>

CISCO. (2014). VLANs. Principios de Enrutamiento y Conmutación. Recuperado de <https://static-course-assets.s3.amazonaws.com/RSE50ES/module3/index.html#3.0.1.1>

CISCO. (2014). Enrutamiento entre VLANs. Principios de Enrutamiento y Conmutación. Recuperado de <https://static-course-assets.s3.amazonaws.com/RSE50ES/module5/index.html#5.0.1.1>

CISCO. (2014). Enrutamiento Estático. Principios de Enrutamiento y Conmutación. Recuperado de <https://static-course-assets.s3.amazonaws.com/RSE50ES/module6/index.html#6.0.1.1>