

EVALUACIÓN - PRUEBA DE HABILIDADES PRÁCTICAS CCNA DIPLOMADO
DE PROFUNDIZACIÓN CISCO (DISEÑO E IMPLEMENTACIÓN DE
SOLUCIONES INTEGRADAS LAN / WAN)

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UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA UNAD
ESCUELA DE CIENCIAS BÁSICAS, TECNOLOGÍA E INGENIERÍA
INGENIERÍA DE SISTEMAS
BOGOTÁ
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Trabajo De Diplomado Para Optar al Título De Ingeniero De Sistemas

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BOGOTÁ

2019

NOTA DE ACEPTACIÓN

Presidente del Jurado

Jurado

Bogotá Diciembre de 2019

Dedicatoria

Dedicado a mis padres, mi esposa e hijos, por su constante apoyo e incentivo para terminar esta etapa de mi vida profesional.

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RESUMEN

El presente trabajo corresponde al análisis y desarrollo de dos escenarios prácticos relacionados con diferentes temas de Networking, tales como configuración de dispositivos, validación de conectividad, construcción de la topología de la red. Los escenarios están planteados de una forma que simula una situación real, por lo que se requiere la aplicación de los conocimientos y habilidades adquiridas durante el transcurso del diplomado de profundización CCNA para su desarrollo.

Como herramienta de configuración y simulación de los escenarios planteados se utiliza el software Packet Tracer, para la creación de las topologías de red y simulaciones de conectividad.

ABSTRACT

The present work corresponds to the analysis and development of two practical scenarios related to different Networking topics, such as device configuration, connectivity validation, construction of the network topology. The scenarios are presented in a way that simulates a real situation, so the application of the knowledge and skills acquired during the course of the CCNA deepening diploma is required for its development.

The Packet Tracer software is used as a configuration and simulation tool for the proposed scenarios, for the creation of network topologies, connectivity simulations.

INTRODUCCIÓN

A través del desarrollo de los temas vistos durante el diplomado de profundización CCNA, se adquirieron conocimientos sobre diferentes aspectos de redes. Durante el desarrollo de los escenarios planteados en el presente trabajo, se aplican los conocimientos y habilidades requeridas para la configuración de los diferentes dispositivos, comprobación de la conectividad, direccionamiento IP, protocolos de enrutamiento y demás aspectos que forman parte de la topología de red.

La implementación de los escenarios se realiza en la herramienta de simulación Packet Tracer, la cual permite recrear las topologías de red planteadas y verificar su comportamiento.

DESCRIPCIÓN GENERAL DE LA PRUEBA DE HABILIDADES

La evaluación denominada “Prueba de habilidades prácticas”, forma parte de las actividades evaluativas del Diplomado de Profundización CCNA, y busca identificar el grado de desarrollo de competencias y habilidades que fueron adquiridas a lo largo del diplomado. Lo esencial es poner a prueba los niveles de comprensión y solución de problemas relacionados con diversos aspectos de Networking.

Para esta actividad, el estudiante dispone de cerca de dos semanas para realizar las tareas asignadas en cada uno de los dos (2) escenarios propuestos, acompañado de los respectivos procesos de documentación de la solución, correspondientes al registro de la configuración de cada uno de los dispositivos, la descripción detallada del paso a paso de cada una de las etapas realizadas durante su desarrollo, el registro de los procesos de verificación de conectividad mediante el uso de comandos ping, traceroute, show ip route, entre otros.

Teniendo en cuenta que la Prueba de habilidades está conformada por dos (2) escenarios, el estudiante deberá realizar el proceso de configuración de usando cualquiera de las siguientes herramientas: Packet Tracer o GNS3.

OBJETIVOS

Objetivo General

Desarrollar los escenarios planteados dentro de la prueba de habilidades aplicando los conocimientos adquiridos durante el diplomado de profundización CCNA de Cisco

Objetivos Específicos

- Realizar la topología física de las redes en la herramienta de simulación Packet Tracer.
- Configurar y conectar los dispositivos de las redes de los escenarios.
- Elaborar el informe de los diferentes procedimientos aplicados a las redes.

DESARROLLO DE LOS ESCENARIOS

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.

1.1. 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.

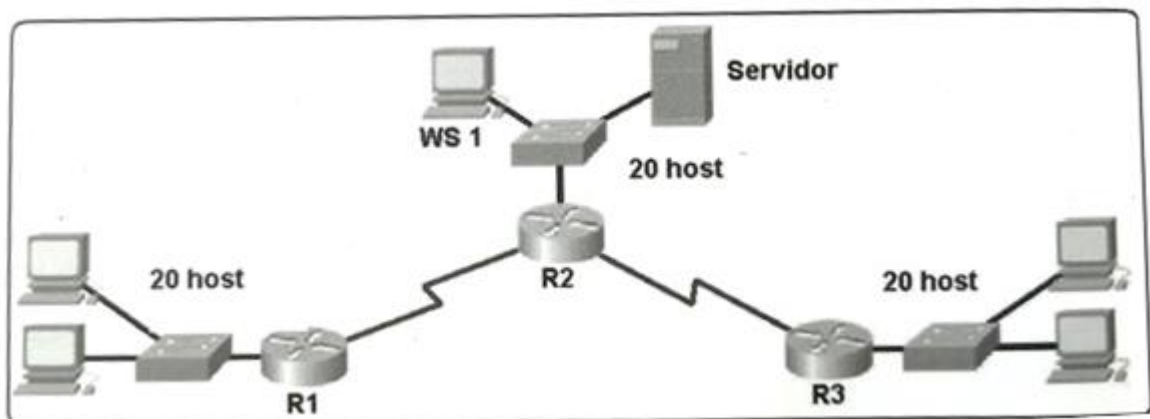
Parte 2: Considerar la asignación de los parámetros básicos y la detección de vecinos directamente conectados.

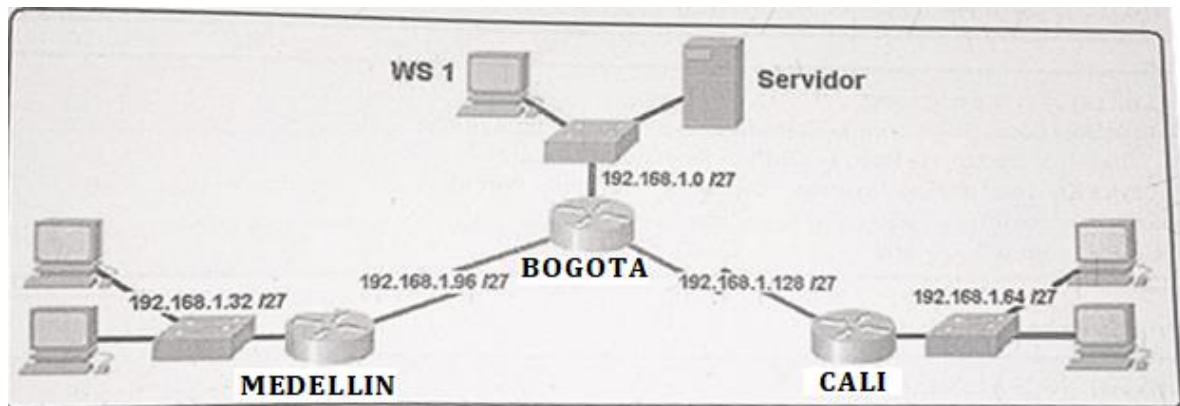
Parte 3: La red y subred establecidas deberán tener una interconexión total, todos los hosts deberán ser visibles y poder comunicarse entre ellos sin restricciones.

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.





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

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

1.2. Configuración Básica Routers y Switch

Se ingresa al modo consola de los dispositivos, en el modo de configuración global se realiza la configuración básica.

- Se cambia el nombre al router con el comando *hostname*,
- Se coloca un mensaje donde se asigne las políticas del router con el comando *banner motd*
- Se configuran las contraseñas; se configura contraseña al modo de configuración global con el comando *enable secret*
- Se configura la contraseña de consola con el comando *line console 0*

- Se configura la contraseña de acceso remoto *line vty 0 4*
- Se encriptan las contraseñas con *service password-encryption*
- Se configura y autentica un usuario con el comando *username y password* para la contraseña
- Luego se copia lo que esta en la memoria RAM memoria NVRAM con el comando *copy-running startup-config*
- Se desactivan los mensajes de DNS con el comando *no ip domain lookup*

1.2.1. Router MEDELLIN

```

Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z
Router(config)#hostname MEDELLIN
MEDELLIN(config)#banner motd $ACCESO RESTRINGIDO, SOLO USUARIOS
AUTORIZADOS$
MEDELLIN(config)#enable secret Manzana2019
MEDELLIN(config)#line console 0
MEDELLIN(config-line)#password Manzana2020
MEDELLIN(config-line)#logging synchronous
MEDELLIN(config-line)#exit
MEDELLIN(config)#line vty 0 4
MEDELLIN(config-line)#password Manzana2020
MEDELLIN(config-line)#logging synchronous
MEDELLIN(config-line)#exit
MEDELLIN(config)#service password-encryption
MEDELLIN(config)#exit
MEDELLIN#
%SYS-5-CONFIG_I: Configured from console by console
MEDELLIN#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
MEDELLIN(config)#username Administrador password Manzana2020
MEDELLIN(config)#line console 0
MEDELLIN(config-line)#login local
MEDELLIN(config-line)#password Manzana2020
MEDELLIN(config-line)#exit
MEDELLIN(config)#banner motd $BIENVENIDOS$
MEDELLIN(config)#exit
MEDELLIN#

```

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

BIENVENIDO

User Access Verification

```
Username: Administrador
Password:
```

```
MEDELLIN>enable
Password:
MEDELLIN#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
MEDELLIN(config)#ip domain lookup
MEDELLIN(config)#exit
MEDELLIN#
%SYS-5-CONFIG_I: Configured from console by console
```

MEDELLIN#

1.2.2. Router BOGOTA

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z
Router(config)#hostname BOGOTA
BOGOTA(config)#banner motd $ACCESO RESTRINGIDO, SOLO USUARIOS
AUTORIZADOS$
BOGOTA(config)#enable secret Manzana2019
BOGOTA(config)#line console 0
BOGOTA(config-line)#password Manzana2020
BOGOTA(config-line)#logging synchronous
BOGOTA(config-line)#exit
BOGOTA(config)#line vty 0 4
BOGOTA(config-line)#password Manzana2020
BOGOTA(config-line)#logging synchronous
BOGOTA(config-line)#exit
```

```
BOGOTA(config)#service password-encryption
BOGOTA(config)#exit
BOGOTA#
%SYS-5-CONFIG_I: Configured from console by console
```

```
BOGOTA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
BOGOTA(config)#username Administrador password Manzana2020
BOGOTA(config)#line console 0
BOGOTA(config-line)#login local
BOGOTA(config-line)#password Manzana2020
BOGOTA(config-line)#exit
BOGOTA(config)#banner motd $BIENVENIDOS$
BOGOTA(config)#exit
BOGOTA#
%SYS-5-CONFIG_I: Configured from console by console
```

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

BIENVENIDO

User Access Verification

Username: Administrador
Password:

```
BOGOTA>enable
Password:
BOGOTA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
BOGOTA(config)#ip domain lookup
BOGOTA(config)#exit
BOGOTA#
%SYS-5-CONFIG_I: Configured from console by console
```

BOGOTA#

1.2.3. Router CALI

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z
Router(config)#hostname CALI
CALI(config)#banner motd $ACCESO RESTRINGIDO, SOLO USUARIOS
AUTORIZADO$
CALI(config)#enable secret Manzana2019
CALI(config)#line console 0
CALI(config-line)#password Manzana2020
CALI(config-line)#logging synchronous
CALI(config-line)#exit
CALI(config)#line vty 0 4
CALI(config-line)#password Manzana2020
CALI(config-line)#logging synchronous
CALI(config-line)#exit
CALI(config)#service password-encryption
CALI(config)#exit
CALI#
%SYS-5-CONFIG_I: Configured from console by console
```

```
CALI#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
CALI(config)#username Administrador password Manzana2020
CALI(config)#line console 0
CALI(config-line)#login local
CALI(config-line)#password Manzana2020
CALI(config-line)#exit
CALI(config)#banner motd $BIENVENIDOS$
CALI(config)#exit
CALI#
%SYS-5-CONFIG_I: Configured from console by console
```

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

1.2.4. SWITCH 1

```
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname S1
S1(config)#banner motd $Acceso Restringido$ACCESO RESTRINGIDO$
S1(config)#enable secret Manzana2020
S1(config)#line console 0
S1(config-line)#password Manzana2019
S1(config-line)#login
S1(config-line)#exit
S1(config)#no ip domain lookup
S1(config)#service password-encryption
S1(config)#line vty 0 4
S1(config-line)#password Manzana2020
S1(config-line)#login
S1(config-line)#exit
S1(config)#service password-encryption
S1(config)#exit
S1#
%SYS-5-CONFIG_I: Configured from console by console

S1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
S1#

S1#exit

Acceso Restringido

User Access Verification

Password:

S1>enable
Password:
S1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
S1(config)#
```

1.2.5. SWITCH 2

```
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname S2
S2(config)#banner motd $Acceso Restringido$ACCESO RESTRINGIDO$
S2(config)#enable secret Manzana2020
S2(config)#line console 0
S2(config-line)#password Manzana2019
S2(config-line)#login
S2(config-line)#exit
S2(config)#no ip domain lookup
S2(config)#service password-encryption
S2(config)#line vty 0 4
S2(config-line)#password Manzana2020
S2(config-line)#login
S2(config-line)#exit
S2(config)#service password-encryption
S2(config)#exit
S2#
%SYS-5-CONFIG_I: Configured from console by console

S2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
S2#
S2#exit
```

Acceso Restringido

User Access Verification

Password:

```
S2>enable
```

Password:

```
S2#configure terminal
```

1.2.6. SWITCH 3

```
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname S3
S3(config)#banner motd $Acceso Restringido$ACCESO RESTRINGIDO$
S3(config)#enable secret Manzana2020
S3(config)#line console 0
S3(config-line)#password Manzana2019
S3(config-line)#login
S3(config-line)#exit
S3(config)#no ip domain lookup
S3(config)#service password-encryption
S3(config)#line vty 0 4
S3(config-line)#password Manzana2020
S3(config-line)#login
S3(config-line)#exit
S3(config)#service password-encryption
S3(config)#exit
S3#
%SYS-5-CONFIG_I: Configured from console by console

S3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
S3#
S3#exit
```

Acceso Restringido

User Access Verification

Password:

```
S3>enable
```

Password:

```
S3#configure terminal
```


1.3. Parte 1: Asignación de direcciones IP

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

1. Network: 192.168.1.0/27
Netmask: 255.255.255.224
HostMin: 192.168.1.1
HostMax: 192.168.1.30
Broadcast: 192.168.1.31

2. Network: 192.168.1.32/27
Netmask: 255.255.255.224
HostMin: 192.168.1.33
HostMax: 192.168.1.62
Broadcast: 192.168.1.63

3. Network: 192.168.1.64/27
Netmask: 255.255.255.224
HostMin: 192.168.1.65
HostMax: 192.168.1.94
Broadcast: 192.168.1.95

4. Network: 192.168.1.96/27
Netmask: 255.255.255.224
HostMin: 192.168.1.97
HostMax: 192.168.1.126
Broadcast: 192.168.1.127

5. Network: 192.168.1.128/27
Netmask: 255.255.255.224
HostMin: 192.168.1.129
HostMax: 192.168.1.158
Broadcast: 192.168.1.159

6. Network: 192.168.1.160/27
Netmask: 255.255.255.224
HostMin: 192.168.1.161
HostMax: 192.168.1.190
Broadcast: 192.168.1.191

7. Network: 192.168.1.192/27
Netmask: 255.255.255.224
HostMin: 192.168.1.193
HostMax: 192.168.1.222
Broadcast: 192.168.1.223

8. Network: 192.168.1.224/27
Netmask: 255.255.255.224
HostMin: 192.168.1.225
HostMax: 192.168.1.254
Broadcast: 192.168.1.255

8 SUBNETS

1.4. Parte 2: Configuración Básica.

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

Tabla 1. Tabla de Configuración Básica de los Routers

	R1	R2	R3
Nombre de Host	MEDELLIN	BOGOTA	CALI
Dirección de Ip en interfaz Serial 0/0	192.168.1.99	192.168.1.98	192.168.1.131
Dirección de Ip en interfaz Serial 0/1	192.168.1.131	192.168.1.130	192.168.1.193
Dirección de Ip en interfaz FA 0/0	192.168.1.33	192.168.1.1	192.168.1.65
Protocolo de enrutamiento	Eigrp	Eigrp	Eigrp
Sistema Autónomo	200	200	200
Afirmaciones de red	192.168.1.0	192.168.1.0	192.168.1.0

1.4.1. Router MEDELLIN

```
Acceso Restringido
User Access Verification
Password:
MEDELLIN>enable
Password:
```

```
MEDELLIN#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
MEDELLIN(config)#interface fastEthernet 0/0
MEDELLIN(config-if)#ip address 192.168.1.33 255.255.255.224
MEDELLIN(config-if)#no shutdown
MEDELLIN(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
```

```

MEDELLIN(config-if)#exit
MEDELLIN(config)#interface serial 0/0
MEDELLIN(config-if)#ip address 192.168.1.99 255.255.255.224
Medellin(config-if)#clock rate 128000
This command applies only to DCE interfaces
MEDELLIN(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down
MEDELLIN(config-if)#exit
MEDELLIN(config)#exit
MEDELLIN#
%SYS-5-CONFIG_I: Configured from console by console
MEDELLIN#

```

1.4.2. Router BOGOTA

```

Acceso Restringido
User Access Verification
Password:
BOGOTA>enable
Password:
BOGOTA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
BOGOTA(config)#interface serial 0/0
BOGOTA(config-if)#ip address 192.168.1.98 255.255.255.224
BOGOTA(config-if)#clock rate 128000
BOGOTA(config-if)#no shutdown
BOGOTA(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up
BOGOTA(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up
BOGOTA(config-if)#
BOGOTA(config-if)#exit
BOGOTA(config)#interface serial 0/1
BOGOTA(config-if)#ip address 191.168.1.130 255.255.255.224
BOGOTA(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to down
BOGOTA(config-if)#
BOGOTA(config-if)#exit
BOGOTA(config)#interface fastEthernet 0/0
BOGOTA(config-if)#ip address 192.168.1.1 255.255.255.224
BOGOTA(config-if)#no shutdown
BOGOTA(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

```

1.4.3. Router CALI

Acceso Restringido

User Access Verification

Password:

CALI>enable

Password:

CALI#configure terminal

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

CALI(config)#interface fastEthernet 0/0

CALI(config-if)#ip address 192.168.1.65 255.255.255.224

CALI(config-if)#no shutdown

CALI(config-if)#

%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

CALI(config-if)#exit

CALI(config)#interface serial 0/0

CALI(config-if)#ip address 192.168.1.131 255.255.255.224

CALI(config-if)#clock rate 128000

CALI(config-if)#no shutdown

CALI(config-if)#

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up

CALI(config-if)#

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up

CALI(config-if)#

CALI(config)#interface Serial 0/1

CALI(config-if)#ip address 192.168.1.193 255.255.255.224

CALI(config-if)#clock rate 128000

CALI(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/1/0, changed state to down

CALI(config-if)#

CALI(config-if)#exit

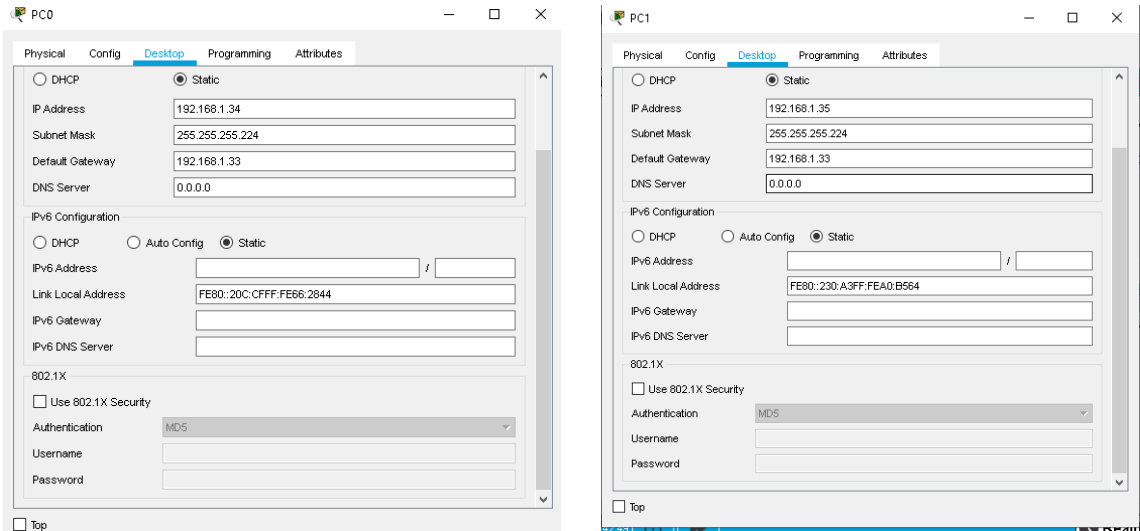
CALI(config)#

CALI#

1.5. Asignación de Direcciones IP a los PC

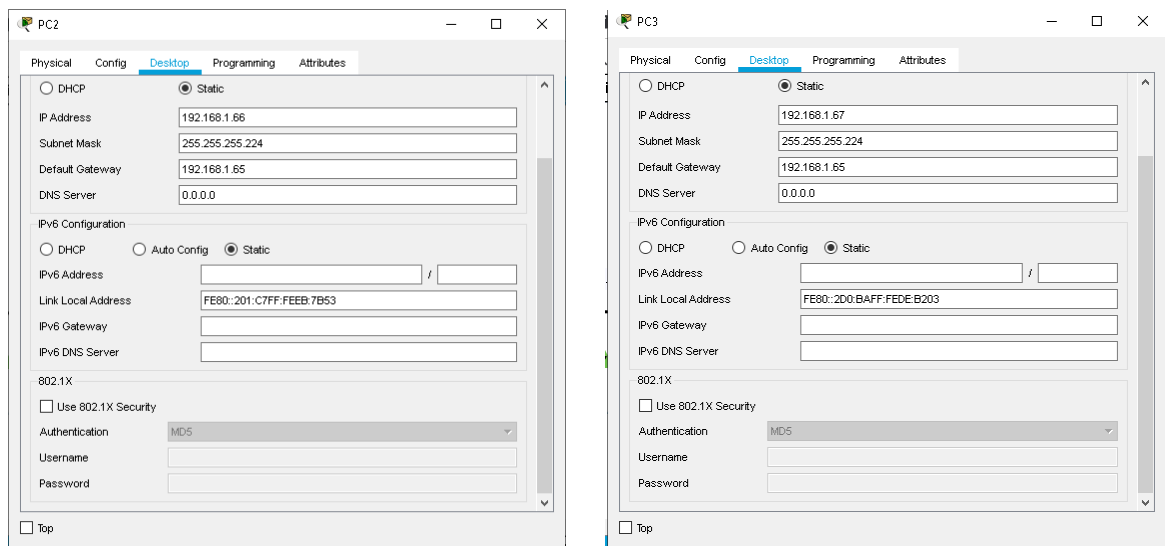
1.5.1. PC MDELLIN

Figura 1. Asignación de Direcciones IP a PC's Medellín



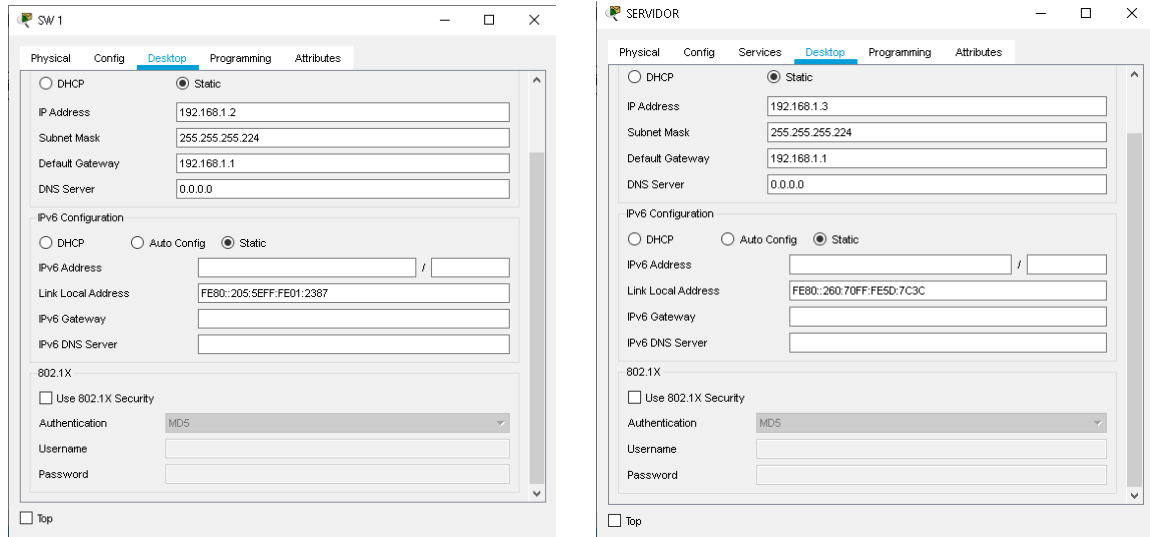
1.5.2. PC CALI

Figura 2. Asignación de Direcciones IP a PC's Cali



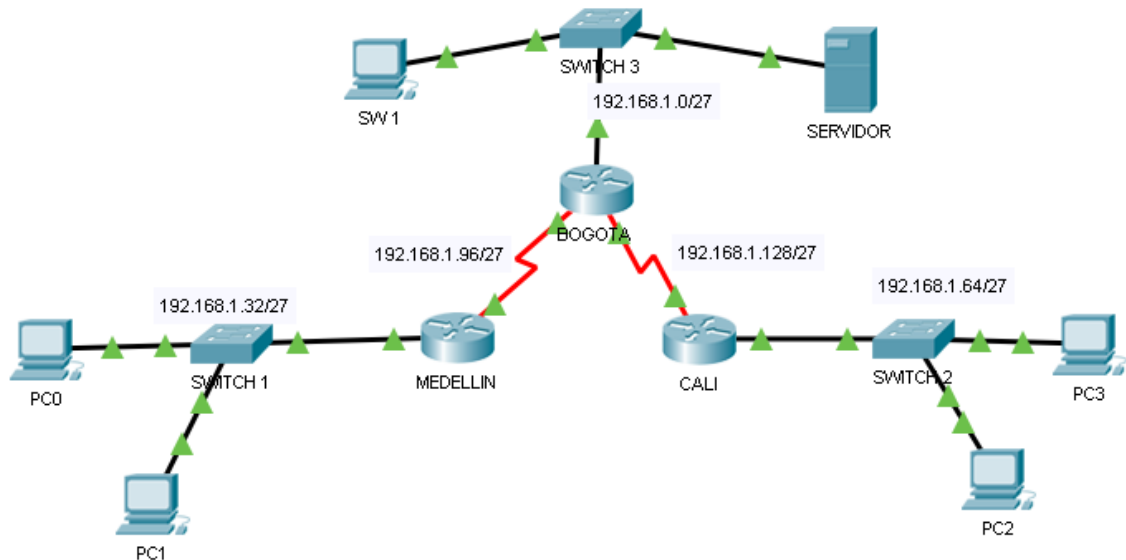
1.5.3. PC Y SERVIDOR BOGOTA

Figura 3. Asignación de Direcciones IP a PC y Servidor Bogota



1.6. Topología

Figura 4. Topología Planteada



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.

1.7. Tablas de enrutamiento

Tabla 2. Tabla Enrutamiento Medellin

Type	Network	Port	Next Hop IP	Metric
S	192.168.1.0/27	---	192.168.1.98	1/0
C	192.168.1.32/27	FastEthernet0/0	---	0/0
S	192.168.1.64/27	---	192.168.1.98	1/0
C	192.168.1.96/27	Serial0/0	---	0/0
S	192.168.1.128/27	---	192.168.1.98	1/0

Tabla 3. Tabla Enrutamiento Bogota

Type	Network	Port	Next Hop IP	Metric
C	192.168.1.0/27	FastEthernet0/0	---	0/0
S	192.168.1.32/27	---	192.168.1.99	1/0
S	192.168.1.64/27	---	192.168.1.131	1/0
C	192.168.1.96/27	Serial0/0	---	0/0
C	192.168.1.128/27	Serial0/1	---	0/0

Tabla 4. Tabla Enrutamiento Cali

Type	Network	Port	Next Hop IP	Metric
S	192.168.1.0/27	---	192.168.1.130	1/0
S	192.168.1.32/27	---	192.168.1.130	1/0
C	192.168.1.64/27	FastEthernet0/0	---	0/0
S	192.168.1.96/27	---	192.168.1.130	1/0
C	192.168.1.128/27	Serial0/0	---	0/0

1.8. Balanceo

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

No se puede hacer ningún tipo de balanceo, los router no tienen ningún direccionamiento en el momento, solo se cuenta con un camino para llegar a un destino por lo tanto no es necesario hacer el análisis del balanceo.

1.9. Diagnóstico de Vecinos con CDP

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

1.9.1. Router MEDELLIN

```
MEDELLIN#show cdp neighbors detail
```

```
Device ID: S1
```

```
Entry address(es):
```

```
Platform: cisco 2960, Capabilities: Switch
```

```
Interface: FastEthernet0/0, Port ID (outgoing port): FastEthernet0/3
```

```
Holdtime: 129
```

Version :
Cisco IOS Software, C2960 Software (C2960-LANBASE-M), Version 12.2(25)FX,
RELEASE SOFTWARE (fc1)
Copyright (c) 1986-2005 by Cisco Systems, Inc.
Compiled Wed 12-Oct-05 22:05 by pt_team

advertisement version: 2
Duplex: full

Device ID: BOGOTA
Entry address(es):
IP address : 192.168.1.98
Platform: cisco C2600, Capabilities: Router
Interface: Serial0/0, Port ID (outgoing port): Serial0/0
Holdtime: 139

Version :
Cisco Internetwork Operating System Software
IOS (tm) C2600 Software (C2600-I-M), Version 12.2(28), RELEASE SOFTWARE (fc5)
Technical Support: <http://www.cisco.com/techsupport>
Copyright (c) 1986-2005 by cisco Systems, Inc.
Compiled Wed 27-Apr-04 19:01 by miwang

advertisement version: 2
Duplex: full
MEDELLIN#

1.9.2. Router BOGOTA

BOGOTA#show cdp neighbors detail

Device ID: CALI
Entry address(es):
IP address : 192.168.1.131
Platform: cisco C2600, Capabilities: Router
Interface: Serial0/1, Port ID (outgoing port): Serial0/0
Holdtime: 165

Version :
Cisco Internetwork Operating System Software
IOS (tm) C2600 Software (C2600-I-M), Version 12.2(28), RELEASE SOFTWARE (fc5)
Technical Support: <http://www.cisco.com/techsupport>

Copyright (c) 1986-2005 by cisco Systems, Inc.
Compiled Wed 27-Apr-04 19:01 by miwang

advertisement version: 2
Duplex: full

Device ID: MEDELLIN
Entry address(es):
IP address : 192.168.1.99
Platform: cisco C2600, Capabilities: Router
Interface: Serial0/0, Port ID (outgoing port): Serial0/0
Holdtime: 120

Version :
Cisco Internetwork Operating System Software
IOS (tm) C2600 Software (C2600-I-M), Version 12.2(28), RELEASE SOFTWARE (fc5)
Technical Support: <http://www.cisco.com/techsupport>
Copyright (c) 1986-2005 by cisco Systems, Inc.
Compiled Wed 27-Apr-04 19:01 by miwang

advertisement version: 2
Duplex: full

Device ID: S3
Entry address(es):
Platform: cisco 2960, Capabilities: Switch
Interface: FastEthernet0/0, Port ID (outgoing port): FastEthernet0/3
Holdtime: 139

Version :
Cisco IOS Software, C2960 Software (C2960-LANBASE-M), Version 12.2(25)FX,
RELEASE SOFTWARE (fc1)
Copyright (c) 1986-2005 by Cisco Systems, Inc.
Compiled Wed 12-Oct-05 22:05 by pt_team

advertisement version: 2
Duplex: full

BOGOTA#

1.9.3. Router CALI

CALI#show cdp neighbors detail

Device ID: S2
Entry address(es):
Platform: cisco 2960, Capabilities: Switch
Interface: FastEthernet0/0, Port ID (outgoing port): FastEthernet0/3
Holdtime: 124

Version :
Cisco IOS Software, C2960 Software (C2960-LANBASE-M), Version 12.2(25)FX,
RELEASE SOFTWARE (fc1)
Copyright (c) 1986-2005 by Cisco Systems, Inc.
Compiled Wed 12-Oct-05 22:05 by pt_team

advertisement version: 2
Duplex: full

Device ID: BOGOTA
Entry address(es):
IP address : 191.168.1.130
Platform: cisco C2600, Capabilities: Router
Interface: Serial0/0, Port ID (outgoing port): Serial0/1
Holdtime: 149

Version :
Cisco Internetwork Operating System Software
IOS (tm) C2600 Software (C2600-I-M), Version 12.2(28), RELEASE SOFTWARE (fc5)
Technical Support: <http://www.cisco.com/techsupport>
Copyright (c) 1986-2005 by cisco Systems, Inc.
Compiled Wed 27-Apr-04 19:01 by miwang

advertisement version: 2
Duplex: full

CALI#

1.10. Configuración IP Routes

1.10.1. Router MEDELLIN

```
MEDELLIN>enable
MEDELLIN#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
MEDELLIN(config)#ip route 192.168.1.0 255.255.255.224 192.168.1.98
MEDELLIN(config)#ip route 192.168.1.128 255.255.255.224 192.168.1.98
MEDELLIN(config)#ip route 192.168.1.64 255.255.255.224 192.168.1.98
MEDELLIN(config)#exit
MEDELLIN#
%SYS-5-CONFIG_I: Configured from console by console
```

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

Gateway of last resort is not set

```
192.168.1.0/27 is subnetted, 5 subnets
S 192.168.1.0 [1/0] via 192.168.1.98
C 192.168.1.32 is directly connected, FastEthernet0/0
S 192.168.1.64 [1/0] via 192.168.1.98
C 192.168.1.96 is directly connected, Serial0/0
S 192.168.1.128 [1/0] via 192.168.1.98
```

```
MEDELLIN#
```

1.10.2. Router BOGOTA

```
BOGOTA>enable
BOGOTA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
BOGOTA(config)#ip route 192.168.1.64 255.255.255.224 192.168.1.131
BOGOTA(config)#ip route 192.168.1.32 255.255.255.224 192.168.1.99
```

```
BOGOTA(config)#exit
BOGOTA#
%SYS-5-CONFIG_I: Configured from console by console
```

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

Gateway of last resort is not set

```
191.168.0.0/27 is subnetted, 1 subnets
C 191.168.1.128 is directly connected, Serial0/1
192.168.1.0/27 is subnetted, 3 subnets
C 192.168.1.0 is directly connected, FastEthernet0/0
S 192.168.1.32 [1/0] via 192.168.1.99
C 192.168.1.96 is directly connected, Serial0/0
```

```
BOGOTA#
```

1.10.3. Router CALI

```
CALI>enable
CALI#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
CALI(config)#ip route 192.168.1.0 255.255.255.224 192.168.1.130
CALI(config)#ip route 192.168.1.96 255.255.255.224 192.168.1.130
CALI(config)#ip route 192.168.1.32 255.255.255.224 192.168.1.130
CALI(config)#exit
CALI#
%SYS-5-CONFIG_I: Configured from console by consol0065

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

P - periodic downloaded static route

Gateway of last resort is not set

192.168.1.0/27 is subnetted, 5 subnets

S 192.168.1.0 [1/0] via 192.168.1.130

S 192.168.1.32 [1/0] via 192.168.1.130

C 192.168.1.64 is directly connected, FastEthernet0/0

S 192.168.1.96 [1/0] via 192.168.1.130

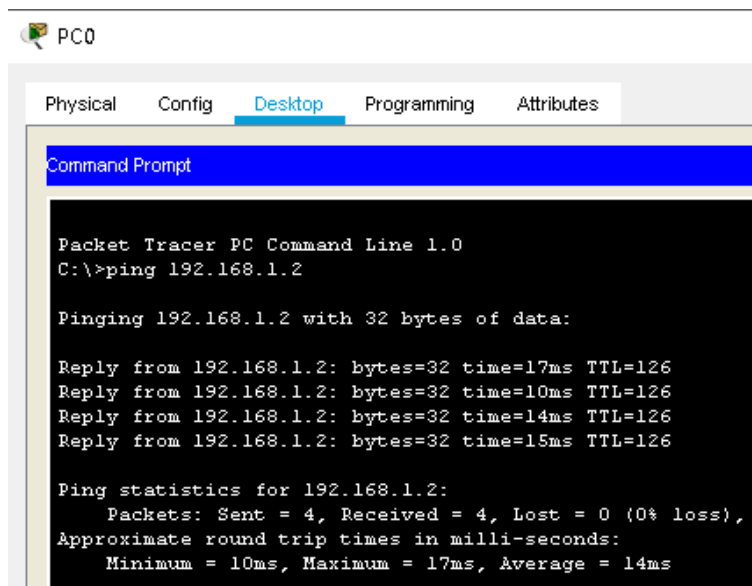
C 192.168.1.128 is directly connected, Serial0/0

CALI#

1.11. Pruebas de Conectividad

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

Figura 5. PC0 MEDELLIN A SW 1 BOGOTA



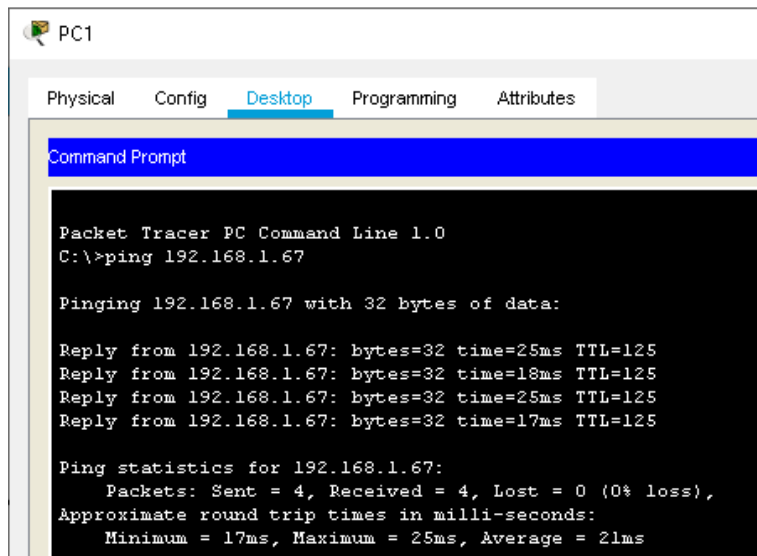
```
PC0
Physical Config Desktop Programming Attributes
Command Prompt
Packet Tracer PC Command Line 1.0
C:\>ping 192.168.1.2

Pinging 192.168.1.2 with 32 bytes of data:

Reply from 192.168.1.2: bytes=32 time=17ms TTL=126
Reply from 192.168.1.2: bytes=32 time=10ms TTL=126
Reply from 192.168.1.2: bytes=32 time=14ms TTL=126
Reply from 192.168.1.2: bytes=32 time=15ms TTL=126

Ping statistics for 192.168.1.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 10ms, Maximum = 17ms, Average = 14ms
```

Figura 6. PC1 MEDELLIN A PC3 CALI



The screenshot shows the Desktop tab of a Packet Tracer PC configuration window for PC1. A Command Prompt window is open, displaying the results of a ping command to 192.168.1.67. The output shows four successful replies with varying round-trip times and a 0% loss rate.

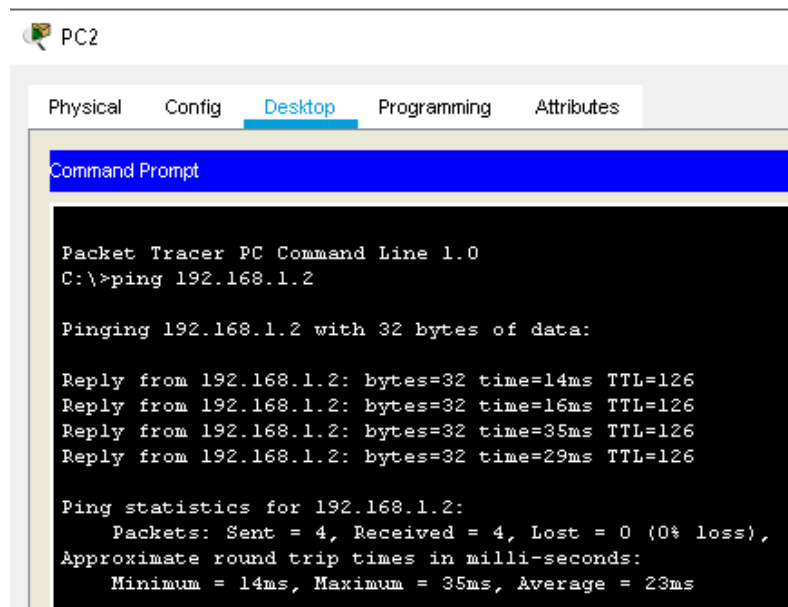
```
Packet Tracer PC Command Line 1.0
C:\>ping 192.168.1.67

Pinging 192.168.1.67 with 32 bytes of data:

Reply from 192.168.1.67: bytes=32 time=25ms TTL=125
Reply from 192.168.1.67: bytes=32 time=18ms TTL=125
Reply from 192.168.1.67: bytes=32 time=25ms TTL=125
Reply from 192.168.1.67: bytes=32 time=17ms TTL=125

Ping statistics for 192.168.1.67:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 17ms, Maximum = 25ms, Average = 21ms
```

Figura 7. PC2 CALI A SW 1 BOGOTA



The screenshot shows the Desktop tab of a Packet Tracer PC configuration window for PC2. A Command Prompt window is open, displaying the results of a ping command to 192.168.1.2. The output shows four successful replies with varying round-trip times and a 0% loss rate.

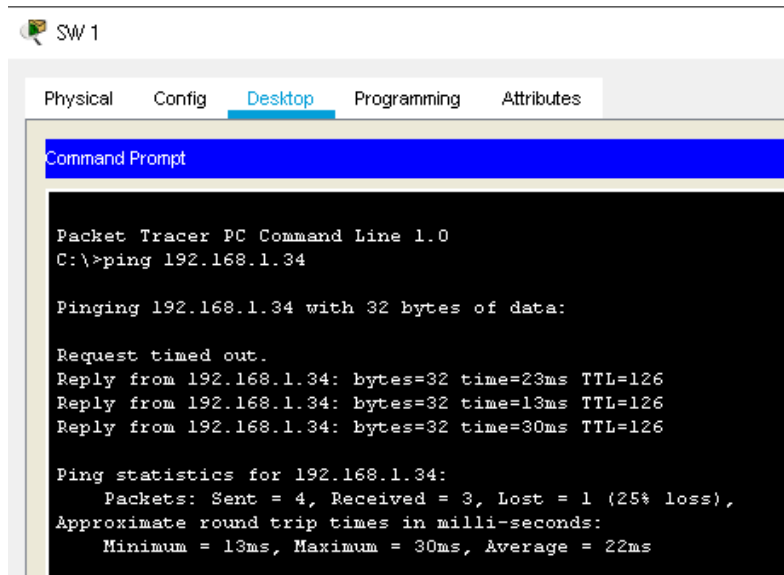
```
Packet Tracer PC Command Line 1.0
C:\>ping 192.168.1.2

Pinging 192.168.1.2 with 32 bytes of data:

Reply from 192.168.1.2: bytes=32 time=14ms TTL=126
Reply from 192.168.1.2: bytes=32 time=16ms TTL=126
Reply from 192.168.1.2: bytes=32 time=35ms TTL=126
Reply from 192.168.1.2: bytes=32 time=29ms TTL=126

Ping statistics for 192.168.1.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 14ms, Maximum = 35ms, Average = 23ms
```


Figura 8. SW1 BOGOTA A PC0 MEDELLIN



1.12. Parte 3: Configuración de Enrutamiento

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

1.12.1. Router MEDELLIN

```
MEDELLIN>enable
MEDELLIN#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
MEDELLIN(config)#route eigrp 200
MEDELLIN(config-router)#network 192.168.1.32 0.0.0.31
MEDELLIN(config-router)#network 192.168.1.96 0.0.0.31
MEDELLIN(config-router)#no auto-summary
```

1.12.2. Router BOGOTA

```
BOGOTA>enable
BOGOTA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
```

```
BOGOTA(config)#route eigrp 200
BOGOTA(config-router)#network 192.168.1.96 0.0.0.31
BOGOTA(config-router)#
%DUAL-5-NBRCHANGE: IP-EIGRP 200: Neighbor 192.168.1.99 (Serial0/0) is up: new
adjacency

BOGOTA(config-router)#network 192.168.1.128 0.0.0.31
BOGOTA(config-router)#network 192.168.1.1 0.0.0.31
BOGOTA(config-router)#no auto-summary
BOGOTA(config-router)#
%DUAL-5-NBRCHANGE: IP-EIGRP 200: Neighbor 192.168.1.99 (Serial0/0) resync:
summary configured
```

1.12.3. Router CALI

```
CALI>enable
CALI#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
CALI(config)#route eigrp 200
CALI(config-router)#network 192.168.1.128 0.0.0.31
CALI(config-router)#
%DUAL-5-NBRCHANGE: IP-EIGRP 200: Neighbor 192.168.1.130 (Serial0/0) is up: new
adjacency

CALI(config-router)#network 192.168.1.64 0.0.0.31
CALI(config-router)#no auto-summary
CALI(config-router)#
%DUAL-5-NBRCHANGE: IP-EIGRP 200: Neighbor 192.168.1.130 (Serial0/0) resync: summary
configured
```

Vecindad con los routers configurados con EIGRP

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

1.13. Comprobación de Tablas de enrutamiento

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

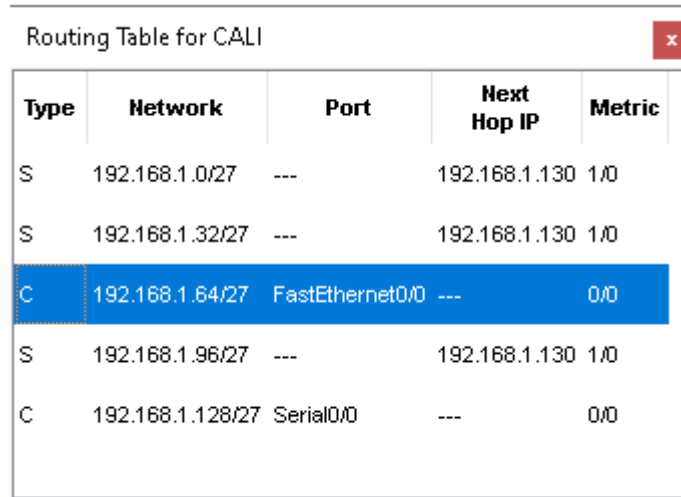
Tabla 5. Tabla Enrutamiento Medellin

Routing Table for MEDELLIN x				
Type	Network	Port	Next Hop IP	Metric
S	192.168.1.0/27	---	192.168.1.98	1/0
C	192.168.1.32/27	FastEthernet0/0	---	0/0
S	192.168.1.64/27	---	192.168.1.98	1/0
C	192.168.1.96/27	Serial0/0	---	0/0
S	192.168.1.128/27	---	192.168.1.98	1/0

Tabla 6. Tabla Enrutamiento Bogota

Routing Table for BOGOTA x				
Type	Network	Port	Next Hop IP	Metric
C	192.168.1.0/27	FastEthernet0/0	---	0/0
S	192.168.1.32/27	---	192.168.1.99	1/0
S	192.168.1.64/27	---	192.168.1.131	1/0
C	192.168.1.96/27	Serial0/0	---	0/0
C	192.168.1.128/27	Serial0/1	---	0/0

Tabla 7. Tabla Enrutamiento Cali



Type	Network	Port	Next Hop IP	Metric
S	192.168.1.0/27	---	192.168.1.130	1/0
S	192.168.1.32/27	---	192.168.1.130	1/0
C	192.168.1.64/27	FastEthernet0/0	---	0/0
S	192.168.1.96/27	---	192.168.1.130	1/0
C	192.168.1.128/27	Serial0/0	---	0/0

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.

1.14. 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:

1.14.1. Establecimiento de Conexiones Telnet

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

Figura 9. Conexión router Medellin router Bogota

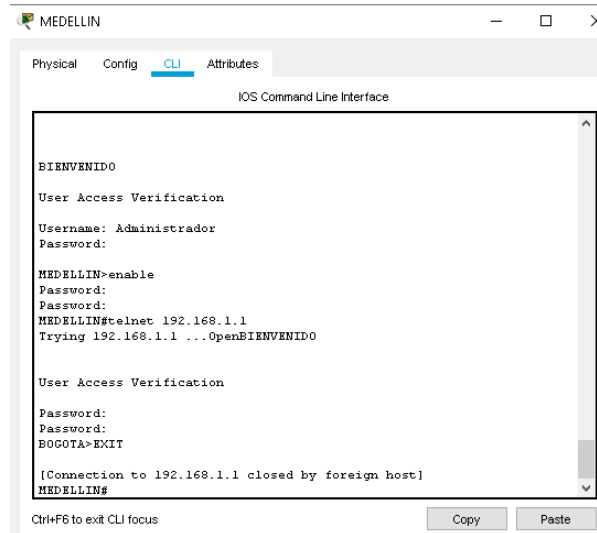


Figura 10. Conexión router Bogota router Medellin

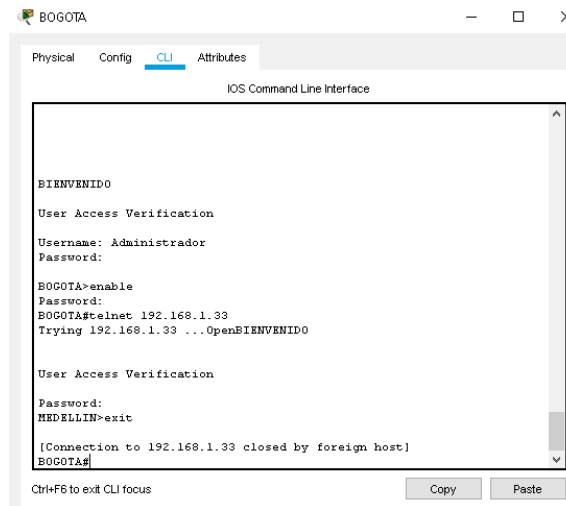


Figura 11. Conexión router Bogota router Cali

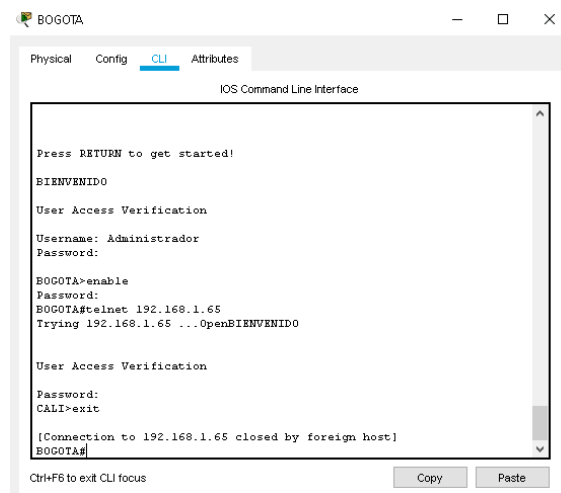


Figura 12. Conexión router Cali router Bogota

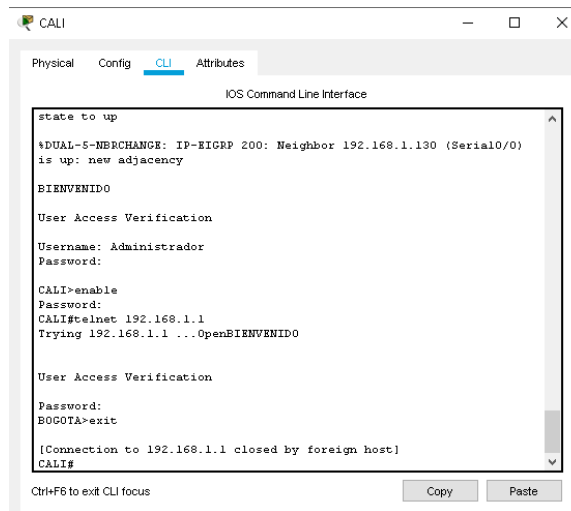
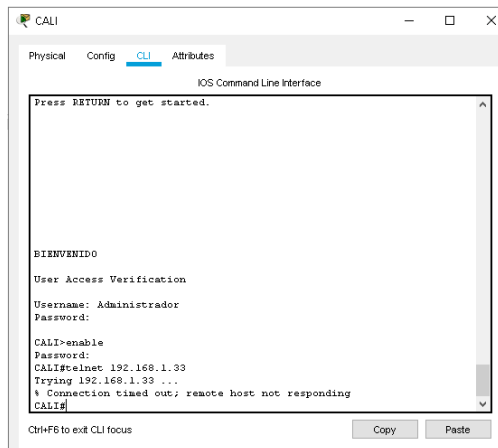


Figura 13. Conexión router Cali router Medellin

La conexión no se realizó.



Habilitamos las conexiones de Telnet en el Router MEDELLIN

1.14.2. Conectividad de Equipo de Bogota a PC's Cali-Medellin

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.

Username: Administrador

Password:

BOGOTA>enable

Password:

BOGOTA#configure terminal

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

BOGOTA(config)#access-list 1 deny 192.168.1.2 0.0.0.31

BOGOTA(config)#interface serial 0/0

BOGOTA(config-if)#ip access-group 1 out

BOGOTA(config-if)#exit

BOGOTA(config)#interface serial 0/1

BOGOTA(config-if)#ip access-group 1 out

BOGOTA(config-if)#exit

BOGOTA(config)#exit

BOGOTA#

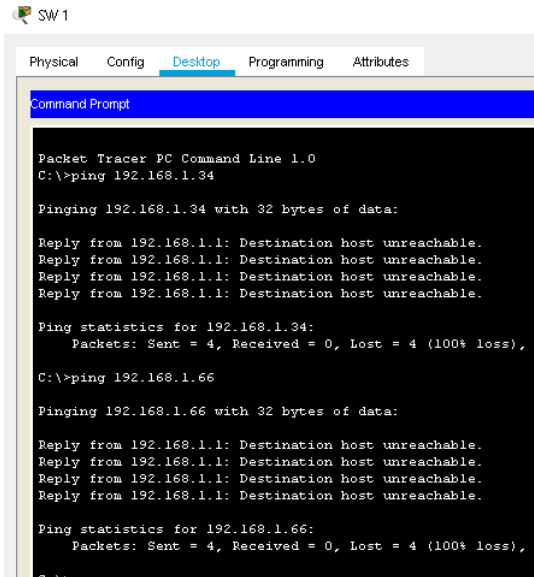
%SYS-5-CONFIG_I: Configured from console by console

BOGOTA#

Conectividad de SW 1 de BOGOTÁ a PC0 de MEDELLIN

Conectividad de SW 1 de BOGOTÁ a PC2 de CALI

Figura 14. Conectividad de Equipo de Bogota a PC's Cali-Medellin



```
SW 1
Physical Config Desktop Programming Attributes
Command Prompt
Packet Tracer PC Command Line 1.0
C:\>ping 192.168.1.34

Pinging 192.168.1.34 with 32 bytes of data:

Reply from 192.168.1.1: Destination host unreachable.
Reply from 192.168.1.1: Destination host unreachable.
Reply from 192.168.1.1: Destination host unreachable.
Reply from 192.168.1.1: Destination host unreachable.

Ping statistics for 192.168.1.34:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 192.168.1.66

Pinging 192.168.1.66 with 32 bytes of data:

Reply from 192.168.1.1: Destination host unreachable.
Reply from 192.168.1.1: Destination host unreachable.
Reply from 192.168.1.1: Destination host unreachable.
Reply from 192.168.1.1: Destination host unreachable.

Ping statistics for 192.168.1.66:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

a. 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.

1.15. Parte 5: Comprobación de la red instalada

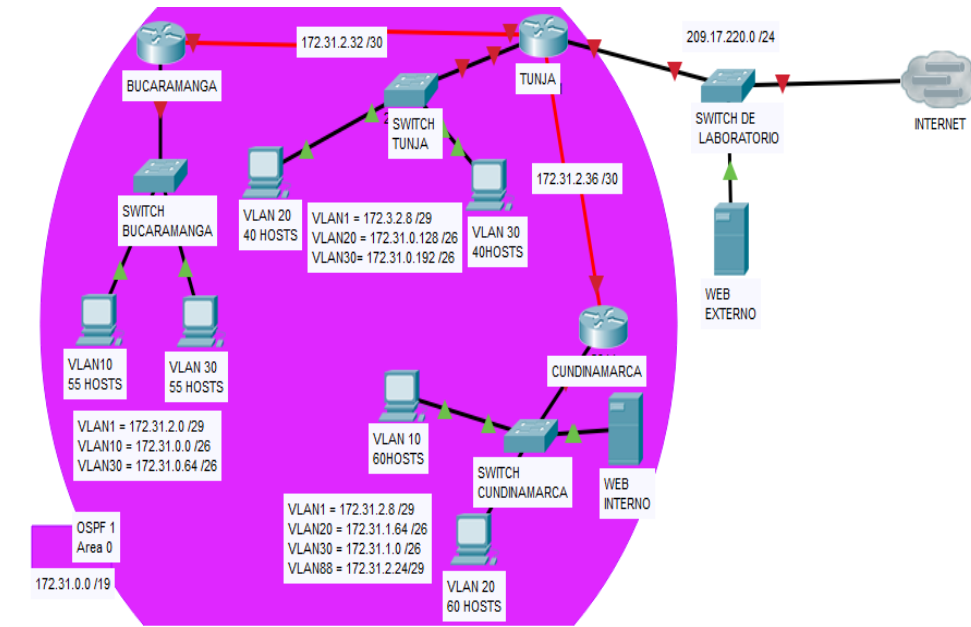
- a. Se debe probar que la configuración de las listas de acceso fue exitosa.
- b. Comprobar y Completar la siguiente tabla de condiciones de prueba para confirmar el óptimo funcionamiento de la red.

Tabla 8. Condiciones de Prueba

	ORIGEN	DESTINO	RESULTADO
TELNET	Router MEDELLIN	Router CALI	FALLO
	WS_1	Router BOGOTA	EXITOSO
	Servidor	Router CALI	EXITOSO
	Servidor	Router MEDELLIN	ÉXITOSO
TELNET	LAN del Router MEDELLIN	Router CALI	FALLO
	LAN del Router CALI	Router CALI	FALLO
	LAN del Router MEDELLIN	Router MEDELLIN	FALLO
	LAN del Router CALI	Router MEDELLIN	FALLO
PING	LAN del Router CALI	WS_1	FALLO
	LAN del Router MEDELLIN	WS_1	FALLO
	LAN del Router MEDELLIN	LAN del Router CALI	FALLO
PING	LAN del Router CALI	Servidor	FALLO
	LAN del Router MEDELLIN	Servidor	FALLO
	Servidor	LAN del Router MEDELLIN	ÉXITO
	Servidor	LAN del Router CALI	ÉXITO
	Router CALI	LAN del Router MEDELLIN	ÉXITO
	Router MEDELLIN	LAN del Router CALI	ÉXITO

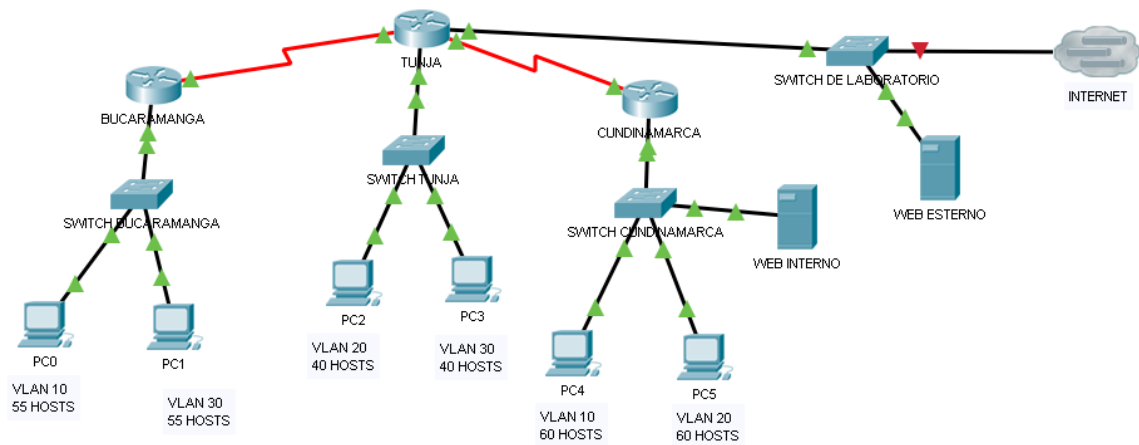
2. ESCENARIO 2

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.



2.1. Topología

Figura 15. Topología planteada



Desarrollo

Los siguientes son los requerimientos necesarios:

Todos los routers deberán tener la siguiente:

2.2. Configuración básica.

2.2.1. Router BUCARAMANGA

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname BUCARAMANGA
BUCARAMANGA(config)#no ip domain-lookup
BUCARAMANGA(config)#banner motd $SOLO USUARIOS AUTORIZADOS$
BUCARAMANGA(config)#enable secret Manzana2020
BUCARAMANGA(config)#line console 0
BUCARAMANGA(config-line)#password Manzana2019
BUCARAMANGA(config-line)#login
BUCARAMANGA(config-line)#logging synchronous
BUCARAMANGA(config-line)#line vty 0 15
BUCARAMANGA(config-line)#password Manzana2019
BUCARAMANGA(config-line)#login
BUCARAMANGA(config-line)#logging synchronous
BUCARAMANGA(config-line)#interface fastEthernet 0/0.1
BUCARAMANGA(config-subif)#encapsulation dot1q 1
BUCARAMANGA(config-subif)#ip address 172.31.2.1 255.255.255.248
BUCARAMANGA(config-subif)#interface fastEthernet 0/0.10
BUCARAMANGA(config-subif)#encapsulation dot1q 10
BUCARAMANGA(config-subif)#ip address 172.31.0.1 255.255.255.192
BUCARAMANGA(config-subif)#interface fastEthernet 0/0.30
BUCARAMANGA(config-subif)#encapsulation dot1q 30
BUCARAMANGA(config-subif)#ip address 172.31.0.65 255.255.255.192
BUCARAMANGA(config-subif)#interface fastEthernet 0/0
BUCARAMANGA(config-if)#no shutdown

BUCARAMANGA(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to
up

%LINK-5-CHANGED: Interface FastEthernet0/0.1, changed state to up
```

```

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.1, changed state
to up

%LINK-5-CHANGED: Interface FastEthernet0/0.10, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.10, changed state
to up

%LINK-5-CHANGED: Interface FastEthernet0/0.30, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.30, changed state
to up

BUCARAMANGA(config-if)#interface serial 0/0/0
BUCARAMANGA(config-if)#ip address 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)#router ospf 1
BUCARAMANGA(config-router)#network 172.31.0.0 0.0.0.63 area 0
BUCARAMANGA(config-router)#network 172.31.0.64 0.0.0.63 area 0
BUCARAMANGA(config-router)#network 172.31.2.0 0.0.0.7 area 0
BUCARAMANGA(config-router)#network 172.31.2.32 0.0.0.3 area 0
BUCARAMANGA(config-router)#end
BUCARAMANGA#
%SYS-5-CONFIG_I: Configured from console by console

BUCARAMANGA#

```

2.2.2. Router TUNJA

```

Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname TUNJA
TUNJA(config)#no ip domain-lookup
TUNJA(config)#banner motd $SOLO USUARIOS AUTORIZADOS$
TUNJA(config)#enable secret Manzana2020
TUNJA(config)#line console 0
TUNJA(config-line)#password Manzana2019
TUNJA(config-line)#login
TUNJA(config-line)#logging synchronous
TUNJA(config-line)#line vty 0 15

```

```
TUNJA(config-line)#password Manzana2019
TUNJA(config-line)#login
TUNJA(config-line)#logging synchronous
TUNJA(config-line)#interface fastEthernet 0/0.1
TUNJA(config-subif)#encapsulation dot1q 1
TUNJA(config-subif)#ip address 172.3.2.9 255.255.255.248
TUNJA(config-subif)#interface fastEthernet 0/0.20
TUNJA(config-subif)#encapsulation dot1q 20
TUNJA(config-subif)#ip address 172.31.0.129 255.255.255.192
TUNJA(config-subif)#interface fastEthernet 0/0.30
TUNJA(config-subif)#encapsulation dot1q 30
TUNJA(config-subif)#ip address 172.31.0.193 255.255.255.192
TUNJA(config-subif)#interface fastEthernet 0/0
TUNJA(config-if)#no shutdown

TUNJA(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to
up

%LINK-5-CHANGED: Interface FastEthernet0/0.1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.1, changed state
to up

%LINK-5-CHANGED: Interface FastEthernet0/0.20, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.20, changed state
to up

%LINK-5-CHANGED: Interface FastEthernet0/0.30, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.30, changed state
to up

TUNJA(config-if)#interface serial 0/0/0
TUNJA(config-if)#ip address 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

TUNJA(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up
```

```
TUNJA(config-if)#interface serial 0/0/1
TUNJA(config-if)#ip address 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)#interface fastEthernet 0/1
TUNJA(config-if)#ip address 209.165.220.1 255.255.255.0
TUNJA(config-if)#no shutdown
```

```
TUNJA(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up
```

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to
up
```

```
TUNJA(config-if)#router ospf 1
TUNJA(config-router)#network 172.3.2.8 0.0.0.7 area 0
TUNJA(config-router)#network 172.31.0.128 0.0.0.63 area 0
TUNJA(config-router)#network 172.31.0.192 0.0.0.63 area 0
TUNJA(config-router)#network 172.31.2.32 0.0.0.3 area 0
TUNJA(config-router)#
00:34:50: %OSPF-5-ADJCHG: Process 1, Nbr 172.31.2.34 on Serial0/0/0 from LOADING
to FULL, Loading Done
```

```
TUNJA(config-router)#network 172.31.2.36 0.0.0.3 area 0
TUNJA(config-router)#end
TUNJA#
%SYS-5-CONFIG_I: Configured from console by console
```

```
TUNJA#
```

2.2.3. Router CUNDINAMARCA

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname CUNDINAMARCA
CUNDINAMARCA(config)#no ip domain-lookup
CUNDINAMARCA(config)#banner motd $SOLO USUARIOS AUTORIZADOS$
CUNDINAMARCA(config)#enable secret Manzana2020
CUNDINAMARCA(config)#line console 0
CUNDINAMARCA(config-line)#password Manzana2019
CUNDINAMARCA(config-line)#login
```

```
CUNDINAMARCA(config-line)#logging synchronous
CUNDINAMARCA(config-line)#line vty 0 15
CUNDINAMARCA(config-line)#password Manzana2019
CUNDINAMARCA(config-line)#login
CUNDINAMARCA(config-line)#logging synchronous
CUNDINAMARCA(config-line)#interface fastEthernet 0/0.1
CUNDINAMARCA(config-subif)#encapsulation dot1q 1
CUNDINAMARCA(config-subif)#ip address 172.31.2.9 255.255.255.248
CUNDINAMARCA(config-subif)#interface fastEthernet 0/0.20
CUNDINAMARCA(config-subif)#encapsulation dot1q 20
CUNDINAMARCA(config-subif)#ip address 172.31.1.65 255.255.255.192
CUNDINAMARCA(config-subif)#interface fastEthernet 0/0.30
CUNDINAMARCA(config-subif)#encapsulation dot1q 30
CUNDINAMARCA(config-subif)#ip address 172.31.1.1 255.255.255.192
CUNDINAMARCA(config-subif)#interface fastEthernet 0/0.88
CUNDINAMARCA(config-subif)#encapsulation dot1q 88
CUNDINAMARCA(config-subif)#ip address 172.31.2.25 255.255.255.248
CUNDINAMARCA(config-subif)#interface fastEthernet 0/0
CUNDINAMARCA(config-if)#no shutdown
```

```
CUNDINAMARCA(config-if)#
```

```
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
```

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
```

```
%LINK-5-CHANGED: Interface FastEthernet0/0.1, changed state to up
```

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.1, changed state to up
```

```
%LINK-5-CHANGED: Interface FastEthernet0/0.20, changed state to up
```

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.20, changed state to up
```

```
%LINK-5-CHANGED: Interface FastEthernet0/0.30, changed state to up
```

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.30, changed state to up
```

```
%LINK-5-CHANGED: Interface FastEthernet0/0.88, changed state to up
```

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.88, changed state to up
```

```
CUNDINAMARCA(config-if)#interface serial 0/0/0
CUNDINAMARCA(config-if)#ip address 172.31.2.38 255.255.255.252
CUNDINAMARCA(config-if)#no shutdown
```

```
CUNDINAMARCA(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up
```

```
CUNDINAMARCA(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up
```

```
CUNDINAMARCA(config-if)#router ospf 1
CUNDINAMARCA(config-router)#network 172.31.1.0 0.0.0.63 area 0
CUNDINAMARCA(config-router)#network 172.31.1.64 0.0.0.63 area 0
CUNDINAMARCA(config-router)#network 172.31.2.8 0.0.0.7 area 0
CUNDINAMARCA(config-router)#network 172.31.2.24 0.0.0.7 area 0
CUNDINAMARCA(config-router)#network 172.31.2.36 0.0.0.3 area 0
CUNDINAMARCA(config-router)#end
CUNDINAMARCA#
%SYS-5-CONFIG_I: Configured from console by console
```

```
CUNDINAMARCA#
00:42:54: %OSPF-5-ADJCHG: Process 1, Nbr 209.165.220.1 on Serial0/0/0 from
LOADING to FULL, Loading Done
```

```
CUNDINAMARCA#
```

2.2.4. Switch BUCARAMANGA

```
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname SWITCHBUCARAMANGA
SWITCHBUCARAMANGA(config)#vlan 1
SWITCHBUCARAMANGA(config-vlan)#vlan 10
SWITCHBUCARAMANGA(config-vlan)#vlan 30
SWITCHBUCARAMANGA(config-vlan)#interface fastEthernet 0/20
SWITCHBUCARAMANGA(config-if)#switchport mode access
SWITCHBUCARAMANGA(config-if)#switchport access vlan 10
SWITCHBUCARAMANGA(config-if)#interface fastEthernet 0/24
SWITCHBUCARAMANGA(config-if)#switchport mode access
SWITCHBUCARAMANGA(config-if)#switchport access vlan 30
SWITCHBUCARAMANGA(config-if)#interface fastEthernet 0/1
```



```

SWITCHBUCARAMANGA(config-if)#switchport mode trunk
SWITCHBUCARAMANGA(config-if)#int vlan 1
SWITCHBUCARAMANGA(config-if)#ip address 172.31.2.3 255.255.255.248
SWITCHBUCARAMANGA(config-if)#no shutdown
SWITCHBUCARAMANGA(config-if)#ip default-gateway 172.31.2.1
SWITCHBUCARAMANGA(config)#
SWITCHBUCARAMANGA(config)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to
down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to
up

%LINK-5-CHANGED: Interface Vlan1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to up

SWITCHBUCARAMANGA(config)#

```

2.2.5. Switch TUNJA

```

Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname SWITCHTUNJA
SWITCHTUNJA(config)#vlan 1
SWITCHTUNJA(config-vlan)#vlan 20
SWITCHTUNJA(config-vlan)#vlan 30
SWITCHTUNJA(config-vlan)#interface fastEthernet 0/20
SWITCHTUNJA(config-if)#switchport mode access
SWITCHTUNJA(config-if)#switchport access vlan 20
SWITCHTUNJA(config-if)#interface fastEthernet 0/24
SWITCHTUNJA(config-if)#switchport mode access
SWITCHTUNJA(config-if)#switchport access vlan 30
SWITCHTUNJA(config-if)#interface fastEthernet 0/1
SWITCHTUNJA(config-if)#switchport mode trunk
SWITCHTUNJA(config-if)#
SWITCHTUNJA(config-if)#int vlan 1
SWITCHTUNJA(config-if)#ip address 172.3.2.11 255.255.255.248
SWITCHTUNJA(config-if)#no shutdown
SWITCHTUNJA(config-if)#
SWITCHTUNJA(config-if)#ip default-gateway 172.3.2.9

```

```
SWITCHTUNJA(config)#
SWITCHTUNJA(config)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to
down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to
up

%LINK-5-CHANGED: Interface Vlan1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to up

SWITCHTUNJA(config)#
```

2.2.6. Switch CUNDINAMARCA

```
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname SWITCHCUNDINAMARCA
SWITCHCUNDINAMARCA(config)#vlan 1
SWITCHCUNDINAMARCA(config-vlan)#vlan 20
SWITCHCUNDINAMARCA(config-vlan)#vlan 30
SWITCHCUNDINAMARCA(config-vlan)#vlan 88
SWITCHCUNDINAMARCA(config-vlan)#exit
SWITCHCUNDINAMARCA(config)#interface fastEthernet 0/20
SWITCHCUNDINAMARCA(config-if)#switchport mode access
SWITCHCUNDINAMARCA(config-if)#switchport access vlan 20
SWITCHCUNDINAMARCA(config-if)#interface fastEthernet 0/24
SWITCHCUNDINAMARCA(config-if)#switchport mode access
SWITCHCUNDINAMARCA(config-if)#switchport access vlan 30
SWITCHCUNDINAMARCA(config-if)#interface fastEthernet 0/10
SWITCHCUNDINAMARCA(config-if)#switchport mode access
SWITCHCUNDINAMARCA(config-if)#switchport access vlan 88
SWITCHCUNDINAMARCA(config-if)#interface fastEthernet 0/1
SWITCHCUNDINAMARCA(config-if)#switchport mode trunk
SWITCHCUNDINAMARCA(config-if)#
SWITCHCUNDINAMARCA(config-if)#int vlan 1
SWITCHCUNDINAMARCA(config-if)#ip address 172.31.2.11 255.255.255.248
SWITCHCUNDINAMARCA(config-if)#no shutdown
SWITCHCUNDINAMARCA(config-if)#
SWITCHCUNDINAMARCA(config-if)#ip default-gateway 172.31.2.9
```

```
SWITCHCUNDINAMARCA(config)#
SWITCHCUNDINAMARCA(config)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to
down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to
up

%LINK-5-CHANGED: Interface Vlan1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to up

SWITCHCUNDINAMARCA(config)#
```

2.3. Autenticación local con AAA

2.3.1. Router BUCARAMANGA

```
BUCARAMANGA(config)#line console 0
BUCARAMANGA(config-line)#username Administrador secret Manzana2020
BUCARAMANGA(config)#aaa new-model
BUCARAMANGA(config)#aaa authentication login AUTH local
BUCARAMANGA(config)#line console 0
BUCARAMANGA(config-line)#login authentication AUTH
BUCARAMANGA(config-line)#line vty 0 15
BUCARAMANGA(config-line)#login authentication AUTH
```

2.3.2. Router TUNJA

```
TUNJA(config)#line console 0
TUNJA(config-line)#username Administrador secret Manzana2020
TUNJA(config)#aaa new-model
TUNJA(config)#aaa authentication login AUTH local
TUNJA(config)#line console 0
TUNJA(config-line)#login authentication AUTH
TUNJA(config-line)#line vty 0 15
TUNJA(config-line)#login authentication AUTH
```

2.3.3. Router CUNDINAMARCA

```
CUNDINAMARCA(config)#line console 0
CUNDINAMARCA(config-line)#username administrador secret Manzana2020
CUNDINAMARCA(config)#aaa new-model
CUNDINAMARCA(config)#aaa authentication login AUTH local
CUNDINAMARCA(config)#line console 0
CUNDINAMARCA(config-line)#login authentication AUTH
CUNDINAMARCA(config-line)#line vty 0 15
CUNDINAMARCA(config-line)#login authentication AUTH
```

2.4. Cifrado de contraseñas

```
BUCARAMANGA(config)#service password-encryption
TUNJA(config)#service password-encryption
CUNDINAMARCA(config)#service password-encryption
```

2.5. Máximo de internos para acceder al router

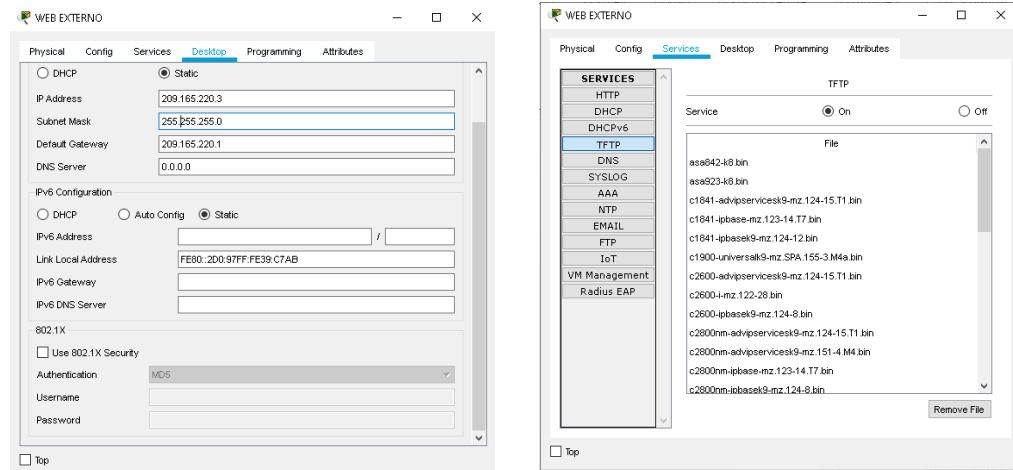
```
BUCARAMANGA(config-line)#login block-for 5 attempts 4 within 60
TUNJA(config-line)#login block-for 5 attempts 4 within 60
CUNDINAMARCA(config-line)#login block-for 5 attempts 4 within 60
```

2.6. Máximo tiempo de acceso al detectar ataques

```
BUCARAMANGA(config-line)#login block-for 5 attempts 4 within 60
TUNJA(config-line)#login block-for 5 attempts 4 within 60
CUNDINAMARCA(config-line)#login block-for 5 attempts 4 within 60
```

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

Figura 16. Servidor TFTP



2.8. El DHCP proporciona solo direcciones a los hosts de Bucaramanga y Cundinamarca

2.8.1. Router TUNJA

```
TUNJA(config)#ip dhcp excluded-address 172.31.0.1
TUNJA(config)#ip dhcp excluded-address 172.31.0.65
TUNJA(config)#ip dhcp excluded-address 172.31.1.65
TUNJA(config)#ip dhcp excluded-address 172.31.1.1
TUNJA(config)#ip dhcp pool V10B
TUNJA(dhcp-config)#network 172.31.0.0 255.255.255.192
TUNJA(dhcp-config)#default-router 172.31.0.1
TUNJA(dhcp-config)#dns-server 172.31.2.28
TUNJA(dhcp-config)#ip dhcp pool V30B
TUNJA(dhcp-config)#network 172.31.0.64 255.255.255.192
TUNJA(dhcp-config)#default-router 172.31.0.65
TUNJA(dhcp-config)#dns-server 172.31.2.28
TUNJA(dhcp-config)#ip dhcp pool V20C
TUNJA(dhcp-config)#network 172.31.1.64 255.255.255.192
TUNJA(dhcp-config)#default-router 172.31.1.65
TUNJA(dhcp-config)#dns-server 172.31.2.28
TUNJA(dhcp-config)#ip dhcp pool V30C
```

```
TUNJA(dhcp-config)#network 172.31.1.0 255.255.255.192
TUNJA(dhcp-config)#default-router 172.31.1.1
TUNJA(dhcp-config)#dns-server 172.31.2.28
TUNJA(dhcp-config)#
```

2.8.2. Router BUCARAMANGA

```
BUCARAMANGA(config)#interface fastEthernet 0/0.10
BUCARAMANGA(config-subif)#ip helper-address 172.31.2.33
BUCARAMANGA(config-subif)#interface fastEthernet 0/0.30
BUCARAMANGA(config-subif)#ip helper-address 172.31.2.33
BUCARAMANGA(config-subif)#end
BUCARAMANGA#
BUCARAMANGA#
%SYS-5-CONFIG_I: Configured from console by console

BUCARAMANGA#
```

2.8.3. Router CUNDINAMARCA

```
CUNDINAMARCA(config)#interface fastEthernet 0/0.20
CUNDINAMARCA(config-subif)#ip helper-address 172.31.2.37
CUNDINAMARCA(config-subif)#interface fastEthernet 0/0.30
CUNDINAMARCA(config-subif)#ip helper-address 172.31.2.37
CUNDINAMARCA(config-subif)#end
CUNDINAMARCA#
%SYS-5-CONFIG_I: Configured from console by console

CUNDINAMARCA#
```

Figura 17. PC's de BUCARAMANGA

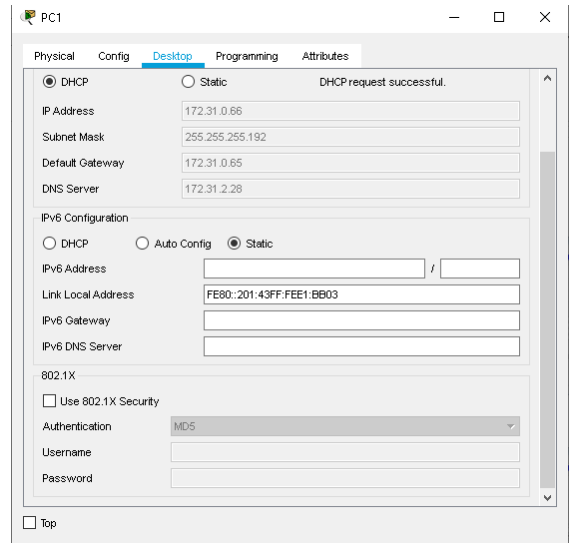
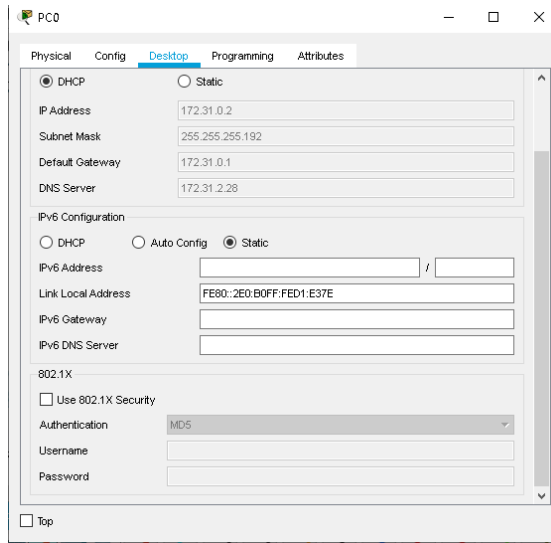
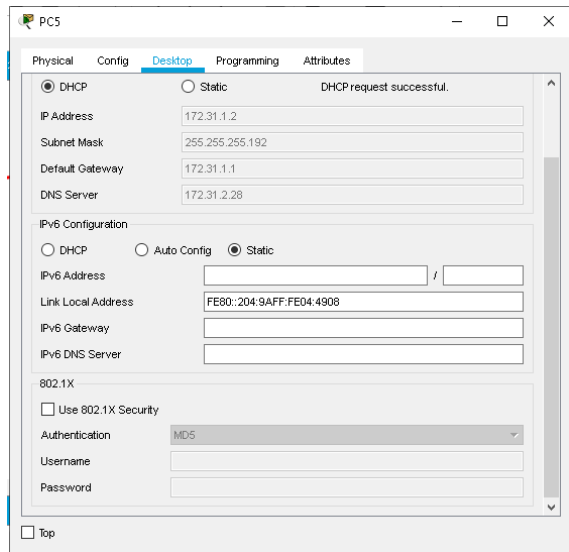
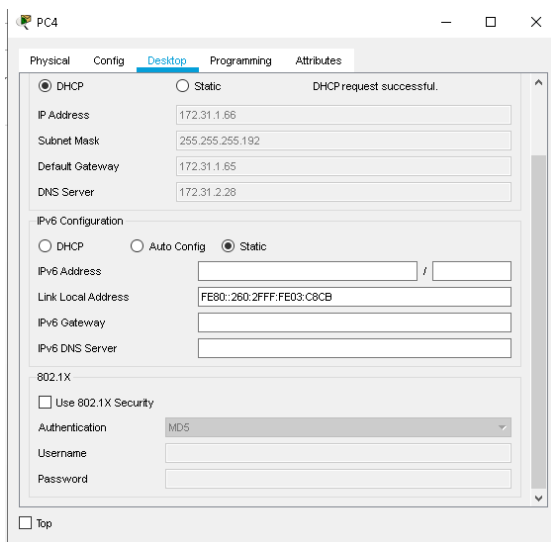


Figura 18. PC's CUNDINAMARCA



2.9. El web server tiene NAT estático y el resto de los equipos de la topología emplean NAT de sobrecarga (PAT).

2.9.1. Router TUNJA

```
TUNJA(dhcp-config)#ip nat inside source static 172.31.2.28 209.165.220.4
TUNJA(config)#access-list 1 permit 172.0.0.0 0.255.255.255
TUNJA(config)#ip nat inside source list 1 interface fastEthernet 0/1 overload
TUNJA(config)#interface fastEthernet 0/1
TUNJA(config-if)#ip nat outside
TUNJA(config-if)#interface fastEthernet 0/0.1
TUNJA(config-subif)#ip nat inside
TUNJA(config-subif)#interface fastEthernet 0/0.20
TUNJA(config-subif)#ip nat inside
TUNJA(config-subif)#interface fastEthernet 0/0.30
TUNJA(config-subif)#ip nat inside
TUNJA(config-subif)#interface serial 0/0/0
TUNJA(config-if)#ip nat inside
TUNJA(config-if)#interface serial 0/0/1
TUNJA(config-if)#ip nat inside
TUNJA(config-if)#exit
TUNJA(config)#ip route 0.0.0.0 0.0.0.0 209.165.220.3
TUNJA(config)#router ospf 1
TUNJA(config-router)#default-information originate
TUNJA(config-router)#
```

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

Gateway of last resort is 209.165.220.3 to network 0.0.0.0

```
172.3.0.0/29 is subnetted, 1 subnets
C 172.3.2.8 is directly connected, FastEthernet0/0.1
172.31.0.0/16 is variably subnetted, 11 subnets, 3 masks
O 172.31.0.0/26 [110/65] via 172.31.2.34, 00:31:06, Serial0/0/0
O 172.31.0.64/26 [110/65] via 172.31.2.34, 00:31:06, Serial0/0/0
```



```
C 172.31.0.128/26 is directly connected, FastEthernet0/0.20
C 172.31.0.192/26 is directly connected, FastEthernet0/0.30
O 172.31.1.0/26 [110/65] via 172.31.2.38, 00:31:06, Serial0/0/1
O 172.31.1.64/26 [110/65] via 172.31.2.38, 00:31:06, Serial0/0/1
O 172.31.2.0/29 [110/65] via 172.31.2.34, 00:31:06, Serial0/0/0
O 172.31.2.8/29 [110/65] via 172.31.2.38, 00:31:06, Serial0/0/1
O 172.31.2.24/29 [110/65] via 172.31.2.38, 00:31:06, Serial0/0/1
C 172.31.2.32/30 is directly connected, Serial0/0/0
C 172.31.2.36/30 is directly connected, Serial0/0/1
C 209.165.220.0/24 is directly connected, FastEthernet0/1
S* 0.0.0.0/0 [1/0] via 209.165.220.3
```

TUNJA#

2.9.2. Router BUCARAMANGA

```
BUCARAMANGA#show ip route
```

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

```
Gateway of last resort is 172.31.2.33 to network 0.0.0.0
```

```
172.3.0.0/29 is subnetted, 1 subnets
O 172.3.2.8 [110/65] via 172.31.2.33, 00:33:09, Serial0/0/0
172.31.0.0/16 is variably subnetted, 11 subnets, 3 masks
C 172.31.0.0/26 is directly connected, FastEthernet0/0.10
C 172.31.0.64/26 is directly connected, FastEthernet0/0.30
O 172.31.0.128/26 [110/65] via 172.31.2.33, 00:33:09, Serial0/0/0
O 172.31.0.192/26 [110/65] via 172.31.2.33, 00:33:09, Serial0/0/0
O 172.31.1.0/26 [110/129] via 172.31.2.33, 00:32:59, Serial0/0/0
O 172.31.1.64/26 [110/129] via 172.31.2.33, 00:32:59, Serial0/0/0
C 172.31.2.0/29 is directly connected, FastEthernet0/0.1
O 172.31.2.8/29 [110/129] via 172.31.2.33, 00:32:59, Serial0/0/0
O 172.31.2.24/29 [110/129] via 172.31.2.33, 00:32:59, Serial0/0/0
C 172.31.2.32/30 is directly connected, Serial0/0/0
O 172.31.2.36/30 [110/128] via 172.31.2.33, 00:33:09, Serial0/0/0
O*E2 0.0.0.0/0 [110/1] via 172.31.2.33, 00:02:24, Serial0/0/0
```

BUCARAMANGA#

2.9.3. Router CUNDINAMARCA

```
CUNDINAMARCA>enable
```

```
Password:
```

```
CUNDINAMARCA#show ip route
```

```
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
```

```
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
```

```
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
```

```
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
```

```
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
```

```
* - candidate default, U - per-user static route, o - ODR
```

```
P - periodic downloaded static route
```

```
Gateway of last resort is 172.31.2.37 to network 0.0.0.0
```

```
172.3.0.0/29 is subnetted, 1 subnets
```

```
O 172.3.2.8 [110/65] via 172.31.2.37, 00:34:32, Serial0/0/0
```

```
172.31.0.0/16 is variably subnetted, 11 subnets, 3 masks
```

```
O 172.31.0.0/26 [110/129] via 172.31.2.37, 00:34:32, Serial0/0/0
```

```
O 172.31.0.64/26 [110/129] via 172.31.2.37, 00:34:32, Serial0/0/0
```

```
O 172.31.0.128/26 [110/65] via 172.31.2.37, 00:34:32, Serial0/0/0
```

```
O 172.31.0.192/26 [110/65] via 172.31.2.37, 00:34:32, Serial0/0/0
```

```
C 172.31.1.0/26 is directly connected, FastEthernet0/0.30
```

```
C 172.31.1.64/26 is directly connected, FastEthernet0/0.20
```

```
O 172.31.2.0/29 [110/129] via 172.31.2.37, 00:34:32, Serial0/0/0
```

```
C 172.31.2.8/29 is directly connected, FastEthernet0/0.1
```

```
C 172.31.2.24/29 is directly connected, FastEthernet0/0.88
```

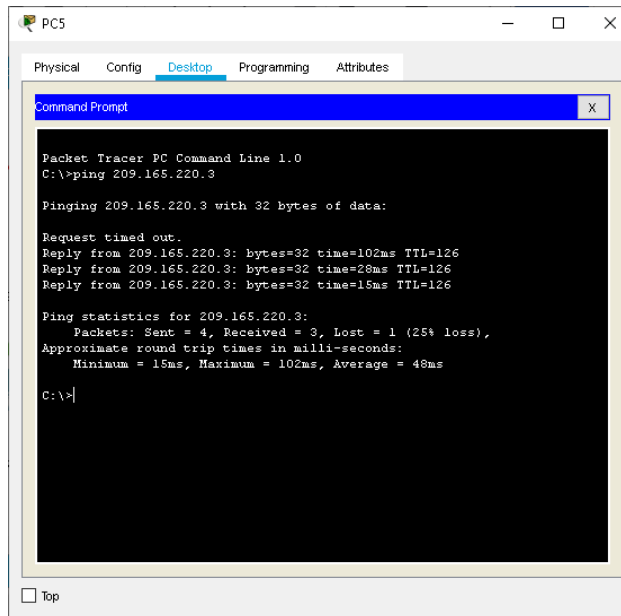
```
O 172.31.2.32/30 [110/128] via 172.31.2.37, 00:34:32, Serial0/0/0
```

```
C 172.31.2.36/30 is directly connected, Serial0/0/0
```

```
O*E2 0.0.0.0/0 [110/1] via 172.31.2.37, 00:03:47, Serial0/0/0
```

```
CUNDINAMARCA#
```

Figura 19. Conectividad de PC5 CUNDINAMARCA al WEB EXTERNO



```
TUNJA#show ip nat translation
Pro Inside global Inside local Outside local Outside global
--- 209.165.220.4 172.31.2.28 --- ---
```

```
TUNJA#
```

```
TUNJA#show ip nat translation
Pro Inside global Inside local Outside local Outside global
icmp 209.165.220.1:1 172.31.1.2:1 209.165.220.3:1 209.165.220.3:1
icmp 209.165.220.1:2 172.31.1.2:2 209.165.220.3:2 209.165.220.3:2
icmp 209.165.220.1:3 172.31.1.2:3 209.165.220.3:3 209.165.220.3:3
icmp 209.165.220.1:4 172.31.1.2:4 209.165.220.3:4 209.165.220.3:4
--- 209.165.220.4 172.31.2.28 --- ---
```

```
TUNJA#
```

2.10. Autenticación del enrutamiento

2.10.1. Router BUCARAMANGA

```
BUCARAMANGA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
BUCARAMANGA(config)#interface serial 0/0/0
```

```
BUCARAMANGA(config-if)#ip ospf authentication message-digest
BUCARAMANGA(config-if)#ip ospf message-digest-key 1 md5 Manzana2019
BUCARAMANGA(config-if)#
00:48:10: %OSPF-5-ADJCHG: Process 1, Nbr 209.165.220.1 on Serial0/0/0 from FULL to
DOWN, Neighbor Down: Dead timer expired

00:48:10: %OSPF-5-ADJCHG: Process 1, Nbr 209.165.220.1 on Serial0/0/0 from FULL to
DOWN, Neighbor Down: Interface down or detached

BUCARAMANGA(config-if)#
```

2.10.2. Router CUNDINAMARCA

```
CUNDINAMARCA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
CUNDINAMARCA(config)#interface serial 0/0/0
CUNDINAMARCA(config-if)#ip ospf authentication message-digest
CUNDINAMARCA(config-if)#ip ospf message-digest-key 1 md5 Manzana2019
CUNDINAMARCA(config-if)#
00:53:10: %OSPF-5-ADJCHG: Process 1, Nbr 209.165.220.1 on Serial0/0/0 from FULL to
DOWN, Neighbor Down: Dead timer expired

00:53:10: %OSPF-5-ADJCHG: Process 1, Nbr 209.165.220.1 on Serial0/0/0 from FULL to
DOWN, Neighbor Down: Interface down or detached

CUNDINAMARCA(config-if)#
```

2.10.3. Router TUNJA

```
TUNJA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
TUNJA(config)#interfac serial 0/0/0
TUNJA(config-if)#ip ospf authentication message-digest
TUNJA(config-if)#ip ospf message-digest-key 1 md5 Manzana2019
TUNJA(config-if)#interface serial 0/0/1
00:57:44: %OSPF-5-ADJCHG: Process 1, Nbr 172.31.2.34 on Serial0/0/0 from LOADING
to FULL, Loading Done

TUNJA(config-if)#interface serial 0/0/1
```

```
TUNJA(config-if)#ip ospf authentication message-digest
TUNJA(config-if)#ip ospf message-digest-key 1 md5 Manzana2019
TUNJA(config-if)#
00:58:21: %OSPF-5-ADJCHG: Process 1, Nbr 172.31.2.38 on Serial0/0/1 from LOADING
to FULL, Loading Done

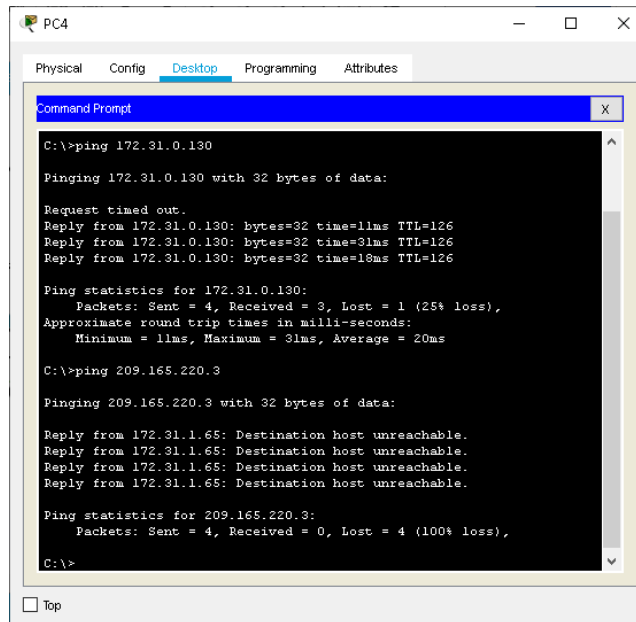
TUNJA(config-if)#
```

2.11. Listas de control de acceso

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

```
CUNDINAMARCA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
CUNDINAMARCA(config)#access-list 111 deny ip 172.31.1.64 0.0.0.63 209.165.220.0
0.0.0.255
CUNDINAMARCA(config)#access-list 111 permit ip any any
CUNDINAMARCA(config)#interface fastEthernet 0/0.20
CUNDINAMARCA(config-subif)#ip access-group 111 in
CUNDINAMARCA(config-subif)#
```

Figura 20. Acceso de PC CUNDINAMARCA a Red TUNJA, no a Internet



2.11.2. Los hosts de VLAN 10 en Cundinamarca si acceden a internet y no a la red interna de Tunja

```
CUNDINAMARCA(config)#access-list 112 permit ip 172.31.1.0 0.0.0.63 209.165.220.0 0.0.0.255
```

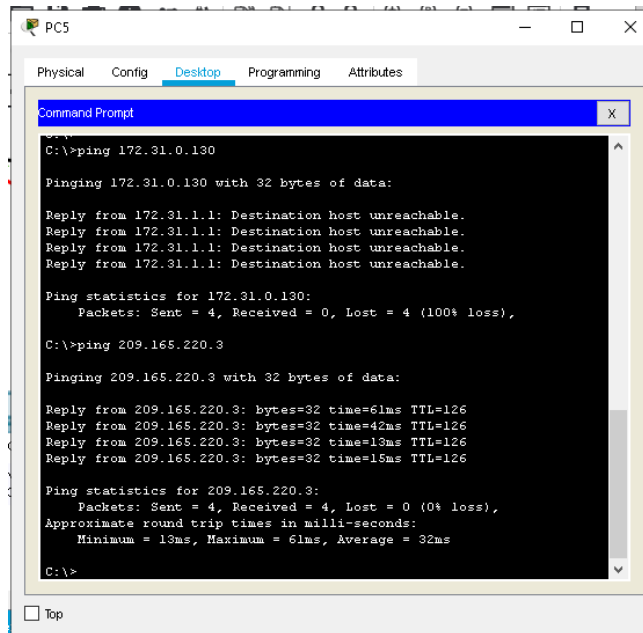
```
CUNDINAMARCA(config)#access-list 112 deny ip any any
```

```
CUNDINAMARCA(config)#interface fastEthernet 0/0.30
```

```
CUNDINAMARCA(config-subif)#ip access-group 112 in
```

```
CUNDINAMARCA(config-subif)#
```

Figura 21. Acceso de PC CUNDINAMARCA a Internet y no a Red TUNJA



2.11.3. Los hosts de VLAN 30 en Tunja solo acceden a servidores web y ftp de internet

TUNJA#configure terminal

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

```
TUNJA(config)#access-list 111 permit tcp 172.31.0.192 0.0.0.63 209.165.220.0 0.0.0.255 eq 80
```

```
TUNJA(config)#access-list 111 permit tcp 172.31.0.192 0.0.0.63 209.165.220.0 0.0.0.255 eq 21
```

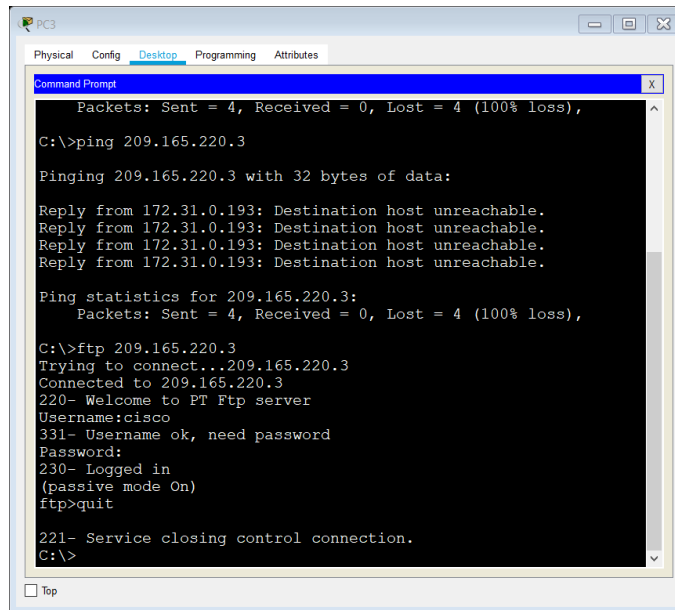
```
TUNJA(config)#access-list 111 permit tcp 172.31.0.192 0.0.0.63 209.165.220.0 0.0.0.255 eq 20
```

```
TUNJA(config)#interface fastEthernet 0/0.30
```

```
TUNJA(config-subif)#ip access-group 111 in
```

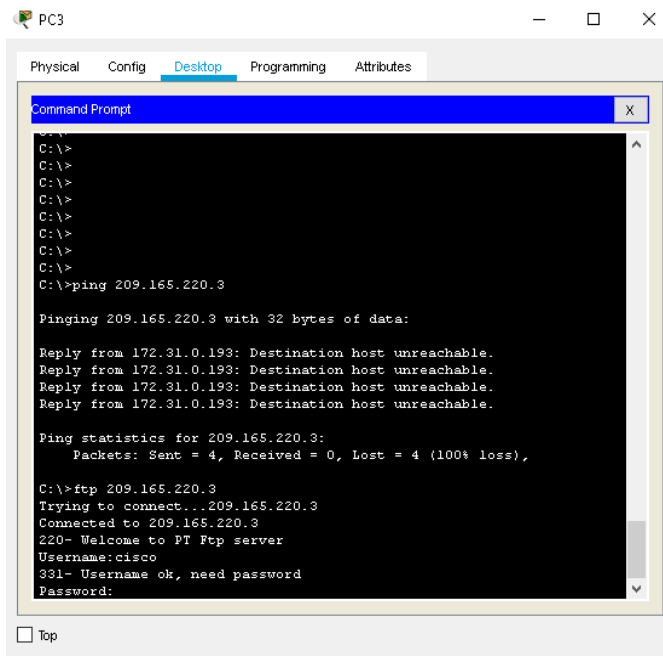
```
TUNJA(config-subif)#
```

Figura 22. Acceso de PC TUNJA a Servidor Web



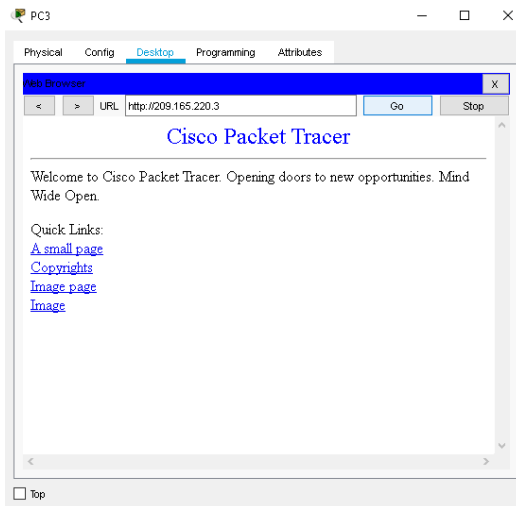
```
PC3
Physical Config Desktop Programming Attributes
Command Prompt
Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>ping 209.165.220.3
Pinging 209.165.220.3 with 32 bytes of data:
Reply from 172.31.0.193: Destination host unreachable.
Reply from 172.31.0.193: Destination host unreachable.
Reply from 172.31.0.193: Destination host unreachable.
Reply from 172.31.0.193: Destination host unreachable.
Ping statistics for 209.165.220.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>ftp 209.165.220.3
Trying to connect...209.165.220.3
Connected to 209.165.220.3
220- Welcome to PT Ftp server
Username:cisco
331- Username ok, need password
Password:
230- Logged in
(passive mode On)
ftp>quit
221- Service closing control connection.
C:\>
```

Figura 23. Acceso de PC TUNJA a Servidor Web



```
PC3
Physical Config Desktop Programming Attributes
Command Prompt
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>ping 209.165.220.3
Pinging 209.165.220.3 with 32 bytes of data:
Reply from 172.31.0.193: Destination host unreachable.
Reply from 172.31.0.193: Destination host unreachable.
Reply from 172.31.0.193: Destination host unreachable.
Reply from 172.31.0.193: Destination host unreachable.
Ping statistics for 209.165.220.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>ftp 209.165.220.3
Trying to connect...209.165.220.3
Connected to 209.165.220.3
220- Welcome to PT Ftp server
Username:cisco
331- Username ok, need password
Password:
```

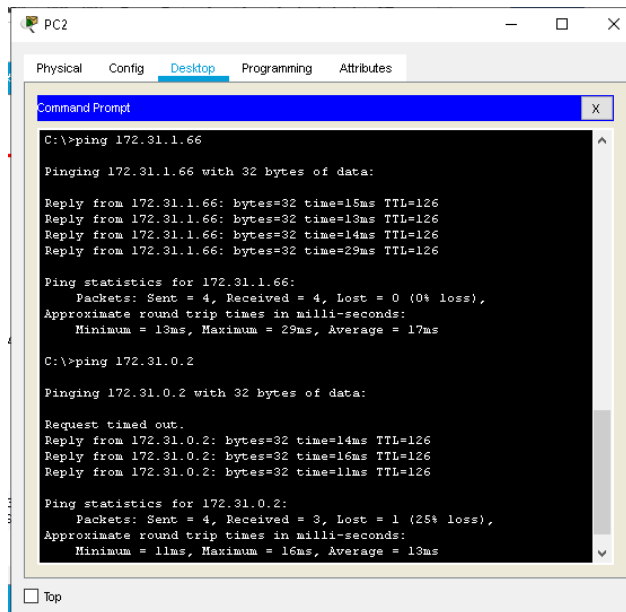

Figura 24. Acceso de PC TUNJA a Servidor FTP de Internet



2.11.4. Los hosts de VLAN 20 en Tunja solo acceden a la VLAN 20 de Cundinamarca y VLAN 10 de Bucaramanga

```
TUNJA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
TUNJA(config)#access-list 112 permit ip 172.31.0.128 0.0.0.63 172.31.1.64 0.0.0.63
TUNJA(config)#access-list 112 permit ip 172.31.0.128 0.0.0.63 172.31.0.0 0.0.0.63
TUNJA(config)#interface fastEthernet 0/0.20
TUNJA(config-subif)#ip access-group 112 in
TUNJA(config-subif)#
```

Figura 25. Acceso de PC TUNJA a PC'S de CUNDINAMARCA y BUCARAMANGA



```
C:\>ping 172.31.1.66

Pinging 172.31.1.66 with 32 bytes of data:

Reply from 172.31.1.66: bytes=32 time=15ms TTL=126
Reply from 172.31.1.66: bytes=32 time=13ms TTL=126
Reply from 172.31.1.66: bytes=32 time=14ms TTL=126
Reply from 172.31.1.66: bytes=32 time=29ms TTL=126

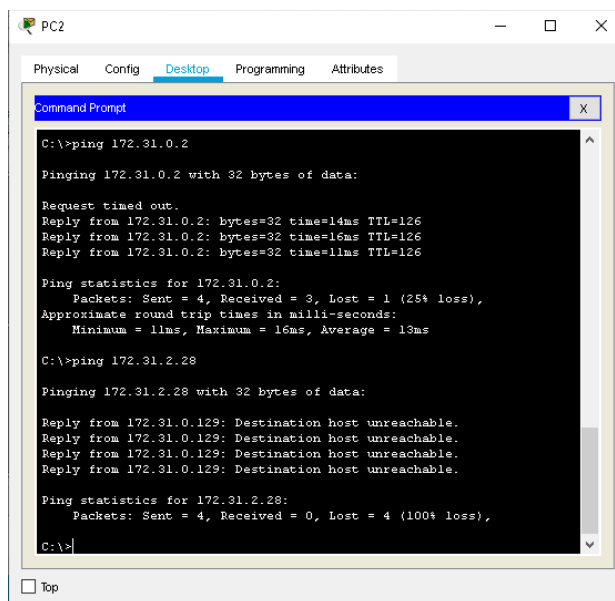
Ping statistics for 172.31.1.66:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 13ms, Maximum = 29ms, Average = 17ms

C:\>ping 172.31.0.2

Pinging 172.31.0.2 with 32 bytes of data:

Request timed out.
Reply from 172.31.0.2: bytes=32 time=14ms TTL=126
Reply from 172.31.0.2: bytes=32 time=16ms TTL=126
Reply from 172.31.0.2: bytes=32 time=11ms TTL=126

Ping statistics for 172.31.0.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 11ms, Maximum = 16ms, Average = 13ms
```



```
C:\>ping 172.31.0.2

Pinging 172.31.0.2 with 32 bytes of data:

Request timed out.
Reply from 172.31.0.2: bytes=32 time=14ms TTL=126
Reply from 172.31.0.2: bytes=32 time=16ms TTL=126
Reply from 172.31.0.2: bytes=32 time=11ms TTL=126

Ping statistics for 172.31.0.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 11ms, Maximum = 16ms, Average = 13ms

C:\>ping 172.31.2.28

Pinging 172.31.2.28 with 32 bytes of data:

Reply from 172.31.0.129: Destination host unreachable.
Reply from 172.31.0.129: Destination host unreachable.
Reply from 172.31.0.129: Destination host unreachable.
Reply from 172.31.0.129: Destination host unreachable.

Ping statistics for 172.31.2.28:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

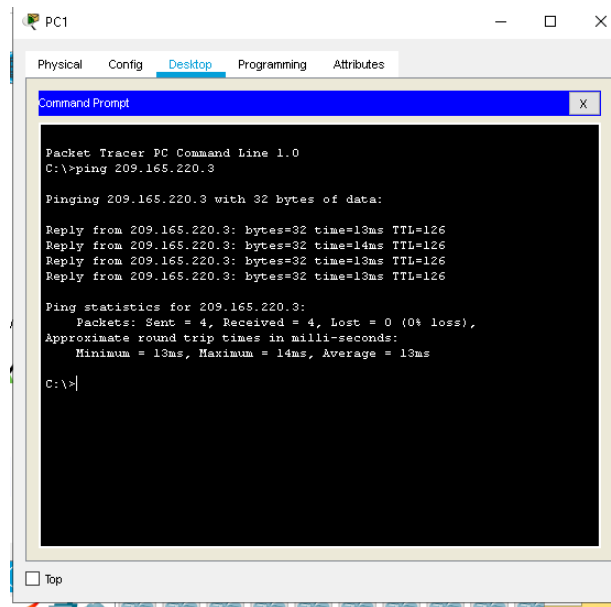
C:\>
```

2.11.5. Los hosts de VLAN 30 de Bucaramanga acceden a internet y a cualquier equipo de VLAN 10

BUCARAMANGA#Configure terminal
Enter configuration commands, one per line. End with CNTL/Z.

```
BUCARAMANGA(config)#access-list 111 permit ip 172.31.0.64 0.0.0.63 209.165.220.0
0.0.0.255
BUCARAMANGA(config)#interface fastEthernet 0/0.30
BUCARAMANGA(config-subif)#ip access-group 111 in
BUCARAMANGA(config-subif)#
BUCARAMANGA#
```

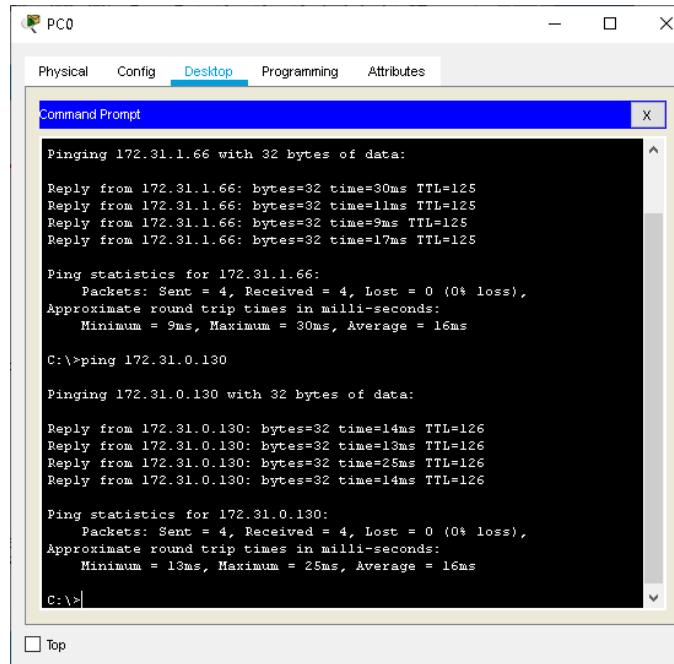
Figura 26. Acceso de PC BUCARAMANGA a Internet



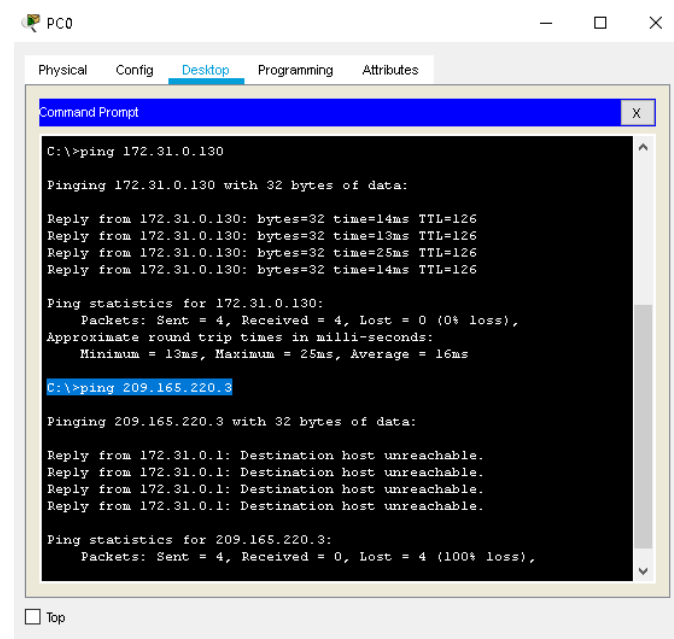
2.11.6. Los hosts de VLAN 10 en Bucaramanga acceden a la red de Cundinamarca (VLAN 20) y Tunja (VLAN 20), no internet

```
BUCARAMANGA(config)#access-list 112 permit ip 172.31.0.0 0.0.0.63 172.31.1.64
0.0.0.63
BUCARAMANGA(config)#access-list 112 permit ip 172.31.0.0 0.0.0.63 172.31.0.128
0.0.0.63
BUCARAMANGA(config)#interface fastEthernet 0/0.10
BUCARAMANGA(config-subif)#ip access-group 112 in
BUCARAMANGA(config-subif)#
```

Figura 27. Acceso de PC BUCARAMANGA a redes de TUNJA y Cundinamarca no a Internet



```
PC0
Physical Config Desktop Programming Attributes
Command Prompt
Pinging 172.31.1.66 with 32 bytes of data:
Reply from 172.31.1.66: bytes=32 time=30ms TTL=125
Reply from 172.31.1.66: bytes=32 time=11ms TTL=125
Reply from 172.31.1.66: bytes=32 time=9ms TTL=125
Reply from 172.31.1.66: bytes=32 time=17ms TTL=125
Ping statistics for 172.31.1.66:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 9ms, Maximum = 30ms, Average = 16ms
C:\>ping 172.31.0.130
Pinging 172.31.0.130 with 32 bytes of data:
Reply from 172.31.0.130: bytes=32 time=14ms TTL=126
Reply from 172.31.0.130: bytes=32 time=13ms TTL=126
Reply from 172.31.0.130: bytes=32 time=25ms TTL=126
Reply from 172.31.0.130: bytes=32 time=14ms TTL=126
Ping statistics for 172.31.0.130:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 13ms, Maximum = 25ms, Average = 16ms
C:\>
```



```
PC0
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 172.31.0.130
Pinging 172.31.0.130 with 32 bytes of data:
Reply from 172.31.0.130: bytes=32 time=14ms TTL=126
Reply from 172.31.0.130: bytes=32 time=13ms TTL=126
Reply from 172.31.0.130: bytes=32 time=25ms TTL=126
Reply from 172.31.0.130: bytes=32 time=14ms TTL=126
Ping statistics for 172.31.0.130:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 13ms, Maximum = 25ms, Average = 16ms
C:\>ping 209.165.220.3
Pinging 209.165.220.3 with 32 bytes of data:
Reply from 172.31.0.1: Destination host unreachable.
Reply from 172.31.0.1: Destination host unreachable.
Reply from 172.31.0.1: Destination host unreachable.
Reply from 172.31.0.1: Destination host unreachable.
Ping statistics for 209.165.220.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>
```

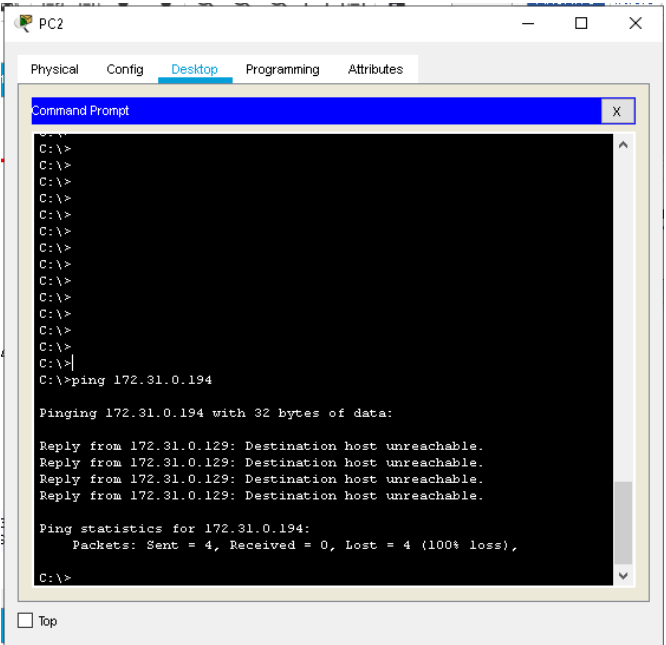
2.11.7. Los hosts de una VLAN no pueden acceder a los de otra VLAN en una ciudad

```
BUCARAMANGA(config-subif)#access-list 113 deny ip 172.31.2.0 0.0.0.7 172.31.0.0
0.0.0.63
BUCARAMANGA(config)#access-list 113 deny ip 172.31.0.64 0.0.0.63 172.31.0.0
0.0.0.63
BUCARAMANGA(config)#access-list 113 permit ip any any
BUCARAMANGA(config)#interface fastEthernet 0/0.10
BUCARAMANGA(config-subif)#ip access-group 113 out
BUCARAMANGA(config-subif)#
```

```
TUNJA(config)#access-list 113 deny ip 172.3.2.8 0.0.0.7 172.31.0.128 0.0.0.63
TUNJA(config)#access-list 113 deny ip 172.3.0.192 0.0.0.63 172.31.0.128 0.0.0.63
TUNJA(config)#access-list 113 permit ip any any
TUNJA(config)#interface fastEthernet 0/0.20
TUNJA(config-subif)#ip access-group 113 out
TUNJA(config-subif)#
```

```
CUNDINAMARCA(config)#access-list 113 deny ip 172.31.2.8 0.0.0.7 172.31.1.64
0.0.0.63
CUNDINAMARCA(config)#access-list 113 deny ip 172.31.1.0 0.0.0.63 172.31.1.64
0.0.0.63
CUNDINAMARCA(config)#access-list 113 deny ip 172.31.2.24 0.0.0.7 172.31.1.64
0.0.0.63
CUNDINAMARCA(config)#access-list 113 permit ip any any
CUNDINAMARCA(config)#interface fastEthernet 0/0.20
CUNDINAMARCA(config-subif)#ip access-group 113 out
CUNDINAMARCA(config-subif)#
```

Figura 28. Host de una VLAN no pueden acceder a los de otra VLAN en una ciudad



The screenshot shows a PC2 desktop environment with a Command Prompt window open. The window title is "Command Prompt" and it has a close button (X). The desktop environment includes tabs for "Physical", "Config", "Desktop", "Programming", and "Attributes". The Command Prompt shows the following text:

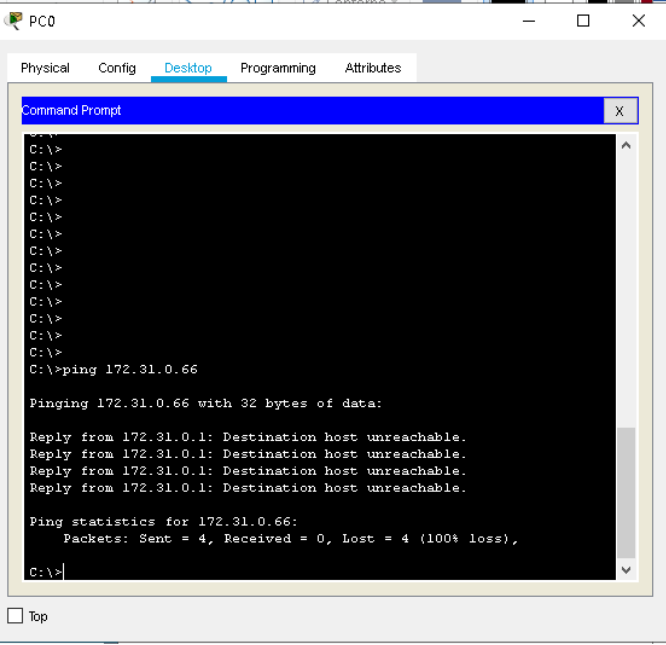
```
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>ping 172.31.0.129

Pinging 172.31.0.129 with 32 bytes of data:

Reply from 172.31.0.129: Destination host unreachable.
Reply from 172.31.0.129: Destination host unreachable.
Reply from 172.31.0.129: Destination host unreachable.
Reply from 172.31.0.129: Destination host unreachable.

Ping statistics for 172.31.0.129:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>
```

A "Top" button is visible at the bottom left of the Command Prompt window.



The screenshot shows a PC0 desktop environment with a Command Prompt window open. The window title is "Command Prompt" and it has a close button (X). The desktop environment includes tabs for "Physical", "Config", "Desktop", "Programming", and "Attributes". The Command Prompt shows the following text:

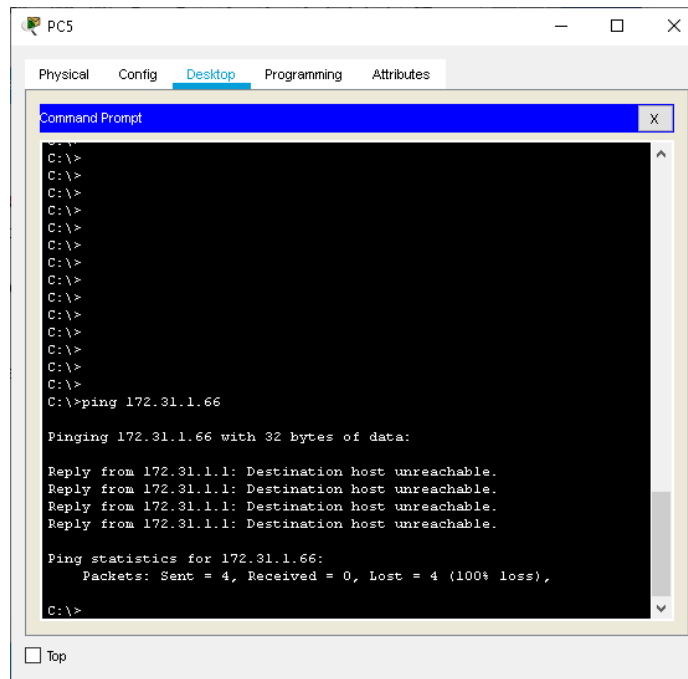
```
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>ping 172.31.0.66

Pinging 172.31.0.66 with 32 bytes of data:

Reply from 172.31.0.1: Destination host unreachable.
Reply from 172.31.0.1: Destination host unreachable.
Reply from 172.31.0.1: Destination host unreachable.
Reply from 172.31.0.1: Destination host unreachable.

Ping statistics for 172.31.0.66:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>
```

A "Top" button is visible at the bottom left of the Command Prompt window.



2.11.8. Solo los hosts de las VLAN administrativas y de la VLAN de servidores tienen acceso a los routers e internet

```

BUCARAMANGA(config-subif)#access-list 3 permit 172.31.2.0 0.0.0.7
BUCARAMANGA(config)#access-list 3 permit 172.3.2.8 0.0.0.7
BUCARAMANGA(config)#access-list 3 permit 172.31.2.8 0.0.0.7
BUCARAMANGA(config)#line vty 0 15
BUCARAMANGA(config-line)#access-class 3 in
BUCARAMANGA(config-line)#
  
```

```

TUNJA(config-subif)#access-list 3 permit 172.31.2.0 0.0.0.7
TUNJA(config)#access-list 3 permit 172.3.2.8 0.0.0.7
TUNJA(config)#access-list 3 permit 172.31.2.8 0.0.0.7
TUNJA(config)#line vty 0 15
TUNJA(config-line)#access-class 3 in
  
```

```

CUNDINAMARCA(config-subif)#access-list 3 permit 172.31.2.0 0.0.0.7
CUNDINAMARCA(config)#access-list 3 permit 172.3.2.8 0.0.0.7
CUNDINAMARCA(config)#access-list 3 permit 172.31.2.8 0.0.0.7
CUNDINAMARCA(config)#line vty 0 15
CUNDINAMARCA(config-line)#access-class 3 in
CUNDINAMARCA(config-line)#
  
```

Figura 29. Acceso de los host de las VLAN administrativas y de Servidores a routers y a Internet

```
SWITCH BUCARAMANGA
Physical Config CLI Attributes
IOS Command Line Interface

$LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/20,
changed state to up

$LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

$LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1,
changed state to up

$LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state
to up

SWITCHBUCARAMANGA>enable
SWITCHBUCARAMANGA#telnet 172.31.2.1
Trying 172.31.2.1 ...OpenSOLO USUARIOS AUTORIZADOS

User Access Verification

Username: Administrador
Password:
BUCARAMANGA>enable
Password:
BUCARAMANGA#
```

```
SWITCH TUNJA
Physical Config CLI Attributes
IOS Command Line Interface

$LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/24,
changed state to up

$LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

$LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1,
changed state to up

$LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state
to up

SWITCHTUNJA>enable
SWITCHTUNJA#telnet 172.31.2.9
Trying 172.31.2.9 ...OpenSOLO USUARIOS AUTORIZADOS

User Access Verification

Username: Administrador
Password:
CUNDINAMARCA>enable
Password:
CUNDINAMARCA#
```


CONCLUSIONES

Inicialmente la ejecución del trabajo permitió de manera práctica aplicar los conocimientos adquiridos durante la realización del diplomado, ayudando a tener una visión más amplia y profunda de los componentes de una red y sus funciones, así como su configuración y comportamiento según las configuraciones realizadas.

A través del desarrollo de los dos escenarios propuestos y con el uso de la herramienta Packet Tracer, se aplicó el paso a paso para la construcción de la topología de la red, la configuración los dispositivos y la simulación de eventos como seguridad en routers y switches, conectividad entre los componentes de las redes y subredes., creación de listas de accesos.

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