

PRUEBA DE HABILIDADES PRÁCTICAS CCNA

DIPLOMADO DE PROFUNDIZACIÓN CISCO (DISEÑO E IMPLEMENTACIÓN DE SOLUCIONES INTEGRADAS LAN / WAN)

CESAR AUGUSTO VILLA TOBÓN

**UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA
ESCUELA DE CIENCIAS BÁSICAS TECNOLOGÍA E INGENIERÍA
PROGRAMA INGENIERÍA DE TELECOMUNICACIONES
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MANIZALES
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IMPLEMENTACIÓN DE SOLUCIONES INTEGRADAS LAN / WAN)**

ESTUDIANTE

CESAR AUGUSTO VILLA TOBÓN

**TRABAJO ESCRITO PARA OPTAR POR EL TÍTULO DE:
INGENIERO DE TELECOMUNICACIONES**

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Nota de Aceptación

Presidente del Jurado

Jurado

Jurado

Ciudad y Fecha: Manizales, 15/ 12/ 2019

DEDICATORIA

El presente trabajo final lo dedico especialmente a mis padres, quienes me han dado el ejemplo e inculcado los valores de superación y perseverancia para lograr las metas propuestas, además de brindarme desde pequeño las herramientas necesarias para afrontar todos los retos y desafíos del día a día.

A mi esposa y mi hijo por brindarme los espacios de equilibrio emocional bañándome de amor incondicional, que me motiva a seguir adelante con nuevos desafíos y experiencias.

TABLA DE CONTENIDO

1. INTRODUCCION.....	12
2. OBJETIVOS.....	13
3. PLANTEAMIENTO DEL PRPROBLEMA 1.....	14
3.1 Topología de red	14
3.2 Desarrollo.....	15
3.3 Parte 1: Asignación de direcciones IP	20
3.4 Parte 2: Configuración Básica	21
3.5 Parte 3: Configuración de enrutamiento	30
3.6 Parte 4: Configuración de las listas de Control de Acceso	35
3.7 Parte 5: Comprobacion de red instalada	36
4. PLANTEAMIENTO DEL PRPROBLEMA 2.....	45
4.1 Topología de Red	46
4.2. Configuración inicial.....	47
4.3. Configuración de VLANs.....	57
4.4. Configuración IP de Hosts.....	60
4.5. Configuración OSPF 1 Área 0	64
4.6. Comprobación de conectividad	69
4.7. Configuración DHCP.....	72
4.8. Configuración IP Helper Address	73
4.9. Configuración NAT	73
4.10. Listas de control de acceso	74
5. CONCLUSIONES.....	88

LISTA DE TABLAS

Tabla 1: Asignación de direcciones IP.....	20
Tabla 2: Configuración básica de routers a completar.....	21
Tabla 3: Direcciones IP de hosts	23
Tabla 4: Tabla de comprobación de red.....	44

LISTA DE GRAFICAS

Gráfica 1: Diseño Esquemático de red	14
Gráfica 2: Topología de Red - Descriptiva	15
Gráfica 3: Diseño de red inicial en Packet Tracer.....	20
Gráfica 4: Balanceo de carga de una única ruta entre routers	27
Gráfica 5: Topología de red Problema 2	45
Gráfica 6: Topología de Red - Packet Tracer Problema 2.....	46

LISTA DE FIGURAS

Figura 1: Configuración inicial Router Bogotá	16
Figura 2: Configuración inicial router Medellín	17
Figura 3: Configuración inicial router Cali	17
Figura 4: Configuración inicial switch Bogotá	18
Figura 5: Configuración inicial Switch Medellín	18
Figura 6: Configuración inicial switch Cali	19
Figura 7: Configuración de direcciones IP de Hosts	25

GLOSARIO

OSPF: Es un protocolo de red para el encaminamiento jerárquico de pasarela interior (Open Shortest Path First).

VLAN: Es un método para crear redes lógicas independientes dentro de una misma red física

CONECTIVIDAD: Es la capacidad de un dispositivo para conectarse con otro de una forma autónoma a través de medios y protocolos de comunicación.

DIRECCIÓN IP: Conjunto de números que identifica de manera lógica y jerárquica, a una interfaz de red de un dispositivo que utilice el protocolo correspondiente (IPv4, IPv6)

NAT: (Traducción de Direcciones de Red) También llamado Enmascaramiento de IP, es utilizado por los routers para intercambiar paquetes entre dos redes que asignan mutuamente direcciones compatibles.

DHCP: (Protocolo de Configuración Dinámica de Hosts) Es un protocolo de red de tipo cliente/servidor mediante el cual un servidor DHC asigna dinámicamente una dirección IP.

DNS: (Sistema de Nombres de Dominio) es la nomenclatura jerárquica descentralizada para dispositivos conectados a redes IP.

PING: Utilidad de diagnóstico de redes de computadoras que comprueba el estado de comunicación del anfitrión local con uno o varios equipos remotos de una red IP

PUERTOS TRONCALES: Enlace punto a punto para enviar y recibir el tráfico entre routers o switches.

SERVIDOR TFTP: Protocolo de transferencia de archivos para leer o escribir archivos de un servidor remoto.

RESUMEN

Se presentan dos escenarios de implementación de red, en los cuales a través de la ejecución de diferentes configuraciones en routers, switches y equipos hosts, se logra configurar adecuadamente los distintos escenarios bajo los parámetros establecidos con los permisos, restricciones, y políticas de seguridad solicitados.

Dentro de las configuraciones y parámetros de red, se lograron crear redes VLAN con sus correspondientes puertos de acceso, implementando de igual forma enrutamiento DHCP, NAT e IP estáticas.

ABSTRACT

Two scenarios of network implementation are presented in which through the execution of different configurations in routers, switches and host computers, it was possible to properly configure the different scenarios under the parameters established with the permissions, restrictions, and security policies requested.

Within the network configurations and parameters, VLAN networks with their corresponding access ports were created, also the implementation of static DHCP, NAT and IP routing.

1. INTRODUCCION

El mundo de hoy, esta interconectado por redes de comunicaciones que permiten a la tecnología avanzar rápidamente, adaptarse fácilmente a diferentes circunstancias, y hacer el mundo un planeta más unido e integrado.

Es por eso que la importancia de conocer la mejor manera de realizar estas interconexiones ha sido un pilar fundamental para el desarrollo de la sociedad, y es por eso que desarrollamos este diplomado de profundización CISCO, donde se adquieren los conocimientos necesarios para resolver estos problemas y realizar diferentes prácticas que nos llevan a demostrar este conocimiento y las capacidades de solucionar problemas en este ámbito.

El presente trabajo es una prueba de nuestra capacidad de resolver problemas y proponer diferentes alternativas de solución que demuestra el conocimiento adquirido durante el tiempo de estudio.

Los archivos de configuración packet tracer como resultado del presente laboratorio, pueden encontrarse en el siguiente link:

<https://www.dropbox.com/sh/gf0086wtmc9wypn/AADF9ex05u8tt2k4MRTeC9MDa?dl=0>

2. OBJETIVOS

OBJETIVO GENERAL

Desarrollar las actividades propuestas y demostrar paso a paso la resolución de acuerdo a las necesidades de red planteado, demostrando así los conocimientos adquiridos a través del diplomado Cisco.

OBJETIVOS ESPECIFICOS

- Realizar los direccionamientos IP necesarios para garantizar la conectividad entre los hosts de red.
- Implementar los diferentes parámetros de seguridad de la red.
- Realizar las rutinas de diagnostico de todos los equipos
- Utilizar los diferentes métodos de direccionamiento IP, DHCP y NAT
- Implementar sistemas VLAN de red para agrupar y distribuir adecuadamente la red
- Registrar y documentar cada uno de los procedimientos realizados al configurar cualquier sistema de red y hosts

3. PLANTEAMIENTO DEL PROBLEMA 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.

3.1 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:

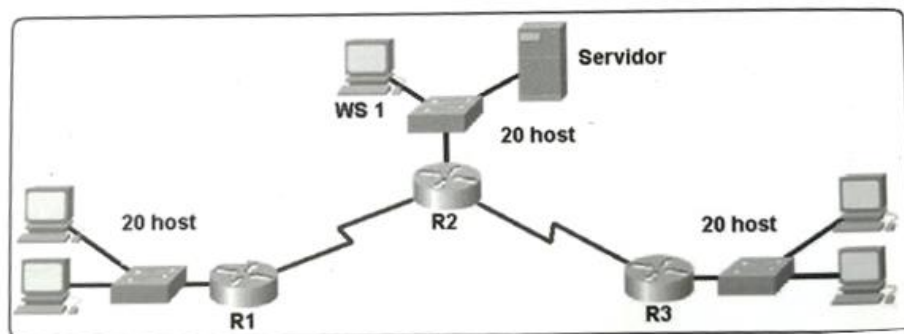
Implementar la seguridad en la red, se debe restringir el acceso y comunicación entre hosts de acuerdo con los requerimientos del administrador de red.

Parte 5:

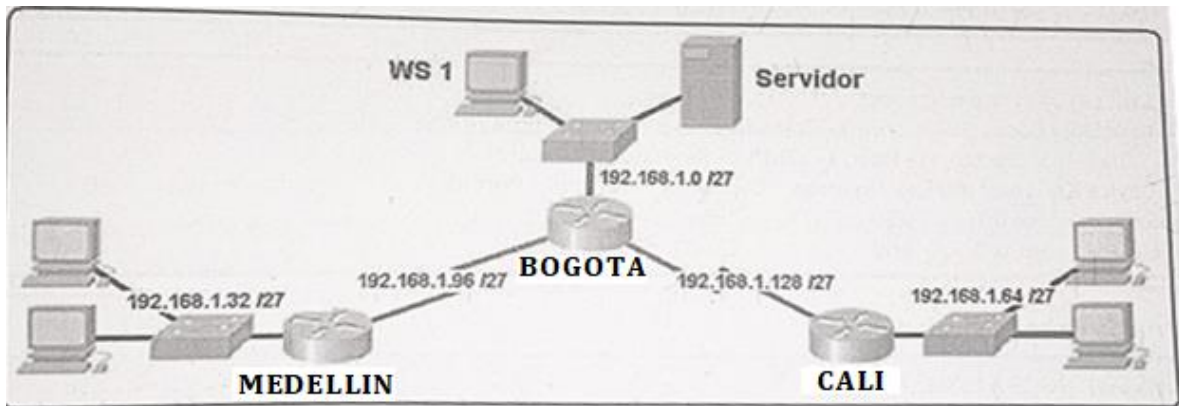
Comprobación total de los dispositivos y su funcionamiento en la red.

Parte 6:

Configuración final.



Gráfica 1: Diseño Esquemático de red



Gráfica 2: Topología de Red - Descriptiva

3.2 Desarrollo

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

Inicialmente en todos los dispositivos utilizaremos la siguiente línea de configuración, el cual es igual para todos, lo único que cambiamos son los nombres de cada host.

```

Router>en
Router#configure terminal
Router(config)#no ip domain-lookup
Router(config)#service password-encryption
Router(config)#banner motd #Acceso restringido, solo realice
configuraciones si se encuentra autorizado para ello!!#
Router(config)#enable secret class
Router(config)#line console 0
Router(config-line)#password cisco
Router(config-line)#login
Router(config-line)#logging synchronous
Router(config-line)#line vty 0 15
Router(config-line)#password cisco
Router(config-line)#login
Router(config-line)#logging synchronous
Router(config-line)#hostname (Nombre de host)
Bogota(config)#
    
```

Configuración en packet tracer:

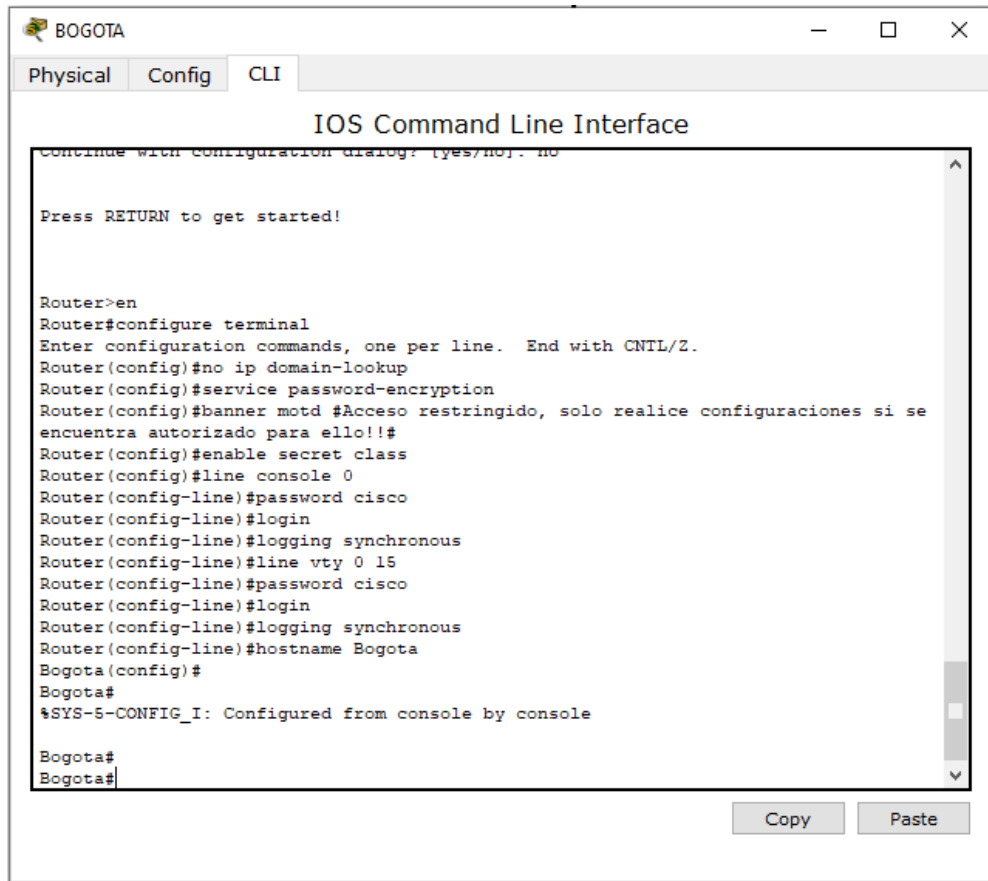
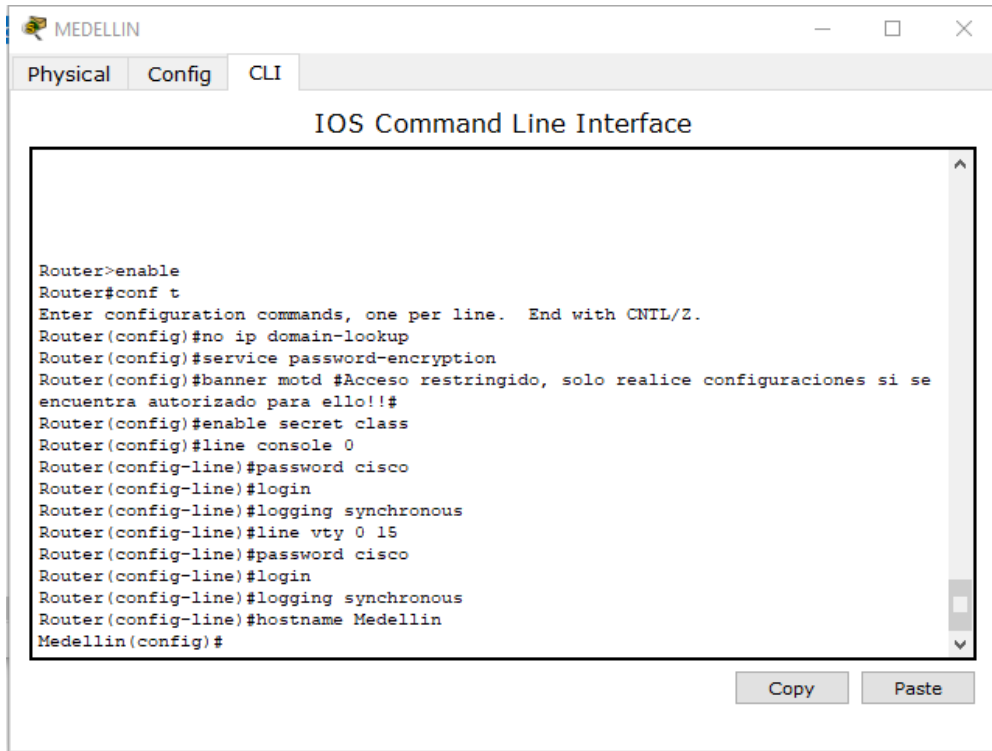


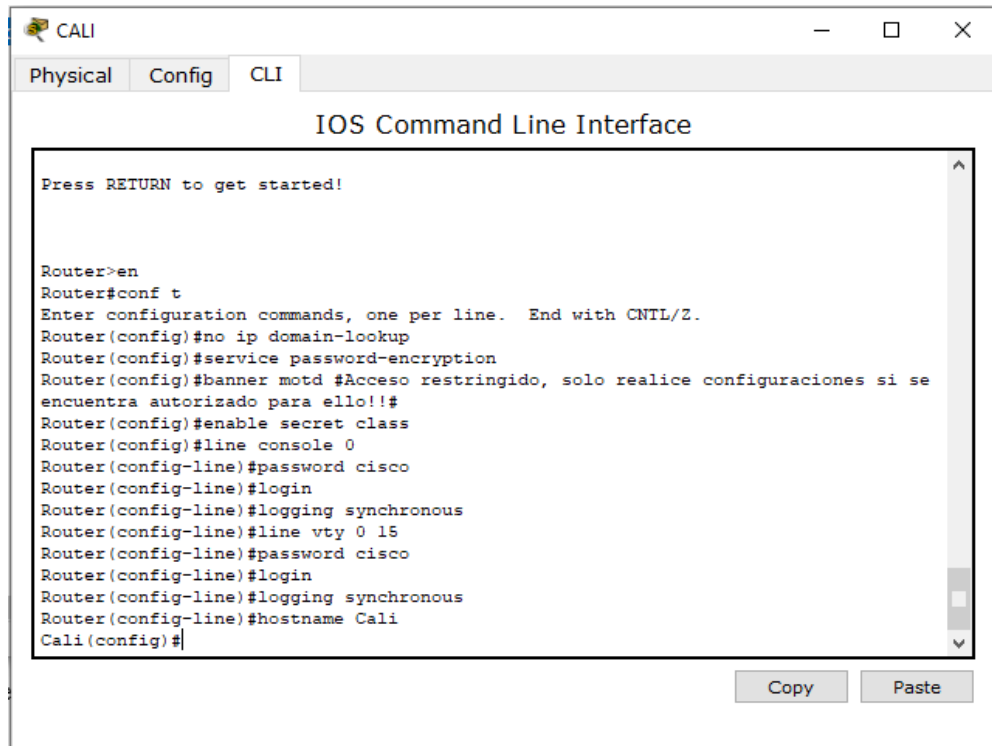
Figura 1: Configuración inicial Router Bogotá



```

Router>enable
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#no ip domain-lookup
Router(config)#service password-encryption
Router(config)#banner motd #Acceso restringido, solo realice configuraciones si se
encuentra autorizado para ello!!#
Router(config)#enable secret class
Router(config)#line console 0
Router(config-line)#password cisco
Router(config-line)#login
Router(config-line)#logging synchronous
Router(config-line)#line vty 0 15
Router(config-line)#password cisco
Router(config-line)#login
Router(config-line)#logging synchronous
Router(config-line)#hostname Medellin
Medellin(config)#
    
```

Figura 2: Configuración inicial router Medellín

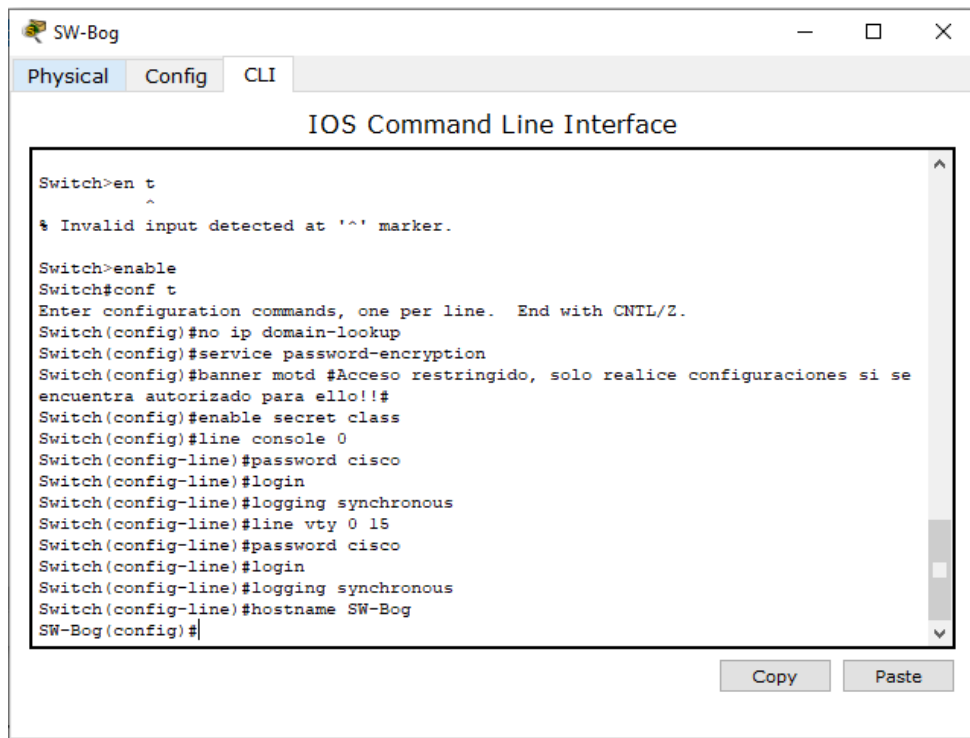


```

Press RETURN to get started!

Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#no ip domain-lookup
Router(config)#service password-encryption
Router(config)#banner motd #Acceso restringido, solo realice configuraciones si se
encuentra autorizado para ello!!#
Router(config)#enable secret class
Router(config)#line console 0
Router(config-line)#password cisco
Router(config-line)#login
Router(config-line)#logging synchronous
Router(config-line)#line vty 0 15
Router(config-line)#password cisco
Router(config-line)#login
Router(config-line)#logging synchronous
Router(config-line)#hostname Cali
Cali(config)#
    
```

Figura 3: Configuración inicial router Cali



SW-Bog

Physical Config CLI

IOS Command Line Interface

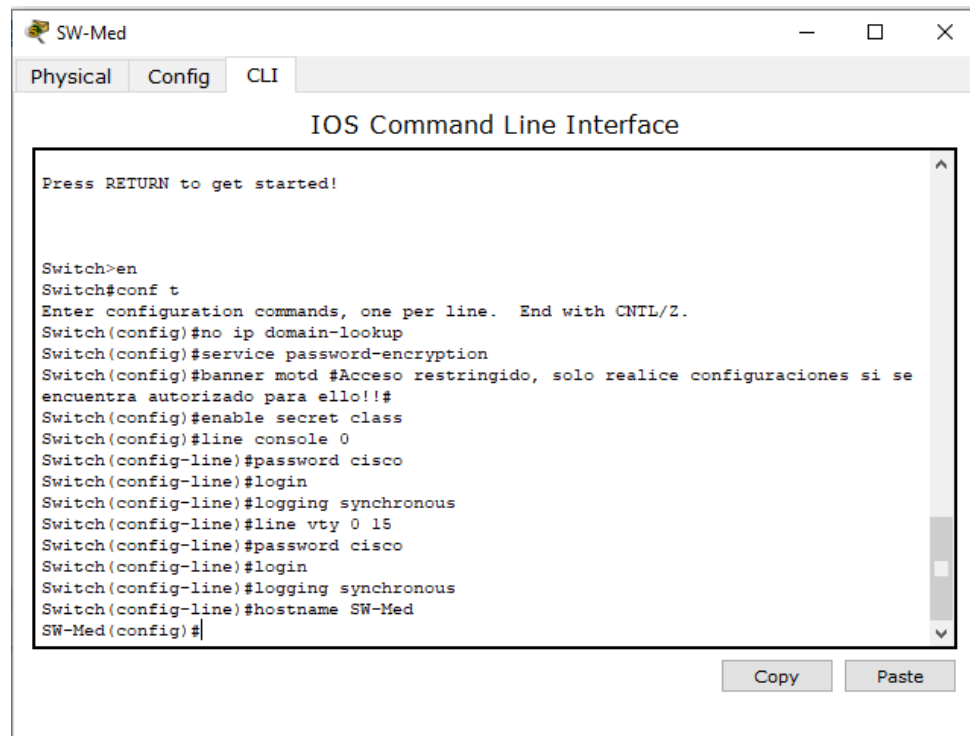
```

Switch>en t
^
% Invalid input detected at '^' marker.

Switch>enable
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#no ip domain-lookup
Switch(config)#service password-encryption
Switch(config)#banner motd #Acceso restringido, solo realice configuraciones si se
encuentra autorizado para ello!!#
Switch(config)#enable secret class
Switch(config)#line console 0
Switch(config-line)#password cisco
Switch(config-line)#login
Switch(config-line)#logging synchronous
Switch(config-line)#line vty 0 15
Switch(config-line)#password cisco
Switch(config-line)#login
Switch(config-line)#logging synchronous
Switch(config-line)#hostname SW-Bog
SW-Bog(config)#
    
```

Copy Paste

Figura 4: Configuración inicial switch Bogotá



SW-Med

Physical Config CLI

IOS Command Line Interface

```

Press RETURN to get started!

Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#no ip domain-lookup
Switch(config)#service password-encryption
Switch(config)#banner motd #Acceso restringido, solo realice configuraciones si se
encuentra autorizado para ello!!#
Switch(config)#enable secret class
Switch(config)#line console 0
Switch(config-line)#password cisco
Switch(config-line)#login
Switch(config-line)#logging synchronous
Switch(config-line)#line vty 0 15
Switch(config-line)#password cisco
Switch(config-line)#login
Switch(config-line)#logging synchronous
Switch(config-line)#hostname SW-Med
SW-Med(config)#
    
```

Copy Paste

Figura 5: Configuración inicial Switch Medellín

```
SW-Cal
Physical Config CLI
IOS Command Line Interface

Press RETURN to get started!

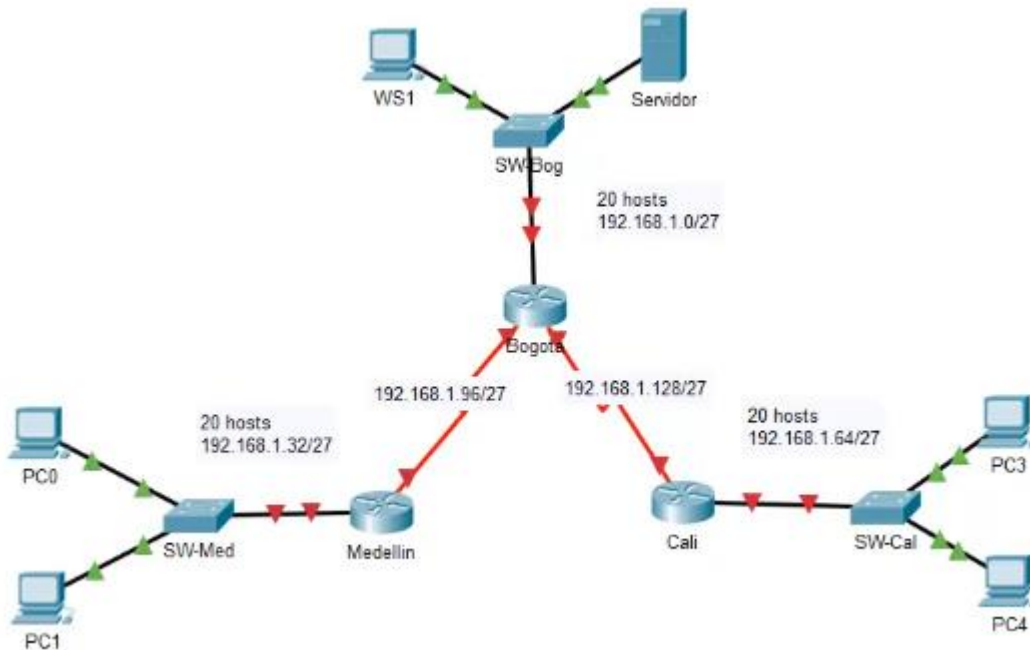
Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#no ip domain-lookup
Switch(config)#service password-encryption
Switch(config)#banner motd #Acceso restringido, solo realice configuraciones si se
encuentra autorizado para ello!!#
Switch(config)#enable secret class
Switch(config)#line console 0
Switch(config-line)#password cisco
Switch(config-line)#login
Switch(config-line)#logging synchronous
Switch(config-line)#line vty 0 15
Switch(config-line)#password cisco
Switch(config-line)#login
Switch(config-line)#logging synchronous
Switch(config-line)#hostname SW-Cal
SW-Cal(config)#
```

Figura 6: Configuración inicial switch Cali

Para realizar la configuración se escogieron los siguientes elementos de red:

- 3 * Router 1941 con asignación de tarjeta de red serial HWIC-2T
- 3 * Switch 2960
- 5 * Equipos host (con proyección de 60 host)
- 1 * Servidor

Para realizar la conexión física de los equipos con base en la topología de red La topología diseñada a partir de los requerimientos iniciales es la siguiente:



Gráfica 3: Diseño de red inicial en Packet Tracer

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

3.3 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.
- Asignar una dirección IP a la red.

La tabla de asignacion de direcciones IP es la siguiente:

Nombre de Subred	Dirección de Red	Mascara de Subred
LAN Bogota	192.168.1.0	255.255.255.224
LAN Medellin	192.168.1.32	255.255.255.224
LAN Cali	192.168.1.64	255.255.255.224
Conexión Bogota - Medellin	192.168.1.96	255.255.255.224
Conexión Bogota - Cali	192.168.1.128	255.255.255.224
Segmento 6	192.168.1.160	255.255.255.224
Segmento 7	192.168.1.192	255.255.255.224
Segmento 8	192.168.1.224	255.255.255.224

Tabla 1: Asignación de direcciones IP

Teniendo en cuenta que necesitamos 20 host por segmento, se ha asignado una mascara de subred termianda en 224 que permite hasta 30 hosts maximo por segmento.

3.4 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	192.168.1.99	192.168.1.98	192.168.1.131
Dirección de Ip en interfaz Serial 0/1		192.168.1.130	
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

Tabla 2: Configuración básica de routers a completar

Configuración Direcciones IP de routers:

Bogotá

```

Bogota>en
Password:
Bogota#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Bogota(config)#int s0/0/0
Bogota(config-if)#ip address 192.168.1.98 255.255.255.224
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)#int s0/0/1
Bogota(config-if)#ip address 192.168.1.130 255.255.255.224
Bogota(config-if)#no shutdown

Bogota(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to up

Bogota(config-if)#

Bogota(config-if)#int g0/0
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 GigabitEthernet0/0, changed state
to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface
GigabitEthernet0/0, changed state to up

Bogota(config-if)#

```

```

Bogota(config-if)#router eigrp 200
Bogota(config-router)#no auto-summary
Bogota(config-router)#do show ip route connected
  C   192.168.1.0/27 is directly connected, GigabitEthernet0/0
  C   192.168.1.96/27 is directly connected, Serial0/0/0
  C   192.168.1.128/27 is directly connected, Serial0/0/1

Bogota(config-router)#network 192.168.1.0 0.0.0.31
Bogota(config-router)#network 192.168.1.96 0.0.0.31
Bogota(config-router)#network 192.168.1.128 0.0.0.31
Bogota(config-router)#

```

Medellín

```

Medellin>en
Password:
Medellin#conf term
Enter configuration commands, one per line. End with CNTL/
Z.
Medellin(config)#int s0/0/0
Medellin(config-if)#ip address 192.168.1.99 255.255.255.224
Medellin(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to
down
Medellin(config-if)#
Medellin(config-if)#int g0/0
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 GigabitEthernet0/0, changed
state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface
GigabitEthernet0/0, changed state to up

Medellin(config-if)#
Medellin(config-if)#router eigrp 200
Medellin(config-router)#no auto-summary
Medellin(config-router)#do show ip route connected
  C   192.168.1.32/27 is directly connected, GigabitEthernet0/0
  C   192.168.1.96/27 is directly connected, Serial0/0/0

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)#
%DUAL-5-NBRCHANGE: IP-EIGRP 200: Neighbor 192.168.1.98
(Serial0/0/0) is up: new adjacency

Medellin(config-router)#

```

Cali:

```

Cali>en
Password:
Cali#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Cali(config)#int s0/0/0
Cali(config-if)#ip address 192.168.1.131 255.255.255.224
Cali(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down
Cali(config-if)#
Cali(config-if)#int g0/0
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 GigabitEthernet0/0, changed state
to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface
GigabitEthernet0/0, changed state to up

Cali(config-if)#
Cali(config-if)#router eigrp 200
Cali(config-router)#no auto-summary
Cali(config-router)#do show ip route connected
  C   192.168.1.64/27 is directly connected, GigabitEthernet0/0
  C   192.168.1.128/27 is directly connected, Serial0/0/0

Cali(config-router)#network 192.168.1.64 0.0.0.31
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 (Serial0/0/0) is
up: new adjacency
I
Cali(config-router)#

```

La tabla de asignación de direcciones IP de Hosts es la siguiente:

Nombre	Direccion IP	Mascara de Subred	Puerta de enlace
PC0_Medellin	192.168.1.42	255.255.255.224	192.168.1.33
PC1_Medellin	192.168.1.43	255.255.255.224	192.168.1.33
WS1_Bogota	192.168.1.10	255.255.255.224	192.168.1.1
Servidor_Bogota	192.168.1.30	255.255.255.224	192.168.1.1
PC3_Cali	192.168.1.74	255.255.224	192.168.1.65
PC4_Cali	192.168.1.75	255.255.224	192.168.1.65

Tabla 3: Direcciones IP de hosts

PC0

Physical Config **Desktop** Programming Attributes

IP Configuration [X]

Interface: FastEthernet0

IP Configuration

DHCP Static

IP Address: 192.168.1.42

Subnet Mask: 255.255.255.224

Default Gateway: 192.168.1.33

DNS Server: 0.0.0.0

PC1

Physical Config **Desktop** Programming Attributes

IP Configuration [X]

Interface: FastEthernet0

IP Configuration

DHCP Static

IP Address: 192.168.1.43

Subnet Mask: 255.255.255.224

Default Gateway: 192.168.1.33

DNS Server: 0.0.0.0

WS1

Physical Config **Desktop** Programming Attributes

IP Configuration [X]

Interface: FastEthernet0

IP Configuration

DHCP Static

IP Address: 192.168.1.10

Subnet Mask: 255.255.255.224

Default Gateway: 192.168.1.1

DNS Server: 0.0.0.0

Servidor

Physical Config Services **Desktop** Programming Attributes

IP Configuration [X]

IP Configuration

DHCP Static

IP Address: 192.168.1.30

Subnet Mask: 255.255.255.224

Default Gateway: 192.168.1.1

DNS Server: 0.0.0.0

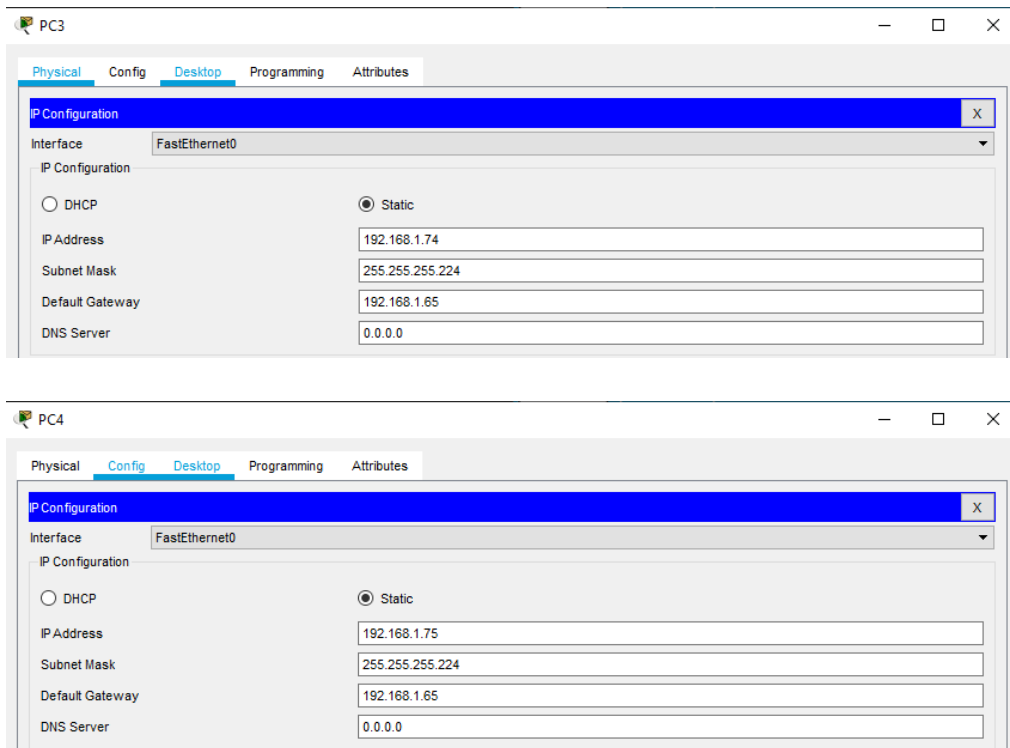


Figura 7: Configuración de direcciones IP de Hosts

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.

Verificación de tabla de enrutamiento:

Bogotá:

```

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

Gateway of last resort is not set

    192.168.1.0/24 is variably subnetted, 8 subnets, 2 masks
C       192.168.1.0/27 is directly connected, GigabitEthernet0/0
L       192.168.1.1/32 is directly connected, GigabitEthernet0/0
D       192.168.1.32/27 [90/2170112] via 192.168.1.99, 00:01:58, Serial0/0/0
D       192.168.1.64/27 [90/2170112] via 192.168.1.131, 00:01:31, Serial0/0/1
C       192.168.1.96/27 is directly connected, Serial0/0/0
L       192.168.1.98/32 is directly connected, Serial0/0/0
C       192.168.1.128/27 is directly connected, Serial0/0/1
L       192.168.1.130/32 is directly connected, Serial0/0/1

Bogota#
    
```

Medellin:

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

Gateway of last resort is not set

```

    192.168.1.0/24 is variably subnetted, 7 subnets, 2 masks
D    192.168.1.0/27 [90/2170112] via 192.168.1.98, 00:02:37, Serial0/0/0
C    192.168.1.32/27 is directly connected, GigabitEthernet0/0
L    192.168.1.33/32 is directly connected, GigabitEthernet0/0
D    192.168.1.64/27 [90/2682112] via 192.168.1.98, 00:02:10, Serial0/0/0
C    192.168.1.96/27 is directly connected, Serial0/0/0
L    192.168.1.99/32 is directly connected, Serial0/0/0
D    192.168.1.128/27 [90/2681856] via 192.168.1.98, 00:02:37, Serial0/0/0
```

Medellin#

Cali:

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

Gateway of last resort is not set

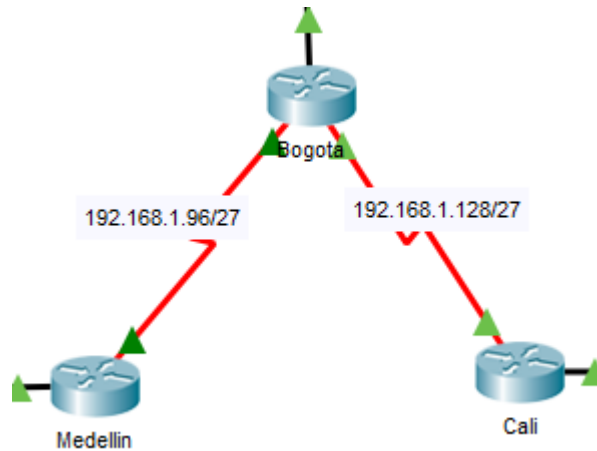
```

    192.168.1.0/24 is variably subnetted, 7 subnets, 2 masks
D    192.168.1.0/27 [90/2170112] via 192.168.1.130, 00:02:20, Serial0/0/0
D    192.168.1.32/27 [90/2682112] via 192.168.1.130, 00:02:20, Serial0/0/0
C    192.168.1.64/27 is directly connected, GigabitEthernet0/0
L    192.168.1.65/32 is directly connected, GigabitEthernet0/0
D    192.168.1.96/27 [90/2681856] via 192.168.1.130, 00:02:20, Serial0/0/0
C    192.168.1.128/27 is directly connected, Serial0/0/0
L    192.168.1.131/32 is directly connected, Serial0/0/0
```

Cali#

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

El balanceo de carga normalmente se da cuando hay diferentes rutas (minimo 2) para llegar a un destino, por ejemplo entre Medellin y Cali solo existe una ruta o salto de conexión a través de Bogota, pero si existiera una conexión directa entre Cali y Medellin podría en algún momento utilizar rutas alternas para balancear la carga.



Gráfica 4: Balanceo de carga de una única ruta entre routers

El actual balanceo de carga de los dispositivos se realiza a través del comando “*show ip eigrp topology*” en todos los dispositivos:

Bogota:

```

Bogota#show ip eigrp topology
IP-EIGRP Topology Table for AS 200/ID(192.168.1.130)

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
       r - Reply status

P 192.168.1.0/27, 1 successors, FD is 2816
   via Connected, GigabitEthernet0/0
P 192.168.1.32/27, 1 successors, FD is 2170112
   via 192.168.1.99 (2170112/2816), Serial0/0/0
P 192.168.1.64/27, 1 successors, FD is 2170112
   via 192.168.1.131 (2170112/2816), Serial0/0/1
P 192.168.1.96/27, 1 successors, FD is 2169856
   via Connected, Serial0/0/0
P 192.168.1.128/27, 1 successors, FD is 2169856
   via Connected, Serial0/0/1
Bogota#
    
```

Medellin:

```
Medellin#show ip eigrp topology
IP-EIGRP Topology Table for AS 200/ID(192.168.1.99)

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
       r - Reply status

P 192.168.1.0/27, 1 successors, FD is 2170112
   via 192.168.1.98 (2170112/2816), Serial0/0/0
P 192.168.1.32/27, 1 successors, FD is 2816
   via Connected, GigabitEthernet0/0
P 192.168.1.64/27, 1 successors, FD is 2682112
   via 192.168.1.98 (2682112/2170112), Serial0/0/0
P 192.168.1.96/27, 1 successors, FD is 2169856
   via Connected, Serial0/0/0
P 192.168.1.128/27, 1 successors, FD is 2681856
   via 192.168.1.98 (2681856/2169856), Serial0/0/0
Medellin#
```

Cali:

```
Cali#show ip eigrp topology
IP-EIGRP Topology Table for AS 200/ID(192.168.1.131)

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
       r - Reply status

P 192.168.1.0/27, 1 successors, FD is 2170112
   via 192.168.1.130 (2170112/2816), Serial0/0/0
P 192.168.1.32/27, 1 successors, FD is 2682112
   via 192.168.1.130 (2682112/2170112), Serial0/0/0
P 192.168.1.64/27, 1 successors, FD is 2816
   via Connected, GigabitEthernet0/0
P 192.168.1.96/27, 1 successors, FD is 2681856
   via 192.168.1.130 (2681856/2169856), Serial0/0/0
P 192.168.1.128/27, 1 successors, FD is 2169856
   via Connected, Serial0/0/0
Cali#
```

d. Realizar un diagnóstico de vecinos usando el comando `cdp`.
 El diagnostico de vecinos se realiza a través del comando `“show cdp neighbor”`
 A continuación se realiza el diagnostico de vecinos en todos los router:

Bogota: Tenemos tres vecinos, Bogota, Cali y el switch de LAN

```
Bogota#show cdp neighbor
Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge
                  S - Switch, H - Host, I - IGMP, r - Repeater, P - Phone
Device ID        Local Intrfce  Holdtme  Capability  Platform  Port ID
Medellin         Ser 0/0/0      160      R           C1900     Ser 0/0/0
Cali              Ser 0/0/1      144      R           C1900     Ser 0/0/0
SW-Bog           Gig 0/0        179      S           2960     Gig 0/1
Bogota#
```

Medellin: Tiene dos vecinos, Bogota y el switch de LAN

```
Medellin#show cdp neighbor
Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge
                  S - Switch, H - Host, I - IGMP, r - Repeater, P - Phone
Device ID        Local Intrfce  Holdtme  Capability  Platform  Port ID
Bogota           Ser 0/0/0      155      R           C1900     Ser 0/0/0
SW-Med           Gig 0/0        137      S           2960     Gig 0/1
Medellin#
```

Cali: Tiene dos vecinos, Bogota y el switch de LAN

```

Cali#show cdp neighbor
Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge
                  S - Switch, H - Host, I - IGMP, r - Repeater, P - Phone
Device ID        Local Intrfce Holdtme  Capability  Platform  Port ID
Bogota           Ser 0/0/0      149         R           C1900     Ser 0/0/1
SW-Cal           Gig 0/0        174         S           2960     Gig 0/1
Cali#
    
```

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

Medellín a Bogotá: Exitoso

```

Medellin#ping 192.168.1.99

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.99, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 2/7/15 ms

Medellin#
    
```

Medellin – Cali: Exitoso

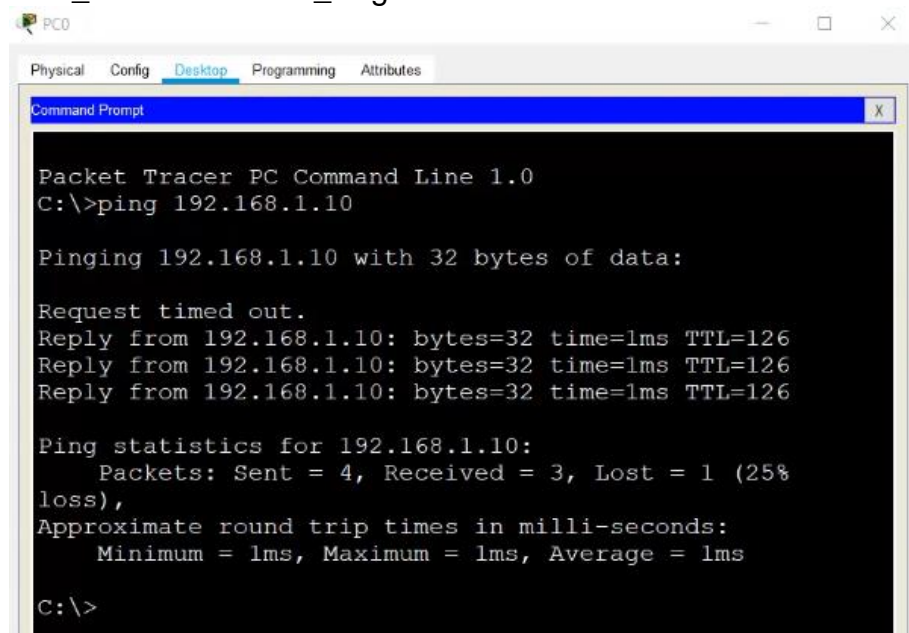
```

Medellin#ping 192.168.1.131

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.131, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/7/14 ms

Medellin#
    
```

PC0_Medellin – WS1_Bogota: Exitoso



PC0_Medellin – PC3_Cali: Exitoso

```
PC0
Physical Config Desktop Programming Attributes
Command Prompt
Ping statistics for 192.168.1.10:
    Packets: Sent = 4, Received = 3, Lost = 1 (25%
loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 1ms, Average = 1ms

C:\>ping 192.168.1.74

Pinging 192.168.1.74 with 32 bytes of data:

Request timed out.
Reply from 192.168.1.74: bytes=32 time=2ms TTL=125
Reply from 192.168.1.74: bytes=32 time=2ms TTL=125
Reply from 192.168.1.74: bytes=32 time=2ms TTL=125

Ping statistics for 192.168.1.74:
    Packets: Sent = 4, Received = 3, Lost = 1 (25%
loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 2ms, Average = 2ms

C:\>
```

3.5 Parte 3: Configuración de Enrutamiento.

a. La asignación de protocolo de enrutamiento EIGRP a los routers ya fue configurado considerando el direccionamiento diseñado previamente.

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

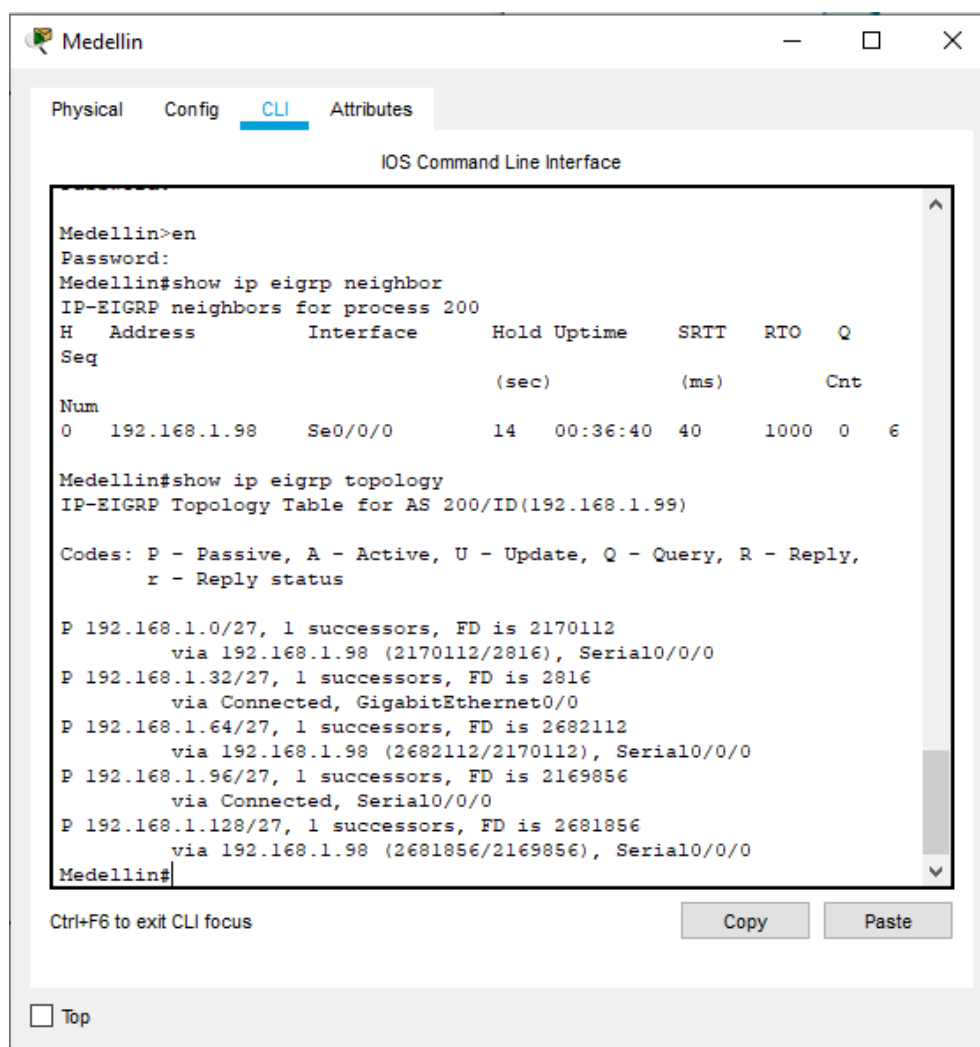
Para verificar la vecindad de los routers se deben utilizar los comandos:

“Show ip eigrp neighbors”

“Show ip eigrp topology”

A continuación, haremos la verificación de los routers en cada ciudad:

Medellín:



The screenshot shows a terminal window titled 'Medellin' with tabs for 'Physical', 'Config', 'CLI', and 'Attributes'. The 'CLI' tab is active, displaying the 'IOS Command Line Interface'. The user has entered the command 'show ip eigrp neighbor' and received the following output:

```

Medellin>en
Password:
Medellin#show ip eigrp neighbor
IP-EIGRP neighbors for process 200
H   Address          Interface      Hold Uptime    SRTT   RTO   Q
Seq
                               (sec)         (ms)          Cnt
Num
0   192.168.1.98      Se0/0/0       14   00:36:40   40    1000  0   6
  
```

Next, the user entered 'show ip eigrp topology', resulting in the following output:

```

Medellin#show ip eigrp topology
IP-EIGRP Topology Table for AS 200/ID(192.168.1.99)

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
       r - Reply status

P 192.168.1.0/27, 1 successors, FD is 2170112
   via 192.168.1.98 (2170112/2816), Serial0/0/0
P 192.168.1.32/27, 1 successors, FD is 2816
   via Connected, GigabitEthernet0/0
P 192.168.1.64/27, 1 successors, FD is 2682112
   via 192.168.1.98 (2682112/2170112), Serial0/0/0
P 192.168.1.96/27, 1 successors, FD is 2169856
   via Connected, Serial0/0/0
P 192.168.1.128/27, 1 successors, FD is 2681856
   via 192.168.1.98 (2681856/2169856), Serial0/0/0
Medellin#
  
```

At the bottom of the window, there are buttons for 'Copy' and 'Paste', and a 'Top' button with a checkbox.

Bogotá:

Bogota
— □ ×

Physical
Config
CLI
Attributes

IOS Command Line Interface

```

Password:
Bogota>en
Password:
Bogota#show ip eigrp neighbor
IP-EIGRP neighbors for process 200
H   Address          Interface      Hold Uptime    SRTT  RTO   Q
Seq
                                     (sec)         (ms)          Cnt
Num
0   192.168.1.131     Se0/0/1       10  00:38:11  40    1000  0   7
1   192.168.1.99      Se0/0/0       14  00:38:10  40    1000  0   7

Bogota#show ip eigrp topology
IP-EIGRP Topology Table for AS 200/ID(192.168.1.130)

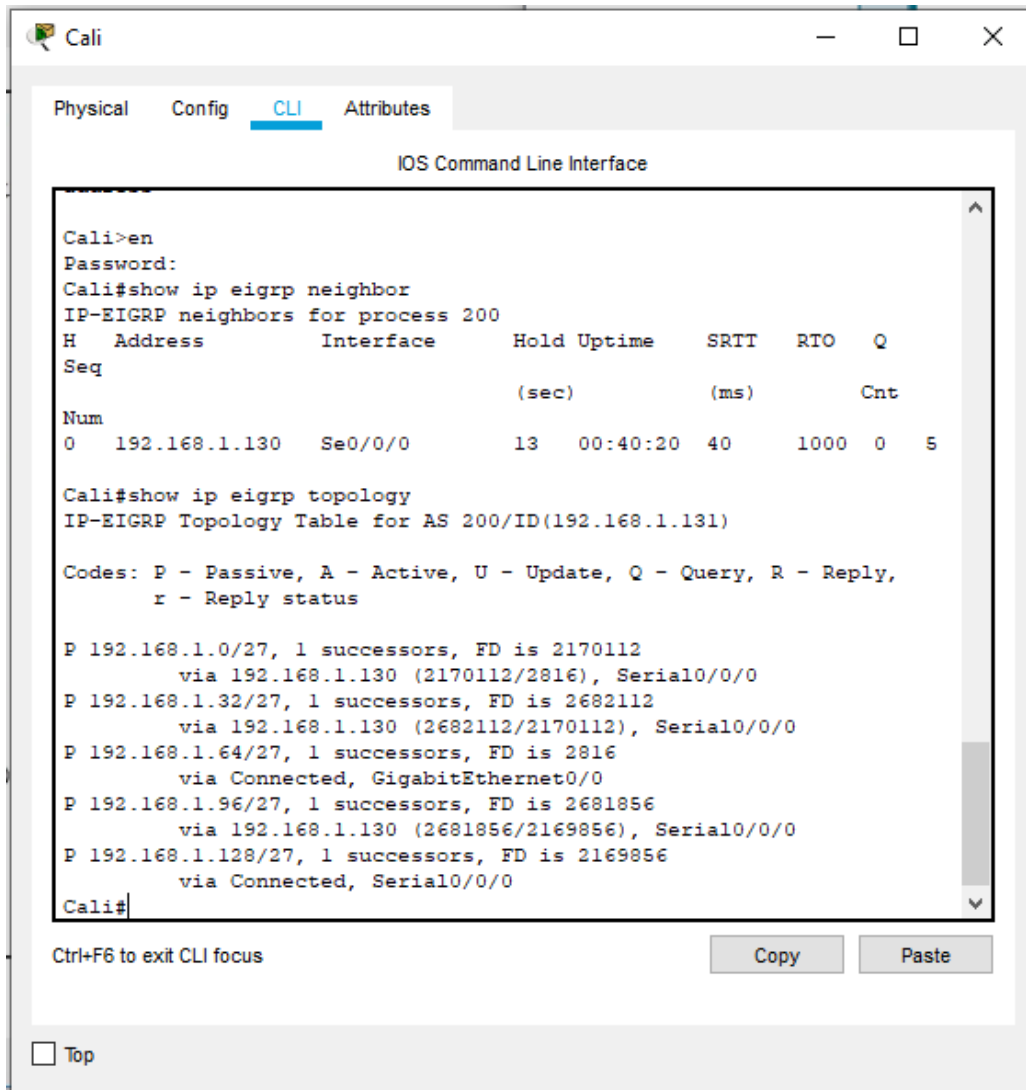
Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
       r - Reply status

P 192.168.1.0/27, 1 successors, FD is 2816
   via Connected, GigabitEthernet0/0
P 192.168.1.32/27, 1 successors, FD is 2170112
   via 192.168.1.99 (2170112/2816), Serial10/0/0
P 192.168.1.64/27, 1 successors, FD is 2170112
   via 192.168.1.131 (2170112/2816), Serial10/0/1
P 192.168.1.96/27, 1 successors, FD is 2169856
   via Connected, Serial10/0/0
P 192.168.1.128/27, 1 successors, FD is 2169856
   via Connected, Serial10/0/1
Bogota#
            
```

Ctrl+F6 to exit CLI focus
Copy
Paste

Top

Cali:



The screenshot shows a terminal window titled "Cali" with tabs for "Physical", "Config", "CLI", and "Attributes". The "CLI" tab is active, displaying the "IOS Command Line Interface".

```

Cali>en
Password:
Cali#show ip eigrp neighbor
IP-EIGRP neighbors for process 200
H   Address          Interface      Hold Uptime    SRTT  RTO   Q
Seq
                               (sec)         (ms)          Cnt
Num
0   192.168.1.130     Se0/0/0        13  00:40:20  40    1000  0   5

Cali#show ip eigrp topology
IP-EIGRP Topology Table for AS 200/ID(192.168.1.131)

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
       r - Reply status

P 192.168.1.0/27, 1 successors, FD is 2170112
   via 192.168.1.130 (2170112/2816), Serial0/0/0
P 192.168.1.32/27, 1 successors, FD is 2682112
   via 192.168.1.130 (2682112/2170112), Serial0/0/0
P 192.168.1.64/27, 1 successors, FD is 2816
   via Connected, GigabitEthernet0/0
P 192.168.1.96/27, 1 successors, FD is 2681856
   via 192.168.1.130 (2681856/2169856), Serial0/0/0
P 192.168.1.128/27, 1 successors, FD is 2169856
   via Connected, Serial0/0/0
    
```

Below the terminal output, there are buttons for "Copy" and "Paste", and a "Top" button with a checkbox.

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

Nota: Revisar Parte 2, numeral e.

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.

PC0_Medellin – Servidor_Bogota

```
C:\>ping 192.168.1.30

Pinging 192.168.1.30 with 32 bytes of data:

Request timed out.
Reply from 192.168.1.30: bytes=32 time=5ms TTL=126
Reply from 192.168.1.30: bytes=32 time=1ms TTL=126
Reply from 192.168.1.30: bytes=32 time=3ms TTL=126

Ping statistics for 192.168.1.30:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 5ms, Average = 3ms

C:\>
```

PC0_Medellin – PC4_Cali

```
C:\>ping 192.168.1.75

Pinging 192.168.1.75 with 32 bytes of data:

Request timed out.
Reply from 192.168.1.75: bytes=32 time=2ms TTL=125
Reply from 192.168.1.75: bytes=32 time=2ms TTL=125
Reply from 192.168.1.75: bytes=32 time=5ms TTL=125

Ping statistics for 192.168.1.75:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 5ms, Average = 3ms

C:\>
```

3.6 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.
Esta configuración se realizó al inicio de las configuraciones básicas del router, cuando se le agrega una contraseña al VTY en cada uno de los dispositivos. Página 14.
- 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.

Esta configuración la aplicaremos en el router de Bogotá, indicando que el host “Servidor” con IP 192.168.1.30 pueda acceder a cualquier destino “any”, aplicándola en la tarjeta de conexión de entrada g0/0 del router

Bogotá:

```
Bogota>en
Password:
Bogota#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Bogota(config)#access-list 101 permit ip host 192.168.1.30 any
Bogota(config)#int g0/0
Bogota(config-if)#ip access-group 101 in
Bogota(config-if)#
```

- 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.

Para lo anterior aplicaremos una lista de control de acceso extendida en Medellín y Cali utilizando el comando en modo de configuración “*access-list 101 permit ip*”. Y denegando el acceso implícitamente que negara toda la comunicación de entrada al router en la g0/0, aplicando el comando “*ip access-group 101 in*”. A continuación, veremos la aplicación de este comando en los dispositivos de Medellín y Cali.

Medellín:

```
Medellin#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Medellin(config)#access-list 101 permit ip 192.168.1.32 0.0.0.31 host 192.168.1.30
Medellin(config)#int g0/0
Medellin(config-if)#ip access-group 101 in
Medellin(config-if)#
```

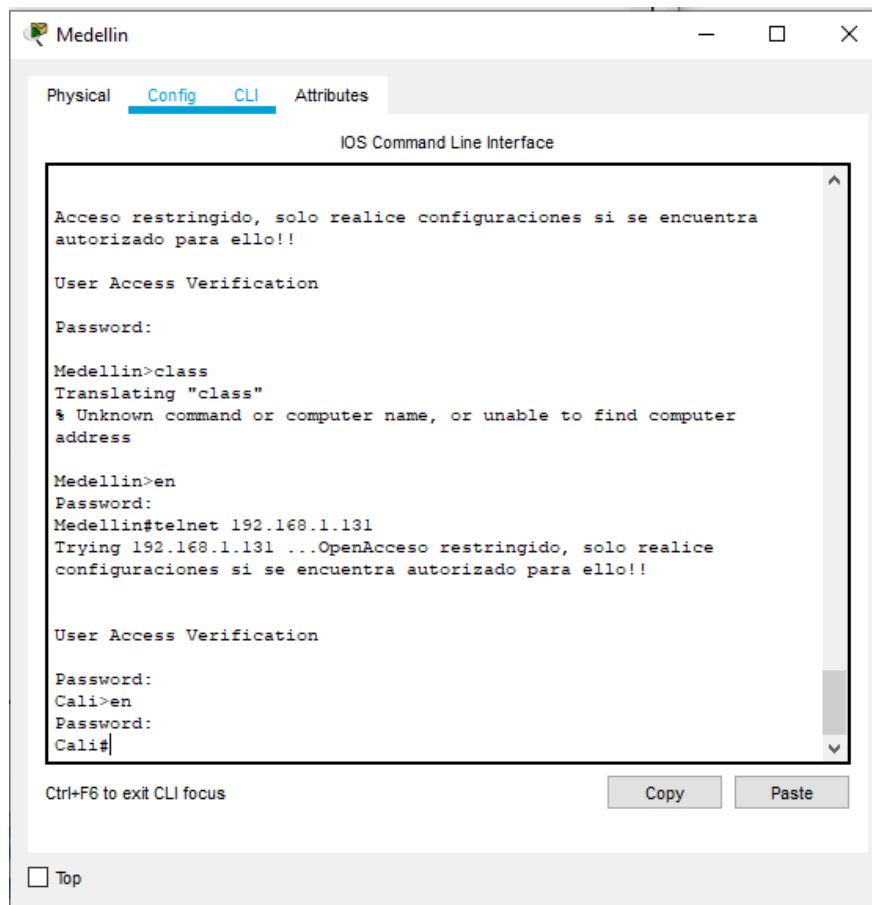
Cali:

```
Cali#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Cali(config)#access-list 101 permit ip 192.168.1.64 0.0.0.31 host 192.168.1.30
Cali(config)#int g0/0
Cali(config-if)#ip access-group 101 in
Cali(config-if)#
```

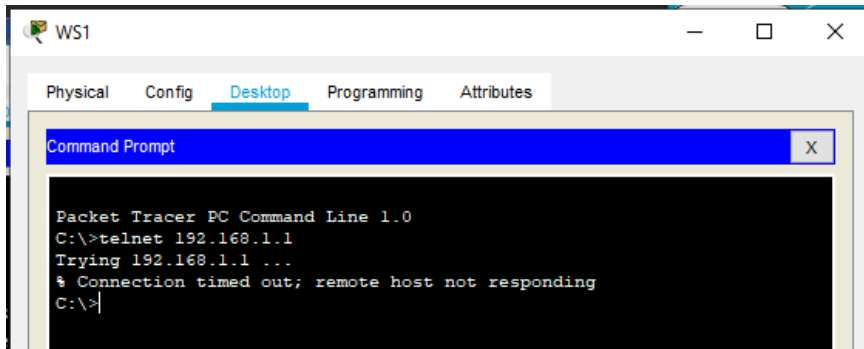
3.7 Parte 5: Comprobación de la red instalada.

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

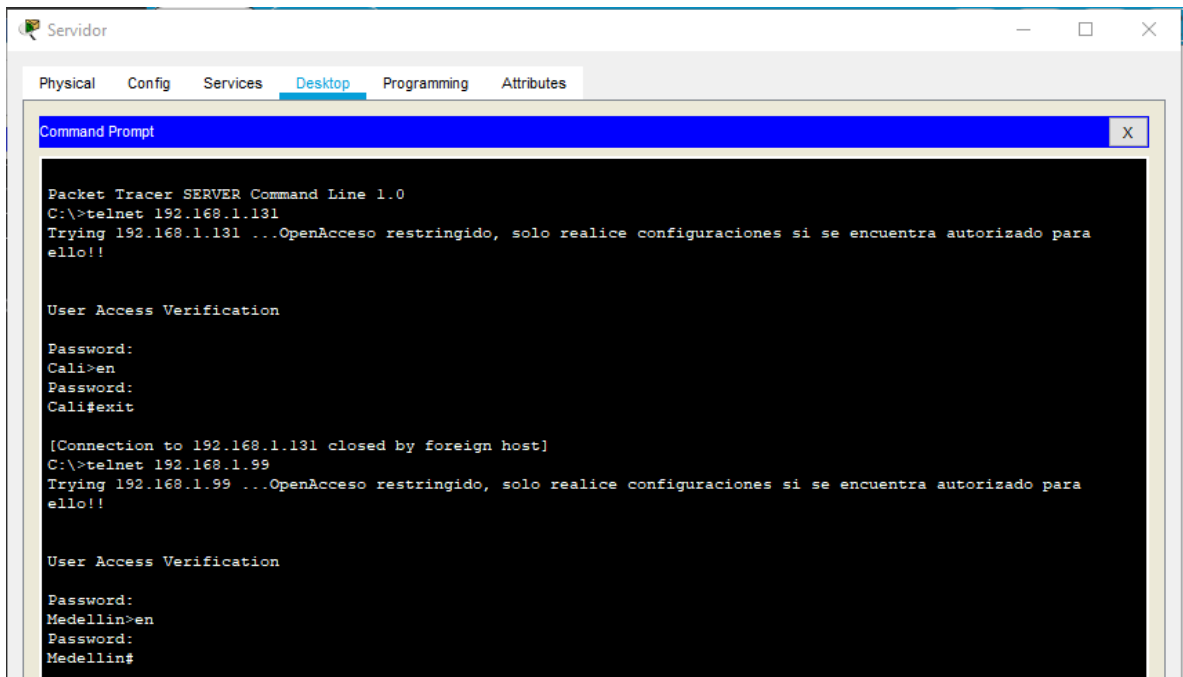
Telnet Router Medellin a Router Cali:



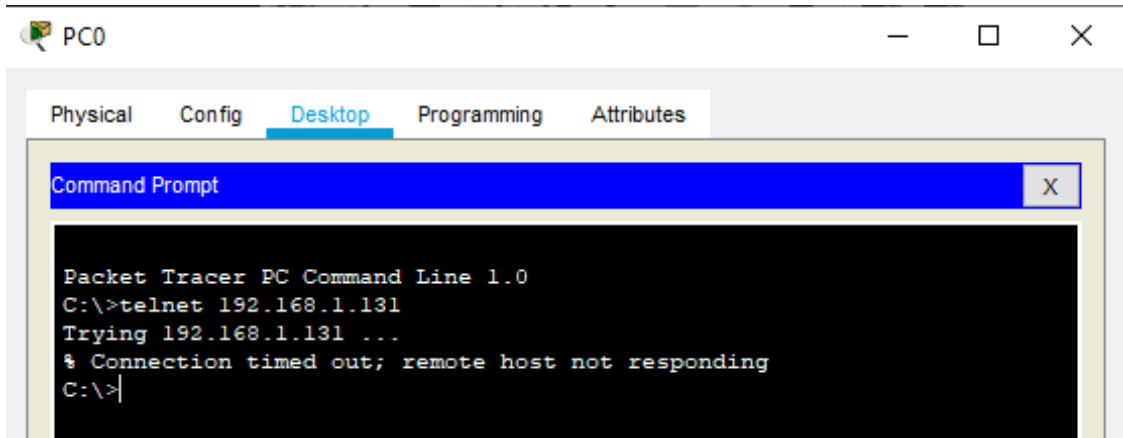
Telnet WS_1 a Router Bogota:



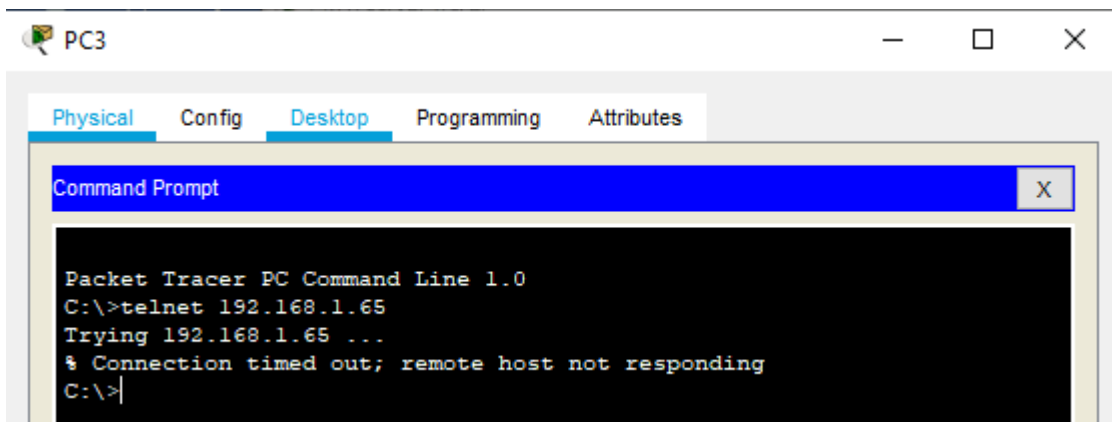
Telnet Servidor_Bogota a Router Cali y Router Medellin



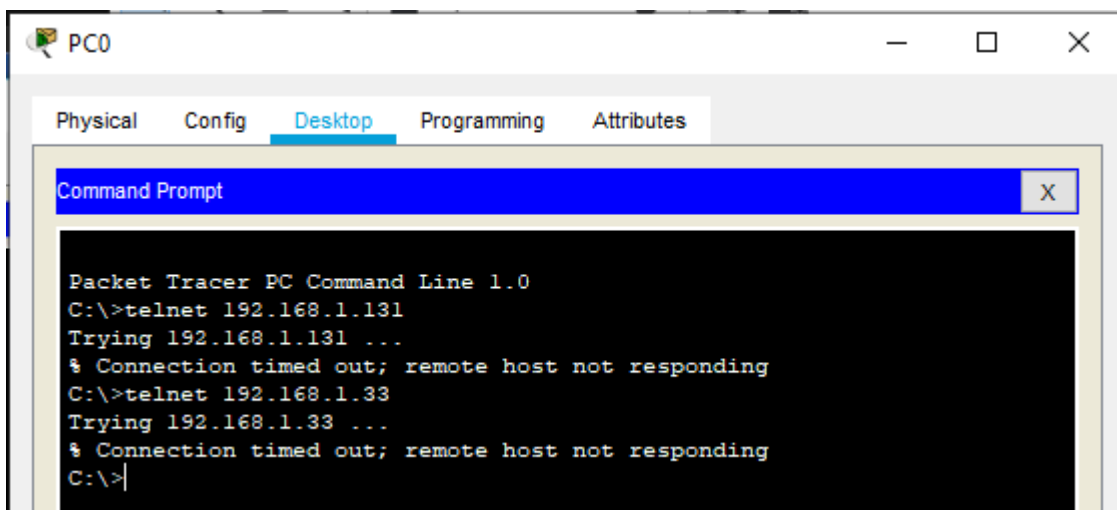
LAN del router Medellin a Router Cali



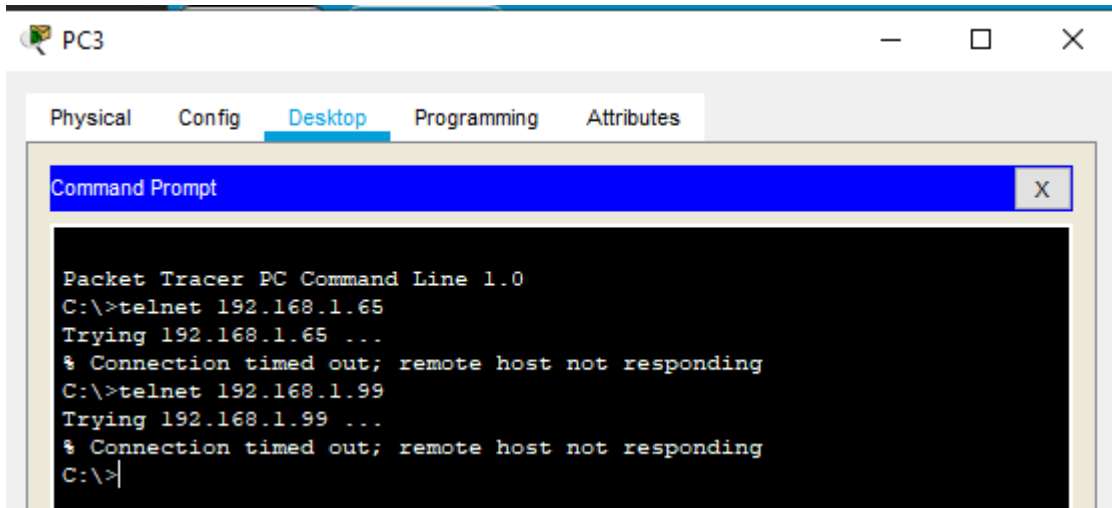
LAN de Router Cali a Router Cali



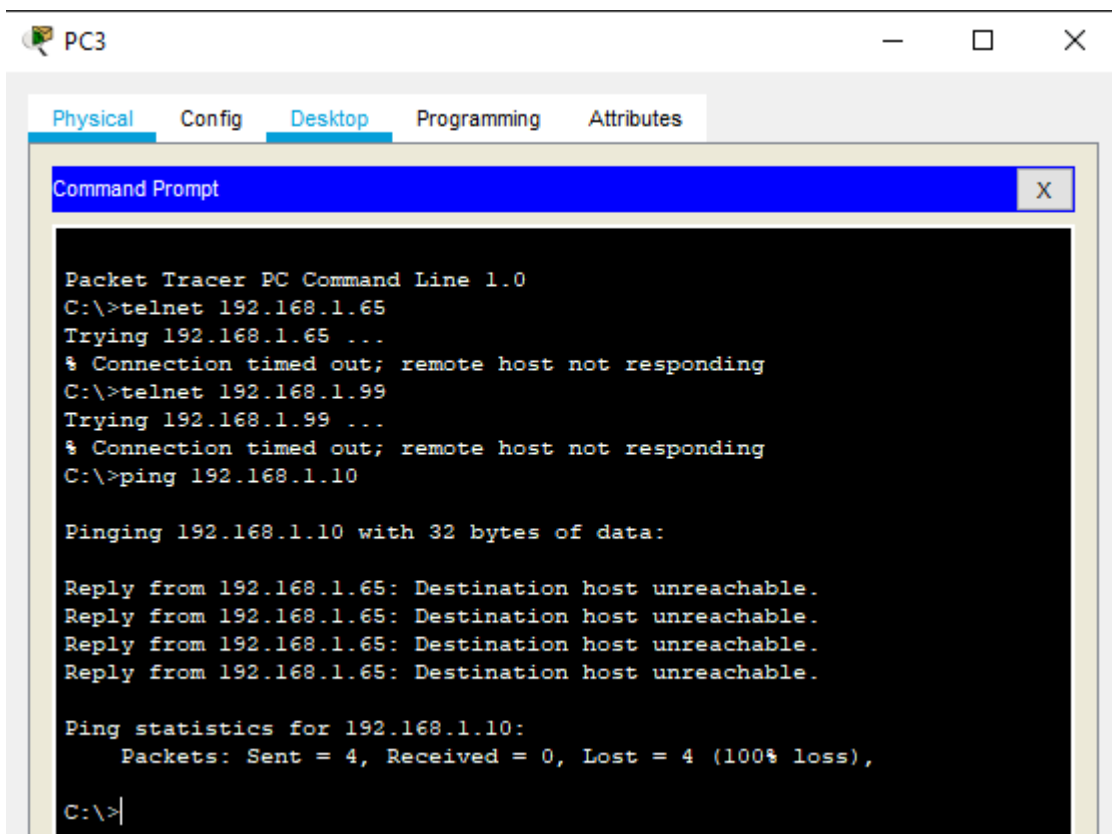
LAN de Router Medellin a Router Medellin



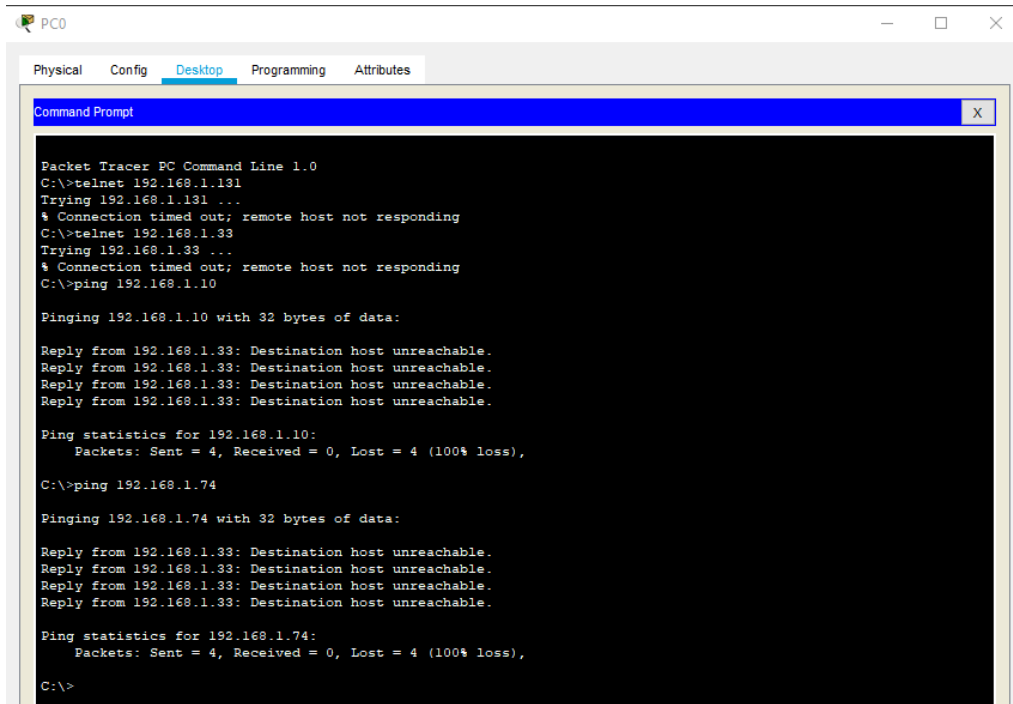
LAN Router Cali a Router Medellin:



Ping LAN Router Cali a WS_1 Bogotá:



Ping LAN Router Medellin a WS_1 Bogota y Cali



```

PC0
Physical Config Desktop Programming Attributes
Command Prompt
Packet Tracer PC Command Line 1.0
C:\>telnet 192.168.1.131
Trying 192.168.1.131 ...
% Connection timed out; remote host not responding
C:\>telnet 192.168.1.33
Trying 192.168.1.33 ...
% Connection timed out; remote host not responding
C:\>ping 192.168.1.10

Pinging 192.168.1.10 with 32 bytes of data:

Reply from 192.168.1.33: Destination host unreachable.
Reply from 192.168.1.33: Destination host unreachable.
Reply from 192.168.1.33: Destination host unreachable.
Reply from 192.168.1.33: Destination host unreachable.

Ping statistics for 192.168.1.10:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 192.168.1.74

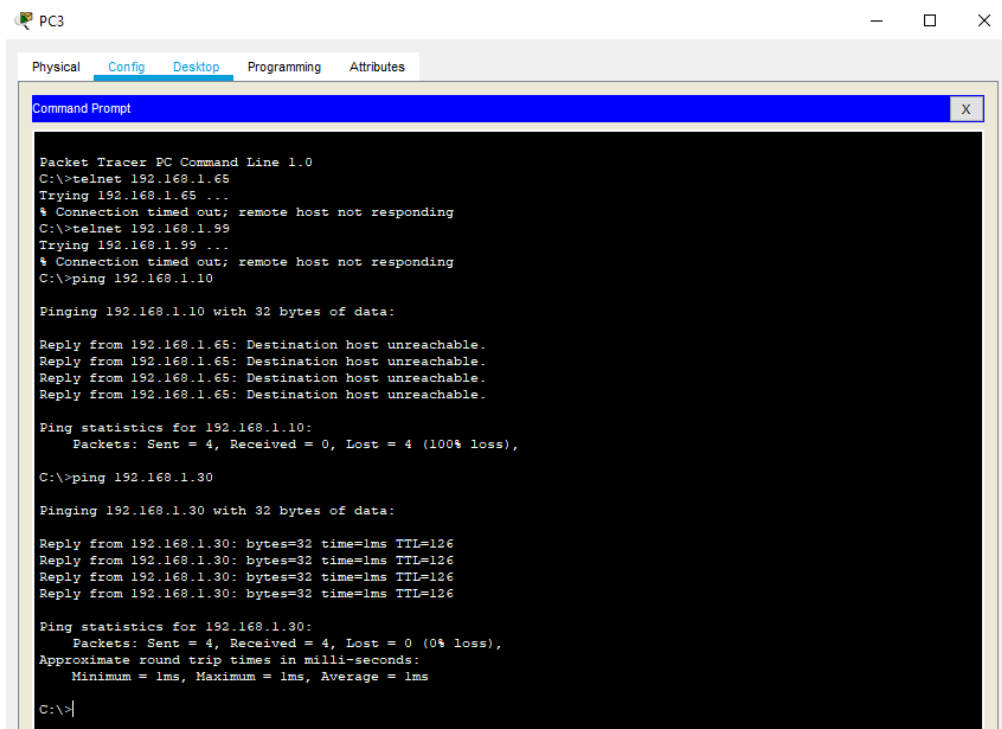
Pinging 192.168.1.74 with 32 bytes of data:

Reply from 192.168.1.33: Destination host unreachable.
Reply from 192.168.1.33: Destination host unreachable.
Reply from 192.168.1.33: Destination host unreachable.
Reply from 192.168.1.33: Destination host unreachable.

Ping statistics for 192.168.1.74:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
    
```

Ping LAN de router Cali al Servidor_ Bogota:



```

PC3
Physical Config Desktop Programming Attributes
Command Prompt
Packet Tracer PC Command Line 1.0
C:\>telnet 192.168.1.65
Trying 192.168.1.65 ...
% Connection timed out; remote host not responding
C:\>telnet 192.168.1.99
Trying 192.168.1.99 ...
% Connection timed out; remote host not responding
C:\>ping 192.168.1.10

Pinging 192.168.1.10 with 32 bytes of data:

Reply from 192.168.1.65: Destination host unreachable.
Reply from 192.168.1.65: Destination host unreachable.
Reply from 192.168.1.65: Destination host unreachable.
Reply from 192.168.1.65: Destination host unreachable.

Ping statistics for 192.168.1.10:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 192.168.1.30

Pinging 192.168.1.30 with 32 bytes of data:

Reply from 192.168.1.30: bytes=32 time=1ms TTL=126
Reply from 192.168.1.30: bytes=32 time=1ms TTL=126
Reply from 192.168.1.30: bytes=32 time=1ms TTL=126
Reply from 192.168.1.30: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.1.30:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 1ms, Average = 1ms

C:\>
    
```


Ping LAN router Medellin al Servidor_ Bogota:

```
PC0
Physical Config Desktop Programming Attributes
Command Prompt
Trying 192.168.1.33 ...
% Connection timed out; remote host not responding
C:\>ping 192.168.1.10

Pinging 192.168.1.10 with 32 bytes of data:

Reply from 192.168.1.33: Destination host unreachable.
Reply from 192.168.1.33: Destination host unreachable.
Reply from 192.168.1.33: Destination host unreachable.
Reply from 192.168.1.33: Destination host unreachable.

Ping statistics for 192.168.1.10:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 192.168.1.74

Pinging 192.168.1.74 with 32 bytes of data:

Reply from 192.168.1.33: Destination host unreachable.
Reply from 192.168.1.33: Destination host unreachable.
Reply from 192.168.1.33: Destination host unreachable.
Reply from 192.168.1.33: Destination host unreachable.

Ping statistics for 192.168.1.74:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 192.168.1.30

Pinging 192.168.1.30 with 32 bytes of data:

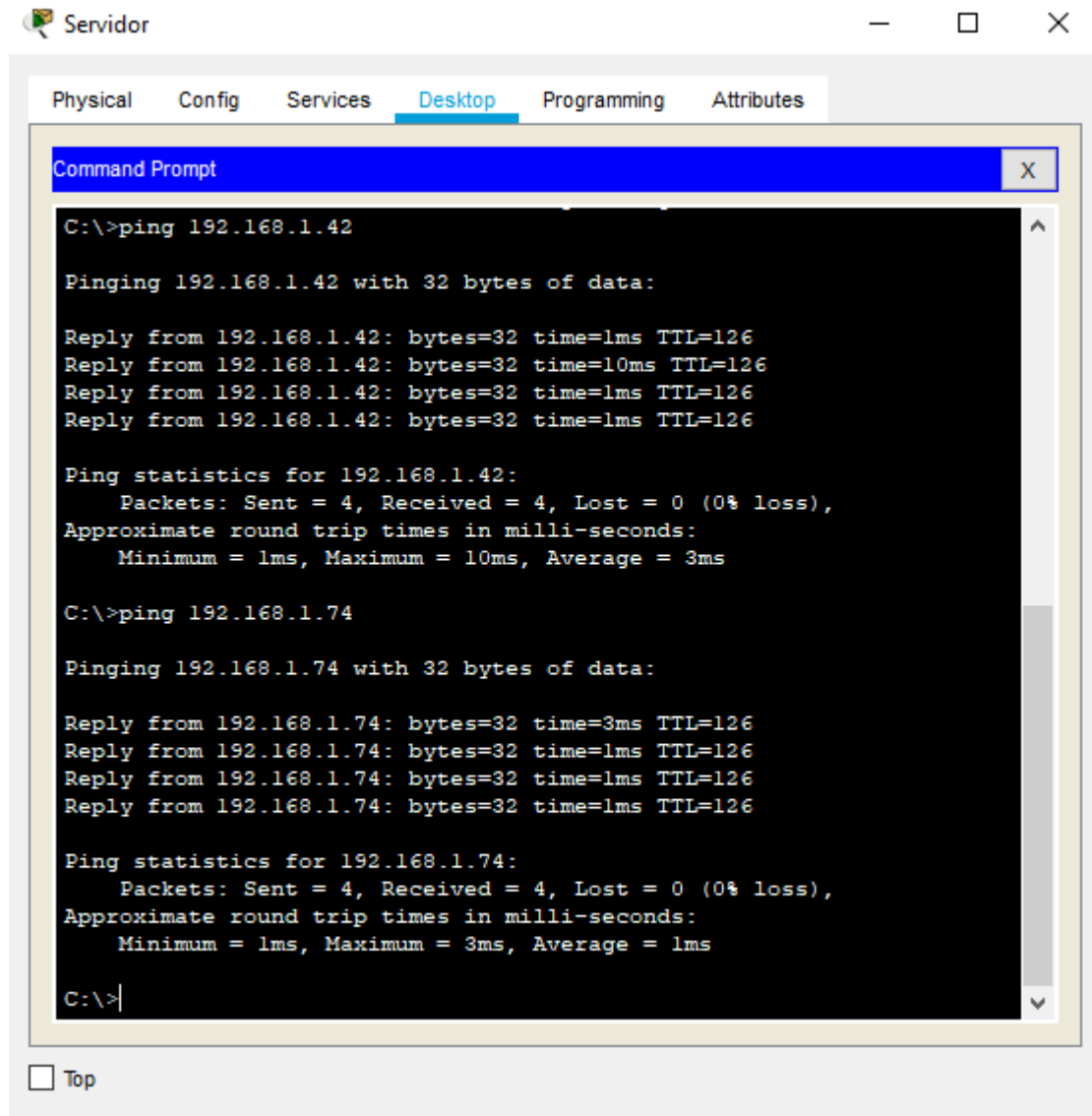
Reply from 192.168.1.30: bytes=32 time=1ms TTL=126
Reply from 192.168.1.30: bytes=32 time=1ms TTL=126
Reply from 192.168.1.30: bytes=32 time=2ms TTL=126
Reply from 192.168.1.30: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.1.30:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 2ms, Average = 1ms

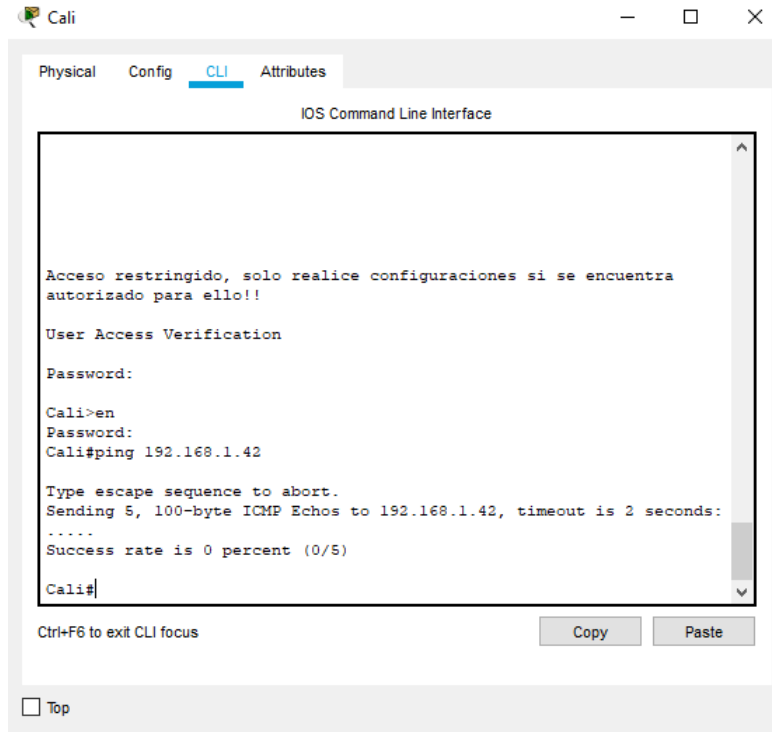
C:\>
```

Top

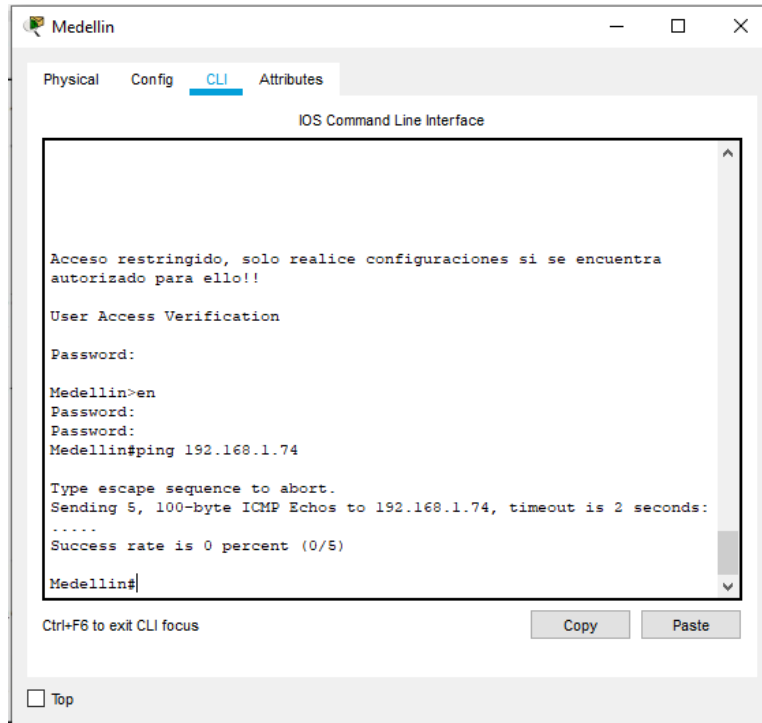
Ping Servidor_Bogota a LAN router Medellin y Cali:



Ping Router Cali a LAN Router Medellin



Ping Router Medellin a LAN Router Cali



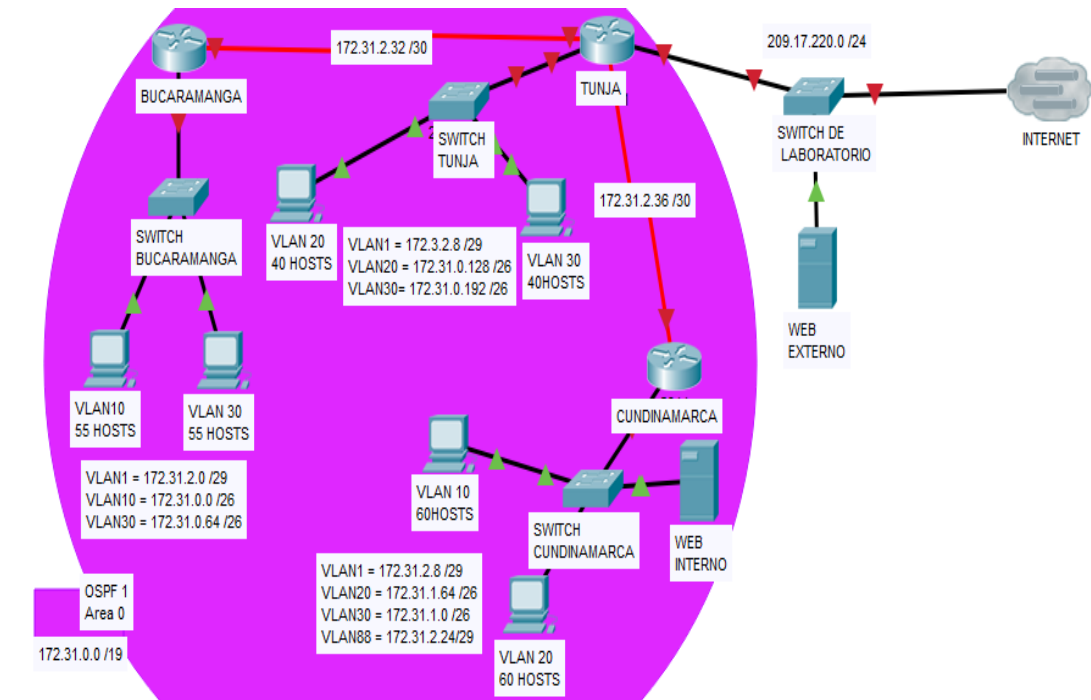
b. Comprobar y Completar la siguiente tabla de condiciones de prueba para confirmar el óptimo funcionamiento de la red e.

	ORIGEN	DESTINO	RESULTADO
TELNET	Router MEDELLIN	Router CALI	Exitoso
	WS_1	Router BOGOTA	Fallido
	Servidor	Router CALI	Exitoso
	Servidor	Router MEDELLIN	Exitoso
TELNET	LAN del Router MEDELLIN	Router CALI	Fallido
	LAN del Router CALI	Router CALI	Fallido
	LAN del Router MEDELLIN	Router MEDELLIN	Fallido
	LAN del Router CALI	Router MEDELLIN	Fallido
PING	LAN del Router CALI	WS_1	Fallido
	LAN del Router MEDELLIN	WS_1	Fallido
	LAN del Router MEDELLIN	LAN del Router CALI	Fallido
PING	LAN del Router CALI	Servidor	Exitoso
	LAN del Router MEDELLIN	Servidor	Exitoso
	Servidor	LAN del Router MEDELLIN	Exitoso
	Servidor	LAN del Router CALI	Exitoso
	Router CALI	LAN del Router MEDELLIN	Fallido
	Router MEDELLIN	LAN del Router CALI	Fallido

Tabla 4: Tabla de comprobación de red

4. PLANTEAMIENTO DEL PROBLEMA 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.



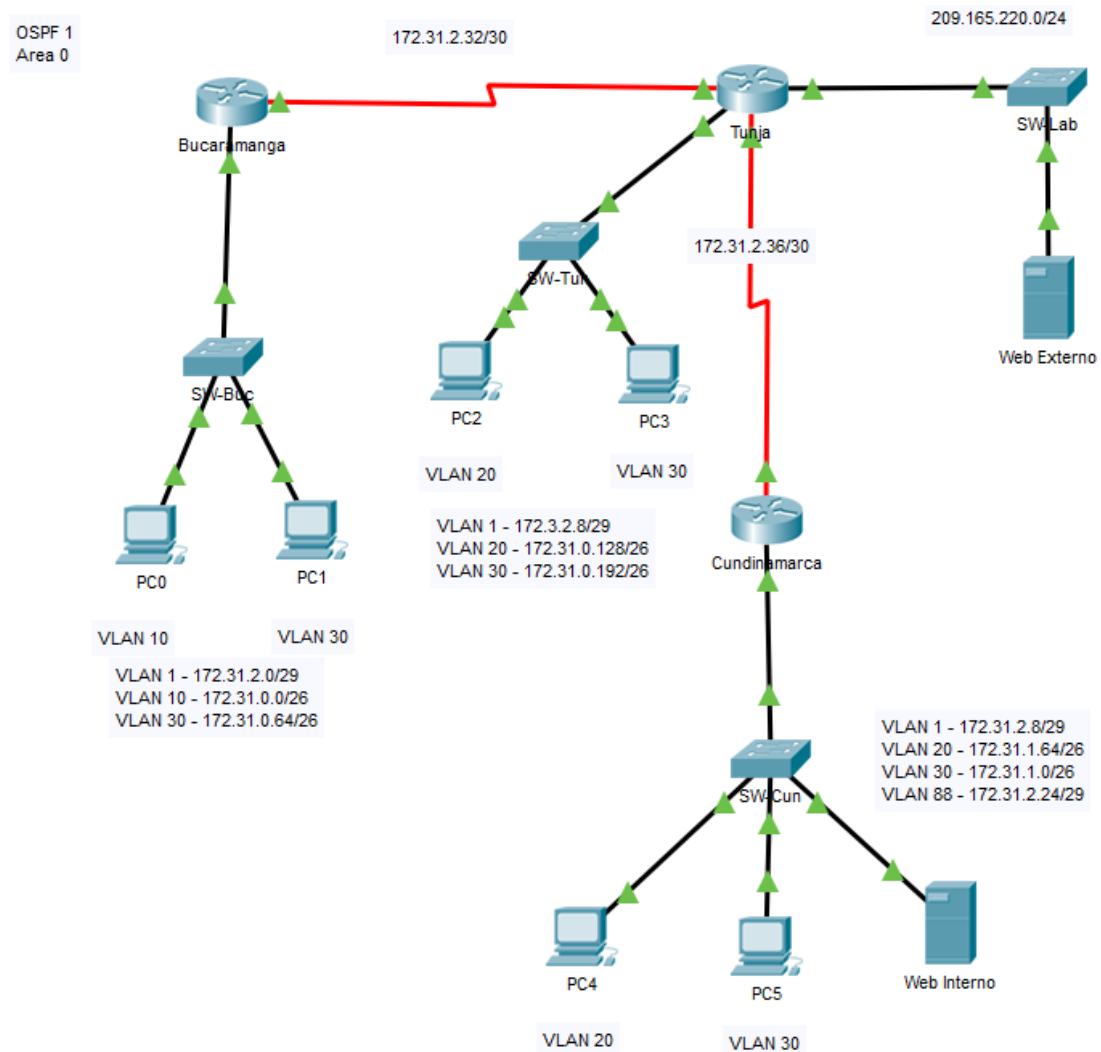
Gráfica 5: Topología de red Problema 2

Para este escenario utilizaremos:

Para realizar la configuración se escogieron los siguientes elementos de red:

- 3 * Router 1941 con asignación de tarjeta de red serial HWIC-2T
- 4 * Switch 2960
- 6 * Equipos host (con proyección de 60 host)
- 2 * Servidor

4.1 Topología de red:



Gráfica 6: Topología de Red - Packet Tracer Problema 2

Aspectos a tener en cuenta

- Habilitar VLAN en cada switch y permitir su enrutamiento.
- Enrutamiento OSPF con autenticación en cada router.
- Servicio DHCP en el router Tunja, mediante el helper address, para los routers Bucaramanga y Cundinamarca.
- Configuración de NAT estático y de sobrecarga.

- Establecer una lista de control de acceso de acuerdo con los criterios señalados.
- Habilitar las opciones en puerto consola y terminal virtual

Los siguientes son los requerimientos necesarios:

4.2 Configuración inicial

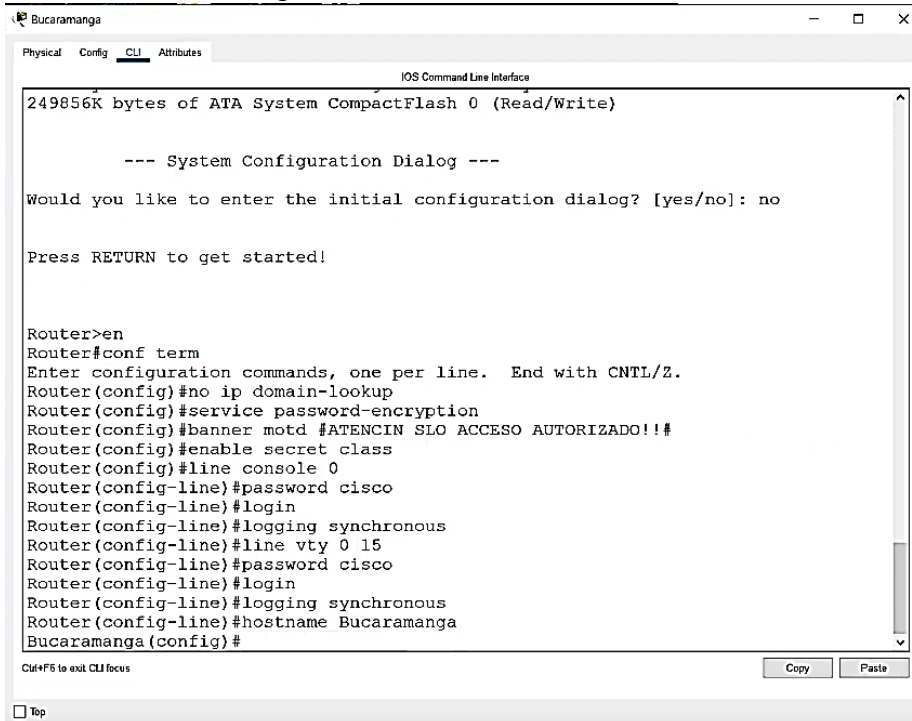
Todos los routers deberán tener los siguiente:

- Configuración básica.
- Cifrado de contraseñas.

Inicialmente en todos los dispositivos utilizaremos la siguiente linea de configuracion, el cual es igual para todos, lo unico que cambiamos son los nombres de cada host.

```
Router>en
Router#configure terminal
Router(config)#no ip domain-lookup
Router(config)#service password-encryption
Router(config)#banner motd #ATENCION, SOLO ACCESO AUTORIZADO!!
Router(config)#enable secret class
Router(config)#line console 0
Router(config-line)#password cisco
Router(config-line)#login
Router(config-line)#logging synchronous
Router(config-line)#line vty 0 15
Router(config-line)#password cisco
Router(config-line)#login
Router(config-line)#logging synchronous
Router(config-line)#hostname (Nombre de host)
Bogota(config)#
```

Router Bucaramanga:



```

IOS Command Line Interface
249856K bytes of ATA System CompactFlash 0 (Read/Write)

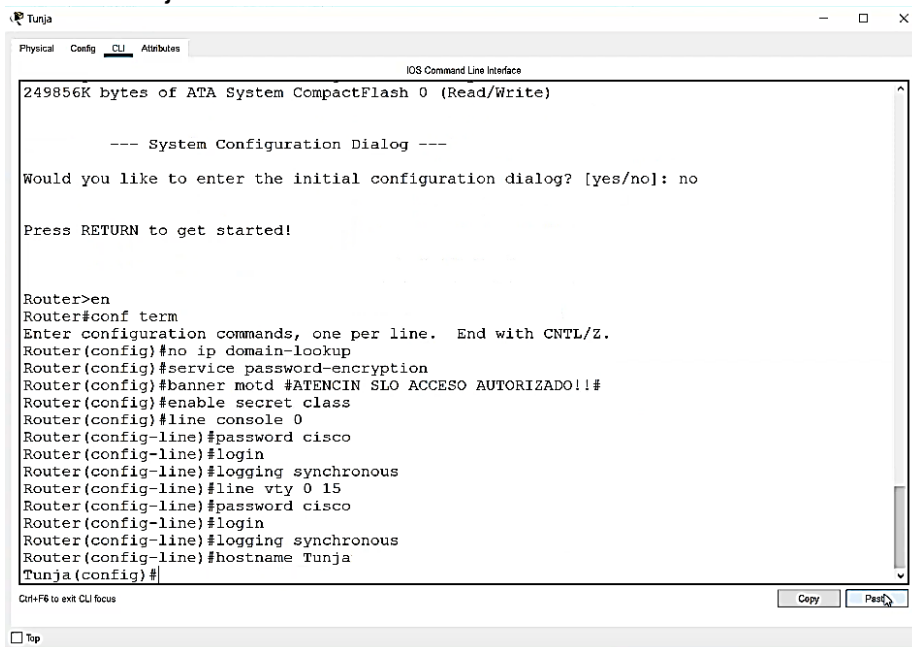
--- System Configuration Dialog ---

Would you like to enter the initial configuration dialog? [yes/no]: no

Press RETURN to get started!

Router>en
Router#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#no ip domain-lookup
Router(config)#service password-encryption
Router(config)#banner motd #ATENCIN SLO ACCESO AUTORIZADO!!#
Router(config)#enable secret class
Router(config)#line console 0
Router(config-line)#password cisco
Router(config-line)#login
Router(config-line)#logging synchronous
Router(config-line)#line vty 0 15
Router(config-line)#password cisco
Router(config-line)#login
Router(config-line)#logging synchronous
Router(config-line)#hostname Bucaramanga
Bucaramanga(config)#
  
```

Router Tunja



```

IOS Command Line Interface
249856K bytes of ATA System CompactFlash 0 (Read/Write)

--- System Configuration Dialog ---

Would you like to enter the initial configuration dialog? [yes/no]: no

Press RETURN to get started!

Router>en
Router#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#no ip domain-lookup
Router(config)#service password-encryption
Router(config)#banner motd #ATENCIN SLO ACCESO AUTORIZADO!!#
Router(config)#enable secret class
Router(config)#line console 0
Router(config-line)#password cisco
Router(config-line)#login
Router(config-line)#logging synchronous
Router(config-line)#line vty 0 15
Router(config-line)#password cisco
Router(config-line)#login
Router(config-line)#logging synchronous
Router(config-line)#hostname Tunja
Tunja(config)#
  
```



```

Tunja
-----
Physical Config CLI Attributes
IOS Command Line Interface

User Access Verification
Username: cisco
Password:
% Login invalid

Username: class
Password:
% Login invalid

Username: admin
Password:
Tunja>en
Tunja#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Tunja(config)#int g0/1
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 GigabitEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up

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

Router Cundinamarca

```

Cundinamarca
-----
Physical Config CLI Attributes
IOS Command Line Interface

--- System Configuration Dialog ---
Would you like to enter the initial configuration dialog? [yes/no]: no

Press RETURN to get started!

Router>en
Router#conf tem
^
% Invalid input detected at '^' marker.

Router#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#no ip domain-lookup
Router(config)#service password-encryption
Router(config)#banner motd #ATENCIÓN SLO ACCESO AUTORIZADO!!#
Router(config)#enable secret class
Router(config)#line console 0
Router(config-line)#password cisco
Router(config-line)#login
Router(config-line)#logging synchronous
Router(config-line)#line vty 0 15
Router(config-line)#password cisco
Router(config-line)#login
Router(config-line)#logging synchronous
Router(config-line)#hostname Cundinamarca
Cundinamarca(config)#
    
```

- Autenticación local con AAA.

La autenticación la haremos con nombre de grupo local (local group) AUTHLOCAL.
Previa creación de usuario: *admin* con contraseña: *admin123*

La línea de comandos será la siguiente:

```
Router(config)#username admin secret admin123
Router(config)#aaa new-model
Router(config)#aaa authentication login AUTHLOCAL local
Router(config)#line console 0
Router(config-line)#login authentication AUTHLOCAL
Router(config-line)#line vty 0 15
Router(config-line)#login authentication AUTHLOCAL
Router(config-line)#end
Router#
```

Router Bucaramanga:

```
Bucaramanga
Physical Config CLI Attributes
IOS Command Line Interface

Press RETURN to get started!
ATENCIN SLO ACCESO AUTORIZADO!!
User Access Verification
Password:
Bucaramanga>en
Password:
Bucaramanga#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Bucaramanga(config)#username admin secret admin123
Bucaramanga(config)#aaa new-model
Bucaramanga(config)#aaa authentication login AUTHLOCAL local
Bucaramanga(config)#line console 0
Bucaramanga(config-line)#login authentication AUTHLOCAL
Bucaramanga(config-line)#line vty 0 15
Bucaramanga(config-line)#login authentication AUTHLOCAL
Bucaramanga(config-line)#

Ctrl+F6 to exit CLI focus
Copy Paste
Top
```

Router Tunja:

```
Tunja
Physical Config CLI Attributes
IOS Command Line Interface

ATENCIN SLO ACCESO AUTORIZADO!!
User Access Verification
Password:

Tunja>en
Password:
Tunja#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Tunja(config)#username admin secret admin123
Tunja(config)#aaa new-model
Tunja(config)#aaa authentication login AUTHLOCAL local
Tunja(config)#line console 0
Tunja(config-line)#login authentication AUTHLOCAL
Tunja(config-line)#line vty 0 15
Tunja(config-line)#login authentication AUTHLOCAL
Tunja(config-line)#

Ctrl+F6 to exit CLI focus
```

Router Cundinamarca

```
Cundinamarca
Physical Config CLI Attributes
IOS Command Line Interface

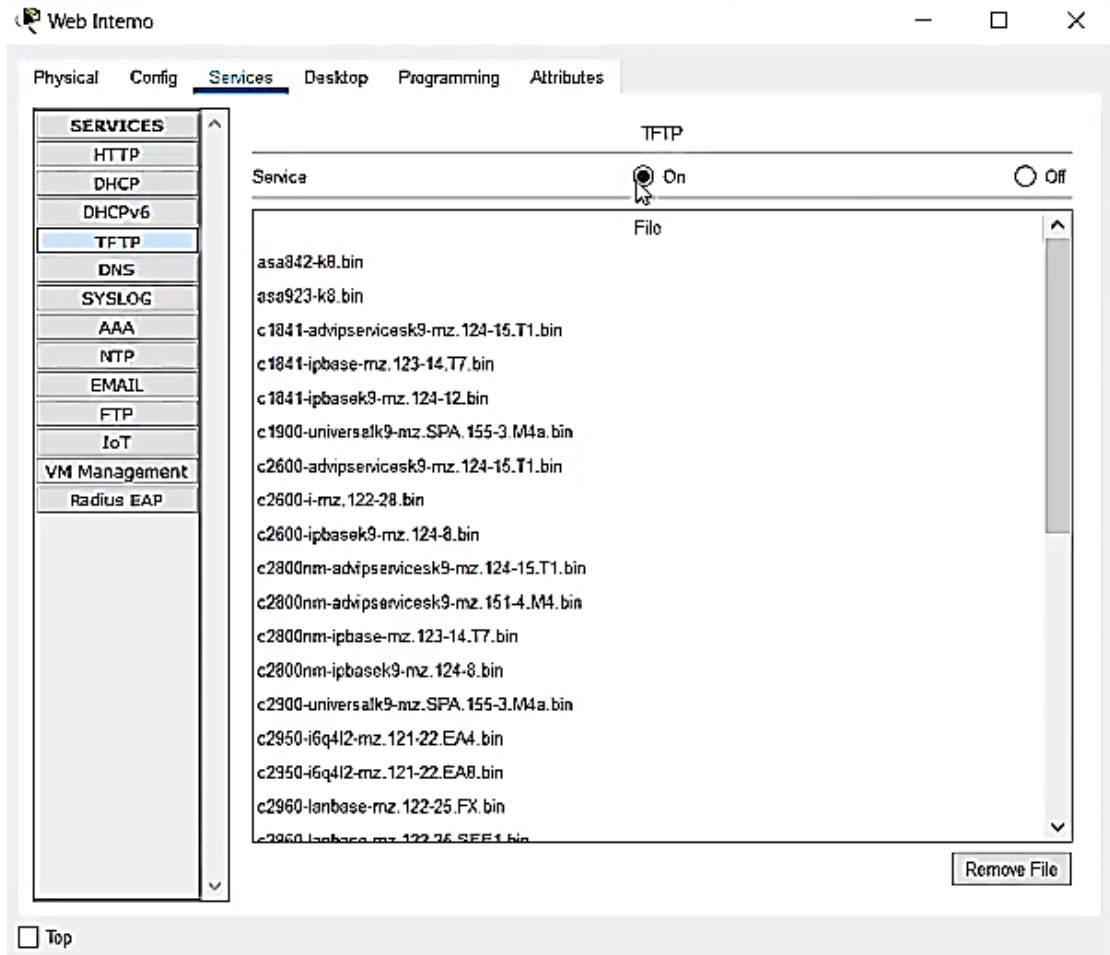
Press RETURN to get started.

ATENCIN SLO ACCESO AUTORIZADO!!
User Access Verification
Password:

Cundinamarca>en
Password:
Cundinamarca#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Cundinamarca(config)#username admin secret admin123
Cundinamarca(config)#aaa new-model
Cundinamarca(config)#aaa authentication login AUTHLOCAL local
Cundinamarca(config)#line console 0
Cundinamarca(config-line)#login authentication AUTHLOCAL
Cundinamarca(config-line)#line vty 0 15
Cundinamarca(config-line)#login authentication AUTHLOCAL
Cundinamarca(config-line)#

Ctrl+F6 to exit CLI focus
```

- Un máximo de internos para acceder al router.
- Máximo tiempo de acceso al detectar ataques.
 El comando para esta característica es la siguiente:
“Login block-for 10 attemps 3 within 60” y sera aplicado a todos los routers
- Establezca un servidor TFTP y almacene todos los archivos necesarios de los routers.



1. El DHCP deberá proporcionar solo direcciones a los hosts de Bucaramanga y Cundinamarca
2. El web server deberá tener NAT estático y el resto de los equipos de la topología emplearan NAT de sobrecarga (PAT).
3. El enrutamiento deberá tener autenticación.
4. 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.
5. VLSM: utilizar la dirección 172.31.0.0 /18 para el direccionamiento.

Configuración de Router Cundinamarca:

```

Bucaramanga
Physical Config CLI Attributes
IOS Command Line Interface
ATENCIN SLO ACCESO AUTORIZADO!!

User Access Verification

Password:

Bucaramanga>en
Password:
Bucaramanga#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Bucaramanga(config)#username admin secret admin123
Bucaramanga(config)#aaa new-model
Bucaramanga(config)#aaa authentication login AUTHLOCAL local
Bucaramanga(config)#line console 0
Bucaramanga(config-line)#login authentication AUTHLOCAL
Bucaramanga(config-line)#line vty 0 15
Bucaramanga(config-line)#login authentication AUTHLOCAL
Bucaramanga(config-line)#login block-for 10 attempts 3 within 60
Bucaramanga(config)#int g0/0.1
Bucaramanga(config-subif)#encapsulation dot1q 1
Bucaramanga(config-subif)#ip address 172.31.2.1 255.255.255.248
Bucaramanga(config-subif)#int g0/0.10
Bucaramanga(config-subif)#encapsulation dot1q 10
Bucaramanga(config-subif)#ip address 172.31.0.1 255.255.255.192
Bucaramanga(config-subif)#int g0/0.30
Bucaramanga(config-subif)#encapsulation dot1q 30
Bucaramanga(config-subif)#ip address 172.31.0.65 255.255.255.192
Bucaramanga(config-subif)#int g0/0
Bucaramanga(config-if)#no shutdown
    
```

```

Bucaramanga
Physical Config CLI Attributes
IOS Command Line Interface

Bucaramanga(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

%LINK-5-CHANGED: Interface GigabitEthernet0/0.1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.1,
changed state to up

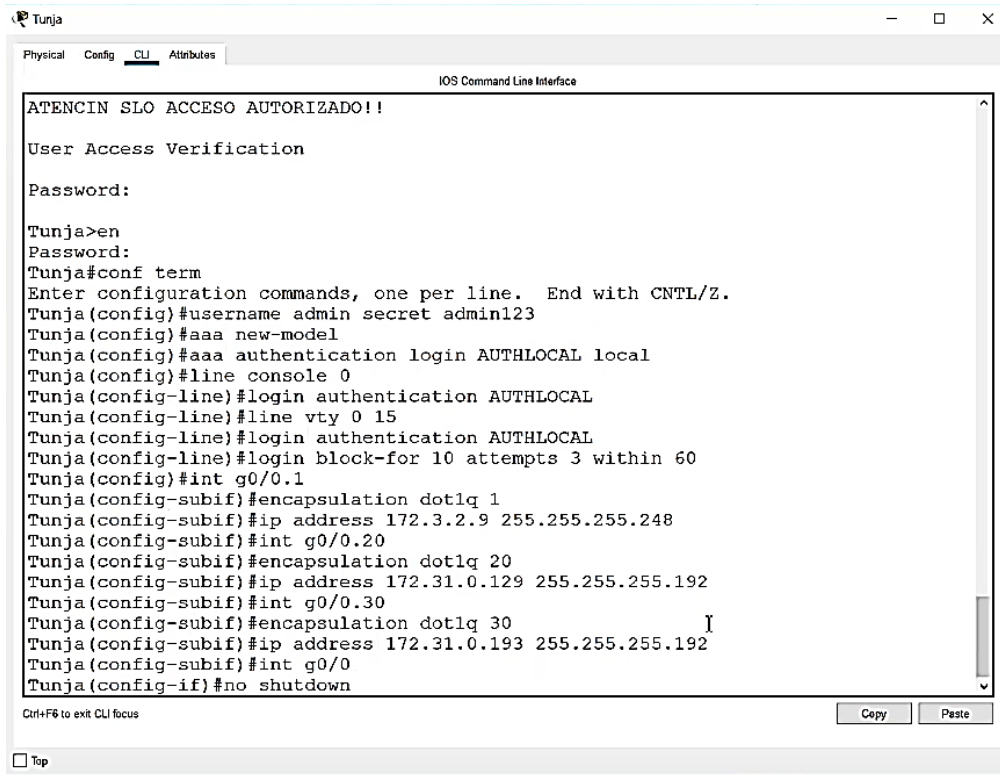
%LINK-5-CHANGED: Interface GigabitEthernet0/0.10, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface
GigabitEthernet0/0.10, changed state to up

%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-if)#
Bucaramanga(config-if)#int s0/0/0
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)#
    
```

Configuración de Router Tunja:



```

Tunja
-----
Physical  Config  CLI  Attributes
-----
IOS Command Line Interface

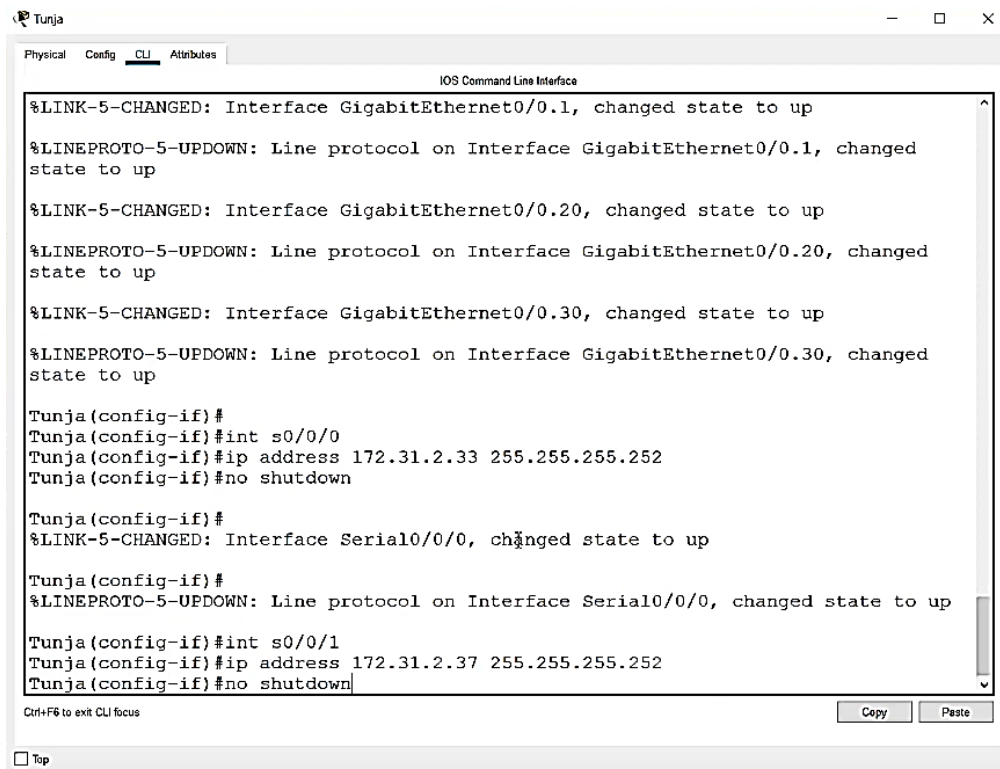
ATENCIN SLO ACCESO AUTORIZADO!!

User Access Verification

Password:

Tunja>en
Password:
Tunja#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Tunja(config)#username admin secret admin123
Tunja(config)#aaa new-model
Tunja(config)#aaa authentication login AUTHLOCAL local
Tunja(config)#line console 0
Tunja(config-line)#login authentication AUTHLOCAL
Tunja(config-line)#line vty 0 15
Tunja(config-line)#login authentication AUTHLOCAL
Tunja(config-line)#login block-for 10 attempts 3 within 60
Tunja(config)#int g0/0.1
Tunja(config-subif)#encapsulation dot1q 1
Tunja(config-subif)#ip address 172.3.2.9 255.255.255.248
Tunja(config-subif)#int g0/0.20
Tunja(config-subif)#encapsulation dot1q 20
Tunja(config-subif)#ip address 172.31.0.129 255.255.255.192
Tunja(config-subif)#int g0/0.30
Tunja(config-subif)#encapsulation dot1q 30
Tunja(config-subif)#ip address 172.31.0.193 255.255.255.192
Tunja(config-subif)#int g0/0
Tunja(config-if)#no shutdown

Ctrl+F6 to exit CLI focus
Copy Paste
Top
  
```



```

Tunja
-----
Physical  Config  CLI  Attributes
-----
IOS Command Line Interface

%LINK-5-CHANGED: Interface GigabitEthernet0/0.1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.1, changed
state to up
%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
Tunja(config-if)#
Tunja(config-if)#int s0/0/0
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)#int s0/0/1
Tunja(config-if)#ip address 172.31.2.37 255.255.255.252
Tunja(config-if)#no shutdown

Ctrl+F6 to exit CLI focus
Copy Paste
Top
  
```

Configuración Router Cundinamarca:

```

Cundinamarca
Physical Config CU Attributes
IOS Command Line Interface

User Access Verification
Password:
Cundinamarca>en
Password:
Cundinamarca#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Cundinamarca (config)#username admin secret admin123
Cundinamarca (config)#aaa new-model
Cundinamarca (config)#aaa authentication login AUTHLOCAL local
Cundinamarca (config)#line console 0
Cundinamarca (config-line)#login authentication AUTHLOCAL
Cundinamarca (config-line)#line vty 0 15
Cundinamarca (config-line)#login authentication AUTHLOCAL
Cundinamarca (config-line)#login block-for 10 attempts 3 within 60
Cundinamarca (config)#int g0/0.1
Cundinamarca (config-subif)#encapsulation dot1q 1
Cundinamarca (config-subif)#ip address 172.31.2.9 255.255.255.248
Cundinamarca (config-subif)#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
Cundinamarca (config-subif)#int g0/0
Cundinamarca (config-if)#no shutdown
    
```

```

Cundinamarca
Physical Config CU Attributes
IOS Command Line Interface

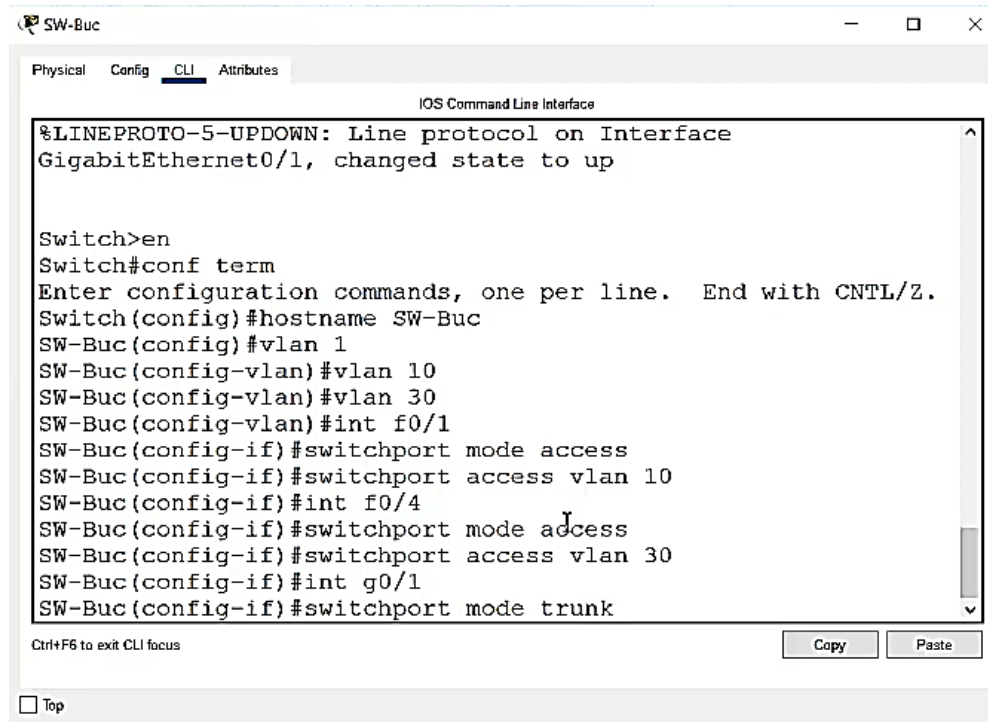
Cundinamarca (config-if) #
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up
%LINK-5-CHANGED: Interface GigabitEthernet0/0.1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.1, changed state to up
%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-if) #int s0/0/0
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) #
Cundinamarca (config-if) #
    
```


4.3 Configuración de VLANs:

Configuración VLAN Switch Bucaramanga



```

SW-Buc
Physical Config CLI Attributes
IOS Command Line Interface
%LINEPROTO-5-UPDOWN: Line protocol on Interface
GigabitEthernet0/1, changed state to up

Switch>en
Switch#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname SW-Buc
SW-Buc(config)#vlan 1
SW-Buc(config-vlan)#vlan 10
SW-Buc(config-vlan)#vlan 30
SW-Buc(config-vlan)#int f0/1
SW-Buc(config-if)#switchport mode access
SW-Buc(config-if)#switchport access vlan 10
SW-Buc(config-if)#int f0/4
SW-Buc(config-if)#switchport mode access
SW-Buc(config-if)#switchport access vlan 30
SW-Buc(config-if)#int g0/1
SW-Buc(config-if)#switchport mode trunk

Ctrl+F6 to exit CLI focus
Copy Paste
 Top

```

```

SW-Buc>en
SW-Buc#conf term
Enter configuration commands, one per line. End with CNTL/Z.
SW-Buc(config)#int vlan 1
SW-Buc(config-if)#ip address 172.31.2.3 255.255.255.248
SW-Buc(config-if)#no shutdown

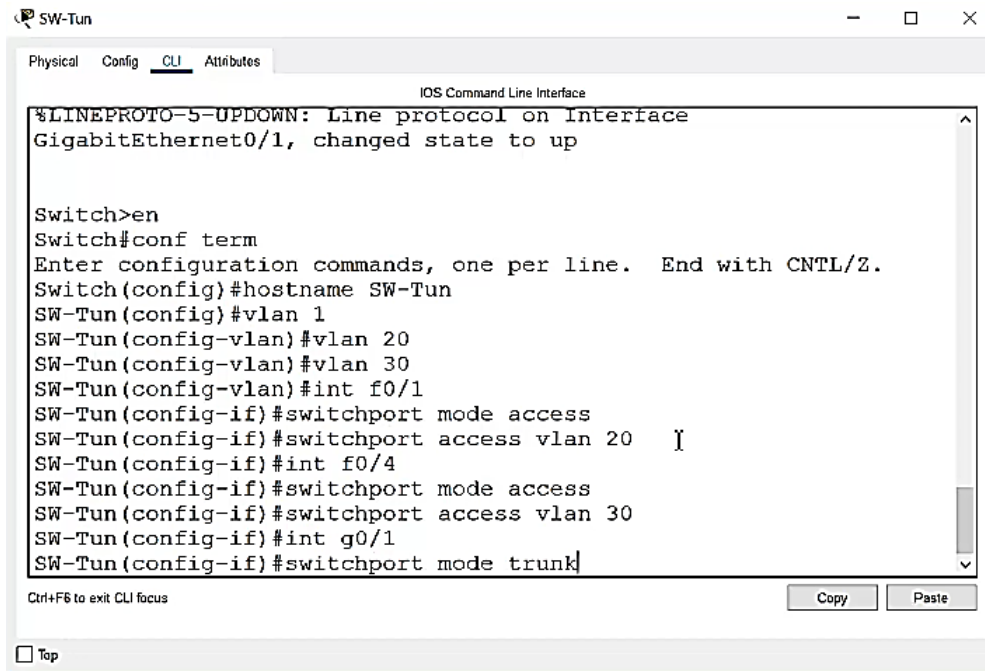
SW-Buc(config-if)#
%LINK-5-CHANGED: Interface Vlan1, changed state to up

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

SW-Buc(config-if)#ip default-gateway 172.31.2.1
SW-Buc(config)#

```

Configuración VLAN Switch Tunja

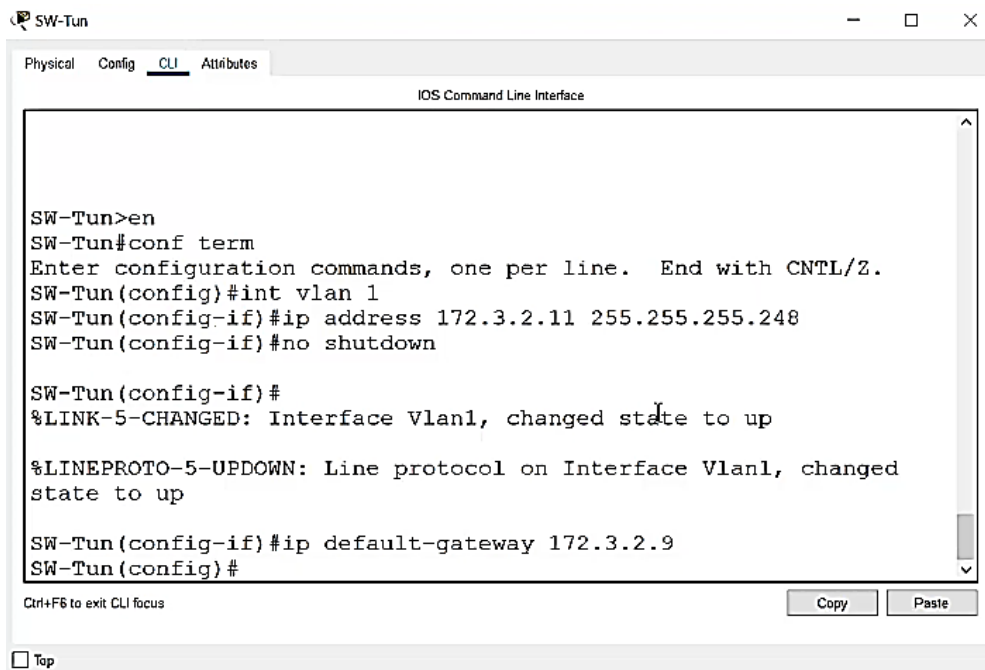


```

IOS Command Line Interface

%LINEPROTO-5-UPDOWN: Line protocol on Interface
GigabitEthernet0/1, changed state to up

Switch>en
Switch#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#hostname SW-Tun
SW-Tun(config)#vlan 1
SW-Tun(config-vlan)#vlan 20
SW-Tun(config-vlan)#vlan 30
SW-Tun(config-vlan)#int f0/1
SW-Tun(config-if)#switchport mode access
SW-Tun(config-if)#switchport access vlan 20
SW-Tun(config-if)#int f0/4
SW-Tun(config-if)#switchport mode access
SW-Tun(config-if)#switchport access vlan 30
SW-Tun(config-if)#int g0/1
SW-Tun(config-if)#switchport mode trunk
  
```



```

IOS Command Line Interface

SW-Tun>en
SW-Tun#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
SW-Tun(config)#int vlan 1
SW-Tun(config-if)#ip address 172.3.2.11 255.255.255.248
SW-Tun(config-if)#no shutdown

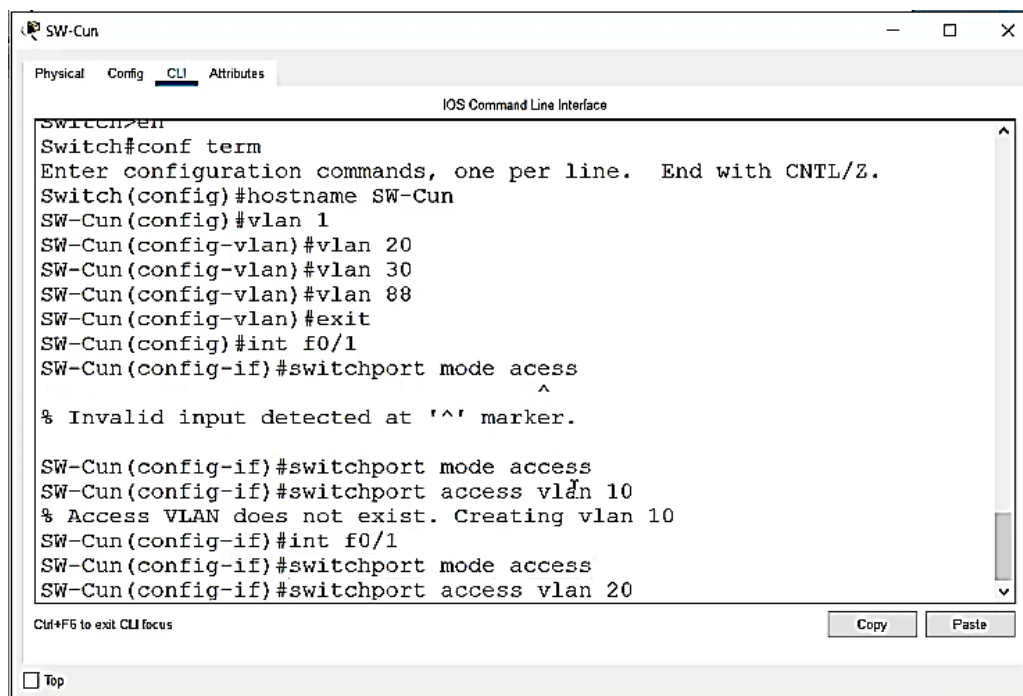
SW-Tun(config-if)#
%LINK-5-CHANGED: Interface Vlan1, changed state to up

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

SW-Tun(config-if)#ip default-gateway 172.3.2.9
SW-Tun(config)#
  
```

Configuración VLAN Switch Cundinamarca

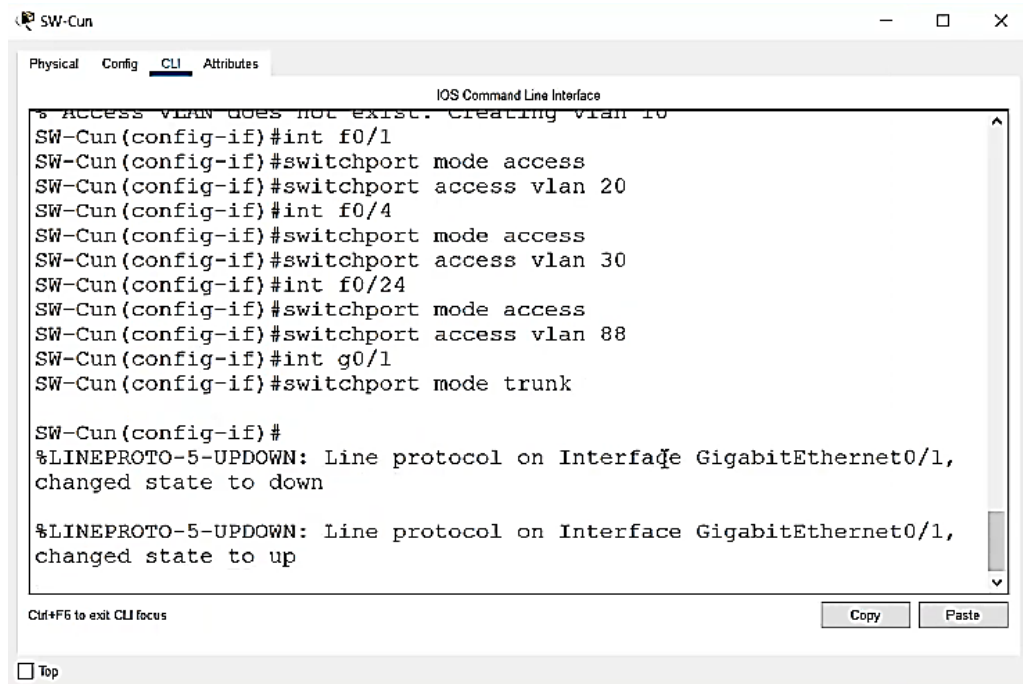
LA VLAN 10 de la guía no puede existir, por lo que la crearemos como VLAN 20.



```

SW-Cun>en
Switch#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname SW-Cun
SW-Cun(config)#vlan 1
SW-Cun(config-vlan)#vlan 20
SW-Cun(config-vlan)#vlan 30
SW-Cun(config-vlan)#vlan 88
SW-Cun(config-vlan)#exit
SW-Cun(config)#int f0/1
SW-Cun(config-if)#switchport mode access
^
% Invalid input detected at '^' marker.

SW-Cun(config-if)#switchport mode access
SW-Cun(config-if)#switchport access vlan 10
% Access VLAN does not exist. Creating vlan 10
SW-Cun(config-if)#int f0/1
SW-Cun(config-if)#switchport mode access
SW-Cun(config-if)#switchport access vlan 20
    
```

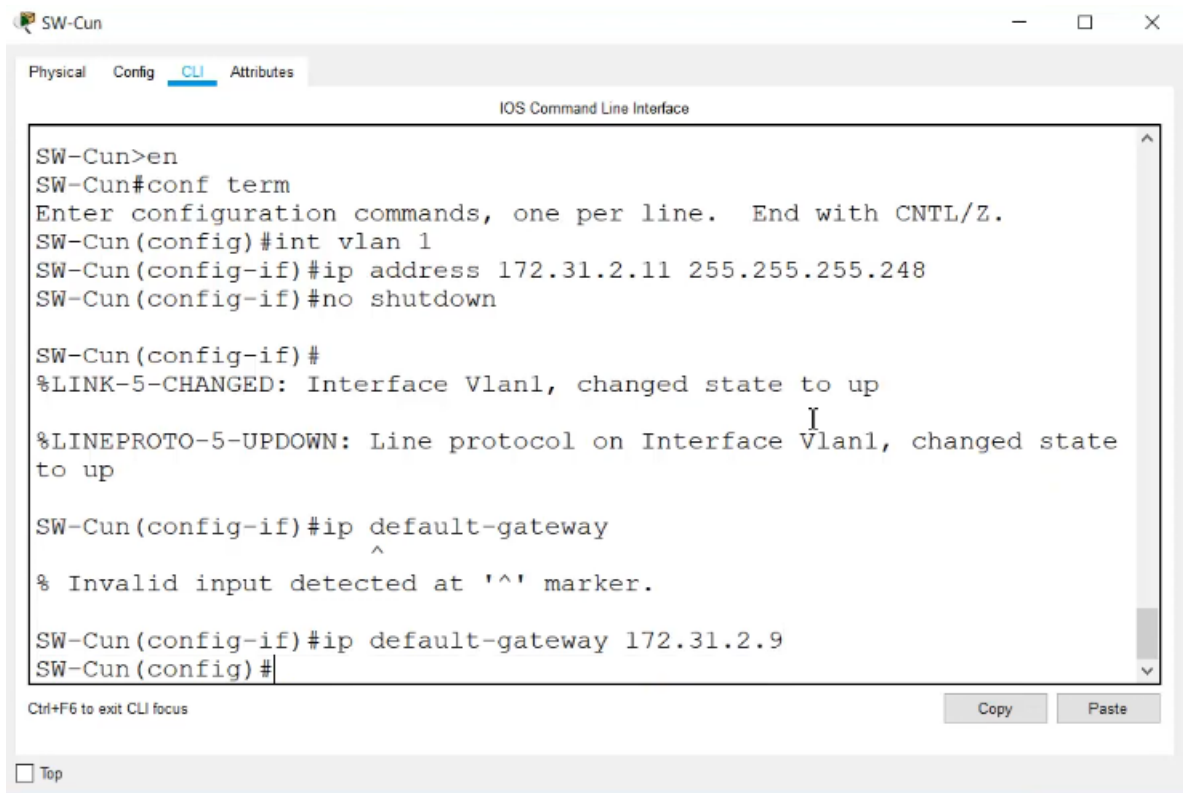


```

% Access VLAN does not exist. Creating vlan 10
SW-Cun(config-if)#int f0/1
SW-Cun(config-if)#switchport mode access
SW-Cun(config-if)#switchport access vlan 20
SW-Cun(config-if)#int f0/4
SW-Cun(config-if)#switchport mode access
SW-Cun(config-if)#switchport access vlan 30
SW-Cun(config-if)#int f0/24
SW-Cun(config-if)#switchport mode access
SW-Cun(config-if)#switchport access vlan 88
SW-Cun(config-if)#int g0/1
SW-Cun(config-if)#switchport mode trunk

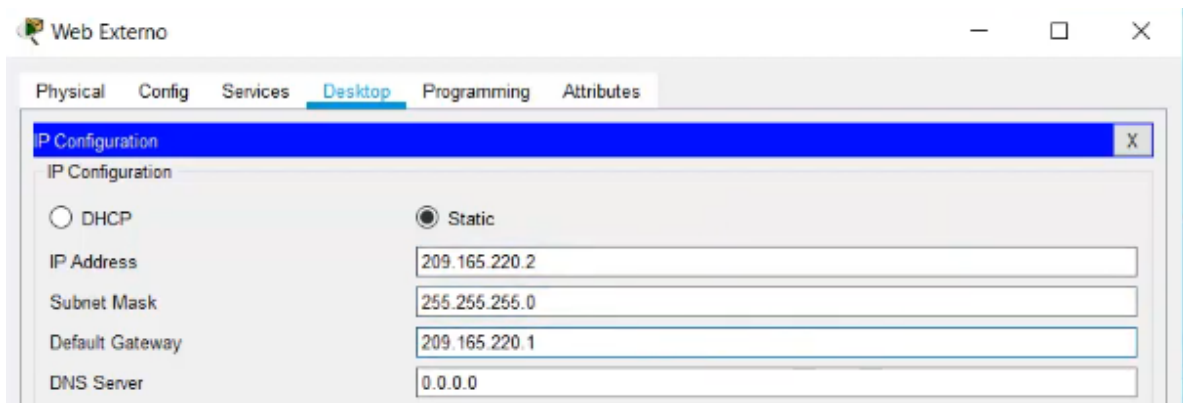
SW-Cun(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1,
changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1,
changed state to up
    
```

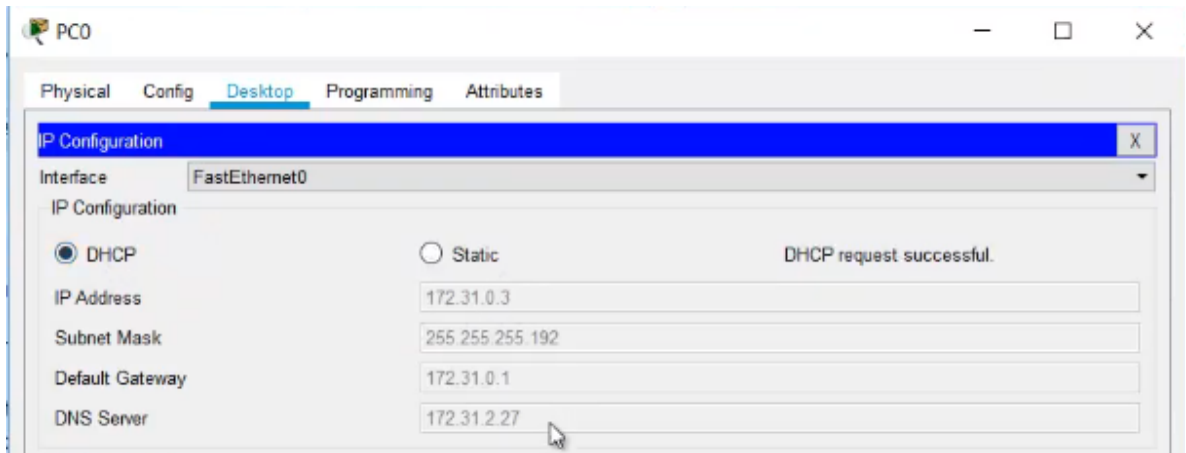


4.4 Configuración IP de Hosts:

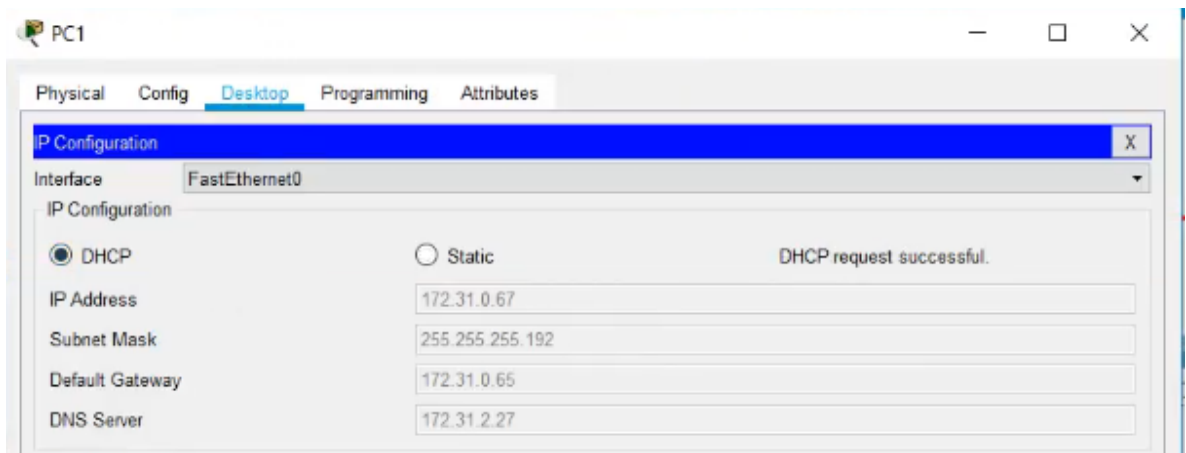
Servidor Tunja:



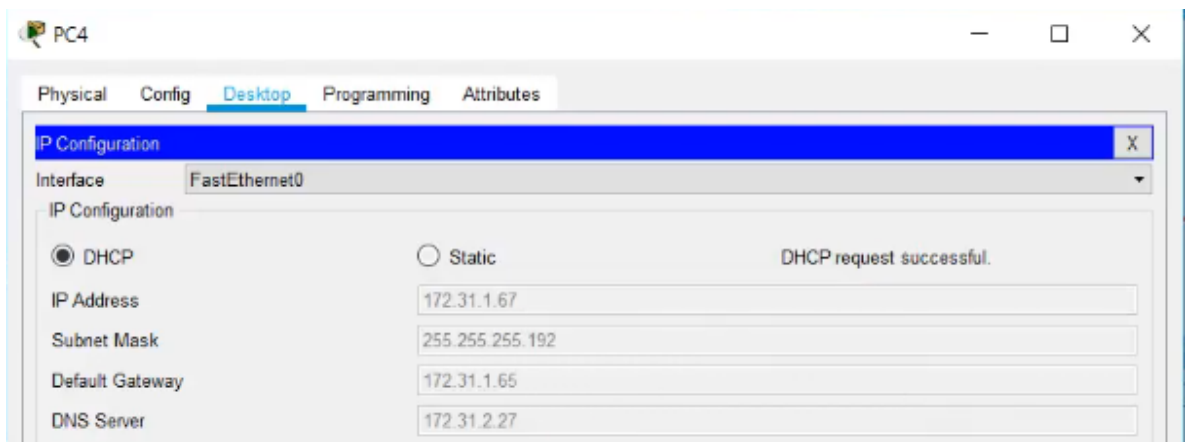
PC0-Bucaramanga



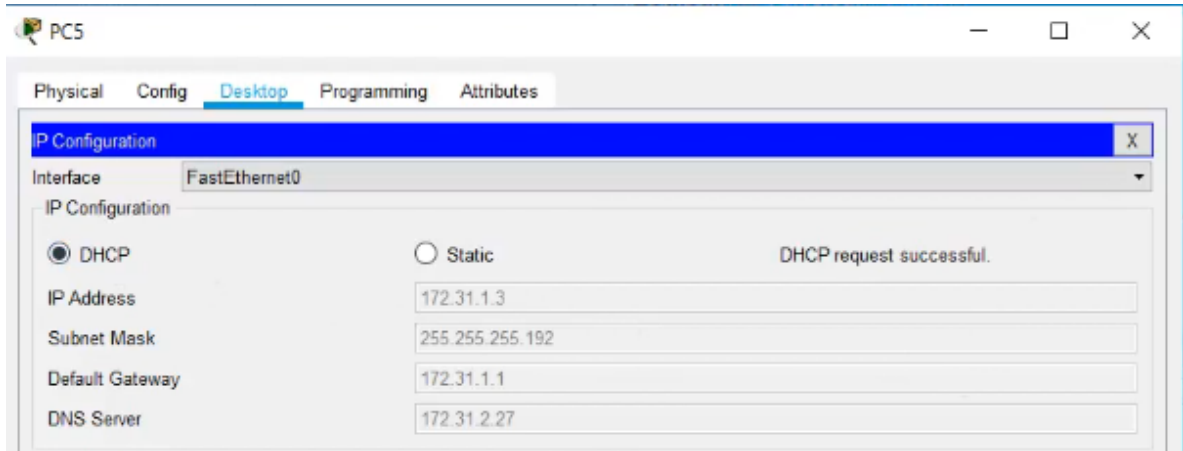
PC1-Bucaramanga



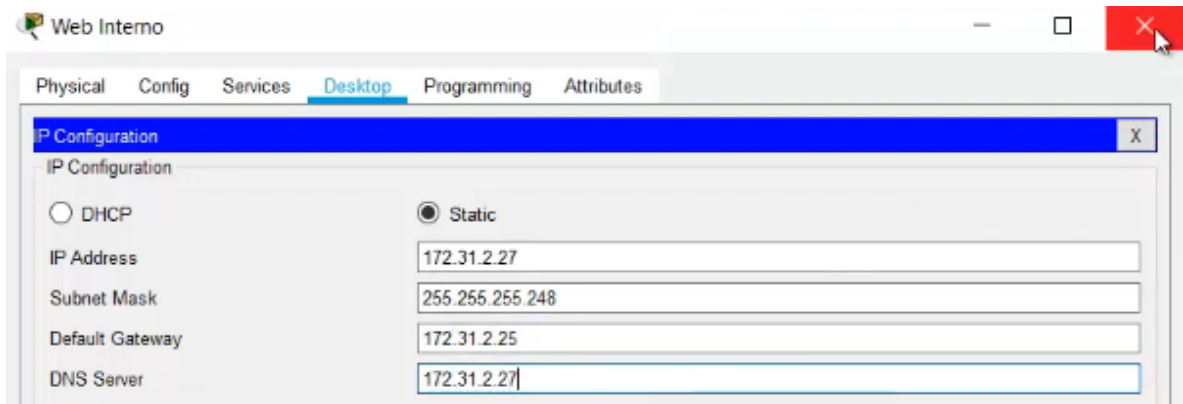
PC4-Cundinamarca



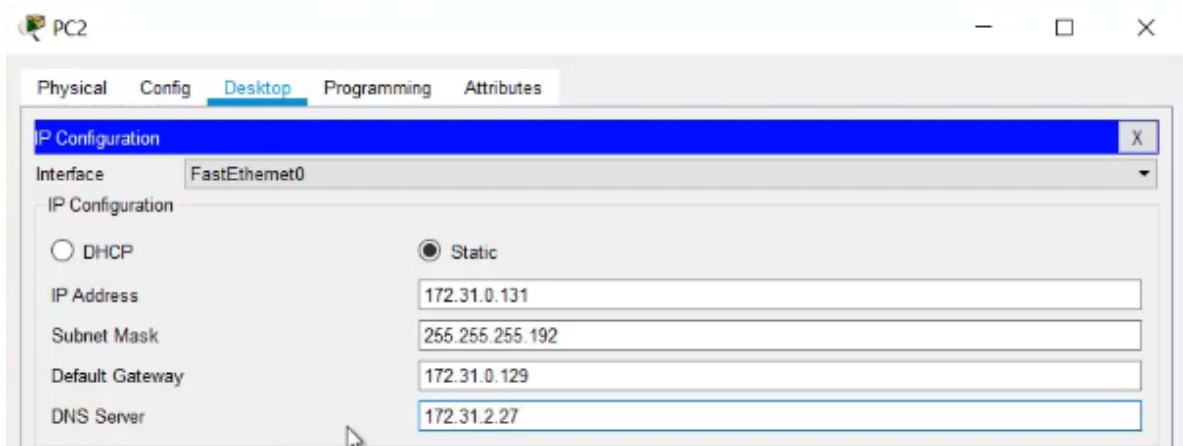
PC5-Cundinamarca



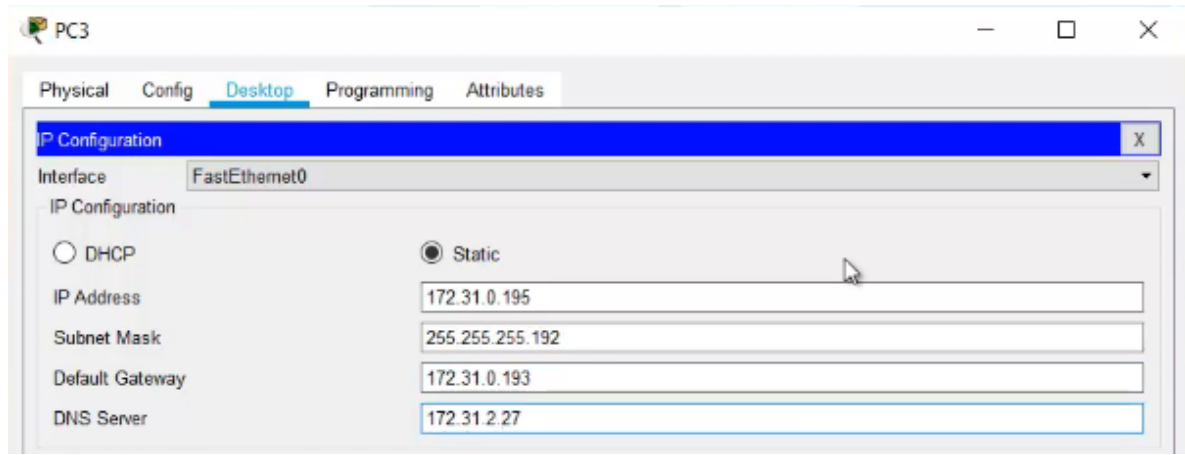
Server Web interno Cundinamarca



PC2-Tunja

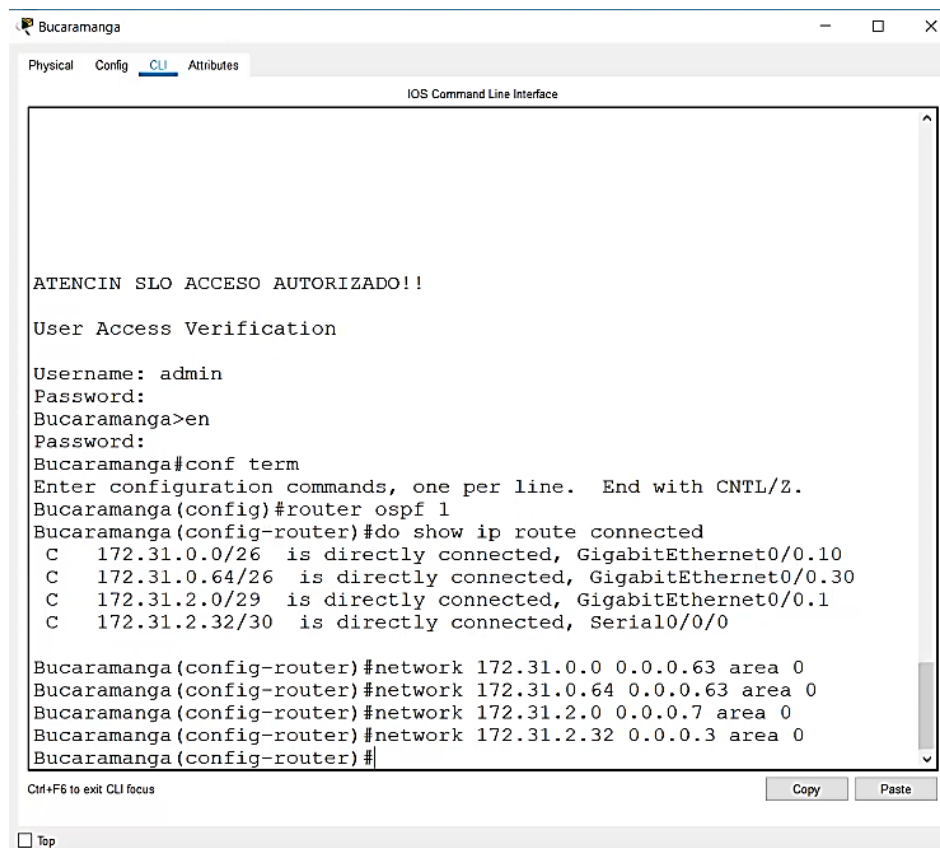


PC3-Tunja



4.5 Configuración OSPF 1 Área 0

OSPF Bucaramanga:



```

Bucaramanga>
ATENCIN SLO ACCESO AUTORIZADO!!

User Access Verification

Username: admin
Password:
Bucaramanga>en
Password:
Bucaramanga#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
Bucaramanga(config)#router ospf 1
Bucaramanga(config-router)#do show ip route connected
C 172.31.0.0/26 is directly connected, GigabitEthernet0/0.10
C 172.31.0.64/26 is directly connected, GigabitEthernet0/0.30
C 172.31.2.0/29 is directly connected, GigabitEthernet0/0.1
C 172.31.2.32/30 is directly connected, Serial0/0/0

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)#
    
```

```

Bucaramanga(config-if)#ip ospf authentication message-digest
Bucaramanga(config-if)#ip ospf message-digest-key ?
<1-255> Key ID
Bucaramanga(config-if)#ip ospf message-digest-key 1 ?
md5 Use MD5 algorithm
Bucaramanga(config-if)#ip ospf message-digest-key 1 md5 ?
LINE The OSPF password (key) (maximum 16 characters)
Bucaramanga(config-if)#ip ospf message-digest-key 1 md5 cisco123
Bucaramanga(config-if)#
01:54:28: %OSPF-5-ADJCHG: Process 1, Nbr 209.165.220.1 on Serial0/0/0 from FULL to DOWN, Neighbor
Down: Dead timer expired

01:54:28: %OSPF-5-ADJCHG: Process 1, Nbr 209.165.220.1 on Serial0/0/0 from FULL to DOWN, Neighbor
Down: Interface down or detached
    
```




Comprobación de configuración Bucaramanga

```
Bucaramanga
Physical Config CLI Attributes
IOS Command Line Interface
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is not set

172.3.0.0/29 is subnetted, 1 subnets
O   172.3.2.8/29 [110/65] via 172.31.2.33, 00:33:37, Serial0/0/0
172.31.0.0/16 is variably subnetted, 15 subnets, 4 masks
C   172.31.0.0/26 is directly connected, GigabitEthernet0/0.10
L   172.31.0.1/32 is directly connected, GigabitEthernet0/0.10
C   172.31.0.64/26 is directly connected, GigabitEthernet0/0.30
L   172.31.0.65/32 is directly connected, GigabitEthernet0/0.30
O   172.31.0.128/26 [110/65] via 172.31.2.33, 00:33:37, Serial0/0/0
O   172.31.0.192/26 [110/65] via 172.31.2.33, 00:33:37, Serial0/0/0
O   172.31.1.0/26 [110/129] via 172.31.2.33, 00:29:49, Serial0/0/0
O   172.31.1.64/26 [110/129] via 172.31.2.33, 00:29:49, Serial0/0/0
C   172.31.2.0/29 is directly connected, GigabitEthernet0/0.1
L   172.31.2.1/32 is directly connected, GigabitEthernet0/0.1
O   172.31.2.8/29 [110/129] via 172.31.2.33, 00:29:49, Serial0/0/0
O   172.31.2.24/29 [110/129] via 172.31.2.33, 00:29:49, Serial0/0/0
C   172.31.2.32/30 is directly connected, Serial0/0/0
L   172.31.2.34/32 is directly connected, Serial0/0/0
O   172.31.2.36/30 [110/128] via 172.31.2.33, 00:33:37, Serial0/0/0

Bucaramanga#
Ctrl+FB to exit CLI focus
Copy Paste
```

OSPF Tunja:

```

Tunja
Physical Config CLI Attributes
IOS Command Line Interface
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 GigabitEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state
to up

Tunja(config-if)#
Tunja(config-if)#router ospf 1
Tunja(config-router)#do show ip route connected
C 172.3.2.8/29 is directly connected, GigabitEthernet0/0.1
C 172.31.0.128/26 is directly connected, GigabitEthernet0/0.20
C 172.31.0.192/26 is directly connected, GigabitEthernet0/0.30
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, GigabitEthernet0/1

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)#network 172.31.2.36 0.0.0.3 area 0
Tunja(config-router)#
00:49:41: %OSPF-5-ADJCHG: Process 1, Nbr 172.31.2.34 on Serial0/0/0 from LOADING
to FULL, Loading Done

Tunja(config-router)#
Ctrl+F6 to exit CLI focus
Copy Paste
Top

```

```

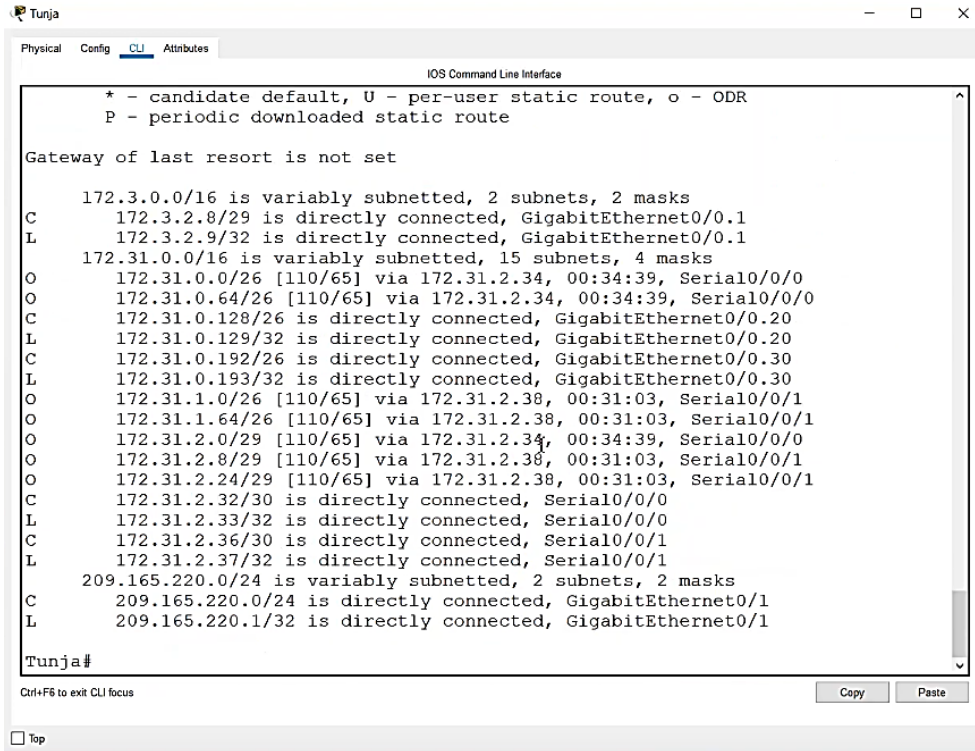
Tunja#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Tunja(config)#int s0/0/0
Tunja(config-if)#ip ospf authentication message-digest
Tunja(config-if)#ip ospf message-digest-key 1 md5 cisco123
Tunja(config-if)#int s0/0/1
Tunja(config-if)#ip ospf authentication message-digest
Tunja(config-if)#ip ospf message-digest-key 1 md5 cisco123
Tunja(config-if)#
01:57:55: %OSPF-5-ADJCHG: Process 1, Nbr 172.31.2.34 on Serial0/0/0
from LOADING to FULL, Loading Done

Tunja(config-if)#
01:58:02: %OSPF-5-ADJCHG: Process 1, Nbr 172.31.2.38 on Serial0/0/1
from LOADING to FULL, Loading Done

Tunja(config-if)#

```

Comprobación de Configuración Tunja:



```

IOS Command Line Interface

* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is not set

172.3.0.0/16 is variably subnetted, 2 subnets, 2 masks
C 172.3.2.8/29 is directly connected, GigabitEthernet0/0.1
L 172.3.2.9/32 is directly connected, GigabitEthernet0/0.1
172.31.0.0/16 is variably subnetted, 15 subnets, 4 masks
O 172.31.0.0/26 [110/65] via 172.31.2.34, 00:34:39, Serial0/0/0
O 172.31.0.64/26 [110/65] via 172.31.2.34, 00:34:39, Serial0/0/0
C 172.31.0.128/26 is directly connected, GigabitEthernet0/0.20
L 172.31.0.129/32 is directly connected, GigabitEthernet0/0.20
C 172.31.0.192/26 is directly connected, GigabitEthernet0/0.30
L 172.31.0.193/32 is directly connected, GigabitEthernet0/0.30
O 172.31.1.0/26 [110/65] via 172.31.2.38, 00:31:03, Serial0/0/1
O 172.31.1.64/26 [110/65] via 172.31.2.38, 00:31:03, Serial0/0/1
O 172.31.2.0/29 [110/65] via 172.31.2.34, 00:34:39, Serial0/0/0
O 172.31.2.8/29 [110/65] via 172.31.2.38, 00:31:03, Serial0/0/1
O 172.31.2.24/29 [110/65] via 172.31.2.38, 00:31:03, Serial0/0/1
C 172.31.2.32/30 is directly connected, Serial0/0/0
L 172.31.2.33/32 is directly connected, Serial0/0/0
C 172.31.2.36/30 is directly connected, Serial0/0/1
L 172.31.2.37/32 is directly connected, Serial0/0/1
209.165.220.0/24 is variably subnetted, 2 subnets, 2 masks
C 209.165.220.0/24 is directly connected, GigabitEthernet0/1
L 209.165.220.1/32 is directly connected, GigabitEthernet0/1

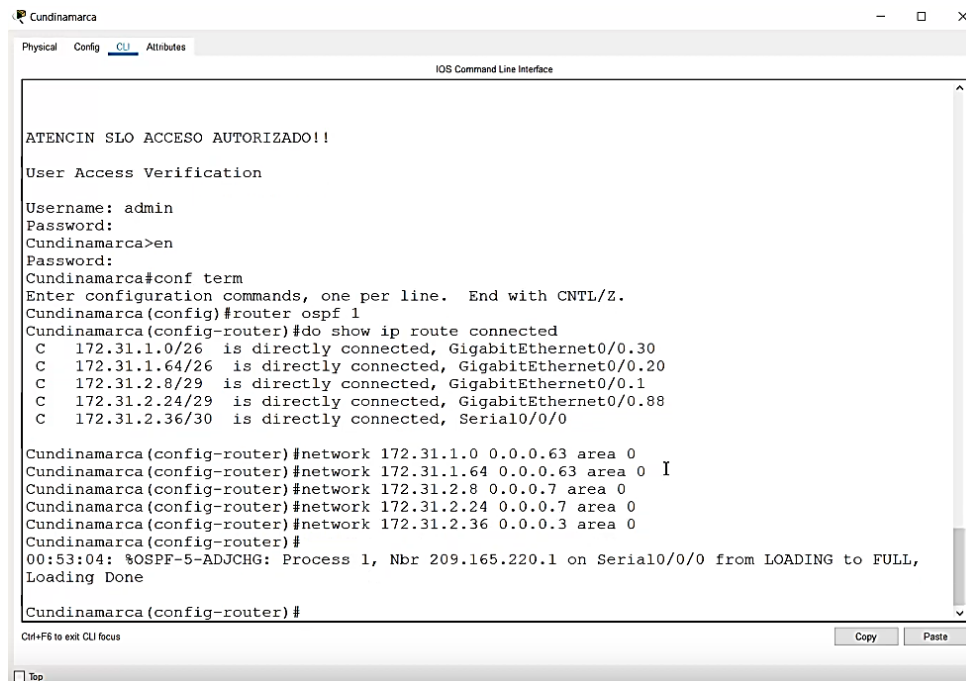
Tunja#
    
```

Ctrl+F6 to exit CLI focus

Copy Paste

Top

OSPF Cundinamarca:



```

Cundinamarca
Physical Config CLI Attributes
IOS Command Line Interface

ATENCIN SLO ACCESO AUTORIZADO!!

User Access Verification

Username: admin
Password:
Cundinamarca>en
Password:
Cundinamarca#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Cundinamarca(config)#router ospf 1
Cundinamarca(config-router)#do show ip route connected
C 172.31.1.0/26 is directly connected, GigabitEthernet0/0.30
C 172.31.1.64/26 is directly connected, GigabitEthernet0/0.20
C 172.31.2.8/29 is directly connected, GigabitEthernet0/0.1
C 172.31.2.24/29 is directly connected, GigabitEthernet0/0.88
C 172.31.2.36/30 is directly connected, Serial0/0/0

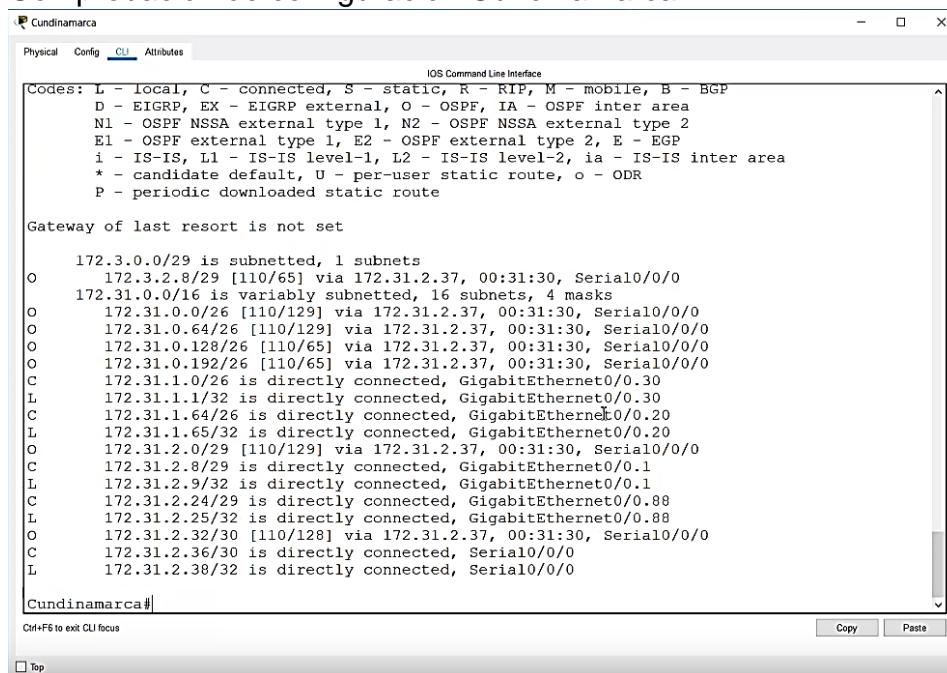
Cundinamarca(config-router)#network 172.31.1.0 0.0.0.63 area 0
Cundinamarca(config-router)#network 172.31.1.64 0.0.0.63 area 0 I
Cundinamarca(config-router)#network 172.31.2.8 0.0.0.7 area 0
Cundinamarca(config-router)#network 172.31.2.24 0.0.0.7 area 0
Cundinamarca(config-router)#network 172.31.2.36 0.0.0.3 area 0
Cundinamarca(config-router)#
00:53:04: %OSPF-5-ADJCHG: Process 1, Nbr 209.165.220.1 on Serial0/0/0 from LOADING to FULL,
Loading Done

Cundinamarca(config-router)#
  
```

```

Cundinamarca#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Cundinamarca(config)#int s0/0/0
Cundinamarca(config-if)#ip ospf authentication message-digest
Cundinamarca(config-if)#ip ospf message-digest-key 1 md5 cisco123
Cundinamarca(config-if)#
  
```

Comprobación de configuración Cundinamarca



```

Cundinamarca
Physical Config CLI Attributes
IOS Command Line Interface

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

Gateway of last resort is not set

172.3.0.0/29 is subnetted, 1 subnets
O 172.3.2.8/29 [110/65] via 172.31.2.37, 00:31:30, Serial0/0/0
172.31.0.0/16 is variably subnetted, 16 subnets, 4 masks
O 172.31.0.0/26 [110/129] via 172.31.2.37, 00:31:30, Serial0/0/0
O 172.31.0.64/26 [110/129] via 172.31.2.37, 00:31:30, Serial0/0/0
O 172.31.0.128/26 [110/65] via 172.31.2.37, 00:31:30, Serial0/0/0
O 172.31.0.192/26 [110/65] via 172.31.2.37, 00:31:30, Serial0/0/0
C 172.31.1.0/26 is directly connected, GigabitEthernet0/0.30
L 172.31.1.1/32 is directly connected, GigabitEthernet0/0.30
C 172.31.1.64/26 is directly connected, GigabitEthernet0/0.20
L 172.31.1.65/32 is directly connected, GigabitEthernet0/0.20
O 172.31.2.0/29 [110/129] via 172.31.2.37, 00:31:30, Serial0/0/0
C 172.31.2.8/29 is directly connected, GigabitEthernet0/0.1
L 172.31.2.9/32 is directly connected, GigabitEthernet0/0.1
C 172.31.2.24/29 is directly connected, GigabitEthernet0/0.88
L 172.31.2.25/32 is directly connected, GigabitEthernet0/0.88
O 172.31.2.32/30 [110/128] via 172.31.2.37, 00:31:30, Serial0/0/0
C 172.31.2.36/30 is directly connected, Serial0/0/0
L 172.31.2.38/32 is directly connected, Serial0/0/0

Cundinamarca#
  
```

4.6 Comprobación de conectividad

Ping entre PC0 y PC1 Bucaramanga, y PC0 con PC2 Tunja.

```
PC0
Physical  Config  Desktop  Programming  Attributes
Command Prompt
Ping statistics for 209.165.220.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 1ms, Average = 1ms

C:\>ping 172.31.0.67

Pinging 172.31.0.67 with 32 bytes of data:

Request timed out.
Reply from 172.31.0.67: bytes=32 time<1ms TTL=127
Reply from 172.31.0.67: bytes=32 time<1ms TTL=127
Reply from 172.31.0.67: bytes=32 time<1ms TTL=127

Ping statistics for 172.31.0.67:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 172.31.0.131

Pinging 172.31.0.131 with 32 bytes of data:

Request timed out.
Reply from 172.31.0.131: bytes=32 time=1ms TTL=126
Reply from 172.31.0.131: bytes=32 time=1ms TTL=126
Reply from 172.31.0.131: bytes=32 time=4ms TTL=126

Ping statistics for 172.31.0.131:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 4ms, Average = 2ms

C:\>
```

Comprobación de conectividad de Ping entre PC0 y PC3 Tunja, y PC0 con PC4 Cundinamarca.

```
PC0
Physical Config Desktop Programming Attributes
Command Prompt
Ping statistics for 172.31.0.131:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 4ms, Average = 2ms

C:\>ping 172.31.0.195

Pinging 172.31.0.195 with 32 bytes of data:

Request timed out.
Reply from 172.31.0.195: bytes=32 time=2ms TTL=126
Reply from 172.31.0.195: bytes=32 time=1ms TTL=126
Reply from 172.31.0.195: bytes=32 time=1ms TTL=126

Ping statistics for 172.31.0.195:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 2ms, Average = 1ms

C:\>ping 172.31.1.67

Pinging 172.31.1.67 with 32 bytes of data:

Request timed out.
Reply from 172.31.1.67: bytes=32 time=2ms TTL=125
Reply from 172.31.1.67: bytes=32 time=2ms TTL=125
Reply from 172.31.1.67: bytes=32 time=2ms TTL=125

Ping statistics for 172.31.1.67:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 2ms, Average = 2ms

C:\>
```

Comprobación de conectividad de Ping entre PC0 y PC5 Tunja, y PC0 con Web Server interno Cundinamarca.

```
PC0
Physical Config Desktop Programming Attributes
Command Prompt
Ping statistics for 172.31.1.67:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 2ms, Average = 2ms

C:\>ping 172.31.1.3

Pinging 172.31.1.3 with 32 bytes of data:

Request timed out.
Reply from 172.31.1.3: bytes=32 time=4ms TTL=125
Reply from 172.31.1.3: bytes=32 time=2ms TTL=125
Reply from 172.31.1.3: bytes=32 time=2ms TTL=125

Ping statistics for 172.31.1.3:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 4ms, Average = 2ms

C:\>ping 172.31.2.27

Pinging 172.31.2.27 with 32 bytes of data:

Reply from 172.31.2.27: bytes=32 time=5ms TTL=125
Reply from 172.31.2.27: bytes=32 time=2ms TTL=125
Reply from 172.31.2.27: bytes=32 time=2ms TTL=125
Reply from 172.31.2.27: bytes=32 time=2ms TTL=125

Ping statistics for 172.31.2.27:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 5ms, Average = 2ms

C:\>
```

4.7 Configuración DHCP

Configuración DHCP Tunja

```
Tunja
Physical Config CLI Attributes
IOS Command Line Interface
C 172.31.2.36/30 is directly connected, Serial0/0/1
L 172.31.2.37/32 is directly connected, Serial0/0/1
 209.165.220.0/24 is variably subnetted, 2 subnets, 2 masks
C 209.165.220.0/24 is directly connected, GigabitEthernet0/1
L 209.165.220.1/32 is directly connected, GigabitEthernet0/1

Tunja#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Tunja(config)#ip dhcp excluded-address 172.31.0.1 172.31.0.2
Tunja(config)#ip dhcp excluded-address 172.31.0.65 172.31.0.66
Tunja(config)#ip dhcp excluded-address 172.31.1.65 172.31.1.66
Tunja(config)#ip dhcp pool VLAN10BUC
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 172.31.2.27
Tunja(dhcp-config)#ip dhcp pool VLAN30BUC
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 172.31.2.27
Tunja(dhcp-config)#ip dhcp pool VLAN20CUN
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 172.31.2.27
Tunja(dhcp-config)#ip dhcp pool VLAN30CUN
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 172.31.2.27
Tunja(dhcp-config)#

Ctrl+F6 to exit CLI focus
Copy Paste
Top
```


4.8 Configuración IP Helper address

IP Helper Address Bucaramanga

```
Bucaramanga#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Bucaramanga(config)#int g0/0.10
Bucaramanga(config-subif)#ip helper-address
% Incomplete command.
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)#
```

IP Helper address Cundinamarca

```
Cundinamarca#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Cundinamarca(config)#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)#
```

4.9 Configuración NAT

Switch Tunja

```
Tunja#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Tunja(config)#ip nat inside source static ?
  A.B.C.D Inside local IP address
  tcp      Transmission Control Protocol
  udp      User Datagram Protocol
Tunja(config)#ip nat inside source static 172.31.2.27 ?
  A.B.C.D Inside global IP address
Tunja(config)#ip nat inside source static 172.31.2.27 209.165.220.3
Tunja(config)#access-list 1 permit 172.0.0.0 0.255.255.255
Tunja(config)#ip nat inside source list 1 interface g0/1 overload
Tunja(config)#int g0/1
Tunja(config-if)#ip nat outside
Tunja(config-if)#int g0/10.1
%Invalid interface type and number
Tunja(config)#int g0/0.1
Tunja(config-subif)#ip nat inside
Tunja(config-subif)#int g0/0.20
Tunja(config-subif)#ip nat inside
Tunja(config-subif)#int g0/0.30
Tunja(config-subif)#ip nat inside
Tunja(config-subif)#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)#exit
Tunja(config)#ip route 0.0.0.0 0.0.0.0 209.165.220.2
Tunja(config)#
Tunja(config)#router ospf 1
Tunja(config-router)#default
Tunja(config-router)#default-information originate
Tunja(config-router)#
```

4.10 Listas de control de acceso

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

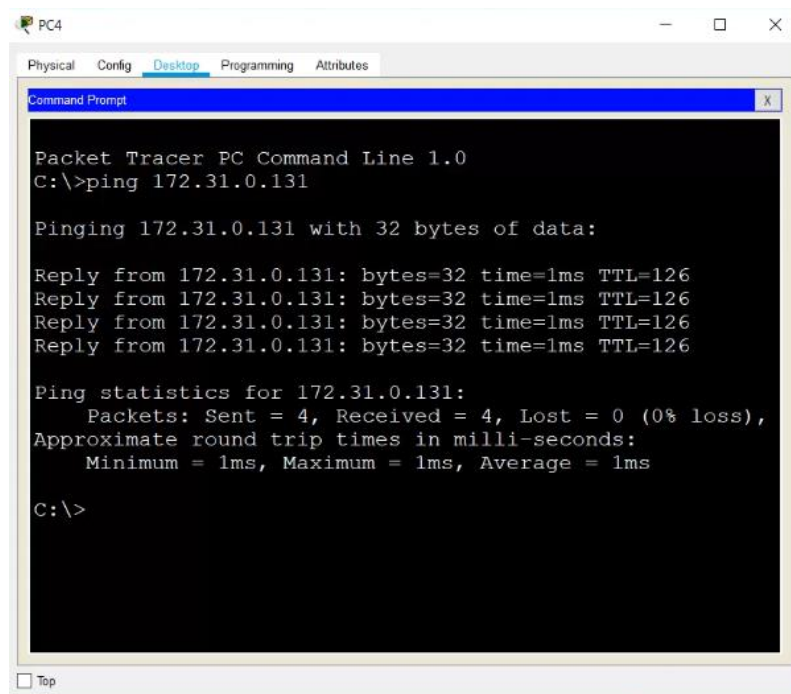
Configuramos el router en Cundinamarca para denegar el acceso a internet y permitir las demás conexiones.

```
Cundinamarca(config)#access-list 101 deny ip 172.31.1.64 0.0.0.63 209.165.220.0 0.0.0.255
Cundinamarca(config)#access-list 101 permit ip any any
Cundinamarca(config)#exit
Cundinamarca#
%SYS-5-CONFIG_I: Configured from console by console

Cundinamarca#int g0/0.20
      ^
% Invalid input detected at '^' marker.

Cundinamarca#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Cundinamarca(config)#int g0/0.20
Cundinamarca(config-subif)#ip access-group 101 in
Cundinamarca(config-subif)#
```

Ping de PC4_VLAN 20 Cundinamarca a PC2 Tunja



```
PC4
Physical Config Desktop Programming Attributes
Command Prompt
Packet Tracer PC Command Line 1.0
C:\>ping 172.31.0.131

Pinging 172.31.0.131 with 32 bytes of data:

Reply from 172.31.0.131: bytes=32 time=1ms TTL=126
Reply from 172.31.0.131: bytes=32 time=1ms TTL=126
Reply from 172.31.0.131: bytes=32 time=1ms TTL=126
Reply from 172.31.0.131: bytes=32 time=1ms TTL=126

Ping statistics for 172.31.0.131:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 1ms, Average = 1ms

C:\>
```

Ping de PC4_VLAN 20 Cundinamarca a Web server externo

```

C:\>ping 209.165.220.2

Pinging 209.165.220.2 with 32 bytes of data:

Reply from 172.31.1.65: Destination host unreachable.
Reply from 172.31.1.65: Destination host unreachable.
Reply from 172.31.1.65: Destination host unreachable.
Reply from 172.31.1.65: Destination host unreachable.

Ping statistics for 209.165.220.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100%
loss),
C:\>
    
```

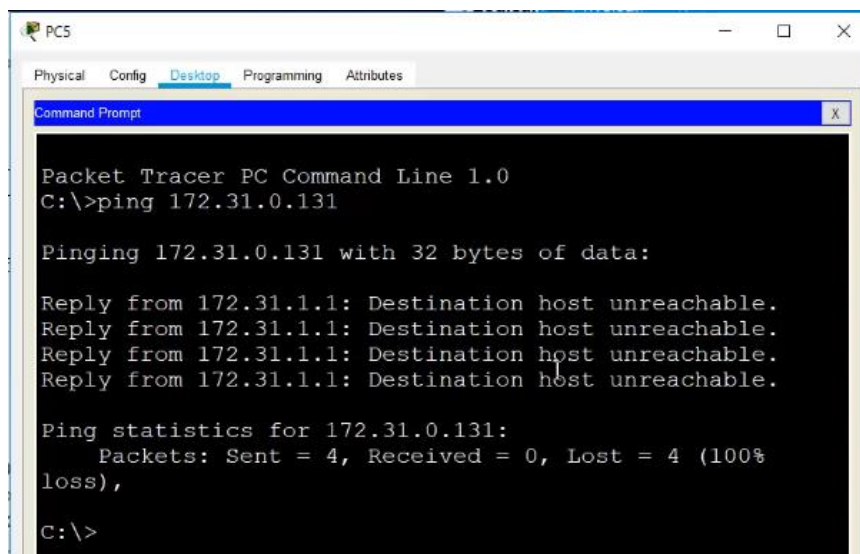
- b. Los hosts de la VLAN 30 en Cundinamarca si acceden a internet y no a la red interna de Tunja.

Configuramos el router en Bucaramanga

```

Cundinamarca(config)#access-list 102 permit ip 172.31.1.0 0.0.0.63 209.165.220.0 0.0.0.255
Cundinamarca(config)#access-list 102 deny ip any any
Cundinamarca(config)#int g0/0.30
Cundinamarca(config-subif)#ip access-group 102 in
Cundinamarca(config-subif)#
    
```

Ping PC5 Cundinamarca a PC2 Tunja



```

Packet Tracer PC Command Line 1.0
C:\>ping 172.31.0.131

Pinging 172.31.0.131 with 32 bytes of data:

Reply from 172.31.1.1: Destination host unreachable.
Reply from 172.31.1.1: Destination host unreachable.
Reply from 172.31.1.1: Destination host unreachable.
Reply from 172.31.1.1: Destination host unreachable.

Ping statistics for 172.31.0.131:
    Packets: Sent = 4, Received = 0, Lost = 4 (100%
loss),
C:\>
    
```

Ping PC5 Cundinamarca a Web externo

```

C:\>ping 209.165.220.2

Pinging 209.165.220.2 with 32 bytes of data:

Reply from 209.165.220.2: bytes=32 time=2ms TTL=126
Reply from 209.165.220.2: bytes=32 time=1ms TTL=126
Reply from 209.165.220.2: bytes=32 time=1ms TTL=126
Reply from 209.165.220.2: bytes=32 time=1ms TTL=126

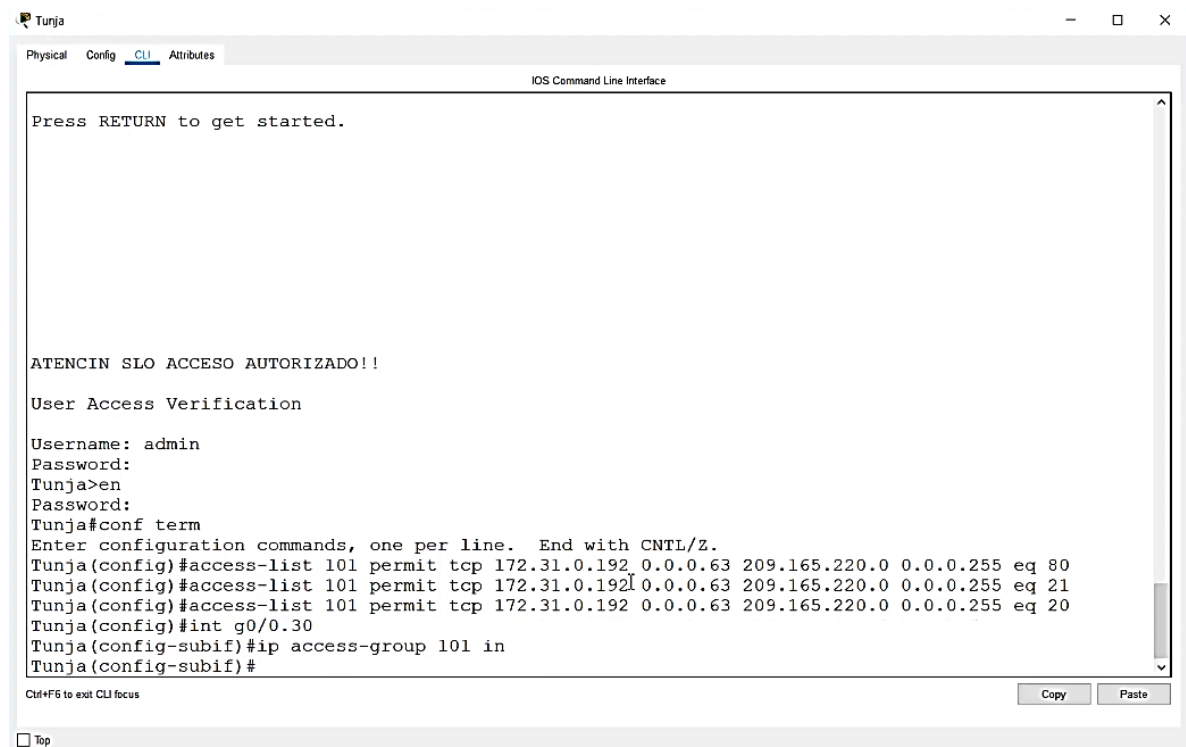
Ping statistics for 209.165.220.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0%
loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 2ms, Average = 1ms

C:\>
    
```

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

Configuramos el router en Tunja permitiendo el protocolo TCP junto con los puertos:

- 80 de servidor web
- 20 y 21 de FTP



```

Tunja
-----
Physical  Config  CLI  Attributes
-----
IOS Command Line Interface

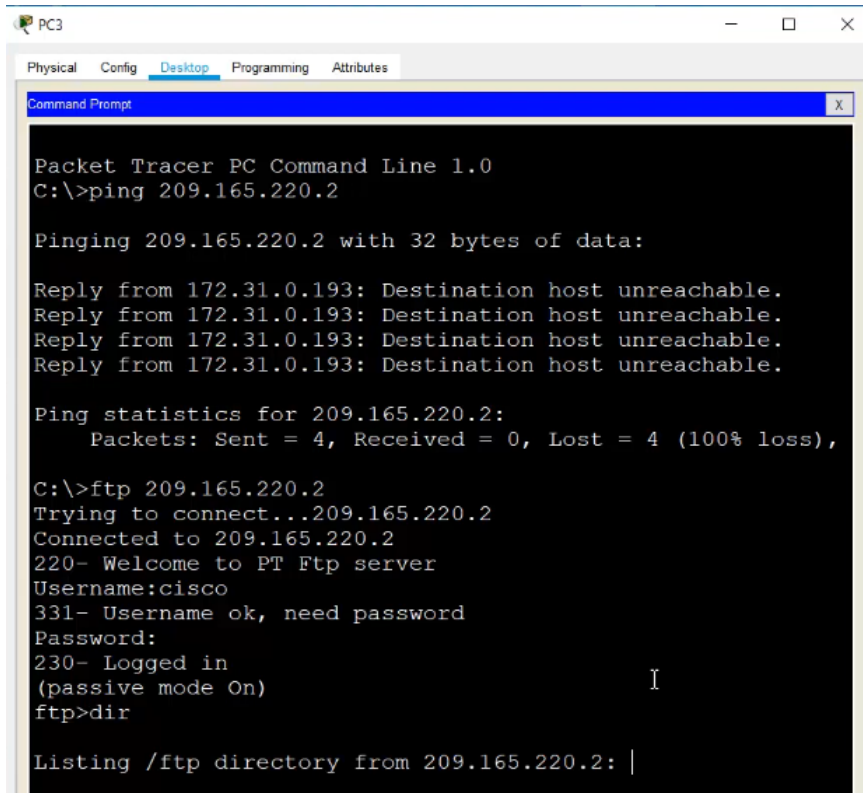
Press RETURN to get started.

ATENCIN SLO ACCESO AUTORIZADO!!

User Access Verification

Username: admin
Password:
Tunja>en
Password:
Tunja#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Tunja(config)#access-list 101 permit tcp 172.31.0.192 0.0.0.63 209.165.220.0 0.0.0.255 eq 80
Tunja(config)#access-list 101 permit tcp 172.31.0.192 0.0.0.63 209.165.220.0 0.0.0.255 eq 21
Tunja(config)#access-list 101 permit tcp 172.31.0.192 0.0.0.63 209.165.220.0 0.0.0.255 eq 20
Tunja(config)#int g0/0/30
Tunja(config-subif)#ip access-group 101 in
Tunja(config-subif)#
    
```

Ping de verificación de PC3 Tunja al servidor y FTP



Prueba con Web



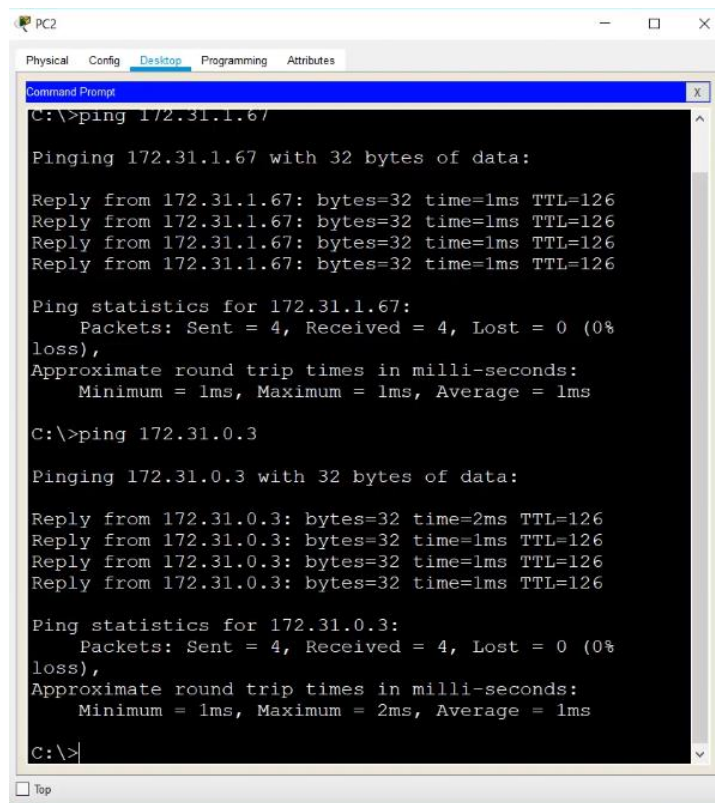
Los hosts de VLAN 20 en Tunja solo deben acceder a la VLAN 20 de Cundinamarca y VLAN 10 de Bucaramanga.

Creamos un Access list 102 definiendo el origen y el destino en el Router Tunja

```
Tunja(config)#access-list 102 permit ip 172.31.0.128 0.0.0.63 172.31.1.64 0.0.0.63
Tunja(config)#access-list 102 permit ip 172.31.0.128 0.0.0.63 172.31.0.0 0.0.0.63
Tunja(config)#int g0/0.20
Tunja(config-subif)#ip access-group 102 in
Tunja(config-subif)#
```

Comprobación Ping desde PC2 VLAN 20 a:

- PC4 VLAN 20: Exitoso
- PC0 VLAN 10: Exitoso
- PC1 VLAN 30: Falla



```

PC2
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 172.31.1.67

Pinging 172.31.1.67 with 32 bytes of data:

Reply from 172.31.1.67: bytes=32 time=1ms TTL=126
Reply from 172.31.1.67: bytes=32 time=1ms TTL=126
Reply from 172.31.1.67: bytes=32 time=1ms TTL=126
Reply from 172.31.1.67: bytes=32 time=1ms TTL=126

Ping statistics for 172.31.1.67:
    Packets: Sent = 4, Received = 4, Lost = 0 (0%
    loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 1ms, Average = 1ms

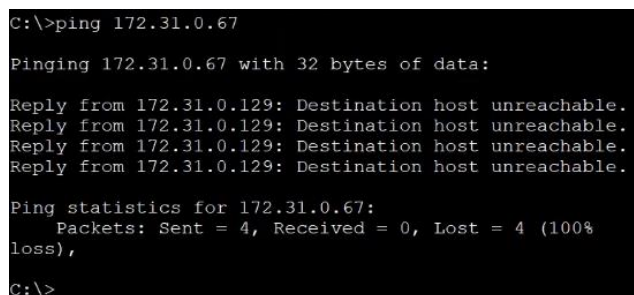
C:\>ping 172.31.0.3

Pinging 172.31.0.3 with 32 bytes of data:

Reply from 172.31.0.3: bytes=32 time=2ms TTL=126
Reply from 172.31.0.3: bytes=32 time=1ms TTL=126
Reply from 172.31.0.3: bytes=32 time=1ms TTL=126
Reply from 172.31.0.3: bytes=32 time=1ms TTL=126

Ping statistics for 172.31.0.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0%
    loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 2ms, Average = 1ms

C:\>
    
```



```

C:\>ping 172.31.0.67

Pinging 172.31.0.67 with 32 bytes of data:

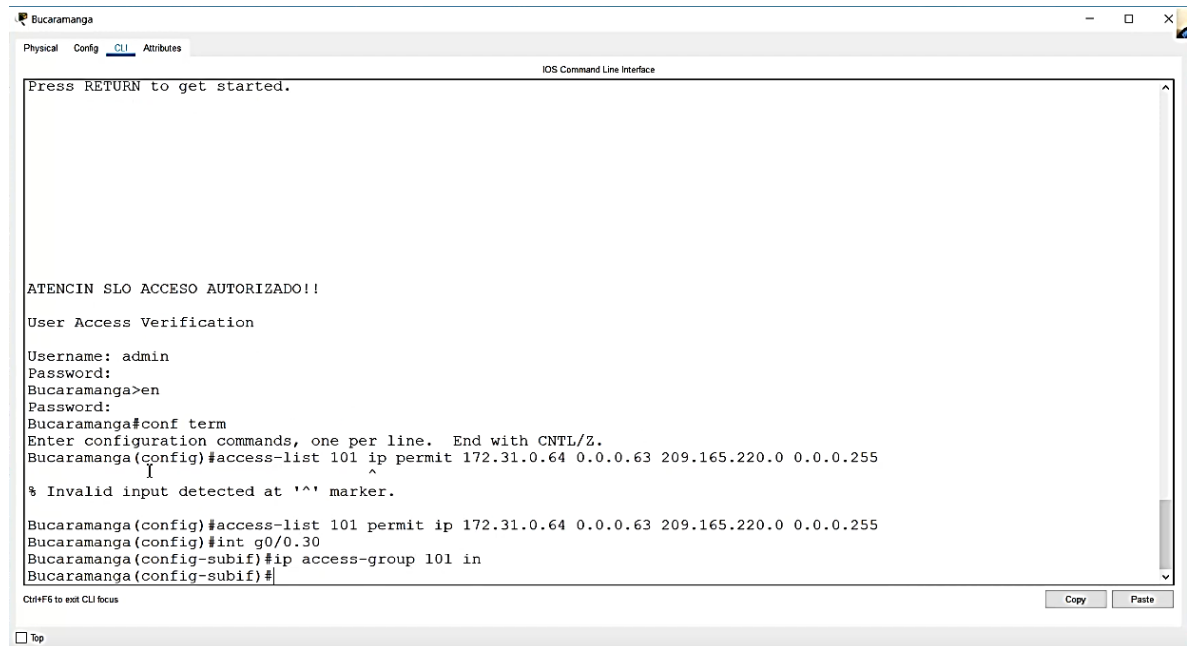
Reply from 172.31.0.129: Destination host unreachable.
Reply from 172.31.0.129: Destination host unreachable.
Reply from 172.31.0.129: Destination host unreachable.
Reply from 172.31.0.129: Destination host unreachable.

Ping statistics for 172.31.0.67:
    Packets: Sent = 4, Received = 0, Lost = 4 (100%
    loss),

C:\>
    
```

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

Realizamos la configuración en Router Bucaramanga en Access list 101 con su respectivo origen y destino.



```

Bucaramanga
Physical Config CLI Attributes
IOS Command Line Interface

Press RETURN to get started.

ATENCIN SLO ACCESO AUTORIZADO!!

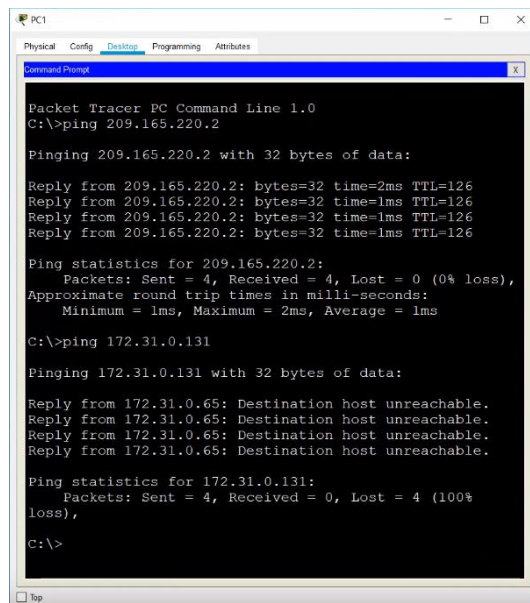
User Access Verification

Username: admin
Password:
Bucaramanga>en
Password:
Bucaramanga#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Bucaramanga(config)#access-list 101 ip permit 172.31.0.64 0.0.0.63 209.165.220.0 0.0.0.255
% Invalid input detected at '^' marker.
Bucaramanga(config)#access-list 101 permit ip 172.31.0.64 0.0.0.63 209.165.220.0 0.0.0.255
Bucaramanga(config)#int g0/0.30
Bucaramanga(config-subif)#ip access-group 101 in
Bucaramanga(config-subif)#
    
```

Comprobación Ping desde PC1 VLAN 30 a:

-Web externo: Exitoso

-PC2 VLAN 20: Falla



```

PC1
Physical Config Desktop Programming Attributes
Command Prompt

Packet Tracer PC Command Line 1.0
C:\>ping 209.165.220.2

Pinging 209.165.220.2 with 32 bytes of data:

Reply from 209.165.220.2: bytes=32 time=2ms TTL=126
Reply from 209.165.220.2: bytes=32 time=1ms TTL=126
Reply from 209.165.220.2: bytes=32 time=1ms TTL=126
Reply from 209.165.220.2: bytes=32 time=1ms TTL=126

Ping statistics for 209.165.220.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 2ms, Average = 1ms

C:\>ping 172.31.0.131

Pinging 172.31.0.131 with 32 bytes of data:

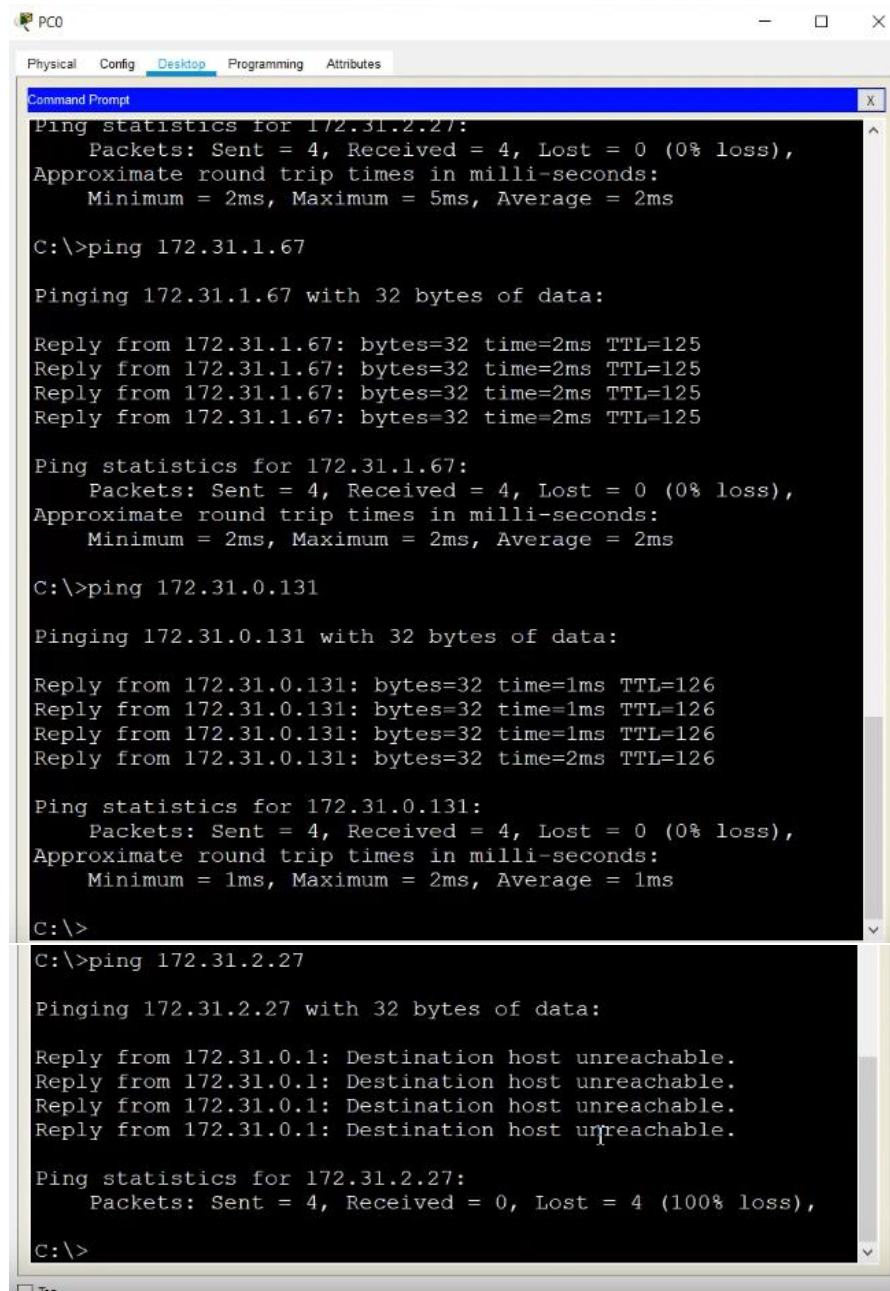
Reply from 172.31.0.65: Destination host unreachable.
Reply from 172.31.0.65: Destination host unreachable.
Reply from 172.31.0.65: Destination host unreachable.
Reply from 172.31.0.65: Destination host unreachable.

Ping statistics for 172.31.0.131:
    Packets: Sent = 4, Received = 0, Lost = 4 (100%
    loss),
C:\>
    
```

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

Realizamos pruebas de conectividad:

- PC0 VLAN 10 y PC4 VLAN 20: Exitoso
- PC0 VLAN 10 y PC2 VLAN 20: Exitoso
- PC0 VLAN 10 y Servidor Web Interno: Falla
- Servidor Web externo: Falla



```

PC0
Physical Config Desktop Programming Attributes
Command Prompt
Ping statistics for 172.31.2.27:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 5ms, Average = 2ms

C:\>ping 172.31.1.67

Pinging 172.31.1.67 with 32 bytes of data:

Reply from 172.31.1.67: bytes=32 time=2ms TTL=125
Reply from 172.31.1.67: bytes=32 time=2ms TTL=125
Reply from 172.31.1.67: bytes=32 time=2ms TTL=125
Reply from 172.31.1.67: bytes=32 time=2ms TTL=125

Ping statistics for 172.31.1.67:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 2ms, Average = 2ms

C:\>ping 172.31.0.131

Pinging 172.31.0.131 with 32 bytes of data:

Reply from 172.31.0.131: bytes=32 time=1ms TTL=126
Reply from 172.31.0.131: bytes=32 time=1ms TTL=126
Reply from 172.31.0.131: bytes=32 time=1ms TTL=126
Reply from 172.31.0.131: bytes=32 time=2ms TTL=126

Ping statistics for 172.31.0.131:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 2ms, Average = 1ms

C:\>

C:\>ping 172.31.2.27

Pinging 172.31.2.27 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 172.31.2.27:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
    
```



```

C:\>ping 209.165.220.2

Pinging 209.165.220.2 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 209.165.220.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
    
```

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

Iniciamos configurando el router en Cundinamarca. Como ya se habían configurado 2 listas de acceso, procedemos a configurar la tercera como 103. Localmente también tiene configurado 4 VLAN, para lo que igualmente negaremos los accesos a esta VLAN, y permitir todo lo demás

```

Cundinamarca
Physical Config CLI Attributes
IOS Command Line Interface

!
line aux 0
!
line vty 0 4
 password 7 0822455D0A16
 logging synchronous
 login authentication AUTHLOCAL
line vty 5 15
 password 7 0822455D0A16
 logging synchronous
 login authentication AUTHLOCAL
!
!
!
end

Cundinamarca#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Cundinamarca(config)#access-list 103 deny ip 172.31.2.8 0.0.0.7 172.31.1.64 0.0.0.63
Cundinamarca(config)#access-list 103 deny ip 172.31.1.0 0.0.0.63 172.31.1.64 0.0.0.63
Cundinamarca(config)#access-list 103 deny ip 172.31.2.24 0.0.0.7 172.31.1.64 0.0.0.63
Cundinamarca(config)#int g0/0.20
Cundinamarca(config-subif)#ip access-group 103 out
Cundinamarca(config-subif)#
    
```



```
Cundinamarca#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Cundinamarca(config)#access-list 103 deny ip 172.31.2.8 0.0.0.7 172.31.1.64 0.0.0.63
Cundinamarca(config)#access-list 103 deny ip 172.31.1.0 0.0.0.63 172.31.1.64 0.0.0.63
Cundinamarca(config)#access-list 103 deny ip 172.31.2.24 0.0.0.7 172.31.1.64 0.0.0.63
Cundinamarca(config)#int g0/0.20
Cundinamarca(config-subif)#ip access-group 103 out
Cundinamarca(config-subif)#exit
Cundinamarca(config)#access-list 103 permit ip any any
Cundinamarca(config)#
```

Prueba de ping:

-PC4 VLAN 20 a PC5 VLAN 30: Falla

-PC4 VLAN 20 a Web interno: Falla

```
PC4
Physical Config Desktop Programming Attributes
Command Prompt
ping statistics for 172.31.2.27:
    Packets: Sent = 4, Received = 0, Lost = 4 (100%
loss),

C:\>ping 172.31.1.3

Pinging 172.31.1.3 with 32 bytes of data:

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

Ping statistics for 172.31.1.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100%
loss),

C:\>ping 172.31.2.27

Pinging 172.31.2.27 with 32 bytes of data:

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

Ping statistics for 172.31.2.27:
    Packets: Sent = 4, Received = 0, Lost = 4 (100%
loss),

C:\>
```

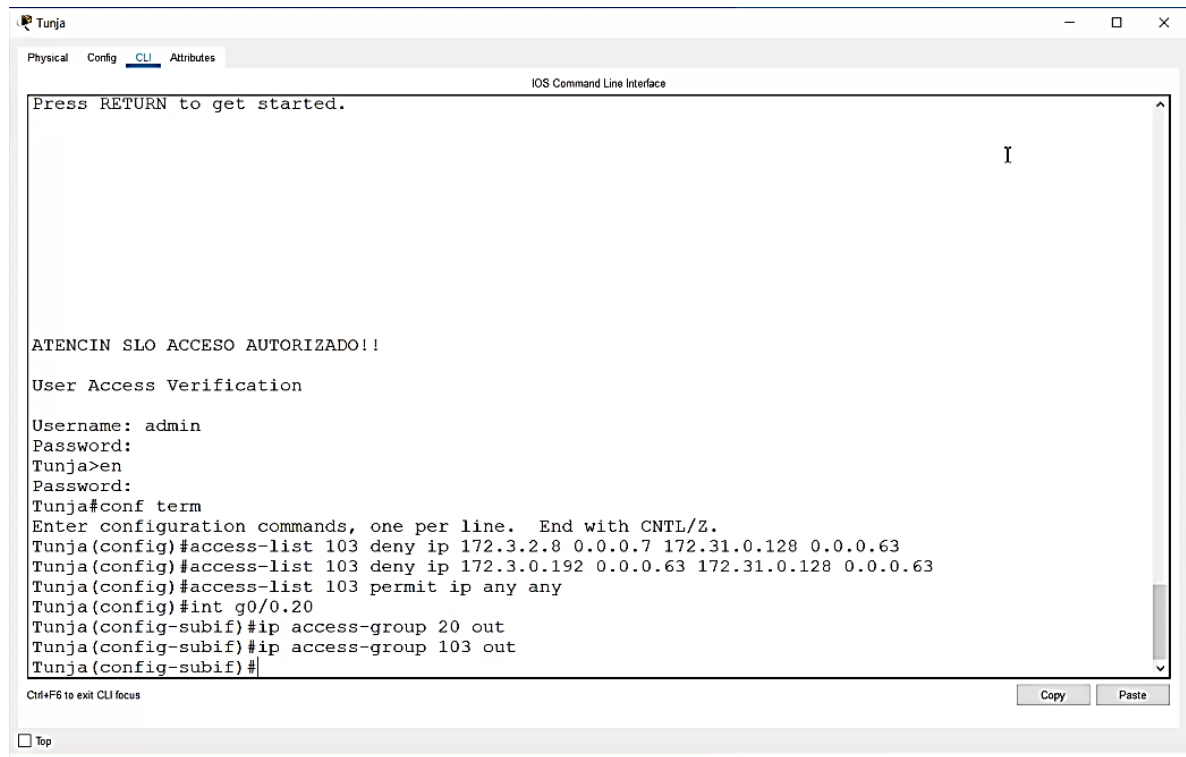
Ping:

-PC4 a Router Tunja: Exito

-PC4 a Router Bucaramanga: Exito

```
PC4
Physical Config Desktop Programming Attributes
Command Prompt
Packets: Sent = 4, Received = 0, Lost = 4 (100%
loss),
C:\>ping 172.31.2.37
Pinging 172.31.2.37 with 32 bytes of data:
Reply from 172.31.2.37: bytes=32 time=1ms TTL=254
Reply from 172.31.2.37: bytes=32 time=1ms TTL=254
Reply from 172.31.2.37: bytes=32 time=4ms TTL=254
Reply from 172.31.2.37: bytes=32 time=2ms TTL=254
Ping statistics for 172.31.2.37:
    Packets: Sent = 4, Received = 4, Lost = 0 (0%
loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 4ms, Average = 2ms
C:\>ping 172.31.2.34
Pinging 172.31.2.34 with 32 bytes of data:
Reply from 172.31.2.34: bytes=32 time=2ms TTL=253
Reply from 172.31.2.34: bytes=32 time=2ms TTL=253
Reply from 172.31.2.34: bytes=32 time=2ms TTL=253
Reply from 172.31.2.34: bytes=32 time=2ms TTL=253
Ping statistics for 172.31.2.34:
    Packets: Sent = 4, Received = 4, Lost = 0 (0%
loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 2ms, Average = 2ms
C:\>
```

Continuamos configurando el Router de Tunja:



```

Tunja
Physical Config CLI Attributes
IOS Command Line Interface

Press RETURN to get started.

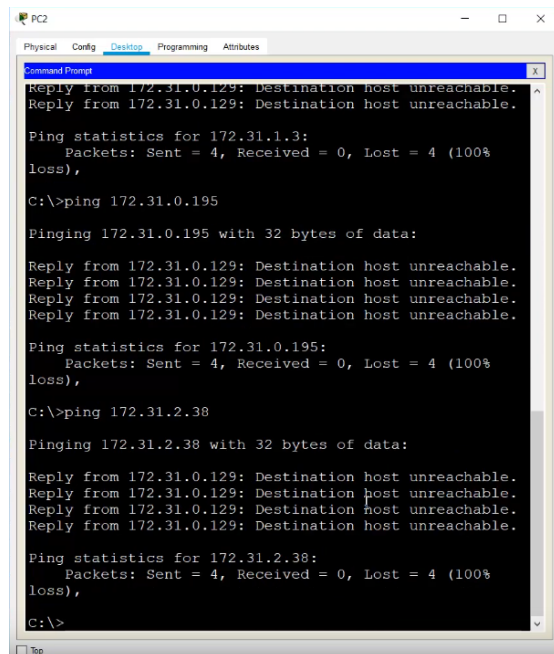
ATENCIN SLO ACCESO AUTORIZADO!!

User Access Verification

Username: admin
Password:
Tunja>en
Password:
Tunja#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Tunja(config)#access-list 103 deny ip 172.3.2.8 0.0.0.7 172.31.0.128 0.0.0.63
Tunja(config)#access-list 103 deny ip 172.3.0.192 0.0.0.63 172.31.0.128 0.0.0.63
Tunja(config)#access-list 103 permit ip any any
Tunja(config)#int g0/0.20
Tunja(config-subif)#ip access-group 20 out
Tunja(config-subif)#ip access-group 103 out
Tunja(config-subif)#
Ctrl+F6 to exit CLI focus
Copy Paste
Top
  
```

Prueba de ping:

- PC2 VLAN 20 a PC3 VLAN 30: Falla
- PC2 VLAN 20 a Router Cundinamarca: Falla



```

PC2
Physical Config Desktop Programming Attributes
Command Prompt

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

Ping statistics for 172.31.1.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100%
    loss),

C:\>ping 172.31.0.195

Pinging 172.31.0.195 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 172.31.0.195:
    Packets: Sent = 4, Received = 0, Lost = 4 (100%
    loss),

C:\>ping 172.31.2.38

Pinging 172.31.2.38 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 172.31.2.38:
    Packets: Sent = 4, Received = 0, Lost = 4 (100%
    loss),

C:\>
Top
  
```

Continuamos configurando Router Bucaramanga:

```
Bucaramanga
Physical Config CLI Attributes
IOS Command Line Interface

ATENCIN SLO ACCESO AUTORIZADO!!
User Access Verification
Username: admin
Password:
Bucaramanga>en
Password:
Bucaramanga#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Bucaramanga(config)#access-list 103 deny ip 172.31.2.0 0.0.0.7 172.31.0.0 0.0.0.63
Bucaramanga(config)#access-list 103 deny ip 172.31.0.64 0.0.0.63 172.31.0.0 0.0.0.63
Bucaramanga(config)#access-list 103 permit ip any any
Bucaramanga(config)#int g0/0.10
Bucaramanga(config-subif)#ip access-group 103 oiut
% Invalid input detected at '^' marker.
Bucaramanga(config-subif)#ip access-group 103 out
Bucaramanga(config-subif)#
Ctrl+F6 to exit CLI focus
Copy Paste
```

Ping PC0 VLAN 10 a PC1 VLAN 30: Falla

```
C:\>ping 172.31.0.67

Pinging 172.31.0.67 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 172.31.0.67:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
```

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

VLAN 1 es la VLAN administrativa, esta configuración debe realizarse en los routers con lista de acceso 2.

Configuración Router Bucaramanga:

```
Bucaramanga(config-subif)#access-list 2 permit 172.31.2.0 0.0.0.7
Bucaramanga(config)#access-list 2 permit 172.3.2.8 0.0.0.7
Bucaramanga(config)#access-list 2 permit 172.31.2.8 0.0.0.7
Bucaramanga(config)#line vty 0 15
Bucaramanga(config-line)#access-class 2 in
Bucaramanga(config-line)#
```

Configuración Router Tunja

```
Tunja(config-subif)#access-list 2 permit 172.31.2.0 0.0.0.7
Tunja(config)#access-list 2 permit 172.3.2.8 0.0.0.7
Tunja(config)#access-list 2 permit 172.31.2.8 0.0.0.7
Tunja(config)#line vty 0 15
Tunja(config-line)#access-class 2 in
Tunja(config-line)#
```

Configuración Router Cundinamarca

```
Cundinamarca#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Cundinamarca(config)#access-list 2 permit 172.31.2.0 0.0.0.7
Cundinamarca(config)#access-list 2 permit 172.3.2.8 0.0.0.7
Cundinamarca(config)#access-list 2 permit 172.31.2.8 0.0.0.7
Cundinamarca(config)#line vty 0 15
Cundinamarca(config-line)#access-class 2 in
Cundinamarca(config-line)#
```

Pruebas con Telnet desde Switch Bucaramanga a switch Tunja: Exitoso

```
SW-Buc
Physical Config CLI Attributes
IOS Command Line Interface

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.165.220.2, timeout is 2
seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max =
1/2/4 ms

SW-Buc#telnet 172.31.2.33
Trying 172.31.2.33 ...OpenATENCIN SLO ACCESO AUTORIZADO!!
User Access Verification

Username: admin
Password:
Tunja>en
Password:
Tunja#
```

Ctrl+F6 to exit CLI focus

Copy Paste

Top

5. CONCLUSIONES

- Se dio solución práctica del escenario propuesto teniendo como base fundamental cada uno de los conocimientos adquiridos durante el desarrollo del Diplomado de Profundización CCNA en cuanto a la implementación y diseño de la topología física y lógica de una red.
- Se analizó la arquitectura propuesta con el fin de implementarla sobre el software de simulación Packet Tracer, el cual no dio las herramientas necesarias para la puesta en marcha de este laboratorio.
- Se aplicaron los conocimientos adquiridos para la Configuración de protocolos que permiten interconectar cada uno de los dispositivos establecidos para el diseño de una topología de red.
- La realización de los diferentes ejercicios nos permitió entender e implementar diferentes niveles de restricción y seguridad en la red, aplicables a diferentes tipos de red mediana y corporativa
- Por medio de este trabajo final se documentó cada uno de los procedimientos realizados en la implementación del escenario propuesto y se registró la verificación de conectividad entre los dispositivos de acuerdo con la finalidad de el laboratorio práctico.

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