

PRUEBA DE HABILIDADES PRÁCTICAS CCNA

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INGENIERÍA DE SISTEMAS  
BOGOTÁ  
2019

## PRUEBA DE HABILIDADES PRÁCTICAS CCNA

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## RESUMEN

El presente trabajo trata sobre los fundamentos de redes y los conocimientos adquiridos en el diplomado de profundización de CISCO, específicamente CCNA (Cisco Certified Network Associate).

A partir de un caso propuesto en el que se suministra un problema orientado al manejo de redes, se pretende dar solución a partir del software de simulación de redes CISCO Packet Tracer. Una vez solucionado lo anterior procedemos a explicar en el presente trabajo escrito.

**Palabras Clave:** CISCO, CCNA, Profundización, Habilidades, Redes, Informática.

## ABSTRACT

This paper deals with the fundamentals of networks and the knowledge acquired in the deepening diploma of CISCO, specifically CCNA (Cisco Certified Network Associate).

Based on a proposed case in which a problem oriented to network management is provided, it is intended to provide a solution based on the network simulation software CISCO Packet Tracer. Once solved the previous we proceed to explain in the present written work.

**Keywords:** CISCO, CCNA, Deepening, Skills, Networks, Informatics.

## INTRODUCCION

Actualmente se habla de desarrollo y modernidad y no puede excluirse el tema de la informática, sobre todo de las redes que nos ayudan a interconectarnos y de esta forma romper el paradigma de la distancia y tiempo, puesto que las herramientas telemáticas nos ayudan a mantener una comunicación tanto síncrona como asíncrona.

El funcionamiento de las nuevas tecnologías de la información y comunicación es posible gracias al uso de redes, que cruzan fronteras continentales y nos permiten estar al tanto de lo que sucede al otro lado del mundo.

En el presente trabajo se pretende poner en practica los conocimientos adquiridos en el diplomado de opción de grado de CISCO y de esta forma conocer a profundidad la configuración y ecosistema de una red.

## OBJETIVOS

### OBJETIVO GENERAL

Poner en practica todo lo aprendido en el transcurso de los módulos en teoría y habilidades, poniendo en evidencia todo lo aprendido en la solución de problemas relacionados con el caso propuesto.

### OBJETIVOS ESPECIFICIVOS

- Resolver los problemas propuestos en el caso usando las herramientas de simulación.
- Hacer una documentación de todo lo realizado.
- Configurar los dispositivos de redes.
- Usar los comandos de Packet Tracer y aprender sobre su funcionalidad.

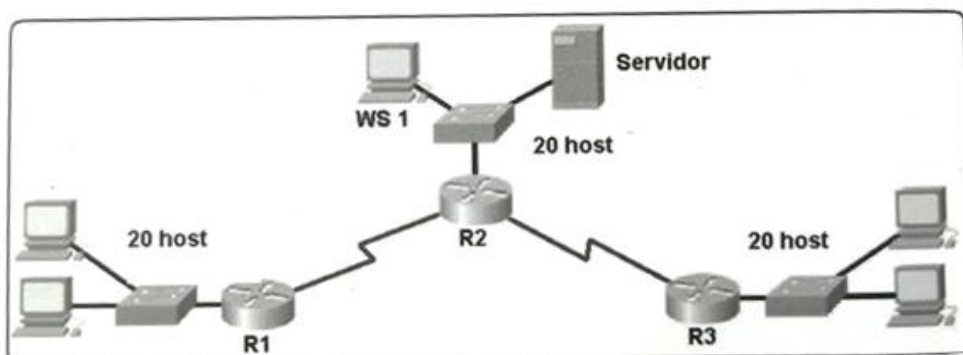
## Escenario 1

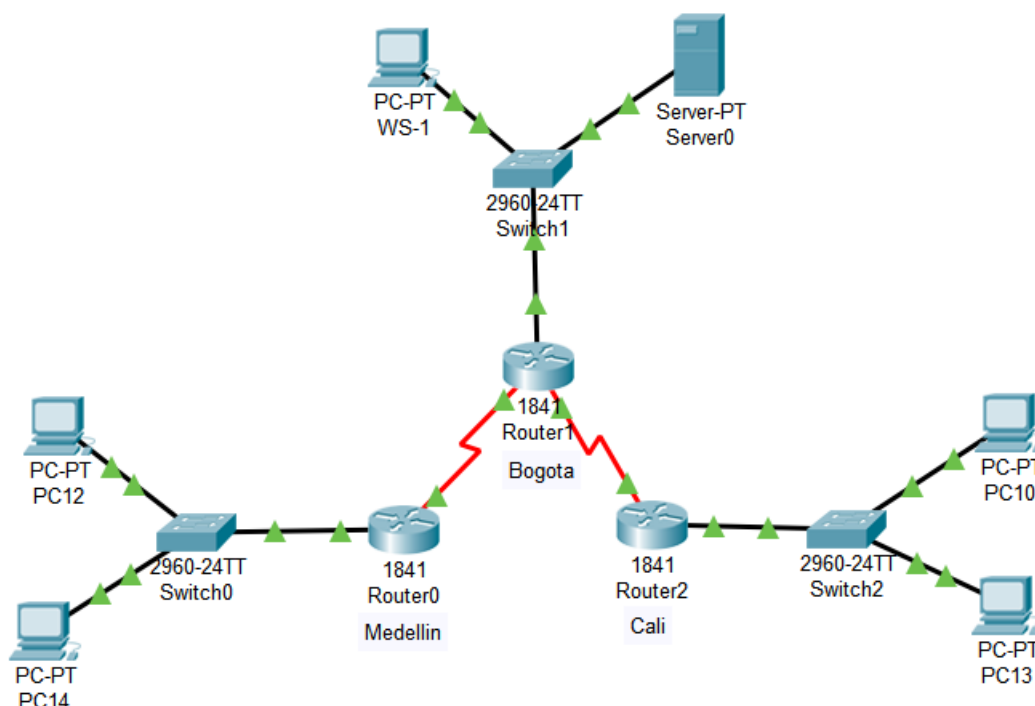
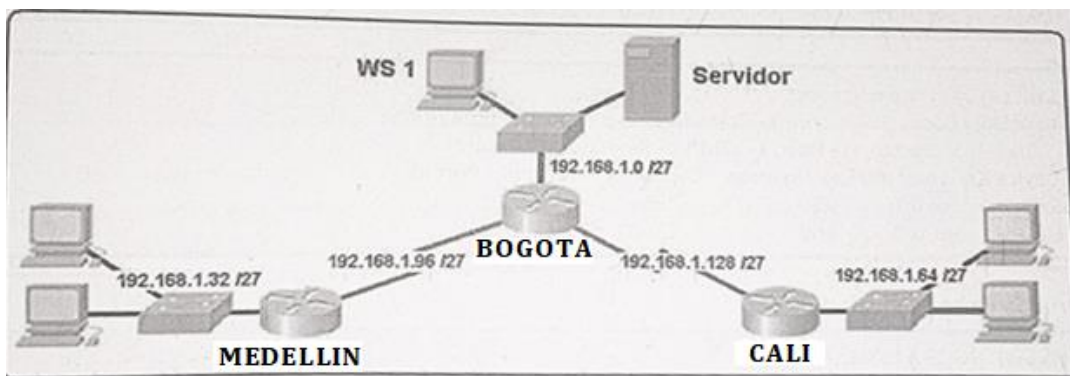
Una empresa posee sucursales distribuidas en las ciudades de Bogotá, Medellín y Cali en donde el estudiante será el administrador de la red, el cual deberá configurar e interconectar entre sí cada uno de los dispositivos que forman parte del escenario, acorde con los lineamientos establecidos para el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

### Topología de red

Los requerimientos solicitados son los siguientes:

- Parte 1: Para el direccionamiento IP debe definirse una dirección de acuerdo con el número de hosts requeridos.
- Parte 2: Considerar la asignación de los parámetros básicos y la detección de vecinos directamente conectados.
- Parte 3: La red y subred establecidas deberán tener una interconexión total, todos los hosts deberán ser visibles y poder comunicarse entre ellos sin restricciones.
- Parte 4: Implementar la seguridad en la red, se debe restringir el acceso y comunicación entre hosts de acuerdo con los requerimientos del administrador de red.
- Parte 5: Comprobación total de los dispositivos y su funcionamiento en la red.
- Parte 6: Configuración final.





## Desarrollo

Como trabajo inicial se debe realizar lo siguiente.

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

```
Router>en
Router#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname bogota
bogota(config)#no ip domain-lookup
bogota(config)#service password-encryption
```

```
bogota(config)#banner motd $El Acceso no autorizado est prohibido$
bogota(config)#enable secret class1
bogota(config)#line console 0
bogota(config-line)#password cisco1
bogota(config-line)#login
bogota(config-line)#line vty 0 15
bogota(config-line)#password cisco1
bogota(config-line)#login
bogota(config-line)#
```

```
Router>en
Router#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname medellin
medellin(config)#no ip domain-lookup
medellin(config)#service password-encryption
medellin(config)#banner motd $El Acceso no autorizado est prohibido$
medellin(config)#enable secret class1
medellin(config)#line console 0
medellin(config-line)#password cisco1
medellin(config-line)#login
medellin(config-line)#line vty 0 15
medellin(config-line)#password cisco1
medellin(config-line)#login
medellin(config-line)#
```

```
Router>en
Router#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname cali
cali(config)#no ip domain-lookup
cali(config)#service password-encryption
cali(config)#banner motd $El Acceso no autorizado est prohibido$
cali(config)#enable secret class1
cali(config)#line console 0
cali(config-line)#password cisco1
cali(config-line)#login
cali(config-line)#line vty 0 15
cali(config-line)#password cisco1
cali(config-line)#login
cali(config-line)#
```

```
Switch>en
Switch#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname switchbogota
switchbogota(config)#no ip domain-lookup
switchbogota(config)#service password-encryption
```

```
switchbogota(config)#banner motd $El Acceso no autorizado est prohibido$
switchbogota(config)#enable secret class1
switchbogota(config)#line console 0
switchbogota(config-line)#password cisco1
switchbogota(config-line)#login
switchbogota(config-line)#line vty 0 15
switchbogota(config-line)#password cisco1
switchbogota(config-line)#login
switchbogota(config-line)#
```

Switch>en

Switch#conf term

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

```
switchmedellin(config)#hostname switchmedellin
switchmedellin(config)#no ip domain-lookup
switchmedellin(config)#service password-encryption
switchmedellin(config)#banner motd $El Acceso no autorizado est prohibido$
switchmedellin(config)#enable secret class1
switchmedellin(config)#line console 0
switchmedellin(config-line)#password cisco1
switchmedellin(config-line)#login
switchmedellin(config-line)#line vty 0 15
switchmedellin(config-line)#password cisco1
switchmedellin(config-line)#login
switchmedellin(config-line)#
```

Switch>en

Switch#conf term

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

```
Switch(config)#hostname switchcali
switchcali(config)#no ip domain-lookup
switchcali(config)#service password-encryption
switchcali(config)#banner motd $El Acceso no autorizado est prohibido$
switchcali(config)#enable secret class1
switchcali(config)#line console 0
switchcali(config-line)#password cisco1
switchcali(config-line)#login
switchcali(config-line)#line vty 0 15
switchcali(config-line)#password cisco1
switchcali(config-line)#login
switchcali(config-line)#
```

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

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

### Parte 1: Asignación de direcciones IP

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

```

Bogota-LAN      192.168.1.0/27
Medellín-LAN   192.168.1.32/27
Cali-LAN       192.168.1.64/27
Bogota-Medellín 192.168.1.96/27
Bogota-Cali   192.168.1.128/27
Futuro        192.168.1.160/27
Futuro        192.168.1.192/27
Futuro        192.168.1.224/27
    
```

### 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
<b>Nombre de Host</b>	<b>MEDELLIN</b>	<b>BOGOTA</b>	<b>CALI</b>
<b>Dirección de Ip en interfaz Serial 0/0</b>	<b>192.168.1.99</b>	<b>192.168.1.98</b>	<b>192.168.1.131</b>
<b>Dirección de Ip en interfaz Serial 0/1</b>		<b>192.168.1.130</b>	
<b>Dirección de Ip en interfaz FA 0/0</b>	<b>192.168.1.33</b>	<b>192.168.1.1</b>	<b>192.168.1.65</b>
<b>Protocolo de enrutamiento</b>	<b>Eigrp</b>	<b>Eigrp</b>	<b>Eigrp</b>
<b>Sistema Autónomo</b>	<b>200</b>	<b>200</b>	<b>200</b>
<b>Afirmaciones de red</b>	<b>192.168.1.0</b>	<b>192.168.1.0</b>	<b>192.168.1.0</b>

```

bogota(config)#int s0/0/0
bogota(config-if)#ip address 192.168.1.98 255.255.255.224
bogota(config-if)#no shutdown
    
```

```

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

```

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

```
bogota(config-if)#int f0/0
bogota(config-if)#ip address 192.168.1.1 255.255.255.224
bogota(config-if)#no shutdown
```

```
bogota(config-if)#
bogota(config-if)#router eigrp 200
bogota(config-router)#no auto-summary
bogota(config-router)#network 192.168.1.0
bogota(config-router)#end
bogota#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

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

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

```
medellin(config)#int s0/0/0
medellin(config-if)#ip address 192.168.1.99 255.255.255.224
medellin(config-if)#no shutdown
```

```
medellin(config-if)#
medellin(config-if)#int f0/0
medellin(config-if)#ip address 192.168.1.33 255.255.255.224
medellin(config-if)#no shutdown
```

```
medellin(config-if)#
medellin(config-if)#router eigrp 200
medellin(config-router)#no auto-summary
medellin(config-router)#network 192.168.1.0
medellin(config-router)#end
medellin#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up

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

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

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

```
cali(config)#int s0/0/0
cali(config-if)#ip address 192.168.1.131 255.255.255.224
cali(config-if)#no shutdown
```

```
cali(config-if)#int f0/0
cali(config-if)#ip address 192.168.1.65 255.255.255.224
cali(config-if)#no shutdown
```

```
cali(config-if)#
cali(config-if)#router eigrp 200
cali(config-router)#no auto-summary
cali(config-router)#network 192.168.1.0
cali(config-router)#end
```

```
cali#
```

```
cali#
```

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

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

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

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

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

```
%DUAL-5-NBRCHANGE: IP-EIGRP 200: Neighbor 192.168.1.130 (Serial0/0/0)
is up: new adjacency
```

**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.**

```
bogota#show ip route
```

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

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

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

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

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

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

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

```
Gateway of last resort is not set
```

```
192.168.1.0/27 is subnetted, 5 subnets
```

```
C 192.168.1.0 is directly connected, FastEthernet0/0
```

```
D 192.168.1.32 [90/2172416] via 192.168.1.99, 00:04:34, Serial0/0/0
```

```
D 192.168.1.64 [90/2172416] via 192.168.1.131, 00:03:31, Serial0/0/1
```

```
C 192.168.1.96 is directly connected, Serial0/0/0
```

```
C 192.168.1.128 is directly connected, Serial0/0/1
```

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

Gateway of last resort is not set

```
192.168.1.0/27 is subnetted, 5 subnets
D 192.168.1.0 [90/2172416] via 192.168.1.98, 00:04:41, Serial0/0/0
C 192.168.1.32 is directly connected, FastEthernet0/0
D 192.168.1.64 [90/2684416] via 192.168.1.98, 00:03:38, Serial0/0/0
C 192.168.1.96 is directly connected, Serial0/0/0
D 192.168.1.128 [90/2681856] via 192.168.1.98, 00:03:44, Serial0/0/0
```

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

Gateway of last resort is not set

```
192.168.1.0/27 is subnetted, 5 subnets
D 192.168.1.0 [90/2172416] via 192.168.1.130, 00:03:47, Serial0/0/0
D 192.168.1.32 [90/2684416] via 192.168.1.130, 00:03:47, Serial0/0/0
C 192.168.1.64 is directly connected, FastEthernet0/0
D 192.168.1.96 [90/2681856] via 192.168.1.130, 00:03:47, Serial0/0/0
C 192.168.1.128 is directly connected, Serial0/0/0
```

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

```
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 28160
via Connected, FastEthernet0/0
P 192.168.1.32/27, 1 successors, FD is 2172416
via 192.168.1.99 (2172416/28160), Serial0/0/0
P 192.168.1.64/27, 1 successors, FD is 2172416
via 192.168.1.131 (2172416/28160), 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
```

```
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 2172416
via 192.168.1.98 (2172416/28160), Serial0/0/0
P 192.168.1.32/27, 1 successors, FD is 28160
via Connected, FastEthernet0/0
P 192.168.1.64/27, 1 successors, FD is 2684416
via 192.168.1.98 (2684416/2172416), 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
```

```
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 2172416
via 192.168.1.130 (2172416/28160), Serial0/0/0
P 192.168.1.32/27, 1 successors, FD is 2684416
via 192.168.1.130 (2684416/2172416), Serial0/0/0
P 192.168.1.64/27, 1 successors, FD is 28160
via Connected, FastEthernet0/0
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
```

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

```

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
switchbogota
Fas 0/0 176 S 2960 Fas 0/1
medellin Ser 0/0/0 145 R C1841 Ser 0/0/0
cali Ser 0/0/1 148 R C1841 Ser 0/0/0

```

```

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
switchmedellin
Fas 0/0 131 S 2960 Fas 0/1
bogota Ser 0/0/0 136 R C1841 Ser 0/0/0

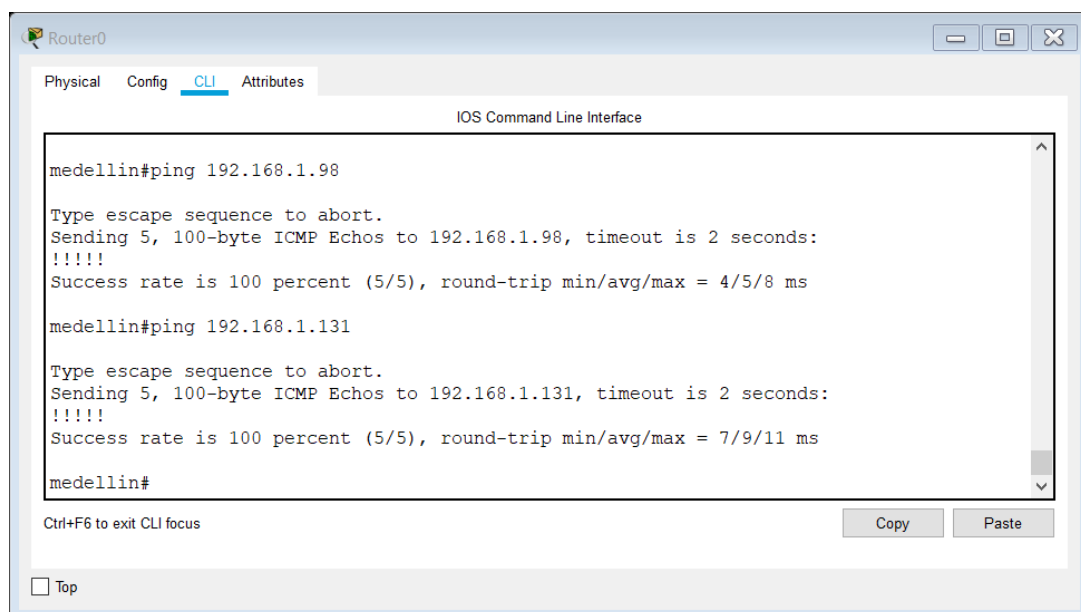
```

```

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
switchcali Fas 0/0 126 S 2960 Fas 0/1
bogota Ser 0/0/0 126 R C1841 Ser 0/0/1

```

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



### Parte 3: Configuración de Enrutamiento.

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

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

#### SHOW IP EIGRP NEIGHBORS

```
bogota#show ip eigrp neighbor
IP-EIGRP neighbors for process 200
H Address Interface Hold Uptime SRTT RTO Q Seq
(sec) (ms) Cnt Num
0 192.168.1.99 Se0/0/0 13 00:04:34 40 1000 0 7
1 192.168.1.131 Se0/0/1 12 00:03:31 40 1000 0 7
```

bogota#

```
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 11 00:04:40 40 1000 0 7
```

medellin#

```
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 12 00:03:47 40 1000 0 8
```

cali#

#### SHOW IP EIGRP TOPOLOGY

```
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 28160
via Connected, FastEthernet0/0
P 192.168.1.32/27, 1 successors, FD is 2172416
via 192.168.1.99 (2172416/28160), Serial0/0/0
P 192.168.1.64/27, 1 successors, FD is 2172416
via 192.168.1.131 (2172416/28160), 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
```

```
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 2172416
via 192.168.1.98 (2172416/28160), Serial0/0/0
P 192.168.1.32/27, 1 successors, FD is 28160
via Connected, FastEthernet0/0
P 192.168.1.64/27, 1 successors, FD is 2684416
via 192.168.1.98 (2684416/2172416), 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
```

```
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 2172416
via 192.168.1.130 (2172416/28160), Serial0/0/0
P 192.168.1.32/27, 1 successors, FD is 2684416
via 192.168.1.130 (2684416/2172416), Serial0/0/0
P 192.168.1.64/27, 1 successors, FD is 28160
via Connected, FastEthernet0/0
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
```

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

```
bogota#show ip route
```

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP  
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area  
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2  
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP

i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area  
\* - candidate default, U - per-user static route, o - ODR  
P - periodic downloaded static route

Gateway of last resort is not set

192.168.1.0/27 is subnetted, 5 subnets  
C 192.168.1.0 is directly connected, FastEthernet0/0  
D 192.168.1.32 [90/2172416] via 192.168.1.99, 00:04:34, Serial0/0/0  
D 192.168.1.64 [90/2172416] via 192.168.1.131, 00:03:31, Serial0/0/1  
C 192.168.1.96 is directly connected, Serial0/0/0  
C 192.168.1.128 is directly connected, Serial0/0/1

medellin#show ip route

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

Gateway of last resort is not set

192.168.1.0/27 is subnetted, 5 subnets  
D 192.168.1.0 [90/2172416] via 192.168.1.98, 00:04:41, Serial0/0/0  
C 192.168.1.32 is directly connected, FastEthernet0/0  
D 192.168.1.64 [90/2684416] via 192.168.1.98, 00:03:38, Serial0/0/0  
C 192.168.1.96 is directly connected, Serial0/0/0  
D 192.168.1.128 [90/2681856] via 192.168.1.98, 00:03:44, Serial0/0/0

cali#show ip route

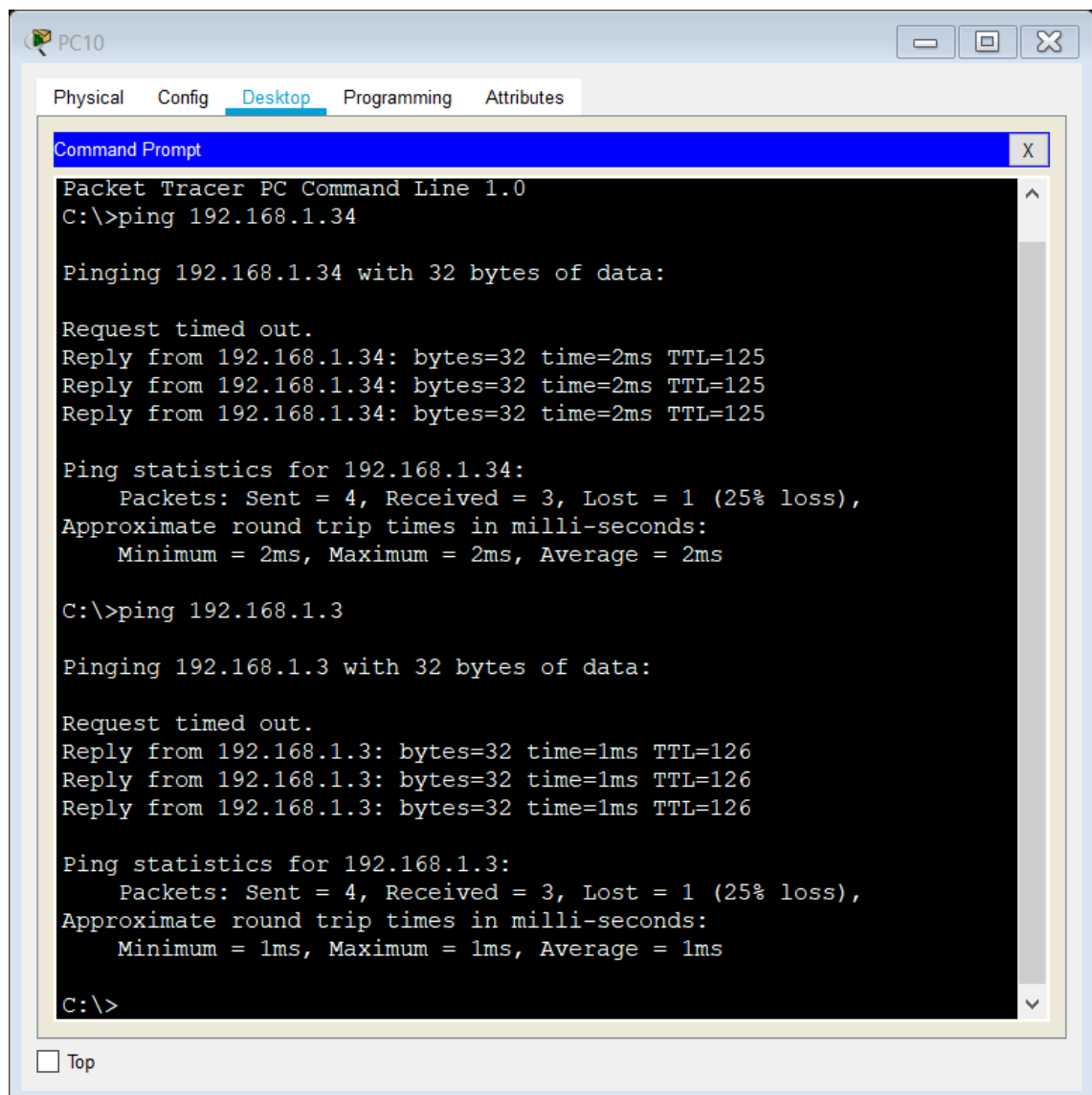
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP  
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area  
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2  
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP  
i - IS-IS, L1 - IS-IS level-1, L2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

Gateway of last resort is not set

192.168.1.0/27 is subnetted, 5 subnets  
D 192.168.1.0 [90/2172416] via 192.168.1.130, 00:03:47, Serial0/0/0  
D 192.168.1.32 [90/2684416] via 192.168.1.130, 00:03:47, Serial0/0/0  
C 192.168.1.64 is directly connected, FastEthernet0/0  
D 192.168.1.96 [90/2681856] via 192.168.1.130, 00:03:47, Serial0/0/0

C 192.168.1.128 is directly connected, Serial0/0/0

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



#### 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:

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

**a. 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.**

```
bogota(config)#access-list 131 permit ip host 192.168.1.30 any
bogota(config)#int f0/0
bogota(config-if)#ip access-group 131 in
bogota(config-if)#
```

**b. 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.**

```
medellin(config)#access-list 131 permit ip 192.168.1.32 0.0.0.31 host
192.168.1.30
medellin(config)#int f0/0
medellin(config-if)#ip access-group 131 in
medellin(config-if)#
```

```
cali(config)#access-list 131 permit ip 192.168.1.64 0.0.0.31 host 192.168.1.30
cali(config)#int f0/0
cali(config-if)#ip access-group 131 in
cali(config-if)#
```

**Parte 5: Comprobación de la red instalada.**

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

	ORIGEN	DESTINO	RESULTADO
TELNET	Router MEDELLIN	Router CALI	Éxito
	WS_1	Router BOGOTA	Falla
	Servidor	Router CALI	Éxito
	Servidor	Router MEDELLIN	Éxito
TELNET	LAN del Router MEDELLIN	Router CALI	Falla

	LAN del Router CALI	Router CALI	Falla
	LAN del Router MEDELLIN	Router MEDELLIN	Falla
	LAN del Router CALI	Router MEDELLIN	Falla
PING	LAN del Router CALI	WS_1	Falla
	LAN del Router MEDELLIN	WS_1	Falla
	LAN del Router MEDELLIN	LAN del Router CALI	Falla
PING	LAN del Router CALI	Servidor	Éxito
	LAN del Router MEDELLIN	Servidor	Éxito
	Servidor	LAN del Router MEDELLIN	Éxito
	Servidor	LAN del Router CALI	Éxito
	Router CALI	LAN del Router MEDELLIN	Falla
	Router MEDELLIN	LAN del Router CALI	Falla

The screenshot shows a terminal window titled "Router0" with tabs for "Physical", "Config", "CLI", and "Attributes". The "CLI" tab is active, displaying the following text:

```

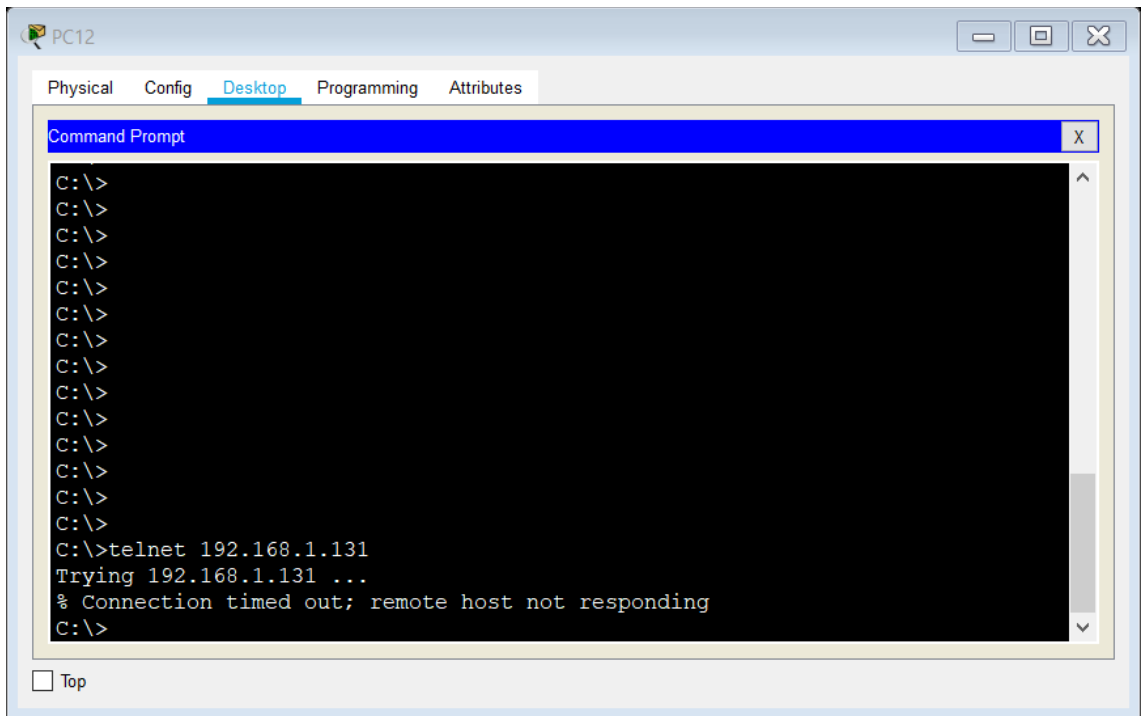
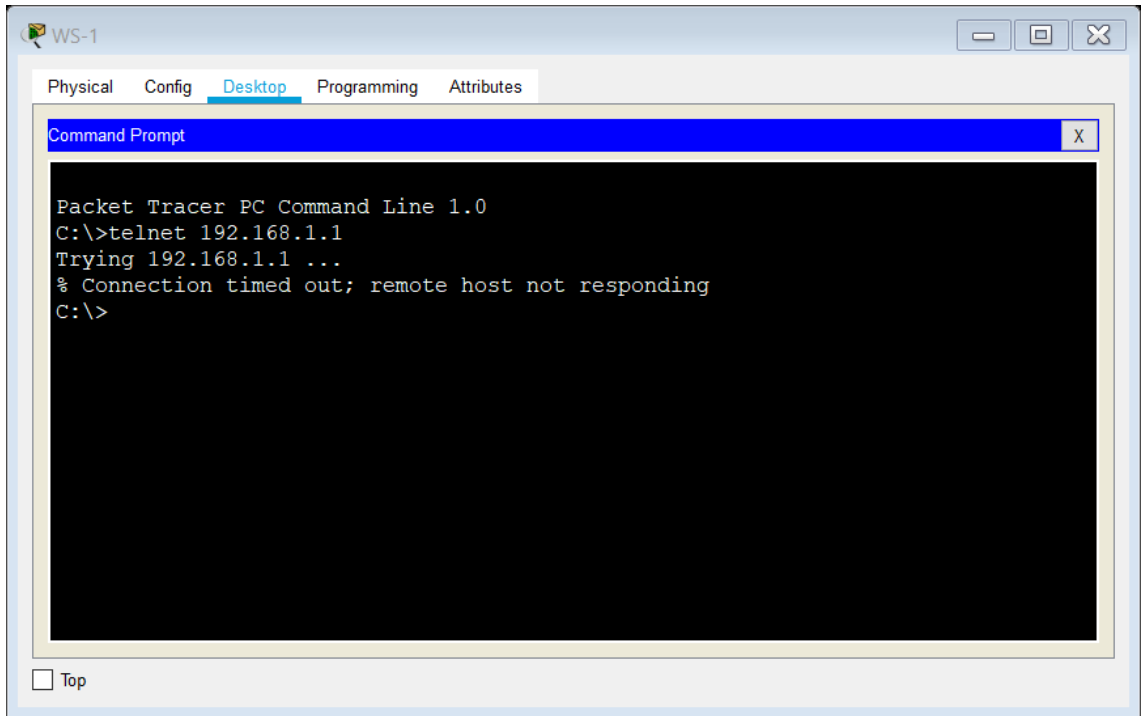
IOS Command Line Interface
medellin(config-if)#
medellin(config-if)#
medellin(config-if)#end
medellin#
%SYS-5-CONFIG_I: Configured from console by console

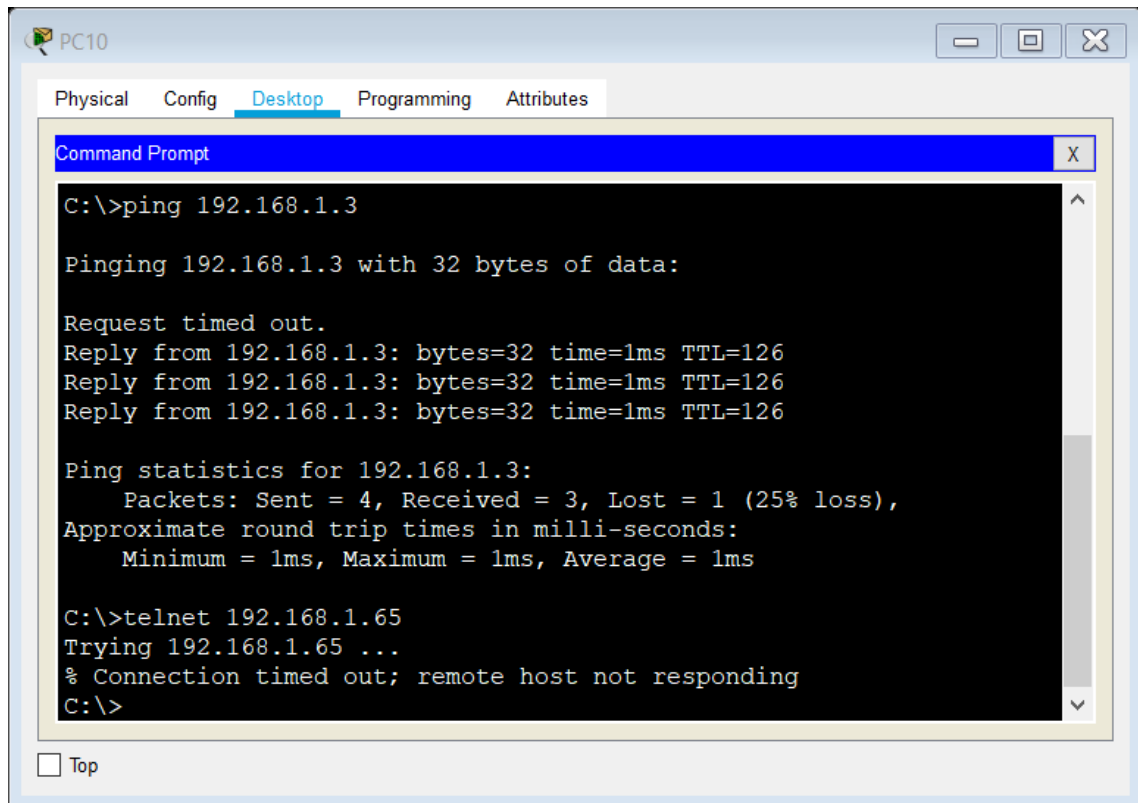
medellin#telnet 192.168.1.131
Trying 192.168.1.131 ...OpenEl Acceso no autorizado est prohibido

User Access Verification

Password:
cali>en
Password:
cali#
  
```

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





PC10

Physical Config **Desktop** Programming Attributes

Command Prompt

```
C:\>ping 192.168.1.3

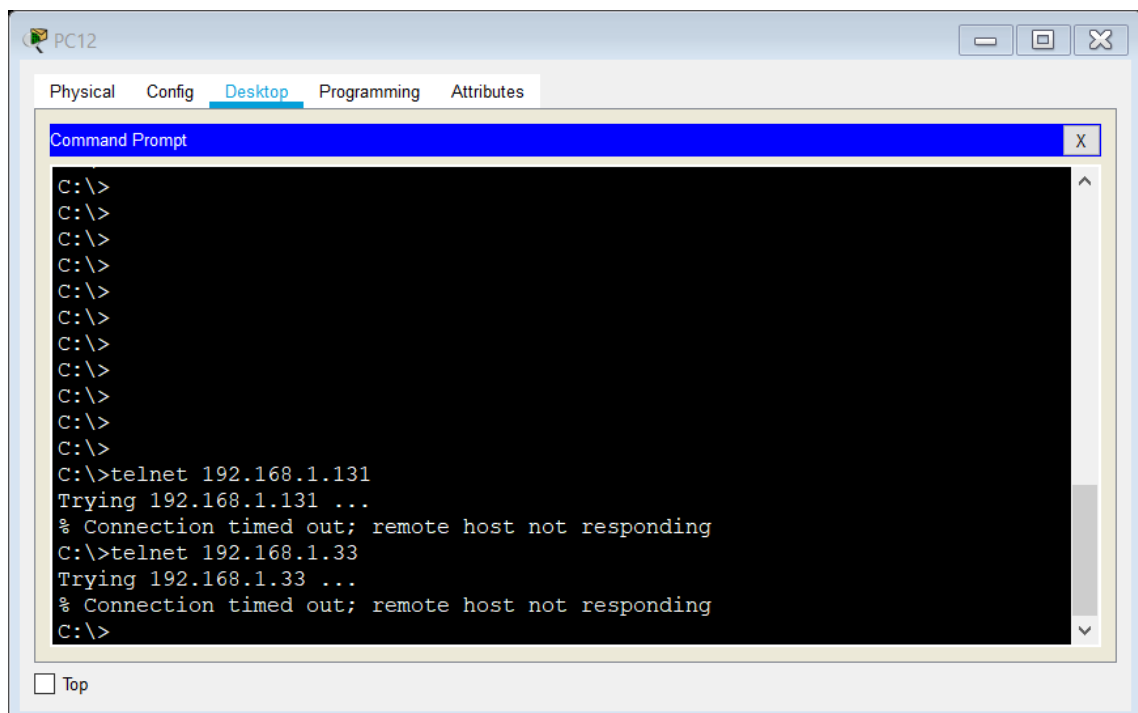
Pinging 192.168.1.3 with 32 bytes of data:

Request timed out.
Reply from 192.168.1.3: bytes=32 time=1ms TTL=126
Reply from 192.168.1.3: bytes=32 time=1ms TTL=126
Reply from 192.168.1.3: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.1.3:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 1ms, Average = 1ms

C:\>telnet 192.168.1.65
Trying 192.168.1.65 ...
% Connection timed out; remote host not responding
C:\>
```

Top



PC12

Physical Config **Desktop** Programming Attributes

Command Prompt

```
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
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:\>
```

Top

```

PC10
Physical  Config  Desktop  Programming  Attributes
Command Prompt
Request timed out.
Reply from 192.168.1.3: bytes=32 time=1ms TTL=126
Reply from 192.168.1.3: bytes=32 time=1ms TTL=126
Reply from 192.168.1.3: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.1.3:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 1ms, Average = 1ms

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:\>
 Top
  
```

```

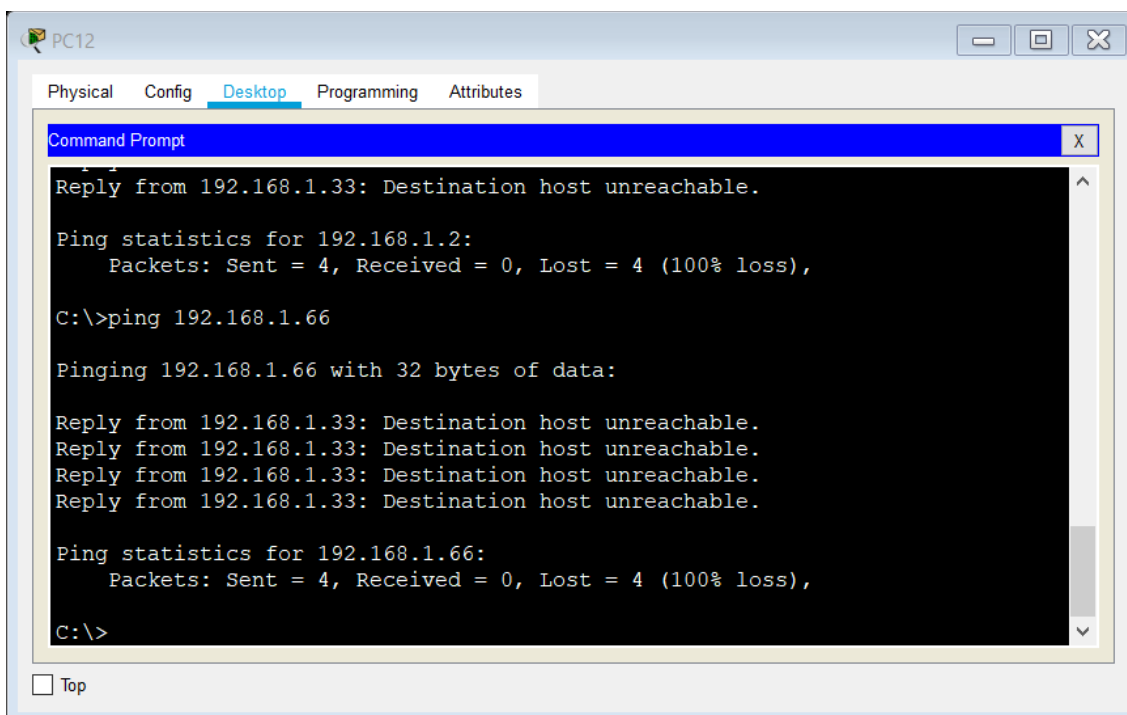
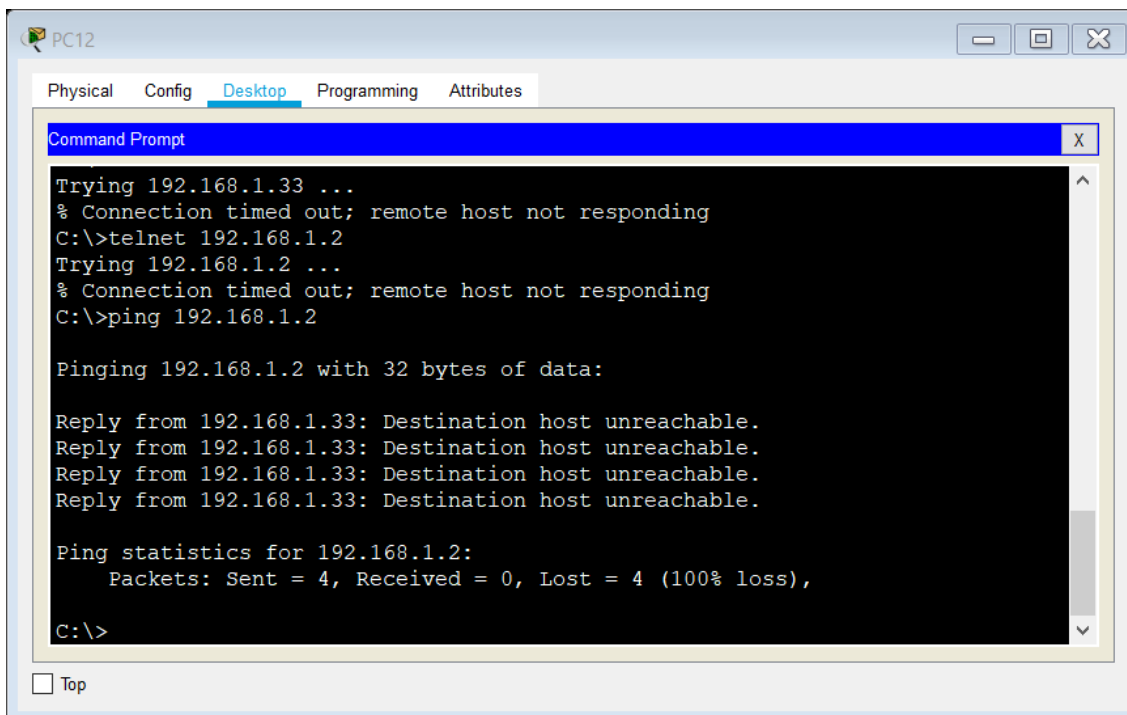
PC10
Physical  Config  Desktop  Programming  Attributes
Command Prompt
Trying 192.168.1.65 ...
% Connection timed out; remote host not responding
C:\>telnet 192.168.1.99
Trying 192.168.1.99 ...
% Connection timed out; remote host not responding
C:\>ping 192.168.1.2

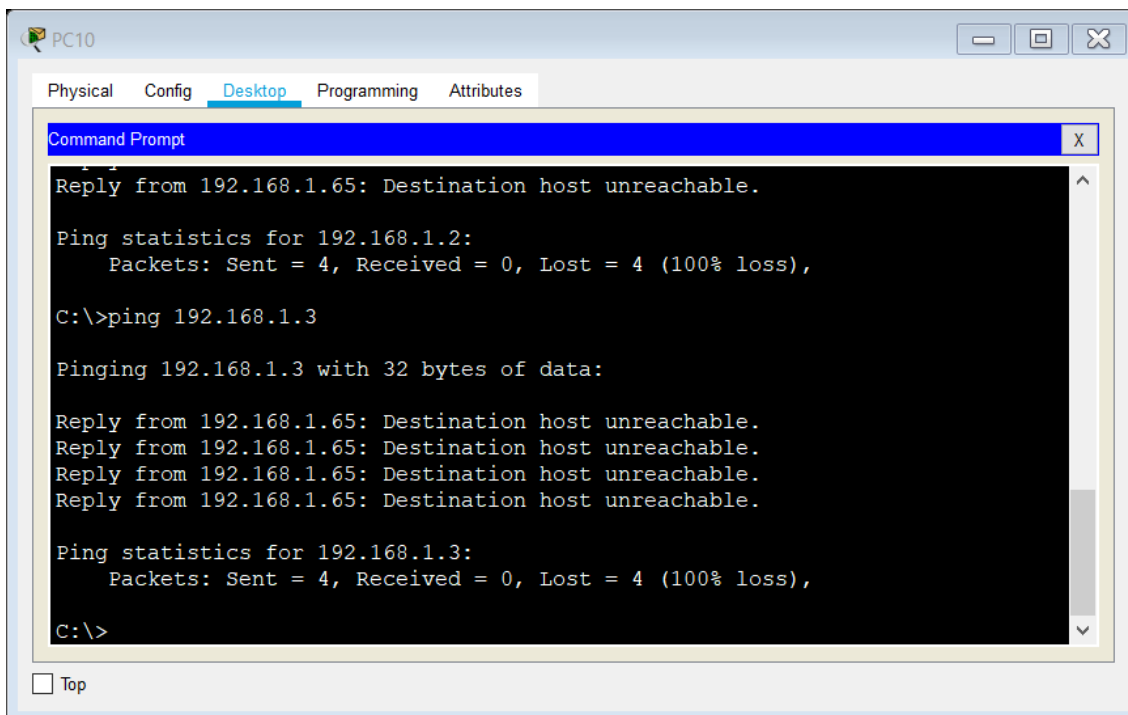
Pinging 192.168.1.2 with 32 bytes of data:

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 192.168.1.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
 Top
  
```





PC10

Physical Config **Desktop** Programming Attributes

```
Command Prompt
Reply from 192.168.1.65: Destination host unreachable.

Ping statistics for 192.168.1.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 192.168.1.3

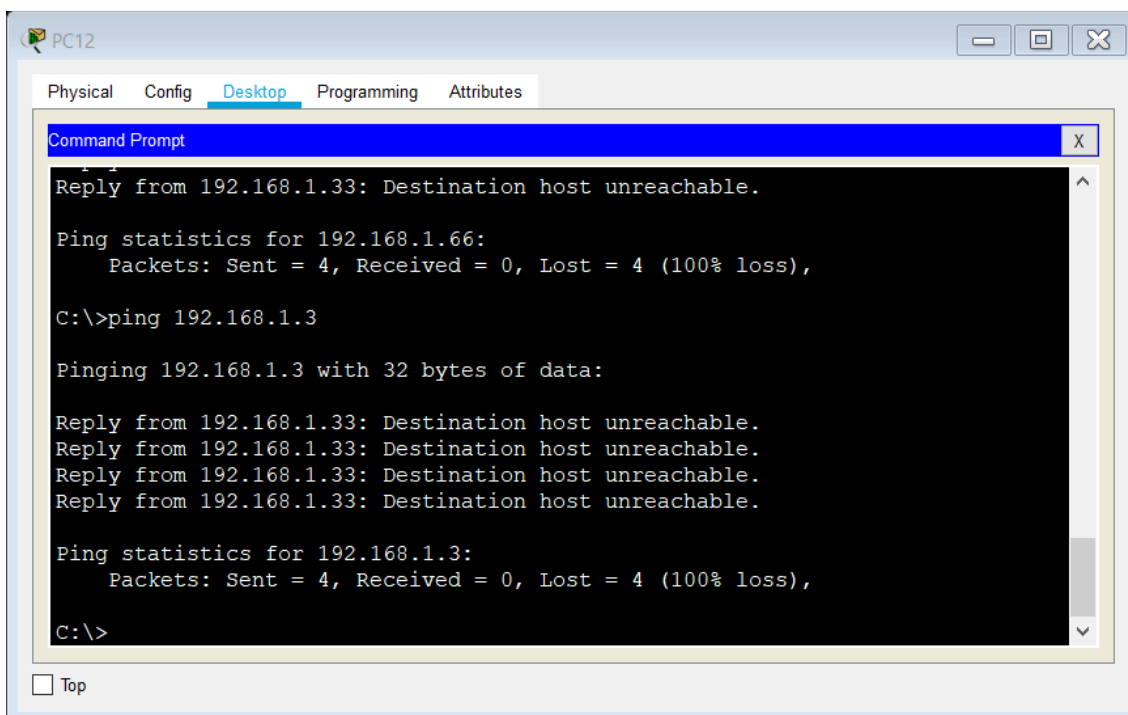
Pinging 192.168.1.3 with 32 bytes of data:

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 192.168.1.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
```

Top



PC12

Physical Config **Desktop** Programming Attributes

```
Command Prompt
Reply from 192.168.1.33: Destination host unreachable.

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

C:\>ping 192.168.1.3

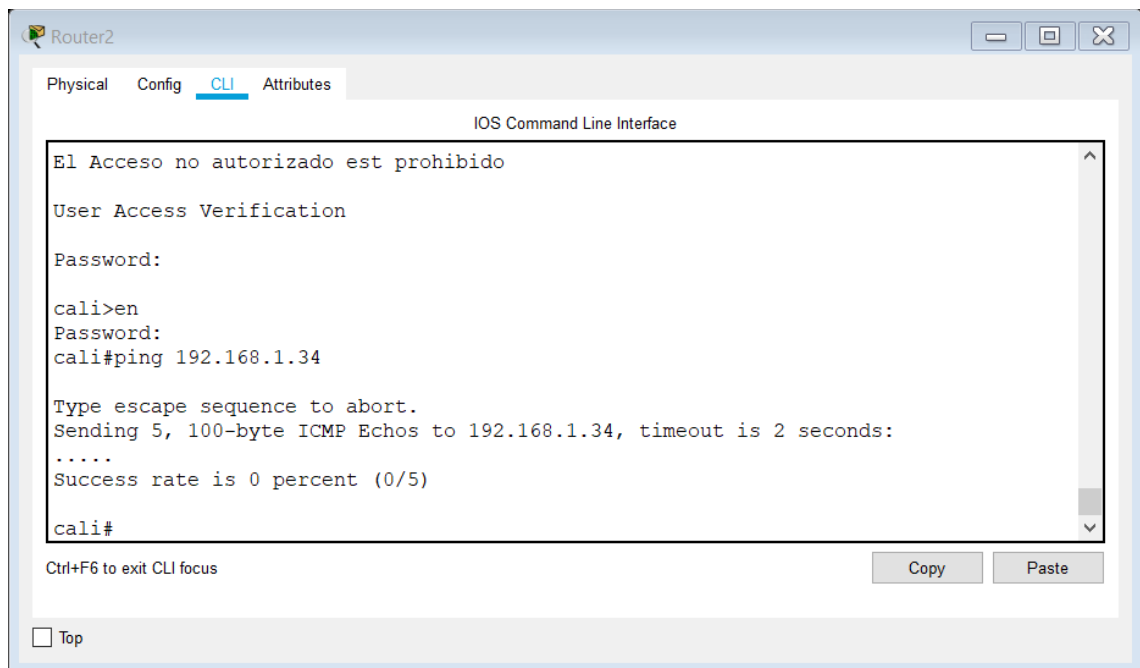
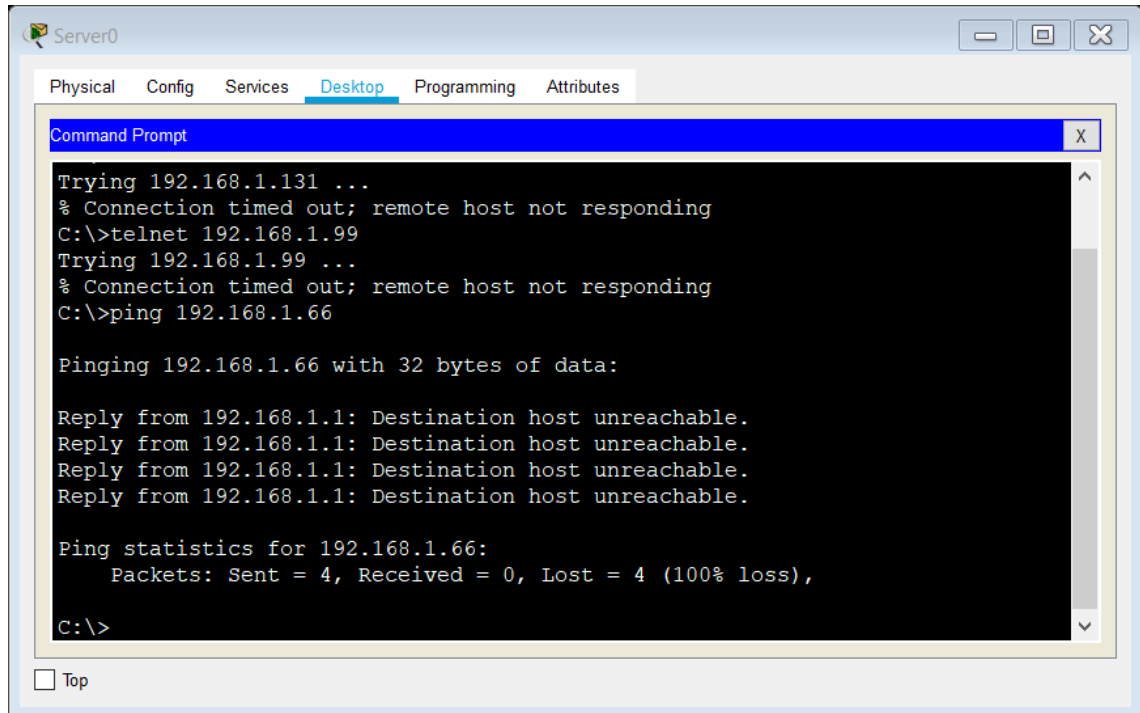
Pinging 192.168.1.3 with 32 bytes of data:

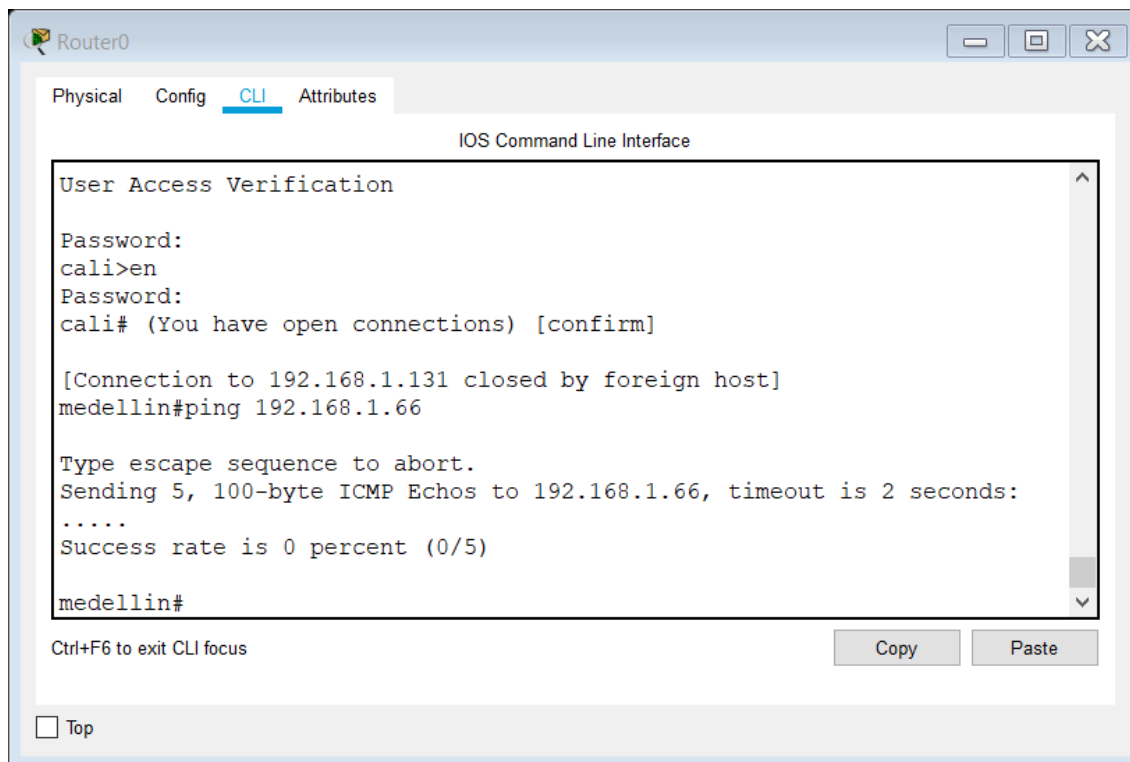
Reply from 192.168.1.33: Destination host unreachable.
Reply from 192.168.1.33: Destination host unreachable.
Reply from 192.168.1.33: Destination host unreachable.
Reply from 192.168.1.33: Destination host unreachable.

Ping statistics for 192.168.1.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
```

Top





The screenshot shows a window titled "Router0" with tabs for "Physical", "Config", "CLI", and "Attributes". The "CLI" tab is active, displaying the "IOS Command Line Interface". The terminal output is as follows:

```
User Access Verification
Password:
cali>en
Password:
cali# (You have open connections) [confirm]

[Connection to 192.168.1.131 closed by foreign host]
medellin#ping 192.168.1.66

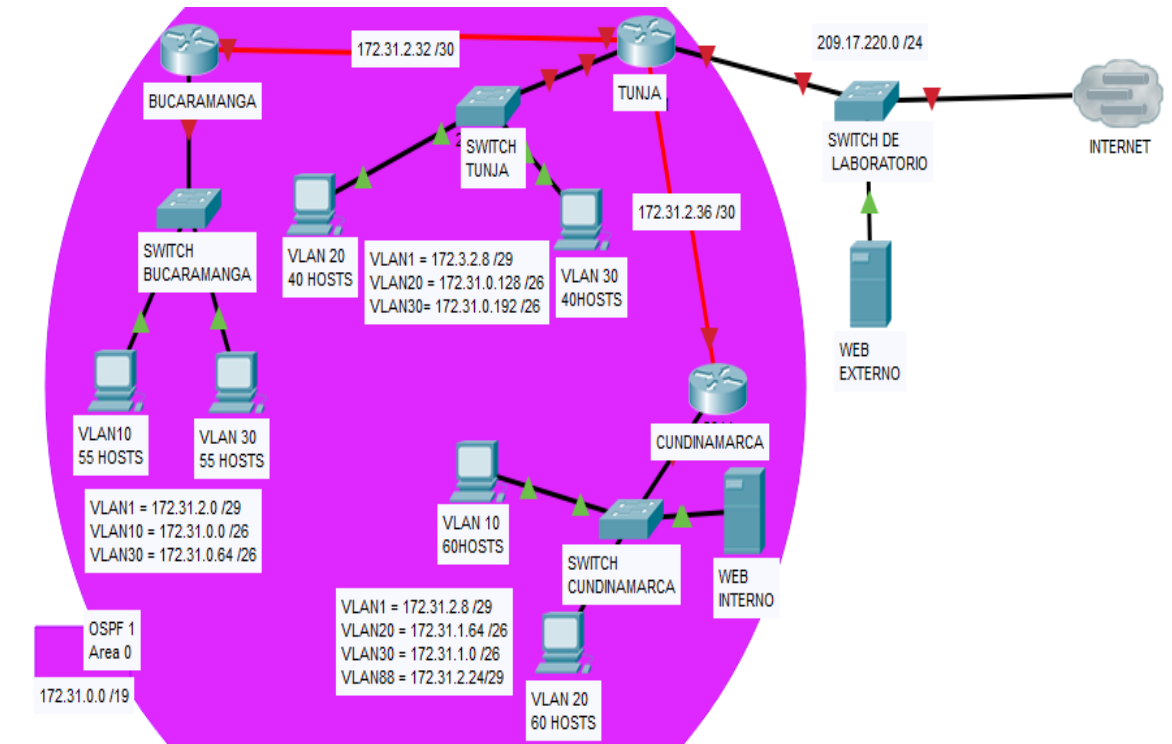
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.66, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)

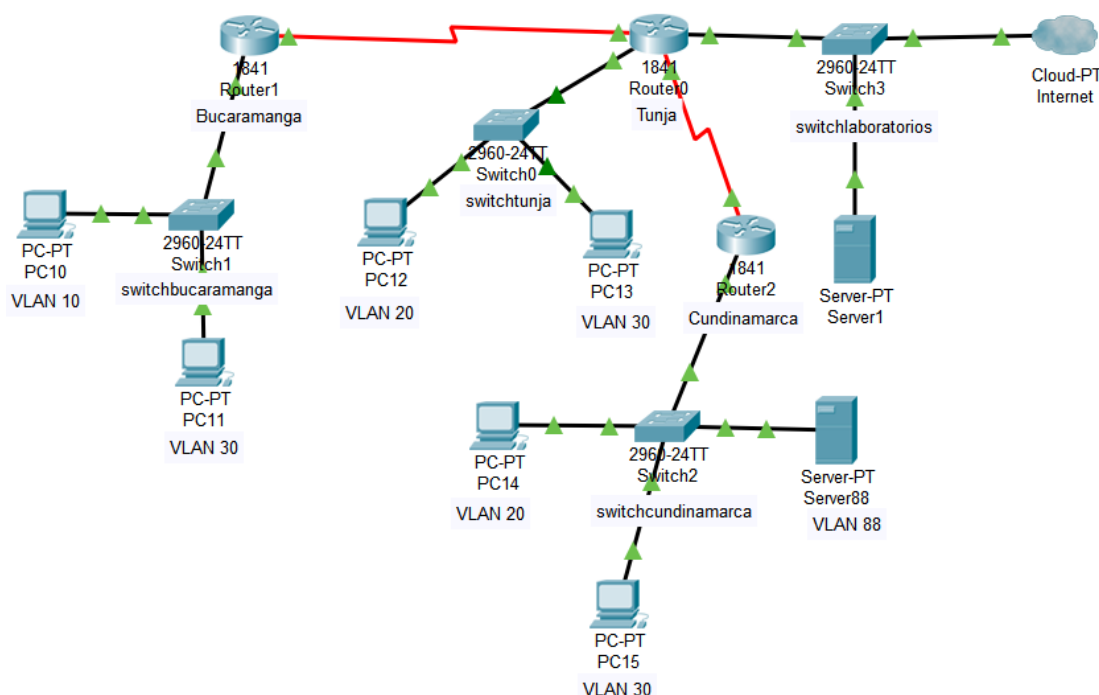
medellin#
```

At the bottom of the window, there is a "Ctrl+F6 to exit CLI focus" label, "Copy" and "Paste" buttons, and a "Top" button with a checkbox.

## Escenario 2

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





## Desarrollo

Los siguientes son los requerimientos necesarios:

1. Todos los routers deberán tener los siguiente:
  - Configuración básica.

```

Router>en
Router#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname bucaramanga
bucaramanga(config)#no ip domain-lookup
bucaramanga(config)#banner motd $El Acceso no autorizado est prohibido$
bucaramanga(config)#enable secret class1
bucaramanga(config)#line console 0
bucaramanga(config-line)#password cisco1
bucaramanga(config-line)#login
bucaramanga(config-line)#line vty 0 15
bucaramanga(config-line)#password cisco1
bucaramanga(config-line)#login
bucaramanga(config)#int f0/0.1
bucaramanga(config-subif)#encapsulation dot1q 1
bucaramanga(config-subif)#ip address 172.31.2.1 255.255.255.248
bucaramanga(config-subif)#int f0/0.10
bucaramanga(config-subif)#encapsulation dot1q 10
    
```

```
bucaramanga(config-subif)#ip address 172.31.0.1 255.255.255.192
bucaramanga(config-subif)#int f0/0.30
bucaramanga(config-subif)#encapsulation dot1q 30
bucaramanga(config-subif)#ip address 172.31.0.65 255.255.255.192
bucaramanga(config-subif)#int f0/0
bucaramanga(config-if)#no shutdown
```

```
bucaramanga(config-if)#
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)#
bucaramanga(config-if)#router ospf 1
bucaramanga(config-router)#network 172.31.0.0 0.0.0.63 area 0
bucaramanga(config-router)#network 172.31.0.64 0.0.0.63 area 0
bucaramanga(config-router)#network 172.31.2.0 0.0.0.7 area 0
bucaramanga(config-router)#network 172.31.2.32 0.0.0.3 area 0
bucaramanga(config-router)#end
```

```
bucaramanga#
```

```
bucaramanga#
```

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

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

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

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

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

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

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

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

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

```
bucaramanga#
```

```

Router>en
Router#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname tunja
tunja(config)#no ip domain-lookup
tunja(config)#banner motd $EI Acceso no autorizado est prohibido$
tunja(config)#enable secret class1
tunja(config)#line console 0
tunja(config-line)#password cisco1
tunja(config-line)#login
tunja(config-line)#line vty 0 15
tunja(config-line)#password cisco1
tunja(config-line)#login
tunja(config)#int f0/0.1
tunja(config-subif)#encapsulation dot1q 1
tunja(config-subif)#ip address 172.3.2.9 255.255.255.248
tunja(config-subif)#int f0/0.20
tunja(config-subif)#encapsulation dot1q 20
tunja(config-subif)#ip address 172.31.0.129 255.255.255.192
tunja(config-subif)#int f0/0.30
tunja(config-subif)#encapsulation dot1q 30
tunja(config-subif)#ip address 172.31.0.193 255.255.255.192
tunja(config-subif)#int f0/0
tunja(config-if)#no shutdown

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)#
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

%LINK-5-CHANGED: Interface Serial0/0/1, changed state to down
tunja(config-if)#int f0/1
tunja(config-if)#ip address 209.165.220.1 255.255.255.0
tunja(config-if)#no shutdown

tunja(config-if)#
tunja(config-if)#router ospf 1
tunja(config-router)#network 172.3.2.8 0.0.0.7 area 0
tunja(config-router)#network 172.31.0.128 0.0.0.63 area 0
tunja(config-router)#network 172.31.0.192 0.0.0.63 area 0
tunja(config-router)#network 172.31.2.32 0.0.0.3 area 0
tunja(config-router)#network 172.31.2.36 0.0.0.3 area 0
tunja(config-router)#end

```

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

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

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

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

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

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

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

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

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

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

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

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

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

00:15:19: %OSPF-5-ADJCHG: Process 1, Nbr 172.31.2.34 on Serial0/0/0 from
LOADING to FULL, Loading Done
```

```
Router>en
Router#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname cundinamarca
cundinamarca(config)#no ip domain-lookup
cundinamarca(config)#banner motd $El Acceso no autorizado est prohibido$
cundinamarca(config)#enable secret class1
cundinamarca(config)#line console 0
```

```
cundinamarca(config-line)#password cisco1
cundinamarca(config-line)#login
cundinamarca(config-line)#line vty 0 15
cundinamarca(config-line)#password cisco1
cundinamarca(config-line)#login
cundinamarca(config)#int f0/0.1
cundinamarca(config-subif)#encapsulation dot1q 1
cundinamarca(config-subif)#ip address 172.31.2.9 255.255.255.248
cundinamarca(config-subif)#int f0/0.20
cundinamarca(config-subif)#encapsulation dot1q 20
cundinamarca(config-subif)#ip address 172.31.1.65 255.255.255.192
cundinamarca(config-subif)#int f0/0.30
cundinamarca(config-subif)#encapsulation dot1q 30
cundinamarca(config-subif)#ip address 172.31.1.1 255.255.255.192
cundinamarca(config-subif)#int f0/0.88
cundinamarca(config-subif)#encapsulation dot1q 88
cundinamarca(config-subif)#ip address 172.31.2.25 255.255.255.248
cundinamarca(config-subif)#int f0/0
cundinamarca(config-if)#no shutdown

cundinamarca(config-if)#
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)#router ospf 1
cundinamarca(config-router)#network 172.31.1.0 0.0.0.63 area 0
cundinamarca(config-router)#network 172.31.1.64 0.0.0.63 area 0
cundinamarca(config-router)#network 172.31.2.8 0.0.0.7 area 0
cundinamarca(config-router)#network 172.31.2.24 0.0.0.7 area 0
cundinamarca(config-router)#network 172.31.2.36 0.0.0.3 area 0
cundinamarca(config-router)#end
cundinamarca#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

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

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

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

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

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

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

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

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

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

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

%SYS-5-CONFIG\_I: Configured from console by console

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

00:16:24: %OSPF-5-ADJCHG: Process 1, Nbr 209.165.220.1 on Serial0/0/0 from LOADING to FULL, Loading Done

Switch>en

Switch#conf term

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

Switch(config)#hostname switchbucaramanga

switchbucaramanga(config)#vlan 1

switchbucaramanga(config-vlan)#vlan 10

switchbucaramanga(config-vlan)#vlan 30

switchbucaramanga(config-vlan)#int f0/10

switchbucaramanga(config-if)#switchport mode access

switchbucaramanga(config-if)#switchport access vlan 10

switchbucaramanga(config-if)#int f0/14

switchbucaramanga(config-if)#switchport mode access

switchbucaramanga(config-if)#switchport access vlan 30

switchbucaramanga(config-if)#int f0/1

switchbucaramanga(config-if)#switchport mode trunk

switchbucaramanga(config-if)#int vlan 1

switchbucaramanga(config-if)#ip address 172.31.2.3 255.255.255.248

switchbucaramanga(config-if)#no shutdown

switchbucaramanga(config-if)#ip default-gateway 172.31.2.1

switchbucaramanga(config)#

switchbucaramanga(config)#

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

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

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

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

Switch>en

Switch#conf term

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

Switch(config)#hostname swtichtunja

swtichtunja(config)#vlan 1

swtichtunja(config-vlan)#vlan 20

swtichtunja(config-vlan)#vlan 30

swtichtunja(config-vlan)#int f0/10

swtichtunja(config-if)#switchport mode access

swtichtunja(config-if)#switchport access vlan 20

swtichtunja(config-if)#int f0/14

swtichtunja(config-if)#switchport mode access

swtichtunja(config-if)#switchport access vlan 30

swtichtunja(config-if)#int f0/1

swtichtunja(config-if)#switchport mode trunk

swtichtunja(config-if)#

swtichtunja(config-if)#int vlan 1

swtichtunja(config-if)#ip address 172.3.2.11 255.255.255.248

swtichtunja(config-if)#no shutdown

swtichtunja(config-if)#

swtichtunja(config-if)#ip default-gateway 172.3.2.9

swtichtunja(config)#

swtichtunja(config)#

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

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

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

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

Switch>en

Switch#conf term

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

Switch(config)#hostname swithccundinamarca

swithccundinamarca(config)#vlan 1

swithccundinamarca(config-vlan)#vlan 20

swithccundinamarca(config-vlan)#vlan 30

swithccundinamarca(config-vlan)#vlan 88

swithccundinamarca(config-vlan)#exit

swithccundinamarca(config)#int f0/10

swithccundinamarca(config-if)#switchport mode access

swithccundinamarca(config-if)#switchport access vlan 20

swithccundinamarca(config-if)#int f0/14

swithccundinamarca(config-if)#switchport mode access

swithccundinamarca(config-if)#switchport access vlan 30

swithccundinamarca(config-if)#int f0/20

swithccundinamarca(config-if)#switchport mode access

swithccundinamarca(config-if)#switchport access vlan 88

swithccundinamarca(config-if)#int f0/1

swithccundinamarca(config-if)#switchport mode trunk

swithccundinamarca(config-if)#

swithccundinamarca(config-if)#int vlan 1

swithccundinamarca(config-if)#ip address 172.31.2.11 255.255.255.248

swithccundinamarca(config-if)#no shutdown

swithccundinamarca(config-if)#

swithccundinamarca(config-if)#ip default-gateway 172.31.2.9

swithccundinamarca(config)#

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

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

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

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

- **Autenticación local con AAA.**

bucaramanga(config-line)#username admin01 secret admin01pass

bucaramanga(config)#aaa new-model

bucaramanga(config)#aaa authentication login aaalocal local

bucaramanga(config)#line console 0

bucaramanga(config-line)#login authentication aaalocal

bucaramanga(config-line)#line vty 0 15

```
bucaramanga(config-line)#login authentication aaalocal
```

```
tunja(config-line)#username admin01 secret admin01pass  
tunja(config)#aaa new-model  
tunja(config)#aaa authentication login aaalocal local  
tunja(config)#line console 0  
tunja(config-line)#login authentication aaalocal  
tunja(config-line)#line vty 0 15  
tunja(config-line)#login authentication aaalocal
```

```
cundinamarca(config-line)#username admin01 secret admin01pass  
cundinamarca(config)#aaa new-model  
cundinamarca(config)#aaa authentication login aaalocal local  
cundinamarca(config)#line console 0  
cundinamarca(config-line)#login authentication aaalocal  
cundinamarca(config-line)#line vty 0 15  
cundinamarca(config-line)#login authentication aaalocal
```

- **Cifrado de contraseñas.**

```
bucaramanga(config)#service password-encryption  
tunja(config)#service password-encryption  
cundinamarca(config)#service password-encryption
```

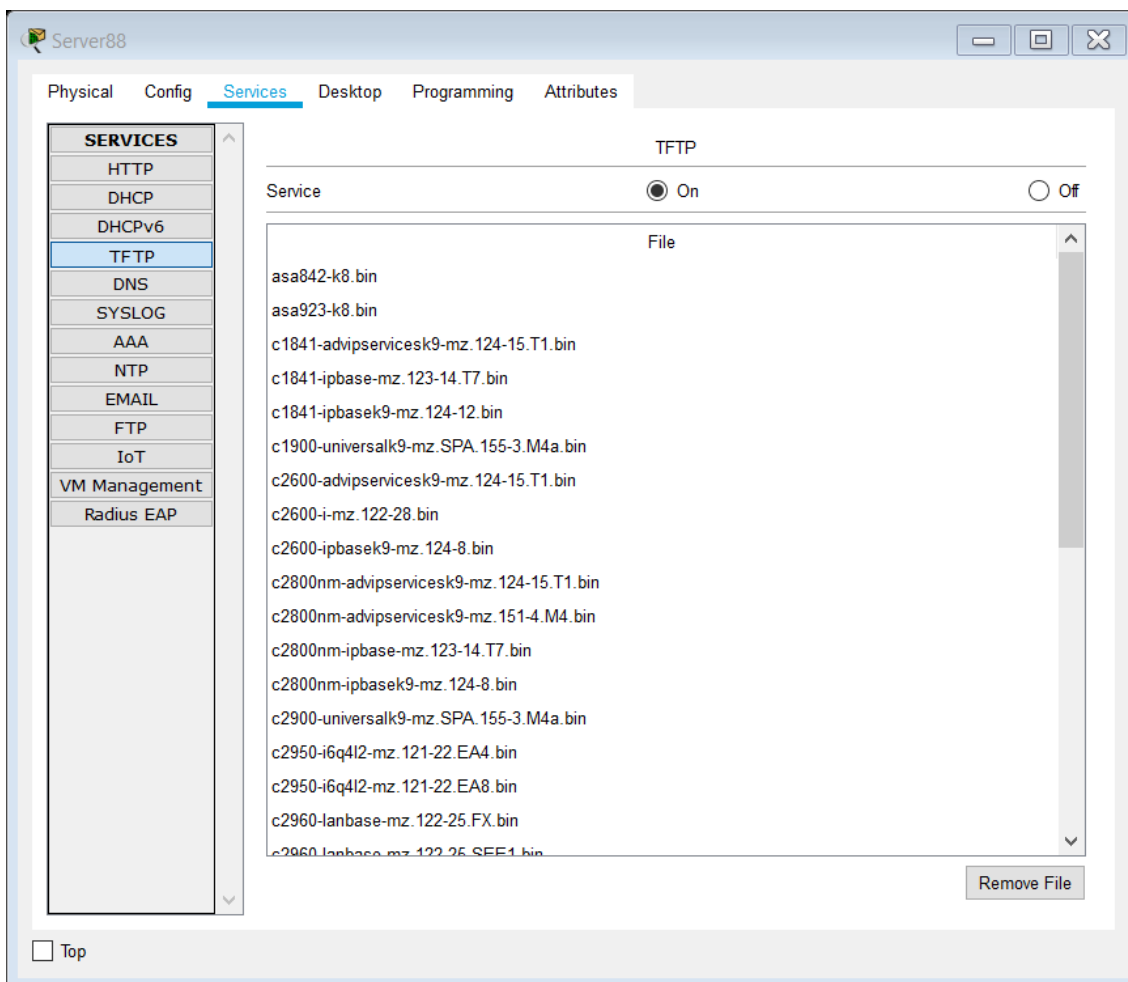
- **Un máximo de internos para acceder al router.**

```
bucaramanga(config-line)#login block-for 20 attempts 10 within 60  
tunja(config-line)#login block-for 20 attempts 10 within 60  
cundinamarca(config-line)#login block-for 20 attempts 10 within 60
```

- **Máximo tiempo de acceso al detectar ataques.**

```
bucaramanga(config-line)#login block-for 20 attempts 10 within 60  
tunja(config-line)#login block-for 20 attempts 10 within 60  
cundinamarca(config-line)#login block-for 20 attempts 10 within 60
```

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



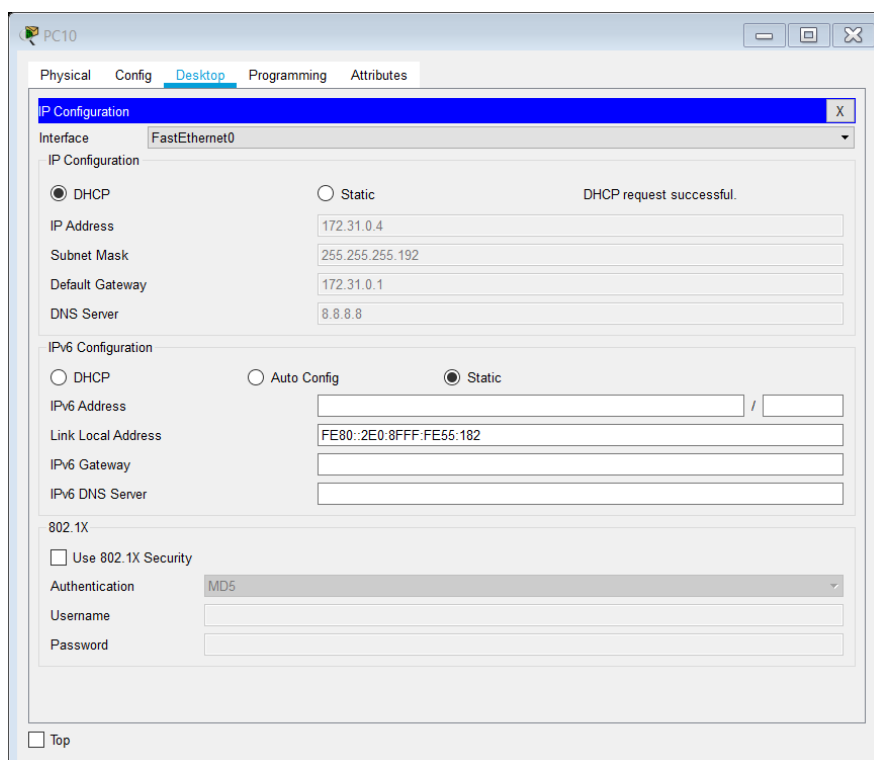
## 2. El DHCP deberá proporcionar solo direcciones a los hosts de Bucaramanga y Cundinamarca

```
tunja(config)#ip dhcp excluded-address 172.31.0.1 172.31.0.3
tunja(config)#ip dhcp excluded-address 172.31.0.65 172.31.0.67
tunja(config)#ip dhcp excluded-address 172.31.1.65 172.31.1.67
tunja(config)#ip dhcp excluded-address 172.31.1.1 172.31.1.3
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 8.8.8.8
tunja(dhcp-config)#ip dhcp pool lan30buc
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 8.8.8.8
tunja(dhcp-config)#ip dhcp pool vlan20cal
```

```
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 8.8.8.8
tunja(dhcp-config)#ip dhcp pool vlan30cal
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 8.8.8.8
tunja(dhcp-config)#
```

```
bucaramanga(config)#int f0/0.10
bucaramanga(config-subif)#ip helper-address 172.31.2.33
bucaramanga(config-subif)#int f0/0.30
bucaramanga(config-subif)#ip helper-address 172.31.2.33
bucaramanga(config-subif)#end
bucaramanga#
```

```
cundinamarca(config)#int f0/0.20
cundinamarca(config-subif)#ip helper-address 172.31.2.37
cundinamarca(config-subif)#int f0/0.30
cundinamarca(config-subif)#ip helper-address 172.31.2.37
cundinamarca(config-subif)#end
cundinamarca#
```



PC11

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

DHCP  Static

IP Address 172.31.0.68

Subnet Mask 255.255.255.192

Default Gateway 172.31.0.65

DNS Server 8.8.8.8

IPv6 Configuration

DHCP  Auto Config  Static

IPv6 Address /

Link Local Address FE80::260:2FFF:FE31:C4B6

IPv6 Gateway

IPv6 DNS Server

802.1X

Use 802.1X Security

Authentication MD5

Username

Password

Top

PC14

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

DHCP  Static

IP Address 172.31.1.68

Subnet Mask 255.255.255.192

Default Gateway 172.31.1.65

DNS Server 8.8.8.8

IPv6 Configuration

DHCP  Auto Config  Static

IPv6 Address /

Link Local Address FE80::201:42FF:FE16:70E1

IPv6 Gateway

IPv6 DNS Server

802.1X

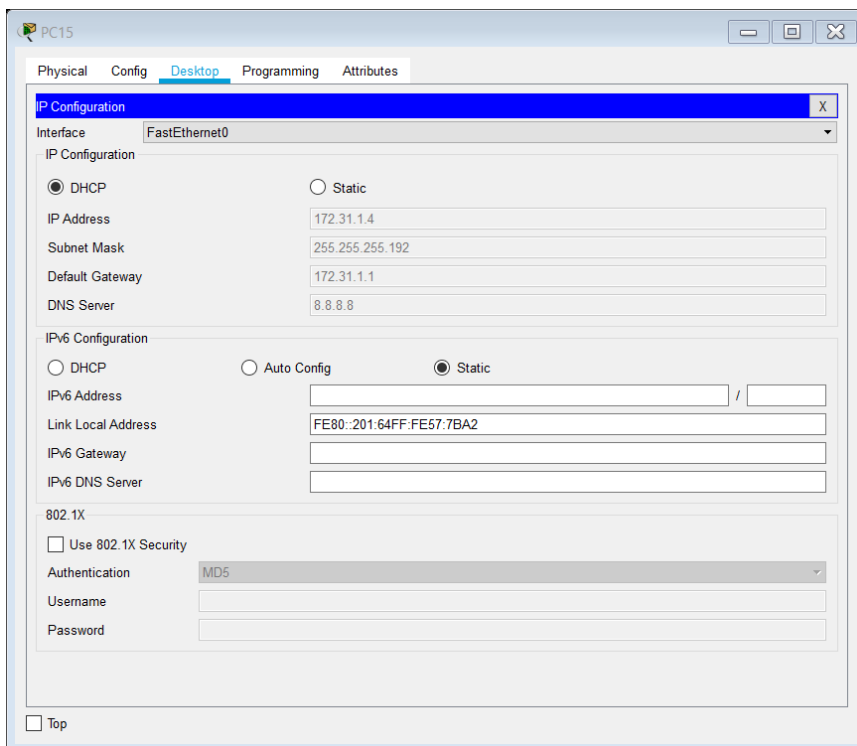
Use 802.1X Security

Authentication MD5

Username

Password

Top



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

```

tunja(config)#ip nat inside source static 172.31.2.28 209.165.220.10
tunja(config)#access-list 11 permit 172.0.0.0 0.255.255.255
tunja(config)#ip nat inside source list 11 interface f0/1 overload
tunja(config)#int f0/1
tunja(config-if)#ip nat outside
tunja(config-if)#int f0/0.1
tunja(config-subif)#ip nat inside
tunja(config-subif)#int f0/0.20
tunja(config-subif)#ip nat inside
tunja(config-subif)#int f0/0.30
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 0.0.0.0 209.165.220.4
tunja(config)#router ospf 1
tunja(config-router)#default-information originate
tunja(config-router)#end
tunja#
    
```

%SYS-5-CONFIG\_I: Configured from console by console

tunja#show ip route

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

Gateway of last resort is 209.165.220.4 to network 0.0.0.0

172.3.0.0/29 is subnetted, 1 subnets  
 C 172.3.2.8 is directly connected, FastEthernet0/0.1  
 172.31.0.0/16 is variably subnetted, 11 subnets, 3 masks  
 O 172.31.0.0/26 [110/65] via 172.31.2.34, 00:10:47, Serial0/0/0  
 O 172.31.0.64/26 [110/65] via 172.31.2.34, 00:10:47, Serial0/0/0  
 C 172.31.0.128/26 is directly connected, FastEthernet0/0.20  
 C 172.31.0.192/26 is directly connected, FastEthernet0/0.30  
 O 172.31.1.0/26 [110/65] via 172.31.2.38, 00:10:47, Serial0/0/1  
 O 172.31.1.64/26 [110/65] via 172.31.2.38, 00:10:47, Serial0/0/1  
 O 172.31.2.0/29 [110/65] via 172.31.2.34, 00:10:47, Serial0/0/0  
 O 172.31.2.8/29 [110/65] via 172.31.2.38, 00:10:47, Serial0/0/1  
 O 172.31.2.24/29 [110/65] via 172.31.2.38, 00:10:47, Serial0/0/1  
 C 172.31.2.32/30 is directly connected, Serial0/0/0  
 C 172.31.2.36/30 is directly connected, Serial0/0/1  
 C 209.165.220.0/24 is directly connected, FastEthernet0/1  
 S\* 0.0.0.0/0 [1/0] via 209.165.220.4

tunja#

bucaramanga#show ip route

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

Gateway of last resort is 172.31.2.33 to network 0.0.0.0

172.3.0.0/29 is subnetted, 1 subnets  
 O 172.3.2.8 [110/65] via 172.31.2.33, 00:11:18, Serial0/0/0  
 172.31.0.0/16 is variably subnetted, 11 subnets, 3 masks  
 C 172.31.0.0/26 is directly connected, FastEthernet0/0.10  
 C 172.31.0.64/26 is directly connected, FastEthernet0/0.30

```
O 172.31.0.128/26 [110/65] via 172.31.2.33, 00:11:18, Serial0/0/0
O 172.31.0.192/26 [110/65] via 172.31.2.33, 00:11:18, Serial0/0/0
O 172.31.1.0/26 [110/129] via 172.31.2.33, 00:11:18, Serial0/0/0
O 172.31.1.64/26 [110/129] via 172.31.2.33, 00:11:18, Serial0/0/0
C 172.31.2.0/29 is directly connected, FastEthernet0/0.1
O 172.31.2.8/29 [110/129] via 172.31.2.33, 00:11:18, Serial0/0/0
O 172.31.2.24/29 [110/129] via 172.31.2.33, 00:11:18, Serial0/0/0
C 172.31.2.32/30 is directly connected, Serial0/0/0
O 172.31.2.36/30 [110/128] via 172.31.2.33, 00:11:18, Serial0/0/0
O*E2 0.0.0.0/0 [110/1] via 172.31.2.33, 00:00:51, Serial0/0/0
```

bucaramanga#

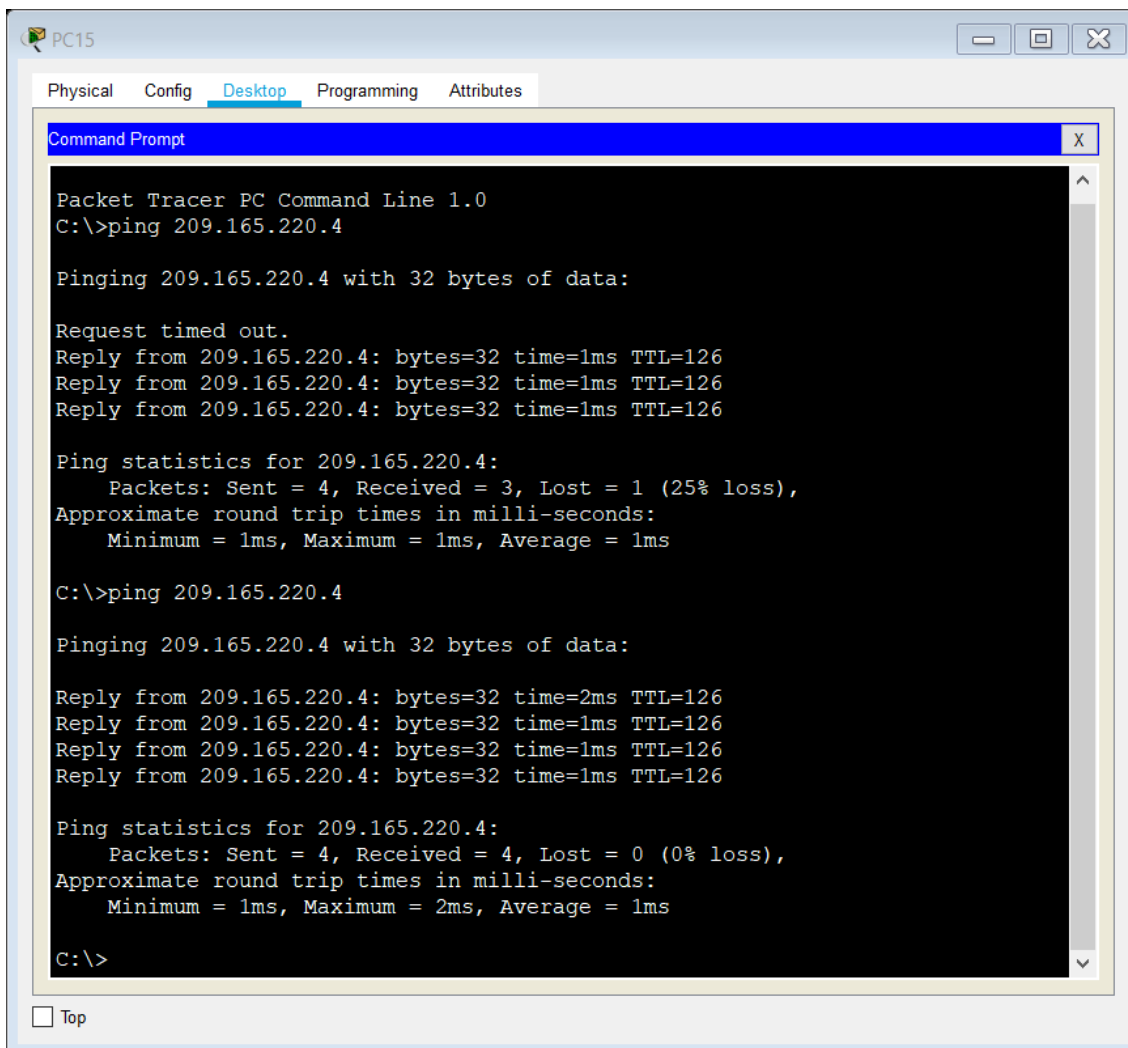
cundinamarca#show ip route

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

Gateway of last resort is 172.31.2.37 to network 0.0.0.0

```
172.3.0.0/29 is subnetted, 1 subnets
O 172.3.2.8 [110/65] via 172.31.2.37, 00:12:02, Serial0/0/0
172.31.0.0/16 is variably subnetted, 11 subnets, 3 masks
O 172.31.0.0/26 [110/129] via 172.31.2.37, 00:11:52, Serial0/0/0
O 172.31.0.64/26 [110/129] via 172.31.2.37, 00:11:52, Serial0/0/0
O 172.31.0.128/26 [110/65] via 172.31.2.37, 00:12:02, Serial0/0/0
O 172.31.0.192/26 [110/65] via 172.31.2.37, 00:12:02, Serial0/0/0
C 172.31.1.0/26 is directly connected, FastEthernet0/0.30
C 172.31.1.64/26 is directly connected, FastEthernet0/0.20
O 172.31.2.0/29 [110/129] via 172.31.2.37, 00:11:52, Serial0/0/0
C 172.31.2.8/29 is directly connected, FastEthernet0/0.1
C 172.31.2.24/29 is directly connected, FastEthernet0/0.88
O 172.31.2.32/30 [110/128] via 172.31.2.37, 00:12:02, Serial0/0/0
C 172.31.2.36/30 is directly connected, Serial0/0/0
O*E2 0.0.0.0/0 [110/1] via 172.31.2.37, 00:01:34, Serial0/0/0
```

cundinamarca#



The screenshot shows a Packet Tracer PC Command Prompt window for PC15. The window has tabs for Physical, Config, Desktop (selected), Programming, and Attributes. The Command Prompt displays the following text:

```

Packet Tracer PC Command Line 1.0
C:\>ping 209.165.220.4

Pinging 209.165.220.4 with 32 bytes of data:

Request timed out.
Reply from 209.165.220.4: bytes=32 time=1ms TTL=126
Reply from 209.165.220.4: bytes=32 time=1ms TTL=126
Reply from 209.165.220.4: bytes=32 time=1ms TTL=126

Ping statistics for 209.165.220.4:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 1ms, Average = 1ms

C:\>ping 209.165.220.4

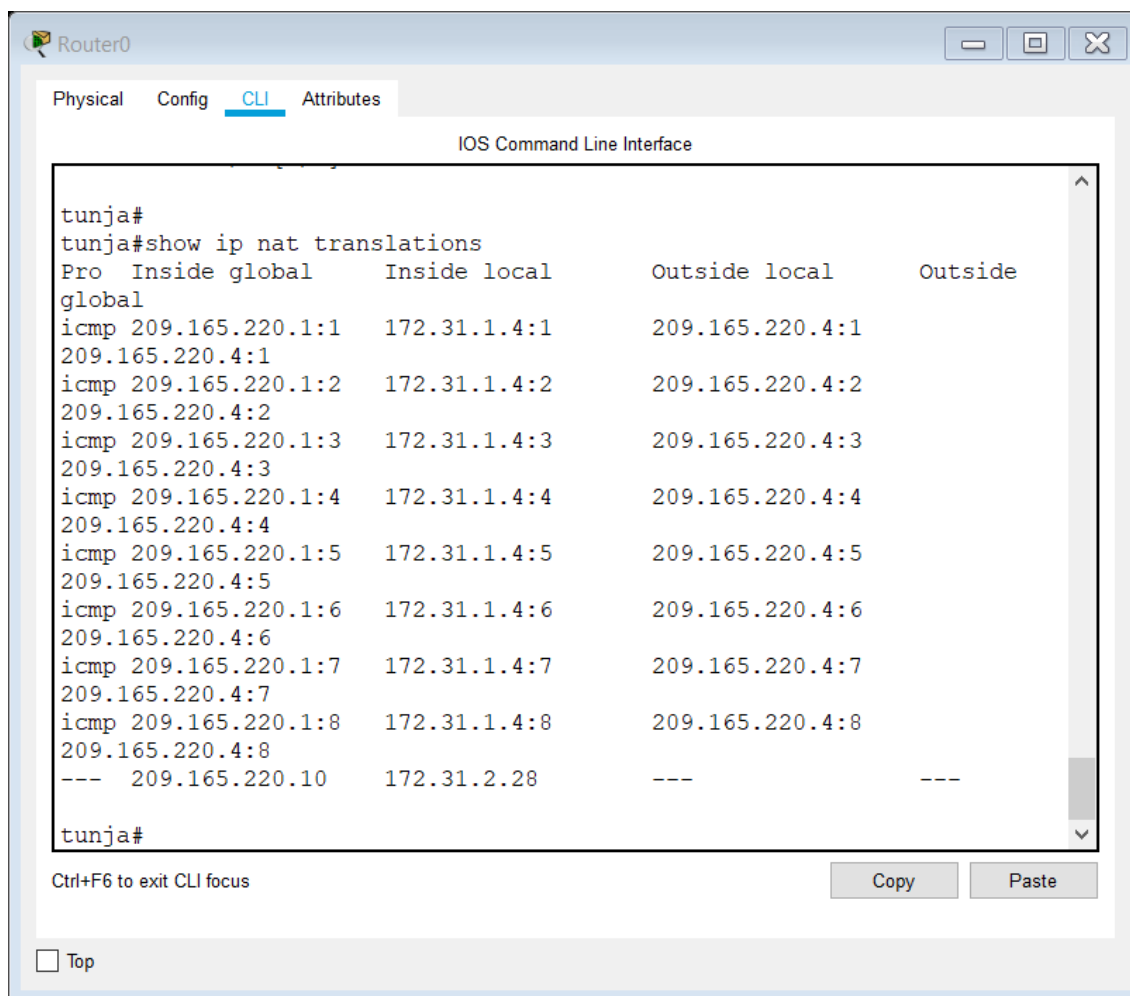
Pinging 209.165.220.4 with 32 bytes of data:

Reply from 209.165.220.4: bytes=32 time=2ms TTL=126
Reply from 209.165.220.4: bytes=32 time=1ms TTL=126
Reply from 209.165.220.4: bytes=32 time=1ms TTL=126
Reply from 209.165.220.4: bytes=32 time=1ms TTL=126

Ping statistics for 209.165.220.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 2ms, Average = 1ms

C:\>
  
```

At the bottom left of the window, there is a checkbox labeled "Top" which is currently unchecked.



#### 4. El enrutamiento deberá tener autenticación.

```

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

```

tunja(config)#int s0/0/0
tunja(config-if)#ip ospf authentication message-digest
tunja(config-if)#ip ospf message-digest-key 1 md5 ospfpass
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 ospfpass
tunja(config-if)#
  
```

```

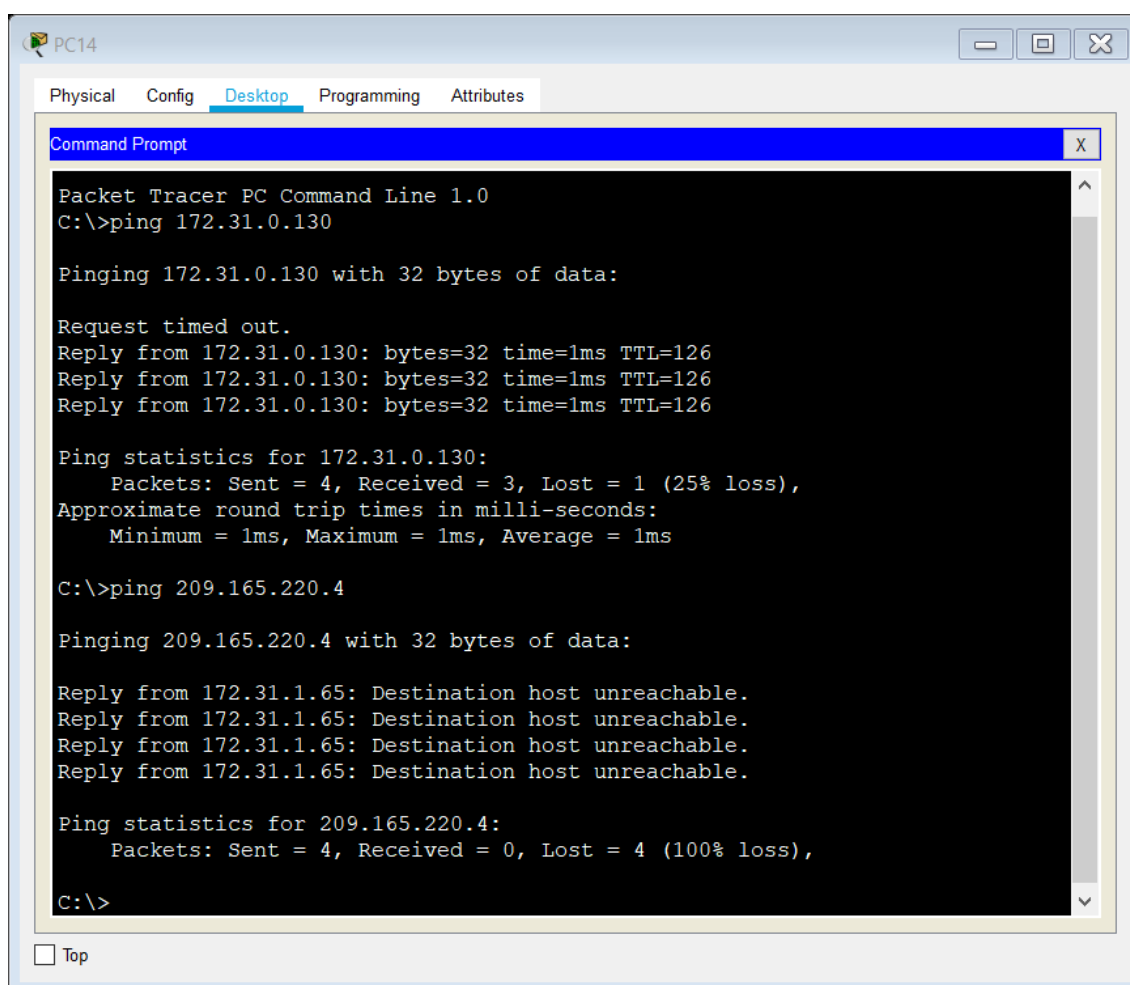
cundinamarca(config)#int s0/0/0
cundinamarca(config-if)#ip ospf authentication message-digest
cundinamarca(config-if)#ip ospf message-digest-key 1 md5 ospfpass
  
```

cundinamarca(config-if)#

### 5. Listas de control de acceso:

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

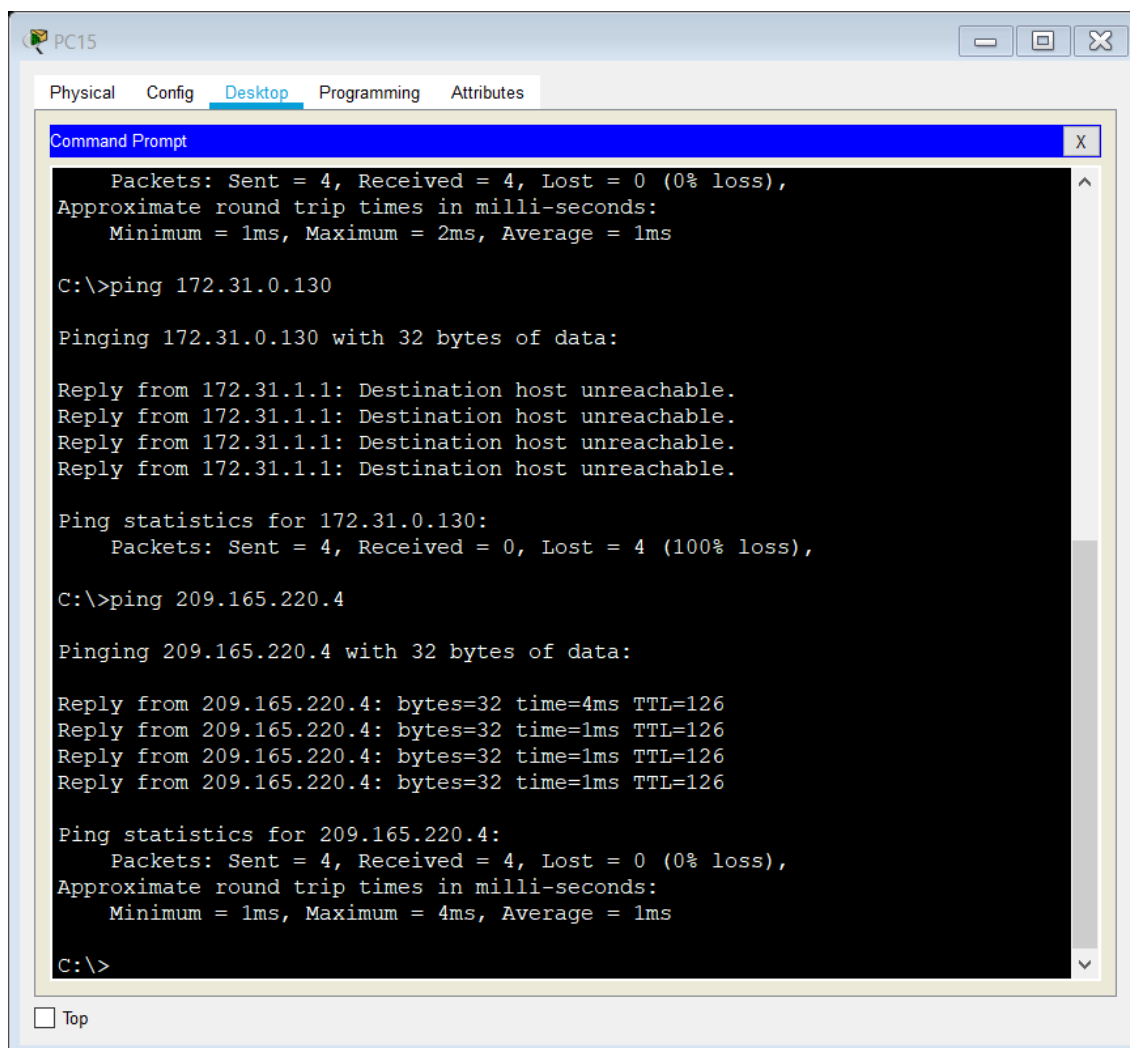
```
cundinamarca(config-if)#access-list 131 deny ip 172.31.1.64 0.0.0.63
209.165.220.0 0.0.0.255
cundinamarca(config)#access-list 131 permit ip any any
cundinamarca(config)#int f0/0.20
cundinamarca(config-subif)#ip access-group 131 in
cundinamarca(config-subif)#
```



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

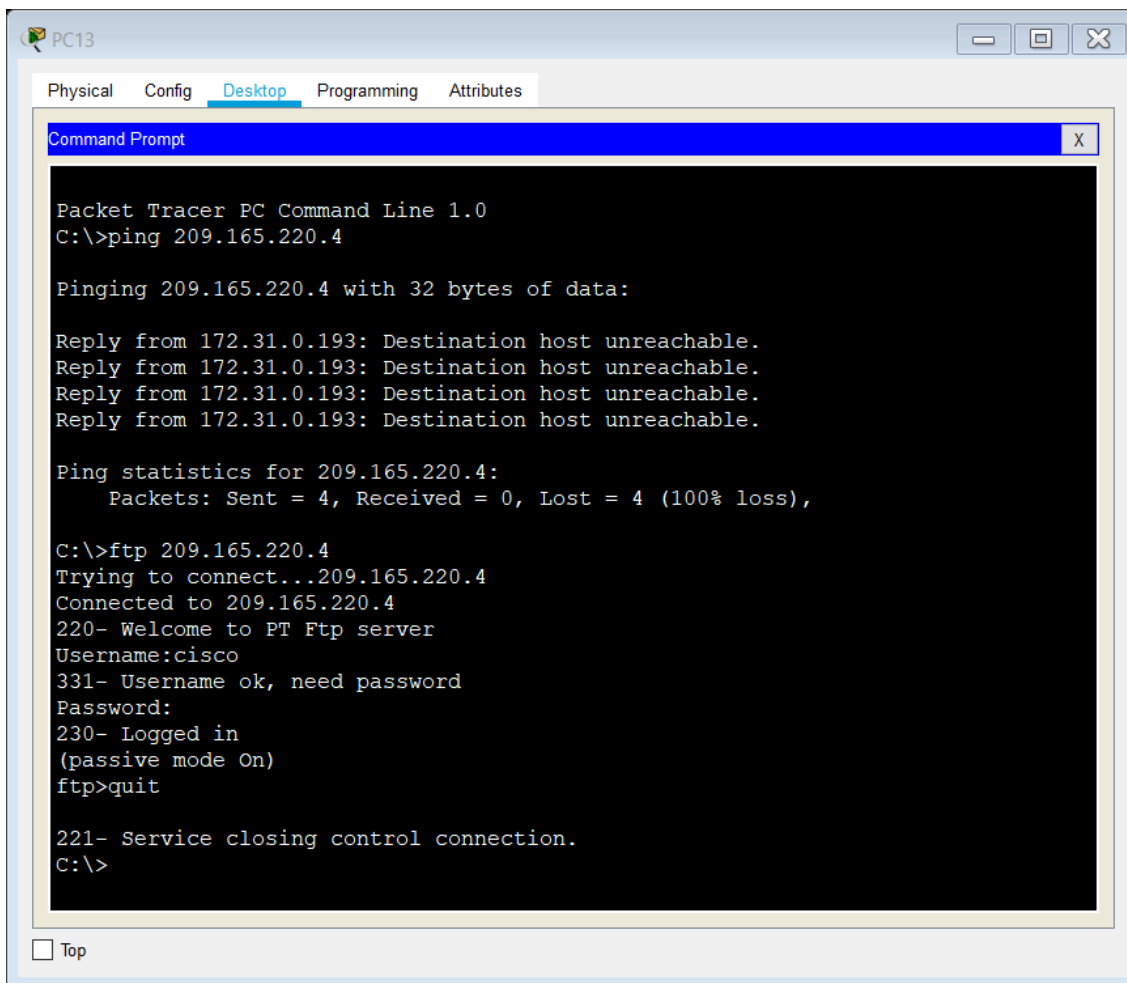
```
cundinamarca(config-subif)#access-list 132 permit ip 172.31.1.0 0.0.0.63
209.165.220.0 0.0.0.255
cundinamarca(config)#access-list 132 deny ip any any
cundinamarca(config)#int f0/0.30
```

```
cundinamarca(config-subif)#ip access-group 132 in
cundinamarca(config-subif)#
```



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

```
tunja(config)#access-list 131 permit tcp 172.31.0.192 0.0.0.63 209.165.220.0
0.0.0.255 eq www
tunja(config)#access-list 131 permit tcp 172.31.0.192 0.0.0.63 209.165.220.0
0.0.0.255 eq ftp
tunja(config)#int f0/0.30
tunja(config-subif)#ip access-group 131 in
tunja(config-subif)#
```



The screenshot shows a Packet Tracer PC Command Prompt window for PC13. The window has tabs for Physical, Config, Desktop (selected), Programming, and Attributes. The Command Prompt displays the following text:

```

Packet Tracer PC Command Line 1.0
C:\>ping 209.165.220.4

Pinging 209.165.220.4 with 32 bytes of data:

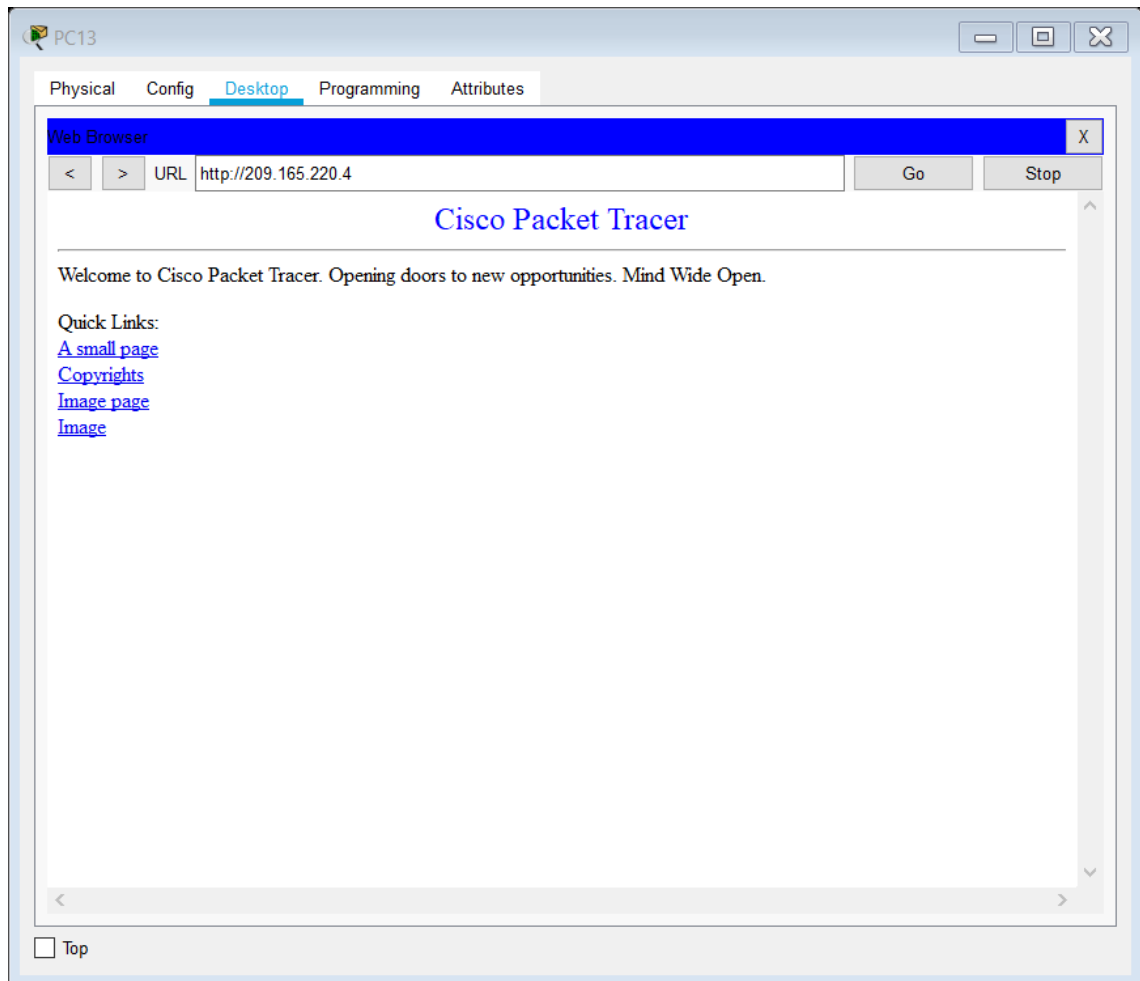
Reply from 172.31.0.193: Destination host unreachable.
Reply from 172.31.0.193: Destination host unreachable.
Reply from 172.31.0.193: Destination host unreachable.
Reply from 172.31.0.193: Destination host unreachable.

Ping statistics for 209.165.220.4:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ftp 209.165.220.4
Trying to connect...209.165.220.4
Connected to 209.165.220.4
220- Welcome to PT Ftp server
Username:cisco
331- Username ok, need password
Password:
230- Logged in
(passive mode On)
ftp>quit

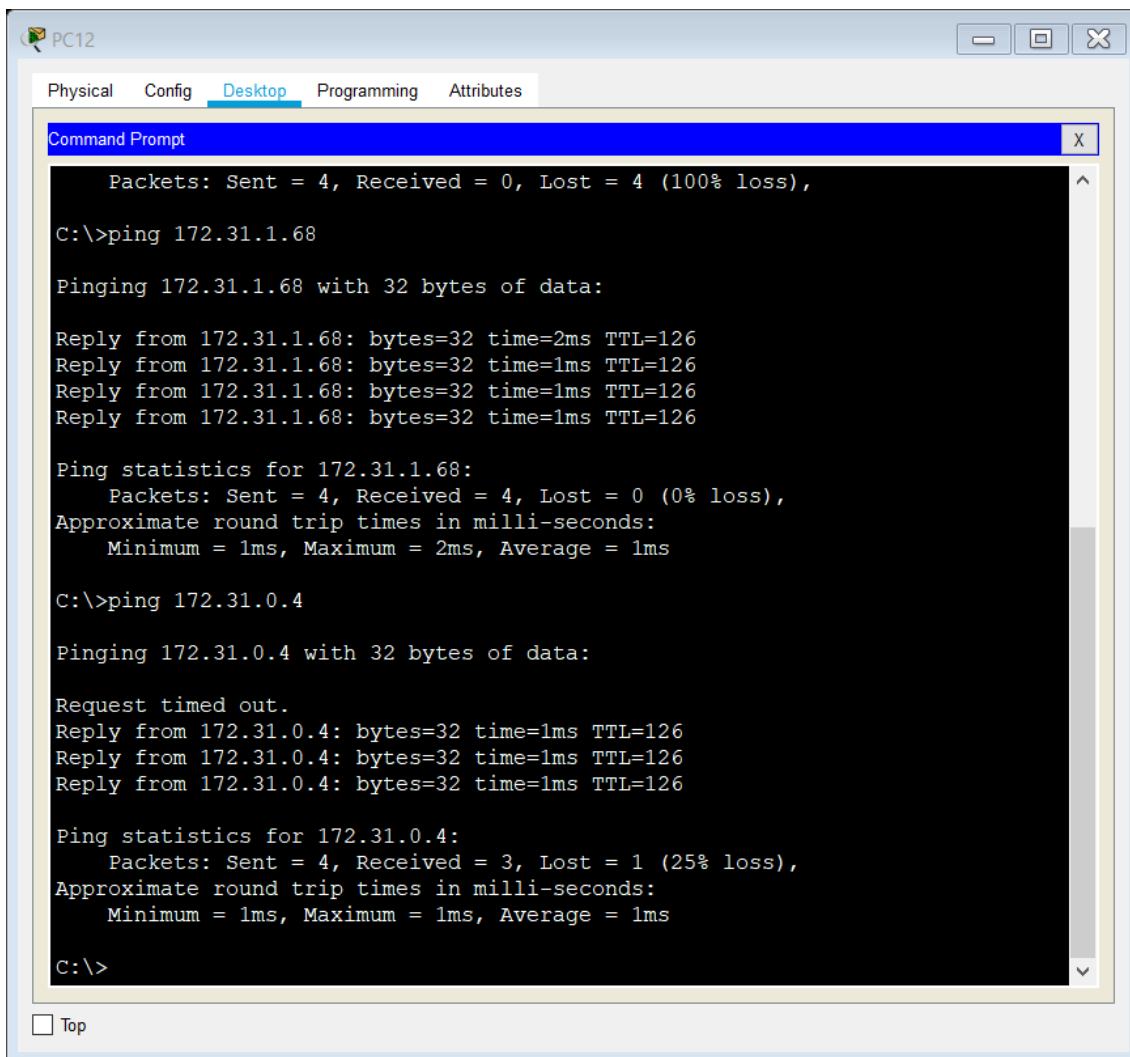
221- Service closing control connection.
C:\>
  
```

At the bottom left of the window, there is a checkbox labeled "Top" which is currently unchecked.



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

```
tunja(config-subif)#access-list 132 permit ip 172.31.0.128 0.0.0.63 172.31.1.64
0.0.0.63
tunja(config)#access-list 132 permit ip 172.31.0.128 0.0.0.63 172.31.0.0
0.0.0.63
tunja(config)#int f0/0.20
tunja(config-subif)#ip access-group 132 in
tunja(config-subif)#
```

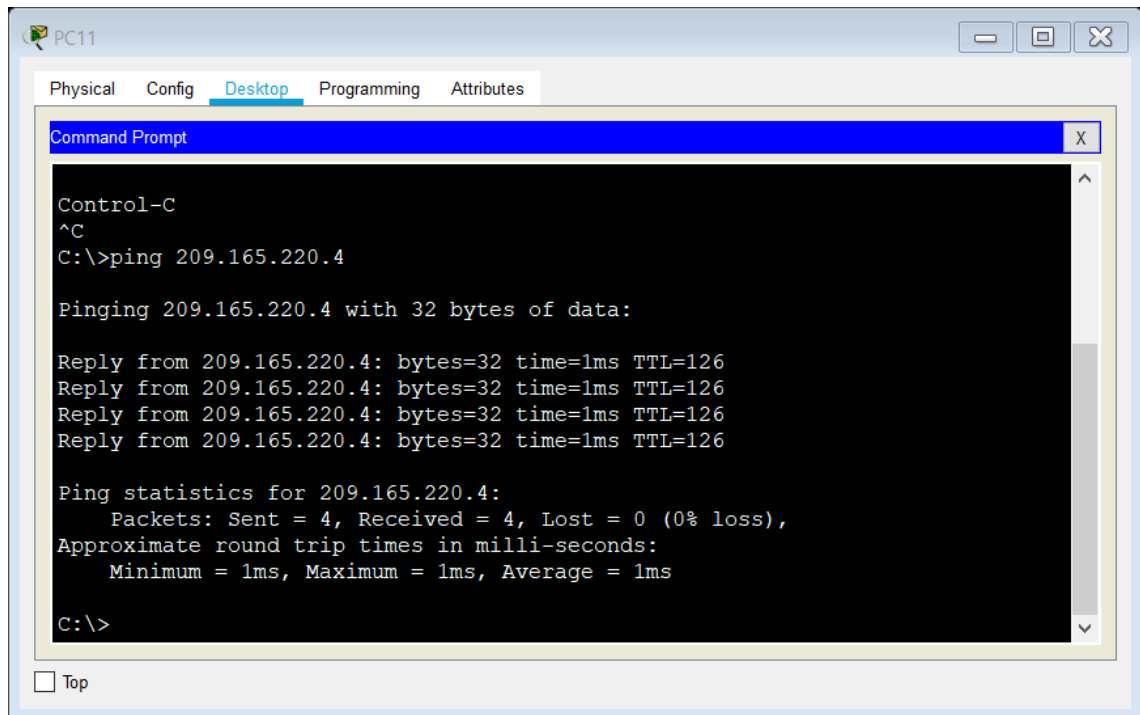


- **Los hosts de VLAN 30 de Bucaramanga acceden a internet y a cualquier equipo de VLAN 10.**

```

bucaramanga(config)#access-list 131 permit ip 172.31.0.64 0.0.0.63
209.165.220.0 0.0.0.255
bucaramanga(config)#int f0/0.30
bucaramanga(config-subif)#ip access-group 131 in
bucaramanga(config-subif)#

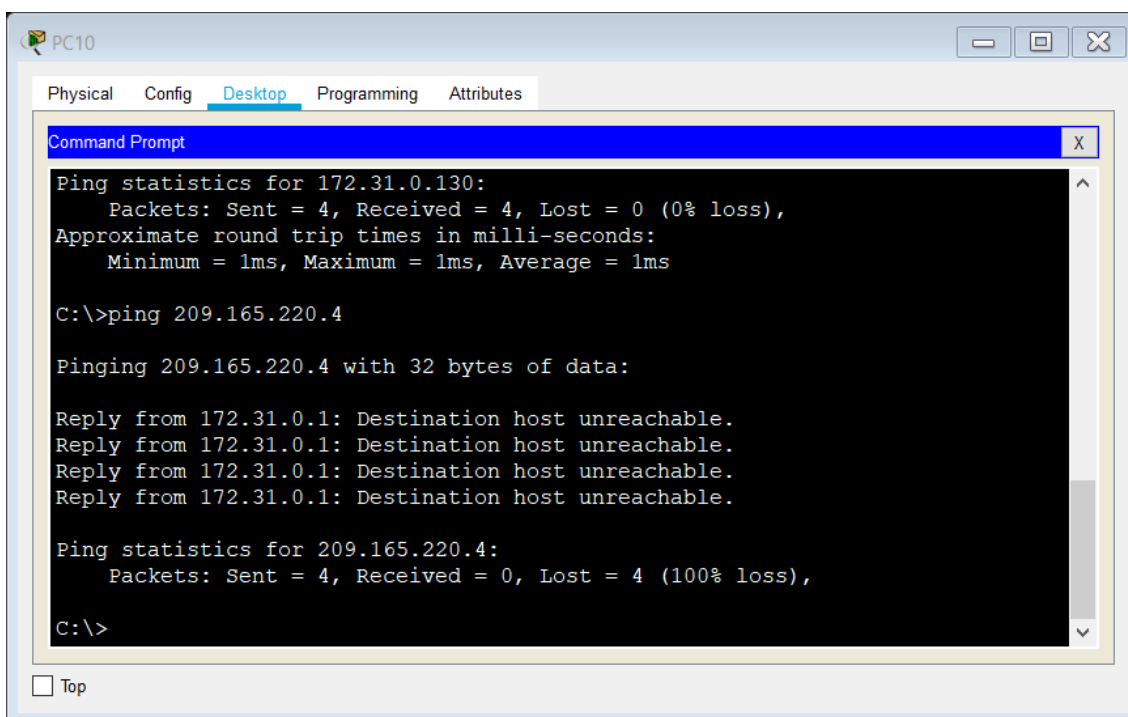
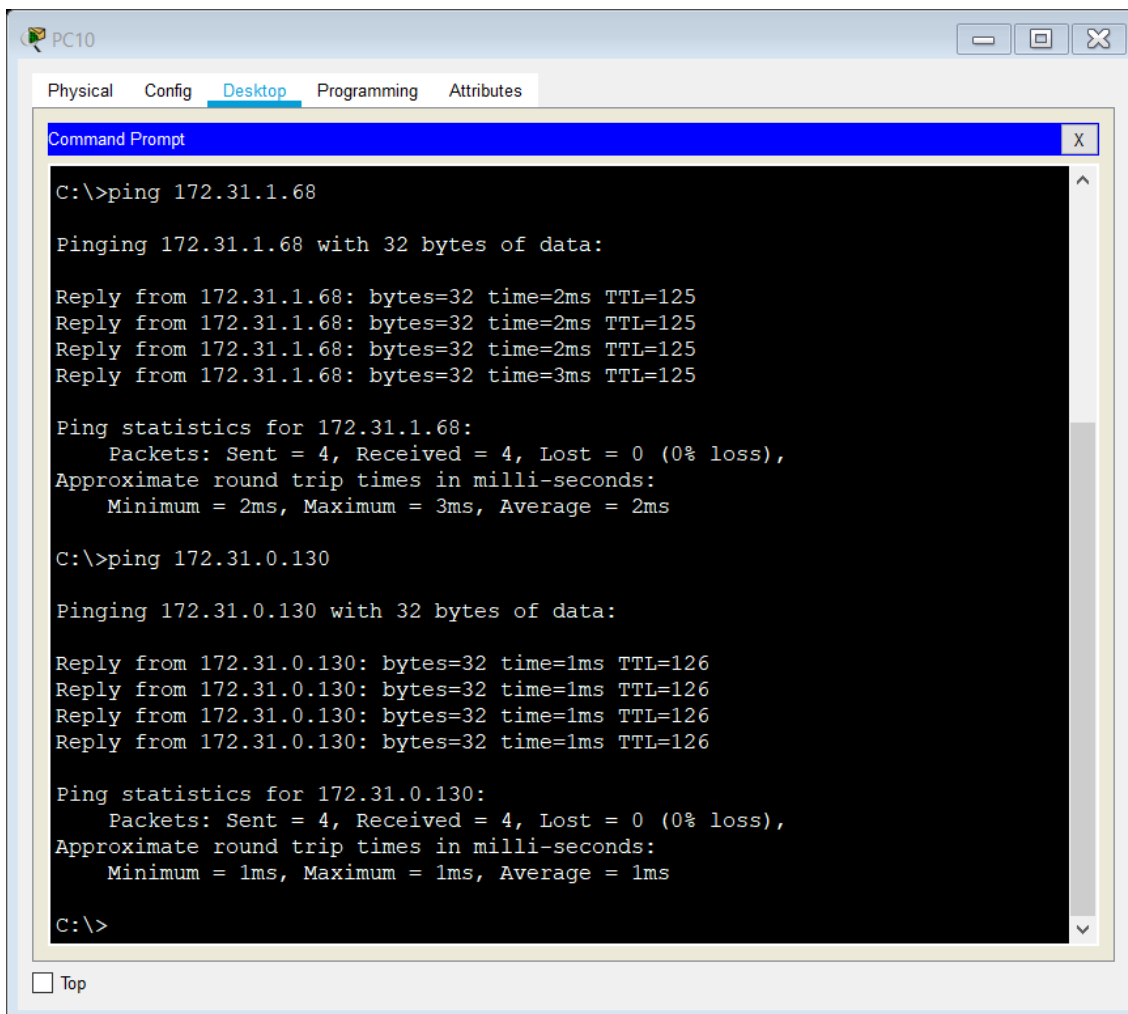
```



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

```

bucaramanga(config-subif)#access-list 132 permit ip 172.31.0.0 0.0.0.63
172.31.1.64 0.0.0.63
bucaramanga(config)#access-list 132 permit ip 172.31.0.0 0.0.0.63
172.31.0.128 0.0.0.63
bucaramanga(config)#int f0/0.10
bucaramanga(config-subif)#ip access-group 132 in
bucaramanga(config-subif)#
  
```

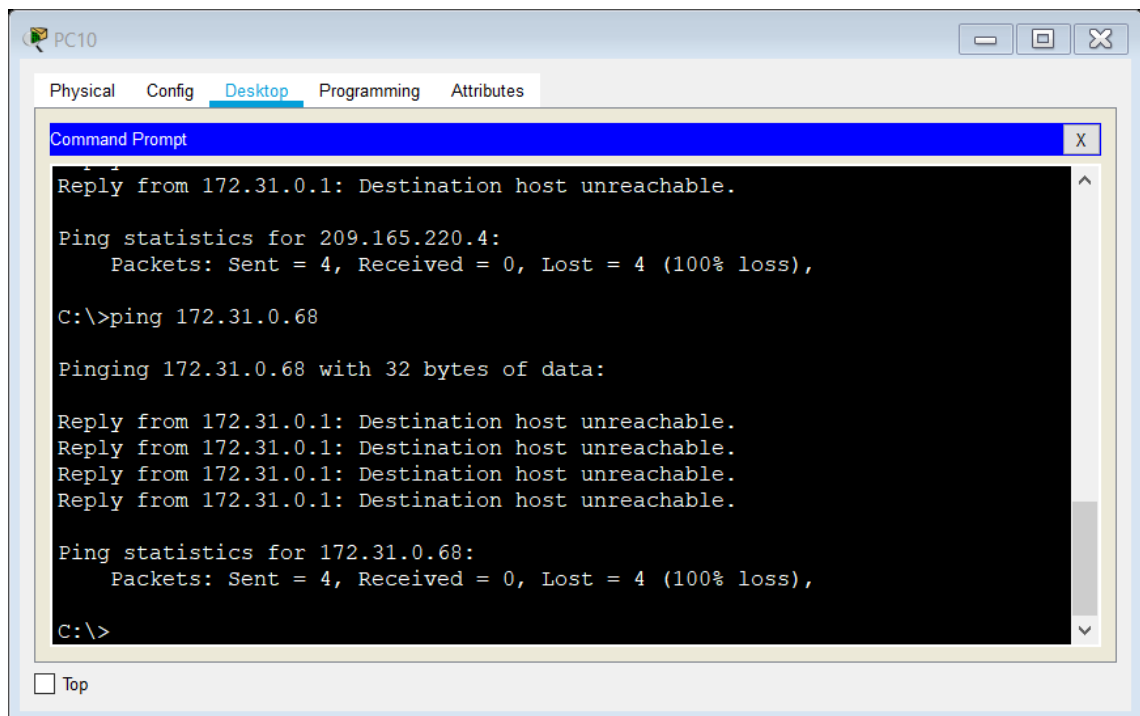
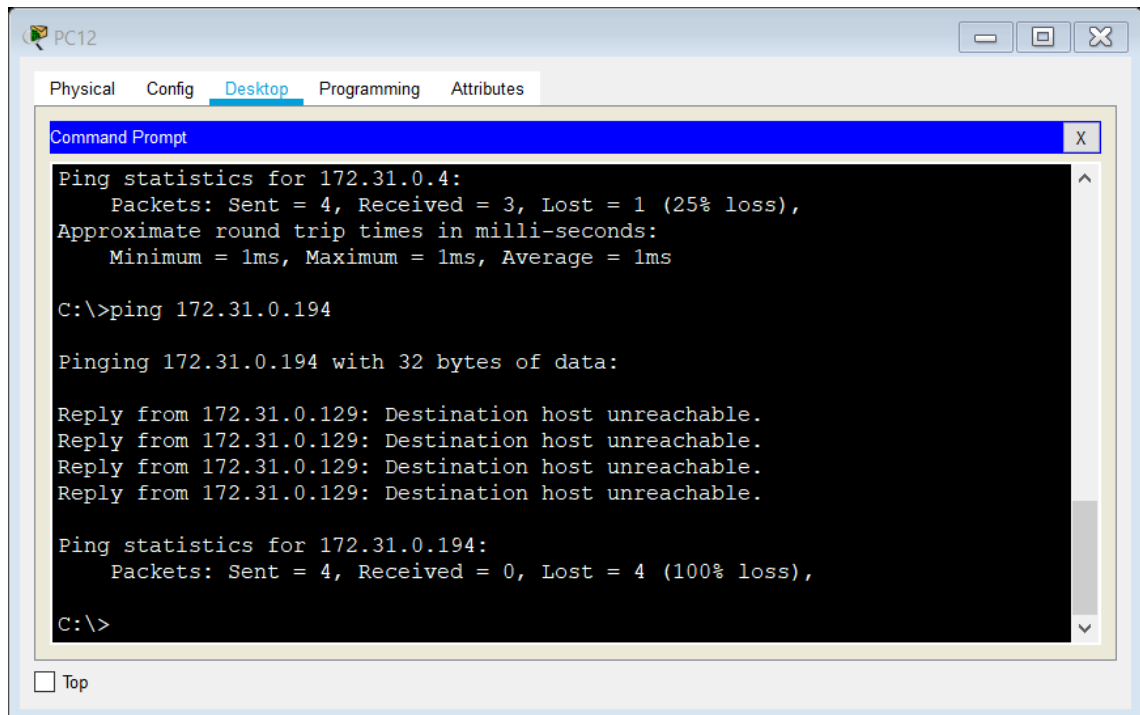


- **Los hosts de una VLAN no pueden acceder a los de otra VLAN en una ciudad.**

```
bucaramanga(config-subif)#access-list 133 deny ip 172.31.2.0 0.0.0.7
172.31.0.0 0.0.0.63
bucaramanga(config)#access-list 133 deny ip 172.31.0.64 0.0.0.63 172.31.0.0
0.0.0.63
bucaramanga(config)#access-list 133 permit ip any any
bucaramanga(config)#int f0/0.10
bucaramanga(config-subif)#ip access-group 133 out
bucaramanga(config-subif)#
```

```
tunja(config)#access-list 133 deny ip 172.3.2.8 0.0.0.7 172.31.0.128 0.0.0.63
tunja(config)#access-list 133 deny ip 172.3.0.192 0.0.0.63 172.31.0.128
0.0.0.63
tunja(config)#access-list 133 permit ip any any
tunja(config)#int f0/0.20
tunja(config-subif)#ip access-group 133 out
tunja(config-subif)#
```

```
cundinamarca(config)#access-list 133 deny ip 172.31.2.8 0.0.0.7 172.31.1.64
0.0.0.63
cundinamarca(config)#access-list 133 deny ip 172.31.1.0 0.0.0.63 172.31.1.64
0.0.0.63
cundinamarca(config)#access-list 133 deny ip 172.31.2.24 0.0.0.7 172.31.1.64
0.0.0.63
cundinamarca(config)#access-list 133 permit ip any any
cundinamarca(config)#int f0/0.20
cundinamarca(config-subif)#ip access-group 133 out
cundinamarca(config-subif)#
```



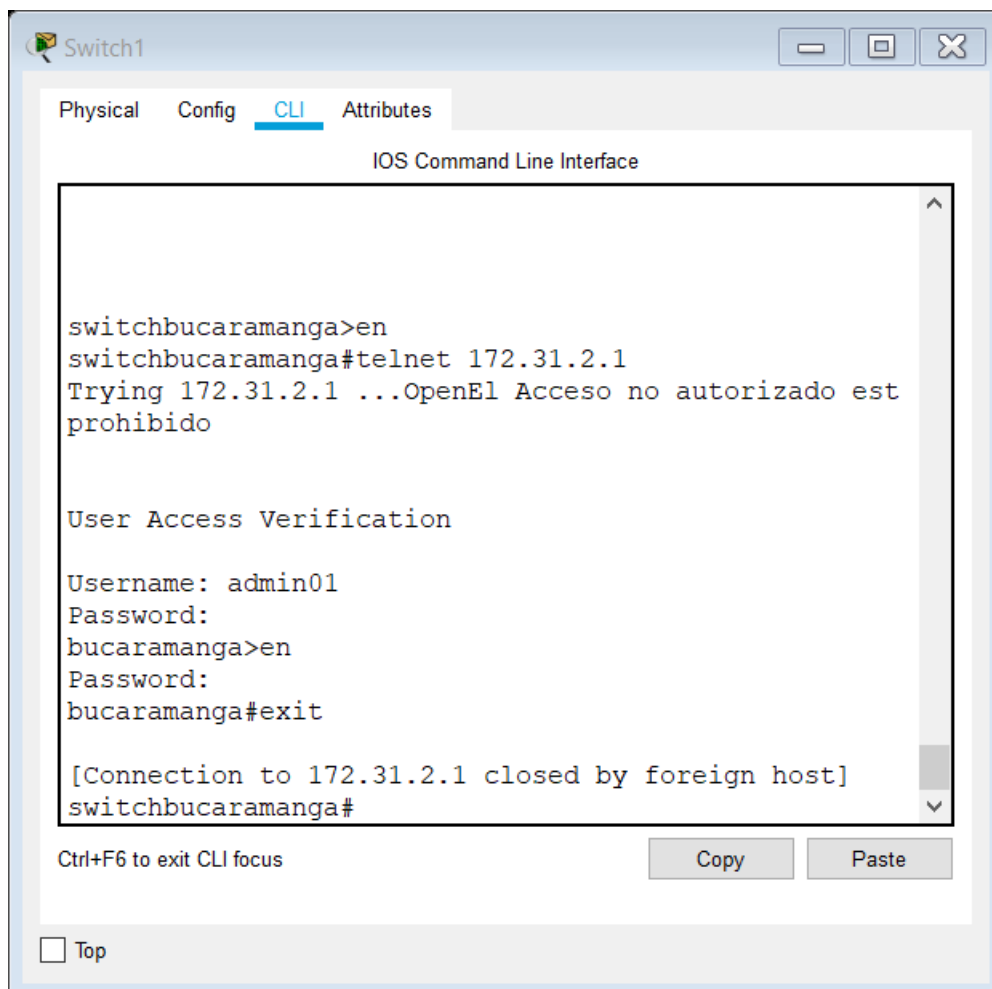
- Solo los hosts de las VLAN administrativas y de la VLAN de servidores tienen acceso a los routers e internet.

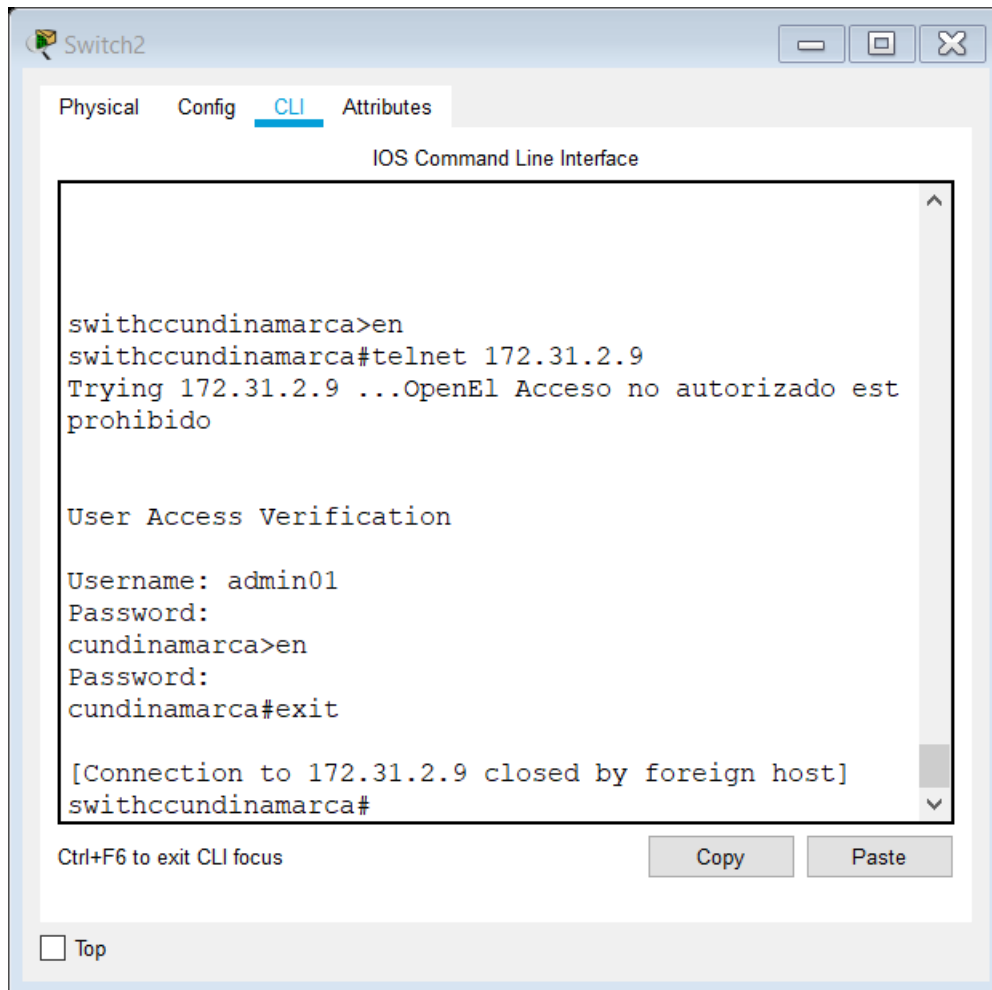
```
bucaramanga(config-subif)#access-list 10 permit 172.31.2.0 0.0.0.7
bucaramanga(config)#access-list 10 permit 172.3.2.8 0.0.0.7
```

```
bucaramanga(config)#access-list 10 permit 172.31.2.8 0.0.0.7
bucaramanga(config)#line vty 0 15
bucaramanga(config-line)#access-class 10 in
bucaramanga(config-line)#
```

```
tunja(config-subif)#access-list 10 permit 172.31.2.0 0.0.0.7
tunja(config)#access-list 10 permit 172.3.2.8 0.0.0.7
tunja(config)#access-list 10 permit 172.31.2.8 0.0.0.7
tunja(config)#line vty 0 15
tunja(config-line)#access-class 10 in
tunja(config-line)#
```

```
cundinamarca(config-subif)#access-list 10 permit 172.31.2.0 0.0.0.7
cundinamarca(config)#access-list 10 permit 172.3.2.8 0.0.0.7
cundinamarca(config)#access-list 10 permit 172.31.2.8 0.0.0.7
cundinamarca(config)#line vty 0 15
cundinamarca(config-line)#access-class 10 in
cundinamarca(config-line)#
```





**6. VLSM: utilizar la dirección 172.31.0.0 /18 para el direccionamiento.**

**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

## CONCLUSIONES

En la realización y respectiva solución de la actividad propuesta, se ejecutaron a cabalidad los 2 escenarios propuestos como prueba hacia todos los temas abarcados durante el presente diplomado de profundización CCNA CISCO, y a la vez, se escatimaron refuerzos sobre lo aprendido dentro de las diversas fases correspondientes, tales como configuración, configuraciones básicas en dispositivos dentro de una topología LAN, configuración de VLANs, entorno DHCP, direccionamiento dinámico y estático, pruebas de conectividad, entre otros.

Se procedió a sustentar todos y cada uno de los pasos y procesos requeridos para la realización de la actividad, tales como validación de comandos y capturas de pantalla.

La prueba de habilidades prácticas desarrollada se presenta como una gran oportunidad para definir futuros procesos de apropiación y configuración de dispositivos dentro de una topología LAN, en un ambiente real hacia optimizaciones de tipo profesional.

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