EVALUACIÓN – PRUEBA DE HABILIDADES PRÁCTICAS CCNA

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UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA
CEAD NEIVA
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TRABAJO FINAL DIPLOMADO DE PROFUNDIZACIÓN CISCO (DISEÑO E IMPLEMENTACIÓN DE SOLUCIONES INTEGRADAS LAN / WAN) (OPCI

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Doy gracias a mis hijas y mi esposa por ser el pilar que me sostienen para continuar día tras día y salir siempre adelante, también a quienes me acompañaron en este proceso y estuvieron siempre presente. Gracias al tutor por guiarnos y corregir donde estuvimos herrando.

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TABLA DE CONTENIDO TABLAS

1. GLOSARIO

RED: Es un conjunto de equipos informáticos y software conectados entre sí por medio de dispositivos físicos o inalámbricos que envían y reciben impulsos eléctricos, ondas electromagnéticas o cualquier otro medio para el transporte de datos, con la finalidad de compartir información, recursos y ofrecer servicios.

VLAN: Es un método para crear redes lógicas independientes dentro de una misma red física. Varias VLAN pueden coexistir en un único conmutador físico o en una única red física. Son útiles para reducir el tamaño del dominio de difusión y ayudan en la administración de la red, separando segmentos lógicos de una red de área local que no deberían intercambiar datos usando la red local.

SWITCH: Es el dispositivo digital lógico de interconexión de equipos que opera en la capa de enlace de datos del modelo OSI. Su función es interconectar dos o más host de manera similar a los puentes de red, pasando datos de un segmento a otro de acuerdo con la dirección MAC de destino de las tramas en la red y eliminando la conexión una vez finalizada ésta.

ROUTER: Es un dispositivo que proporciona conectividad a nivel de red o nivel tres en el modelo OSI. Su función principal consiste en enviar o encaminar paquetes de datos de una red a otra, es decir, interconectar subredes.

CCNP: Es el nivel intermedio de certificación de la compañía. Para obtener esta certificación, se han de superar varios exámenes, clasificados según la empresa en 3 módulos.

2. RESUMEN

En el presente proyecto se contextualizaran los diversos temas del área de networking y seguridad los cuales fueron vistos durante el presente semestre, a su vez la aplicación práctica de los mismos sobre diversos esquemas topológicos de red para los módulos de CCNP ROUTE y CCNA SWITCH en ambientes de simulación lógica.

Se pretende aplicar los conocimientos adquiridos y el enriquecimiento del estudiante en un área de profundización del área de telecomunicaciones que permita poseer una base práctica para el mejoramiento del pensamiento crítico y la capacidad de análisis proactivo sobre plataforma de red, el análisis de situaciones conflictivas que permitan al estudiante entender el funcionamiento de corta mediana y gran envergadura.

3. ABSTRACT

This project will contextualize the various topics of the area of networking and security which were seen during this semester, in turn the practical application of them on various network topological schemes for CCNP ROUTE and CCNA SWITCH modules in environments of logical simulation.

It is intended to apply the knowledge acquired and the enrichment of the student in an area of deepening of the telecommunications area that allows to have a practical basis for the improvement of critical thinking and the ability of proactive analysis on a network platform, the analysis of conflict situations that allow the student understand the operation of short medium and large scale.

4. PALABRAS CLAVE

- Enrutamiento
- Conmutación
- Seguridad
- Red

5. INTRODUCCIÓN

Teniendo en cuenta que las redes día tras día se han convertido en una necesidad básica para el desarrollo personal y la posibilidad de realizar comunicaciones en tiempo real independientemente del sitio, la globalización de la información y el aumento del conocimiento requerido para entender el funcionamiento de estos sistemas, permite que esto sea posible.

En el siguiente documento se pretende aplicar los conocimientos adquiridos basados en los conceptos, para lo cual se realiza una prueba práctica de configuración apoyándose en el material el cual se ha desarrollado durante el presente semestre.

6. JUSTIFICACIÓN

El desarrollo del diplomado de profundización Cisco CCNP (Cisco Certified Network Professional) nos permite acceder a conocimientos avanzados sobre networking, adquiriendo conocimientos que nos permiten instalar, configurar y administrar redes LAN, MAN, WAN y servicios de acceso para organizaciones de diversas envergaduras.

Un profesional CCNP está capacitado para manejar sistemas basados en IP, IGRP, IPX, Async Routing, AppleTalk, Extended Access Lists, IP RIP, Route Redistribution, RIP, Route Summarization, OSPF, VLSM, BGP, Serial, Frame Relay, ISDN, ISL, X.25, DDR, PSTN, PPP, VLANs, Ethernet, FDDI, Transparent y Translational Bridging. Esta certificación se encuentra en un nivel intermedio a nivel de las certificaciones de cisco las cuales se consideran de alto nivel en la industria de las telecomunicaciones.

7. OBJETIVOS

7.1 OBJETIVO GENERAL

Aplicar los conocimientos adquiridos en los módulos CCNP vistos durante el presente semestre, potencializando los conceptos de tal manera que el profesional se encuentre en la capacidad de afrontar las diversas novedades que se presentan en el día a día del área de telecomunicaciones.

7.2 OBJETIVOS ESPECÍFICOS

- Desarrollar la actividad practica del módulo CCNP ROUTE que permita comprobar los conocimientos adquiridos durante el semestre en temas como: protocolos de enrutamiento dinámico, enrutamiento estático, seguridad en router, IPv6, BGP, OSPF, EIGRP, administración de updates, VRF, HSRP, Sistema Autónomo entre otros.

- Desarrollar la actividad practica del módulo CCNP SWITCH que permita comprobar los conocimientos adquiridos durante el semestre en temas como: VLAN, Routing interVLAN, Spanning-Tree, VTP, entre otros.

8. DESARROLLO DE LOS DOS ESCENARIOS

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.

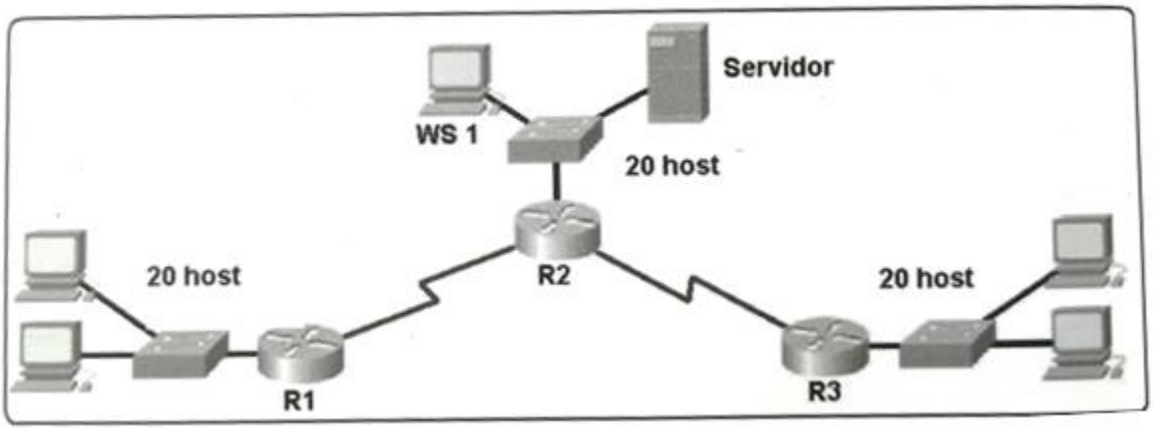

Ilustración 1. Escenario 1

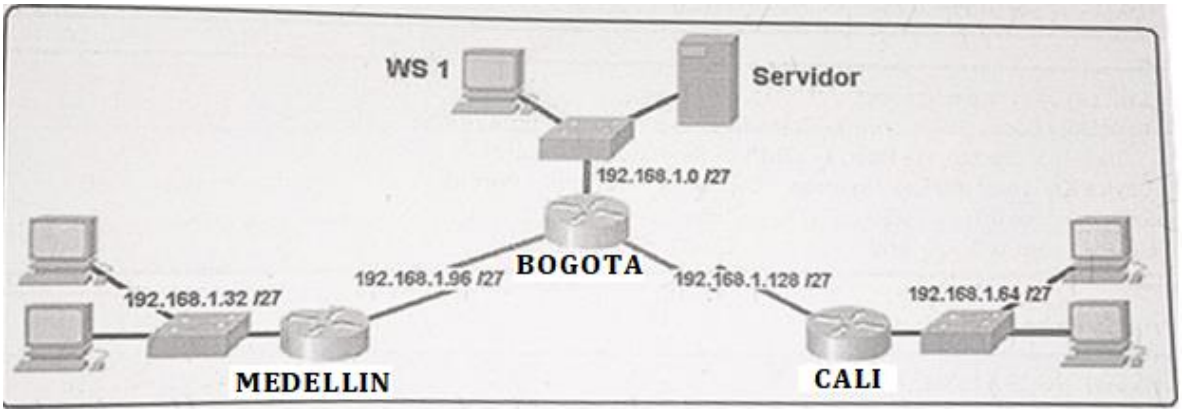

Ilustración 2 Tipología de Red

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)#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 Bogota
Bogota(config)#
```

```
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 #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 Medellin
Medellin(config)#
```

```
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 #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 Cali
Cali(config)#
```

```
Switch>en
Switch#conf term
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 #ATENCION SOLO ACCESO AUTORIZADO!!#
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)#
```

```
Switch>en
Switch#conf term
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 #ATENCION SOLO ACCESO AUTORIZADO!!#
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)#
```

```
Switch>en
Switch#conf term
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 #ATENCION SOLO ACCESO AUTORIZADO!!#
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)#
```

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

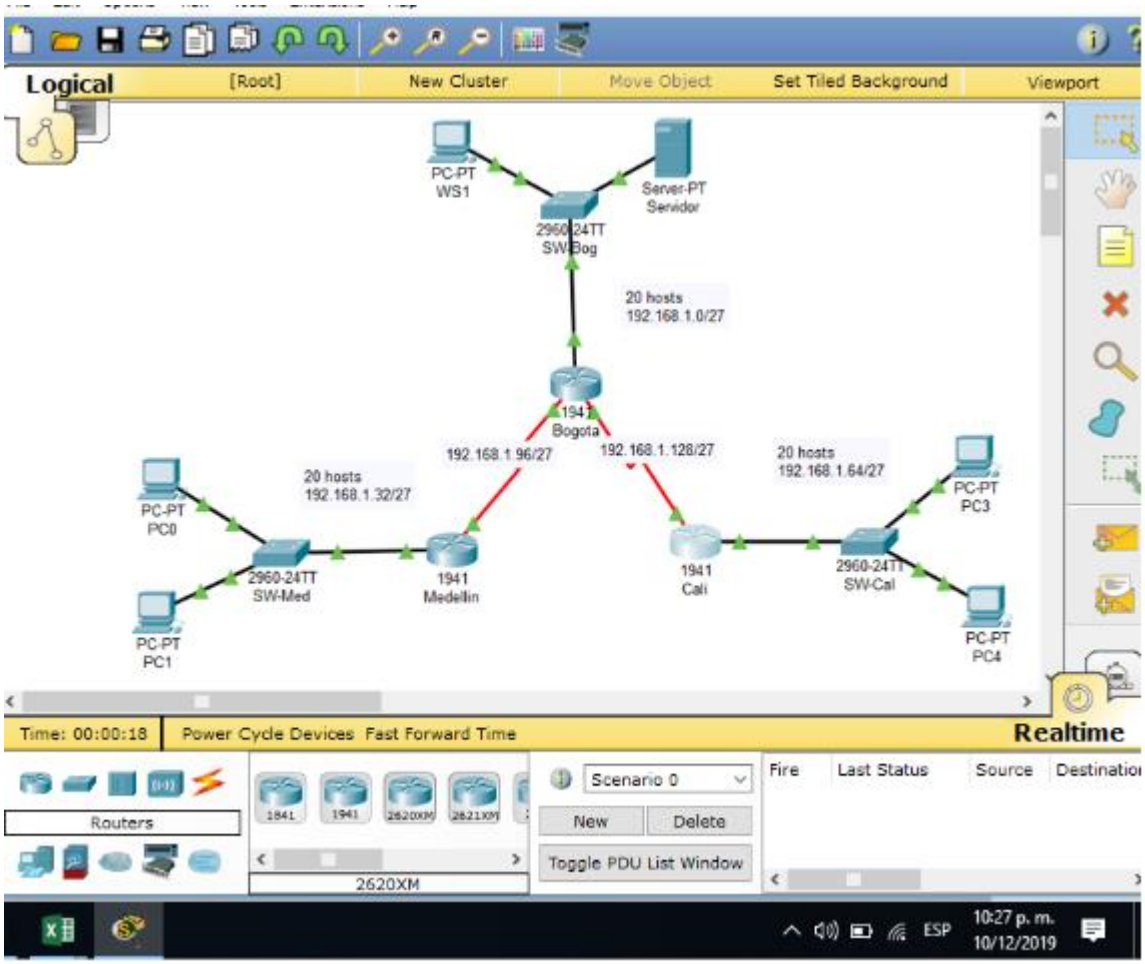

Ilustración 3 Tipología de Red en Cisco Packet Tracer Student

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.

Nombre de Subred	Dirección de Red	Máscara de Subred
Bogota LAN	192.168.1.0	255.255.255.224
Medellín LAN	192.168.1.32	255.255.255.224
Cali LAN	192.168.1.64	255.255.255.224
Bogota Medellín	192.168.1.96	255.255.255.224
Bogota Cali	192.168.1.128	255.255.255.224
Futuro	192.168.1.160	255.255.255.224
Futuro	192.168.1.192	255.255.255.224
Futuro	192.168.1.224	255.255.255.224

Tabla 1. Direcciones IP

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

```
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)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/1, changed state
to up


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)#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)#
%DUAL-5-NBRCHANGE: IP-EIGRP 200: Neighbor 192.168.1.99 (Serial0/0/0) is
up: new adjacency

Bogota(config-router)#
%DUAL-5-NBRCHANGE: IP-EIGRP 200: Neighbor 192.168.1.131 (Serial0/0/1) is
up: new adjacency
```

Bogota(config-router)#

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

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

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

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

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)#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

Cali(config-router)#

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: 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

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

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

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 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

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

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

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
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#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#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.

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#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#

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 NEIG

HBORS

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 12 00:15:26 40 1000 0 7
1 192.168.1.131 Se0/0/1 13 00:14:59 40 1000 0 7

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 12 00:15:10 40 1000 0 5

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 11 00:15:05 40 1000 0 6

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 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

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

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

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: 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

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

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

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.

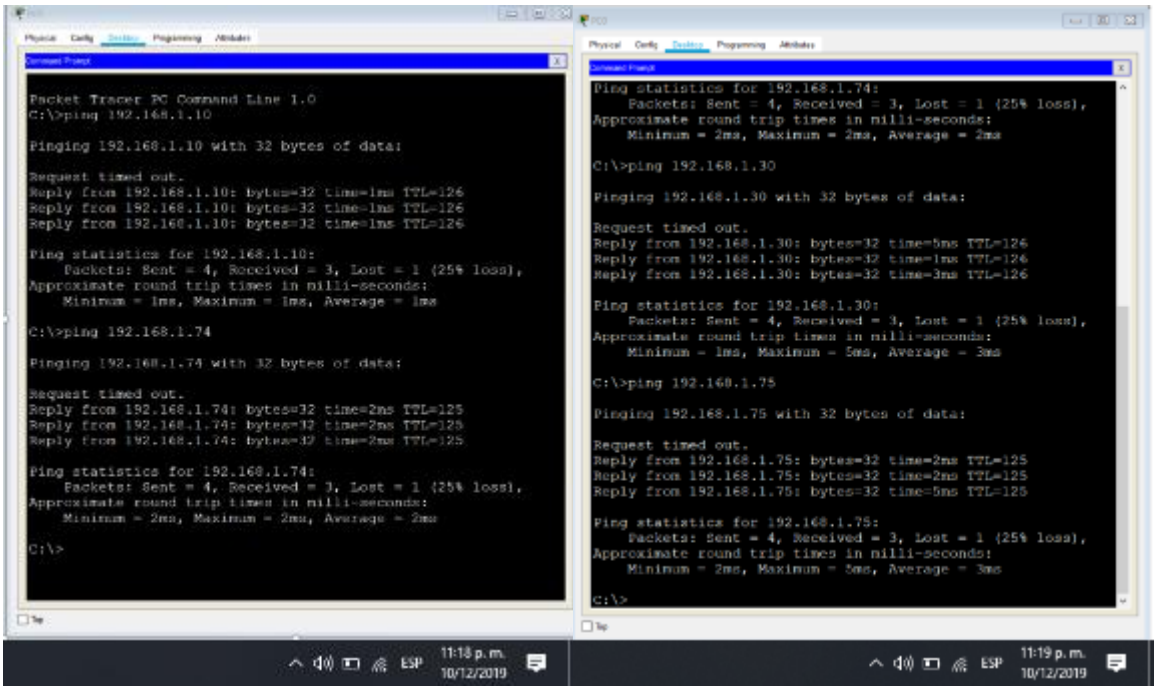

Ilustración 4. Prueba Ping 1

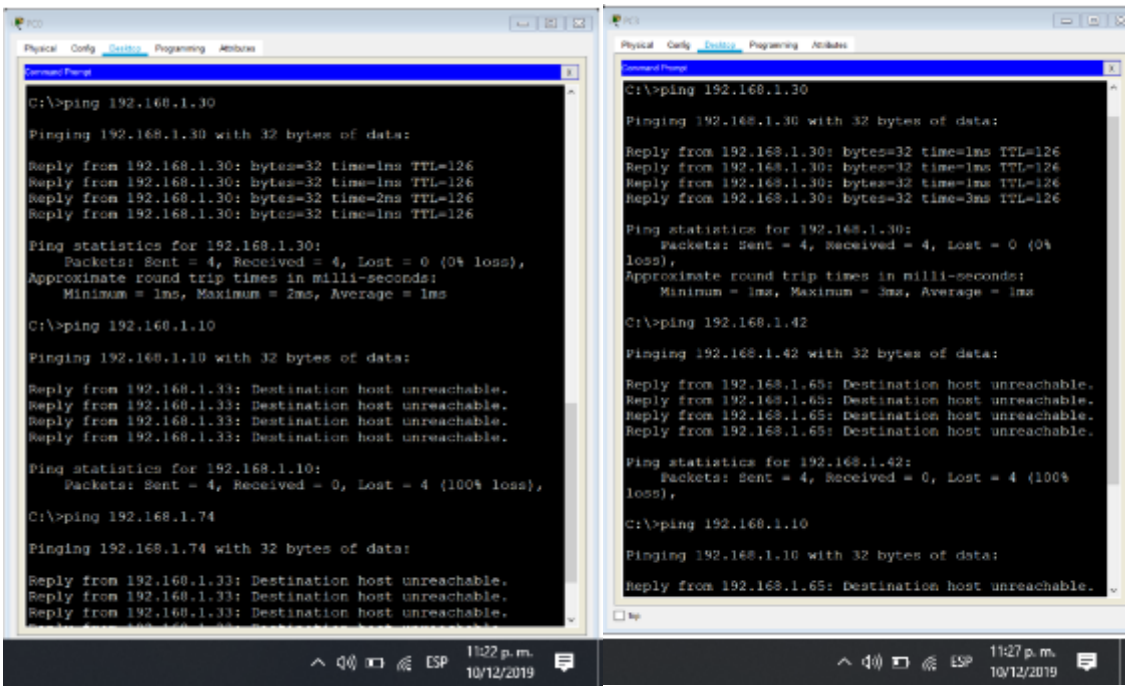

Ilustración 5. Prueba Ping 2

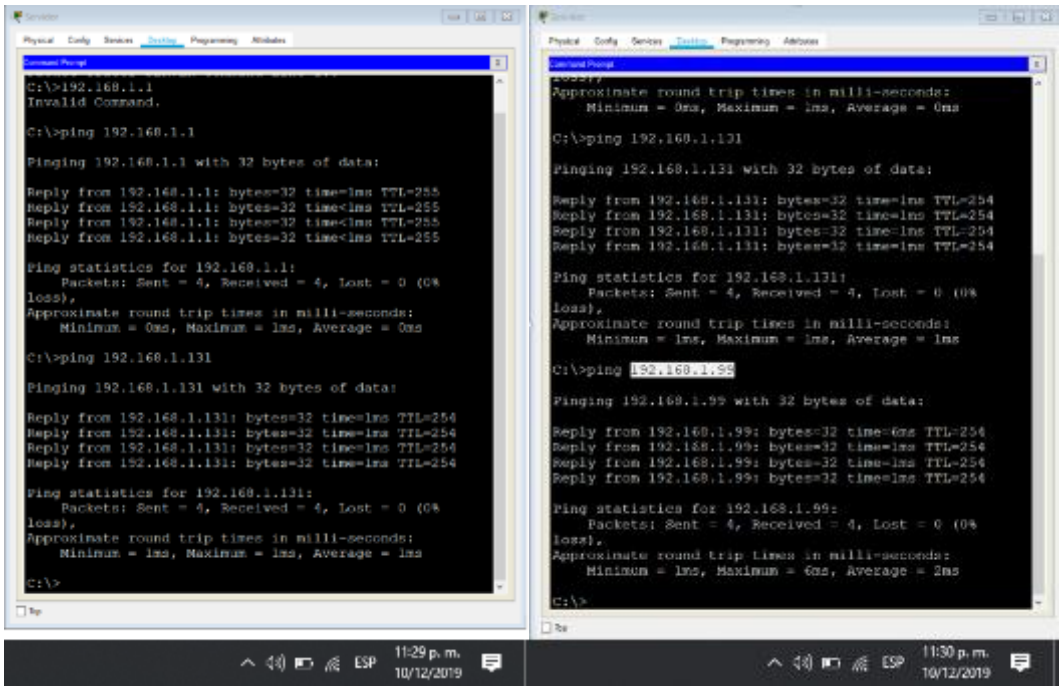

Ilustración 6. Prueba Ping 3

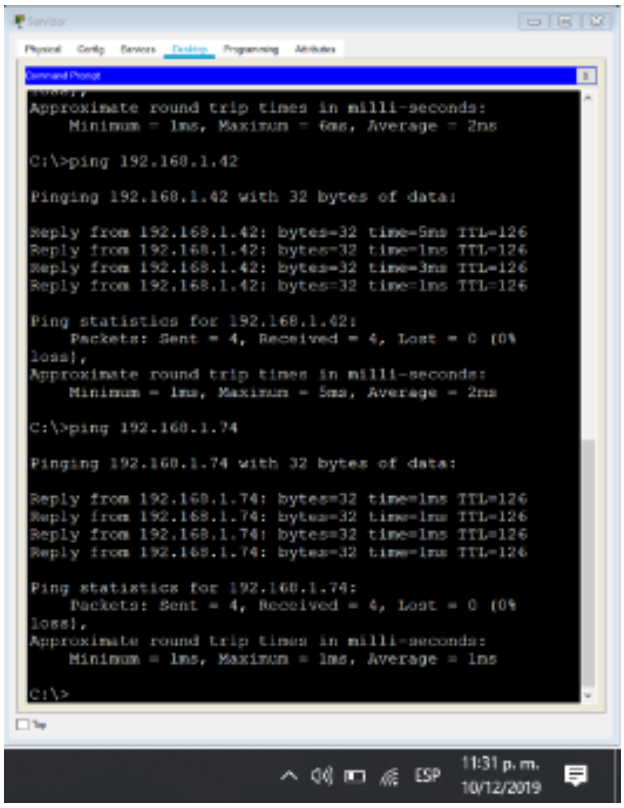

Ilustración 7. Prueba ping 4

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

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

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

```
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 #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 Bogota
Bogota(config)#
```

```
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 #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 Medellin
Medellin(config)#
```

```
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 #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 Cali
Cali(config)#
```

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.

```
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.

```
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(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)#
```

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

Tabla 3. Tabla de Condiciones

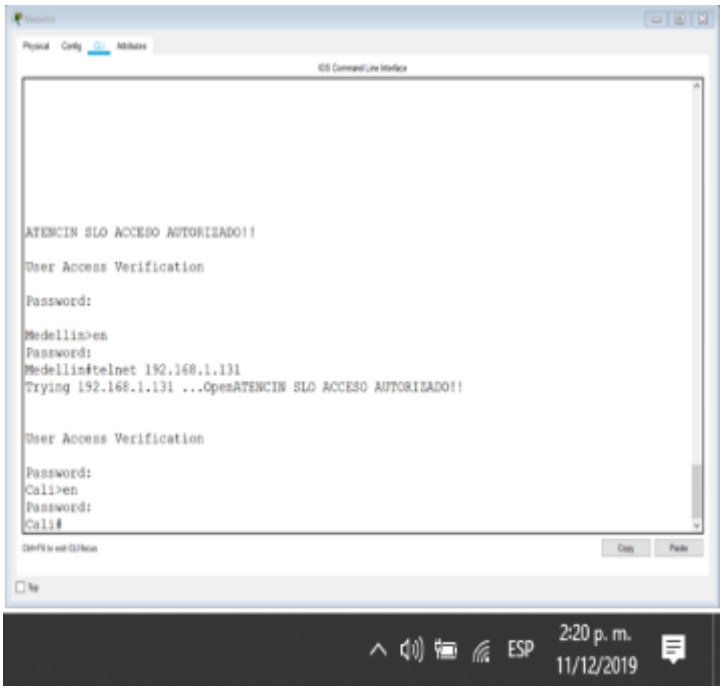

Ilustración 8. Prueba Red Instalada

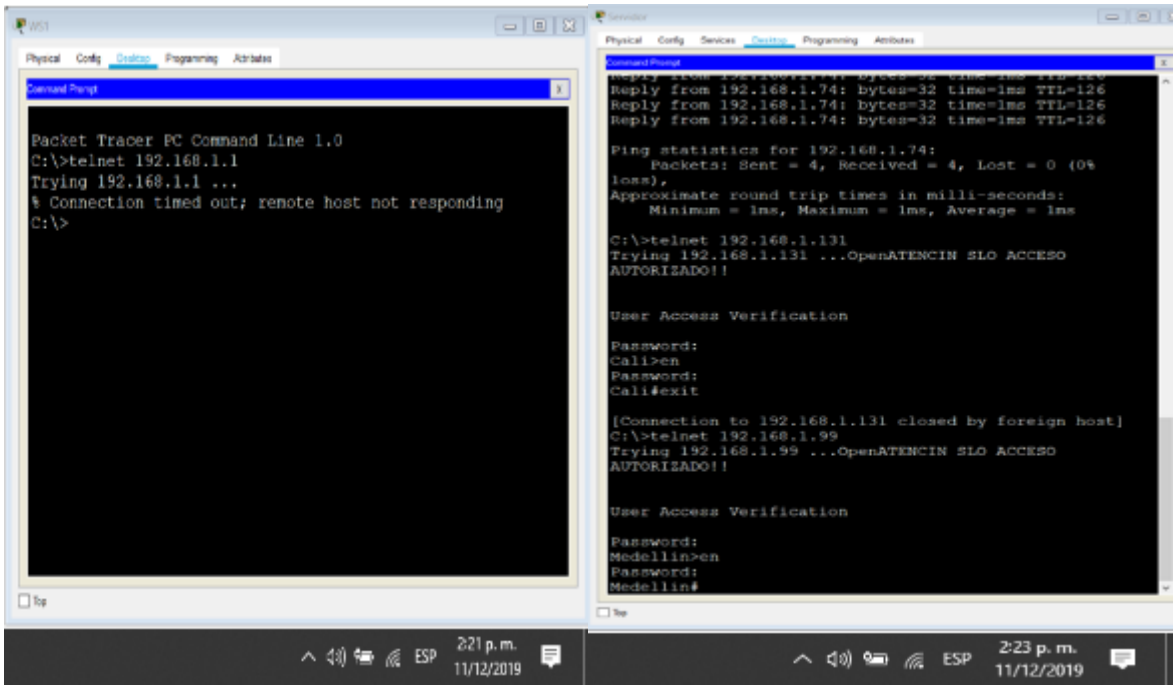

Ilustración 9. Prueba Ping 5

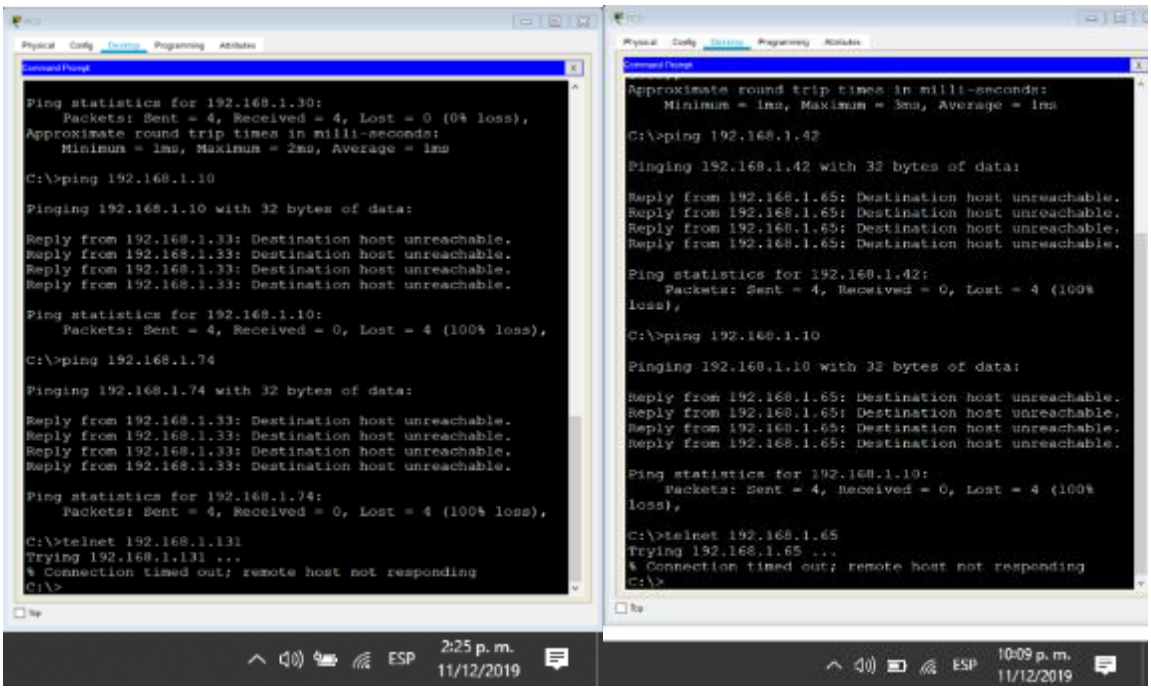

Ilustración 10. Prueba Ping 6

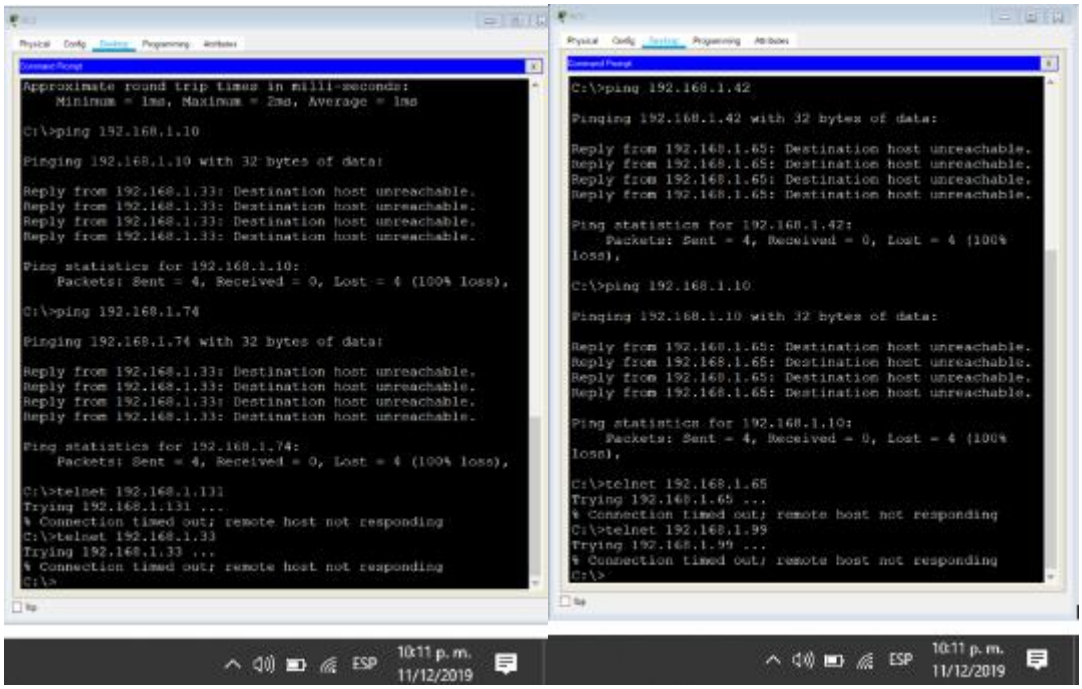

Ilustración 11. Prueba Ping 7

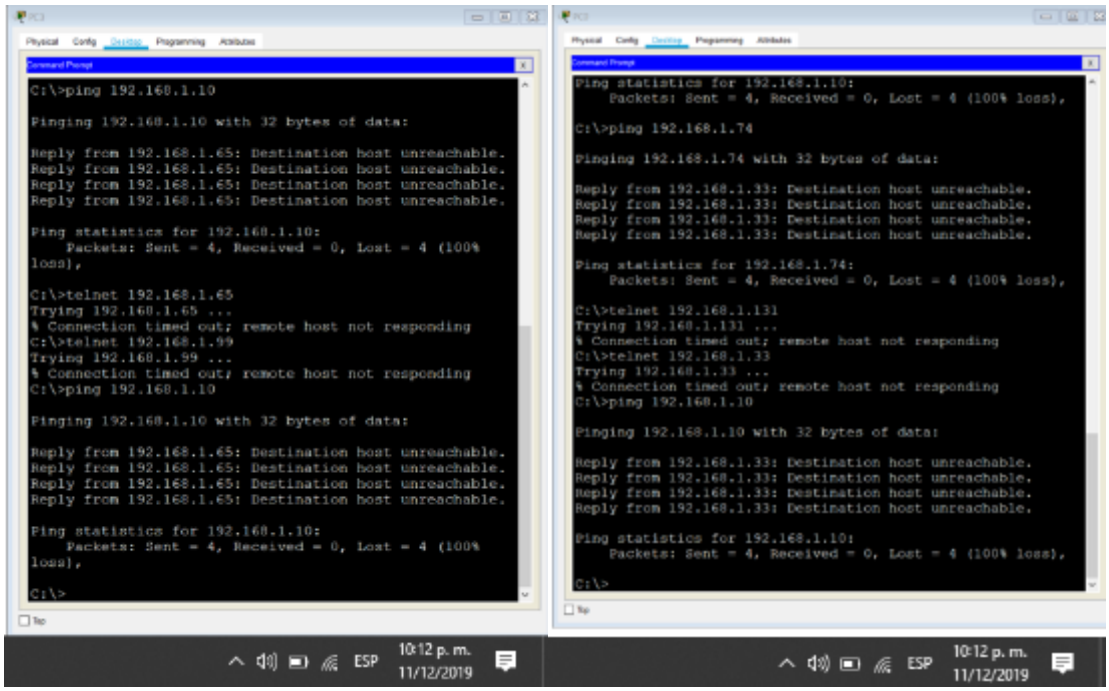

Ilustración 12. Prueba Ping 8

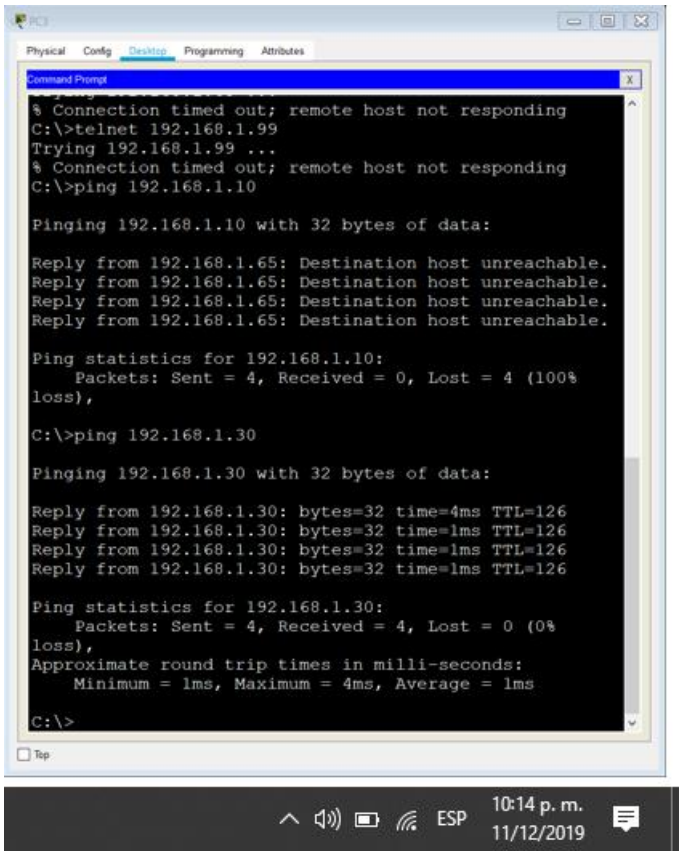

Ilustración 13. Prueba Ping 9

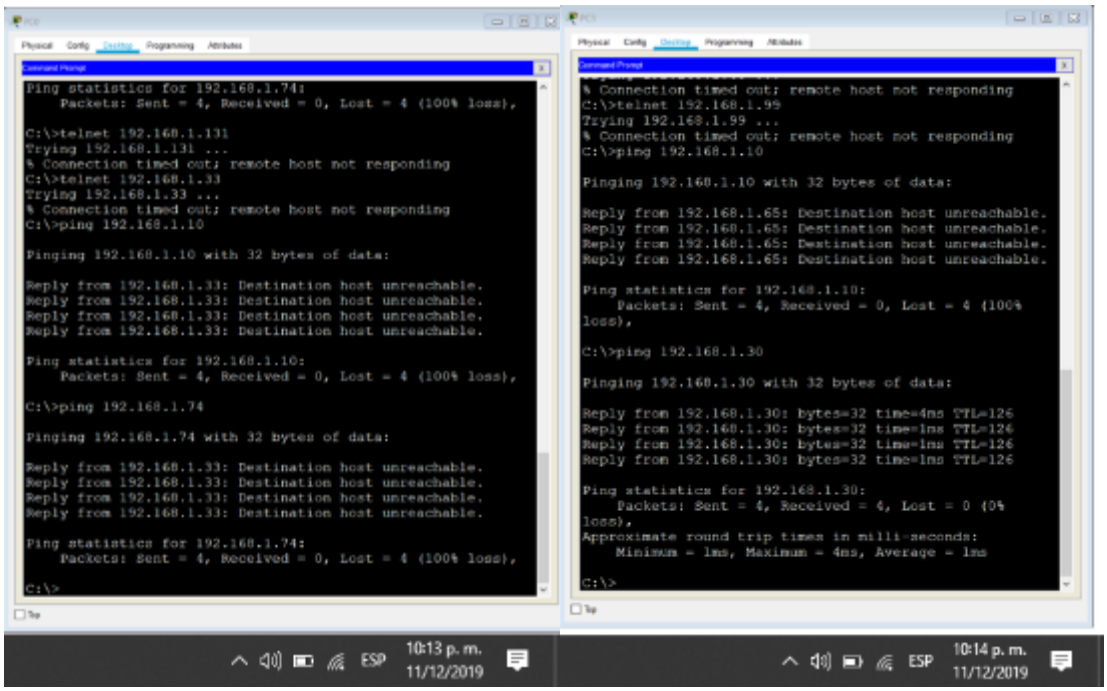

Ilustración 14. Prueba Ping 10

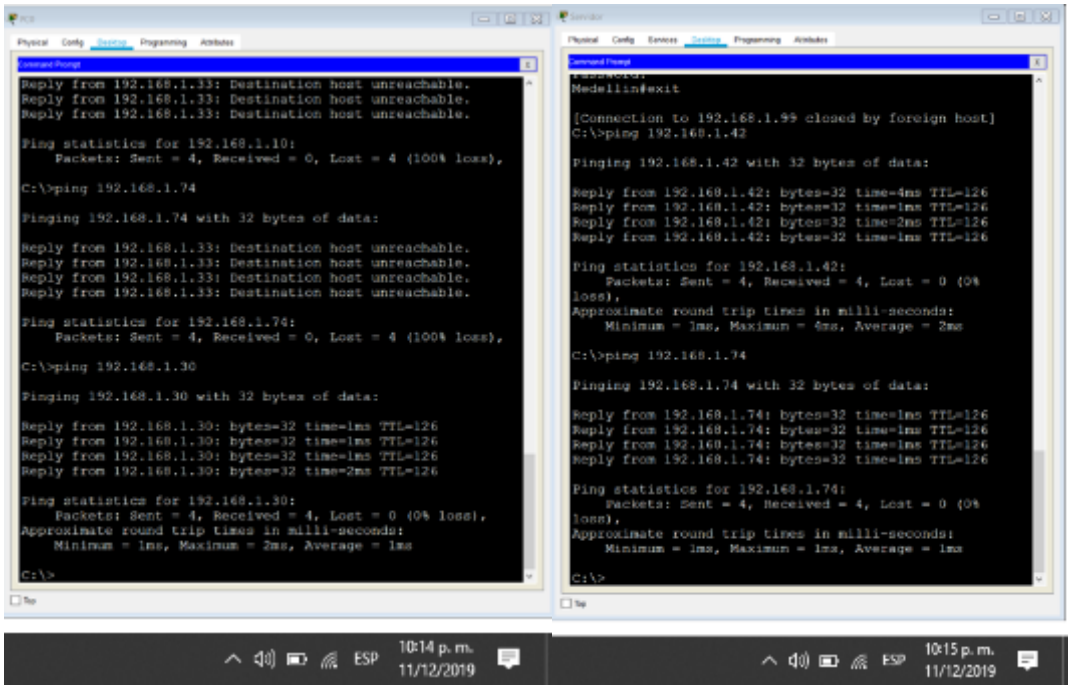

Ilustración 15. Prueba Ping 11

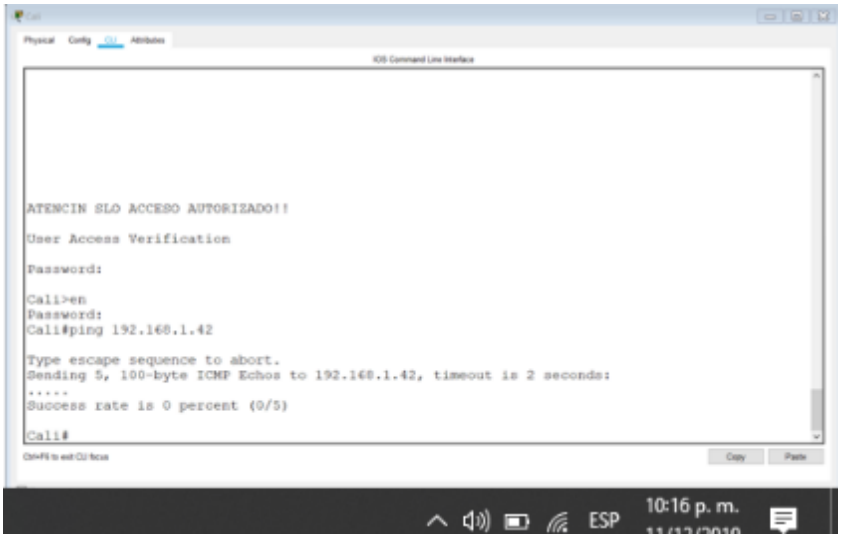

Ilustración 16. Acceso Cali

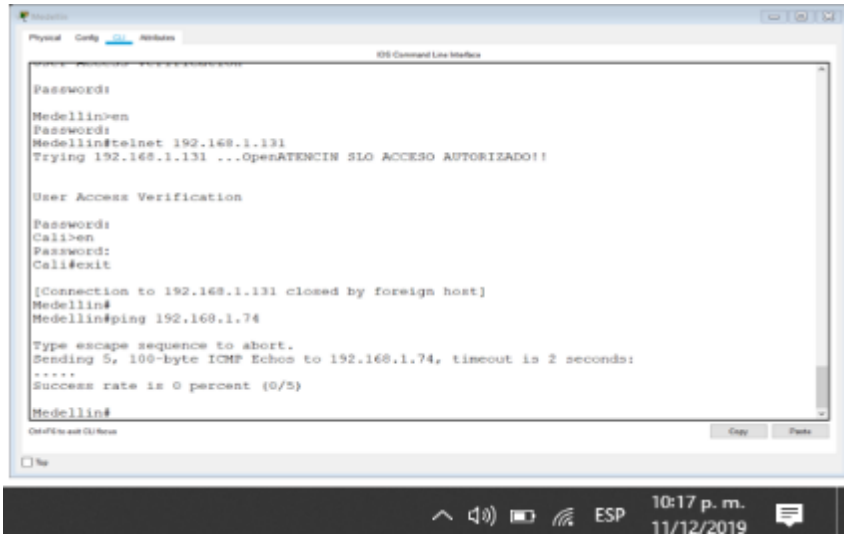

Ilustración 17. Acceso Medellín

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.

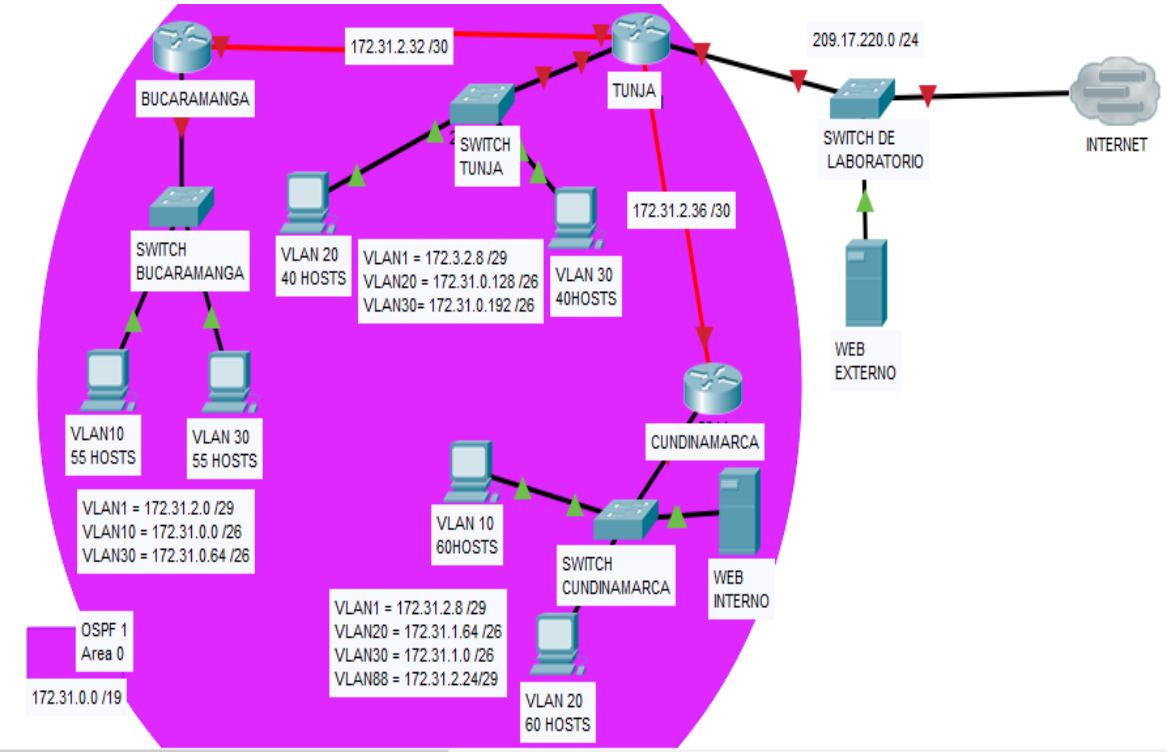

Ilustración 18. Escenario 2

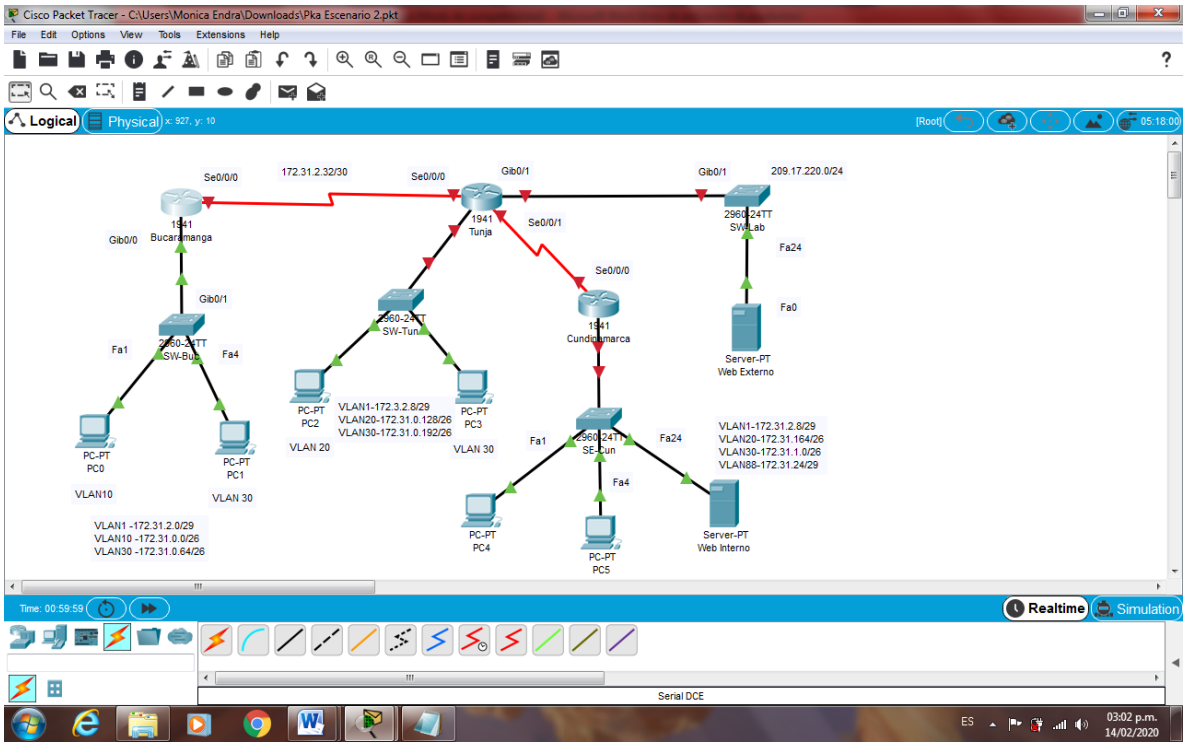

Ilustración 19 Topología Escenario 2

```
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 #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 Bucaramanga
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(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)#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)#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

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)#exit
Bucaramanga(config)#exit
```

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

Bucaramanga#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

172.31.0.0/16 is variably subnetted, 6 subnets, 3 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
C 172.31.2.0/29 is directly connected, GigabitEthernet0/0.1
L 172.31.2.1/32 is directly connected, GigabitEthernet0/0.1

Bucaramanga#


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 #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 Tunja
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

Tunja(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

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

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

```
Tunja(config-if)#exit
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)#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 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)#
00:47:26: %OSPF-5-ADJCHG: Process 1, Nbr 172.31.2.34 on Serial0/0/0 from
LOADING to FULL, Loading Done

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

Tunja#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

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, 9 subnets, 4 masks
O 172.31.0.0/26 [110/65] via 172.31.2.34, 00:01:04, Serial0/0/0
O 172.31.0.64/26 [110/65] via 172.31.2.34, 00:01:04, 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 172.31.2.0/29 [110/65] via 172.31.2.34, 00:01:04, Serial0/0/0
C 172.31.2.32/30 is directly connected, Serial0/0/0
L 172.31.2.33/32 is directly connected, Serial0/0/0
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#


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

Cundinamarca(config-if)#exit
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
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)#
00:55:57: %OSPF-5-ADJCHG: Process 1, Nbr 209.165.220.1 on Serial0/0/0 from
LOADING to FULL, Loading Done

Cundinamarca(config-router)#exit
Cundinamarca(config)#exit
Cundinamarca#
%SYS-5-CONFIG_I: Configured from console by console

Cundinamarca#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

172.3.0.0/29 is subnetted, 1 subnets
O 172.3.2.8/29 [110/65] via 172.31.2.37, 00:00:36, 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, 00:00:36, Serial0/0/0
O 172.31.0.64/26 [110/129] via 172.31.2.37, 00:00:36, Serial0/0/0
O 172.31.0.128/26 [110/65] via 172.31.2.37, 00:00:36, Serial0/0/0
O 172.31.0.192/26 [110/65] via 172.31.2.37, 00:00:36, 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, 00:00:36, 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, 00:00:36, 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#
```

```
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

SW-Buc(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

SW-Buc(config-if)#exit
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)#

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

SW-Tun(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

SW-Tun(config-if)#exit
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)#

Switch>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
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

SW-Cun(config-if)#exit
SW-Cun(config)#int vlan 1
SW-Cun(config-if)#ip address 172.31.2.11 255.255.255.248
SW-Cun(config-if)#no shutdown

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

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

SW-Cun(config-if)#ip default-gateway 172.31.2.9
SW-Cun(config)#
```

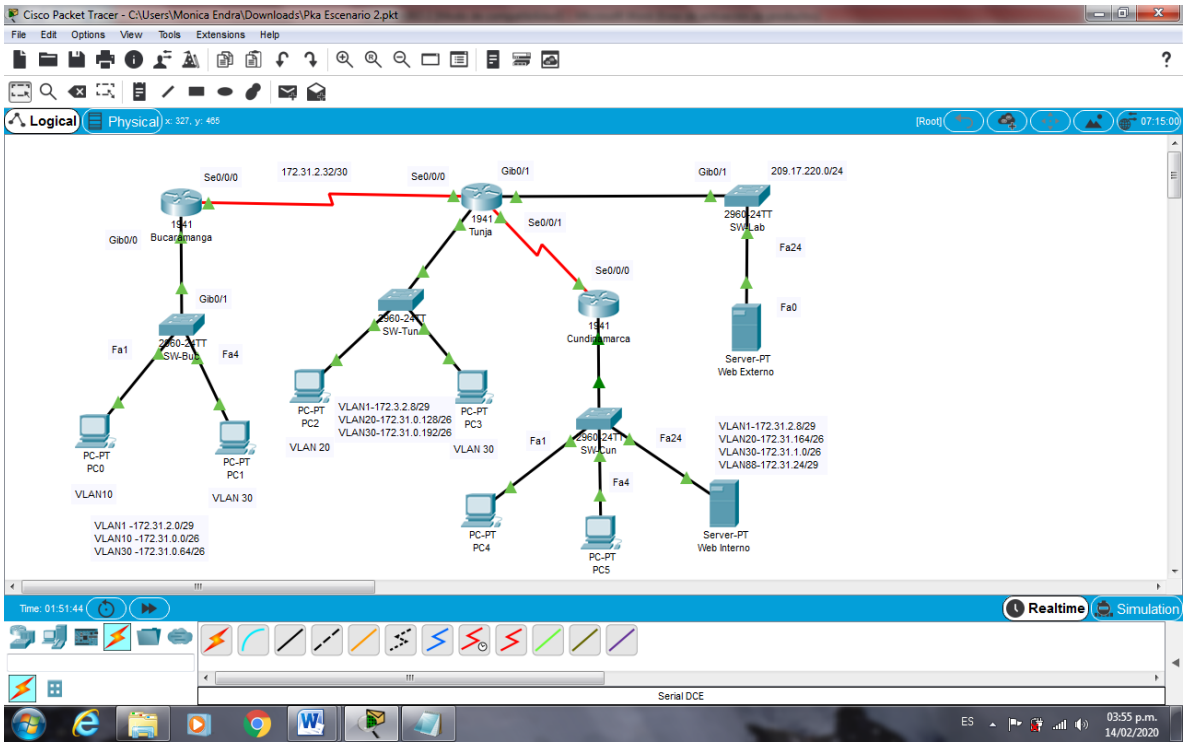

Ilustración 20 Tipología Escenario 2 completo

- **Autenticación local con AAA.**

```
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)#
```

```
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)#
```

```
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)#
```

- **Cifrado de contraseñas.**

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

```
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 #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 Tunja
Tunja(config)#

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 #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 Cundinamarca
Cundinamarca(config)#
```

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

```
Bucaramanga(config-line)#login block-for 10 attempts 3 within 60

Tunja(config-line)#login block-for 10 attempts 3 within 60

Cundinamarca(config-line)#login block-for 10 attempts 3 within 60
```

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

Bucaramanga(config-line)#login block-for 10 attempts 3 within 60

Tunja(config-line)#login block-for 10 attempts 3 within 60

Cundinamarca(config-line)#login block-for 10 attempts 3 within 60

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

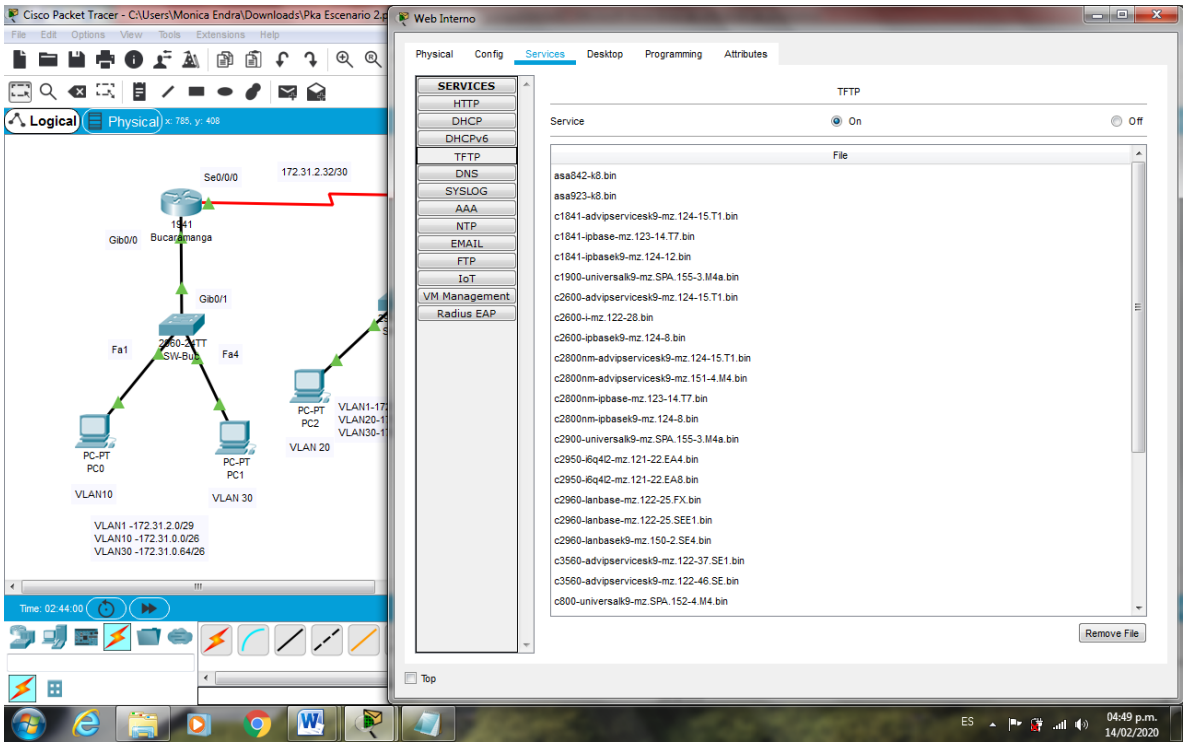

Ilustración 21 Establecimiento de un servidor TFTP y almacenamiento de los archivos de los routers

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

Tunja(config)#ip dhcp excluded-address 172.31.0.1 172.31.0.2

```
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 excluded-address 172.31.1.1 172.31.1.2
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)#
```

```
Bucaramanga(config)#int g0/0.10
Bucaramanga(config-subif)#ip helper-address 172.31.2.33
Bucaramanga(config-subif)#int g0/0.30
Bucaramanga(config-subif)#ip helper-address 172.31.2.33
Bucaramanga(config-subif)#
```

```
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)#
```

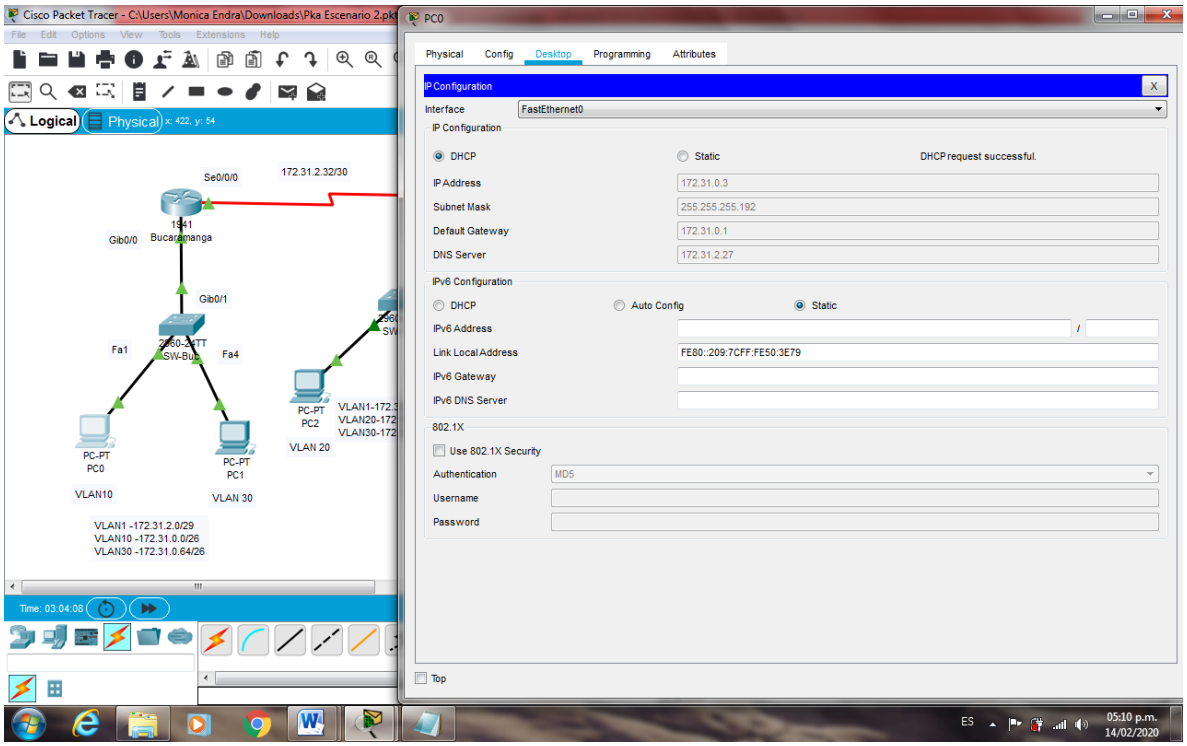

Ilustración 22 Configuración DHCP PC0

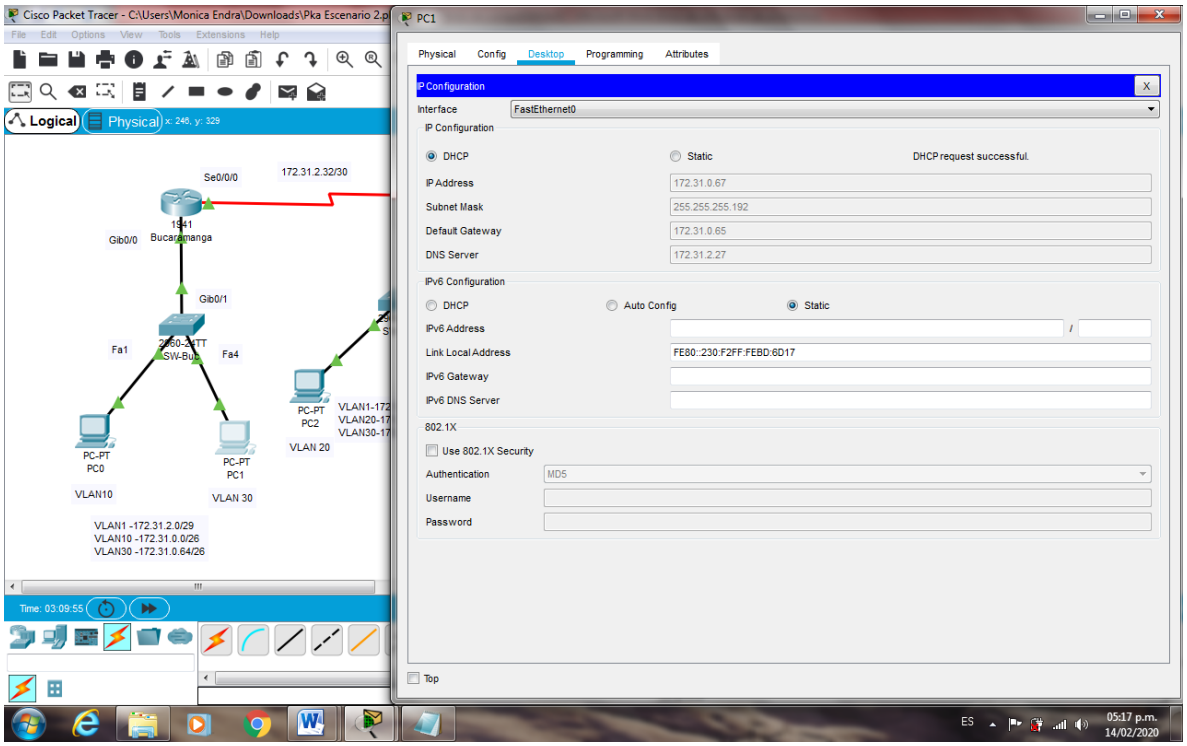

Ilustración 23 Configuración DHCP PC1

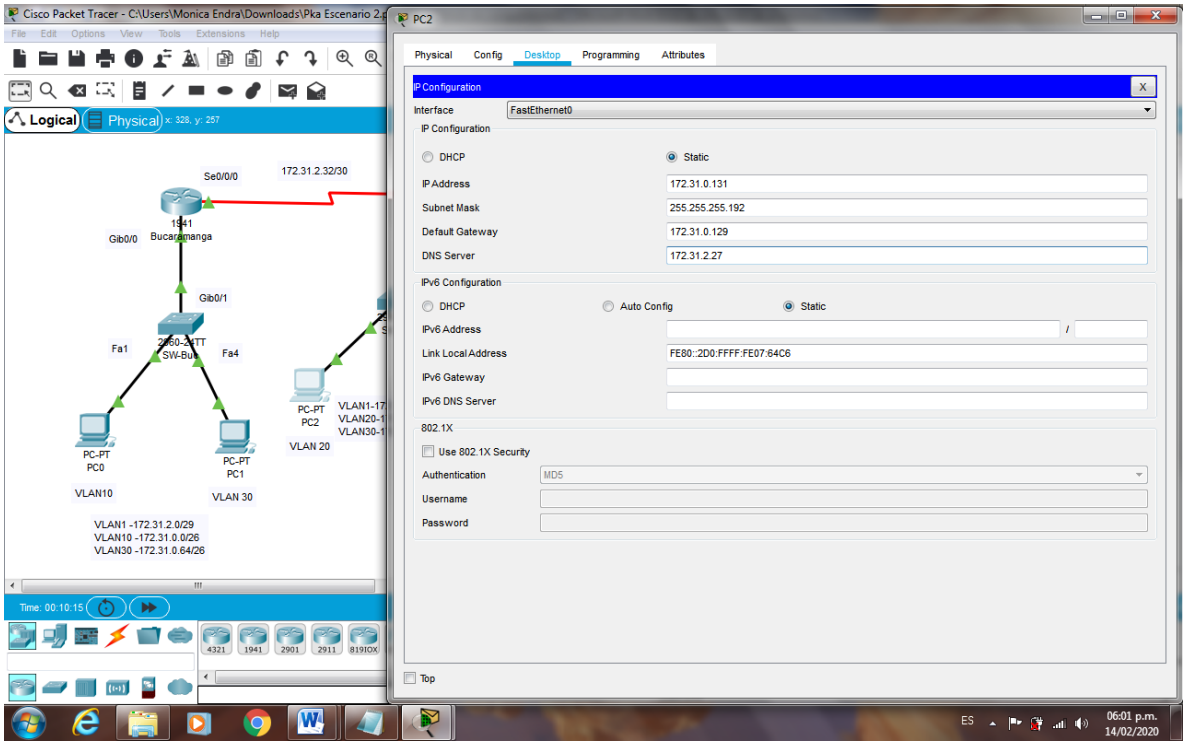

Ilustración 24 Configuración DHCP PC2

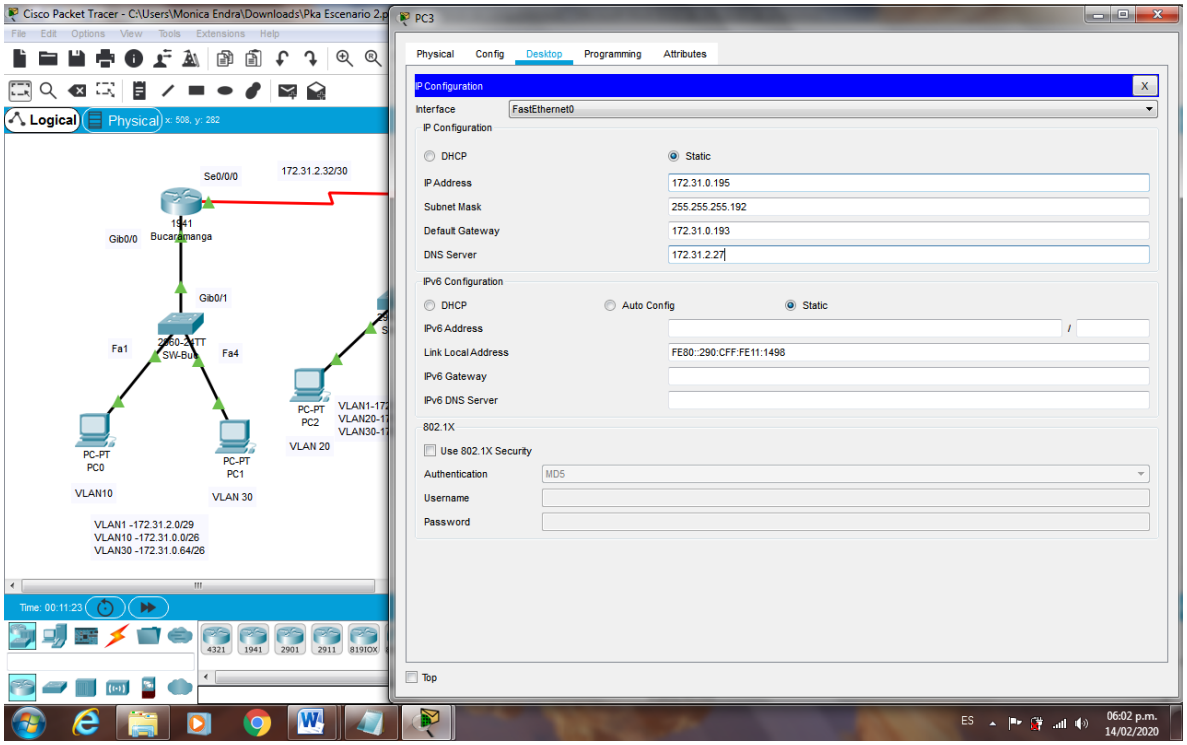

Ilustración 19 Configuración DHCP PC3

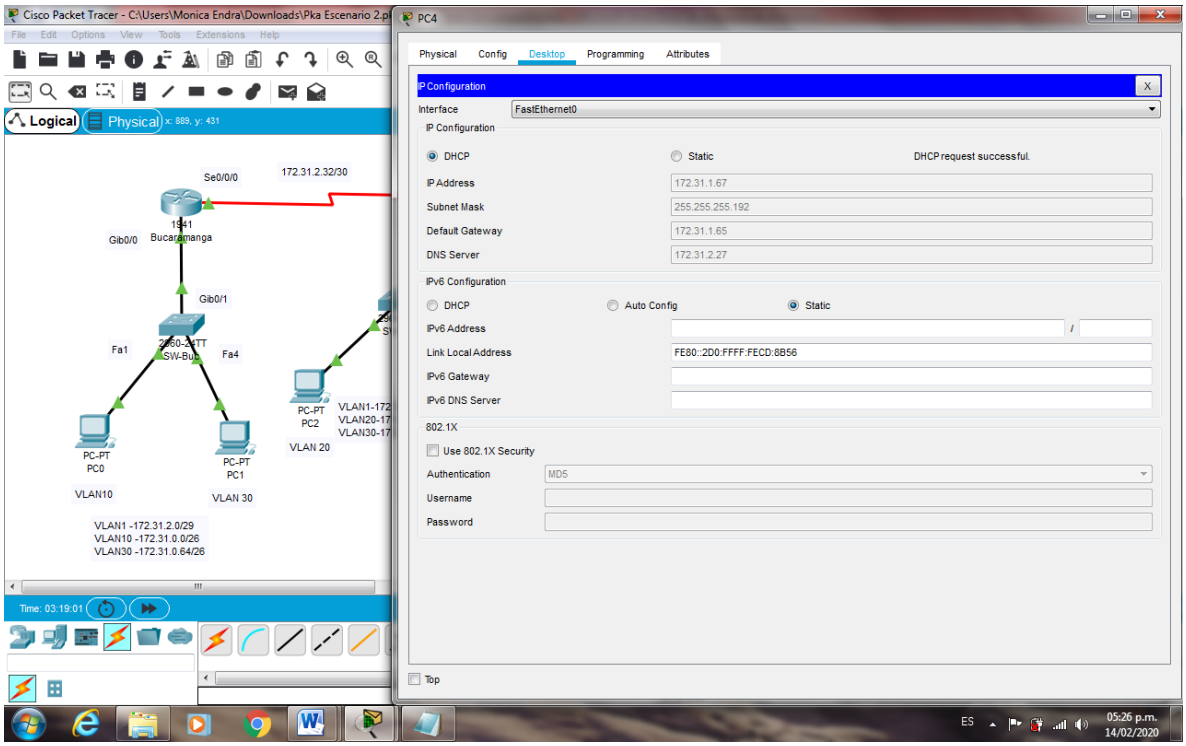

Ilustración 20 Configuración DHCP PC4

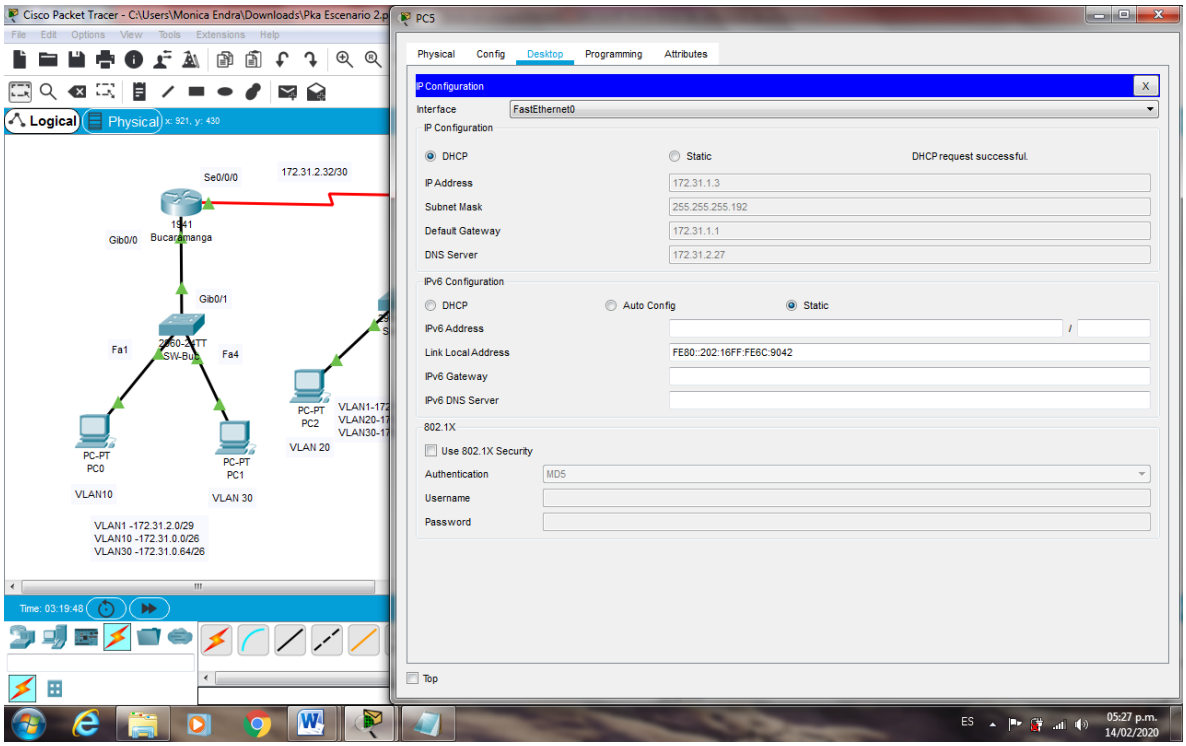

Ilustración 21 Configuración DHCP PC5

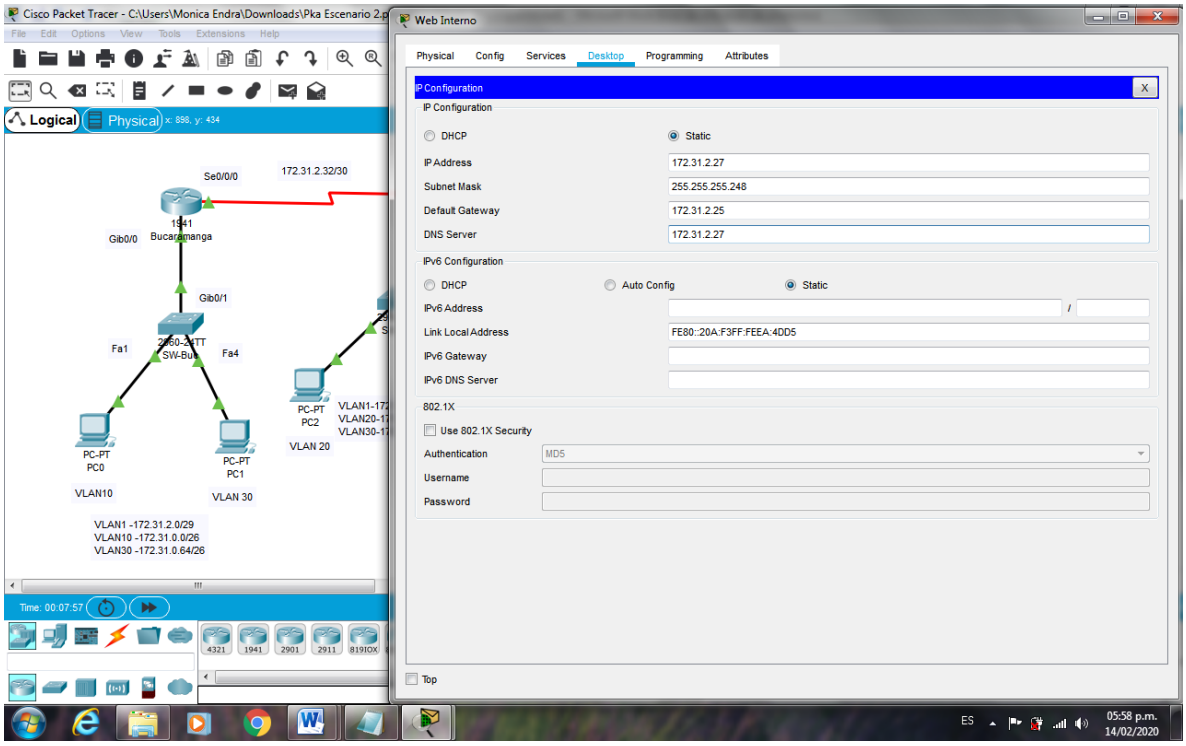

Ilustración 22 Configuración DHCP Web Interno

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

```
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 excluded-address 172.31.1.1 172.31.1.2
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)#exit
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 g0/0.1
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)#router ospf 1
Tunja(config-router)#default-information originate
Tunja(config-router)#exit
Tunja(config)#exit
Tunja#
%SYS-5-CONFIG_I: Configured from console by console

Tunja#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 209.165.220.2 to network 0.0.0.0

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, 00:46:37, Serial0/0/0
```

O 172.31.0.64/26 [110/65] via 172.31.2.34, 00:46:37, 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, 00:46:37, Serial0/0/1
O 172.31.1.64/26 [110/65] via 172.31.2.38, 00:46:37, Serial0/0/1
O 172.31.2.0/29 [110/65] via 172.31.2.34, 00:46:37, Serial0/0/0
O 172.31.2.8/29 [110/65] via 172.31.2.38, 00:46:37, Serial0/0/1
O 172.31.2.24/29 [110/65] via 172.31.2.38, 00:46:37, 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
S* 0.0.0.0/0 [1/0] via 209.165.220.2

Tunja#

Bucaramanga#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 172.31.2.33 to network 0.0.0.0

172.3.0.0/29 is subnetted, 1 subnets
O 172.3.2.8/29 [110/65] via 172.31.2.33, 01:00:01, 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, 01:00:01, Serial0/0/0
O 172.31.0.192/26 [110/65] via 172.31.2.33, 01:00:01, Serial0/0/0
O 172.31.1.0/26 [110/129] via 172.31.2.33, 00:59:51, Serial0/0/0
O 172.31.1.64/26 [110/129] via 172.31.2.33, 00:59:51, 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, 00:59:51, Serial0/0/0
O 172.31.2.24/29 [110/129] via 172.31.2.33, 00:59:51, 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, 01:00:01, Serial0/0/0
O*E2 0.0.0.0/0 [110/1] via 172.31.2.33, 00:13:45, Serial0/0/0

Bucaramanga#

Cundinamarca#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 172.31.2.37 to network 0.0.0.0

172.3.0.0/29 is subnetted, 1 subnets
O 172.3.2.8/29 [110/65] via 172.31.2.37, 01:01:15, 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, 01:01:15, Serial0/0/0
O 172.31.0.64/26 [110/129] via 172.31.2.37, 01:01:15, Serial0/0/0
O 172.31.0.128/26 [110/65] via 172.31.2.37, 01:01:15, Serial0/0/0
O 172.31.0.192/26 [110/65] via 172.31.2.37, 01:01:15, 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, 01:01:15, 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, 01:01:15, 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
O*E2 0.0.0.0/0 [110/1] via 172.31.2.37, 00:15:09, Serial0/0/0

Cundinamarca#

Tunja#show ip nat translation
Pro Inside global Inside local Outside local Outside global

--- 209.165.220.3 172.31.2.27 --- ---

Tunja#

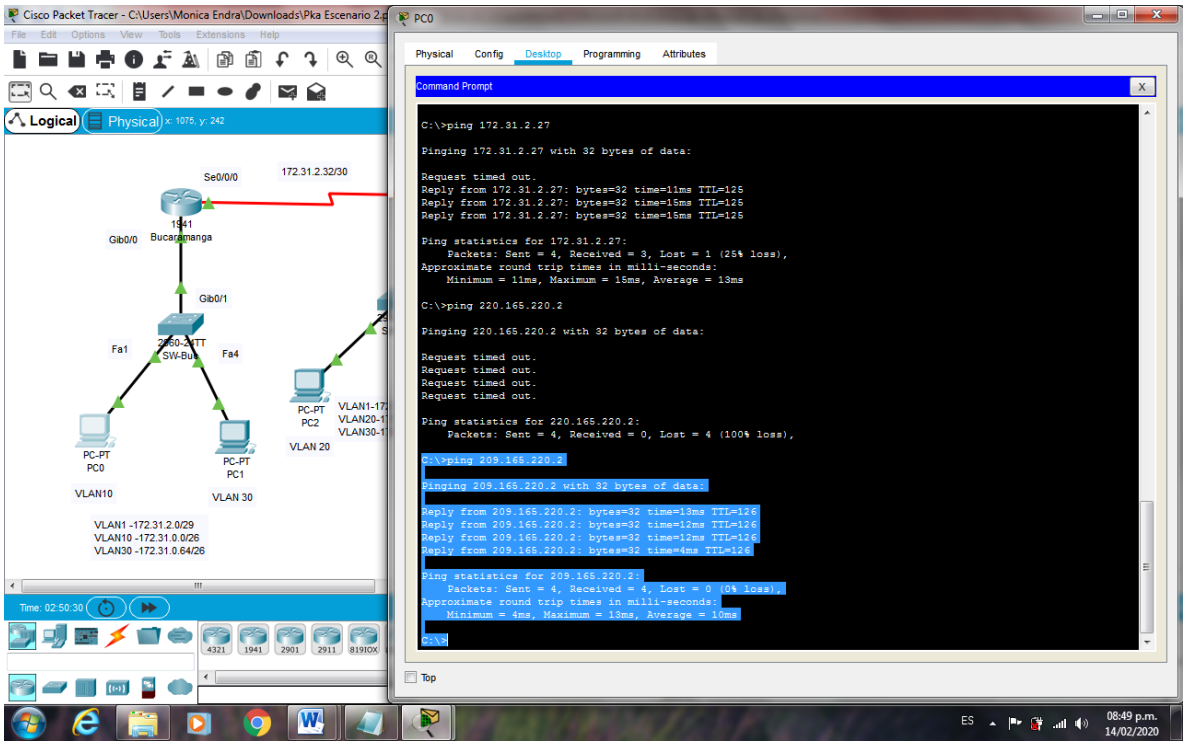

Ilustración 23 Comprobación ping a Servidor

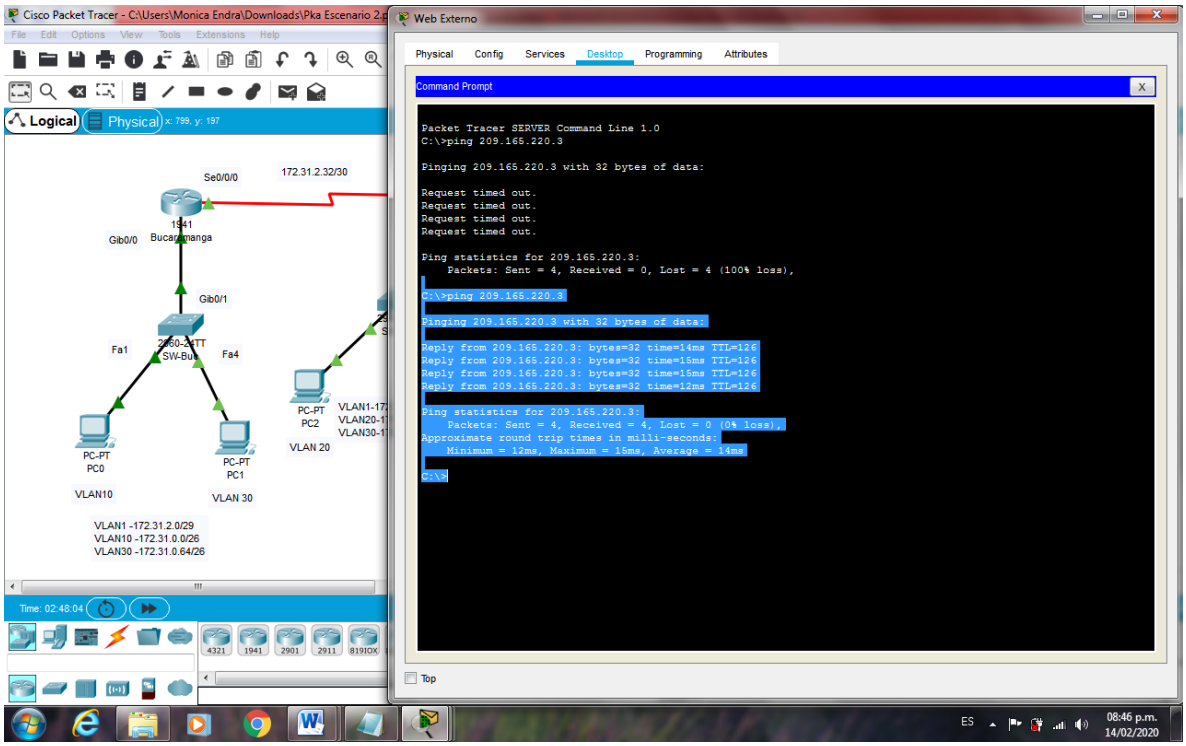

Ilustración 24 Comprobación ping NAT estático

2.4. El enrutamiento deberá tener autenticación.

Bucaramanga(config)#int s0/0/0
Bucaramanga(config-if)#ip ospf authentication message-digest
Bucaramanga(config-if)#ip ospf message-digest-key 1 md5 cisco123
Bucaramanga(config-if)#
01:55:23: %OSPF-5-ADJCHG: Process 1, Nbr 209.165.220.1 on Serial0/0/0 from FULL to DOWN, Neighbor Down: Dead timer expired

01:55:23: %OSPF-5-ADJCHG: Process 1, Nbr 209.165.220.1 on Serial0/0/0 from FULL to DOWN, Neighbor Down: Interface down or detached

Bucaramanga(config-if)#

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)#
01:57:33: %OSPF-5-ADJCHG: Process 1, Nbr 209.165.220.1 on Serial0/0/0 from FULL to DOWN, Neighbor Down: Dead timer expired

01:57:33: %OSPF-5-ADJCHG: Process 1, Nbr 209.165.220.1 on Serial0/0/0 from FULL to DOWN, Neighbor Down: Interface down or detached

Cundinamarca(config-if)#

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)#
01:58:35: %OSPF-5-ADJCHG: Process 1, Nbr 172.31.2.34 on Serial0/0/0 from LOADING to FULL, Loading Done

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)#
01:59:05: %OSPF-5-ADJCHG: Process 1, Nbr 172.31.2.38 on Serial0/0/1 from LOADING to FULL, Loading Done

Tunja(config-if)#

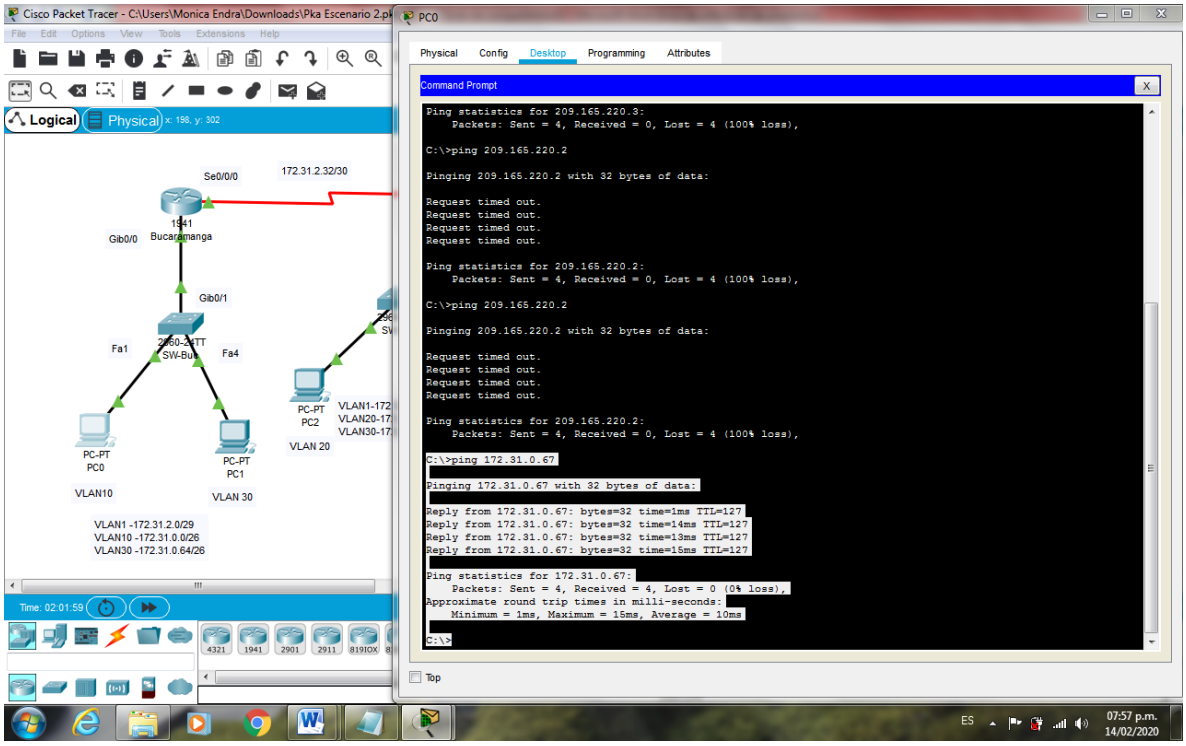

Ilustración 25 Comprobación ping PC0 a PC1

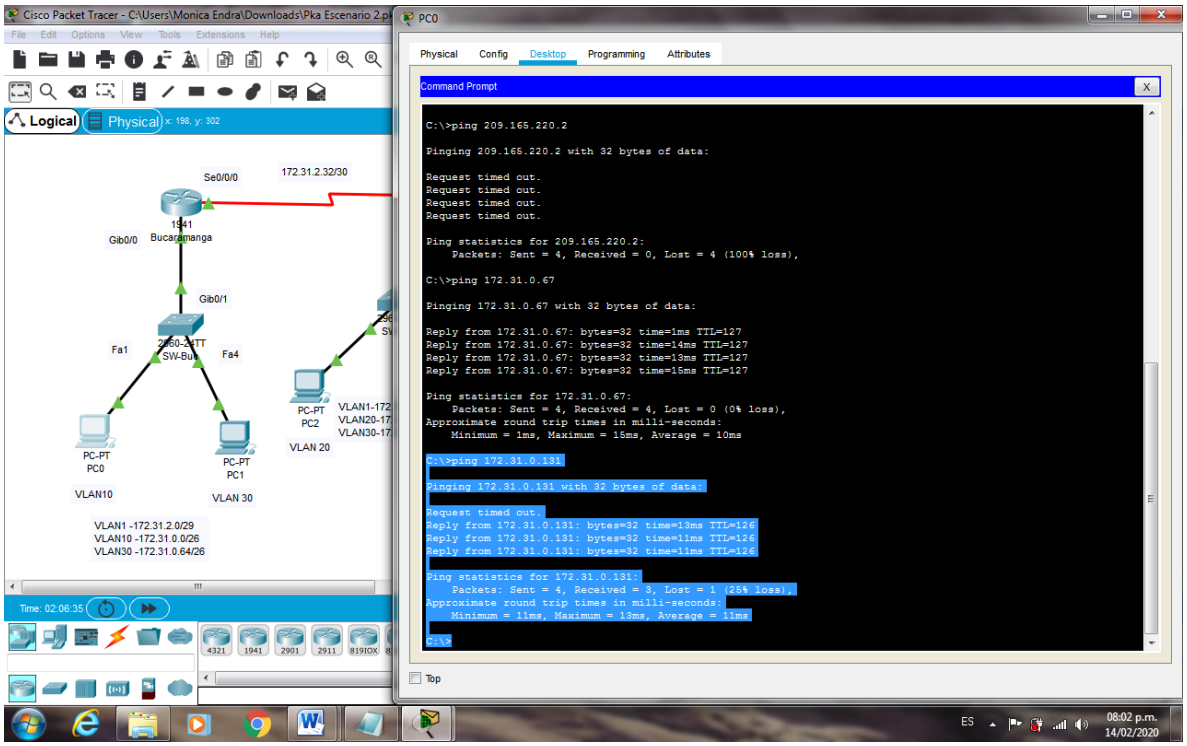

Ilustración 26 Comprobación ping PC0 a PC2

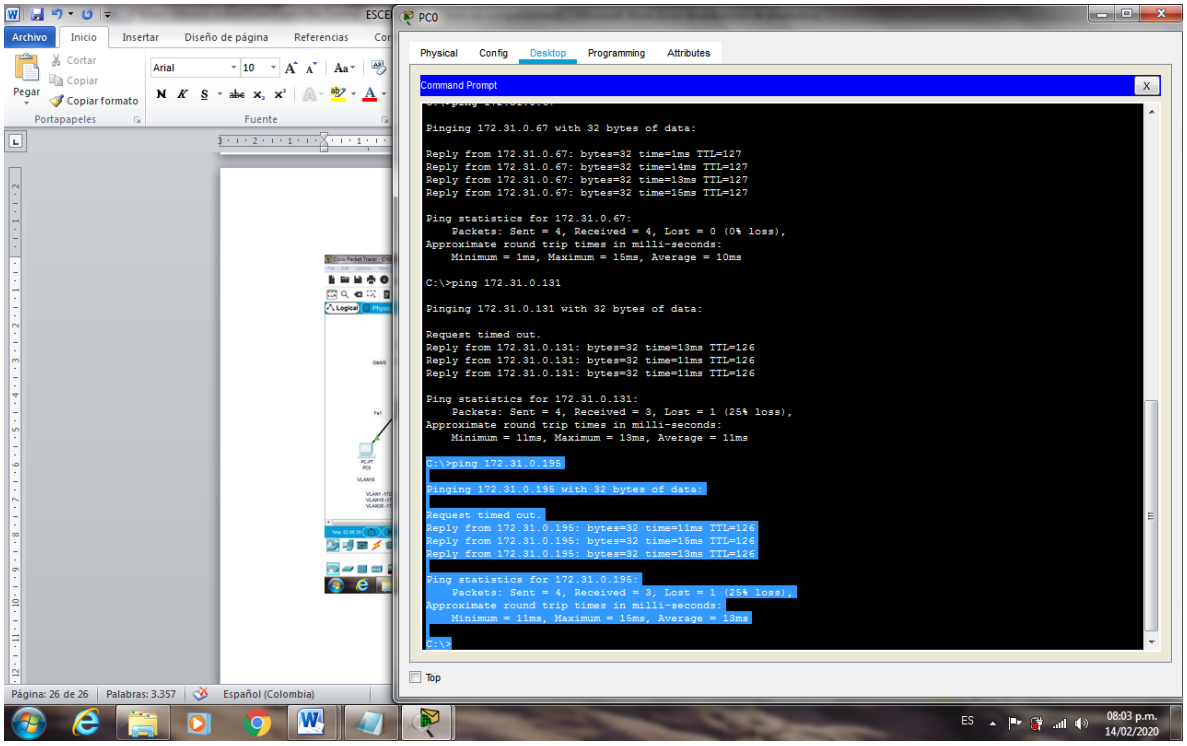

Ilustración 27 Comprobación ping PC0 a PC3

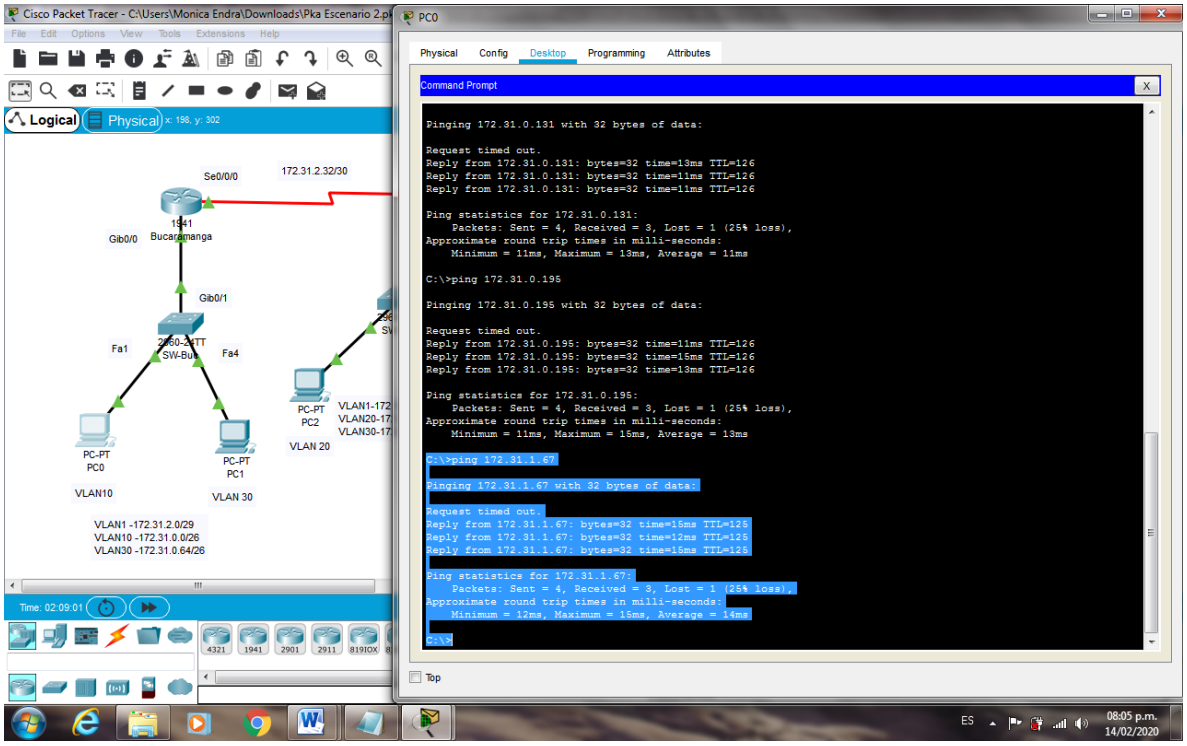

Ilustración 28 Comprobación ping PC0 a PC4

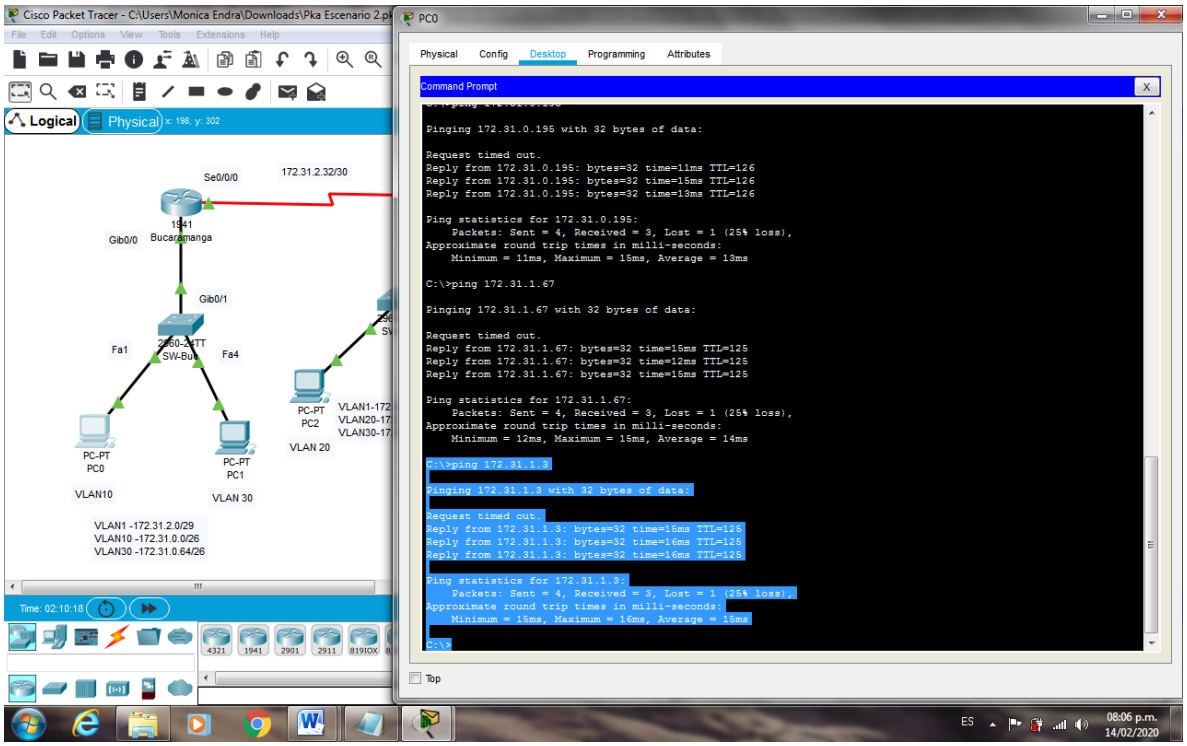

Ilustración 29 Comprobación ping PC0 a PC5

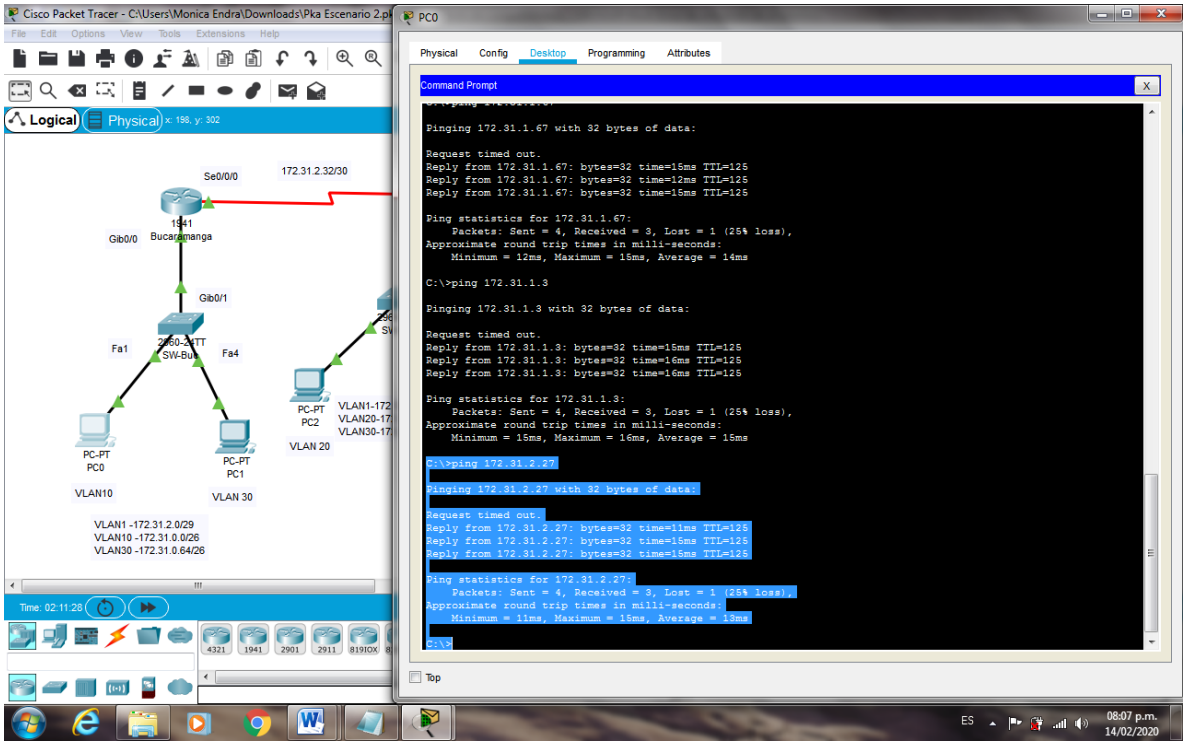

Ilustración 30 Comprobación ping PC0 a Servidor

2.5. Listas de control de acceso:

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

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)#int g0/0.20
Cundinamarca(config-subif)#ip access-group 101 in
Cundinamarca(config-subif)#

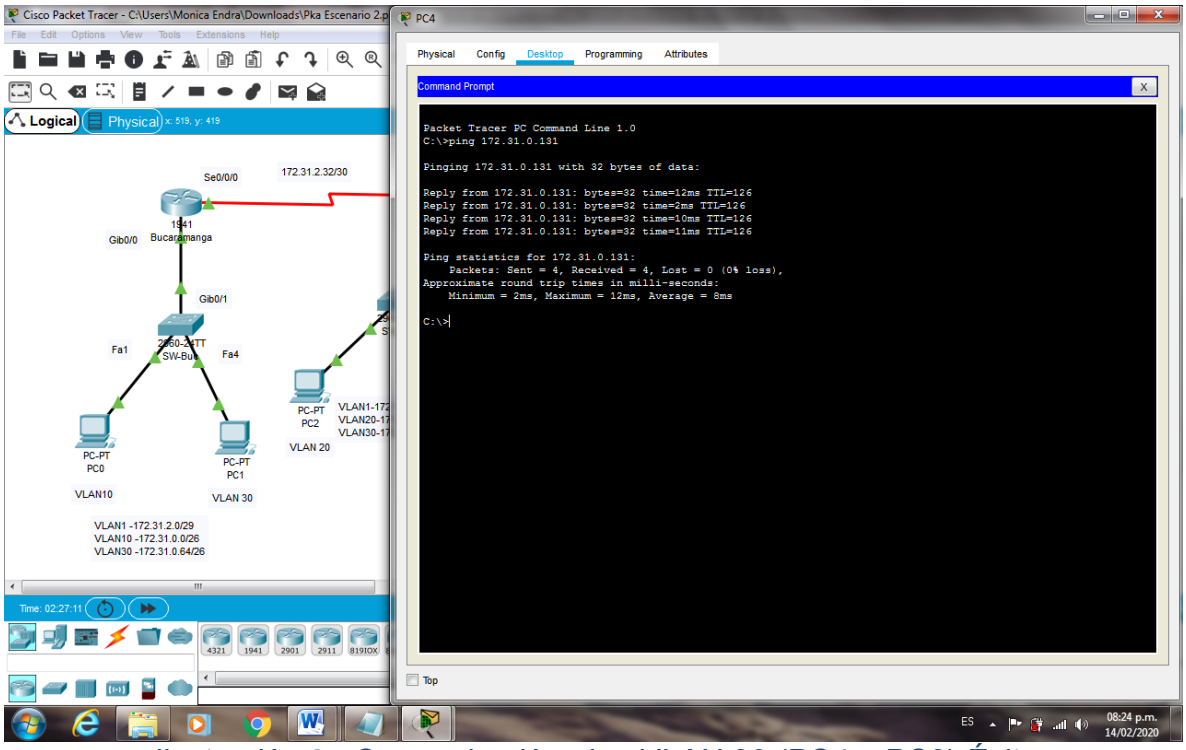

Ilustración 31 Comprobación ping VLAN 20 (PC4 a PC2) Éxito

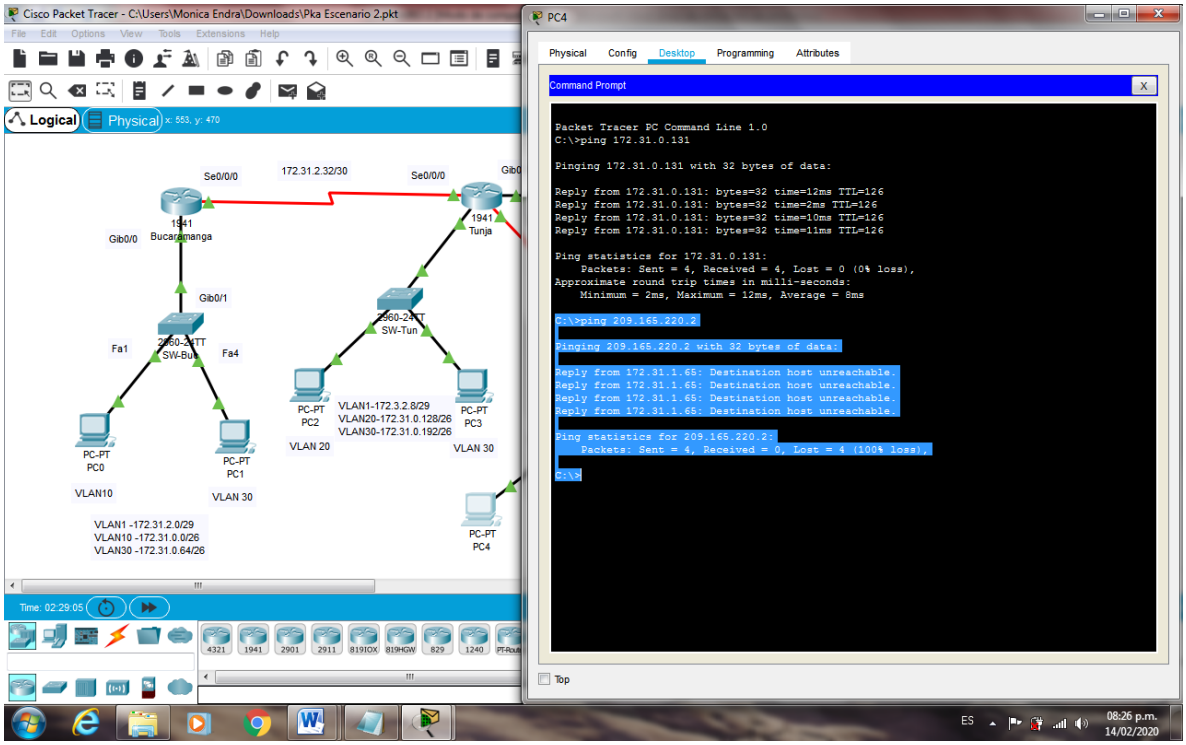

Ilustración 32 Comprobación ping VLAN 20 (PC4 a Servidor) Se niega el acceso

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

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)#

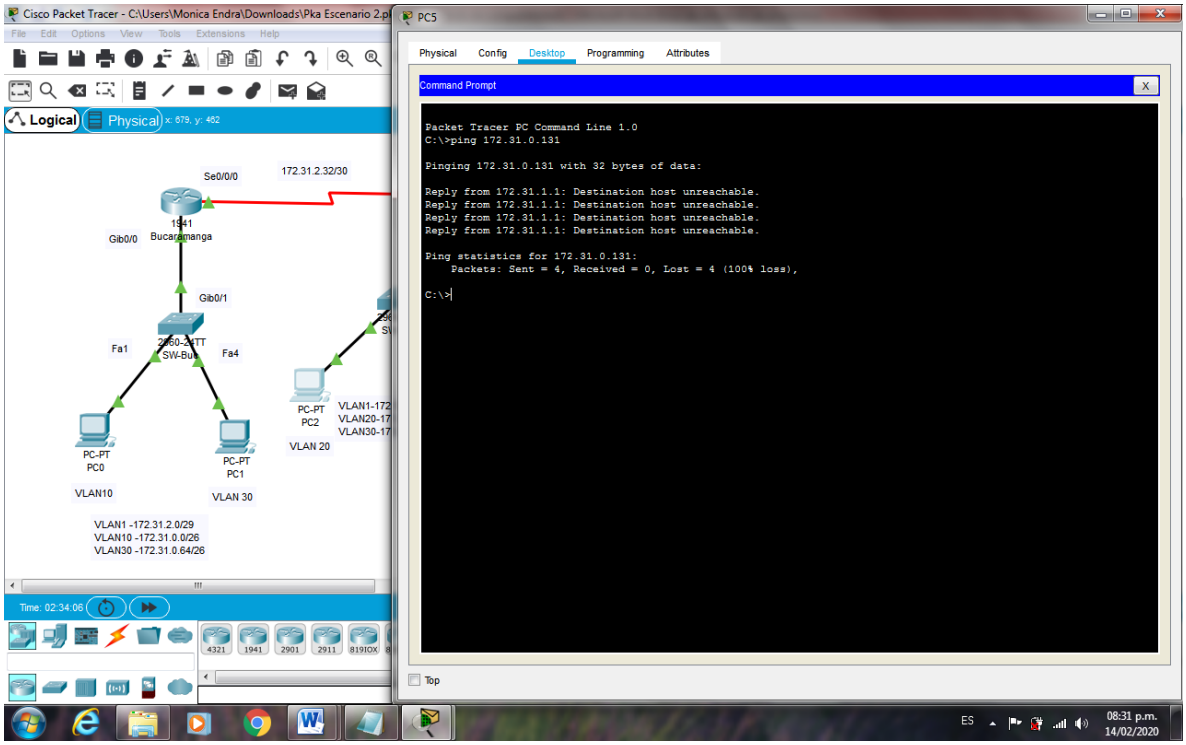

Ilustración 33 Comprobación ping VLAN 10 (PC5 a PC2) Se niega el acceso

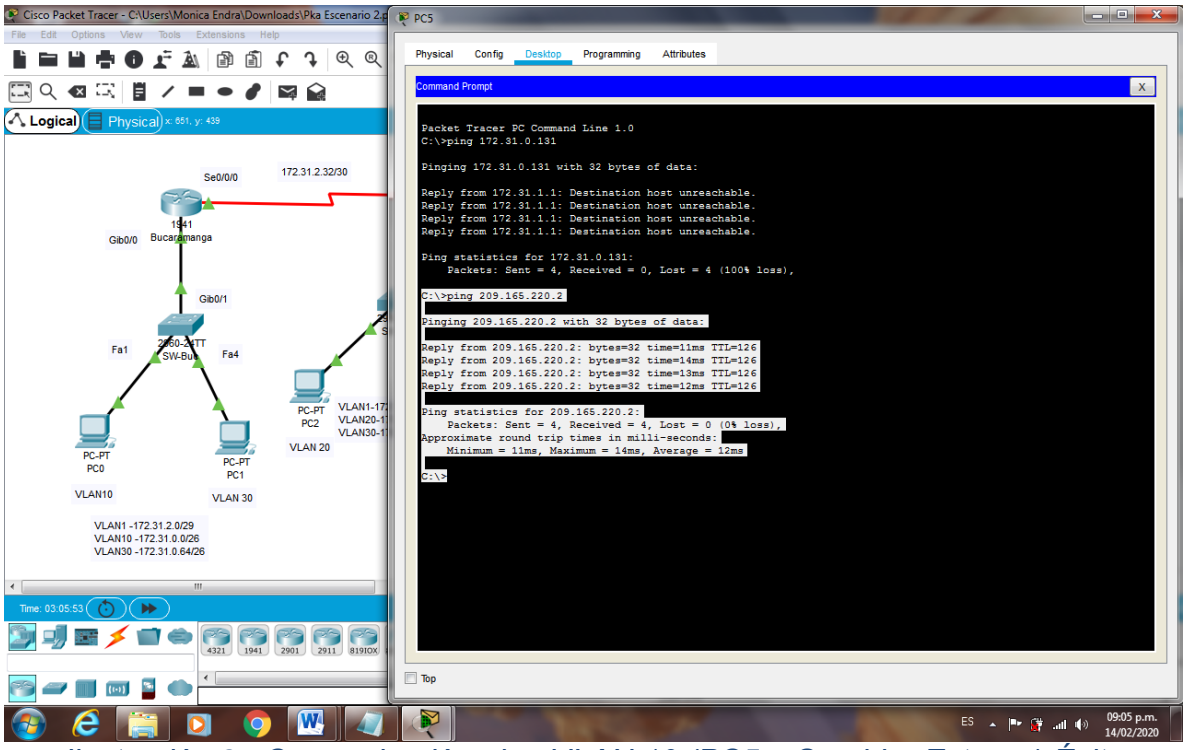

Ilustración 34 Comprobación ping VLAN 10 (PC5 a Servidor Externo) Éxito

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

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)#

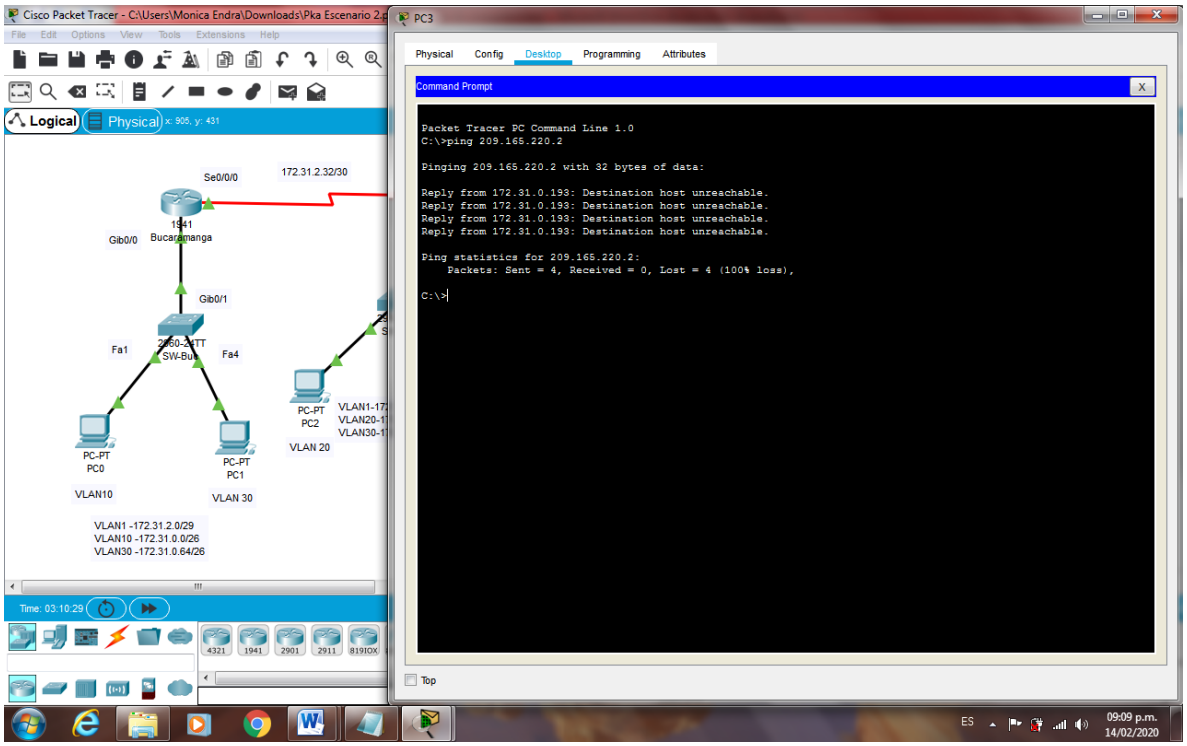

Ilustración 35 Comprobación ping VLAN 30 (PC3 a Servidor Externo) Se niega el acceso

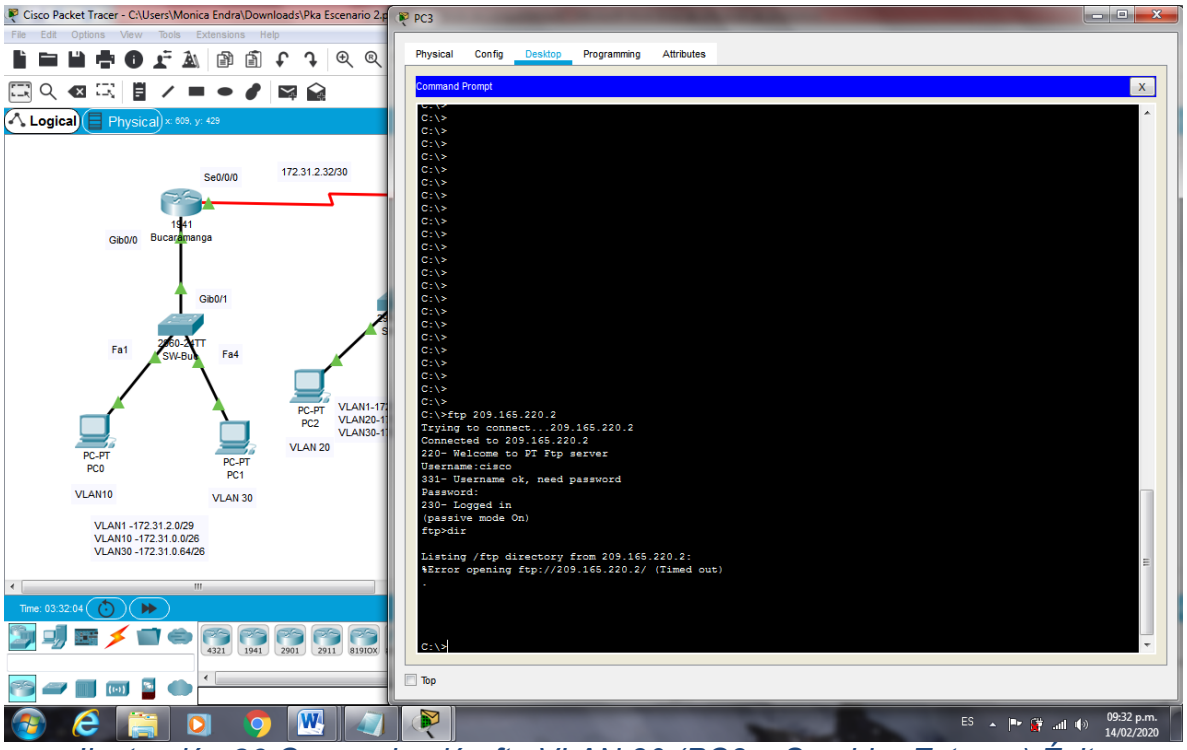

Ilustración 36 Comprobación ftp VLAN 30 (PC3 a Servidor Externo) Éxito

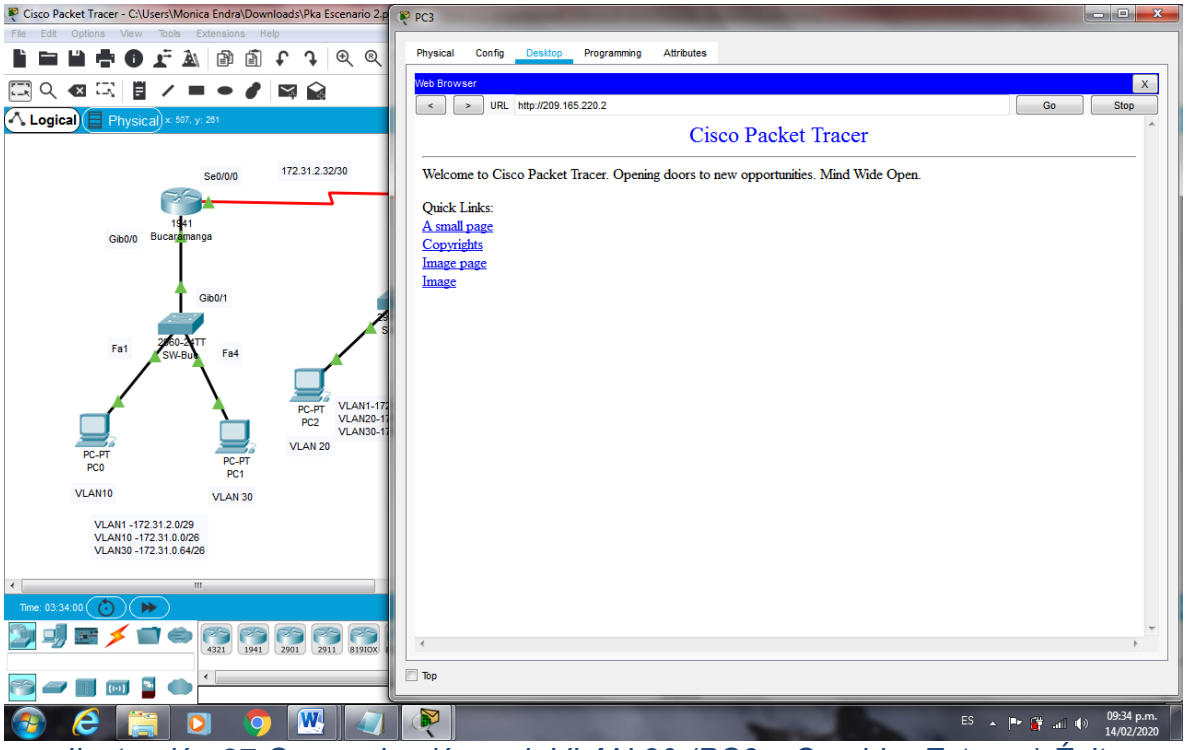

Ilustración 37 Comprobación web VLAN 30 (PC3 a Servidor Externo) Éxito

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

```
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)#
```

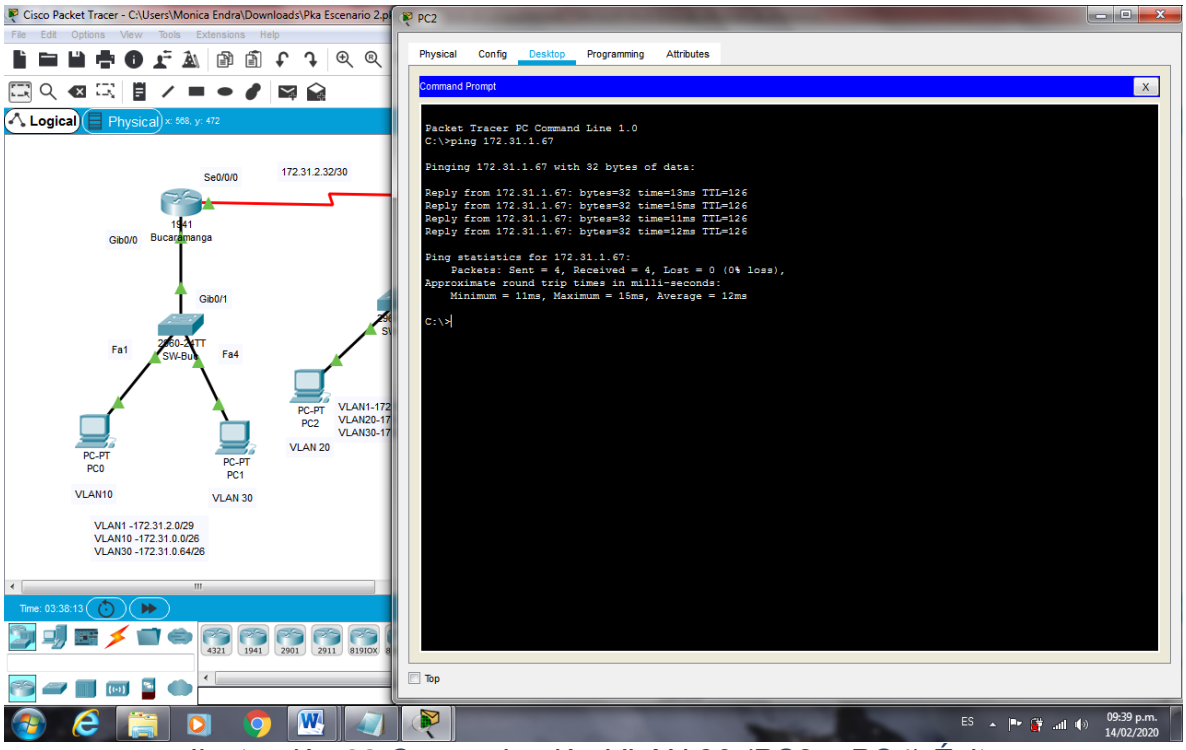

Ilustración 38 Comprobación VLAN 20 (PC2 a PC4) Éxito

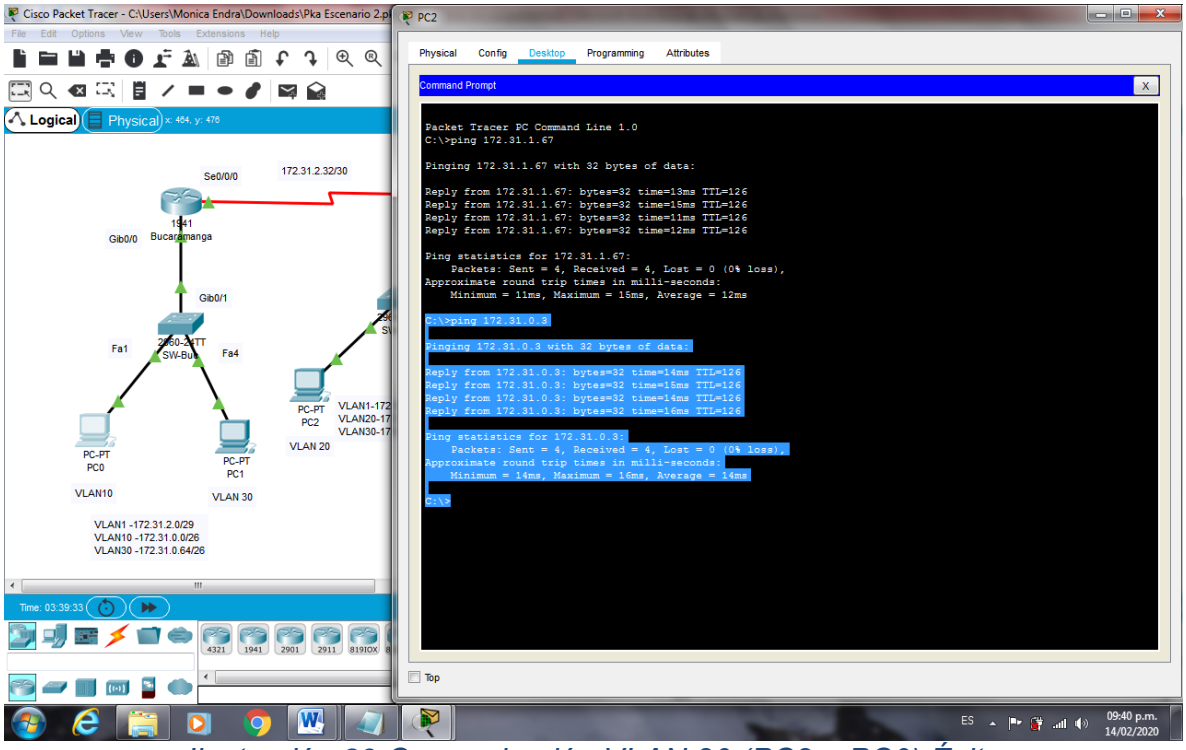

Ilustración 39 Comprobación VLAN 20 (PC2 a PC0) Éxito

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

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)#

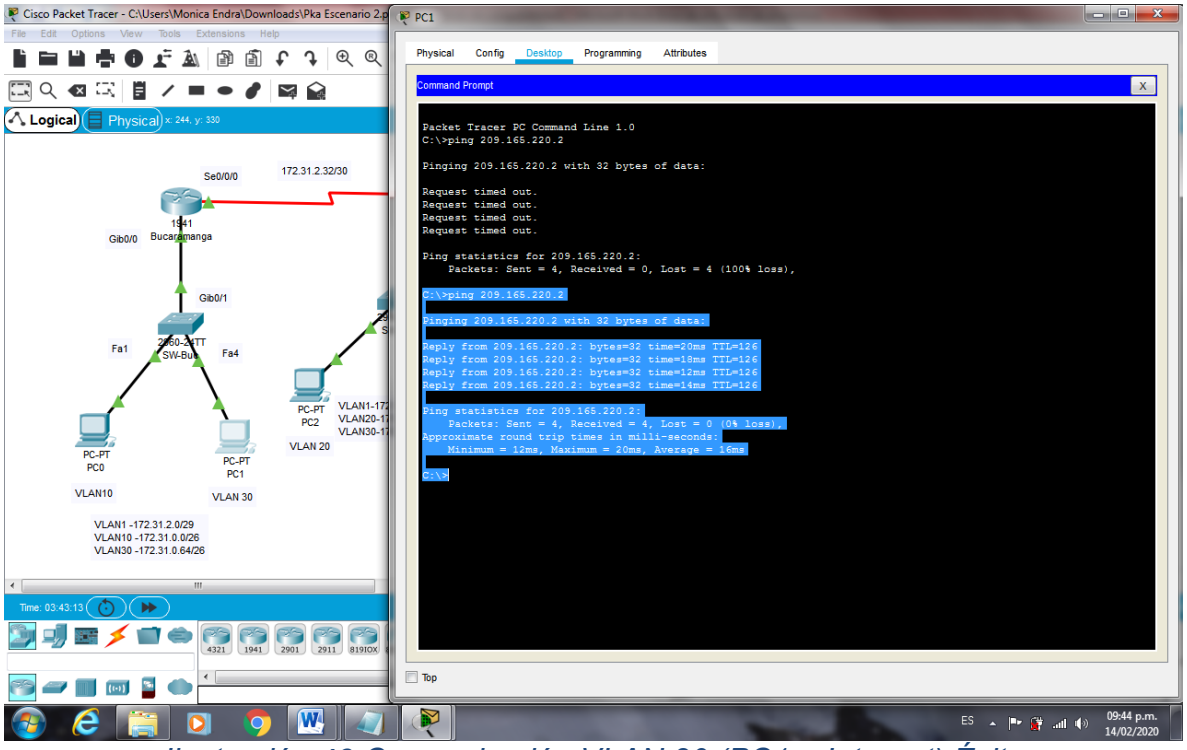

Ilustración 40 Comprobación VLAN 30 (PC1 a Internet) Éxito

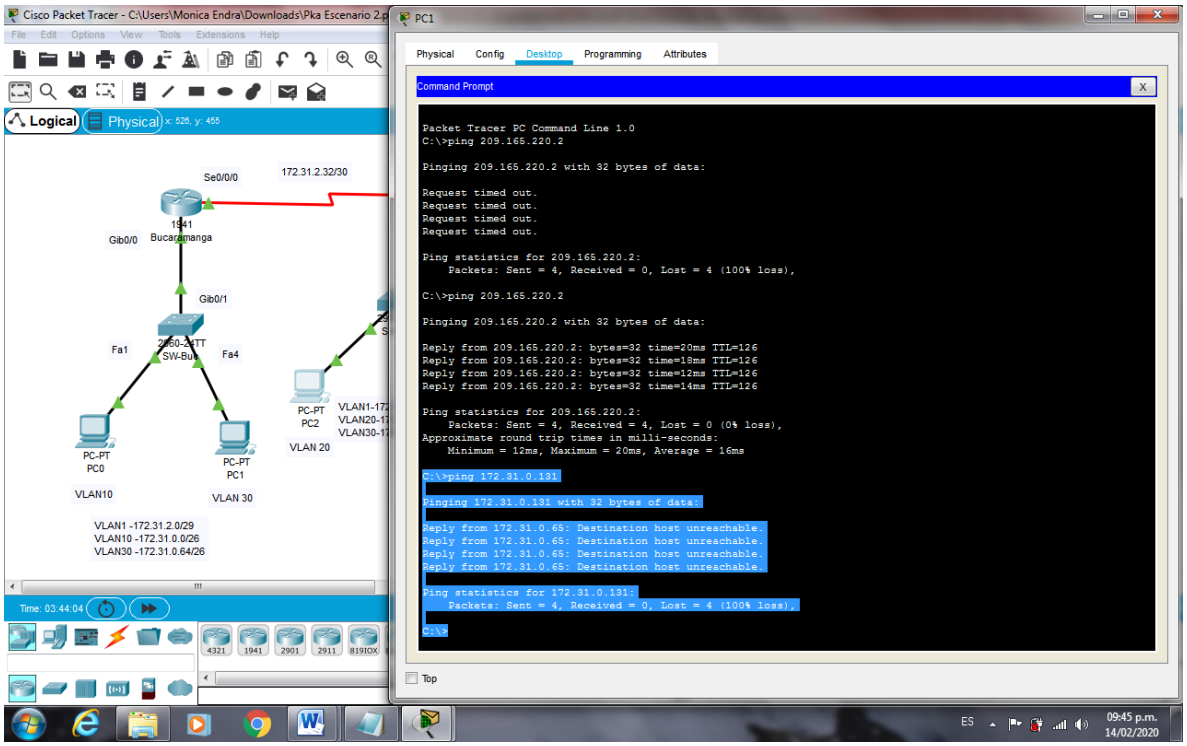

Ilustración 41 Comprobación VLAN 30 (PC1 a PC2) Se niega el acceso

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

```
Bucaramanga(config)#access-list 102 permit ip 172.31.0.0 0.0.0.63 172.31.1.64
0.0.0.63
Bucaramanga(config)#access-list 102 permit ip 172.31.0.0 0.0.0.63 172.31.0.128
0.0.0.63
Bucaramanga(config)#int g0/0.10
Bucaramanga(config-subif)#ip access-group 102 in
Bucaramanga(config-subif)#
```

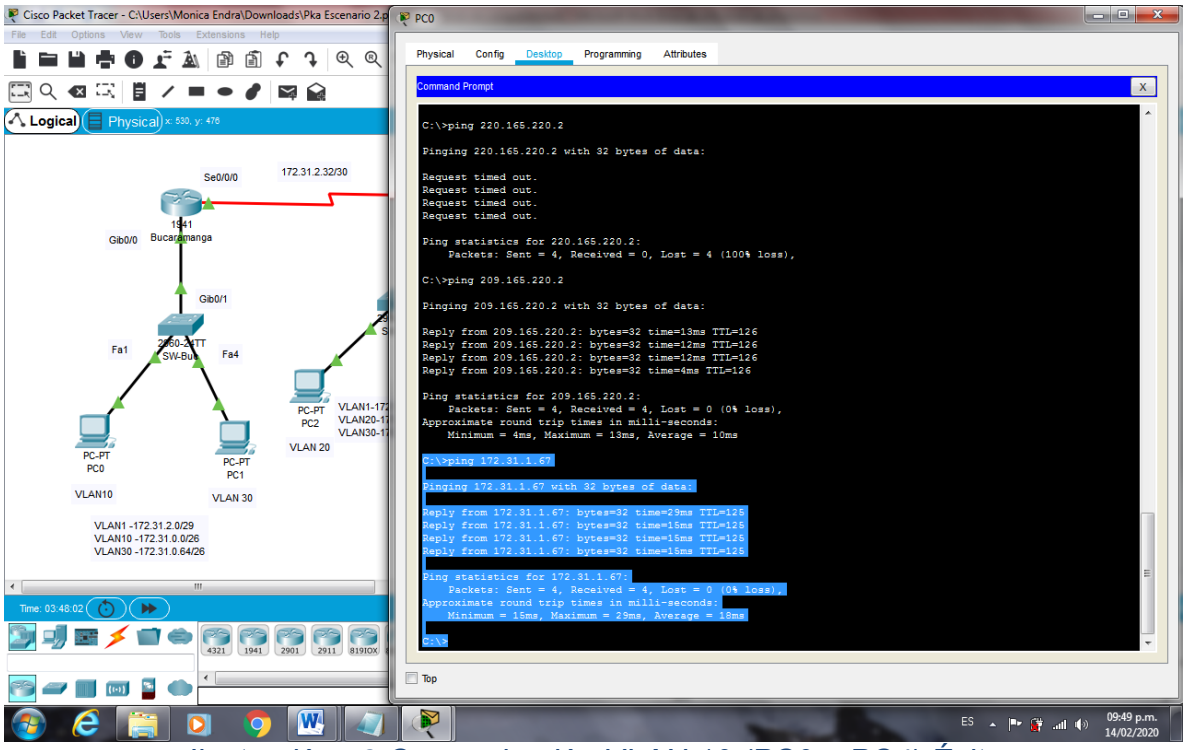

Ilustración 42 Comprobación VLAN 10 (PC0 a PC4) Éxito

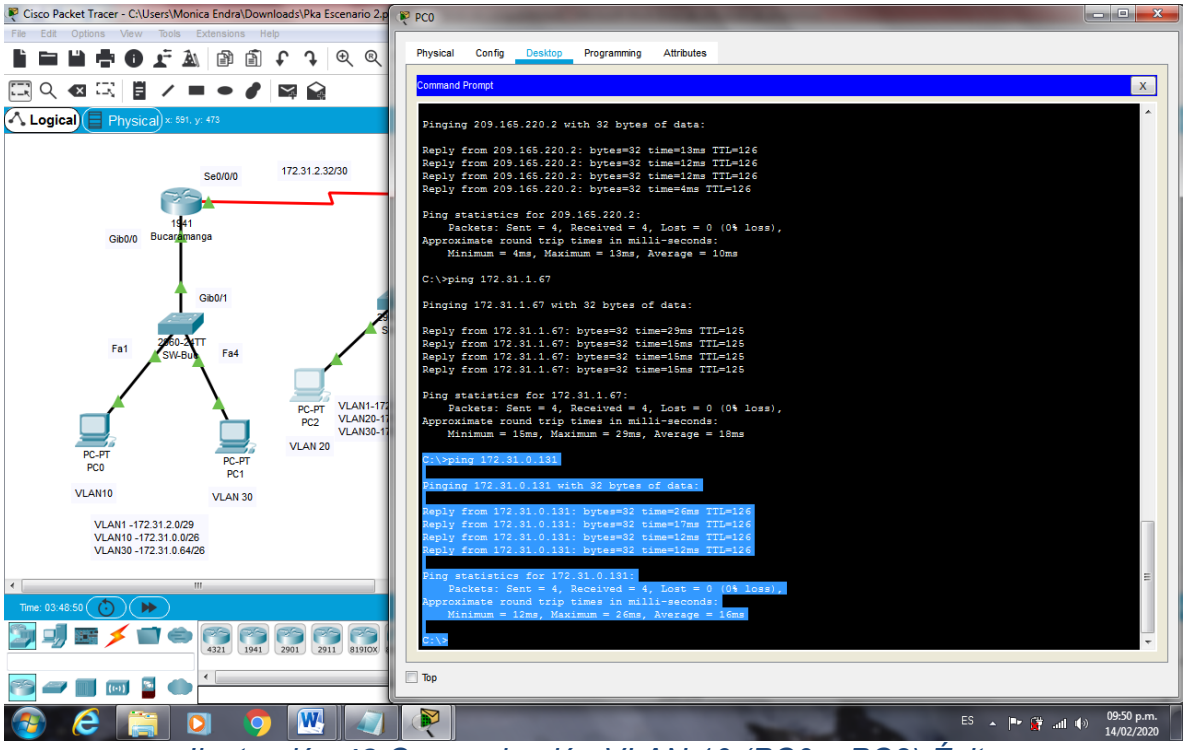

Ilustración 43 Comprobación VLAN 10 (PC0 a PC2) Éxito

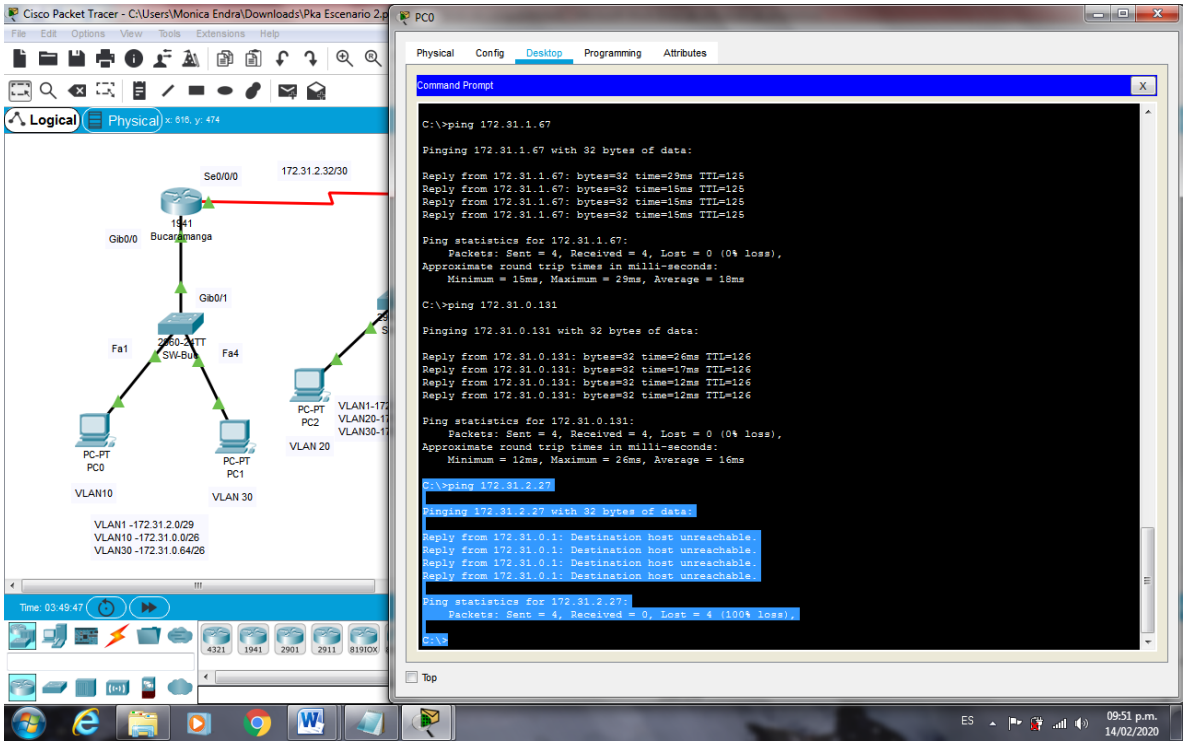

Ilustración 44 Comprobación VLAN 10 (PC0 a Web Interno) Se niega el acceso

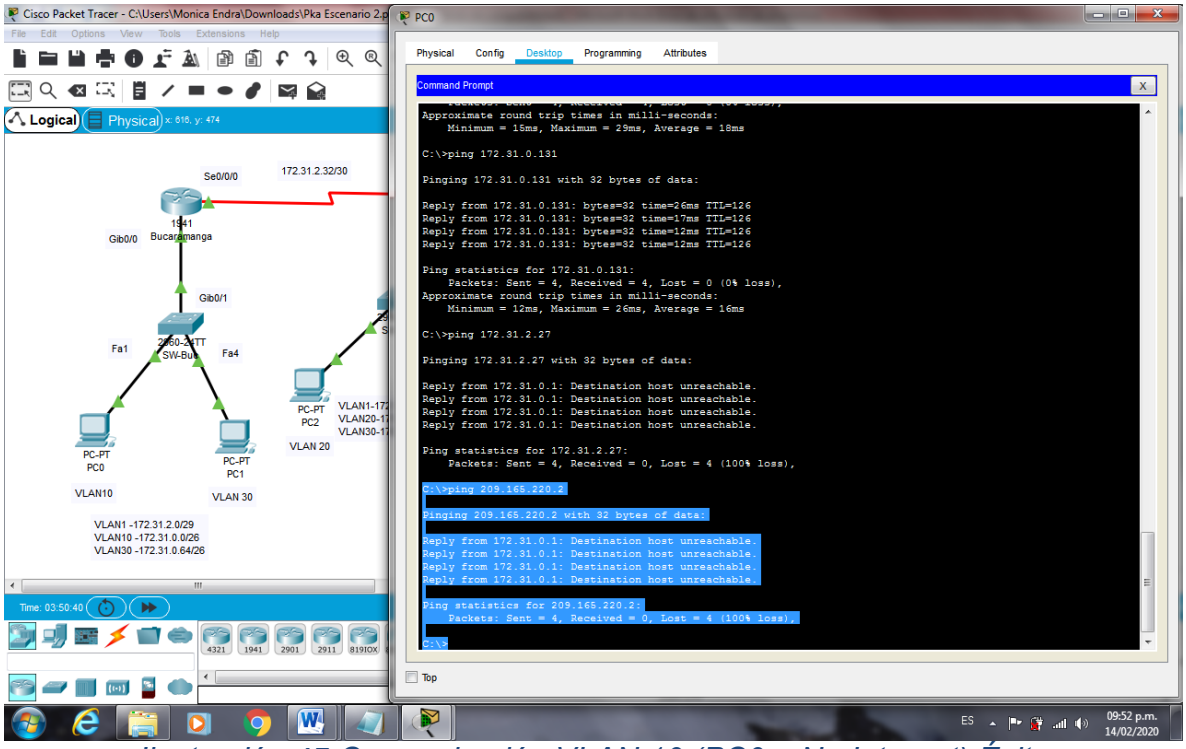

Ilustración 45 Comprobación VLAN 10 (PC0 a No Internet) Éxito

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

```
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 out
Bucaramanga(config-subif)#

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 103 out
Tunja(config-subif)#

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)#
```

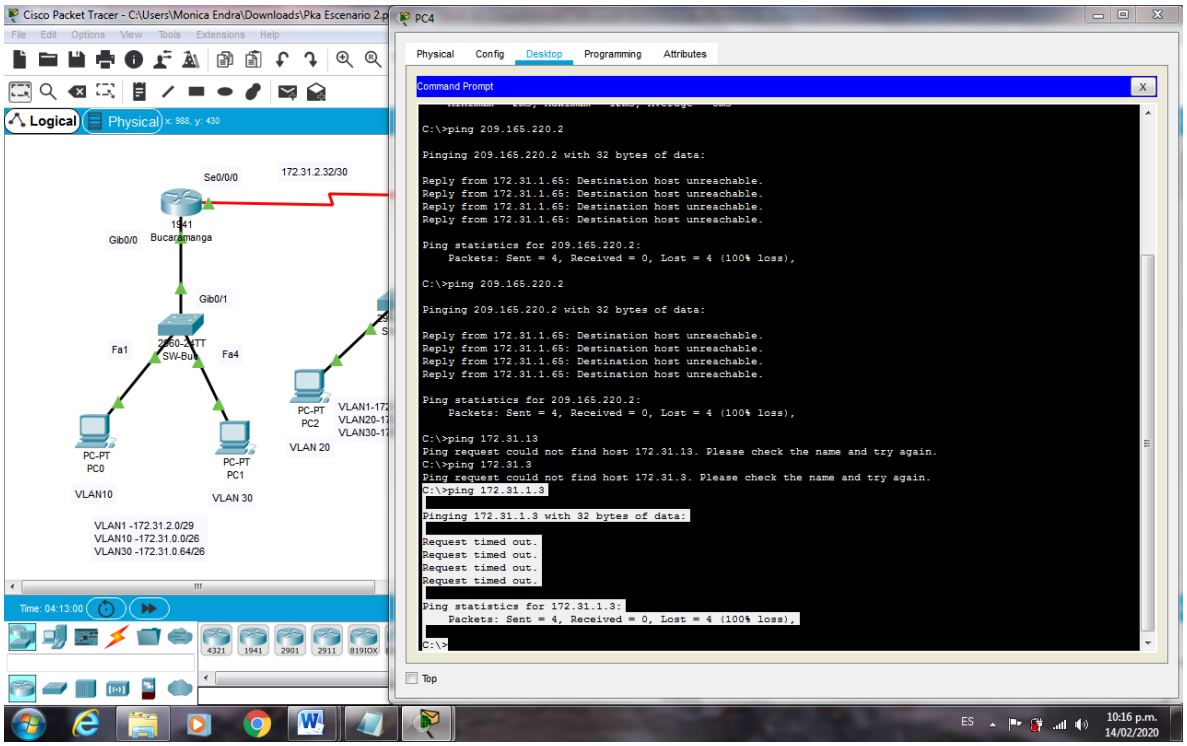

Ilustración 46 Comprobación una VLAN no pueden acceder a los de otra VLAN (PC4 a PC5) Éxito

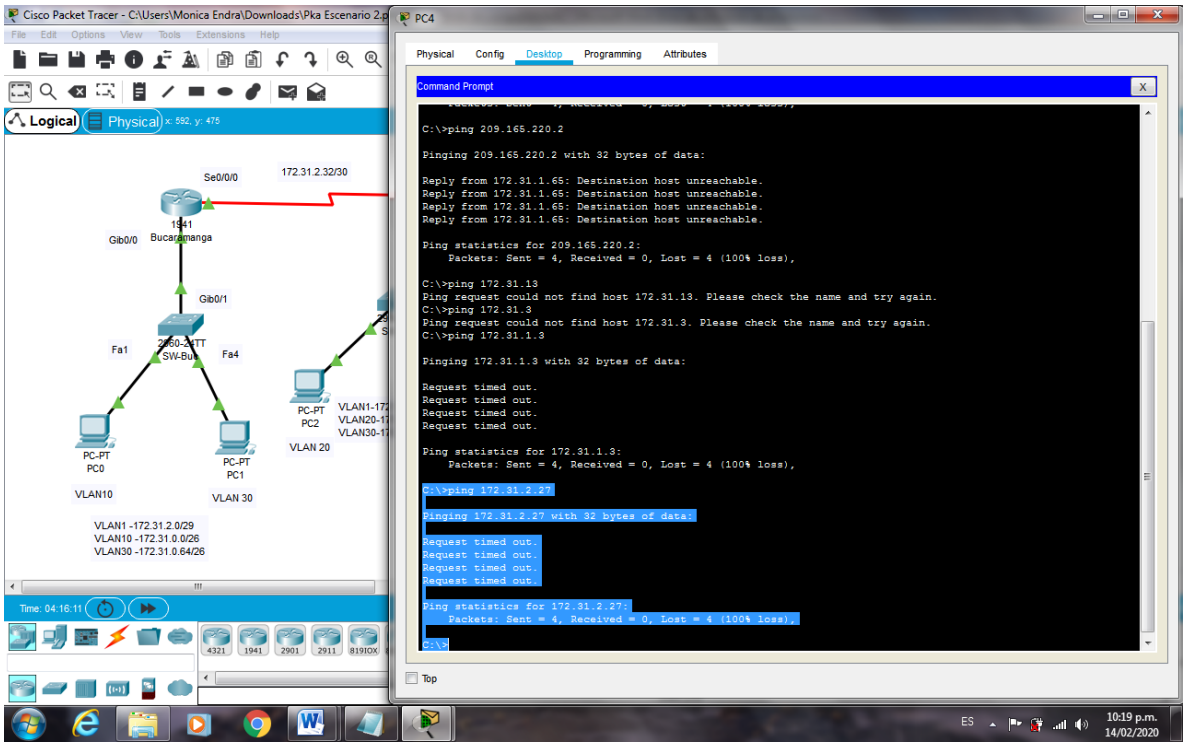

Ilustración 47 Comprobación una VLAN no pueden acceder a los de otra VLAN (PC4 a Web Interno) Éxito

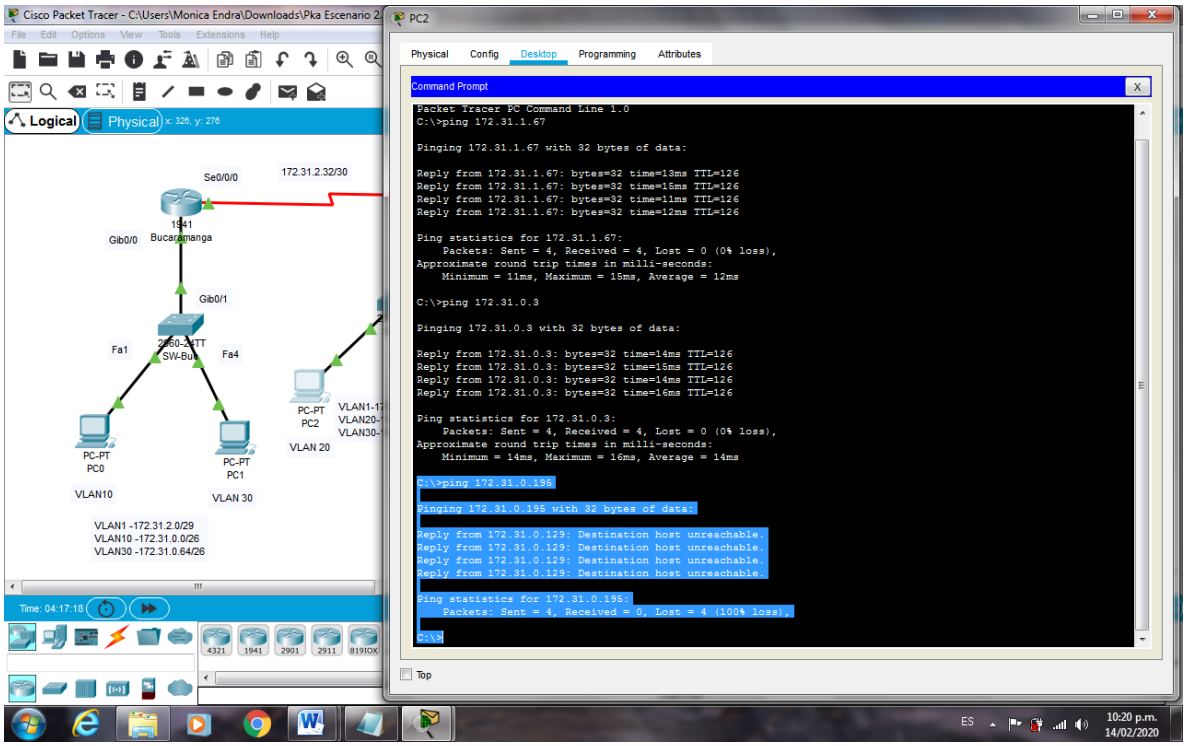

Ilustración 48 Comprobación una VLAN no pueden acceder a los de otra VLAN (PC2 a PC3) Éxito

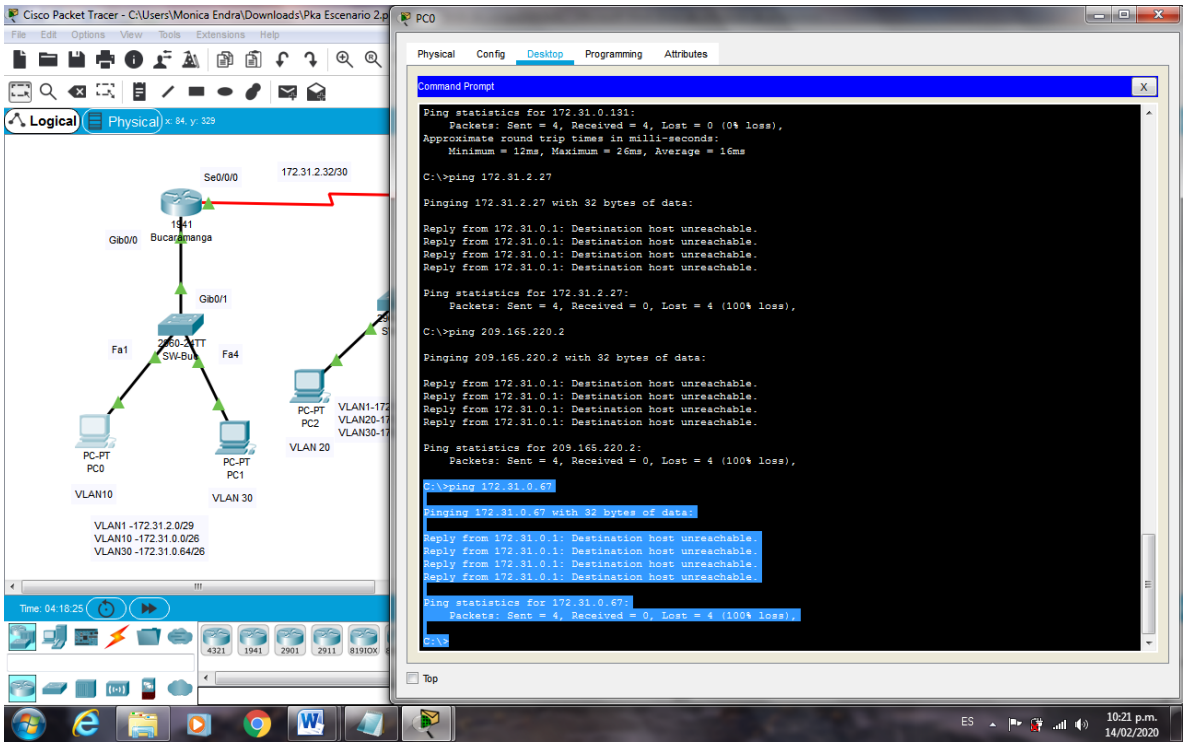

Ilustración 49 Comprobación una VLAN no pueden acceder a los de otra VLAN (PC0 a PC1) Éxito

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

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)#

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)#

Cundinamarca(config-subif)#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)#

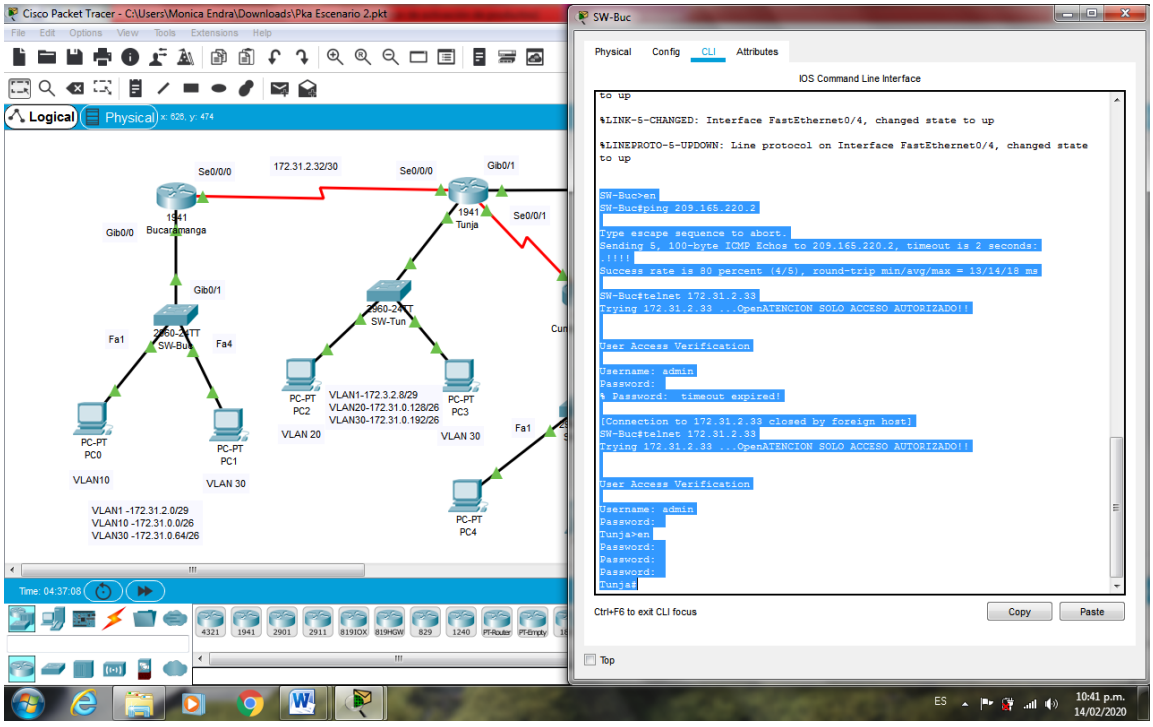

Ilustración 50 Comprobación VLAN administrativas y de la VLAN de servidores tienen accedo a los routers e internet (SW-Buc a Tunja) Éxito

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

- 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

9. CONCLUSIONES

- El uso de protocolos de enrutamiento dinámico nos permite el aprendizaje de la topología de red por la cual estemos pasando y la cantidad de saltos posibles para alcanzar un destino.

- Como elemento de seguridad el uso de Vlan nos permite la segmentación adecuada de una red limitando el acceso a los recursos que sean absolutamente necesarios.

- Se debe poseer especial cuidado al momento de implementar un esquema de red usando el protocolo VTP ya que al ser el aprendizaje de Vlan dinámico, la introducción de un nuevo Switch con un número de revisión más alto puede afectar el funcionamiento y generar indisponibilidad.

- En un ambiente empresarial de alta envergadura donde la disponibilidad de los servicios posee una alta demanda se hace necesaria la implementación de soluciones redundantes donde soluciones como HSRP para los Router y Etherchanne aparecen como alternativas eficientes para dar solución a esta necesidad.

10. BIBLIOGRAFÍA

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