

UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA

Tarea 11 – Prueba de habilidades técnicas  
Diplomado de profundización Cisco 203092

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Informe final pruebas de habilidades CCNA

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## RESUMEN

Dentro del programa de formación Cisco CCNA se tocan los aspectos principales de la operación, configuración y diagnóstico de las redes LAN y WAN. Este trabajo ha sido desarrollado utilizando todo el conocimiento adquirido a través del curso, llevándolos a la práctica por medio de dos laboratorios prácticos que plantean topologías de red similares a las encontradas en entornos de producción.

Para el desarrollo de las mismas se ha tenido que poner en práctica conocimientos básicos para el diseño de redes (direccionamiento IP, dimensionamiento de equipos, tipos de conectividad), así como el desarrollo de protocolos de enrutamiento, y servicios de redes para usuarios finales (DNS, DHCP, ARP).

A nivel de capa 2 se han puesto en práctica conceptos de segmentación virtual de switches (VLAN), así como los aspectos más importantes del protocolo 802.1Q, configurando interfaces de acceso y troncales.

A nivel de seguridad se han puesto en práctica los protocolos de seguridad del plano de control de los equipos (bloqueo de sesiones, AAA, niveles de autenticación, banner de ingreso, seguridad en líneas de acceso), como seguridad en el plano de datos (listas de acceso estándar y extendidas, NAT dinámico y estático para la publicación de servidores).

Se realizaron todas las configuraciones solicitadas en los laboratorios, tomando evidencia de cada paso realizado hasta llegar a las configuraciones finales (agregadas en el apéndice – configuraciones finales).

## ABSTRACT

The Cisco CCNA education program includes main aspects about operating, configure and troubleshooting LAN and WAN networks. This inform has been developed using the acquired knowledge through the course, putting in practice through both practical labs that includes logical topologies close enough to the environment founded in production networks.

In order to develop the practical labs has been necessary put in practice basical knowledge for network design (IP protocol, devices sizing, link types), also the configuration and operation of routing protocols, and network services for end users (DNS, DHCP, ARP).

For layer 2 services has been in practice basical concepts for virtual segmentation of switches (VLAN), also the main factors of 802.1Q protocol, configuring trunks and Access ports.

For security has been configuring security protocols for the control plane of the devices (sesión blocking, AAA, authentication levels, banner MOTD, remote Access security), as well as security in the data plane (extended and standard access list, dynamic and static NAT for internet connection and public servers).

All the configurations required in the practical guide have been done, taking evidence in every step until complete the final configurations (includes in the appendix chapter).

## INTRODUCCION

La tecnología se ha convertido en un elemento habilitador del core de negocio de diferentes compañías, ha pasado de ser concebida de como un gasto a una inversión, cada día más las compañías entienden la necesidad no solo de contar con tecnología avanzada, sino con servicios maduros en diferentes aspectos (conectividad, movilidad, seguridad), así como con servicios de ingeniería que enfoquen el desarrollo de los servicios en garantizar la continuidad y el crecimiento del negocio.

Dentro de este marco se establece como necesidad perentoria el contar con ingenieros que sean capaces de aportar tanto en el conocimiento técnico de las soluciones, así como en la concepción del uso de toda esta tecnología en función del crecimiento de las compañías, lo que convierte a los equipos de TI no solo en los responsables de conocer las tecnologías de punta, sino también poder identificar las más adecuadas en costo-eficiencia para sus propias compañías, que sean capaces de usar la tecnología como un habilitador de servicios.

Este informe ha sido desarrollado buscando mostrar el crecimiento de estos dos aspectos por medio del curso Cisco CCNA, en el cual se habilita a los participantes en el propósito de diseñar, construir, operar y resolver problemas en entornos de networking reales, así como en la capacidad de dimensionar y entender los servicios principales en las redes actuales, teniendo en cuenta protocolos emergentes como IPv6, habilitantes de nuevos servicios en arquitecturas IoT, así como entornos de transformación digital.

## OBJETIVOS

Los objetivos generales de este informe se definen a continuación:

- Establecer los parámetros necesarios para el diseño de redes LAN, incluyendo la construcción de topologías físicas, definición de plataformas en función de las necesidades (interfaces, throughput, licenciamiento, módulos, fabricantes, etc).
- Entender los requerimientos generales de una arquitectura de red, y establecer las configuraciones necesarias para ofrecer los servicios en función de las necesidades expresadas por el cliente final.
- Demostrar el conocimiento de los protocolos de enrutamiento, direccionamiento IP, servicios de usuario final como DNS y DHCP, así como la gestión de redes virtuales en los switches, estableciendo troncales y segmentación de puertos de acceso.
- Definir la mejor estrategia de seguridad en función de los requerimientos del cliente, estableciendo puntos de control en los equipos, comprendiendo el flujo del tráfico y permitiendo que solamente circulen sobre la red los servicios necesarios.
- Entender la necesidad de hacer endurecimiento del plano de control de los equipos, asegurando que solo las áreas y responsables indicados tengan el acceso asegurado a la gestión de los equipos.
- Aumentar las destrezas en el manejo de la consola de configuración de los equipos, comprendiendo los niveles de acceso, protocolos configurables y opciones permitidas.

## DESARROLLO DE LA GUIA

### ESCENARIO 1

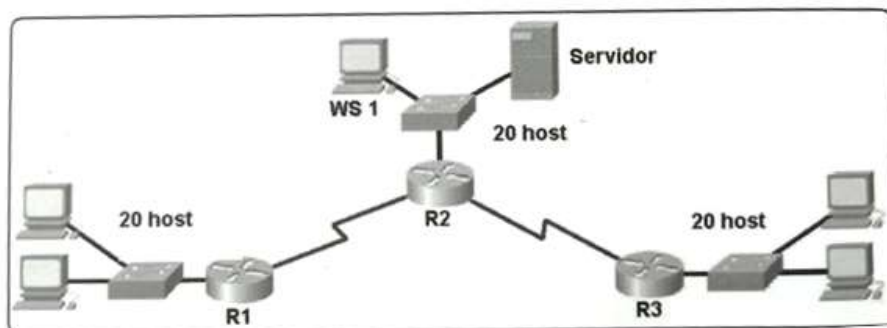
#### PLANTEAMIENTO DEL PROBLEMA

De acuerdo a la guía el escenario 1 plantea el siguiente esquema: 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. 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

El grafico ilustrativo sugerido por la guía es el siguiente:

*Ilustración 1. Topología sugerida*



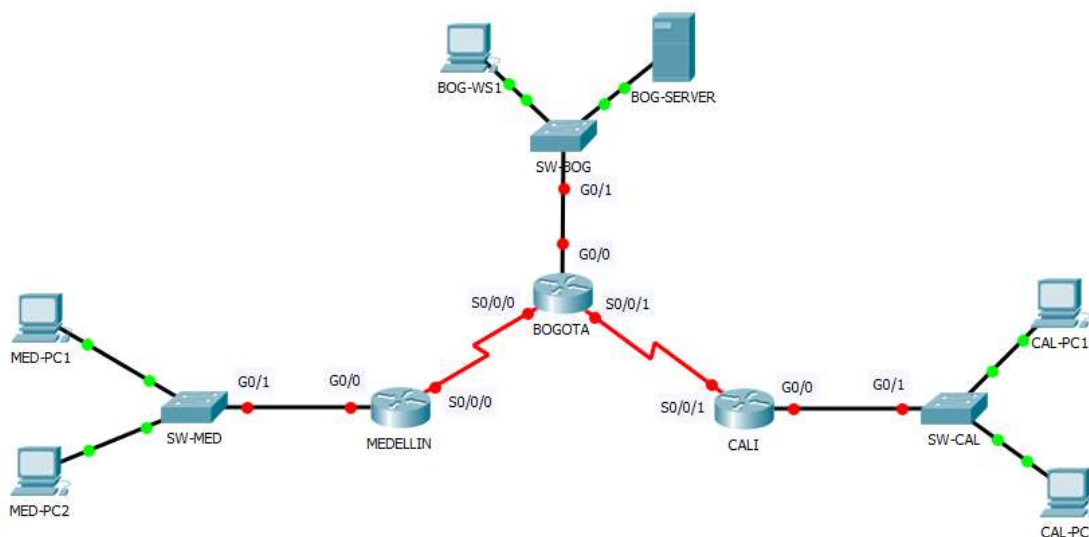
## DESARROLLO

Para el desarrollo del laboratorio se hará uso del simulador Packet tracer versión 7.1.1.0138, después de hacer una validación previa de los pasos a desarrollar en la guía se concluye que todos son configurables en la aplicación. Se construye la topología de acuerdo a la guía usando los siguientes componentes:

- Como routers se usaron equipos ISR2 de referencia 2911, para las conexiones WAN se insertaron tarjetas HWIC-2T en los slots HWIC0.
- Para los switches LAN de cada sede se usaron equipos Cisco Catalyst 2960 con 24 puertos LAN.
- Para los endpoint de cada sede se usaron los PC genéricos del ambiente de simulación.
- Para el servidor de Bogotá se usó un servidor genérico del ambiente de simulación.

El siguiente grafico ilustra os componentes de la topología y las conexiones realizadas:

*Ilustración 2. Topología packet tracer*



Con la topología construida y la definición de interfaces se procede con los siguientes puntos de la guía.

## PARTE 1 – ASIGNACION DE DIRECCIONES IP

La topología requiere 5 segmentos de red distintos, organizados así:

- Red LAN router R1 (Medellín) – 20 host
- Red LAN router R2 (Bogotá) – 20 host
- Red LAN router R3 (Cali) – 20 host
- Conexión punto a punto R1 a R2 – 2 host
- Conexión punto a punto R2 a R3 - 2 host

Para la definición de los segmentos se tomaron las siguientes premisas:

- La guía sugiere un subneting de 8 segmentos.
- Se definirá el segmento de red privada 172.16.20.0/24 como base para el direccionamiento IP de toda la red.

Aunque en entornos prácticos la sugerencia para los enlaces punto a punto es cerrar con la máscara de subred específicamente la cantidad de IPs necesaria (2 cuando son solo 2 routers o 6 para ambientes de alta disponibilidad con protocolos como HSRP o VRRP), para la guía se tomara uno de los 8 segmentos creados, la tabla de subneting del segmento elegido es:

Tabla 1. distribución segmentos de red Escenario 1

SUBRED	CANTIDAD HOST	ASIGNACION
172.16.20.0/27	30	Red LAN R2 (Bogotá)
172.16.20.32/27	30	Red LAN R2 (Medellín)
172.16.20.64/27	30	Red LAN R3 (Cali)
172.16.20.96/27	30	Red P2P Bog – Med
172.16.20.128/27	30	Red P2P Bog - Cal
172.16.20.160/27	30	Libre
172.16.20.192/27	30	Libre
172.16.20.224/27	30	Libre

## PARTE 2 – CONFIGURACION BASICA

En esta segunda parte se harán las configuraciones relacionadas al plano de control de los equipos, asignación de direccionamiento IP y otros parámetros básicos para proveer de conectividad básica a todos los dispositivos, los protocolos y servicios a configurar en esta segunda parte son:

- Hostname de equipos
- Configuración de banner MOTD
- Configuración de acceso por consola y remoto
- Configuración DHCP server para cada segmento LAN.
- Configuración interfaces LAN y seriales para conectividad.
- Habilitación CDP
- Como premisa se configurará usuario local de nivel 15 Administrador, password 4dm1n1str4d0r y password de enable 4dm1n1str4d0r.

Antes de proceder con la configuración se define la asignación de IPs para cada dispositivo de acuerdo a la definición de segmentos de red de la tabla 1:

Tabla 2. Asignación IPs Escenario 1

HOSTNAME	INT	DIRECCION IP	MASCARA	UBICACIÓN
MED-ROUTER	SE 0/0/0	172.16.20.98	/27	MEDELLIN
	G 0/0	172.16.20.33	/27	MEDELLIN
MED-SW	VLAN1	172.16.20.34	/27	MEDELLIN
MED-PC1	FE0	DHCP	DHCP	MEDELLIN
MED-PC2	FE0	DHCP	DHCP	MEDELLIN
BOG-ROUTER	SE0/0/0	172.16.20.97	/27	BOGOTA
	SE0/0/1	172.16.20.129	/27	BOGOTA
	G0/0	172.16.20.1	/27	BOGOTA
BOG-SW	VLAN1	172.160.20.2	/27	BOGOTA
BOG-SERVER	FE0	172.16.20.3	/27	BOGOTA
BOG-WS1	FE0	172.16.20.4	/27	BOGOTA
CAL-ROUTER	SE 0/0/1	172.16.20.130	/27	CALI
	G 0/0	172.16.20.65	/27	CALI
CAL-SW	VLAN1	172.16.20.66	/27	CALI
CAL-PC1	FE0	DHCP	DHCP	CALI
CAL-PC2	FE0	DHCP	DHCP	CALI

Esta configuración se realizará en los 3 routers, a continuación, se presentan las plantillas resultantes de la configuración en cada uno de los 3 equipos:

Tabla 3. configuración routers Escenario 1

ROUTER	SERVICIO	COMANDOS
MEDELLIN	Hostname	hostname MED-ROUTER !
	Banner MOTD	banner motd ^C *****ADVERTENCIA***** * * La administracion de este dispositivo esta restringido * * y solamente es administrado por personal de TI de la * * compania, abstengase de ingresar a este sistema. * * *****^C !
	Acceso admón.	username Administrador privilege 15 secret 5 \$1\$mERr\$W0B5Pu7Ns/uUv94a1WJl.0 ! ip ssh version 2 no ip domain-lookup ip domain-name unad.edu.co ! ! line con 0 logging synchronous login local ! line aux 0 ! line vty 0 4 logging synchronous login local line vty 5 15 logging synchronous login local
	DHCP	! ip dhcp excluded-address 172.16.20.33 172.16.20.34 ! ip dhcp pool POOL_LAN_MED network 172.16.20.32 255.255.224 default-router 172.16.20.33 dns-server 172.16.20.3 !
	Configuración interfaces	interface GigabitEthernet0/0 description CONEXION_LAN_MED ip address 172.16.20.33 255.255.255.224 duplex auto speed auto ! interface GigabitEthernet0/1 no ip address duplex auto speed auto shutdown ! interface Serial0/0/0 description CONEXION_MED_BOG ip address 172.16.20.98 255.255.255.224 ! interface Serial0/0/1 no ip address clock rate 2000000 shutdown
BOGOTA	Hostname	! hostname BOG-ROUTER
	Banner MOTD	! banner motd ^C *****ADVERTENCIA***** * * La administracion de este dispositivo esta restringido * * y solamente es administrado por personal de TI de la * * compania, abstengase de ingresar a este sistema. * * *****^C

	Acceso admón.	<pre>! username Administrador privilege 15 secret 5 \$1\$mERr\$WOB5Pu7Ns/uUv94a1WJl.0 ! ! ip ssh version 2 no ip domain-lookup ip domain-name unad.edu.co ! line con 0  logging synchronous  login local ! line aux 0 ! line vty 0 4  logging synchronous  login local line vty 5 15  logging synchronous  login local !</pre>
	DHCP	<pre>! ip dhcp excluded-address 172.16.20.1 172.16.20.4 ! ip dhcp pool POOL_LAN_BOG  network 172.16.20.0 255.255.255.224  default-router 172.16.20.1  dns-server 172.16.20.3 !</pre>
	Configuración interfaces	<pre>! interface GigabitEthernet0/0  description CONEXION_LAN_BOG  ip address 172.16.20.1 255.255.255.224  duplex auto  speed auto ! interface GigabitEthernet0/1  no ip address  duplex auto  speed auto  shutdown ! interface GigabitEthernet0/2  no ip address  duplex auto  speed auto  shutdown ! interface Serial0/0/0  description CONEXION_BOG_MED  ip address 172.16.20.97 255.255.255.224  clock rate 128000 ! interface Serial0/0/1  description CONEXION_BOG_CAL  ip address 172.16.20.129 255.255.255.224  clock rate 128000 !</pre>
CALI	Hostname	<pre>! hostname CAL-ROUTER !</pre>
	Banner MOTD	<pre>! banner motd ^C *****ADVERTENCIA***** * * La administracion de este dispositivo esta restringido * * y solamente es administrado por personal de TI de la * * compania, abstengase de ingresar a este sistema. * * *****^C !</pre>

	Acceso admón.	<pre> ! username Administrador privilege 15 secret 5 \$1\$mERr\$W0B5Pu7Ns/uUv94a1WJl.0 ! ! ip ssh version 2 no ip domain-lookup ip domain-name unad.edu.co ! ! line con 0  logging synchronous  login local ! ! line aux 0 ! ! line vty 0 4  logging synchronous  login local line vty 5 15  logging synchronous  login local ! ! </pre>
	DHCP	<pre> ! ip dhcp excluded-address 172.16.20.65 172.16.20.66 ! ip dhcp pool POOL_LAN_CAL  network 172.16.20.64 255.255.255.224  default-router 172.16.20.65  dns-server 172.16.20.3 ! </pre>
	Configuración interfaces	<pre> interface GigabitEthernet0/0  description CONEXION_LAN_CAL  ip address 172.16.20.65 255.255.255.224  duplex auto  speed auto ! interface GigabitEthernet0/1  no ip address  duplex auto  speed auto  shutdown ! interface GigabitEthernet0/2  no ip address  duplex auto  speed auto  shutdown ! interface Serial0/0/0  no ip address  clock rate 2000000  shutdown ! interface Serial0/0/1  description CONEXION_CAL_BOG  ip address 172.16.20.130 255.255.255.224 ! </pre>

Aunque entre los comandos en la tabla 3 no aparecen, para habilitar SSHv2 fue necesario crear una llave RSA, en el caso del laboratorio se creó una llave de uso general con un módulo de 1024; adicional a esto se habilito de forma global CDP, lo que permitió visibilidad de los neighbors por las interfaces seriales y ethernet de los routers.

Por otro lado, aunque la guía no lo exigía, se definieron IPs para gestión de los switches en las 3 ciudades, así como configuración de administracion:

Tabla 4. Configuración switches - escenario 1

HOSTNAME	CONFIGURACION REALIZADA
SW MEDELLIN	<pre> hostname MED-SW ! ip ssh version 2 no ip domain-lookup ip domain-name unad.edu.co ! username Administrador secret 5 \$1\$mERr\$W0B5Pu7Ns/uUv94a1WJ1.0 ! ! spanning-tree mode pvst spanning-tree extend system-id ! interface Vlan1  ip address 172.16.20.34 255.255.255.224 ! ip default-gateway 172.16.20.33 ! ! ! ! line con 0  logging synchronous  login local ! line vty 0 4  logging synchronous  login local line vty 5 15  logging synchronous  login local ! </pre>
SW BOGOTA	<pre> hostname BOG-SW ! ip ssh version 2 no ip domain-lookup ip domain-name unad.edu.co ! username Administrador secret 5 \$1\$mERr\$W0B5Pu7Ns/uUv94a1WJ1.0 ! ! spanning-tree mode pvst spanning-tree extend system-id ! interface Vlan1  ip address 172.16.20.2 255.255.255.224 ! ip default-gateway 172.16.20.1 ! ! ! ! line con 0  logging synchronous  login local ! line vty 0 4  logging synchronous  login local line vty 5 15  logging synchronous  login local ! </pre>
SW CALI	<pre> hostname CAL-SW ! ip ssh version 2 no ip domain-lookup ip domain-name unad.edu.co ! username Administrador secret 5 \$1\$mERr\$W0B5Pu7Ns/uUv94a1WJ1.0 ! ! spanning-tree mode pvst </pre>

```

spanning-tree extend system-id
!
interface Vlan1
 ip address 172.16.20.66 255.255.255.224
!
 ip default-gateway 172.16.20.65
!
!
!
!
line con 0
 logging synchronous
 login local
!
line vty 0 4
 logging synchronous
 login local
line vty 5 15
 logging synchronous
 login local

```

## REVISION TABLAS DE ENRUTAMIENTO

Una vez finalizada la configuración de interfaces se tomó evidencia de las tablas de enrutamiento, verificando que las redes asociadas a las interfaces directamente conectadas aparecieran en las tablas de enrutamiento:

Tabla 5. tablas de enrutamiento - escenario 1

HOSTNAME	TABLA DE ENRUTAMIENTO
MED-ROUTER	<pre> MED-ROUTER#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  172.16.0.0/16 is variably subnetted, 4 subnets, 2 masks C 172.16.20.32/27 is directly connected, GigabitEthernet0/0 L 172.16.20.33/32 is directly connected, GigabitEthernet0/0 C 172.16.20.96/27 is directly connected, Serial0/0/0 L 172.16.20.98/32 is directly connected, Serial0/0/0 </pre>
BOG-ROUTER	<pre> BOG-ROUTER#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  172.16.0.0/16 is variably subnetted, 6 subnets, 2 masks C 172.16.20.0/27 is directly connected, GigabitEthernet0/0 L 172.16.20.1/32 is directly connected, GigabitEthernet0/0 C 172.16.20.96/27 is directly connected, Serial0/0/0 L 172.16.20.97/32 is directly connected, Serial0/0/0 C 172.16.20.128/27 is directly connected, Serial0/0/1 L 172.16.20.129/32 is directly connected, Serial0/0/1 </pre>

SW CALI	<pre> CAL-ROUTER#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  172.16.0.0/16 is variably subnetted, 4 subnets, 2 masks C   172.16.20.64/27 is directly connected, GigabitEthernet0/0 L   172.16.20.65/32 is directly connected, GigabitEthernet0/0 C   172.16.20.128/27 is directly connected, Serial0/0/1 L   172.16.20.130/32 is directly connected, Serial0/0/1 </pre>
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## DIAGNOSTICO DE VECINOS Y CONECTIVIDAD – ROUTER MEDELLIN

En primer lugar, se hizo ping desde el router de Medellín a sus vecinos (MED-SW y BOG-ROUTER) con los siguientes resultados:

Tabla 6. Pruebas ICMP y CDP - escenario 1

HOSTNAME	PRUEBA	TABLA DE ENRUTAMIENTO
MED-ROUTER	ICMP	<pre> Username: Administrador Password:  MED-ROUTER#ping 172.16.20.34  Type escape sequence to abort. Sending 5, 100-byte ICMP Echos to 172.16.20.34, timeout is 2 seconds: !!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/3 ms  MED-ROUTER#ping 172.16.20.97  Type escape sequence to abort. Sending 5, 100-byte ICMP Echos to 172.16.20.97, timeout is 2 seconds: !!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 1/3/6 ms  MED-ROUTER# </pre>
	CDP	<pre> MED-ROUTER#show cdp neig det  Device ID: BOG-ROUTER Entry address(es):   IP address : 172.16.20.97 Platform: cisco C2900, Capabilities: Router Interface: Serial0/0/0, Port ID (outgoing port): Serial0/0/0 Holdtime: 160  Version : Cisco IOS Software, C2900 Software (C2900-UNIVERSALK9-M), Version 15.1(4)M4, RELEASE SOFTWARE (fc2) Technical Support: http://www.cisco.com/techsupport Copyright (c) 1986-2012 by Cisco Systems, Inc. Compiled Thurs 5-Jan-12 15:41 by pt_team  advertisement version: 2 Duplex: full -----  Device ID: MED-SW Entry address(es):   IP address : 172.16.20.34 </pre>

		<pre>Platform: cisco 2960, Capabilities: Switch Interface: GigabitEthernet0/0, Port ID (outgoing port): GigabitEthernet0/1 Holdtime: 145  Version : Cisco IOS Software, C2960 Software (C2960-LANBASE-M), Version 12.2(25)FX, RELEASE SOFTWARE (fc1) Copyright (c) 1986-2005 by Cisco Systems, Inc. Compiled Wed 12-Oct-05 22:05 by pt_team  advertisement version: 2 Duplex: full</pre>
BOG-ROUTER	ICMP	<pre>Username: Administrador Password:  BOG-ROUTER#ping 172.16.20.2  Type escape sequence to abort. Sending 5, 100-byte ICMP Echos to 172.16.20.2, timeout is 2 seconds: !!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms  BOG-ROUTER#ping 172.16.20.98  Type escape sequence to abort. Sending 5, 100-byte ICMP Echos to 172.16.20.98, timeout is 2 seconds: !!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/8 ms  BOG-ROUTER#ping 172.16.20.130  Type escape sequence to abort. Sending 5, 100-byte ICMP Echos to 172.16.20.130, timeout is 2 seconds: !!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/9 ms  ER#</pre>
	CDP	<pre>BOG-ROUTER#show cdp neig det  Device ID: MED-ROUTER Entry address(es):   IP address : 172.16.20.98 Platform: cisco C2900, Capabilities: Router Interface: Serial0/0/0, Port ID (outgoing port): Serial0/0/0 Holdtime: 123  Version : Cisco IOS Software, C2900 Software (C2900-UNIVERSALK9-M), Version 15.1(4)M4, RELEASE SOFTWARE (fc2) Technical Support: http://www.cisco.com/techsupport Copyright (c) 1986-2012 by Cisco Systems, Inc. Compiled Thurs 5-Jan-12 15:41 by pt_team  advertisement version: 2 Duplex: full -----  Device ID: CAL-ROUTER Entry address(es):   IP address : 172.16.20.130 Platform: cisco C2900, Capabilities: Router Interface: Serial0/0/1, Port ID (outgoing port): Serial0/0/1 Holdtime: 149  Version : Cisco IOS Software, C2900 Software (C2900-UNIVERSALK9-M), Version 15.1(4)M4, RELEASE SOFTWARE (fc2) Technical Support: http://www.cisco.com/techsupport Copyright (c) 1986-2012 by Cisco Systems, Inc. Compiled Thurs 5-Jan-12 15:41 by pt_team  advertisement version: 2 Duplex: full -----</pre>

		<pre> Device ID: BOG-SW Entry address(es):   IP address : 172.16.20.2 Platform: cisco 2960, Capabilities: Switch Interface: GigabitEthernet0/0, Port ID (outgoing port): GigabitEthernet0/1 Holdtime: 162  Version : Cisco IOS Software, C2960 Software (C2960-LANBASE-M), Version 12.2(25)FX, RELEASE SOFTWARE (fc1) Copyright (c) 1986-2005 by Cisco Systems, Inc. Compiled Wed 12-Oct-05 22:05 by pt_team  advertisement version: 2 Duplex: full </pre>
CAL-ROUTER	ICMP	<pre> Username: Administrador Password:  CAL-ROUTER#ping 172.16.20.66  Type escape sequence to abort. Sending 5, 100-byte ICMP Echos to 172.16.20.66, timeout is 2 seconds: !!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/3 ms  CAL-ROUTER#ping 172.16.20.129  Type escape sequence to abort. Sending 5, 100-byte ICMP Echos to 172.16.20.129, timeout is 2 seconds: !!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 1/3/9 ms  CAL-ROUTER# </pre>
	CDP	<pre> CAL-ROUTER#show cdp neig det  Device ID: BOG-ROUTER Entry address(es):   IP address : 172.16.20.129 Platform: cisco C2900, Capabilities: Router Interface: Serial0/0/1, Port ID (outgoing port): Serial0/0/1 Holdtime: 168  Version : Cisco IOS Software, C2900 Software (C2900-UNIVERSALK9-M), Version 15.1(4)M4, RELEASE SOFTWARE (fc2) Technical Support: http://www.cisco.com/techsupport Copyright (c) 1986-2012 by Cisco Systems, Inc. Compiled Thurs 5-Jan-12 15:41 by pt_team  advertisement version: 2 Duplex: full -----  Device ID: CAL-SW Entry address(es):   IP address : 172.16.20.66 Platform: cisco 2960, Capabilities: Switch Interface: GigabitEthernet0/0, Port ID (outgoing port): GigabitEthernet0/1 Holdtime: 153  Version : Cisco IOS Software, C2960 Software (C2960-LANBASE-M), Version 12.2(25)FX, RELEASE SOFTWARE (fc1) Copyright (c) 1986-2005 by Cisco Systems, Inc. Compiled Wed 12-Oct-05 22:05 by pt_team  advertisement version: 2 Duplex: full </pre>

En conclusión, hay completa conectividad y visibilidad entre los routers y sus vecinos, las vecindades de CDP se establecieron correctamente.

## PARTE 3 – CONFIGURACION DE ENRUTAMIENTO

En esta parte del laboratorio se habilita EIGRP como protocolo de enrutamiento, tomando evidencia de las tablas de enrutamiento, tablas de vecinos de EIGRP y pruebas de conectividad.

### CONFIGURACION EIGRP

De acuerdo a la guía se usará el AS 200 para la configuración de las instancias de EIGRP en todos los routers, adicional a esto se habilitará para la dirección completa de la red en uso (172.16.20.0), de tal forma que todas las interfaces que tienen segmentos de red asociados a la red principal participaran de la convergencia del protocolo, la siguiente tabla resume las configuraciones realizadas en cada router:

Tabla 7. Configuración EIGRP – escenario 1

HOSTNAME	CONFIGURACION
MED-ROUTER	<pre> MED-ROUTER(config)# MED-ROUTER(config)#router eigrp 200 MED-ROUTER(config-router)#network 172.16.20.0 0.0.0.255 MED-ROUTER(config-router)#passive-interface gi 0/0 MED-ROUTER(config-router)#exit MED-ROUTER(config)#           </pre>
BOG-ROUTER	<pre> BOG-ROUTER(config)#router eigrp 200 BOG-ROUTER(config-router)#network 172.16.20.0 0.0.0.255 BOG-ROUTER(config-router)# %DUAL-5-NBRCHANGE: IP-EIGRP 200: Neighbor 172.16.20.98 (Serial0/0/0) is up: new adjacency  BOG-ROUTER(config-router)#passive-interface gi 0/0 BOG-ROUTER(config-router)#exit BOG-ROUTER(config)#           </pre>
CAL-ROUTER	<pre> CAL-ROUTER(config)#router eigrp 200 CAL-ROUTER(config-router)#network 172.16.20.0 0.0.0.255 CAL-ROUTER(config-router)# %DUAL-5-NBRCHANGE: IP-EIGRP 200: Neighbor 172.16.20.129 (Serial0/0/1) is up: new adjacency  CAL-ROUTER(config-router)#passive-interface gi 0/0 CAL-ROUTER(config-router)#exit CAL-ROUTER(config)#           </pre>

Se usó mascara de wildcard para limitar la red solo al segmento usado en el laboratorio, adicional a esto se configuraron como interfaces pasivas las interfaces LAN de cada router, de tal forma que estas redes se anuncien en las actualizaciones de EIGRP, pero evitando que estas actualizaciones sean propagadas por las interfaces LAN.

## VALIDACION PROTOCOLO DE ENRUTAMIENTO – ROUTER MEDELLIN

Se toman evidencias de los siguientes comandos:

- **Show ip route:** verificación de la tabla de enrutamiento
- **Show ip protocol:** verificación de la operación de EIGRP
- **Show ip eigrp neighbors:** verificación de los vecinos EIGRP
- **Show ip eigrp topology:** tabla de topología con rutas alternas en caso de que el protocolo deba converger de nuevo por cambios en la red.

Se adjuntan las salidas de todos los resultados:

Tabla 8. verificacion convergencia EIGRP - escenario 1

HOSTNAME	PRUEBA	TABLA DE ENRUTAMIENTO
MED-ROUTER	Show ip route	<pre> MED-ROUTER#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  172.16.0.0/16 is variably subnetted, 7 subnets, 2 masks D    172.16.20.0/27 [90/2170112] via 172.16.20.97, 00:12:12, Serial0/0/0 C    172.16.20.32/27 is directly connected, GigabitEthernet0/0 L    172.16.20.33/32 is directly connected, GigabitEthernet0/0 D    172.16.20.64/27 [90/2682112] via 172.16.20.97, 00:08:41, Serial0/0/0 C    172.16.20.96/27 is directly connected, Serial0/0/0 L    172.16.20.98/32 is directly connected, Serial0/0/0 D    172.16.20.128/27 [90/2681856] via 172.16.20.97, 00:12:12, Serial0/0/0 </pre>
	Show ip protocol	<pre> MED-ROUTER#show ip protocol  Routing Protocol is "eigrp 200 "   Outgoing update filter list for all interfaces is not set   Incoming update filter list for all interfaces is not set   Default networks flagged in outgoing updates   Default networks accepted from incoming updates   Redistributing: eigrp 200   EIGRP-IPv4 Protocol for AS(200)     Metric weight K1=1, K2=0, K3=1, K4=0, K5=0     NSF-aware route hold timer is 240     Router-ID: 172.16.20.33     Topology : 0 (base)       Active Timer: 3 min       Distance: internal 90 external 170       Maximum path: 4       Maximum hopcount 100       Maximum metric variance 1    Automatic Summarization: disabled   Automatic address summarization:   Maximum path: 4   Routing for Networks:     172.16.20.0/24   Passive Interface(s):     GigabitEthernet0/0   Routing Information Sources:     Gateway         Distance         Last Update     172.16.20.97     90               10469006   Distance: internal 90 external 170 </pre>

	<p>Show ip eigrp neighbors</p>	<pre> ER#show ip eigrp nei neighbors for process 200 ess      Interface      Hold Uptime      SRTT   RTO   Q   Seq           (sec)              (ms)   RTO   Cnt   Num 16.20.97 Se0/0/0           11 00:12:39 40    1000 0   5  ER# ER# ER#show ip eigrp topology Topology Table for AS 200/ID(172.16.20.98)  - Passive, A - Active, U - Update, Q - Query, R - Reply, - Reply status  .20.0/27, 1 successors, FD is 2170112 via 172.16.20.97 (2170112/2816), Serial0/0/0 .20.32/27, 1 successors, FD is 2816 via Connected, GigabitEthernet0/0 .20.64/27, 1 successors, FD is 2682112 via 172.16.20.97 (2682112/2170112), Serial0/0/0 .20.96/27, 1 successors, FD is 2169856 via Connected, Serial0/0/0 .20.128/27, 1 successors, FD is 2681856 via 172.16.20.97 (2681856/2169856), Serial0/0/0 ER# </pre>
<p>BOG-ROUTER</p>	<p>Show ip route</p>	<pre> BOG-ROUTER#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  172.16.0.0/16 is variably subnetted, 8 subnets, 2 masks C 172.16.20.0/27 is directly connected, GigabitEthernet0/0 L 172.16.20.1/32 is directly connected, GigabitEthernet0/0 D 172.16.20.32/27 [90/2170112] via 172.16.20.98, 00:18:21, Serial0/0/0 D 172.16.20.64/27 [90/2170112] via 172.16.20.130, 00:14:50, Serial0/0/1 C 172.16.20.96/27 is directly connected, Serial0/0/0 L 172.16.20.97/32 is directly connected, Serial0/0/0 C 172.16.20.128/27 is directly connected, Serial0/0/1 L 172.16.20.129/32 is directly connected, Serial0/0/1 </pre>
<p>BOG-ROUTER</p>	<p>Show ip protocol</p>	<pre> BOG-ROUTER#show ip protocol  Routing Protocol is "eigrp 200 " Outgoing update filter list for all interfaces is not set Incoming update filter list for all interfaces is not set Default networks flagged in outgoing updates Default networks accepted from incoming updates Redistributing: eigrp 200 EIGRP-IPv4 Protocol for AS(200) Metric weight K1=1, K2=0, K3=1, K4=0, K5=0 NSF-aware route hold timer is 240 Router-ID: 172.16.20.1 Topology : 0 (base) Active Timer: 3 min Distance: internal 90 external 170 Maximum path: 4 Maximum hopcount 100 Maximum metric variance 1  Automatic Summarization: disabled Automatic address summarization: Maximum path: 4 Routing for Networks: 172.16.20.0/24 Passive Interface(s): GigabitEthernet0/0 Routing Information Sources: Gateway Distance Last Update 172.16.20.98 90 7694758 172.16.20.130 90 7905839 </pre>

		<pre> Distance: internal 90 external 170  BOG-ROUTER#show ip eigrp neig IP-EIGRP neighbors for process 200 H Address Interface Hold Uptime SRTT RTO Q Seq (sec) (ms) Cnt Num 0 172.16.20.98 Se0/0/0 12 00:19:18 40 1000 0 7 .20.130 Se0/0/1 13 00:15:47 40 1000 0 7 </pre>
	<p>Show ip eigrp topology</p>	<pre> BOG-ROUTER#show ip eigrp topology IP-EIGRP Topology Table for AS 200/ID(172.16.20.129)  Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply, r - Reply status  P 172.16.20.0/27, 1 successors, FD is 2816 via Connected, GigabitEthernet0/0 P 172.16.20.32/27, 1 successors, FD is 2170112 via 172.16.20.98 (2170112/2816), Serial0/0/0 P 172.16.20.64/27, 1 successors, FD is 2170112 via 172.16.20.130 (2170112/2816), Serial0/0/1 P 172.16.20.96/27, 1 successors, FD is 2169856 via Connected, Serial0/0/0 P 172.16.20.128/27, 1 successors, FD is 2169856 via Connected, Serial0/0/1 BOG-ROUTER# </pre>
<p>CAL-ROUTER</p>	<p>Show ip route</p>	<pre> CAL-ROUTER#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  172.16.0.0/16 is variably subnetted, 7 subnets, 2 masks D 172.16.20.0/27 [90/2170112] via 172.16.20.129, 05:15:58, Serial0/0/1 D 172.16.20.32/27 [90/2682112] via 172.16.20.129, 05:15:58, Serial0/0/1 C 172.16.20.64/27 is directly connected, GigabitEthernet0/0 L 172.16.20.65/32 is directly connected, GigabitEthernet0/0 D 172.16.20.96/27 [90/2681856] via 172.16.20.129, 05:15:58, Serial0/0/1 C 172.16.20.128/27 is directly connected, Serial0/0/1 L 172.16.20.130/32 is directly connected, Serial0/0/1 </pre>
	<p>Show ip protocol</p>	<pre> CAL-ROUTER#show ip protocol  Routing Protocol is "eigrp 200 "   Outgoing update filter list for all interfaces is not set   Incoming update filter list for all interfaces is not set   Default networks flagged in outgoing updates   Default networks accepted from incoming updates   Redistributing: eigrp 200   EIGRP-IPv4 Protocol for AS(200)     Metric weight K1=1, K2=0, K3=1, K4=0, K5=0     NSF-aware route hold timer is 240     Router-ID: 172.16.20.65     Topology : 0 (base)       Active Timer: 3 min       Distance: internal 90 external 170       Maximum path: 4       Maximum hopcount 100       Maximum metric variance 1    Automatic Summarization: disabled   Automatic address summarization:   Maximum path: 4   Routing for Networks:     172.16.20.0/24   Passive Interface(s):     GigabitEthernet0/0   Routing Information Sources:     Gateway          Distance      Last Update     172.16.20.129    90           10595049   Distance: internal 90 external 170 </pre>

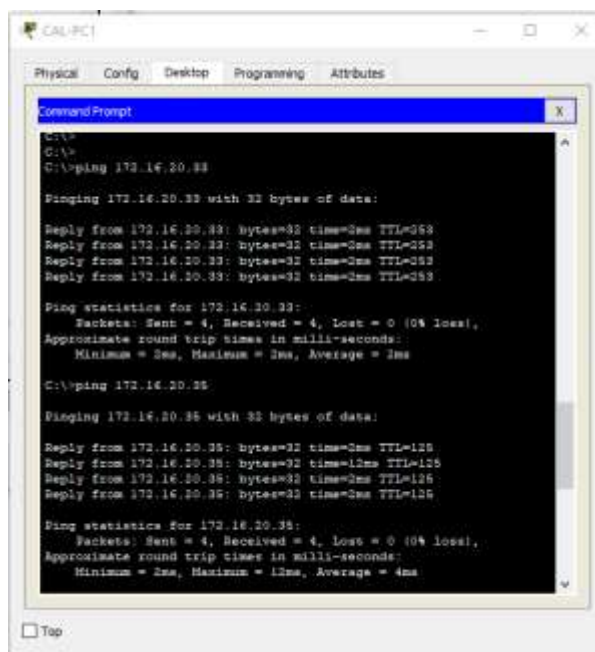
	<p>Show ip eigrp topology</p>	<pre> CAL-ROUTER#show ip eigrp neig IP-EIGRP neighbors for process 200 H   Address           Interface           Hold Uptime      SRTT   RTO   Q   Seq                                (sec)              (ms)              Cnt   Num 0   172.16.20.129      Se0/0/1             12   05:16:10  40    1000  0   6  CAL-ROUTER#show ip eigrp topology IP-EIGRP Topology Table for AS 200/ID(172.16.20.130)  Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,        r - Reply status  P 172.16.20.0/27, 1 successors, FD is 2170112    via 172.16.20.129 (2170112/2816), Serial0/0/1 P 172.16.20.32/27, 1 successors, FD is 2682112    via 172.16.20.129 (2682112/2170112), Serial0/0/1 P 172.16.20.64/27, 1 successors, FD is 2816    via Connected, GigabitEthernet0/0 P 172.16.20.96/27, 1 successors, FD is 2681856    via 172.16.20.129 (2681856/2169856), Serial0/0/1 P 172.16.20.128/27, 1 successors, FD is 2169856    via Connected, Serial0/0/1 CAL-ROUTER# </pre>
--	---------------------------------------	---

- Para el caso de Medellin se puede evidenciar que el protocolo ha convergido completamente, en la tabla de enrutamiento hay rutas aprendidas por EIGRP, en el protocolo se puede ver que el AS configurado es el 200 (en línea con la guía), también se puede ver la configuración de la interface pasiva, y, por último, en la tabla de vecinos se puede ver la adyacencia con el router de Bogotá.
- Para el caso de Bogota es posible ver rutas aprendidas por EIGRP, el SA configurado es 200, definiendo la interface LAN como pasiva dentro de la convergencia, se encuentran dos adyacencias (hacia los routers de Cali y Medellín), y por último la tabla de topología con los sucesores por ruta.
- Para el caso de Cali es posible ver rutas aprendidas por EIGRP, el SA configurado es 200, definiendo la interface LAN como pasiva dentro de la convergencia, se encuentra una adyacencia (hacia el router de Bogotá), y por último la tabla de topología con los sucesores por ruta.

## PRUEBAS DE CONECTIVIDAD

De acuerdo a la guía se hacen pruebas de conectividad desde un host de CALI, validando conexión a la red de MEDELLIN y al servidor de BOGOTA:

*Ilustración 3. pruebas conexión CAL-MED*



```

CAL-PC]
Physical  Config  Desktop  Programming  Attributes

Command Prompt
C:\>
C:\>
C:\>ping 172.16.20.33

Pinging 172.16.20.33 with 32 bytes of data:

Reply from 172.16.20.33: bytes=32 time=3ms TTL=63
Reply from 172.16.20.33: bytes=32 time=3ms TTL=63
Reply from 172.16.20.33: bytes=32 time=3ms TTL=63
Reply from 172.16.20.33: bytes=32 time=3ms TTL=63

Ping statistics for 172.16.20.33:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 3ms, Maximum = 3ms, Average = 3ms

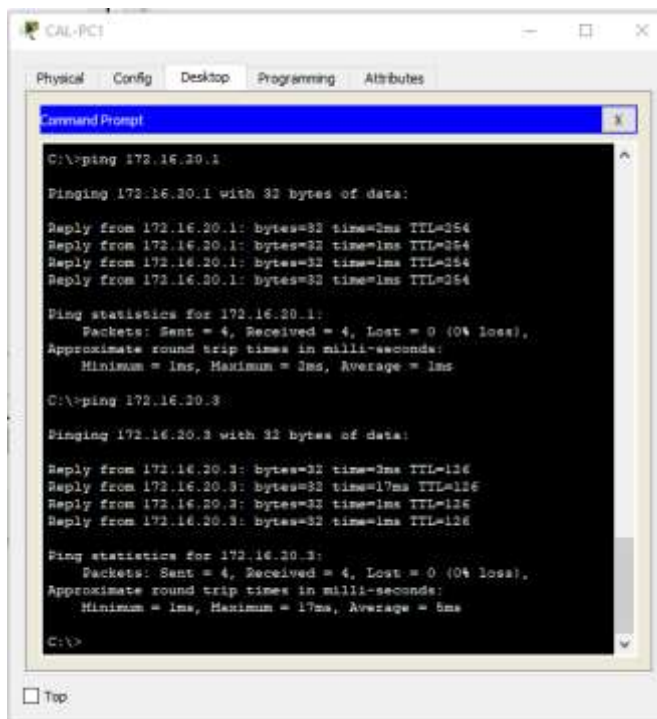
C:\>ping 172.16.20.35

Pinging 172.16.20.35 with 32 bytes of data:

Reply from 172.16.20.35: bytes=32 time=12ms TTL=125
Reply from 172.16.20.35: bytes=32 time=12ms TTL=125
Reply from 172.16.20.35: bytes=32 time=12ms TTL=125
Reply from 172.16.20.35: bytes=32 time=12ms TTL=125

Ping statistics for 172.16.20.35:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 12ms, Average = 4ms
  
```

*Ilustración 4. Pruebas conexión CAL-BOG*



```

CAL-PC]
Physical  Config  Desktop  Programming  Attributes

Command Prompt
C:\>ping 172.16.20.1

Pinging 172.16.20.1 with 32 bytes of data:

Reply from 172.16.20.1: bytes=32 time=2ms TTL=64
Reply from 172.16.20.1: bytes=32 time=1ms TTL=64
Reply from 172.16.20.1: bytes=32 time=1ms TTL=64
Reply from 172.16.20.1: bytes=32 time=1ms TTL=64

Ping statistics for 172.16.20.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 2ms, Average = 1ms

C:\>ping 172.16.20.3

Pinging 172.16.20.3 with 32 bytes of data:

Reply from 172.16.20.3: bytes=32 time=3ms TTL=126
Reply from 172.16.20.3: bytes=32 time=17ms TTL=126
Reply from 172.16.20.3: bytes=32 time=1ms TTL=126
Reply from 172.16.20.3: bytes=32 time=1ms TTL=126

Ping statistics for 172.16.20.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 17ms, Average = 5ms

C:\>
  
```

## PARTE 4 – CONFIGURACION LISTAS DE CONTROL DE ACCESO

De acuerdo a la guía las condiciones de seguridad a establecer deben cumplir los siguientes requerimientos:

- Cada router debe estar habilitado para establecer conexiones Telnet con los demás routers y tener acceso a cualquier dispositivo en la red.
- 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.
- Las estaciones de trabajo en las LAN de MEDELLIN y CALI no deben tener acceso a ningún dispositivo fuera de su subred, excepto para interconectar con el servidor.

Para cumplir con estos requerimientos lo que se realizará respecto a listas de acceso será lo siguiente:

- Se debe proteger el acceso por las líneas VTY en todos los routers, para que los únicos que puedan ingresar sean los routers (desde cualquiera de sus interfaces) y el servidor de BOGOTA.
- Se debe establecer una lista de acceso en el router MEDELLIN, en la interface G0/0 para que el tráfico de la LAN que vaya hacia el servidor de BOGOTA sea permitido, el resto del trafico será descartado.
- Se debe establecer una lista de acceso en el router CALI, en la interface G0/0 para que el tráfico de la LAN que vaya hacia el servidor de BOGOTA sea permitido, el resto del trafico será descartado.

Definido el propósito y las ubicaciones de las ACL se procede a la configuración de las mismas, el siguiente cuadro contiene el resumen de las configuraciones realizadas:

Tabla 9. Configuración ACLs

ROUTER	SERVICIO	COMANDOS
MEDELLIN	ACL gestión	<pre> MED-ROUTER(config)#ip access-list standard GESTION_ROUTERS MED-ROUTER(config-std-nacl)#permit host 172.16.20.1 MED-ROUTER(config-std-nacl)#permit host 172.16.20.3 MED-ROUTER(config-std-nacl)#permit host 172.16.20.97 MED-ROUTER(config-std-nacl)#permit host 172.16.20.129 MED-ROUTER(config-std-nacl)#permit host 172.16.20.33 MED-ROUTER(config-std-nacl)#permit host 172.16.20.98 MED-ROUTER(config-std-nacl)#permit host 172.16.20.65 MED-ROUTER(config-std-nacl)#permit host 172.16.20.130 MED-ROUTER(config-std-nacl)#deny any MED-ROUTER(config-std-nacl)#exit MED-ROUTER(config)#                     </pre>
	ACL LAN Medellín	<pre> MED-ROUTER(config)#ip access-list extended BLOCK_LAN_MED MED-ROUTER(config-ext-nacl)#permit ip 172.16.20.32 0.0.0.31 host 172.16.20.3                     </pre>

		<pre> MED-ROUTER(config-ext-nacl)#permit icmp 172.16.20.32 0.0.0.31 host 172.16.20.33 MED-ROUTER(config-ext-nacl)# permit udp any any eq 67 MED-ROUTER(config-ext-nacl)# permit udp any any eq 68 MED-ROUTER(config-ext-nacl)#deny ip any any MED-ROUTER(config-ext-nacl)#exit </pre>
	Configuración líneas VTY	<pre> MED-ROUTER(config)#line vty 0 15 MED-ROUTER(config-line)#ip access-class GESTION_ROUTERS in MED-ROUTER(config-line)#exit </pre>
	Configuración interface GO/0	<pre> MED-ROUTER(config)#interface giga 0/0 MED-ROUTER(config-if)#ip access-group BLOCK_LAN_MED in MED-ROUTER(config-if)#exit </pre>
BOGOTA	ACL gestión	<pre> BOG-ROUTER(config)#ip access-list standard GESTION_ROUTERS BOG-ROUTER(config-std-nacl)#permit host 172.16.20.1 BOG-ROUTER(config-std-nacl)#permit host 172.16.20.3 BOG-ROUTER(config-std-nacl)#permit host 172.16.20.97 BOG-ROUTER(config-std-nacl)#permit host 172.16.20.129 BOG-ROUTER(config-std-nacl)#permit host 172.16.20.33 BOG-ROUTER(config-std-nacl)#permit host 172.16.20.98 BOG-ROUTER(config-std-nacl)#permit host 172.16.20.65 BOG-ROUTER(config-std-nacl)#permit host 172.16.20.130 BOG-ROUTER(config-std-nacl)#deny any BOG-ROUTER(config-std-nacl)#exit BOG-ROUTER(config)# </pre>
	Configuración líneas VTY	<pre> BOG-ROUTER(config)#line vty 0 15 BOG-ROUTER(config-line)#access-class GESTION_ROUTERS in BOG-ROUTER(config-line)#exit </pre>
CALI	ACL gestión	<pre> CAL-ROUTER(config)#ip access-list standard GESTION_ROUTERS CAL-ROUTER(config-std-nacl)# permit host 172.16.20.1 CAL-ROUTER(config-std-nacl)# permit host 172.16.20.3 CAL-ROUTER(config-std-nacl)# permit host 172.16.20.97 CAL-ROUTER(config-std-nacl)# permit host 172.16.20.129 CAL-ROUTER(config-std-nacl)# permit host 172.16.20.33 CAL-ROUTER(config-std-nacl)# permit host 172.16.20.98 CAL-ROUTER(config-std-nacl)# permit host 172.16.20.65 CAL-ROUTER(config-std-nacl)# permit host 172.16.20.130 CAL-ROUTER(config-std-nacl)# deny any CAL-ROUTER(config-std-nacl)#exit </pre>
	ACL LAN Cali	<pre> CAL-ROUTER(config)#ip access-list extended BLOCK_LAN_CAL CAL-ROUTER(config-ext-nacl)# permit ip 172.16.20.64 0.0.0.31 host 172.16.20.3 CAL-ROUTER(config-ext-nacl)#permit icmp 172.16.20.64 0.0.0.31 host 172.16.20.65 CAL-ROUTER(config-ext-nacl)# permit udp any any eq 67 CAL-ROUTER(config-ext-nacl)# permit udp any any eq 68 CAL-ROUTER(config-ext-nacl)# deny ip any any CAL-ROUTER(config-ext-nacl)#exit </pre>
	Configuración líneas VTY	<pre> CAL-ROUTER(config)#line vty 0 15 CAL-ROUTER(config-line)#access-class GESTION_ROUTERS in CAL-ROUTER(config-line)#exit </pre>
	Configuración interface GO/0	<pre> CAL-ROUTER(config)#int giga 0/0 CAL-ROUTER(config-if)#ip access-group BLOCK_LAN_CAL in CAL-ROUTER(config-if)#exit CAL-ROUTER(config)# </pre>

Para la configuración de la lista de acceso de gestión de los routers se tuvo en cuenta las siguientes premisas:


- Por facilidad de administración se usó el mismo nombre para la ACL en todos los routers.
- Se unifico la lista de host permitidos en todos los routers, en caso de tener una plataforma de gestión unificada esto permitirá hacer modificaciones sobre solo una lista de acceso y aplicarla en todos los equipos de forma uniforme.


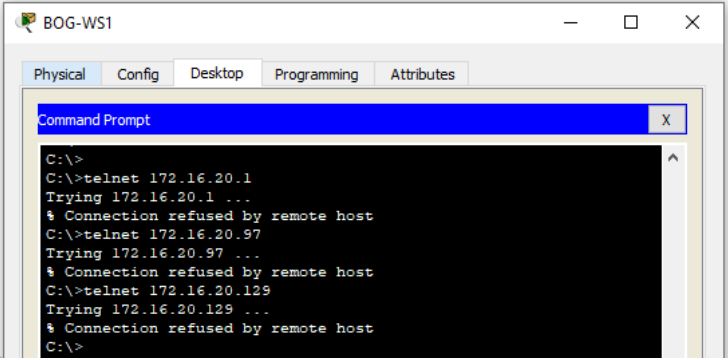
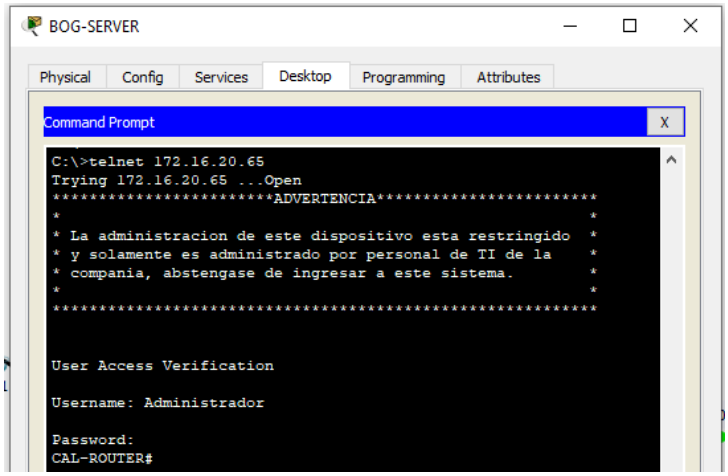
- Se pusieron como host permitidos las IP de todas las interfaces de los routers, esto debido a que al hacer telnet o SSH de un router a otro, en un escenario real, es posible definir como origen de la sesión cualquiera de las interfaces activas del router.
- En las ACL para bloqueo de las LAN en MEDELLIN y CALI se incluyeron permisos para que los equipos de la red LAN de cada sede pudieran hacer ping al default Gateway (interface Gi0/0 de cada router)
- Para que el protocolo DHCP operara dentro de las LAN de MEDELLIN y CALI se permitió en la interface LAN de cada router los paquetes UDP de los puertos 67 y 68, de esta forma los equipos pueden acceder al servicio DHCP.

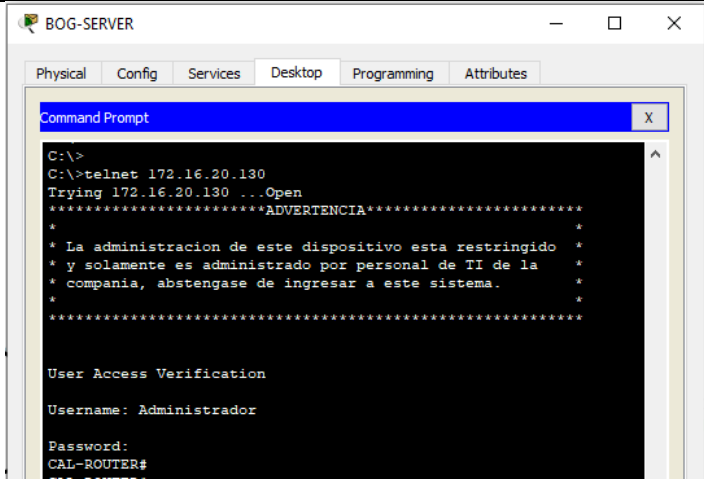
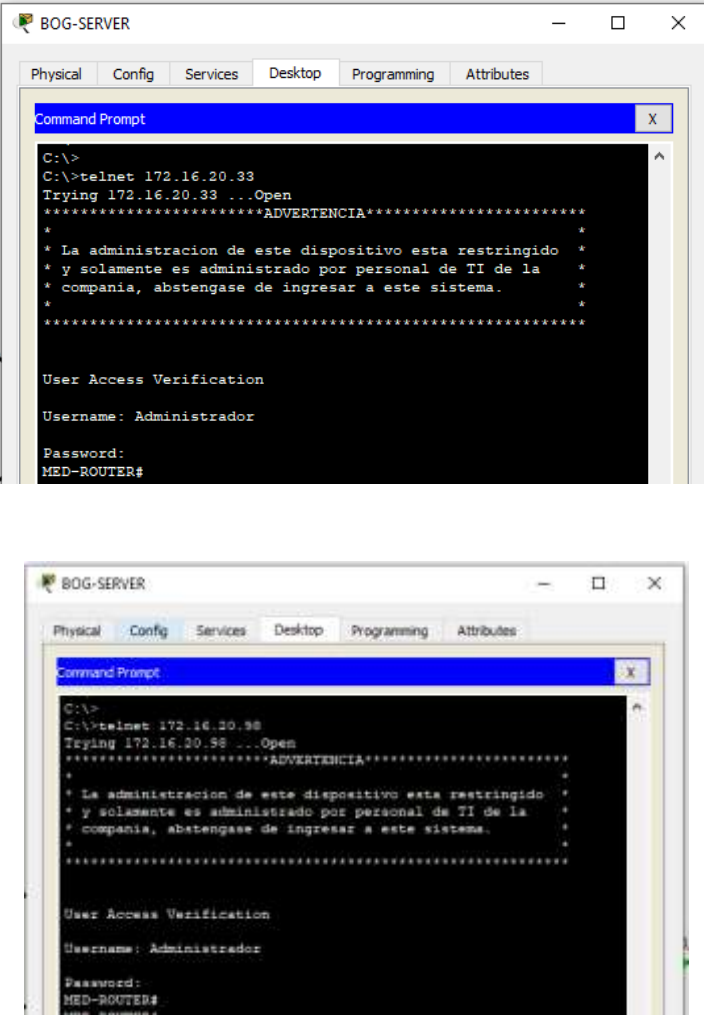
## PARTE 5 – COMPROBACION DE LA RED INSTALADA

Con las ACL configuradas tanto para gestión como para acceso se procede a diligenciar el cuadro de check, donde se tomará evidencia de la conexión tanto por telnet como por ICMP desde diferentes orígenes hacia diferentes destinos:

Tabla 10. Pruebas conectividad TELNET – escenario 1

SRC	DEST	RESULT	EVIDENCIA
Router MED	Router CAL	OK	 <pre> MEDELLIN ----- Physical  Config  CLI  Attributes ----- IDS Command Line Interface  MED-ROUTER# MED-ROUTER# MED-ROUTER# MED-ROUTER# MED-ROUTER#telnet 172.16.20.130 Trying 172.16.20.130 ...Open *****ADVERTENCIA***** * * La administración de este dispositivo esta restringida * y solamente es administrado por personal de TI de la * compania, abstengase de ingresar a este sistema.. * *****  User Access Verification Username: Administrador Password: CAL-ROUTER# </pre>

			
WS1	Router BOG	Block	
Server	Router CAL	OK	

			
Server	Router MED	OK	

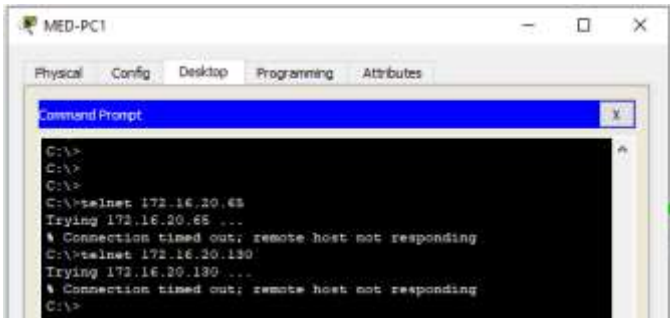
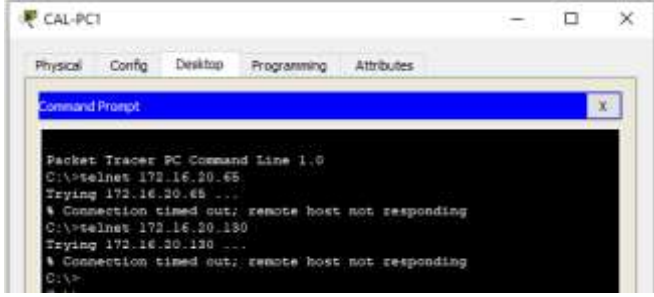
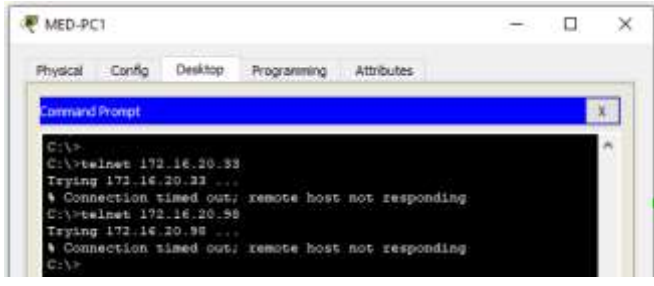
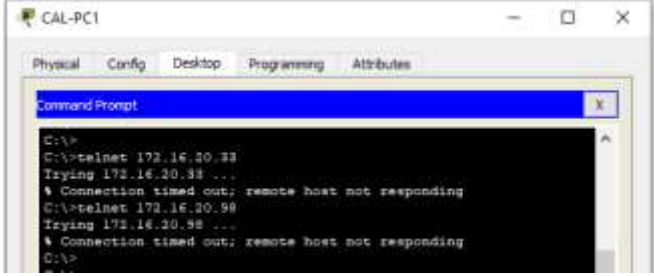
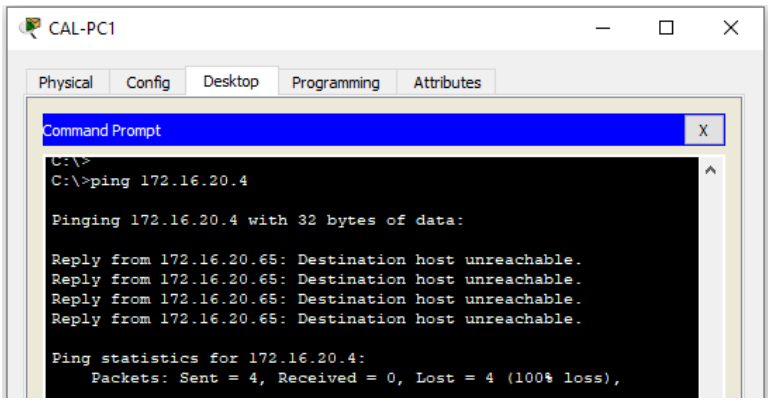
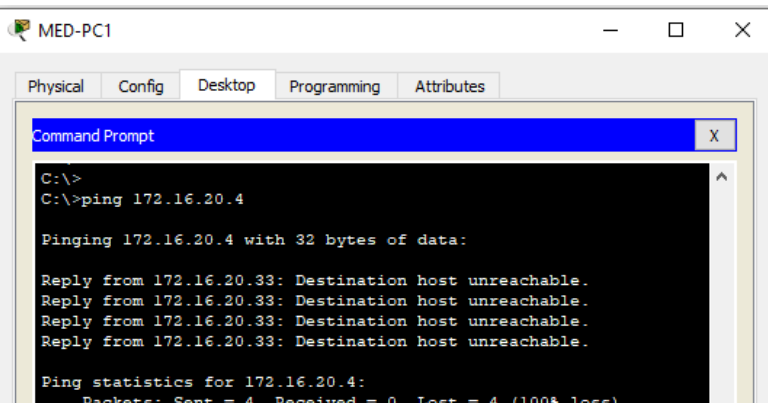
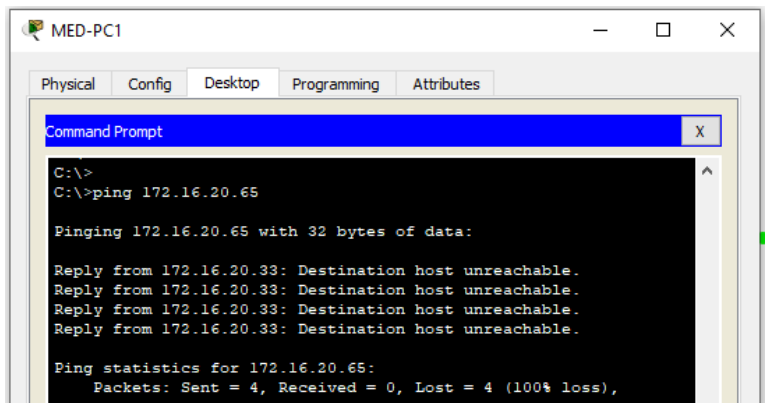
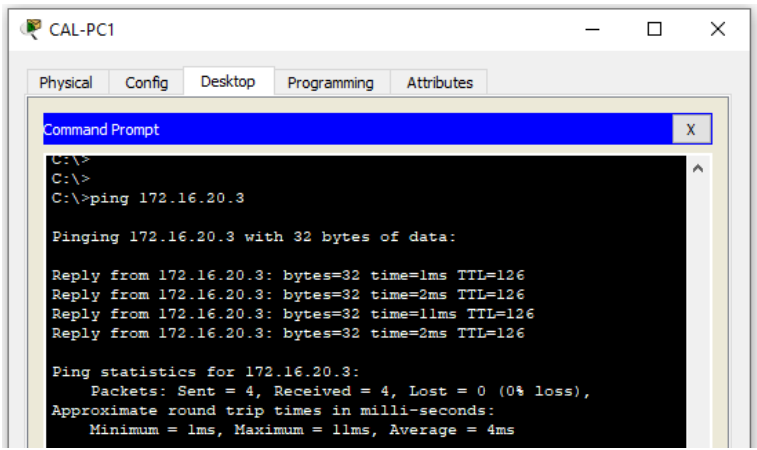
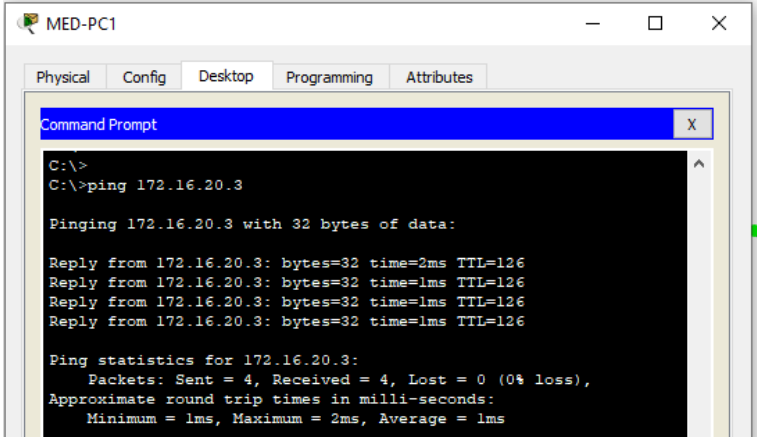
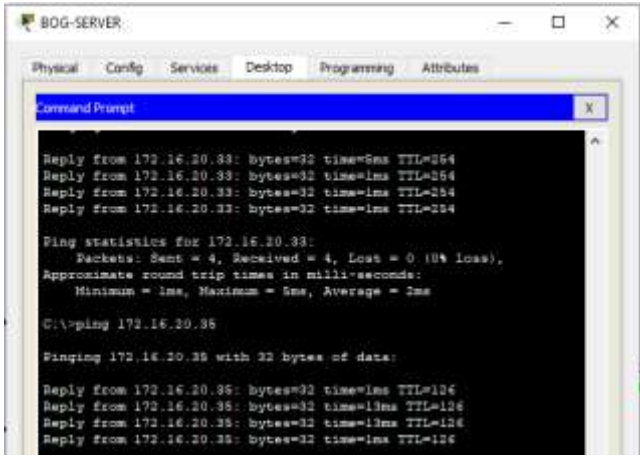
LAN MED	Router CAL	Block	
LAN CAL	Router CAL	Block	
LAN MED	Router MED	Block	
LAN Router CAL	Router MED	Block	

Tabla 11. Pruebas conectividad ICMP

SRC	DEST	RESULT	EVIDENCIA
LAN CAL	WS1	Block	 <pre> CAL-PC1 Physical Config Desktop Programming Attributes Command Prompt C:\&gt; C:\&gt;ping 172.16.20.4  Pinging 172.16.20.4 with 32 bytes of data:  Reply from 172.16.20.65: Destination host unreachable. Reply from 172.16.20.65: Destination host unreachable. Reply from 172.16.20.65: Destination host unreachable. Reply from 172.16.20.65: Destination host unreachable.  Ping statistics for 172.16.20.4:     Packets: Sent = 4, Received = 0, Lost = 4 (100% loss), </pre>
LAN MED	WS1	Block	 <pre> MED-PC1 Physical Config Desktop Programming Attributes Command Prompt C:\&gt; C:\&gt;ping 172.16.20.4  Pinging 172.16.20.4 with 32 bytes of data:  Reply from 172.16.20.33: Destination host unreachable. Reply from 172.16.20.33: Destination host unreachable. Reply from 172.16.20.33: Destination host unreachable. Reply from 172.16.20.33: Destination host unreachable.  Ping statistics for 172.16.20.4:     Packets: Sent = 4, Received = 0, Lost = 4 (100% loss), </pre>
LAN MED	LAN CAL	Block	 <pre> MED-PC1 Physical Config Desktop Programming Attributes Command Prompt C:\&gt; C:\&gt;ping 172.16.20.65  Pinging 172.16.20.65 with 32 bytes of data:  Reply from 172.16.20.33: Destination host unreachable. Reply from 172.16.20.33: Destination host unreachable. Reply from 172.16.20.33: Destination host unreachable. Reply from 172.16.20.33: Destination host unreachable.  Ping statistics for 172.16.20.65:     Packets: Sent = 4, Received = 0, Lost = 4 (100% loss), </pre>

LAN CAL	Server	OK	 <pre> CAL-PC1 Physical Config Desktop Programming Attributes Command Prompt C:\&gt; C:\&gt; C:\&gt;ping 172.16.20.3  Pinging 172.16.20.3 with 32 bytes of data:  Reply from 172.16.20.3: bytes=32 time=1ms TTL=126 Reply from 172.16.20.3: bytes=32 time=2ms TTL=126 Reply from 172.16.20.3: bytes=32 time=11ms TTL=126 Reply from 172.16.20.3: bytes=32 time=2ms TTL=126  Ping statistics for 172.16.20.3:     Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),     Approximate round trip times in milli-seconds:         Minimum = 1ms, Maximum = 11ms, Average = 4ms </pre>
LAN MED	Server	OK	 <pre> MED-PC1 Physical Config Desktop Programming Attributes Command Prompt C:\&gt; C:\&gt;ping 172.16.20.3  Pinging 172.16.20.3 with 32 bytes of data:  Reply from 172.16.20.3: bytes=32 time=2ms TTL=126 Reply from 172.16.20.3: bytes=32 time=1ms TTL=126 Reply from 172.16.20.3: bytes=32 time=1ms TTL=126 Reply from 172.16.20.3: bytes=32 time=1ms TTL=126  Ping statistics for 172.16.20.3:     Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),     Approximate round trip times in milli-seconds:         Minimum = 1ms, Maximum = 2ms, Average = 1ms </pre>
Server	LAN MED	OK	 <pre> BOG-SERVER Physical Config Services Desktop Programming Attributes Command Prompt Reply from 172.16.20.33: bytes=32 time=5ms TTL=254 Reply from 172.16.20.33: bytes=32 time=1ms TTL=254 Reply from 172.16.20.33: bytes=32 time=1ms TTL=254 Reply from 172.16.20.33: bytes=32 time=1ms TTL=254  Ping statistics for 172.16.20.33:     Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),     Approximate round trip times in milli-seconds:         Minimum = 1ms, Maximum = 5ms, Average = 2ms  C:\&gt;ping 172.16.20.35  Pinging 172.16.20.35 with 32 bytes of data:  Reply from 172.16.20.35: bytes=32 time=1ms TTL=126 Reply from 172.16.20.35: bytes=32 time=13ms TTL=126 Reply from 172.16.20.35: bytes=32 time=13ms TTL=126 Reply from 172.16.20.35: bytes=32 time=1ms TTL=126 </pre>

Server	LAN CAL	OK	 <pre> BOG-SERVER Physical Config Services Desktop Programming Attributes Command Prompt C:\&gt; C:\&gt;ping 172.16.20.65  Pinging 172.16.20.65 with 32 bytes of data:  Reply from 172.16.20.65: bytes=32 time=1ms TTL=254 Reply from 172.16.20.65: bytes=32 time=1ms TTL=254 Reply from 172.16.20.65: bytes=32 time=1ms TTL=254 Reply from 172.16.20.65: bytes=32 time=1ms TTL=254  Ping statistics for 172.16.20.65:     Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),     Approximate round trip times in milli-seconds:         Minimum = 1ms, Maximum = 1ms, Average = 1ms  C:\&gt;ping 172.16.20.67  Pinging 172.16.20.67 with 32 bytes of data:  Reply from 172.16.20.67: bytes=32 time=1ms TTL=126 Reply from 172.16.20.67: bytes=32 time=1ms TTL=126 Reply from 172.16.20.67: bytes=32 time=1ms TTL=126 Reply from 172.16.20.67: bytes=32 time=1ms TTL=126 </pre>
Router CAL	LAN MED	OK	 <pre> CALI Physical Config CLI Attributes IOS Command Line Interface ... User Access Verification Username: Administrador Password:  CAL-ROUTER# CAL-ROUTER# CAL-ROUTER# CAL-ROUTER#ping 172.16.20.33  Type escape sequence to abort. Sending 5, 100-byte ICMP Echoes to 172.16.20.33, timeout is 2 seconds: !!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 2/4/11 ms CAL-ROUTER# </pre>
Router MED	LAN CAL	OK	 <pre> MEDELLIN Physical Config CLI Attributes IOS Command Line Interface Password: MED-ROUTER#ping 172.16.20.65  Type escape sequence to abort. Sending 5, 100-byte ICMP Echoes to 172.16.20.65, timeout is 2 seconds: !!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 2/3/9 ms MED-ROUTER# </pre>

## ESCENARIO 2

### PLANTEAMIENTO DEL PROBLEMA

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.

Los siguientes son los requerimientos necesarios:

- Todos los routers deberán tener los siguiente:
  - Configuración básica.
  - Autenticación local con AAA.
  - Cifrado de contraseñas.
  - Un máximo de internos para acceder al router.
  - Máximo tiempo de acceso al detectar ataques.
  - Establezca un servidor TFTP y almacene todos los archivos necesarios de los routers.
  
- El DHCP deberá proporcionar solo direcciones a los hosts de Bucaramanga y Cundinamarca
  
- El web server deberá tener NAT estático y el resto de los equipos de la topología emplearan NAT de sobrecarga (PAT).
  
- El enrutamiento deberá tener autenticación.
  
- Listas de control de acceso:
  - Los hosts de VLAN 20 en Cundinamarca no acceden a internet, solo a la red interna de Tunja.
  - Los hosts de VLAN 10 en Cundinamarca si acceden a internet y no a la red interna de Tunja.
  - Los hosts de VLAN 30 en Tunja solo acceden a servidores web y ftp de internet.
  - Los hosts de VLAN 20 en Tunja solo acceden a la VLAN 20 de Cundinamarca y VLAN 10 de Bucaramanga.
  - Los hosts de VLAN 30 de Bucaramanga acceden a internet y a cualquier equipo de VLAN 10.
  - Los hosts de VLAN 10 en Bucaramanga acceden a la red de Cundinamarca (VLAN 20) y Tunja (VLAN 20), no internet.

- Los hosts de una VLAN no pueden acceder a los de otra VLAN en una ciudad.
  - Solo los hosts de las VLAN administrativas y de la VLAN de servidores tienen acceso a los routers e internet.
- 
- VLSM: utilizar la dirección 172.31.0.0 /18 para el direccionamiento.

Se deben tener los siguientes aspectos 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

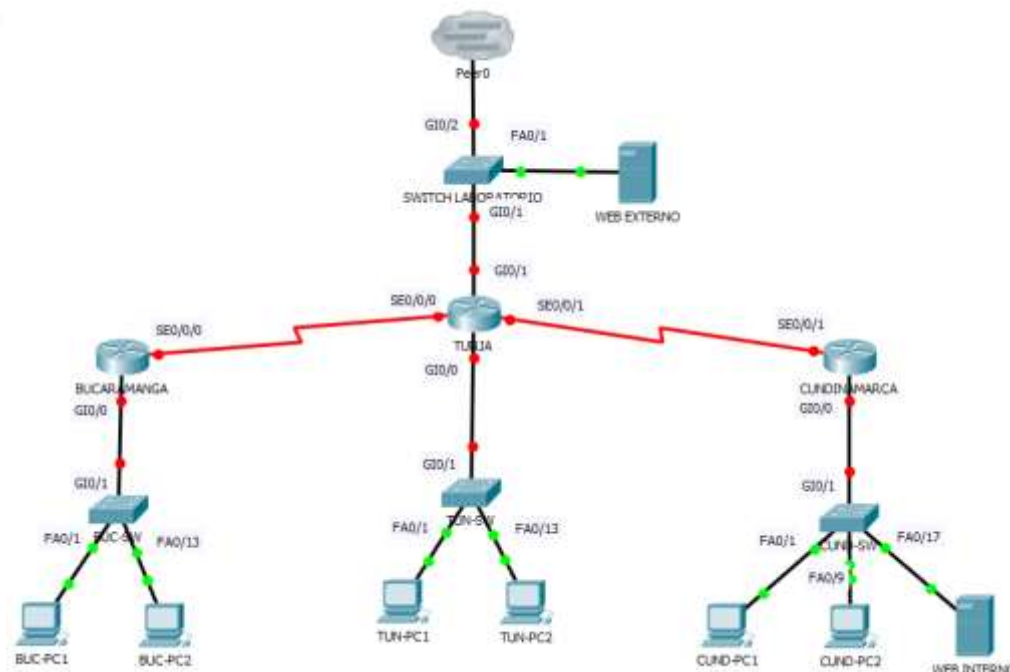
## **DESARROLLO DEL EJERCICIO**

En primer lugar, se implementa la topología sugerida en la guía usando los siguientes componentes:

- Router ISR2 Cisco 2911 con licenciamiento Base.
- Para los switches capa 2 de cada sede se usaron switches Cisco Catalyst 2960.
- Para el switch de laboratorio se hará uso de un switch Catalyst 2960, para brindar conectividad entre el servidor web externo y el router.
- Para los endpoint de cada sede se usaron los PC genéricos del ambiente de simulación.
- Para el servidor de Bogotá se usó un servidor genérico del ambiente de simulación.

El siguiente grafico ilustra la topología sugerida en la guía, implementada en packet tracer y con los dispositivos listados anteriormente:

Ilustración 5. Topología - escenario 2



Como premisa se configurará usuario local de nivel 15 Administrador, password 4dm1n1str4d0r y password de enable 4dm1n1str4d0r. Con la topología definida y todos los elementos intercoenctados se procede a la configuración de cada uno de los puntos solicitados en la guía.

## PUNTO 1 – CONFIGURACION INICIAL

En primer lugar, se define el esquema de direccionamiento a usar, de acuerdo a la guía se debe usar el segmento 172.31.0.0 /18, con esta mascara las direcciones a usar comienzan en 172.31.0.0/18 y terminan en la 172.16.64.255/18.

Para la asignación de las direcciones IP se usará el tercer octeto como identificador de las diferentes sedes de la topología de esta forma:

- 172.31.0.X – segmento dedicado a enlaces WAN punto a punto
- 172.31.1.X – segmento dedicado a la red de Bucaramanga y todas sus VLAN
- 172.31.2.X – segmento dedicado a la red de Tunja y todas sus VLAN
- 172.31.3.X – segmento dedicado a la red de Cundinamarca y todas sus VLAN

Tabla 12. Direccionamiento IP – escenario 2

SEDE	NOMBRE VLAN	# HOST	SUBRED
Bucaramanga	VLAN 1	6	172.31.1.248/29
	VLAN 10	55	172.31.1.0/26
	VLAN 30	55	172.31.1.64/26
TUNJA	VLAN 1	6	172.31.2.248/29
	VLAN 20	40	172.31.2.0/26
	VLAN 30	40	172.31.2.64/26
CUNDINAMARCA	VLAN 1	6	172.31.3.248/29
	VLAN 10	60	172.31.3.0/26
	VLAN 20	60	172.31.3.64/26
	VLAN 88	6	172.31.3.240/29
WAN	ENLACE BUC-TUN	2	172.31.0.0/30
	ELACE CUND-TUN	2	172.31.0.4/30
INTERNET	IPS PUBLICAS	254	209.17.220.0/24

Con el esquema de direccionamiento IP definido, se procede a asignar las IP a todos los dispositivos activos de la red:

Tabla 13. Asignacion IPs interfaces - escenario 2

HOSTNAME	INT	DIRECCION IP	MASCARA	UBICACIÓN
BUC-ROUTER	SEO/0/0	172.31.0.2	/30	BUCARAMANGA
	GI0/0.1	172.31.1.249	/29	
	GI0/0.10	172.31.1.1	/26	
	GI0/0.30	172.31.1.65	/26	
BUC-SW	VLAN1	172.31.1.250	/29	
TUN-ROUTER	SEO/0/0	172.31.0.1	/30	TUNJA
	SEO/0/1	172.31.0.5	/30	
	GI0/1	209.17.220.1	/24	
	GI0/0.1	172.31.2.249	/29	
	GI0/0.20	172.31.2.1	/26	
	GI0/0.30	172.31.2.65	/26	
TUN-SW	VLAN1	172.31.2.250	/29	
CUND-ROUTER	SEO/0/1	172.31.0.6	/30	CUNDINAMARCA
	GI0/0.1	172.31.3.249	/29	
	GI0/0.10	172.31.3.1	/26	
	GI0/0.20	172.31.3.65	/26	
	GI0/0.88	172.31.3.241	/29	
CUND-SW	VLAN1	172.31.3.250	/29	
SERVER-INT	FA0	172.31.3.242	/29	
SW-LAB	VLAN1	209.17.220.2	/24	INTERNET
SERVER-EXT	FA0	209.17.220.3	/24	

La tabla 14 resume las configuraciones basicas realizadas en los routers y switches de Bucaramanga, Tunja y Cundinamarca:

Tabla 14. Configuraciones iniciales equipos - Escenario 2

ROUTER	SERVICIO	COMANDOS
BUC-ROUTER	Hostname	! hostname BUC-ROUTER
	Bloqueo login incorrectos	login block-for 60 attempts 3 within 30 ! ip access-list extended sl_def_acl deny tcp any any eq telnet deny tcp any any eq www deny tcp any any eq 22 permit tcp any any eq 22 !
	Configuración AAA local	service password-encryption ! aaa new-model ! aaa authentication login default local aaa authentication enable default enable ! enable secret 5 \$1\$mERr\$WOB5Pu7Ns/uUv94a1WJ1.0 ! username Administrador privilege 15 secret 5 \$1\$mERr\$WOB5Pu7Ns/uUv94a1WJ1.0
	DNS y dominio	no ip domain-lookup ip domain-name unad.edu.co !
	Configuración interfaces	interface GigabitEthernet0/0 no ip address duplex auto speed auto ! interface GigabitEthernet0/0.1 encapsulation dot1Q 1 native ip address 172.31.1.249 255.255.255.248 ! interface GigabitEthernet0/0.10 encapsulation dot1Q 10 ip address 172.31.1.1 255.255.255.192 ! interface GigabitEthernet0/0.30 encapsulation dot1Q 30 ip address 172.31.1.65 255.255.255.192 ! interface GigabitEthernet0/1 no ip address duplex auto speed auto shutdown ! interface Serial0/0/0 description CONEXION_BUC_TUN ip address 172.31.0.2 255.255.255.252 ! interface Serial0/0/1 no ip address clock rate 2000000 shutdown !
	Banner MOTD	banner motd ^C *****ADVERTENCIA***** * * La administracion de este dispositivo esta restringido * * y solamente es administrado por personal de TI de la * * compania, abstengase de ingresar a este sistema. * * *****^C !
	Lineas consola y VTY	line con 0 login authentication default ! line aux 0 !

		<pre> line vty 0 4 login authentication default line vty 5 15 login authentication default ! </pre>
BUC-SW	Hostname	<pre> hostname BUC-SW ! </pre>
	Configuracion AAA local	<pre> service password-encryption ! username Administrador secret 5 \$1\$mERr\$WOB5Pu7Ns/uUv94a1WJl.0 ! </pre>
	DNS y dominio	<pre> no ip domain-lookup ip domain-name unad.edu.co ! </pre>
	Configuracion interfaces Y enrutamiento	<pre> interface FastEthernet0/1 switchport access vlan 10 switchport mode access ! interface FastEthernet0/12 ! interface FastEthernet0/13 switchport access vlan 30 switchport mode access ! interface GigabitEthernet0/1 description CONEXION_ROUTER_BUC switchport trunk allowed vlan 1,10,30 switchport mode trunk ! interface Vlan1 ip address 172.31.1.250 255.255.255.248 ! ip default-gateway 172.31.1.249 </pre>
	Banner MOTD	<pre> banner motd ^C *****ADVERTENCIA***** * * La administracion de este dispositivo esta restringido * * y solamente es administrado por personal de TI de la * * compania, abstengase de ingresar a este sistema. * * *****^C ! </pre>
	Lineas consola y VTY	<pre> line con 0 logging synchronous login local ! line vty 0 4 login local line vty 5 15 login local ! </pre>
TUN-ROUTER	Hostname	<pre> hostname TUN-ROUTER ! </pre>
	Bloqueo login incorrectos	<pre> login block-for 60 attempts 3 within 30 ! ! ip access-list extended sl_def_acl deny tcp any any eq telnet deny tcp any any eq www deny tcp any any eq 22 permit tcp any any eq 22 ! </pre>
	Configuracion AAA local	<pre> service password-encryption  aaa new-model ! aaa authentication login default local aaa authentication enable default enable ! enable secret 5 \$1\$mERr\$WOB5Pu7Ns/uUv94a1WJl.0 ! username Administrador privilege 15 secret 5 \$1\$mERr\$WOB5Pu7Ns/uUv94a1WJl.0 </pre>

	DNS y dominio	no ip domain-lookup ip domain-name unad.edu.co !
	Configuracion interfaces	interface GigabitEthernet0/0 no ip address duplex auto speed auto ! interface GigabitEthernet0/0.1 encapsulation dot1Q 1 native ip address 172.31.2.249 255.255.255.248 ! interface GigabitEthernet0/0.20 encapsulation dot1Q 20 ip address 172.31.2.1 255.255.255.192 ! interface GigabitEthernet0/0.30 encapsulation dot1Q 30 ip address 172.31.2.65 255.255.255.192 ! interface GigabitEthernet0/1 description CONEXION_INTERNET ip address 209.17.220.1 255.255.255.0 duplex auto speed auto ! interface Serial0/0/0 description CONEXION_TUN_BUC ip address 172.31.0.1 255.255.255.252 clock rate 2000000 ! interface Serial0/0/1 description CONEXION_TUN_CUND ip address 172.31.0.5 255.255.255.252 clock rate 2000000
	Banner MOTD	banner motd ^C *****ADVERTENCIA***** * * La administracion de este dispositivo esta restringido * * y solamente es administrado por personal de TI de la * * compania, abstengase de ingresar a este sistema. * * *****^C !
	Lineas consola y VTY	line con 0 login authentication default ! line aux 0 ! line vty 0 4 login authentication default line vty 5 15 login authentication default !
TUN-SW	Hostname	hostname TUN-SW !
	Configuracion AAA local	username Administrador secret 5 \$1\$mERr\$W0B5Pu7Ns/uUv94a1WJ1.0 ! service password-encryption !
	DNS y dominio	no ip domain-lookup ip domain-name unad.edu.co !
	Configuracion interfaces Y enrutamiento	interface FastEthernet0/1 switchport access vlan 20 switchport mode access ! interface FastEthernet0/13 switchport access vlan 30 switchport mode access ! interface GigabitEthernet0/1 description CONEXION_ROUTER_TUN switchport trunk allowed vlan 1,20,30

		<pre>switchport mode trunk ! interface Vlan1  ip address 172.31.2.250 255.255.255.248 !  ip default-gateway 172.31.2.249</pre>
	Banner MOTD	<pre>banner motd ^C *****ADVERTENCIA***** * * La administracion de este dispositivo esta restringido * * y solamente es administrado por personal de TI de la * * compania, abstengase de ingresar a este sistema. * * *****^C !</pre>
	Lineas consola y VTY	<pre>line con 0  logging synchronous  login local ! line vty 0 4  logging synchronous  login local line vty 5 15  login !</pre>
CUND-ROUTER	Hostname	<pre>hostname CUND-ROUTER !</pre>
	Bloqueo login incorrectos	<pre>login block-for 60 attempts 3 within 3 ! ip access-list extended sl_def_acl  deny tcp any any eq telnet  deny tcp any any eq www  deny tcp any any eq 22  permit tcp any any eq 22 !</pre>
	Configuracion AAA local	<pre>service password-encryption ! aaa new-model ! aaa authentication login default local aaa authentication enable default enable ! enable secret 5 \$1\$mERr\$W0B5Pu7Ns/uUv94a1WJ1.0 ! username Administrador privilege 15 secret 5 \$1\$mERr\$W0B5Pu7Ns/uUv94a1WJ1.0 !</pre>
	DNS y dominio	<pre>no ip domain-lookup ip domain-name unad.edu.co !</pre>
	Configuracion interfaces	<pre>interface GigabitEthernet0/0  no ip address  duplex auto  speed auto ! interface GigabitEthernet0/0.1  encapsulation dot1Q 1 native  ip address 172.31.3.249 255.255.255.248 ! interface GigabitEthernet0/0.10  encapsulation dot1Q 10  ip address 172.31.3.1 255.255.255.192 ! interface GigabitEthernet0/0.20  encapsulation dot1Q 20  ip address 172.31.3.65 255.255.255.192 ! interface GigabitEthernet0/0.88  encapsulation dot1Q 88  ip address 172.31.3.241 255.255.255.248 ! interface GigabitEthernet0/1  no ip address  duplex auto</pre>

		<pre> speed auto shutdown ! interface Serial0/0/0 no ip address clock rate 2000000 shutdown ! interface Serial0/0/1 description CONEXION_CUND_TUN ip address 172.31.0.6 255.255.255.252 ! </pre>
	Banner MOTD	<pre> banner motd ^C *****ADVERTENCIA***** * * La administracion de este dispositivo esta restringido * * y solamente es administrado por personal de TI de la * * compania, abstengase de ingresar a este sistema. * * *****^C ! </pre>
	Lineas consola y VTY	<pre> line con 0 login authentication default ! line aux 0 ! line vty 0 4 login authentication default line vty 5 15 login authentication default ! </pre>
CUND-SW	Hostname	<pre> hostname SW-CUND ! </pre>
	Configuracion AAA local	<pre> service password-encryption ! username Administrador secret 5 \$1\$mERr\$W0B5Pu7Ns/uUv94a1WJ1.0 ! </pre>
	DNS y dominio	<pre> no ip domain-lookup ip domain-name unad.edu.co ! </pre>
	Configuracion interfaces Y enrutamiento	<pre> interface FastEthernet0/1 switchport access vlan 10 switchport mode access ! interface FastEthernet0/9 switchport access vlan 20 switchport mode access ! interface FastEthernet0/17 switchport access vlan 88 switchport mode access ! interface GigabitEthernet0/1 description CONEXION_ROUTER_CUND switchport trunk allowed vlan 1,10,20,88 switchport mode trunk ! interface Vlan1 ip address 172.31.3.250 255.255.255.248 ! </pre>
	Banner MOTD	<pre> banner motd ^C *****ADVERTENCIA***** * * La administracion de este dispositivo esta restringido * * y solamente es administrado por personal de TI de la * * compania, abstengase de ingresar a este sistema. * * *****^C ! </pre>
	Lineas consola y VTY	<pre> line con 0 logging synchronous login local ! line vty 0 4 logging synchronous ! </pre>

		<pre>login local line vty 5 15 logging synchronous login local !</pre>
--	--	--

Dentro de estas configuraciones se deben tener en cuenta las siguientes premisas:

- En este punto aun no se ha definido un repositorio TFTP para alojar las imagenes de los routers ni los archivos de configuracion, este punto se abarcará una vez se haya configurado el protocolo de enrutamiento sugerido en la guía y haya completa conectividad entre los routers y el servidor TFTP.
- No fue posible habilitar el *login delay* para poner un tiempo de retardo entre logins incorrectos, esto es debido a una restricción de Packet tracert, sin embargo, el login block-for se habilito para un bloqueo de 60 seg por 3 logins incorrectos en menos de 30 seg.
- Las opciones de AAA no se pudieron habilitar en los switches por restricción de packet tracert, a cambio de esto se configuro autenticación contra la base de datos local.

Luego de hacer todas las configuraciones básicas y de interfaces según el esquema de direccionamiento, se procede a tomar evidencias de conectividad por ICMP y CDP para garantizar laconectividad de los equipos con sus vecinos:

Tabla 15. pruebas ICMP y CDP routers y switches - Escenario 2

ROUTER	RESULTADOS ICMP Y CDP
<p>Conectividad ICMP y CDP Router BUC</p>	<pre>BUC-ROUTER#show cdp neig 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 BUC-SW         Gig 0/0.1      156      S           2960      Gig 0/1 TUN-ROUTER     Ser 0/0/0      164      R           C2900     Ser 0/0/0 BUC-ROUTER#show cdp neig det  Device ID: BUC-SW Entry address(es):   IP address : 172.31.1.250 Platform: cisco 2960, Capabilities: Switch Interface: GigabitEthernet0/0.1, Port ID (outgoing port): GigabitEthernet0/1 Holdtime: 143  Version : Cisco IOS Software, C2960 Software (C2960-LANBASE-M), Version 12.2(25)FX, RELEASE SOFTWARE (fc1) Copyright (c) 1986-2005 by Cisco Systems, Inc. Compiled Wed 12-Oct-05 22:05 by pt_team  advertisement version: 2 Duplex: full -----  Device ID: TUN-ROUTER Entry address(es):   IP address : 172.31.0.1 Platform: cisco C2900, Capabilities: Router Interface: Serial0/0/0, Port ID (outgoing port): Serial0/0/0 Holdtime: 150  Version :</pre>

	<pre> Cisco IOS Software, C2900 Software (C2900-UNIVERSALK9-M), Version 15.1(4)M4, RELEASE SOFTWARE (fc2) Technical Support: http://www.cisco.com/techsupport Copyright (c) 1986-2012 by Cisco Systems, Inc. Compiled Thurs 5-Jan-12 15:41 by pt_team  advertisement version: 2 Duplex: full  BUC-ROUTER#ping 172.31.1.250  Type escape sequence to abort. Sending 5, 100-byte ICMP Echos to 172.31.1.250, timeout is 2 seconds: !!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 0/2/7 ms  BUC-ROUTER#ping 172.31.0.1  Type escape sequence to abort. Sending 5, 100-byte ICMP Echos to 172.31.0.1, timeout is 2 seconds: !!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 1/4/12 ms  BUC-ROUTER# </pre>
<p>Conectividad ICMP y CDP Sw BUC</p>	<pre> BUC-SW#show cdp neig 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 BUC-ROUTER    Gig 0/1        120      R           C2900     Gig 0/0 BUC-ROUTER    Gig 0/1        120      R           C2900     Gig 0/0.1 BUC-ROUTER    Gig 0/1        120      R           C2900     Gig 0/0.10 BUC-ROUTER    Gig 0/1        120      R           C2900     Gig 0/0.30 BUC-SW# BUC-SW# BUC-SW#showcdp neig det ^ % Invalid input detected at '^' marker.  BUC-SW#show cdp neig det  Device ID: BUC-ROUTER Entry address(es): Platform: cisco C2900, Capabilities: Router Interface: GigabitEthernet0/1, Port ID (outgoing port): GigabitEthernet0/0 Holdtime: 170  Version : Cisco IOS Software, C2900 Software (C2900-UNIVERSALK9-M), Version 15.1(4)M4, RELEASE SOFTWARE (fc2) Technical Support: http://www.cisco.com/techsupport Copyright (c) 1986-2012 by Cisco Systems, Inc. Compiled Thurs 5-Jan-12 15:41 by pt_team  advertisement version: 2 Duplex: full -----  Device ID: BUC-ROUTER Entry address(es):   IP address : 172.31.1.249 Platform: cisco C2900, Capabilities: Router Interface: GigabitEthernet0/1, Port ID (outgoing port): GigabitEthernet0/0.1 Holdtime: 170  Version : Cisco IOS Software, C2900 Software (C2900-UNIVERSALK9-M), Version 15.1(4)M4, RELEASE SOFTWARE (fc2) Technical Support: http://www.cisco.com/techsupport Copyright (c) 1986-2012 by Cisco Systems, Inc. Compiled Thurs 5-Jan-12 15:41 by pt_team  advertisement version: 2 Duplex: full ----- </pre>

	<pre> Device ID: BUC-ROUTER Entry address(es):   IP address : 172.31.1.1 Platform: cisco C2900, Capabilities: Router Interface: GigabitEthernet0/1, Port ID (outgoing port): GigabitEthernet0/0.10 Holdtime: 170  Version : Cisco IOS Software, C2900 Software (C2900-UNIVERSALK9-M), Version 15.1(4)M4, RELEASE SOFTWARE (fc2) Technical Support: http://www.cisco.com/techsupport Copyright (c) 1986-2012 by Cisco Systems, Inc. Compiled Thurs 5-Jan-12 15:41 by pt_team  advertisement version: 2 Duplex: full -----  Device ID: BUC-ROUTER Entry address(es):   IP address : 172.31.1.65 Platform: cisco C2900, Capabilities: Router Interface: GigabitEthernet0/1, Port ID (outgoing port): GigabitEthernet0/0.30 Holdtime: 170  Version : Cisco IOS Software, C2900 Software (C2900-UNIVERSALK9-M), Version 15.1(4)M4, RELEASE SOFTWARE (fc2) Technical Support: http://www.cisco.com/techsupport Copyright (c) 1986-2012 by Cisco Systems, Inc. Compiled Thurs 5-Jan-12 15:41 by pt_team  advertisement version: 2 Duplex: full  BUC-SW#ping 172.31.1.249  Type escape sequence to abort. Sending 5, 100-byte ICMP Echos to 172.31.1.249, timeout is 2 seconds: !!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms  BUC-SW# </pre>
<p>Conectividad ICMP y CDP Router TUN</p>	<pre> TUN-ROUTER#show cdp neig 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 TUN-SW        Gig 0/0.1      134      S           2960      Gig 0/1 CUND-ROUTER   Ser 0/0/1      147      R           C2900     Ser 0/0/1 BUC-ROUTER    Ser 0/0/0      178      R           C2900     Ser 0/0/0 SW-INTERNET   Gig 0/1        139      S           2960      Gig 0/1 TUN-ROUTER#show cdp neig det  Device ID: TUN-SW Entry address(es):   IP address : 172.31.2.250 Platform: cisco 2960, Capabilities: Switch Interface: GigabitEthernet0/0.1, Port ID (outgoing port): GigabitEthernet0/1 Holdtime: 128  Version : Cisco IOS Software, C2960 Software (C2960-LANBASE-M), Version 12.2(25)FX, RELEASE SOFTWARE (fc1) Copyright (c) 1986-2005 by Cisco Systems, Inc. Compiled Wed 12-Oct-05 22:05 by pt_team  advertisement version: 2 Duplex: full -----  Device ID: CUND-ROUTER Entry address(es):   IP address : 172.31.0.6 Platform: cisco C2900, Capabilities: Router Interface: Serial0/0/1, Port ID (outgoing port): Serial0/0/1 </pre>

```

Holdtime: 140

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advertisement version: 2
Duplex: full
-----

Device ID: BUC-ROUTER
Entry address(es):
  IP address : 172.31.0.2
Platform: cisco C2900, Capabilities: Router
Interface: Serial0/0/0, Port ID (outgoing port): Serial0/0/0
Holdtime: 172

Version :
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advertisement version: 2
Duplex: full
-----

Device ID: SW-INTERNET
Entry address(es):
  IP address : 209.17.220.2
Platform: cisco 2960, Capabilities: Switch
Interface: GigabitEthernet0/1, Port ID (outgoing port): GigabitEthernet0/1
Holdtime: 133

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advertisement version: 2
Duplex: full

TUN-ROUTER#ping 172.31.2.250

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.31.2.250, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms

TUN-ROUTER#ping 172.31.0.6

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.31.0.6, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/4/16 ms

TUN-ROUTER#ping 172.31.0.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.31.0.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/4/17 ms

TUN-ROUTER#ping 209.17.220.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.17.220.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms

```

```

TUN-SW#sho cdp neig
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
TUN-ROUTER    Gig 0/1      145     R           C2900     Gig 0/0
TUN-ROUTER    Gig 0/1      145     R           C2900     Gig 0/0.1
TUN-ROUTER    Gig 0/1      145     R           C2900     Gig 0/0.20
TUN-ROUTER    Gig 0/1      145     R           C2900     Gig 0/0.30
TUN-SW#
TUN-SW#
TUN-SW#show cdp neig det

Device ID: TUN-ROUTER
Entry address(es):
Platform: cisco C2900, Capabilities: Router
Interface: GigabitEthernet0/1, Port ID (outgoing port): GigabitEthernet0/0
Holdtime: 136

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advertisement version: 2
Duplex: full
-----

Device ID: TUN-ROUTER
Entry address(es):
  IP address : 172.31.2.249
Platform: cisco C2900, Capabilities: Router
Interface: GigabitEthernet0/1, Port ID (outgoing port): GigabitEthernet0/0.1
Holdtime: 136

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advertisement version: 2
Duplex: full
-----

Device ID: TUN-ROUTER
Entry address(es):
  IP address : 172.31.2.1
Platform: cisco C2900, Capabilities: Router
Interface: GigabitEthernet0/1, Port ID (outgoing port): GigabitEthernet0/0.20
Holdtime: 136

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advertisement version: 2
Duplex: full
-----

Device ID: TUN-ROUTER
Entry address(es):
  IP address : 172.31.2.65
Platform: cisco C2900, Capabilities: Router
Interface: GigabitEthernet0/1, Port ID (outgoing port): GigabitEthernet0/0.30
Holdtime: 136

Version :
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```

Conectividad  
ICMP y CDP  
SW TUN

	<pre> Technical Support: http://www.cisco.com/techsupport Copyright (c) 1986-2012 by Cisco Systems, Inc. Compiled Thurs 5-Jan-12 15:41 by pt_team  advertisement version: 2 Duplex: full  TUN-Sw#ping 172.31.2.249  Type escape sequence to abort. Sending 5, 100-byte ICMP Echos to 172.31.2.249, timeout is 2 seconds: !!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms  TUN-Sw# </pre>
<p>Conectividad ICMP y CDP Router CUND</p>	<pre> CUND-ROUTER#show cd neig 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 SW-CUND       Gig 0/0.1      121      S           2960      Gig 0/1 TUN-ROUTER    Ser 0/0/1      133      R           C2900     Ser 0/0/1 CUND-ROUTER#show cd neig det  Device ID: SW-CUND Entry address(es):   IP address : 172.31.3.250 Platform: cisco 2960, Capabilities: Switch Interface: GigabitEthernet0/0.1, Port ID (outgoing port): GigabitEthernet0/1 Holdtime: 176  Version: Cisco IOS Software, C2960 Software (C2960-LANBASE-M), Version 12.2(25)FX, RELEASE SOFTWARE (fc1) Copyright (c) 1986-2005 by Cisco Systems, Inc. Compiled Wed 12-Oct-05 22:05 by pt_team  advertisement version: 2 Duplex: full -----  Device ID: TUN-ROUTER Entry address(es):   IP address : 172.31.0.5 Platform: cisco C2900, Capabilities: Router Interface: Serial0/0/1, Port ID (outgoing port): Serial0/0/1 Holdtime: 127  Version : Cisco IOS Software, C2900 Software (C2900-UNIVERSALK9-M), Version 15.1(4)M4, RELEASE SOFTWARE (fc2) Technical Support: http://www.cisco.com/techsupport Copyright (c) 1986-2012 by Cisco Systems, Inc. Compiled Thurs 5-Jan-12 15:41 by pt_team  advertisement version: 2 Duplex: full  CUND-ROUTER#ping 172.31.3.250  Type escape sequence to abort. Sending 5, 100-byte ICMP Echos to 172.31.3.250, timeout is 2 seconds: !!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms  CUND-ROUTER#ping 172.31.0.5  Type escape sequence to abort. Sending 5, 100-byte ICMP Echos to 172.31.0.5, timeout is 2 seconds: !!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 1/4/18 ms  CUND-ROUTER# </pre>

```

SW-CUND#show cdp neig
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
CUND-ROUTER   Gig 0/1          140      R           C2900     Gig 0/0
CUND-ROUTER   Gig 0/1          140      R           C2900     Gig 0/0.1
CUND-ROUTER   Gig 0/1          140      R           C2900     Gig 0/0.10
CUND-ROUTER   Gig 0/1          140      R           C2900     Gig 0/0.20
CUND-ROUTER   Gig 0/1          140      R           C2900     Gig 0/0.88
SW-CUND#show cdp neig det

Device ID: CUND-ROUTER
Entry address(es):
Platform: cisco C2900, Capabilities: Router
Interface: GigabitEthernet0/1, Port ID (outgoing port): GigabitEthernet0/0
Holdtime: 134

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advertisement version: 2
Duplex: full
-----

Device ID: CUND-ROUTER
Entry address(es):
  IP address : 172.31.3.249
Platform: cisco C2900, Capabilities: Router
Interface: GigabitEthernet0/1, Port ID (outgoing port): GigabitEthernet0/0.1
Holdtime: 134

Version :
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advertisement version: 2
Duplex: full
-----

Device ID: CUND-ROUTER
Entry address(es):
  IP address : 172.31.3.1
Platform: cisco C2900, Capabilities: Router
Interface: GigabitEthernet0/1, Port ID (outgoing port): GigabitEthernet0/0.10
Holdtime: 134

Version :
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advertisement version: 2
Duplex: full
-----

Device ID: CUND-ROUTER
Entry address(es):
  IP address : 172.31.3.65
Platform: cisco C2900, Capabilities: Router
Interface: GigabitEthernet0/1, Port ID (outgoing port): GigabitEthernet0/0.20
Holdtime: 134

Version :
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```

Conectividad  
ICMP y CDP  
Sw CUND

	<pre> Copyright (c) 1986-2012 by Cisco Systems, Inc. Compiled Thurs 5-Jan-12 15:41 by pt_team  advertisement version: 2 Duplex: full -----  Device ID: CUND-ROUTER Entry address(es):   IP address : 172.31.3.241 Platform: cisco C2900, Capabilities: Router Interface: GigabitEthernet0/1, Port ID (outgoing port): GigabitEthernet0/0.88 Holdtime: 134  Version : Cisco IOS Software, C2900 Software (C2900-UNIVERSALK9-M), Version 15.1(4)M4, RELEASE SOFTWARE (fc2) Technical Support: http://www.cisco.com/techsupport Copyright (c) 1986-2012 by Cisco Systems, Inc. Compiled Thurs 5-Jan-12 15:41 by pt_team  advertisement version: 2 Duplex: full  SW-CUND#ping 172.31.3.249  Type escape sequence to abort. Sending 5, 100-byte ICMP Echos to 172.31.3.249, timeout is 2 seconds: !!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms  SW-CUND# </pre>
<p>Conectividad ICMP y CDP Sw Internet</p>	<pre> SW-INTERNET#show cdp neig 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 TUN-ROUTER    Gig 0/1        130      R           C2900     Gig 0/1 SW-INTERNET#show cdp neig det  Device ID: TUN-ROUTER Entry address(es):   IP address : 209.17.220.1 Platform: cisco C2900, Capabilities: Router Interface: GigabitEthernet0/1, Port ID (outgoing port): GigabitEthernet0/1 Holdtime: 126  Version : Cisco IOS Software, C2900 Software (C2900-UNIVERSALK9-M), Version 15.1(4)M4, RELEASE SOFTWARE (fc2) Technical Support: http://www.cisco.com/techsupport Copyright (c) 1986-2012 by Cisco Systems, Inc. Compiled Thurs 5-Jan-12 15:41 by pt_team  advertisement version: 2 Duplex: full  SW-INTERNET#ping 209.17.220.1  Type escape sequence to abort. Sending 5, 100-byte ICMP Echos to 209.17.220.1, timeout is 2 seconds: !!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms  SW-INTERNET# </pre>

## PUNTO 2 – CONFIGURACION ENRUTAMIENTO

Se hace la configuración del protocolo de enrutamiento previo a las configuraciones de DHCP y servicio de TFTP, ya que estos dos servicios requieren que haya visibilidad completa de la red; de acuerdo a la guía las premisas para la configuración del protocolo de enrutamiento configurado son las siguientes:

- El protocolo a usar debe ser OSPF.
- Se debe usar autenticación, por lo que se habilita autenticación OSPF MD5
- Se habilita autenticación en las interfaces seriales que conectan los 3 routers, usando como contraseña 4dm1n1str4d0r.
- En las interfaces LAN se deshabilita el envío de actualizaciones de OSPF incluyendo todas las subinterfaces en la lista de interfaces pasivas del protocolo.
- Se configura una ruta por defecto en el router de Tunja y se propaga por medio del mismo protocolo a todos los routers.

Con estas premisas definidas se hacen las siguientes configuraciones en los routers:

Tabla 16. Configuración OSPF - escenario 2

ROUTER	CONFIGURACION
Router BUC	<pre> ! interface Serial0/0/0 description CONEXION_BUC_TUN ip address 172.31.0.2 255.255.255.252 ip ospf message-digest-key 1 md5 4dm1n1str4d0r ! router ospf 10 log-adjacency-changes area 0 authentication message-digest passive-interface GigabitEthernet0/0.1 passive-interface GigabitEthernet0/0.10 passive-interface GigabitEthernet0/0.30 network 172.31.1.0 0.0.0.255 area 0 network 172.31.0.0 0.0.0.3 area 0 ! </pre>
Router TUN	<pre> ! interface Serial0/0/0 description CONEXION_TUN_BUC ip address 172.31.0.1 255.255.255.252 ip ospf message-digest-key 1 md5 4dm1n1str4d0r clock rate 2000000 ! interface Serial0/0/1 description CONEXION_TUN_CUND ip address 172.31.0.5 255.255.255.252 ip ospf message-digest-key 1 md5 4dm1n1str4d0r clock rate 2000000 ! ! router ospf 10 log-adjacency-changes </pre>

	<pre> area 0 authentication message-digest passive-interface GigabitEthernet0/0.1 passive-interface GigabitEthernet0/0.20 passive-interface GigabitEthernet0/0.30 network 172.31.2.0 0.0.0.255 area 0 network 172.31.0.0 0.0.0.3 area 0 network 172.31.0.4 0.0.0.3 area 0 default-information originate ! ip classless ip route 0.0.0.0 0.0.0.0 209.17.220.3 ! </pre>
Router CUND	<pre> ! interface Serial0/0/1 description CONEXION_CUND_TUN ip address 172.31.0.6 255.255.255.252 ip ospf message-digest-key 1 md5 4dm1n1str4d0r ! ! router ospf 10 log-adjacency-changes area 0 authentication message-digest passive-interface GigabitEthernet0/0.1 passive-interface GigabitEthernet0/0.10 passive-interface GigabitEthernet0/0.20 passive-interface GigabitEthernet0/0.88 network 172.31.3.0 0.0.0.255 area 0 network 172.31.0.4 0.0.0.3 area 0 ! </pre>

Una vez terminada la configuracion se verifican adyacencias de OSPF y tablas de enrutamiento, el resumen de las evidencias se consigna en la tabla a continuación:

Tabla 17. Verificacion OSPF y enrutamiento - Escenario 2

ROUTER	COMANDO	RESULTADO
Router BUC	Show ip protocol	<pre> BUC-ROUTER#show ip protocol  Routing Protocol is "ospf 10"   Outgoing update filter list for all interfaces is not set   Incoming update filter list for all interfaces is not set   Router ID 172.31.1.249   Number of areas in this router is 1. 1 normal 0 stub 0 nssa   Maximum path: 4   Routing for Networks:     172.31.1.0 0.0.0.255 area 0     172.31.0.0 0.0.0.3 area 0   Passive Interface(s):     GigabitEthernet0/0.1     GigabitEthernet0/0.10     GigabitEthernet0/0.30   Routing Information Sources:     Gateway         Distance      Last Update     172.31.1.249          110          00:14:45     172.31.3.249          110          00:09:49     209.17.220.1          110          00:08:49   Distance: (default is 110) </pre>
	Show ip ospf neighbor	<pre> BUC-ROUTER#show ip ospf neighbor  Neighbor ID  Pri  State           Dead Time  Address        Interface 209.17.220.1  0   FULL/ -         00:00:36   172.31.0.1    Serial0/0/0 </pre>
	Show ip route	<pre> BUC-ROUTER#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 </pre>

		<pre> 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 172.31.0.1 to network 0.0.0.0  172.31.0.0/16 is variably subnetted, 16 subnets, 4 masks C 172.31.0.0/30 is directly connected, Serial0/0/0 L 172.31.0.2/32 is directly connected, Serial0/0/0 O 172.31.0.4/30 [110/128] via 172.31.0.1, 00:15:22, Serial0/0/0 C 172.31.1.0/26 is directly connected, GigabitEthernet0/0.10 L 172.31.1.1/32 is directly connected, GigabitEthernet0/0.10 C 172.31.1.64/26 is directly connected, GigabitEthernet0/0.30 L 172.31.1.65/32 is directly connected, GigabitEthernet0/0.30 C 172.31.1.248/29 is directly connected, GigabitEthernet0/0.1 L 172.31.1.249/32 is directly connected, GigabitEthernet0/0.1 O 172.31.2.0/26 [110/65] via 172.31.0.1, 00:15:22, Serial0/0/0 O 172.31.2.64/26 [110/65] via 172.31.0.1, 00:15:22, Serial0/0/0 O 172.31.2.248/29 [110/65] via 172.31.0.1, 00:15:22, Serial0/0/0 O 172.31.3.0/26 [110/129] via 172.31.0.1, 00:10:21, Serial0/0/0 O 172.31.3.64/26 [110/129] via 172.31.0.1, 00:10:21, Serial0/0/0 O 172.31.3.240/29 [110/129] via 172.31.0.1, 00:10:21, Serial0/0/0 O 172.31.3.248/29 [110/129] via 172.31.0.1, 00:10:21, Serial0/0/0 O*E2 0.0.0.0/0 [110/1] via 172.31.0.1, 00:09:25, Serial0/0/0 </pre>
Router TUN	Show ip protocol	<pre> TUN-ROUTER#show ip protocol  Routing Protocol is "ospf 10"   Outgoing update filter list for all interfaces is not set   Incoming update filter list for all interfaces is not set   Router ID 209.17.220.1   It is an autonomous system boundary router   Redistributing External Routes from,   Number of areas in this router is 1. 1 normal 0 stub 0 nssa   Maximum path: 4   Routing for Networks:     172.31.2.0 0.0.0.255 area 0     172.31.0.0 0.0.0.3 area 0     172.31.0.4 0.0.0.3 area 0   Passive Interface(s):     GigabitEthernet0/0.1     GigabitEthernet0/0.20     GigabitEthernet0/0.30   Routing Information Sources:     Gateway         Distance      Last Update     172.31.1.249          110           00:15:52     172.31.3.249          110           00:10:56     209.17.220.1         110           00:09:56   Distance: (default is 110) </pre>
	Show ip ospf neighbor	<pre> TUN-ROUTER#show ip ospf neighbor  Neighbor ID  Pri  State           Dead Time   Address        Interface 172.31.1.249  0  FULL/ -        00:00:30   172.31.0.2    Serial0/0/0 172.31.3.249  0  FULL/ -        00:00:36   172.31.0.6    Serial0/0/1 </pre>
	Show ip route	<pre> TUN-ROUTER#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 209.17.220.3 to network 0.0.0.0  172.31.0.0/16 is variably subnetted, 17 subnets, 4 masks C 172.31.0.0/30 is directly connected, Serial0/0/0 L 172.31.0.1/32 is directly connected, Serial0/0/0 C 172.31.0.4/30 is directly connected, Serial0/0/1 L 172.31.0.5/32 is directly connected, Serial0/0/1 O 172.31.1.0/26 [110/65] via 172.31.0.2, 00:16:00, Serial0/0/0 </pre>

		<pre>O 172.31.1.64/26 [110/65] via 172.31.0.2, 00:16:00, Serial0/0/0 O 172.31.1.248/29 [110/65] via 172.31.0.2, 00:16:00, Serial0/0/0 C 172.31.2.0/26 is directly connected, GigabitEthernet0/0.20 L 172.31.2.1/32 is directly connected, GigabitEthernet0/0.20 C 172.31.2.64/26 is directly connected, GigabitEthernet0/0.30 L 172.31.2.65/32 is directly connected, GigabitEthernet0/0.30 C 172.31.2.248/29 is directly connected, GigabitEthernet0/0.1 L 172.31.2.249/32 is directly connected, GigabitEthernet0/0.1 O 172.31.3.0/26 [110/65] via 172.31.0.6, 00:11:04, Serial0/0/1 O 172.31.3.64/26 [110/65] via 172.31.0.6, 00:11:04, Serial0/0/1 O 172.31.3.240/29 [110/65] via 172.31.0.6, 00:11:04, Serial0/0/1 O 172.31.3.248/29 [110/65] via 172.31.0.6, 00:11:04, Serial0/0/1 209.17.220.0/24 is variably subnetted, 2 subnets, 2 masks C 209.17.220.0/24 is directly connected, GigabitEthernet0/1 L 209.17.220.1/32 is directly connected, GigabitEthernet0/1 S* 0.0.0.0/0 [1/0] via 209.17.220.3</pre>
Router CUND	Show ip protocol	<pre>CUND-ROUTER#show ip proto  Routing Protocol is "ospf 10"   Outgoing update filter list for all interfaces is not set   Incoming update filter list for all interfaces is not set   Router ID 172.31.3.249   Number of areas in this router is 1. 1 normal 0 stub 0 nssa   Maximum path: 4   Routing for Networks:     172.31.3.0 0.0.0.255 area 0     172.31.0.4 0.0.0.3 area 0   Passive Interface(s):     GigabitEthernet0/0.1     GigabitEthernet0/0.10     GigabitEthernet0/0.20     GigabitEthernet0/0.88   Routing Information Sources:     Gateway         Distance      Last Update     172.31.1.249     110           00:16:38     172.31.3.249     110           00:11:42     209.17.220.1     110           00:10:41   Distance: (default is 110)</pre>
	Shwo ip ospf neig	<pre>CUND-ROUTER#show ip ospf neig  Neighbor ID  Pri  State           Dead Time   Address        Interface 209.17.220.1  0   FULL/ -         00:00:38    172.31.0.5     Serial0/0/1</pre>
	Show ip route	<pre>CUND-ROUTER#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 172.31.0.5 to network 0.0.0.0      172.31.0.0/16 is variably subnetted, 17 subnets, 4 masks O   172.31.0.0/30 [110/128] via 172.31.0.5, 00:11:49, Serial0/0/1 C   172.31.0.4/30 is directly connected, Serial0/0/1 L   172.31.0.6/32 is directly connected, Serial0/0/1 O   172.31.1.0/26 [110/129] via 172.31.0.5, 00:11:49, Serial0/0/1 O   172.31.1.64/26 [110/129] via 172.31.0.5, 00:11:49, Serial0/0/1 O   172.31.1.248/29 [110/129] via 172.31.0.5, 00:11:49, Serial0/0/1 O   172.31.2.0/26 [110/65] via 172.31.0.5, 00:11:49, Serial0/0/1 O   172.31.2.64/26 [110/65] via 172.31.0.5, 00:11:49, Serial0/0/1 O   172.31.2.248/29 [110/65] via 172.31.0.5, 00:11:49, Serial0/0/1 C   172.31.3.0/26 is directly connected, GigabitEthernet0/0.10 L   172.31.3.1/32 is directly connected, GigabitEthernet0/0.10 C   172.31.3.64/26 is directly connected, GigabitEthernet0/0.20 L   172.31.3.65/32 is directly connected, GigabitEthernet0/0.20 C   172.31.3.240/29 is directly connected, GigabitEthernet0/0.88 L   172.31.3.241/32 is directly connected, GigabitEthernet0/0.88 C   172.31.3.248/29 is directly connected, GigabitEthernet0/0.1 L   172.31.3.249/32 is directly connected, GigabitEthernet0/0.1 O*E2 0.0.0.0/0 [110/1] via 172.31.0.5, 00:10:48, Serial0/0/1</pre>

### PUNTO 3 – CONFIGURACION DHCP

Una vez se tiene visibilidad completa de toda la red a nivel de enrutamiento se puede configurar el servicio de DHCP, las premisas para la configuracion de este servicio según la guía son las siguientes:

- Se debe configurar el servicio para las sedes de Bucaramanga y Cundinamarca, para las VLAN de cada una de las sedes (4 pools de IPs).
- Los pools se deben centralizar en el router de Tunja, y por medio de helper address se deben alcanzar los recursos DHCP en Tunja.

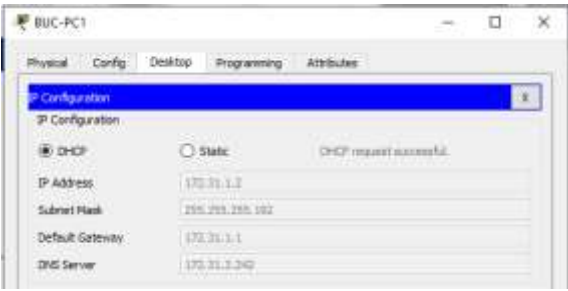
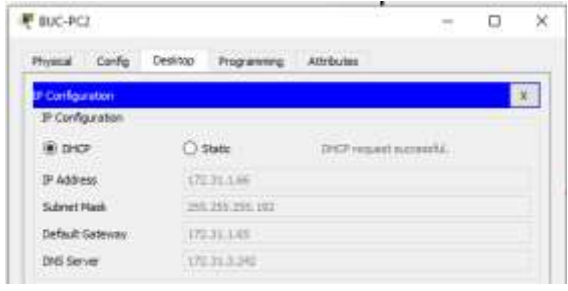
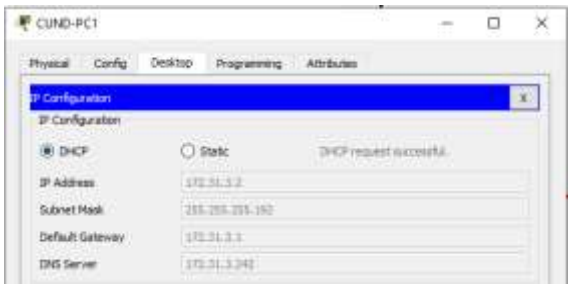
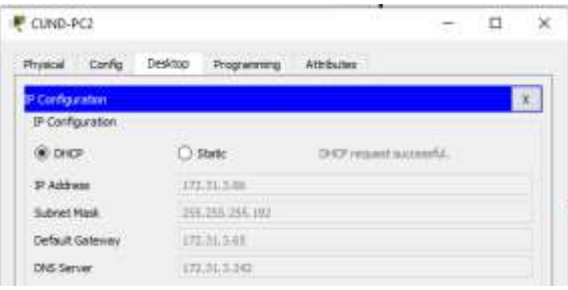
Con estos puntos definidos se hacen las siguientes configuraciones en los 3 routers:

Tabla 18. Configuración DHCP - Escenario 2

ROUTER	CONFIGURACION
<p>Router TUN Servidor DHCP</p>	<pre>! ip dhcp pool POOL_BUC_VLAN_10 network 172.31.1.0 255.255.255.192 default-router 172.31.1.1 dns-server 172.31.3.242 ip dhcp pool POOL_BUC_VLAN_30 network 172.31.1.64 255.255.255.192 default-router 172.31.1.65 dns-server 172.31.3.242 ip dhcp pool POOL_CUND_VLAN_10 network 172.31.3.0 255.255.255.192 default-router 172.31.3.1 dns-server 172.31.3.242 ip dhcp pool POOL_CUND_VLAN_20 network 172.31.3.64 255.255.255.192 default-router 172.31.3.65 dns-server 172.31.3.242 !</pre>
<p>ROUTER BUC DHCP RELAY</p>	<pre>! interface GigabitEthernet0/0.10 encapsulation dot1Q 10 ip address 172.31.1.1 255.255.255.192 ip helper-address 172.31.0.1 ! interface GigabitEthernet0/0.30 encapsulation dot1Q 30 ip address 172.31.1.65 255.255.255.192 ip helper-address 172.31.0.1 !</pre>
<p>ROUTER CUND DHCP RELAY</p>	<pre>! interface GigabitEthernet0/0.10 encapsulation dot1Q 10 ip address 172.31.3.1 255.255.255.192 ip helper-address 172.31.0.5 ! interface GigabitEthernet0/0.20 encapsulation dot1Q 20 ip address 172.31.3.65 255.255.255.192 ip helper-address 172.31.0.5 !</pre>

Después de realizada la configuración se configuran los PC para tomar IPs por DHCP, se consignan las evidencias en la siguiente tabla:

Tabla 19. Validacion servicios DHCP - Escenario 2

ROUTER	COMANDOS
PC BUCARAMANGA VLAN 10	
PC BUCARAMANGA VLAN 30	
PC CUNDINAMARCA VLAN 10	
PC CUNDINAMARCA VLAN 20	

Se revisa la tabla de asignaciones de IPs en el router de tunja para confirmar la asignacion tomada por los PC:

Tabla 20. Validacion DHCP Router Tunja - Escenario 2

ROUTER	COMANDO	RESULTADO
TUN-ROUTER	Show ip dhcp binding	<pre>TUN-ROUTER#show ip dhcp bind IP address Client-ID/ Lease expiration Type Hardware address 172.31.1.2 0001.9601.BB28 -- Automatic 172.31.1.66 0002.172B.E266 -- Automatic 172.31.3.2 000A.F31A.515E -- Automatic 172.31.3.66 0090.2B23.6000 -- Automatic TUN-ROUTER#</pre>
	Show ip dhcp pool	<pre>TUN-ROUTER#show ip dhcp pool  Pool POOL_BUC_VLAN_10 : Utilization mark (high/low) : 100 / 0 Subnet size (first/next) : 0 / 0 Total addresses : 62 Leased addresses : 1 Excluded addresses : 0 Pending event : none  1 subnet is currently in the pool Current index IP address range Leased/Excluded/Total 172.31.1.1 172.31.1.1 - 172.31.1.62 1 / 0 / 62  Pool POOL_BUC_VLAN_30 : Utilization mark (high/low) : 100 / 0 Subnet size (first/next) : 0 / 0 Total addresses : 62 Leased addresses : 1 Excluded addresses : 0 Pending event : none  1 subnet is currently in the pool Current index IP address range Leased/Excluded/Total 172.31.1.65 172.31.1.65 - 172.31.1.126 1 / 0 / 62  Pool POOL_CUND_VLAN_10 : Utilization mark (high/low) : 100 / 0 Subnet size (first/next) : 0 / 0 Total addresses : 62 Leased addresses : 1 Excluded addresses : 0 Pending event : none  1 subnet is currently in the pool Current index IP address range Leased/Excluded/Total 172.31.3.1 172.31.3.1 - 172.31.3.62 1 / 0 / 62  Pool POOL_CUND_VLAN_20 : Utilization mark (high/low) : 100 / 0 Subnet size (first/next) : 0 / 0 Total addresses : 62 Leased addresses : 1 Excluded addresses : 0 Pending event : none  1 subnet is currently in the pool Current index IP address range Leased/Excluded/Total 172.31.3.65 172.31.3.65 - 172.31.3.126 1 / 0 / 62 TUN-ROUTER#</pre>

## PUNTO 4 – CONFIGURACION NAT Y PAT

De acuerdo a la guía las premisas para configurar este servicio son las siguientes:

- El web server deberá tener NAT estático
- resto de los equipos de la topología emplearan NAT de sobrecarga (PAT)
- para la IP del servidor interno se usará la IP 209.17.220.4
- para la IP de NAT de sobrecarga se usara la IP de la interface.

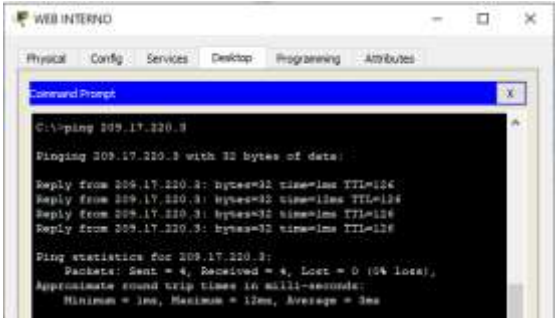
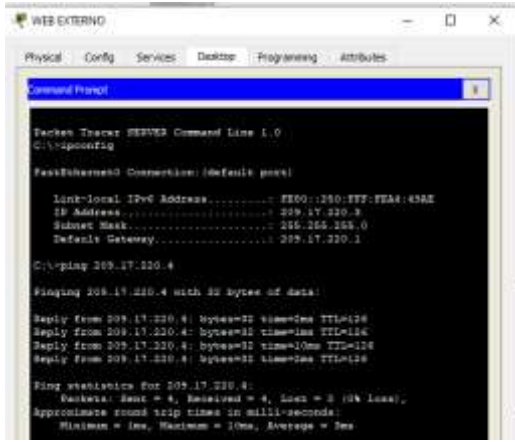
Con las condiciones definidas para la configuración de los NAT se procede a realizar la configuración.

Tabla 21. Configuración y pruebas NAT overload - Escenario 2

CONFIG	COMANDOS
Configuración ACL	<pre>ip access-list standard NAVEGACION permit 172.31.1.0 0.0.0.63 permit 172.31.1.64 0.0.0.63 permit 172.31.1.248 0.0.0.7 permit 172.31.2.0 0.0.0.63 permit 172.31.2.64 0.0.0.63 permit 172.31.2.248 0.0.0.7 permit 172.31.3.0 0.0.0.63 permit 172.31.3.64 0.0.0.63 permit 172.31.3.248 0.0.0.7 permit 172.31.0.0 0.0.0.3 permit 172.31.0.4 0.0.0.3</pre>
Configuración NAT	<pre>ip nat inside source list NAVEGACION interface GigabitEthernet0/1 overload</pre>
Asignación interfaces inside y outside	<pre>interface GigabitEthernet0/0.1 encapsulation dot1Q 1 native ip address 172.31.2.249 255.255.255.248 ip nat inside ! interface GigabitEthernet0/0.20 encapsulation dot1Q 20 ip address 172.31.2.1 255.255.255.192 ip nat inside ! interface GigabitEthernet0/0.30 encapsulation dot1Q 30 ip address 172.31.2.65 255.255.255.192 ip nat inside ! interface GigabitEthernet0/1 description CONEXION_INTERNET ip address 209.17.220.1 255.255.255.0 ip nat outside duplex auto speed auto ! interface Serial0/0/0 description CONEXION_TUN_BUC ip address 172.31.0.1 255.255.255.252 ip ospf message-digest-key 1 md5 4dm1n1str4d0r ip nat inside clock rate 2000000 ! interface Serial0/0/1 description CONEXION_TUN_CUND ip address 172.31.0.5 255.255.255.252 ip ospf message-digest-key 1 md5 4dm1n1str4d0r ip nat inside clock rate 2000000</pre>

<p>Pruebas de operaci3n NAT</p> <p>Ping desde equipos internos a server externo</p>	TUN-ROUTER#show ip nat translations			
	Pro	Inside global	Inside local	Outside local
	icmp	209.17.220.1:1024	172.31.3.2:1	209.17.220.3:1
	icmp	209.17.220.1:1025	172.31.3.2:2	209.17.220.3:2
	icmp	209.17.220.1:1026	172.31.3.2:3	209.17.220.3:3
	icmp	209.17.220.1:1027	172.31.3.2:4	209.17.220.3:4
	icmp	209.17.220.1:1028	172.31.3.66:1	209.17.220.3:1
	icmp	209.17.220.1:1029	172.31.3.66:2	209.17.220.3:2
	icmp	209.17.220.1:1030	172.31.3.66:3	209.17.220.3:3
	icmp	209.17.220.1:1031	172.31.3.66:4	209.17.220.3:4
	icmp	209.17.220.1:1	172.31.2.66:1	209.17.220.3:1
	icmp	209.17.220.1:2	172.31.2.66:2	209.17.220.3:2
	icmp	209.17.220.1:3	172.31.2.66:3	209.17.220.3:3
icmp	209.17.220.1:4	172.31.2.66:4	209.17.220.3:4	

Tabla 22. Configuraci3n y pruebas NAT estatico - Escenario 2

PRUEBA	RESULTADOS
Configuraci3n NAT	! ip nat inside source list NAVEGACION interface GigabitEthernet0/1 overload
Ping server interno externo	
Verificaci3n traslaci3n	<pre>TUN-ROUTER#show ip nat translations Pro  Inside global    Inside local    Outside local    Outside global ---  209.17.220.4      172.31.3.242   ---              ---  TUN-ROUTER#</pre>
Ping server externo - interno	
Verificaci3n traslaci3n	<pre>TUN-ROUTER# clear ip nat translation * TUN-ROUTER# TUN-ROUTER#show ip nat translations Pro  Inside global    Inside local    Outside local    Outside global ---  209.17.220.4      172.31.3.242   ---              ---</pre>







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

Para organizar de forma mas clara los requerimientos de las listas de acceso se organizan en la siguiente tabla:

Tabla 23. organizacion sentencias guía - Escenario 2

SEDE	ORIGEN	CONDICIONES
BUCARAMANGA	VLAN 1	ACCESO A INTERNET ACCESO ROUTER BUCARAMANGA ACCESO ROUTER TUNJA ACCESO ROUTER CUNDINAMARCA
	VLAN 10	ACCESO VLAN 20 DE CUNDINAMARCA ACCESO VLAN 20 DE TUNJA BLOQUEO VLAN 30 DE BUCARAMANGA BLOQUEO A INTERNET
	VLAN 30	ACCESO VLAN 10 DE TUNJA ACCESO VLAN 10 DE CUNDINAMARCA BLOQUEO VLAN 10 DE BUCARAMANGA ACCESO A INTERNET
TUNJA	VLAN 1	ACCESO A INTERNET ACCESO ROUTER BUCARAMANGA ACCESO ROUTER TUNJA ACCESO ROUTER CUNDINAMARCA
	VLAN 20	ACCESO VLAN 20 DE CUNDINAMARCA ACCESO VLAN 10 DE BUCARAMANGA BLOQUEO VLAN 30 DE TUNJA
	VLAN 30	ACCESO ASERVIDOR WEB EXTERNO ACCESO ASERVIDOR WEB INTERNO BLOQUEO VLAN 20 TUNJA
CUNDINAMARCA	VLAN 1	ACCESO A INTERNET ACCESO ROUTER BUCARAMANGA ACCESO ROUTER TUNJA ACCESO ROUTER CUNDINAMARCA
	VLAN 10	BLOQUEO VLAN 20 DE TUNJA BLOQUEO VLAN 30 DE TUNJA BLOQUEO VLAN 20 DE CUNDINAMARCA BLOQUEO VLAN 88 DE CUNDINAMARCA ACCESO A INTERNET
	VLAN 20	ACCESO VLAN 20 DE TUNJA ACCESO VLAN 30 DE TUNJA BLOQUEO VLAN 10 DE CUNDINAMARCA BLOQUEO VLAN 88 DE CUNDINAMARCA BLOQUEO A INTERNET
	VLAN 88	ACCESO ROUTER BUCARAMANGA ACCESO ROUTER TUNJA ACCESO ROUTER CUNDINAMARCA BLOQUEO VLAN 10 DE CUNDINAMARCA BLOQUEO VLAN 20 DE CUNDINAMARCA

Ya que las listas de acceso de los routers evalúan paquetes y no sesiones (a diferencia de los firewalls) es necesario evaluar que para las sentencias que permitan tráfico en un sentido, también se permita en el sentido contrario, se revisan las sentencias de permiso y se complementan con las faltantes para el tráfico de vuelta (marcadas en verde):

Tabla 24. complemento ACL - Escenario 2

SEDE	ORIGEN	CONDICIONES
BUCARAMANGA	VLAN 1	ACCESO ROUTER BUCARAMANGA ACCESO ROUTER TUNJA ACCESO ROUTER CUNDINAMARCA
	VLAN 10	ACCESO VLAN 20 DE CUNDINAMARCA ACCESO VLAN 20 DE TUNJA BLOQUEO VLAN 30 DE BUCARAMANGA BLOQUEO A INTERNET
	VLAN 30	ACCESO VLAN 10 DE CUNDINAMARCA BLOQUEO VLAN 10 DE BUCARAMANGA ACCESO A INTERNET
TUNJA	VLAN 1	ACCESO ROUTER BUCARAMANGA ACCESO ROUTER TUNJA ACCESO ROUTER CUNDINAMARCA
	VLAN 20	ACCESO VLAN 20 DE CUNDINAMARCA ACCESO VLAN 10 DE BUCARAMANGA BLOQUEO VLAN 30 DE TUNJA
	VLAN 30	ACCESO ASERVIDOR WEB EXTERNO ACCESO ASERVIDOR WEB INTERNO ACCESO VLAN 20 CUNDINAMARCA BLOQUEO VLAN 20 TUNJA
CUNDINAMARCA	VLAN 1	ACCESO ROUTER BUCARAMANGA ACCESO ROUTER TUNJA ACCESO ROUTER CUNDINAMARCA
	VLAN 10	ACCESO VLAN 30 DE BUCARAMANGA BLOQUEO VLAN 20 DE TUNJA BLOQUEO VLAN 30 DE TUNJA BLOQUEO VLAN 20 DE CUNDINAMARCA BLOQUEO VLAN 88 DE CUNDINAMARCA ACCESO A INTERNET
	VLAN 20	ACCESO VLAN 20 DE TUNJA ACCESO VLAN 30 DE TUNJA ACCESO VLAN 10 DE BUCARAMANGA BLOQUEO VLAN 10 DE CUNDINAMARCA BLOQUEO VLAN 88 DE CUNDINAMARCA BLOQUEO A INTERNET
	VLAN 88	ACCESO ROUTER BUCARAMANGA ACCESO ROUTER TUNJA ACCESO ROUTER CUNDINAMARCA ACCESO VLAN 30 TUNJA BLOQUEO VLAN 10 DE CUNDINAMARCA BLOQUEO VLAN 20 DE CUNDINAMARCA

Finalmente, se parte del principio que lo que no esta permitido explícitamente se debe bloquear, adicional se agrega en todas lasserencias permisos para que el servicio de DHCP opere sin problema (UDP puertos 67 y 68) con este concepto se consolida la tabla y se organizan las sentencias:

Tabla 25. Consolidacion final ACL - Escenario 2

SEDE	ORIGEN	CONDICIONES
BUCARAMANGA	VLAN 1	ACCESO ANY ANY
	VLAN 10	ACCESO VLAN 20 DE CUNDINAMARCA ACCESO VLAN 20 DE TUNJA BLOQUEO ANY ANY
	VLAN 30	ACCESO VLAN 10 DE CUNDINAMARCA BLOQUEO VLAN 1 BUCARAMANGA BLOQUEO VLAN 10 DE BUCARAMANGA BLOQUEO VLAN 20 CUNDINAMARCA BLOQUEO VLAN 88 CUNDINAMARCA BLOQUEO TOTAL TUNJA ACCESO A INTETRNET
TUNJA	VLAN 1	ACCESO ANY ANY
	VLAN 20	ACCESO VLAN 20 DE CUNDINAMARCA ACCESO VLAN 10 DE BUCARAMANGA BLOQUEO ANY ANY
	VLAN 30	ACCESO ASERVIDOR WEB EXTERNO ACCESO ASERVIDOR WEB INTERNO ACCESO VLAN 20 CUNDINAMARCA BLOQUEO ANY ANY
CUNDINAMARCA	VLAN 1	ACCESO ANY ANY
	VLAN 10	ACCESO VLAN 30 DE BUCARAMANGA BLOQUEO TOTAL TUNJA BLOQUEO VLAN 10 DE BUCARAMANGA BLOQUEO VLAN 1 CUNDINAMARCA BLOQUEO VLAN 20 DE CUNDINAMARCA BLOQUEO VLAN 88 DE CUNDINAMARCA ACCESO A INTERNET
	VLAN 20	ACCESO VLAN 20 DE TUNJA ACCESO VLAN 30 DE TUNJA ACCESO VLAN 10 DE BUCARAMANGA BLOQUEO ANY ANY
	VLAN 88	ACCESO VLAN 30 TUNJA ACCESO ENLACE BUC-TUN ACCESO ENLACE TUN-CUND BLOQUEO ANY ANY
GESTION ROUTERS	LINEAS VTY	ACCESO VLAN 1 BUCARAMANGA ACCESO VLAN 1 TUNJA ACCESO VLAN 1 CUNDINAMARCA ACCESO VLAN 88 CUNDINAMARCA

Con las sentencias consolidadas y optimizadas se procede a la configuracion de las listas de acceso en cada una de las interfaces VLAN, asi como la lista de acceso para la gestión de los routers, se usarán listas de acceso nombradas extendidas:

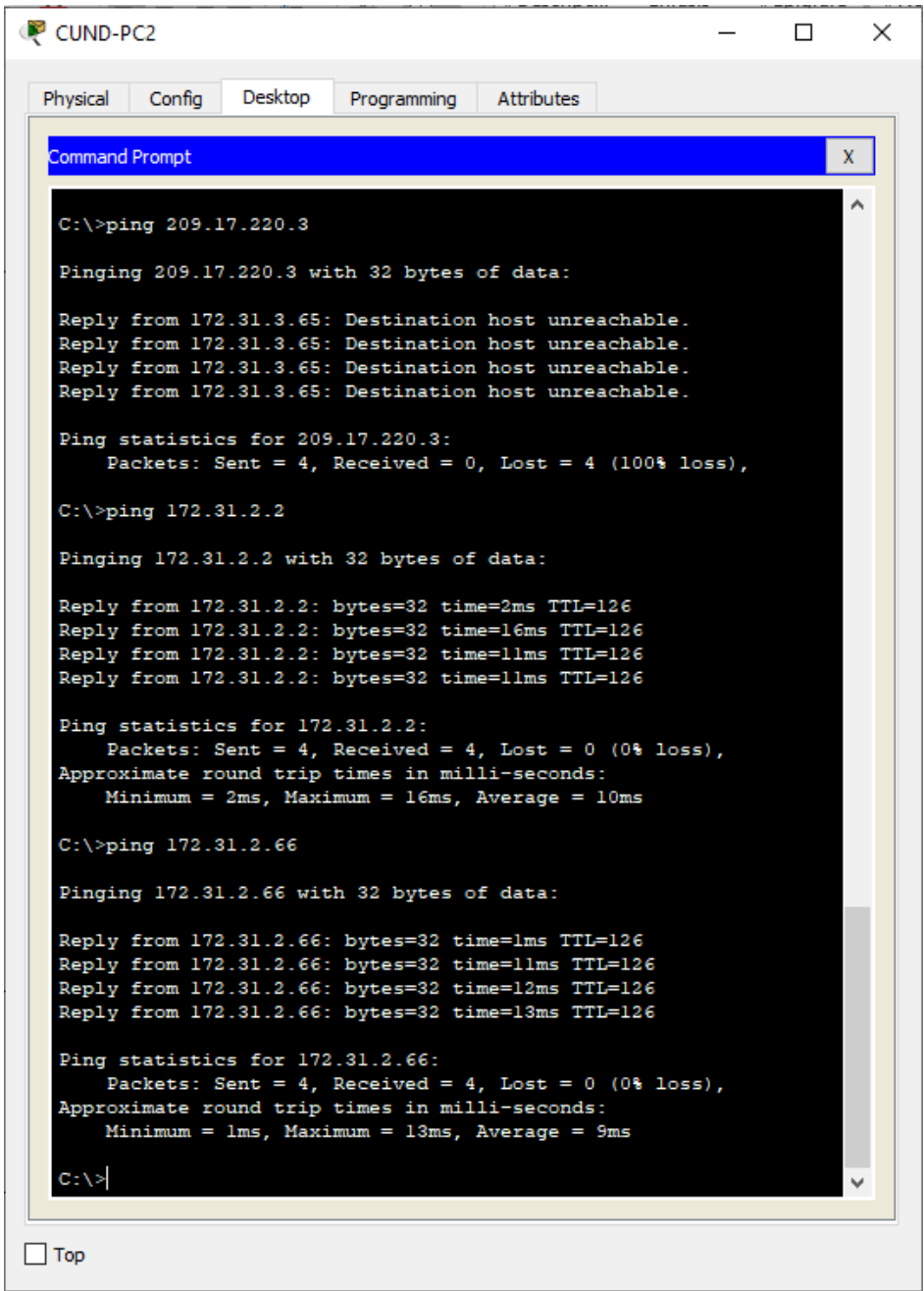
Tabla 26. Comandos configuracion ACL - Escenario 2

ROUTER	INTERFACE	CONFIGURACION
BUCARAMANGA	VLAN 1	<pre>ip access-list extended ACL_BUC_VLAN1 permit ip any any  interface GigabitEthernet0/0.1 encapsulation dot1Q 1 native ip address 172.31.1.249 255.255.255.248 ip access-group ACL_BUC_VLAN1 in</pre>
	VLAN 10	<pre>ip access-list extended ACL_BUC_VLAN10 permit udp any any eq bootpc permit udp any any eq bootps permit ip 172.31.1.0 0.0.0.63 172.31.3.64 0.0.0.63 permit ip 172.31.1.0 0.0.0.63 172.31.2.0 0.0.0.63 deny ip any any  interface GigabitEthernet0/0.10 encapsulation dot1Q 10 ip address 172.31.1.1 255.255.255.192 ip helper-address 172.31.0.1 ip access-group ACL_BUC_VLAN10 in</pre>
	VLAN 30	<pre>ip access-list extended ACL_BUC_VLAN30 permit udp any any eq bootpc permit udp any any eq bootps permit ip 172.31.1.64 0.0.0.63 172.31.3.0 0.0.0.63 deny ip 172.31.1.64 0.0.0.63 172.31.1.248 0.0.0.7 deny ip 172.31.1.64 0.0.0.63 172.31.1.0 0.0.0.63 deny ip 172.31.1.64 0.0.0.63 172.31.2.0 0.0.0.255 deny ip 172.31.1.64 0.0.0.63 172.31.3.64 0.0.0.63 deny ip 172.31.1.64 0.0.0.63 172.31.3.240 0.0.0.7 permit ip any any  interface GigabitEthernet0/0.30 encapsulation dot1Q 30 ip address 172.31.1.65 255.255.255.192 ip helper-address 172.31.0.1 ip access-group ACL_BUC_VLAN30 in</pre>
TUNJA	VLAN 1	<pre>ip access-list extended ACL_TUN_VLAN1 permit ip any any  interface GigabitEthernet0/0.1 encapsulation dot1Q 1 native ip address 172.31.2.249 255.255.255.248 ip access-group ACL_TUN_VLAN1 in ip nat inside</pre>
	VLAN 20	<pre>ip access-list extended ACL_TUN_VLAN20 permit udp any any eq bootpc permit udp any any eq bootps permit ip 172.31.2.0 0.0.0.63 172.31.3.64 0.0.0.63 permit ip 172.31.2.0 0.0.0.63 172.31.1.0 0.0.0.63 deny ip any any  interface GigabitEthernet0/0.20 encapsulation dot1Q 20 ip address 172.31.2.1 255.255.255.192 ip access-group ACL_TUN_VLAN20 in ip nat inside</pre>
	VLAN 30	<pre>ip access-list extended ACL_TUN_VLAN30 permit udp any any eq bootpc permit udp any any eq bootps permit ip 172.31.2.64 0.0.0.63 host 209.17.220.3 permit ip 172.31.2.64 0.0.0.63 host 172.31.3.242 permit ip 172.31.2.64 0.0.0.63 172.31.3.64 0.0.0.63 deny ip any any  interface GigabitEthernet0/0.30</pre>

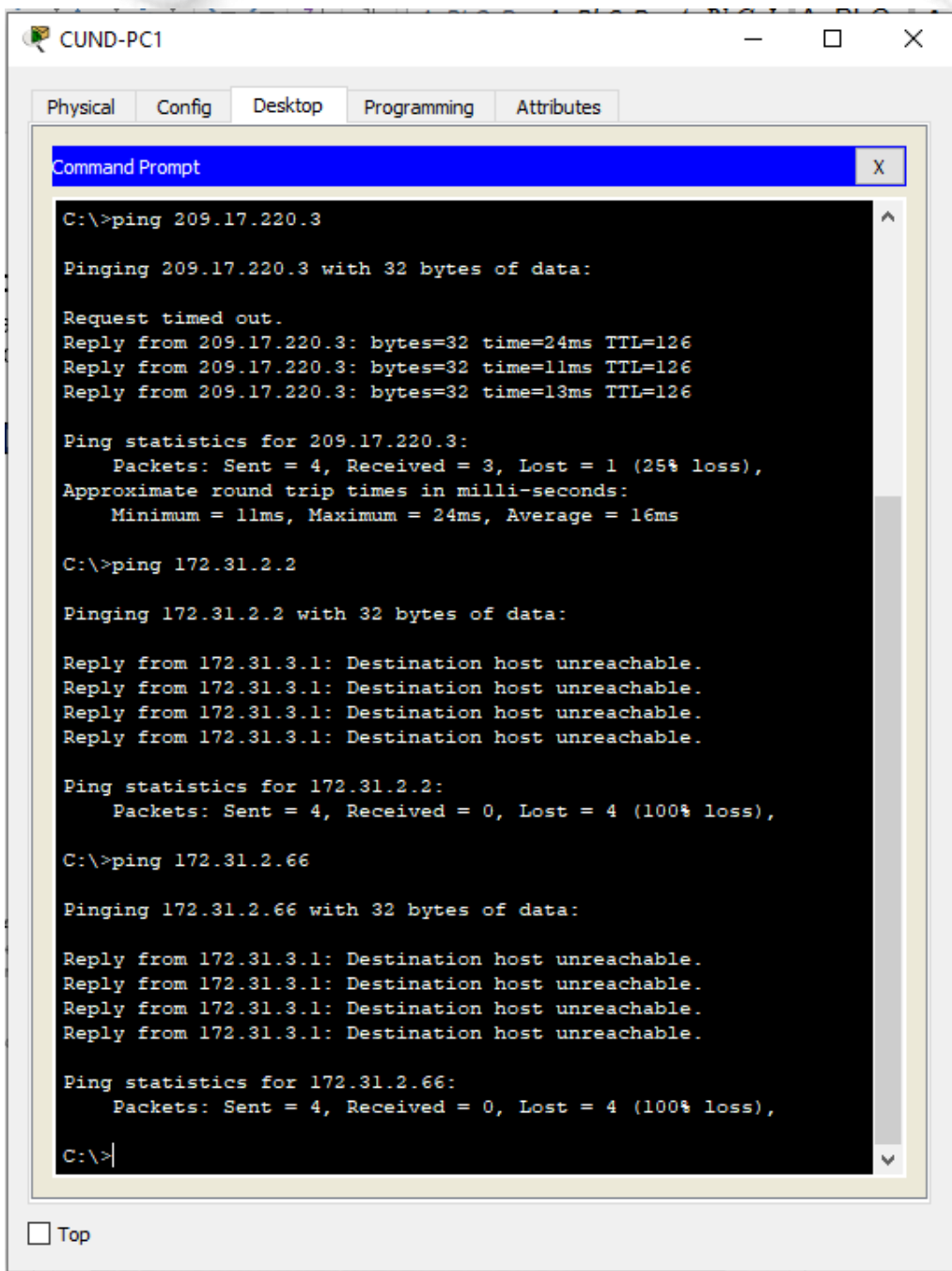
		<pre>encapsulation dot1Q 30 ip address 172.31.2.65 255.255.255.192 ip access-group ACL_TUN_VLAN30 in ip nat inside</pre>
CUNDINAMARCA	VLAN 1	<pre>ip access-list extended ACL_CUND_VLAN1 permit ip any any  interface GigabitEthernet0/0.1 encapsulation dot1Q 1 native ip address 172.31.3.249 255.255.255.248 ip access-group ACL_CUND_VLAN1 in</pre>
	VLAN 10	<pre>ip access-list extended ACL_CUND_VLAN10 permit udp any any eq bootpc permit udp any any eq bootps permit ip 172.31.3.0 0.0.0.63 172.31.1.64 0.0.0.63 deny ip 172.31.3.0 0.0.0.63 172.31.2.0 0.0.0.255 deny ip 172.31.3.0 0.0.0.63 172.31.1.0 0.0.0.63 deny ip 172.31.3.0 0.0.0.63 172.31.3.248 0.0.0.7 deny ip 172.31.3.0 0.0.0.63 172.31.3.64 0.0.0.63 deny ip 172.31.3.0 0.0.0.63 172.31.3.240 0.0.0.7 permit ip any any  interface GigabitEthernet0/0.10 encapsulation dot1Q 10 ip address 172.31.3.1 255.255.255.192 ip helper-address 172.31.0.5 ip access-group ACL_CUND_VLAN10 in</pre>
	VLAN 20	<pre>ip access-list extended ACL_CUND_VLAN20 permit udp any any eq bootpc permit udp any any eq bootps permit ip 172.31.3.64 0.0.0.63 172.31.2.0 0.0.0.63 permit ip 172.31.3.64 0.0.0.63 172.31.2.64 0.0.0.63 deny ip any any  interface GigabitEthernet0/0.20 encapsulation dot1Q 20 ip address 172.31.3.65 255.255.255.192 ip helper-address 172.31.0.5 ip access-group ACL_CUND_VLAN20 in</pre>
	VLAN 88	<pre>ip access-list extended ACL_CUND_VLAN88 permit udp any any eq bootpc permit udp any any eq bootps permit ip 172.31.3.240 0.0.0.7 172.31.2.64 0.0.0.63 permit ip 172.31.3.240 0.0.0.7 172.31.0.0 0.0.0.3 permit ip 172.31.3.240 0.0.0.7 172.31.0.4 0.0.0.3 permit ip 172.31.3.240 0.0.0.7 172.31.1.248 0.0.0.7 permit ip 172.31.3.240 0.0.0.7 172.31.2.248 0.0.0.7 permit ip 172.31.3.240 0.0.0.7 172.31.3.248 0.0.0.7 deny ip any any  interface GigabitEthernet0/0.88 encapsulation dot1Q 88 ip address 172.31.3.241 255.255.255.248 ip access-group ACL_CUND_VLAN88 in</pre>
GESTION ROUTERS	LINEAS VTY	<pre>ip access-list standard GESTION_ROUTERS permit 172.31.1.248 0.0.0.7 permit 172.31.2.248 0.0.0.7 permit 172.31.3.248 0.0.0.7 permit 172.31.3.240 0.0.0.7  line vty 0 4 access-class GESTION_ROUTERS in login authentication default line vty 5 15 access-class GESTION_ROUTERS in login authentication default</pre>

## PUNTO 8 – VERIFICACION LISTAS DE ACCESO

Con todas las ACL configuradas sobre cada interface, se hace una comprobación de las condiciones solicitadas en la guía y se consignan en la tabla 27:

CONDICION	CONDICIONES
<p>Los hosts de VLAN 20 en Cundinamarca no acceden a internet, solo a la red interna de Tunja.</p>	 <pre> CUND-PC2 Physical Config Desktop Programming Attributes Command Prompt C:\&gt;ping 209.17.220.3  Pinging 209.17.220.3 with 32 bytes of data:  Reply from 172.31.3.65: Destination host unreachable. Reply from 172.31.3.65: Destination host unreachable. Reply from 172.31.3.65: Destination host unreachable. Reply from 172.31.3.65: Destination host unreachable.  Ping statistics for 209.17.220.3:     Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),  C:\&gt;ping 172.31.2.2  Pinging 172.31.2.2 with 32 bytes of data:  Reply from 172.31.2.2: bytes=32 time=2ms TTL=126 Reply from 172.31.2.2: bytes=32 time=16ms TTL=126 Reply from 172.31.2.2: bytes=32 time=11ms TTL=126 Reply from 172.31.2.2: bytes=32 time=11ms TTL=126  Ping statistics for 172.31.2.2:     Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),     Approximate round trip times in milli-seconds:         Minimum = 2ms, Maximum = 16ms, Average = 10ms  C:\&gt;ping 172.31.2.66  Pinging 172.31.2.66 with 32 bytes of data:  Reply from 172.31.2.66: bytes=32 time=1ms TTL=126 Reply from 172.31.2.66: bytes=32 time=11ms TTL=126 Reply from 172.31.2.66: bytes=32 time=12ms TTL=126 Reply from 172.31.2.66: bytes=32 time=13ms TTL=126  Ping statistics for 172.31.2.66:     Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),     Approximate round trip times in milli-seconds:         Minimum = 1ms, Maximum = 13ms, Average = 9ms  C:\&gt; </pre>

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



```

CUND-PC1
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 209.17.220.3

Pinging 209.17.220.3 with 32 bytes of data:

Request timed out.
Reply from 209.17.220.3: bytes=32 time=24ms TTL=126
Reply from 209.17.220.3: bytes=32 time=11ms TTL=126
Reply from 209.17.220.3: bytes=32 time=13ms TTL=126

Ping statistics for 209.17.220.3:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 11ms, Maximum = 24ms, Average = 16ms

C:\>ping 172.31.2.2

Pinging 172.31.2.2 with 32 bytes of data:

Reply from 172.31.3.1: Destination host unreachable.
Reply from 172.31.3.1: Destination host unreachable.
Reply from 172.31.3.1: Destination host unreachable.
Reply from 172.31.3.1: Destination host unreachable.

Ping statistics for 172.31.2.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 172.31.2.66

Pinging 172.31.2.66 with 32 bytes of data:

Reply from 172.31.3.1: Destination host unreachable.
Reply from 172.31.3.1: Destination host unreachable.
Reply from 172.31.3.1: Destination host unreachable.
Reply from 172.31.3.1: Destination host unreachable.

Ping statistics for 172.31.2.66:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>

```

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

TUN-PC2
\_ □ ×

Physical
Config
Desktop
Programming
Attributes

Command Prompt

```

C:\>ping 172.31.3.242

Pinging 172.31.3.242 with 32 bytes of data:

Request timed out.
Reply from 172.31.3.242: bytes=32 time=11ms TTL=126
Reply from 172.31.3.242: bytes=32 time=13ms TTL=126
Reply from 172.31.3.242: bytes=32 time=11ms TTL=126

Ping statistics for 172.31.3.242:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 11ms, Maximum = 13ms, Average = 11ms

C:\>ping 209.17.220.3

Pinging 209.17.220.3 with 32 bytes of data:

Reply from 209.17.220.3: bytes=32 time<1ms TTL=127
Reply from 209.17.220.3: bytes=32 time=11ms TTL=127
Reply from 209.17.220.3: bytes=32 time<1ms TTL=127
Reply from 209.17.220.3: bytes=32 time=11ms TTL=127

Ping statistics for 209.17.220.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 11ms, Average = 5ms

C:\>ping 172.31.1.2

Pinging 172.31.1.2 with 32 bytes of data:

Reply from 172.31.2.65: Destination host unreachable.
Reply from 172.31.2.65: Destination host unreachable.
Reply from 172.31.2.65: Destination host unreachable.
Reply from 172.31.2.65: Destination host unreachable.

Ping statistics for 172.31.1.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 172.31.3.2

Pinging 172.31.3.2 with 32 bytes of data:

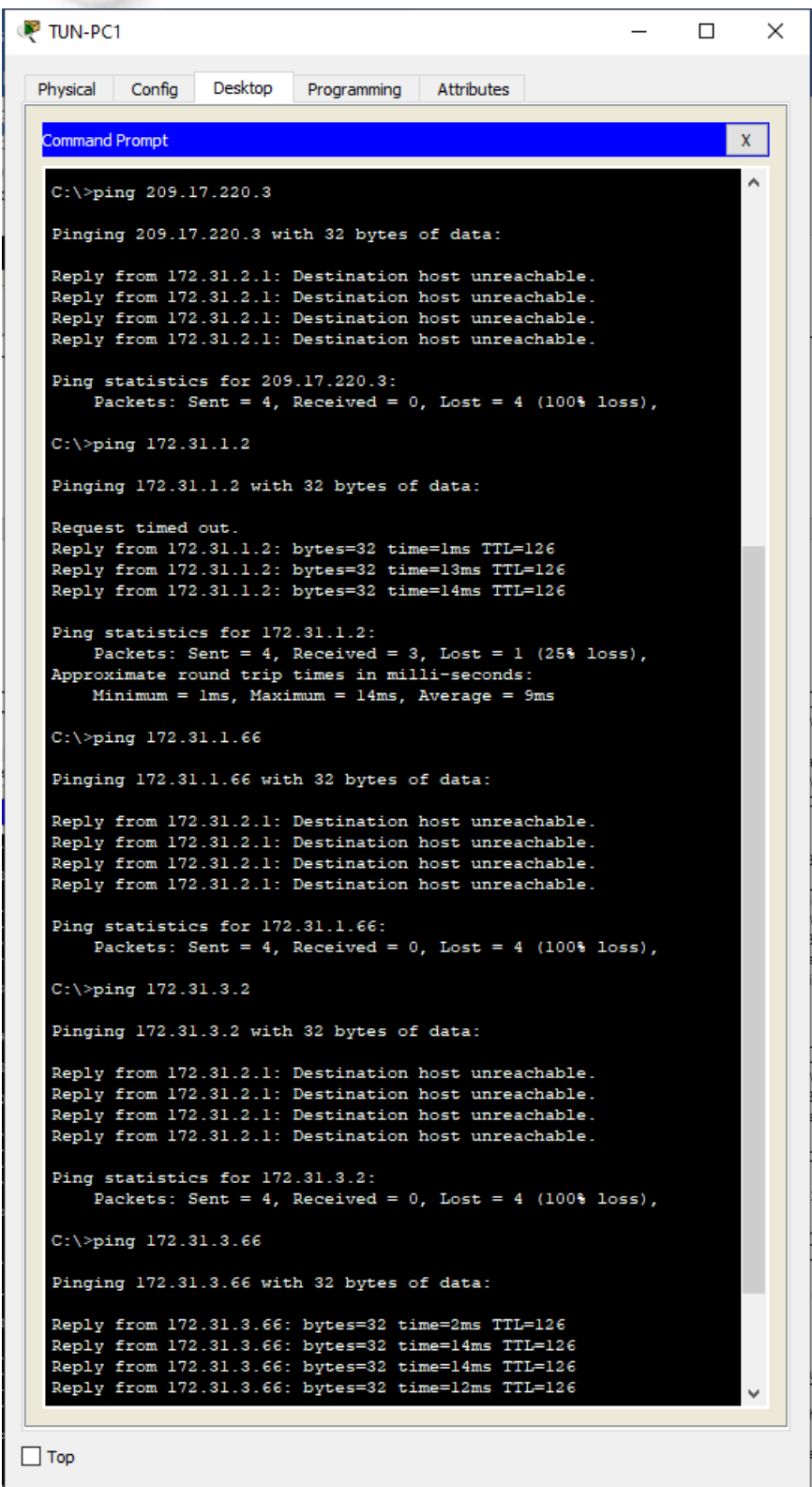
Reply from 172.31.2.65: Destination host unreachable.
Reply from 172.31.2.65: Destination host unreachable.
Reply from 172.31.2.65: Destination host unreachable.
Reply from 172.31.2.65: Destination host unreachable.

Ping statistics for 172.31.3.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>|
                    
```

Top

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



```

TUN-PC1
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 209.17.220.3

Pinging 209.17.220.3 with 32 bytes of data:

Reply from 172.31.2.1: Destination host unreachable.
Reply from 172.31.2.1: Destination host unreachable.
Reply from 172.31.2.1: Destination host unreachable.
Reply from 172.31.2.1: Destination host unreachable.

Ping statistics for 209.17.220.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 172.31.1.2

Pinging 172.31.1.2 with 32 bytes of data:

Request timed out.
Reply from 172.31.1.2: bytes=32 time=1ms TTL=126
Reply from 172.31.1.2: bytes=32 time=13ms TTL=126
Reply from 172.31.1.2: bytes=32 time=14ms TTL=126

Ping statistics for 172.31.1.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 14ms, Average = 9ms

C:\>ping 172.31.1.66

Pinging 172.31.1.66 with 32 bytes of data:

Reply from 172.31.2.1: Destination host unreachable.
Reply from 172.31.2.1: Destination host unreachable.
Reply from 172.31.2.1: Destination host unreachable.
Reply from 172.31.2.1: Destination host unreachable.

Ping statistics for 172.31.1.66:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 172.31.3.2

Pinging 172.31.3.2 with 32 bytes of data:

Reply from 172.31.2.1: Destination host unreachable.
Reply from 172.31.2.1: Destination host unreachable.
Reply from 172.31.2.1: Destination host unreachable.
Reply from 172.31.2.1: Destination host unreachable.

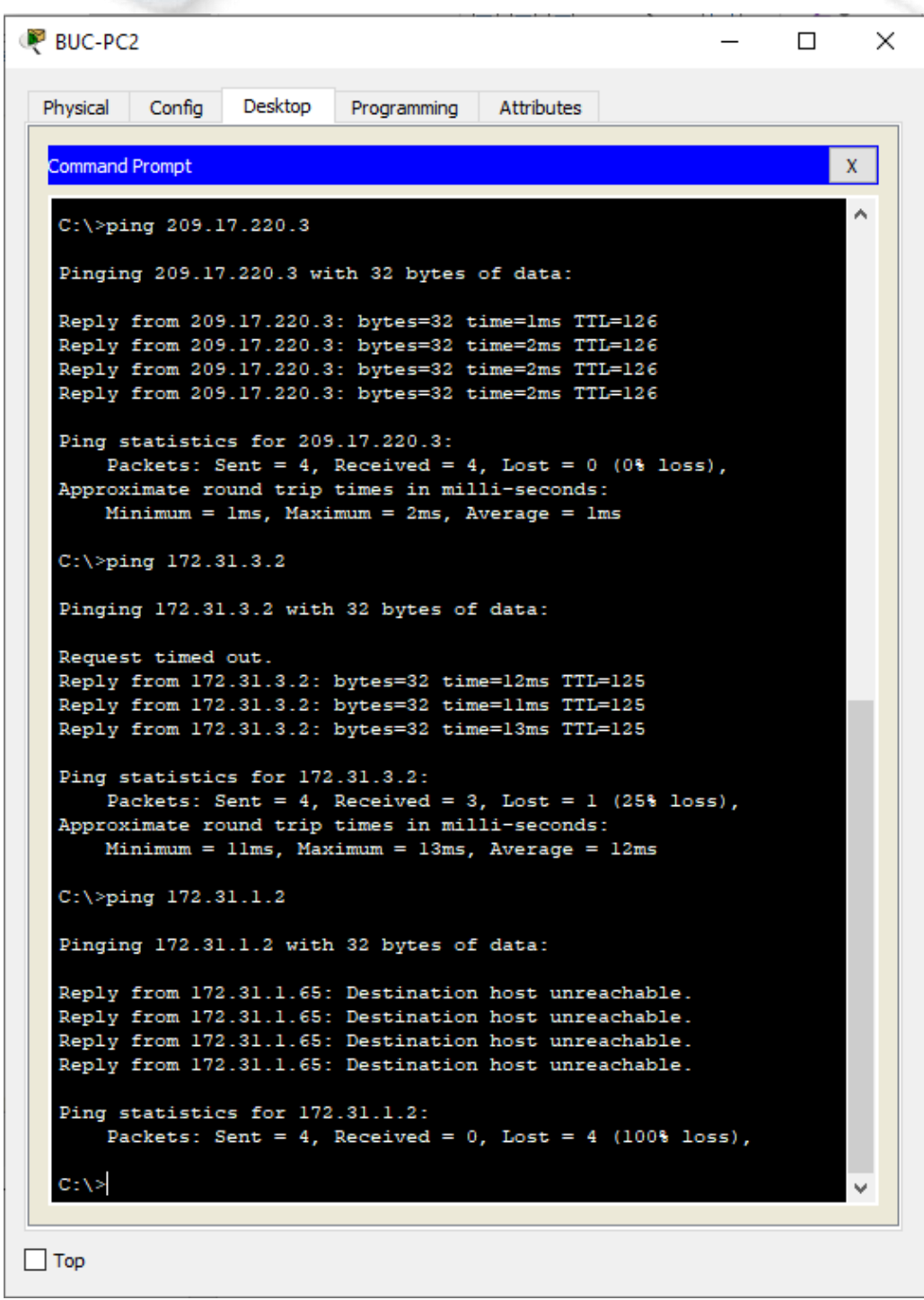
Ping statistics for 172.31.3.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 172.31.3.66

Pinging 172.31.3.66 with 32 bytes of data:

Reply from 172.31.3.66: bytes=32 time=2ms TTL=126
Reply from 172.31.3.66: bytes=32 time=14ms TTL=126
Reply from 172.31.3.66: bytes=32 time=14ms TTL=126
Reply from 172.31.3.66: bytes=32 time=12ms TTL=126
                    
```

los hosts de VLAN 30 de Bucaramang a acceden a internet y a cualquier equipo de VLAN 10.



```

C:\>ping 209.17.220.3

Pinging 209.17.220.3 with 32 bytes of data:

Reply from 209.17.220.3: bytes=32 time=1ms TTL=126
Reply from 209.17.220.3: bytes=32 time=2ms TTL=126
Reply from 209.17.220.3: bytes=32 time=2ms TTL=126
Reply from 209.17.220.3: bytes=32 time=2ms TTL=126

Ping statistics for 209.17.220.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 2ms, Average = 1ms

C:\>ping 172.31.3.2

Pinging 172.31.3.2 with 32 bytes of data:

Request timed out.
Reply from 172.31.3.2: bytes=32 time=12ms TTL=125
Reply from 172.31.3.2: bytes=32 time=11ms TTL=125
Reply from 172.31.3.2: bytes=32 time=13ms TTL=125

Ping statistics for 172.31.3.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 11ms, Maximum = 13ms, Average = 12ms

C:\>ping 172.31.1.2

Pinging 172.31.1.2 with 32 bytes of data:

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

Ping statistics for 172.31.1.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>

```

NOTA: el ping a la VLAN 10 de Bucaramanga falla porque mas delanter hay otra sentencia que pide que entre las VLAN de la misma sede no se puedan ver, por lo que el trafico de la VLAN 30 de BUC a la VLAN 10 de BUC esta restringido.

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



```

BUC-PC1
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 209.17.220.3

Pinging 209.17.220.3 with 32 bytes of data:

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

Ping statistics for 209.17.220.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 172.31.2.2

Pinging 172.31.2.2 with 32 bytes of data:

Reply from 172.31.2.2: bytes=32 time=1ms TTL=126
Reply from 172.31.2.2: bytes=32 time=14ms TTL=126
Reply from 172.31.2.2: bytes=32 time=12ms TTL=126
Reply from 172.31.2.2: bytes=32 time=4ms TTL=126

Ping statistics for 172.31.2.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 14ms, Average = 7ms

C:\>ping 172.31.2.66

Pinging 172.31.2.66 with 32 bytes of data:

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

Ping statistics for 172.31.2.66:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 172.31.3.2

Pinging 172.31.3.2 with 32 bytes of data:

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

Ping statistics for 172.31.3.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 172.31.3.66

Pinging 172.31.3.66 with 32 bytes of data:

Reply from 172.31.3.66: bytes=32 time=3ms TTL=125
Reply from 172.31.3.66: bytes=32 time=11ms TTL=125
Reply from 172.31.3.66: bytes=32 time=20ms TTL=125
Reply from 172.31.3.66: bytes=32 time=12ms TTL=125

```

### Conectividad VLANs BUCARAMANGA

```
BUC-PC1
Command Prompt
C:\>ping 172.31.1.66
Pinging 172.31.1.66 with 32 bytes of data:
Reply from 172.31.1.1: Destination host unreachable.
Reply from 172.31.1.1: Destination host unreachable.
Reply from 172.31.1.1: Destination host unreachable.
Reply from 172.31.1.1: Destination host unreachable.

Ping statistics for 172.31.1.66:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 172.31.1.250
Pinging 172.31.1.250 with 32 bytes of data:
Reply from 172.31.1.1: Destination host unreachable.
Reply from 172.31.1.1: Destination host unreachable.
Reply from 172.31.1.1: Destination host unreachable.
Reply from 172.31.1.1: Destination host unreachable.

Ping statistics for 172.31.1.250:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

BUC-PC2
Command Prompt
C:\>ping 172.31.1.3
Pinging 172.31.1.3 with 32 bytes of data:
Reply from 172.31.1.66: Destination host unreachable.
Reply from 172.31.1.66: Destination host unreachable.
Reply from 172.31.1.66: Destination host unreachable.
Reply from 172.31.1.66: Destination host unreachable.

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

C:\>ping 172.31.1.250
Pinging 172.31.1.250 with 32 bytes of data:
Reply from 172.31.1.66: Destination host unreachable.
Reply from 172.31.1.66: Destination host unreachable.
Reply from 172.31.1.66: Destination host unreachable.
Reply from 172.31.1.66: Destination host unreachable.

Ping statistics for 172.31.1.250:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

### Conectividad VLANs TUNJA

```
TUN-PC1
Command Prompt
C:\>ping 172.31.2.66
Pinging 172.31.2.66 with 32 bytes of data:
Reply from 172.31.2.1: Destination host unreachable.
Reply from 172.31.2.1: Destination host unreachable.
Reply from 172.31.2.1: Destination host unreachable.
Reply from 172.31.2.1: Destination host unreachable.

Ping statistics for 172.31.2.66:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 172.31.2.250
Pinging 172.31.2.250 with 32 bytes of data:
Reply from 172.31.2.1: Destination host unreachable.
Reply from 172.31.2.1: Destination host unreachable.
Reply from 172.31.2.1: Destination host unreachable.
Reply from 172.31.2.1: Destination host unreachable.

Ping statistics for 172.31.2.250:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

TUN-PC2
Command Prompt
C:\>ping 172.31.2.3
Pinging 172.31.2.3 with 32 bytes of data:
Reply from 172.31.2.66: Destination host unreachable.
Reply from 172.31.2.66: Destination host unreachable.
Reply from 172.31.2.66: Destination host unreachable.
Reply from 172.31.2.66: Destination host unreachable.

Ping statistics for 172.31.2.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 172.31.2.250
Pinging 172.31.2.250 with 32 bytes of data:
Reply from 172.31.2.66: Destination host unreachable.
Reply from 172.31.2.66: Destination host unreachable.
Reply from 172.31.2.66: Destination host unreachable.
Reply from 172.31.2.66: Destination host unreachable.

Ping statistics for 172.31.2.250:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

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

### Conectividad VLANs CUNDINAMARCA

```
CUND-PC1
Command Prompt
C:\>ping 172.31.3.66
Pinging 172.31.3.66 with 32 bytes of data:
Reply from 172.31.3.1: Destination host unreachable.
Reply from 172.31.3.1: Destination host unreachable.
Reply from 172.31.3.1: Destination host unreachable.
Reply from 172.31.3.1: Destination host unreachable.

Ping statistics for 172.31.3.66:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 172.31.3.250
Pinging 172.31.3.250 with 32 bytes of data:
Reply from 172.31.3.1: Destination host unreachable.
Reply from 172.31.3.1: Destination host unreachable.
Reply from 172.31.3.1: Destination host unreachable.
Reply from 172.31.3.1: Destination host unreachable.

Ping statistics for 172.31.3.250:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

CUND-PC2
Command Prompt
C:\>ping 172.31.3.3
Pinging 172.31.3.3 with 32 bytes of data:
Reply from 172.31.3.66: Destination host unreachable.
Reply from 172.31.3.66: Destination host unreachable.
Reply from 172.31.3.66: Destination host unreachable.
Reply from 172.31.3.66: Destination host unreachable.

Ping statistics for 172.31.3.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 172.31.3.250
Pinging 172.31.3.250 with 32 bytes of data:
Reply from 172.31.3.66: Destination host unreachable.
Reply from 172.31.3.66: Destination host unreachable.
Reply from 172.31.3.66: Destination host unreachable.
Reply from 172.31.3.66: Destination host unreachable.

Ping statistics for 172.31.3.250:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

<p>Solo los hosts de las VLAN administrativas y de la VLAN de servidores tienen acceso a los routers e internet.</p>	<pre> PRUEBAS DESDE SW BUC A ROUTERS E INTERNET  BUC-SW#telnet 172.31.0.2 Trying 172.31.0.2 ...Open *****ADVERTENCIA***** * * La administracion de este dispositivo esta restringido * * y solamente es administrado por personal de TI de la * * compania, abstengase de ingresar a este sistema. * * *****  User Access Verification  Username: Administrador  Password: BUC-ROUTER&gt;exit  [Connection to 172.31.0.2 closed by foreign host] BUC-SW#telnet 172.31.0.1 Trying 172.31.0.1 ...Open *****ADVERTENCIA***** * * La administracion de este dispositivo esta restringido * * y solamente es administrado por personal de TI de la * * compania, abstengase de ingresar a este sistema. * * *****  User Access Verification  Username: Administrador  Password: TUN-ROUTER&gt;exit  [Connection to 172.31.0.1 closed by foreign host] BUC-SW#telnet 172.31.0.6 Trying 172.31.0.6 ...Open *****ADVERTENCIA***** * * La administracion de este dispositivo esta restringido * * y solamente es administrado por personal de TI de la * * compania, abstengase de ingresar a este sistema. * * *****  User Access Verification  Username: Administrador  Password: CUND-ROUTER&gt;exit  [Connection to 172.31.0.6 closed by foreign host] BUC-SW#ping 209.17.220.3  Type escape sequence to abort. Sending 5, 100-byte ICMP Echos to 209.17.220.3, timeout is 2 seconds: !!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 2/6/12 ms  BUC-SW#ping 172.31.3.242  Type escape sequence to abort. Sending 5, 100-byte ICMP Echos to 172.31.3.242, timeout is 2 seconds: !!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 3/9/16 ms  PRUEBAS DESDE SW TUN A ROUTERS E INTERNET  TUN-SW#telnet 172.31.0.2 Trying 172.31.0.2 ...Open </pre>
--	--

```

*****ADVERTENCIA*****
*
* La administracion de este dispositivo esta restringido *
* y solamente es administrado por personal de TI de la *
* compania, abstengase de ingresar a este sistema. *
*
*****

User Access Verification

Username: Administrador

Password:
BUC-ROUTER>exit

[Connection to 172.31.0.2 closed by foreign host]
TUN-SW#telnet 172.31.0.1
Trying 172.31.0.1 ...Open
*****ADVERTENCIA*****
*
* La administracion de este dispositivo esta restringido *
* y solamente es administrado por personal de TI de la *
* compania, abstengase de ingresar a este sistema. *
*
*****

User Access Verification

Username: Administrador

Password:
TUN-ROUTER>exit

[Connection to 172.31.0.1 closed by foreign host]
TUN-SW#telnet 172.31.0.6
Trying 172.31.0.6 ...Open
*****ADVERTENCIA*****
*
* La administracion de este dispositivo esta restringido *
* y solamente es administrado por personal de TI de la *
* compania, abstengase de ingresar a este sistema. *
*
*****

User Access Verification

Username: Administrador

Password:
CUND-ROUTER>exit

[Connection to 172.31.0.6 closed by foreign host]
TUN-SW#ping 172.31.3.242

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.31.3.242, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 2/10/15 ms

TUN-SW#ping 209.17.220.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.17.220.3, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/2/11 ms

PRUEBAS DESDE SW CUND A ROUTERS E INTERNET

SW-CUND#telnet 172.31.0.2
Trying 172.31.0.2 ...Open
*****ADVERTENCIA*****
*
* La administracion de este dispositivo esta restringido *
* y solamente es administrado por personal de TI de la *

```

```

* compania, abstengase de ingresar a este sistema.      *
*                                                         *
*****
User Access Verification

Username: Administrador

Password:
BUC-ROUTER>exit

[Connection to 172.31.0.2 closed by foreign host]
SW-CUND#telnet 172.31.0.1
Trying 172.31.0.1 ...Open
*****ADVERTENCIA*****
*                                                         *
* La administracion de este dispositivo esta restringido *
* y solamente es administrado por personal de TI de la  *
* compania, abstengase de ingresar a este sistema.     *
*                                                         *
*****

User Access Verification

Username: Administrador

Password:
TUN-ROUTER>exit

[Connection to 172.31.0.1 closed by foreign host]
SW-CUND#telnet 172.31.0.6
Trying 172.31.0.6 ...Open
*****ADVERTENCIA*****
*                                                         *
* La administracion de este dispositivo esta restringido *
* y solamente es administrado por personal de TI de la  *
* compania, abstengase de ingresar a este sistema.     *
*                                                         *
*****

User Access Verification

Username: Administrador

Password:
CUND-ROUTER>exit

[Connection to 172.31.0.6 closed by foreign host]
SW-CUND#ping 172.31.3.242

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.31.3.242, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/4/11 ms

SW-CUND#ping 209.17.220.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.17.220.3, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 2/8/12 ms

```

## CONCLUSIONES

El desarrollo de estos dos laboratorios ha permitido desarrollar un nivel de conocimiento mucho más alto en aspectos como arquitecturas de red, dimensionamiento de equipos, construcción de servicios de red, y aspectos tan importantes como controles de seguridad en el plano de control y de datos.

Uno de los puntos más relevantes que permitió desarrollar estas guías prácticas es la necesidad de desarrollar en proyectos de implementación de redes una documentación completa, que permita hacer seguimiento respecto al propósito, operación y configuración de las redes, así como escenarios de continuidad de negocio donde a pesar que haya rotación de personal la información concerniente a la operación de la red esté clara y organizada.

Otro aspecto que se debe resaltar es la necesidad de seguir creciendo en el conocimiento de otros servicios y arquitecturas adicionales y complementarias en los servicios de cliente final; servicios enfocados en Datacenter on premise, así como arquitecturas operativas en nubes públicas, servicios SaaS y usuarios móviles, obligan a los arquitectos de red nuevos a conocer los diferentes entornos, sus aspectos principales, operación y cómo integrarlos en función de los servicios de cliente final, todo con el enfoque de saber que la tecnología es un habilitador de servicios.

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## APENDICE – CONFIGURACIONES FINALES

### CONFIGURACIONES ESCENARIO 1

#### ROUTER BOGOTA

```

BOG-ROUTER#show run
Building configuration...

Current configuration : 2230 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname BOG-ROUTER
!
!
!
!
ip dhcp excluded-address 172.16.20.1 172.16.20.4
!
ip dhcp pool POOL_LAN_BOG
 network 172.16.20.0 255.255.255.224
 default-router 172.16.20.1
 dns-server 172.16.20.3
!
!
!
ip cef
no ipv6 cef
!
!
!
username Administrador privilege 15 secret 5 $1$mERn$WOB5Pu7Ns/uUv94a1WJl.0
!
!
license udi pid CISCO2911/K9 sn FTX1524MNZO
!
!
!
!
!
!
!
!
!
!
ip ssh version 2
no ip domain-lookup
ip domain-name unad.edu.co
!
!
spanning-tree mode pvst
!
!
!
!
!
interface GigabitEthernet0/0
 description CONEXION_LAN_BOG
 ip address 172.16.20.1 255.255.255.224
 duplex auto
 speed auto
!
interface GigabitEthernet0/1
 no ip address
 duplex auto
 speed auto
 shutdown
!

```

```

interface GigabitEthernet0/2
no ip address
duplex auto
speed auto
shutdown
!
interface Serial0/0/0
description CONEXION_BOG_MED
ip address 172.16.20.97 255.255.255.224
clock rate 128000
!
interface Serial0/0/1
description CONEXION_BOG_CAL
ip address 172.16.20.129 255.255.255.224
clock rate 128000
!
interface Vlan1
no ip address
shutdown
!
router eigrp 200
passive-interface GigabitEthernet0/0
network 172.16.20.0 0.0.0.255

!
ip classless
!
ip flow-export version 9
!
!
ip access-list standard GESTION_ROUTERS
permit host 172.16.20.1
permit host 172.16.20.3
permit host 172.16.20.97
permit host 172.16.20.129
permit host 172.16.20.33
permit host 172.16.20.98
permit host 172.16.20.65
permit host 172.16.20.130
deny any
!
banner motd ^C
*****ADVERTENCIA*****
*
* La administracion de este dispositivo esta restringido *
* y solamente es administrado por personal de TI de la *
* compania, abstengase de ingresar a este sistema. *
*
*****^C
!
!
!
!
line con 0
logging synchronous
login local
!
line aux 0
!
line vty 0 4
access-class GESTION_ROUTERS in
logging synchronous
login local
line vty 5 15
access-class GESTION_ROUTERS in
logging synchronous
login local
!
!
!
end

```

**SWITCH BOGOTA**

BOG-SW#show run

Building configuration...

```

Current configuration : 1308 bytes
!
version 12.2
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname BOG-SW
!
!
!
ip ssh version 2
no ip domain-lookup
ip domain-name unad.edu.co
!
username Administrador secret 5 $1$mERr$WOB5Pu7Ns/uUv94a1WJ1.0
!
!
spanning-tree mode pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
!
interface FastEthernet0/2
!
interface FastEthernet0/3
!
interface FastEthernet0/4
!
interface FastEthernet0/5
!
interface FastEthernet0/6
!
interface FastEthernet0/7
!
interface FastEthernet0/8
!
interface FastEthernet0/9
!
interface FastEthernet0/10
!
interface FastEthernet0/11
!
interface FastEthernet0/12
!
interface FastEthernet0/13
!
interface FastEthernet0/14
!
interface FastEthernet0/15
!
interface FastEthernet0/16
!
interface FastEthernet0/17
!
interface FastEthernet0/18
!
interface FastEthernet0/19
!
interface FastEthernet0/20
!
interface FastEthernet0/21
!
interface FastEthernet0/22
!
interface FastEthernet0/23
!
interface FastEthernet0/24
!
interface GigabitEthernet0/1
!
interface GigabitEthernet0/2
!

```

```

interface Vlan1
 ip address 172.16.20.2 255.255.255.224
 !
 !
 !
 !
 line con 0
 logging synchronous
 login local
 !
 line vty 0 4
 logging synchronous
 login local
 line vty 5 15
 logging synchronous
 login local
 !
 !
 !
 end

```

#### ROUTER MEDELLIN

```

MED-ROUTER#show run
Building configuration...

Current configuration : 2395 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname MED-ROUTER
!
!
!
!
ip dhcp excluded-address 172.16.20.33 172.16.20.34
!
ip dhcp pool POOL_LAN_MED
 network 172.16.20.32 255.255.255.224
 default-router 172.16.20.33
 dns-server 172.16.20.3
!
!
!
no ip cef
no ipv6 cef
!
!
!
username Administrador privilege 15 secret 5 $1$mERr$WOB5Pu7Ns/uUv94a1WJl.0
!
!
license udi pid CISCO2911/K9 sn FTX15248I12
!
!
!
!
!
!
!
!
!
!
ip ssh version 2
no ip domain-lookup
ip domain-name unad.edu.co
!
!
spanning-tree mode pvst
!
!
!
!

```

```

!
!
!
interface GigabitEthernet0/0
description CONEXION_LAN_MED
ip address 172.16.20.33 255.255.255.224
ip access-group BLOCK_LAN_MED in
duplex auto
speed auto
!
interface GigabitEthernet0/1
no ip address
duplex auto
speed auto
shutdown
!
interface GigabitEthernet0/2
no ip address
duplex auto
speed auto
shutdown
!
interface Serial0/0/0
description CONEXION_MED_BOG
ip address 172.16.20.98 255.255.255.224
!
interface Serial0/0/1
no ip address
clock rate 2000000
shutdown
!
interface Vlan1
no ip address
shutdown
!
router eigrp 200
passive-interface GigabitEthernet0/0
network 172.16.20.0 0.0.0.255

!
ip classless
!
ip flow-export version 9
!
!
ip access-list standard GESTION_ROUTERS
permit host 172.16.20.1
permit host 172.16.20.3
permit host 172.16.20.97
permit host 172.16.20.129
permit host 172.16.20.33
permit host 172.16.20.98
permit host 172.16.20.65
permit host 172.16.20.130
deny any
ip access-list extended BLOCK_LAN_MED
permit ip 172.16.20.32 0.0.0.31 host 172.16.20.3
permit icmp 172.16.20.32 0.0.0.31 host 172.16.20.33
permit udp any any eq bootpc
deny ip any any
!
banner motd ^C
*****ADVERTENCIA*****
*
* La administracion de este dispositivo esta restringido *
* y solamente es administrado por personal de TI de la *
* compania, abstengase de ingresar a este sistema. *
*
*****^C
!
!
!
line con 0
logging synchronous

```

```

login local
!
line aux 0
!
line vty 0 4
access-class GESTION_ROUTERS in
logging synchronous
login local
line vty 5 15
access-class GESTION_ROUTERS in
logging synchronous
login local
!
!
!
end

```

#### SWITCH MEDELLIN

```

MED-SW#show run
Building configuration...

Current configuration : 1343 bytes
!
version 12.2
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname MED-SW
!
!
!
ip ssh version 2
no ip domain-lookup
ip domain-name unad.edu.co
!
username Administrador secret 5 $1$mERr$W0B5Pu7Ns/uUv94a1WJl.0
!
!
spanning-tree mode pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
!
interface FastEthernet0/2
!
interface FastEthernet0/3
!
interface FastEthernet0/4
!
interface FastEthernet0/5
!
interface FastEthernet0/6
!
interface FastEthernet0/7
!
interface FastEthernet0/8
!
interface FastEthernet0/9
!
interface FastEthernet0/10
!
interface FastEthernet0/11
!
interface FastEthernet0/12
!
interface FastEthernet0/13
!
interface FastEthernet0/14
!
interface FastEthernet0/15
!
interface FastEthernet0/16

```

```

!
interface FastEthernet0/17
!
interface FastEthernet0/18
!
interface FastEthernet0/19
!
interface FastEthernet0/20
!
interface FastEthernet0/21
!
interface FastEthernet0/22
!
interface FastEthernet0/23
!
interface FastEthernet0/24
!
interface GigabitEthernet0/1
!
interface GigabitEthernet0/2
!
interface Vlan1
 ip address 172.16.20.34 255.255.255.224
!
 ip default-gateway 172.16.20.33
!
!
!
!
line con 0
 logging synchronous
 login local
!
line vty 0 4
 logging synchronous
 login local
line vty 5 15
 logging synchronous
 login local
!
!
!
End

```

#### ROUTER CALI

```

CAL-ROUTER#show run
Building configuration...

Current configuration : 2426 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname CAL-ROUTER
!
!
!
!
 ip dhcp excluded-address 172.16.20.65 172.16.20.66
!
 ip dhcp pool POOL_LAN_CAL
 network 172.16.20.64 255.255.255.224
 default-router 172.16.20.65
 dns-server 172.16.20.3
!
!
!
!
no ip cef
no ipv6 cef
!
!
!
!

```



```

permit host 172.16.20.65
permit host 172.16.20.130
deny any
ip access-list extended BLOCK_LAN_CAL
permit ip 172.16.20.64 0.0.0.31 host 172.16.20.3
permit icmp 172.16.20.64 0.0.0.31 host 172.16.20.65
permit udp any any eq bootps
permit udp any any eq bootpc
deny ip any any
!
banner motd ^C
*****ADVERTENCIA*****
*
* La administracion de este dispositivo esta restringido *
* y solamente es administrado por personal de TI de la *
* compania, abstengase de ingresar a este sistema. *
*
*****^C
!
!
!
!
line con 0
logging synchronous
login local
!
line aux 0
!
line vty 0 4
access-class GESTION_ROUTERS in
logging synchronous
login local
line vty 5 15
access-class GESTION_ROUTERS in
logging synchronous
login local
!
!
!
!
End

```

#### SWITCH CALI

```

CAL-SW#show run
Building configuration...

Current configuration : 1343 bytes
!
version 12.2
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname CAL-SW
!
!
!
ip ssh version 2
no ip domain-lookup
ip domain-name unad.edu.co
!
username Administrador secret 5 $1$mERr$W0B5Pu7Ns/uUv94a1WJl.0
!
!
spanning-tree mode pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
!
interface FastEthernet0/2
!
interface FastEthernet0/3
!
interface FastEthernet0/4
!

```

```

interface FastEthernet0/5
!
interface FastEthernet0/6
!
interface FastEthernet0/7
!
interface FastEthernet0/8
!
interface FastEthernet0/9
!
interface FastEthernet0/10
!
interface FastEthernet0/11
!
interface FastEthernet0/12
!
interface FastEthernet0/13
!
interface FastEthernet0/14
!
interface FastEthernet0/15
!
interface FastEthernet0/16
!
interface FastEthernet0/17
!
interface FastEthernet0/18
!
interface FastEthernet0/19
!
interface FastEthernet0/20
!
interface FastEthernet0/21
!
interface FastEthernet0/22
!
interface FastEthernet0/23
!
interface FastEthernet0/24
!
interface GigabitEthernet0/1
!
interface GigabitEthernet0/2
!
interface Vlan1
 ip address 172.16.20.66 255.255.255.224
!
ip default-gateway 172.16.20.65
!
!
!
!
line con 0
 logging synchronous
 login local
!
line vty 0 4
 logging synchronous
 login local
line vty 5 15
 logging synchronous
 login local
!
!
!
End

```

## CONFIGURACIONES ESCENARIO 2


### ROUTER BUCARAMANGA

```

BUC-ROUTER#show run
Building configuration...

Current configuration : 3600 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname BUC-ROUTER
!
login block-for 60 attempts 3 within 30
!
!
enable secret 5 $1$mERr$WOB5Pu7Ns/uUv94a1WJl.0
!
!
!
!
!
aaa new-model
!
aaa authentication login default local
aaa authentication enable default enable
!
!
!
!
!
no ip cef
no ipv6 cef
!
!
!
username Administrador privilege 15 secret 5 $1$mERr$WOB5Pu7Ns/uUv94a1WJl.0
username monitor secret 5 $1$mERr$FE01NFm1DOA5Ku.Zwb4UD.
!
!
!
license udi pid CISCO2911/K9 sn FTX1524ZIGV
!
!
!
!
!
!
no ip domain-lookup
ip domain-name unad.edu.co
!
!
spanning-tree mode pvst
!
!
!
!
!
interface GigabitEthernet0/0
no ip address
duplex auto
speed auto
!
interface GigabitEthernet0/0.1
encapsulation dot1Q 1 native

```



```

ip address 172.31.1.249 255.255.255.248
ip access-group ACL_BUC_VLAN1 in
!
interface GigabitEthernet0/0.10
encapsulation dot1Q 10
ip address 172.31.1.1 255.255.255.192
ip helper-address 172.31.0.1
ip access-group ACL_BUC_VLAN10 in
!
interface GigabitEthernet0/0.30
encapsulation dot1Q 30
ip address 172.31.1.65 255.255.255.192
ip helper-address 172.31.0.1
ip access-group ACL_BUC_VLAN30 in
!
interface GigabitEthernet0/1
no ip address
duplex auto
speed auto
shutdown
!
interface GigabitEthernet0/2
no ip address
duplex auto
speed auto
shutdown
!
interface Serial0/0/0
description CONEXION_BUC_TUN
ip address 172.31.0.2 255.255.255.252
ip ospf message-digest-key 1 md5 4dm1n1str4d0r
!
interface Serial0/0/1
no ip address
clock rate 2000000
shutdown
!
interface Vlan1
no ip address
shutdown
!
router ospf 10
log-adjacency-changes
area 0 authentication message-digest
passive-interface GigabitEthernet0/0.1
passive-interface GigabitEthernet0/0.10
passive-interface GigabitEthernet0/0.30
network 172.31.1.0 0.0.0.255 area 0
network 172.31.0.0 0.0.0.3 area 0
!
ip classless
!
ip flow-export version 9
!
!
ip access-list extended sl_def_acl
deny tcp any any eq telnet
deny tcp any any eq www
deny tcp any any eq 22
permit tcp any any eq 22
ip access-list extended ACL_BUC_VLAN1
permit ip any any
ip access-list extended ACL_BUC_VLAN10
permit udp any any eq bootpc
permit udp any any eq bootps
permit ip 172.31.1.0 0.0.0.63 172.31.3.64 0.0.0.63
permit ip 172.31.1.0 0.0.0.63 172.31.2.0 0.0.0.63
deny ip any any
ip access-list extended ACL_BUC_VLAN30
permit udp any any eq bootps
permit udp any any eq bootpc
permit ip 172.31.1.64 0.0.0.63 172.31.3.0 0.0.0.63
deny ip 172.31.1.64 0.0.0.63 172.31.1.248 0.0.0.7
deny ip 172.31.1.64 0.0.0.63 172.31.1.0 0.0.0.63
deny ip 172.31.1.64 0.0.0.63 172.31.2.0 0.0.0.255

```

```

deny ip 172.31.1.64 0.0.0.63 172.31.3.64 0.0.0.63
deny ip 172.31.1.64 0.0.0.63 172.31.3.240 0.0.0.7
permit ip any any
ip access-list standard GESTION_ROUTERS
permit 172.31.1.248 0.0.0.7
permit 172.31.2.248 0.0.0.7
permit 172.31.3.248 0.0.0.7
permit 172.31.3.240 0.0.0.7
!
banner motd ^C
*****ADVERTENCIA*****
*
* La administracion de este dispositivo esta restringido *
* y solamente es administrado por personal de TI de la *
* compania, abstengase de ingresar a este sistema. *
*
*****^C
!
!
!
!
line con 0
login authentication default
!
line aux 0
!
line vty 0 4
access-class GESTION_ROUTERS in
login authentication default
line vty 5 15
access-class GESTION_ROUTERS in
login authentication default
!
!
!
end

```

**SWITCH BUCARAMANGA**

```

BUC-SW#show run
Building configuration...

Current configuration : 1913 bytes
!
version 12.2
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname BUC-SW
!
!
!
no ip domain-lookup
ip domain-name unad.edu.co
!
username Administrador secret 5 $1$mERr$W0B5Pu7Ns/uUv94a1WJl.0
!
!
spanning-tree mode pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
switchport access vlan 10
switchport mode access
!
interface FastEthernet0/2
!
interface FastEthernet0/3
!
interface FastEthernet0/4
!
interface FastEthernet0/5
!

```

```

interface FastEthernet0/6
!
interface FastEthernet0/7
!
interface FastEthernet0/8
!
interface FastEthernet0/9
!
interface FastEthernet0/10
!
interface FastEthernet0/11
!
interface FastEthernet0/12
!
interface FastEthernet0/13
 switchport access vlan 30
 switchport mode access
!
interface FastEthernet0/14
!
interface FastEthernet0/15
!
interface FastEthernet0/16
!
interface FastEthernet0/17
!
interface FastEthernet0/18
!
interface FastEthernet0/19
!
interface FastEthernet0/20
!
interface FastEthernet0/21
!
interface FastEthernet0/22
!
interface FastEthernet0/23
!
interface FastEthernet0/24
!
interface GigabitEthernet0/1
 description CONEXION_ROUTER_BUC
 switchport trunk allowed vlan 1,10,30
 switchport mode trunk
!
interface GigabitEthernet0/2
!
interface Vlan1
 ip address 172.31.1.250 255.255.255.248
!
ip default-gateway 172.31.1.249
!
banner motd ^C
*****ADVERTENCIA*****
*
* La administracion de este dispositivo esta restringido *
* y solamente es administrado por personal de TI de la *
* compania, abstengase de ingresar a este sistema. *
*
*****^C
!
!
!
line con 0
 logging synchronous
 login local
!
line vty 0 4
 login local
line vty 5 15
 login local
!
!
!
End

```

**ROUTER TUNJA**

```

TUN-ROUTER#show run
Building configuration...

Current configuration : 4620 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname TUN-ROUTER
!
login block-for 60 attempts 3 within 30
!
!
enable secret 5 $1$mERr$WOB5Pu7Ns/uUv94a1WJl.0
!
!
ip dhcp pool POOL_BUC_VLAN_10
network 172.31.1.0 255.255.255.192
default-router 172.31.1.1
dns-server 172.31.3.242
ip dhcp pool POOL_BUC_VLAN_30
network 172.31.1.64 255.255.255.192
default-router 172.31.1.65
dns-server 172.31.3.242
ip dhcp pool POOL_CUND_VLAN_10
network 172.31.3.0 255.255.255.192
default-router 172.31.3.1
dns-server 172.31.3.242
ip dhcp pool POOL_CUND_VLAN_20
network 172.31.3.64 255.255.255.192
default-router 172.31.3.65
dns-server 172.31.3.242
!
!
aaa new-model
!
aaa authentication login default local
aaa authentication enable default enable
!
!
!
!
!
!
no ip cef
no ipv6 cef
!
!
username Administrador privilege 15 secret 5 $1$mERr$WOB5Pu7Ns/uUv94a1WJl.0
!
!
license udi pid CISCO2911/K9 sn FTX15242IRL
!
!
!
!
!
!
!
no ip domain-lookup
ip domain-name unad.edu.co
!
!
spanning-tree mode pvst
!
!

```

```

!
!
!
!
interface GigabitEthernet0/0
no ip address
duplex auto
speed auto
!
interface GigabitEthernet0/0.1
encapsulation dot1Q 1 native
ip address 172.31.2.249 255.255.255.248
ip access-group ACL_TUN_VLAN1 in
ip nat inside
!
interface GigabitEthernet0/0.20
encapsulation dot1Q 20
ip address 172.31.2.1 255.255.255.192
ip access-group ACL_TUN_VLAN20 in
ip nat inside
!
interface GigabitEthernet0/0.30
encapsulation dot1Q 30
ip address 172.31.2.65 255.255.255.192
ip access-group ACL_TUN_VLAN30 in
ip nat inside
!
interface GigabitEthernet0/1
description CONEXION_INTERNET
ip address 209.17.220.1 255.255.255.0
ip nat outside
duplex auto
speed auto
!
interface GigabitEthernet0/2
no ip address
duplex auto
speed auto
shutdown
!
interface Serial0/0/0
description CONEXION_TUN_BUC
ip address 172.31.0.1 255.255.255.252
ip ospf message-digest-key 1 md5 4dm1n1str4d0r
ip nat inside
clock rate 2000000
!
interface Serial0/0/1
description CONEXION_TUN_CUND
ip address 172.31.0.5 255.255.255.252
ip ospf message-digest-key 1 md5 4dm1n1str4d0r
ip nat inside
clock rate 2000000
!
interface Vlan1
no ip address
shutdown
!
router ospf 10
log-adjacency-changes
area 0 authentication message-digest
passive-interface GigabitEthernet0/0.1
passive-interface GigabitEthernet0/0.20
passive-interface GigabitEthernet0/0.30
network 172.31.2.0 0.0.0.255 area 0
network 172.31.0.0 0.0.0.3 area 0
network 172.31.0.4 0.0.0.3 area 0
default-information originate
!
ip nat inside source list NAVEGACION interface GigabitEthernet0/1 overload
ip nat inside source static 172.31.3.242 209.17.220.4
ip classless
ip route 0.0.0.0 0.0.0.0 209.17.220.3
!
ip flow-export version 9

```

```

!
!
ip access-list extended sl_def_acl
deny tcp any any eq telnet
deny tcp any any eq www
deny tcp any any eq 22
permit tcp any any eq 22
ip access-list standard NAVEGACION
permit 172.31.1.0 0.0.0.63
permit 172.31.1.64 0.0.0.63
permit 172.31.1.248 0.0.0.7
permit 172.31.2.0 0.0.0.63
permit 172.31.2.64 0.0.0.63
permit 172.31.2.248 0.0.0.7
permit 172.31.3.0 0.0.0.63
permit 172.31.3.64 0.0.0.63
permit 172.31.3.248 0.0.0.7
permit 172.31.0.0 0.0.0.3
permit 172.31.0.4 0.0.0.3
ip access-list extended ACL_TUN_VLAN1
permit ip any any
ip access-list extended ACL_TUN_VLAN20
permit udp any any eq bootpc
permit udp any any eq bootps
permit ip 172.31.2.0 0.0.0.63 172.31.3.64 0.0.0.63
permit ip 172.31.2.0 0.0.0.63 172.31.1.0 0.0.0.63
deny ip any any
ip access-list standard GESTION_ROUTERS
permit 172.31.1.248 0.0.0.7
permit 172.31.2.248 0.0.0.7
permit 172.31.3.248 0.0.0.7
permit 172.31.3.240 0.0.0.7
ip access-list extended ACL_TUN_VLAN30
permit udp any any eq bootpc
permit udp any any eq bootps
permit ip 172.31.2.64 0.0.0.63 host 209.17.220.3
permit ip 172.31.2.64 0.0.0.63 host 172.31.3.242
permit ip 172.31.2.64 0.0.0.63 172.31.3.64 0.0.0.63
!
banner motd ^C
*****ADVERTENCIA*****
*
* La administracion de este dispositivo esta restringido *
* y solamente es administrado por personal de TI de la *
* compania, abstengase de ingresar a este sistema. *
*
*****^C
!
!
!
!
line con 0
login authentication default
!
line aux 0
!
line vty 0 4
access-class GESTION_ROUTERS in
login authentication default
line vty 5 15
access-class GESTION_ROUTERS in
login authentication default
!
!
!
end

SWITCH TUNJA

TUN-SW#show run
Building configuration...

Current configuration : 1493 bytes
!
version 12.2


```

```

no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname TUN-SW
!
!
!
no ip domain-lookup
ip domain-name unad.edu.co
!
username Administrador secret 5 $1$mERr$W0B5Pu7Ns/uUv94a1WJl.0
!
!
spanning-tree mode pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
 switchport access vlan 20
 switchport mode access
!
interface FastEthernet0/2
!
interface FastEthernet0/3
!
interface FastEthernet0/4
!
interface FastEthernet0/5
!
interface FastEthernet0/6
!
interface FastEthernet0/7
!
interface FastEthernet0/8
!
interface FastEthernet0/9
!
interface FastEthernet0/10
!
interface FastEthernet0/11
!
interface FastEthernet0/12
!
interface FastEthernet0/13
 switchport access vlan 30
 switchport mode access
!
interface FastEthernet0/14
!
interface FastEthernet0/15
!
interface FastEthernet0/16
!
interface FastEthernet0/17
!
interface FastEthernet0/18
!
interface FastEthernet0/19
!
interface FastEthernet0/20
!
interface FastEthernet0/21
!
interface FastEthernet0/22
!
interface FastEthernet0/23
!
interface FastEthernet0/24
!
interface GigabitEthernet0/1
 description CONEXION_ROUTER_TUN
 switchport trunk allowed vlan 1,20,30
 switchport mode trunk
!
interface GigabitEthernet0/2

```





```

no ip domain-lookup
ip domain-name unad.edu.co
!
!
spanning-tree mode pvst
!
!
!
!
!
interface GigabitEthernet0/0
no ip address
duplex auto
speed auto
!
interface GigabitEthernet0/0.1
encapsulation dot1Q 1 native
ip address 172.31.3.249 255.255.255.248
ip access-group ACL_CUND_VLAN1 in
!
interface GigabitEthernet0/0.10
encapsulation dot1Q 10
ip address 172.31.3.1 255.255.255.192
ip helper-address 172.31.0.5
ip access-group ACL_CUND_VLAN10 in
!
interface GigabitEthernet0/0.20
encapsulation dot1Q 20
ip address 172.31.3.65 255.255.255.192
ip helper-address 172.31.0.5
ip access-group ACL_CUND_VLAN20 in
!
interface GigabitEthernet0/0.88
encapsulation dot1Q 88
ip address 172.31.3.241 255.255.255.248
ip access-group ACL_CUND_VLAN88 in
!
interface GigabitEthernet0/1
no ip address
duplex auto
speed auto
shutdown
!
interface GigabitEthernet0/2
no ip address
duplex auto
speed auto
shutdown
!
interface Serial0/0/0
no ip address
clock rate 2000000
shutdown
!
interface Serial0/0/1
description CONEXION_CUND_TUN
ip address 172.31.0.6 255.255.255.252
ip ospf message-digest-key 1 md5 4dm1n1str4d0r
!
interface Vlan1
no ip address
shutdown
!
router ospf 10
log-adjacency-changes
area 0 authentication message-digest
passive-interface GigabitEthernet0/0.1
passive-interface GigabitEthernet0/0.10
passive-interface GigabitEthernet0/0.20
passive-interface GigabitEthernet0/0.88
network 172.31.3.0 0.0.0.255 area 0
network 172.31.0.4 0.0.0.3 area 0
!
ip classless

```

```

!
ip flow-export version 9
!
!
ip access-list extended sl_def_acl
deny tcp any any eq telnet
deny tcp any any eq www
deny tcp any any eq 22
permit tcp any any eq 22
ip access-list extended ACL_CUND_VLAN1
permit ip any any
ip access-list extended ACL_CUND_VLAN10
permit udp any any eq bootpc
permit udp any any eq bootps
permit ip 172.31.3.0 0.0.0.63 172.31.1.64 0.0.0.63
deny ip 172.31.3.0 0.0.0.63 172.31.2.0 0.0.0.255
deny ip 172.31.3.0 0.0.0.63 172.31.1.0 0.0.0.63
deny ip 172.31.3.0 0.0.0.63 172.31.3.248 0.0.0.7
deny ip 172.31.3.0 0.0.0.63 172.31.3.64 0.0.0.63
deny ip 172.31.3.0 0.0.0.63 172.31.3.240 0.0.0.7
permit ip any any
ip access-list extended ACL_CUND_VLAN20
permit udp any any eq bootpc
permit udp any any eq bootps
permit ip 172.31.3.64 0.0.0.63 172.31.1.0 0.0.0.63
permit ip 172.31.3.64 0.0.0.63 172.31.2.0 0.0.0.63
permit ip 172.31.3.64 0.0.0.63 172.31.2.64 0.0.0.63
deny ip any any
ip access-list extended ACL_CUND_VLAN88
permit udp any any eq bootpc
permit udp any any eq bootps
permit ip 172.31.3.240 0.0.0.7 172.31.2.64 0.0.0.63
permit ip 172.31.3.240 0.0.0.7 172.31.0.0 0.0.0.3
permit ip 172.31.3.240 0.0.0.7 172.31.0.4 0.0.0.3
permit ip 172.31.3.240 0.0.0.7 172.31.1.248 0.0.0.7
permit ip 172.31.3.240 0.0.0.7 172.31.2.248 0.0.0.7
permit ip 172.31.3.240 0.0.0.7 172.31.3.248 0.0.0.7
deny ip any any
ip access-list standard GESTION_ROUTERS
permit 172.31.1.248 0.0.0.7
permit 172.31.2.248 0.0.0.7
permit 172.31.3.248 0.0.0.7
permit 172.31.3.240 0.0.0.7
!
banner motd ^C
*****ADVERTENCIA*****
*
* La administracion de este dispositivo esta restringido *
* y solamente es administrado por personal de TI de la *
* compania, abstengase de ingresar a este sistema. *
*
*****^C
!
!
!
!
line con 0
login authentication default
!
line aux 0
!
line vty 0 4
access-class GESTION_ROUTERS in
login authentication default
line vty 5 15
access-class GESTION_ROUTERS in
login authentication default
!
!
!
End

SWITCH CUNDINAMARCA

SW-CUND#show run

```

Building configuration...

```

Current configuration : 2011 bytes
!
version 12.2
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname SW-CUND
!
!
no ip domain-lookup
ip domain-name unad.edu.co
!
username Administrador secret 5 $1$mERr$WOB5Pu7Ns/uUv94a1WJl.0
!
!
spanning-tree mode pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
 switchport access vlan 10
 switchport mode access
!
interface FastEthernet0/2
!
interface FastEthernet0/3
!
interface FastEthernet0/4
!
interface FastEthernet0/5
!
interface FastEthernet0/6
!
interface FastEthernet0/7
!
interface FastEthernet0/8
!
interface FastEthernet0/9
 switchport access vlan 20
 switchport mode access
!
interface FastEthernet0/10
!
interface FastEthernet0/11
!
interface FastEthernet0/12
!
interface FastEthernet0/13
!
interface FastEthernet0/14
!
interface FastEthernet0/15
!
interface FastEthernet0/16
!
interface FastEthernet0/17
 switchport access vlan 88
 switchport mode access
!
interface FastEthernet0/18
!
interface FastEthernet0/19
!
interface FastEthernet0/20
!
interface FastEthernet0/21
!
interface FastEthernet0/22
!
interface FastEthernet0/23
!
interface FastEthernet0/24

```

```
!
interface GigabitEthernet0/1
description CONEXION_ROUTER_CUND
switchport trunk allowed vlan 1,10,20,88
switchport mode trunk
!
interface GigabitEthernet0/2
!
interface Vlan1
ip address 172.31.3.250 255.255.255.248
!
ip default-gateway 172.31.3.249
!
banner motd ^C
*****ADVERTENCIA*****
*
* La administracion de este dispositivo esta restringido *
* y solamente es administrado por personal de TI de la *
* compania, abstengase de ingresar a este sistema. *
*
*****^C
!
!
!
line con 0
logging synchronous
login local
!
line vty 0 4
logging synchronous
login local
line vty 5 15
logging synchronous
login local
!
!
!
end
```