

**PRUEBA DE HABILIDADES CCNA 16-4 2019 - FINAL**

**PRUEBA DE HABILIDADES CCNA 16-4 2019 - FINAL**

**REALIZADO POR:  
DAIRO JOSE ORTEGA FONSECA  
GRUPO: 203092\_35**

**TUTOR:  
DIEGO EDINSON RAMIREZ**

**UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA – UNAD  
2019**

## CONTENIDO

CONTENIDO .....	2
TABLA DE ILUSTRACIONES.....	3
RESUMEN.....	6
ABSTRACT.....	7
INTRODUCCIÓN.....	8
OBJETIVOS .....	9
Descripción de escenarios propuestos para la prueba de habilidades .....	10
Escenario 1.....	10
Desarrollo .....	11
Preparación de los Routers:.....	11
Parte 1: Asignación de direcciones IP:.....	19
Parte 2: Configuración Básica.....	20
Parte 3: Configuración de Enrutamiento. ....	33
Parte 4: Configuración de las listas de Control de Acceso. ....	40
Parte 5: Comprobación de la red instalada. ....	42
Escenario 2.....	43
Desarrollo .....	43
• Configuración básica. ....	43
• Autenticación local con AAA. ....	54
El enrutamiento deberá tener autenticación.....	68
5. Listas de control de acceso:.....	70
<b>CONCLUSIONES</b> .....	82
ANEXOS.....	83
Bibliografía.....	84

## TABLA DE ILUSTRACIONES

Ilustración 1 Esquema de Red (CISCO).....	10
Ilustración 2 Esquema de Red (CISCO).....	11
Ilustración 3 Instalación de tarjeta HWIC-2T .....	11
Ilustración 4 Borrar Configuración .....	12
Ilustración 5 Configuración Router MEDELLIN .....	13
Ilustración 6 Configuración Router BOGOTA.....	14
Ilustración 7 Configuración Router CALI .....	15
Ilustración 8 Configuración Switch S1 .....	16
Ilustración 9 Configuración Switch S2 .....	17
Ilustración 10 Configuración Switch S3 .....	18
Ilustración 11 conexión física de los equipos .....	18
Ilustración 12 Configuración Básica Router MEDELLIN.....	21
Ilustración 13 Configuración Básica Router BOGOTA .....	22
Ilustración 14 Esquema de RED .....	23
Ilustración 15 Tabla de Enrutamiento MEDELLIN .....	24
Ilustración 16 Tabla de Enrutamiento BOGOTA.....	24
Ilustración 17 Tabla de Enrutamiento CALI.....	25
Ilustración 18 Balanceo de carga Router MEDELLIN.....	25
Ilustración 19 Balanceo de carga Router BOGOTA .....	25
Ilustración 20 Balanceo de carga Router CALI.....	26
Ilustración 21 diagnóstico de vecinos MEDELLIN .....	26
Ilustración 22 diagnóstico de vecinos BOGOTA.....	27
Ilustración 23 diagnóstico de vecinos CALI .....	29
Ilustración 24 Configuración IP Route MEDELLIN .....	31
Ilustración 25 Configuración IP Route BOGOTA.....	31
Ilustración 26 Configuración IP Route CALI .....	31
Ilustración 27 Ping de MEDELLIN a BOGOTA.....	32
Ilustración 28 Ping MEDELLIN a CALI .....	32
Ilustración 29 Ping BOGOTA a CALI.....	32
Ilustración 30 Ping CALI a MEDELLIN .....	32
Ilustración 31 Configuración de Enrutamiento MEDELLIN.....	33

Ilustración 32 Configuración de Enrutamiento BOGOTA .....	34
Ilustración 33 Configuración de Enrutamiento CALI.....	34
Ilustración 34 Verificar vecindad router MEDELLIN .....	35
Ilustración 35 Verificar vecindad router BOGOTA .....	35
Ilustración 36 Verificar vecindad router CALI .....	36
Ilustración 37 tablas de enrutamiento MEDELLIN.....	37
Ilustración 38 tablas de enrutamiento BOGOTA .....	38
Ilustración 39 tablas de enrutamiento CALI.....	39
Ilustración 40 Ping PC3 Lan CALI a PC1 MEDELLIN .....	39
Ilustración 41 Ping PC4 Lan CALI a SERVIDOR Lan BOGOTA .....	40
Ilustración 42 Ping PC2 Lan MEDELLIN a WS_1 Lan BOGOTA .....	40
Ilustración 43 Control de Acceso MEDELLIN.....	41
Ilustración 44 Control de Acceso CALI.....	42
Ilustración 45 Configuración básica Router BUCARAMANGA.....	45
Ilustración 46 Configuración básica Router TUNJA .....	48
Ilustración 47 Configuración básica Router CUNDINAMARCA.....	50
Ilustración 48 Configuración básica SWITCH SWBUCARAMANGA.....	51
Ilustración 49 Configuración básica SWITCH SWTUNJA .....	52
Ilustración 50 Configuración básica SWITCH SWCUNDINAMARCA.....	53
Ilustración 51 Autenticación BUCARAMANGA.....	54
Ilustración 52 Autenticación TUNJA.....	55
Ilustración 53 Autenticación CUNDINAMARCA .....	56
Ilustración 54 Configuramos la ip fija en el Servidor.....	57
Ilustración 55 Activamos el servicio TFTP.....	58
Ilustración 56 Configuramos el DHCP en el Router TUNJA.....	59
Ilustración 57 Configuramos el DHCP en el Router BUCARAMANGA .....	60
Ilustración 58 Configuramos el DHCP en el Router CUNDINAMARCA .....	61
Ilustración 59 DHCP en los equipos.....	61
Ilustración 60 DHCP en los equipos.....	61
Ilustración 61 DHCP en los equipos.....	62
Ilustración 62 DHCP en los equipos.....	62
Ilustración 63 Configuración NAT Router TUNJA.....	63
Ilustración 64 configuración en Router BUCARAMANGA .....	65

Ilustración 65 configuración en Router CUNDINAMARCA.....	67
Ilustración 66 configuración NAT Router TUNJA .....	67
Ilustración 67 Autenticación Router BUCARAMANGA.....	68
Ilustración 68 Autenticación Router CUNDINAMARCA.....	69
Ilustración 69 Autenticación Router TUNJA .....	70
Ilustración 70 Control de acceso router CUNDINAMARCA.....	70
Ilustración 71 Prueba de control de acceso .....	71
Ilustración 72 Control de acceso router CUNDINAMARCA.....	71
Ilustración 73 Control de acceso router TUNJA .....	72
Ilustración 74 Control de acceso .....	72
Ilustración 75 Control de acceso .....	73
Ilustración 76 Control de acceso .....	73
Ilustración 77 Control de acceso router TUNJA .....	74
Ilustración 78 Control de acceso .....	74
Ilustración 79 Control de acceso router BUCARAMANGA.....	75
Ilustración 80 Control de acceso .....	75
Ilustración 81 Control de acceso router BUCARAMANGA.....	76
Ilustración 82 Control de acceso .....	76
Ilustración 83 Control de acceso .....	77
Ilustración 84 Control de acceso router BUCARAMANGA.....	77
Ilustración 85 Control de acceso router TUNJA .....	78
Ilustración 86 Control de acceso router CUNDINAMARCA.....	78
Ilustración 87 Control de acceso .....	79
Ilustración 88 Control de acceso .....	79
Ilustración 89 Control de acceso .....	79
Ilustración 90 Control de acceso router BUCARAMANGA.....	80
Ilustración 91 Control de acceso router TUNJA .....	80
Ilustración 92 Control de acceso router CUNDINAMARCA.....	81
Ilustración 93 Control de acceso Telnet .....	81

## RESUMEN

Como estudiante de Ingeniería de Sistemas y en medio de la era de la Información se hace necesario tener grandes conocimientos en redes de datos. Estos conocimientos nos permiten adaptarnos a un creciente mercado mundial que demanda a diario profesionales competitivos y con la capacidad para entender, diseñar e implementar redes de datos. Además, se hace necesario poder diagnosticar y dar solución a los problemas específicos sobre redes.

Afortunadamente Cisco, Líder mundial en la fabricación y comercialización de componentes de comunicación, ofrece la oportunidad de certificarse realizando los cursos CCNA. Según CISCO la certificación CCNA “Es una de las certificaciones más importantes dentro de la industria de la Tecnología de la Información. Esta certificación representa el nivel asociado, orientada a habilidades prácticas en el diagnóstico y solución de problemas específicos de redes.” (Cobos Domínguez, 2017)

Este proyecto hace parte de la prueba de habilidades de la certificación CCNA. Vamos a desarrollar dos escenarios prácticos utilizando la herramienta Packet Tracer y las temáticas: direccionamiento IP, Configuración Básica de Routers y detección de vecinos, seguridad en la red, balanceo de carga, Configuración de protocolo de enrutamiento EIGRP, creación de Vlans, Configuración de NAT estático y de sobrecarga y configuración de listas de control de acceso.

## ABSTRACT

As a student of Systems Engineering and in the midst of the Information Age, great knowledge is gained in data networks. This knowledge adapts us to a growing global market that demands competitive and with the ability to understand, design and implement data networks. In addition, it is necessary to be able to diagnose and solve specific problems on networks.

Fortunately, Cisco, a world leader in the manufacture and commercialization of communication components, offers the opportunity to be certified by taking CCNA courses. According to CISCO CCNA certification "It is one of the most important certifications within the Information Technology industry. This certification represents the associated level, practically oriented in the diagnosis and resolution of network-specific problems.

This project is part of the CCNA certification skills test. We are going to programs two practical scenarios using the Packet Tracer tool and the themes: IP address, Basic Router Configuration and Neighbor Detection, Network Security, Load Balancing, EIGRP Routing Protocol Configuration, Creating Vlans, Static NAT configuration and access control list information and configuration.

## INTRODUCCIÓN

La certificación CCNA de Cisco permite adquirir los conocimientos técnicos para implementar redes de datos y solucionar cualquier tipo de problema. En esta actividad vamos a desarrollar dos situaciones elementales que contienen los lineamientos para evaluar los conceptos tratados en el este curso.

Cada una de las situaciones permite que el estudiante aplique los procedimientos y comandos necesarios para cumplir cada lineamiento. La herramienta a usar para representar gráficamente y simular las situaciones será Packet tracer. Una herramienta vital para desarrollar simulaciones y aplicar los conocimientos teóricos en un entorno amigable e intuitiva.

## OBJETIVOS

### OBJETIVO GENERAL

Presentar la PRUEBA DE HABILIDADES CCNA 16-4 2019, aplicando los diferentes conceptos aprendidos en los módulos CCNA1 y CCNA2.

### OBJETIVOS ESPECÍFICOS

#### Resolver Escenario 1

- Definir una dirección de acuerdo con el número de hosts requeridos.
- Asignar los parámetros básicos y la detección de vecinos directamente conectados.
- Establecer interconexión total entre todos los hosts y poder comunicarse entre ellos sin restricciones.
- Implementar la seguridad en la red, se debe restringir el acceso y comunicación entre hosts de acuerdo con los requerimientos del administrador de red.
- Comprobar los dispositivos y su funcionamiento en la red.
- Realizar la configuración final.

#### Resolver Escenario 2

- 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.
- Configurar DHCP.
- Configurar el web server deberá tener NAT estático y el resto de los equipos de la topología emplearan NAT de sobrecarga (PAT).
- Configurar listas de control de acceso:

## Descripción de escenarios propuestos para la prueba de habilidades

### Escenario 1

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

#### Topología de red

Los requerimientos solicitados son los siguientes:

Parte 1: Para el direccionamiento IP debe definirse una dirección de acuerdo con el número de hosts requeridos.

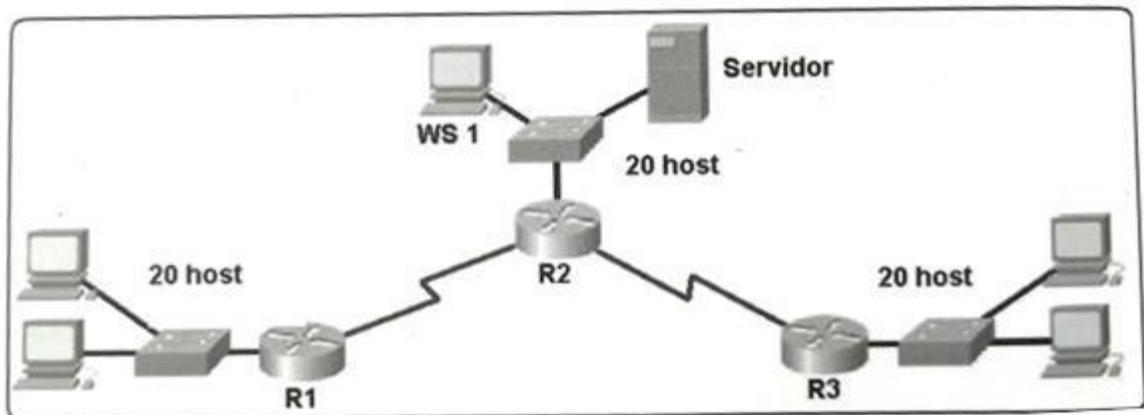
Parte 2: Considerar la asignación de los parámetros básicos y la detección de vecinos directamente conectados.

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

Parte 4: Implementar la seguridad en la red, se debe restringir el acceso y comunicación entre hosts de acuerdo con los requerimientos del administrador de red.

Parte 5: Comprobación total de los dispositivos y su funcionamiento en la red.

Parte 6: Configuración final.



*Ilustración 1 Esquema de Red (CISCO)*

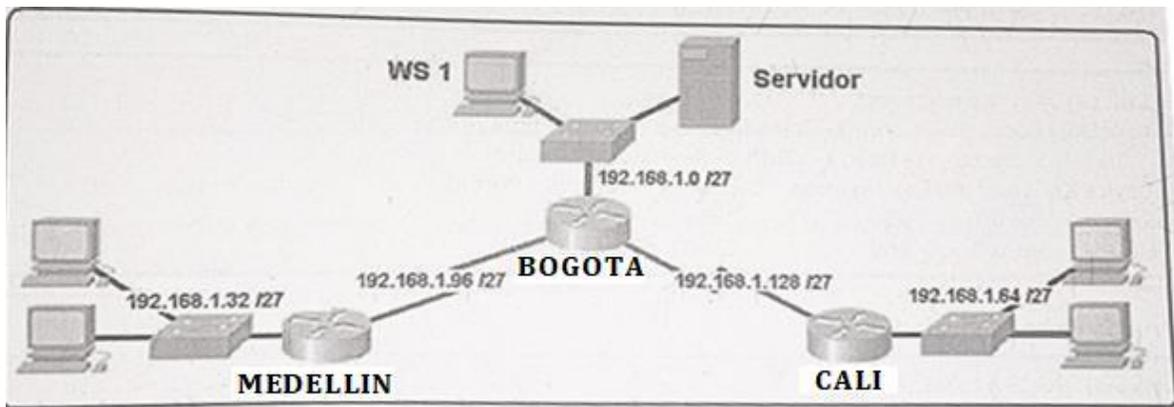


Ilustración 2 Esquema de Red (CISCO)

### Desarrollo

Como trabajo inicial se debe realizar lo siguiente.

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

### Preparación de los Routers:

- Instalamos una tarjeta HWIC-2T que proporciona 2 puertos serie y una tarjeta en cada uno de los 3 Routers y una cobertura para el espacio vacío.



Ilustración 3 Instalación de tarjeta HWIC-2T

- Borrar la configuración de inicio  
Utilizamos el comando: `erase startup-config` en cada uno de los Routers  
`Router>enable`  
`Router#erase startup-config`  
Erasing the nvram filesystem will remove all configuration files! Continue?  
[confirm]

[OK]

Erase of nvram: complete

%SYS-7-NV\_BLOCK\_INIT: Initialized the geometry of nvram

```
Router>enable
Router#erase startup-config
Erasing the nvram filesystem will remove all configuration
files! Continue? [confirm]
[OK]
Erase of nvram: complete
%SYS-7-NV_BLOCK_INIT: Initialized the geometry of nvram
Router#
```

*Ilustración 4 Borrar Configuración*

- **Configuración Router MEDELLIN**

Router>enable

Router#configure terminal

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

Router(config)#hostname MEDELLIN

MEDELLIN(config)#no ip domain-lookup

MEDELLIN(config)#enable secret class

MEDELLIN(config)#line con 0

MEDELLIN(config-line)#password cisco

MEDELLIN(config-line)#login

MEDELLIN(config-line)#line vty 0 4

MEDELLIN(config-line)#password cisco

MEDELLIN(config-line)#login

MEDELLIN(config-line)#exit

MEDELLIN(config)#service password-encryption

MEDELLIN(config)#banner motd \$ Prohibido el acceso no autorizado \$

MEDELLIN(config)#exit

The screenshot shows a window titled 'MEDELLIN' with tabs for 'Physical', 'Config', 'CLI', and 'Attributes'. The 'CLI' tab is active, displaying the 'IOS Command Line Interface'. The terminal output shows the following configuration commands and prompts:

```

Enter configuration commands, one per line. End with
CNTL/Z.
MEDELLIN(config)#no ip domain-lookup
MEDELLIN(config)#enable secret class
MEDELLIN(config)#line con 0
MEDELLIN(config-line)#password cisco
MEDELLIN(config-line)#login
MEDELLIN(config-line)#line vty 0 4
MEDELLIN(config-line)#password cisco
MEDELLIN(config-line)#login
MEDELLIN(config-line)#exit
MEDELLIN(config)#service pass
MEDELLIN(config)#service password-encryption
MEDELLIN(config)#banner motd $ Prohibido el acceso no
autorizado $
MEDELLIN(config)#exit
MEDELLIN#
%SYS-5-CONFIG_I: Configured from console by console
copy run start
Destination filename [startup-config]?
Building configuration...
[OK]
MEDELLIN#
    
```

*Ilustración 5 Configuración Router MEDELLIN*

- **Configuración Router BOGOTA**

```

Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname BOGOTA
BOGOTA(config)#no ip domain-lookup
BOGOTA(config)#enable secret class
BOGOTA(config)#line con 0
BOGOTA(config-line)#password cisco
BOGOTA(config-line)#login
BOGOTA(config-line)#line vty 0 4
BOGOTA(config-line)#password cisco
BOGOTA(config-line)#login
BOGOTA(config-line)#exit
BOGOTA(config)#service password-encryption
BOGOTA(config)#banner motd $ Prohibido el acceso no autorizado $
BOGOTA(config)#exit
    
```

```

User Access Verification

Password:

BOGOTA>enable
Password:
BOGOTA#configure terminal
Enter configuration commands, one per line. End with
CNTL/Z.
BOGOTA(config)#no ip domain-lookup
BOGOTA(config)#enable secret class
BOGOTA(config)#line con 0
BOGOTA(config-line)#password cisco
BOGOTA(config-line)#login
BOGOTA(config-line)#line vty 0 4
BOGOTA(config-line)#password cisco
BOGOTA(config-line)#login
BOGOTA(config-line)#exit
BOGOTA(config)#service password-encryption
BOGOTA(config)#banner motd $ Prohibido el acceso no
autorizado $
BOGOTA(config)#exit
BOGOTA#
    
```

*Ilustración 6 Configuración Router BOGOTA*

- **Configuración Router CALI**

```

Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname CALI
CALI(config)#no ip domain-lookup
CALI(config)#enable secret class
CALI(config)#line con 0
CALI(config-line)#password cisco
CALI(config-line)#login
CALI(config-line)#line vty 0 4
CALI(config-line)#password cisco
CALI(config-line)#login
CALI(config-line)#exit
CALI(config)#service password-encryption
CALI(config)#banner motd $ Prohibido el acceso no autorizado $
CALI(config)#exit
    
```

```

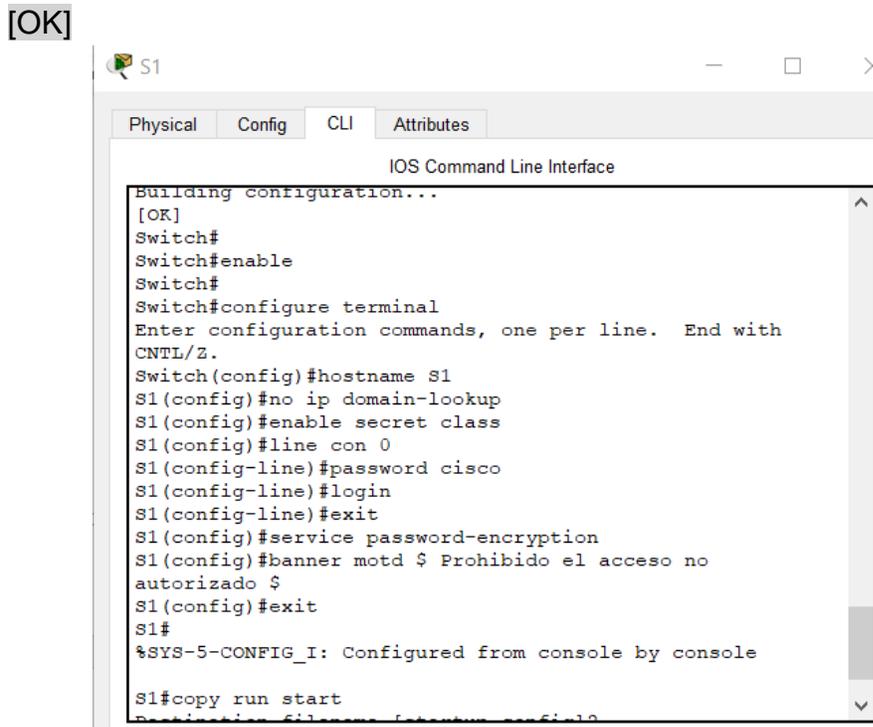
CALI>enable
Password:
CALI#configure terminal
Enter configuration commands, one per line. End with
CNTL/Z.
CALI(config)#no ip domain-lookup
CALI(config)#enable secret class
CALI(config)#line con 0
CALI(config-line)#password cisco
CALI(config-line)#login
CALI(config-line)#line vty 0 4
CALI(config-line)#password cisco
CALI(config-line)#login
CALI(config-line)#rxmit
CALI(config-line)#^
^
% Invalid input detected at '^' marker.
CALI(config-line)#exit
CALI(config)#service password-encryption
CALI(config)#banner motd $ Prohibido el acceso no
autorizado $
CALI(config)#exit
    
```

*Ilustración 7 Configuración Router CALI*

- **Configuración Switch S1**

```

Switch#enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname S1
S1(config)#no ip domain-lookup
S1(config)#enable secret class
S1(config)#line con 0
S1(config-line)#password cisco
S1(config-line)#login
S1(config-line)#exit
S1(config)#service password-encryption
S1(config)#banner motd $ Prohibido el acceso no autorizado $
S1(config)#exit
S1#
%SYS-5-CONFIG_I: Configured from console by console
S1#copy run start
Destination filename [startup-config]?
Building configuration...
    
```



*Ilustración 8 Configuración Switch S1*

- **Configuración Switch S2**

```

Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname S2
S2(config)#no ip domain-lookup
S2(config)#enable secret class
S2(config)#line con 0
S2(config-line)#password cisco
S2(config-line)#login
S2(config-line)#exit
S2(config)#service password-encryption
S2(config)#banner motd $ Prohibido el acceso no autorizado $
S2(config)#exit
S2#copy run start
Destination filename [startup-config]?
Building configuration...
[OK]

```

```

Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with
CNTL/Z.
Switch(config)#hostname S2
S2(config)#no ip domain-lookup
S2(config)#enable secret class
S2(config)#line con 0
S2(config-line)#password cisco
S2(config-line)#login
S2(config-line)#exit
S2(config)#service password-encryption
S2(config)#banner motd $ Prohibido el acceso no
autorizado
Enter TEXT message. End with the character '$'.
banner motd $ Prohibido el acceso no autorizado $

S2(config)#copy run start
      ^
% Invalid input detected at '^' marker.
S2(config)#
    
```

*Ilustración 9 Configuración Switch S2*

- **Configuración Switch S3**

```

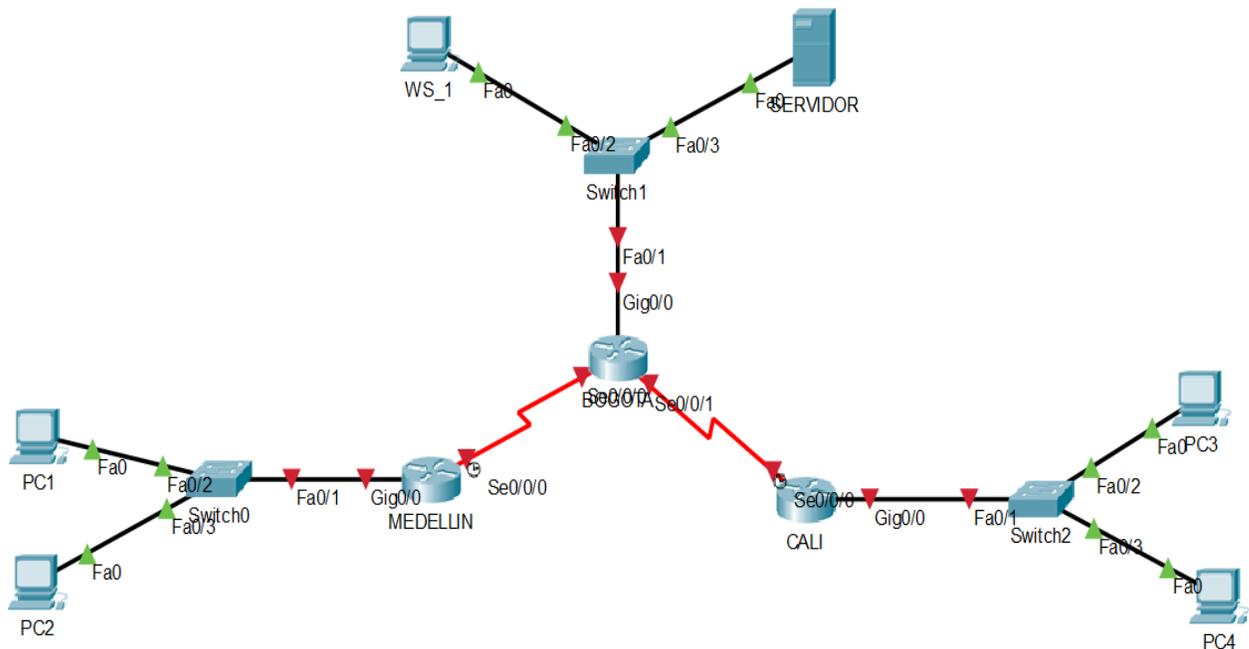
Switch#enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname S3
S3(config)#no ip domain-lookup
S3(config)#enable secret class
S3(config)#line con 0
S3(config-line)#password cisco
S3(config-line)#login
S3(config-line)#exit
S3(config)#service password-encryption
S3(config)#banner motd $ Prohibido el acceso no autorizado $
S3(config)#exit
S3#
%SYS-5-CONFIG_I: Configured from console by console
copy run start
Destination filename [startup-config]?
Building configuration...
[OK]
    
```

```

[OK]
Switch#enable
Switch#configure terminal
Enter configuration commands, one per line. End with
CNTL/Z.
Switch(config)#hostname S3
S3(config)#no ip domain-lookup
S3(config)#enable secret class
S3(config)#line con 0
S3(config-line)#password cisco
S3(config-line)#login
S3(config-line)#exit
S3(config)#service password-encryption
S3(config)#banner motd $ Prohibido el acceso no
autorizado $
S3(config)#exit
S3#
%SYS-5-CONFIG_I: Configured from console by console
copy run start
Destination filename [startup-config]?
Building configuration...
[OK]
S3#
    
```

*Ilustración 10 Configuración Switch S3*

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



*Ilustración 11 conexión física de los equipos*

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

**Parte 1: Asignación de direcciones IP:**

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

Procedemos a crear 8 subredes tomando prestados 3 bits:

Red 1	Red	192.	168.	1.	000	0	0000	192.168.1.0 /27
	Mascara							255.255.255.224
	Primera	192.	168.	1.	000	0	0001	192.168.1.1
	Ultima	192.	168.	1.	000	1	1110	192.168.1.30
	Broadcast	192.	168.	1.	000	1	1111	192.168.1.31

Red 2	Red	192.	168.	1.	001	0	0000	192.168.1.32 /27
	Mascara							255.255.255.224
	Primera	192.	168.	1.	001	0	0001	192.168.1.33
	Ultima	192.	168.	1.	001	1	1110	192.168.1.62
	Broadcast	192.	168.	1.	001	1	1111	192.168.1.63

Red 3	Red	192.	168.	1.	010	0	0000	192.168.1.64 /27
	Mascara							255.255.255.224
	Primera	192.	168.	1.	010	0	0001	192.168.1.65
	Ultima	192.	168.	1.	010	1	1110	192.168.1.94
	Broadcast	192.	168.	1.	010	1	1111	192.168.1.95

Red 4	Red	192.	168.	1.	011	0	0000	192.168.1.96 /27
	Mascara							255.255.255.224
	Primera	192.	168.	1.	011	0	0001	192.168.1.97
	Ultima	192.	168.	1.	011	1	1110	192.168.1.126
	Broadcast	192.	168.	1.	011	1	1111	192.168.1.127

Red 5	Red	192.	168.	1.	100	0	0000	192.168.1.128 /27
	Mascara							255.255.255.224
	Primera	192.	168.	1.	100	0	0001	192.168.1.129
	Ultima	192.	168.	1.	100	1	1110	192.168.1.158
	Broadcast	192.	168.	1.	100	1	1111	192.168.1.159

Red 6	Red	192.	168.	1.	101	0	0000	192.168.1.160 /27
	Mascara							255.255.255.224
	Primera	192.	168.	1.	101	0	0001	192.168.1.161
	Ultima	192.	168.	1.	101	1	1110	192.168.1.190
	Broadcast	192.	168.	1.	101	1	1111	192.168.1.191

Red 7	Red	192.	168.	1.	110	0	0000	192.168.1.192 /27
	Mascara							255.255.255.224
	Primera	192.	168.	1.	110	0	0001	192.168.1.193
	Ultima	192.	168.	1.	110	1	1110	192.168.1.222
	Broadcast	192.	168.	1.	110	1	1111	192.168.1.223

Red 8	Red	192.	168.	1.	111	0	0000	192.168.1.224 /27
	Mascara							255.255.255.224
	Primera	192.	168.	1.	111	0	0001	192.168.1.225
	Ultima	192.	168.	1.	111	1	1110	192.168.1.254
	Broadcast	192.	168.	1.	111	1	1111	192.168.1.255

b. Asignar una dirección IP a la red.

R/ 192.168.0.1

Mascara: 255.255.255.224 o /27

## Parte 2: Configuración Básica.

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

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

Afirmaciones de red	192.168.1.0	192.168.1.0	192.168.1.0
---------------------	-------------	-------------	-------------

## Configurar MEDELLIN

```

MEDELLIN#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
MEDELLIN(config)#interface Serial0/0/0
MEDELLIN(config-if)#ip address 192.168.1.99 255.255.255.224
MEDELLIN(config-if)#clock rate 128000
MEDELLIN(config-if)#no shutdown
MEDELLIN(config-if)#interface Serial0/0/1
MEDELLIN(config-if)#ip address 192.168.1.131 255.255.255.224
MEDELLIN(config-if)#clock rate 128000
MEDELLIN(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to down
MEDELLIN(config-if)#interface g0/0
MEDELLIN(config-if)#ip address 192.168.1.33 255.255.255.224
MEDELLIN(config-if)#no shutdown
MEDELLIN(config-if)#exit
    
```

```

MEDELLIN
Physical Config CLI Attributes
IOS Command Line Interface
%SYS-5-CONFIG_I: Configured from console by console
!
MEDELLIN#!
MEDELLIN#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
MEDELLIN(config)#interface Serial0/0/0
MEDELLIN(config-if)#ip address 192.168.1.99 255.255.255.224
MEDELLIN(config-if)#clock rate 128000
MEDELLIN(config-if)#no shutdown
MEDELLIN(config-if)#interface Serial0/0/1
MEDELLIN(config-if)#ip address 192.168.1.131 255.255.255.224
MEDELLIN(config-if)#clock rate 128000
MEDELLIN(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/0/1, changed state to down
MEDELLIN(config-if)#interface g0/0
MEDELLIN(config-if)#192.168.1.33 255.255.255.224
^
% Invalid input detected at '^' marker.

MEDELLIN(config-if)#ip address 192.168.1.33 255.255.255.224
MEDELLIN(config-if)#no shutdown
MEDELLIN(config-if)#exit
    
```

*Ilustración 12 Configuración Básica Router MEDELLIN*

## Configurar BOGOTA

```

BOGOTA>enable
Password:
BOGOTA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
BOGOTA(config-if)#interface s0/0/0
BOGOTA(config-if)#ip address 192.168.1.98 255.255.255.224
BOGOTA(config-if)#clock rate 128000
This command applies only to DCE interfaces
BOGOTA(config-if)#no shutdown
BOGOTA(config-if)#interface g0/0
BOGOTA(config-if)#ip address 192.168.1.1 255.255.255.224
BOGOTA(config-if)#no shutdown
BOGOTA(config-if)#exit
BOGOTA(config)#interface s0/0/1
BOGOTA(config-if)#ip address 192.168.1.130 255.255.255.224
BOGOTA(config-if)#no shutdown
BOGOTA(config-if)#exit
BOGOTA(config)#exit
BOGOTA(config)#exit
BOGOTA(config)#exit

```

The screenshot shows a terminal window titled 'BOGOTA' with tabs for Physical, Config, CLI, and Attributes. The CLI tab is active, displaying the following commands and their outputs:

```

IOS Command Line Interface
BOGOTA(config)#interface s0/0/1
BOGOTA(config-if)#ip address 192.168.1.130 255.255.255.224
BOGOTA(config-if)#no shutdown
BOGOTA(config-if)#exit
BOGOTA(config)#exit
BOGOTA#
%SYS-5-CONFIG_I: Configured from console by console
copy run start
Destination filename [startup-config]?
Building configuration...
[OK]
BOGOTA#!
BOGOTA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
BOGOTA(config)#interface s0/0/1
BOGOTA(config-if)#ip address 192.168.1.130 255.255.255.224
BOGOTA(config-if)#clock rate 128000
This command applies only to DCE interfaces
BOGOTA(config-if)#!
BOGOTA#
%SYS-5-CONFIG_I: Configured from console by console
BOGOTA#

```

*Ilustración 13 Configuración Básica Router BOGOTA*

## Configurar CALI

```
CALI>enable
```

```
Password:
```

```
CALI#configure terminal
```

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

```
CALI(config)#interface s0/0/0
```

```
CALI(config-if)#ip address 192.168.1.131 255.255.255.224
```

```
CALI(config-if)#clock rate 128000
```

```
CALI(config-if)#no shutdown
```

```
CALI(config-if)#interface g0/0
```

```
CALI(config-if)#ip address 192.168.1.65 255.255.255.224
```

```
CALI(config-if)#no shutdown
```

```
CALI(config-if)#exit
```

```
CALI(config)#interface s0/0/1
```

```
CALI(config-if)#ip address 192.168.1.193 255.255.255.224
```

```
CALI(config-if)#clock rate 128000
```

```
CALI(config-if)#no shutdown
```

```
CALI(config-if)#exit
```

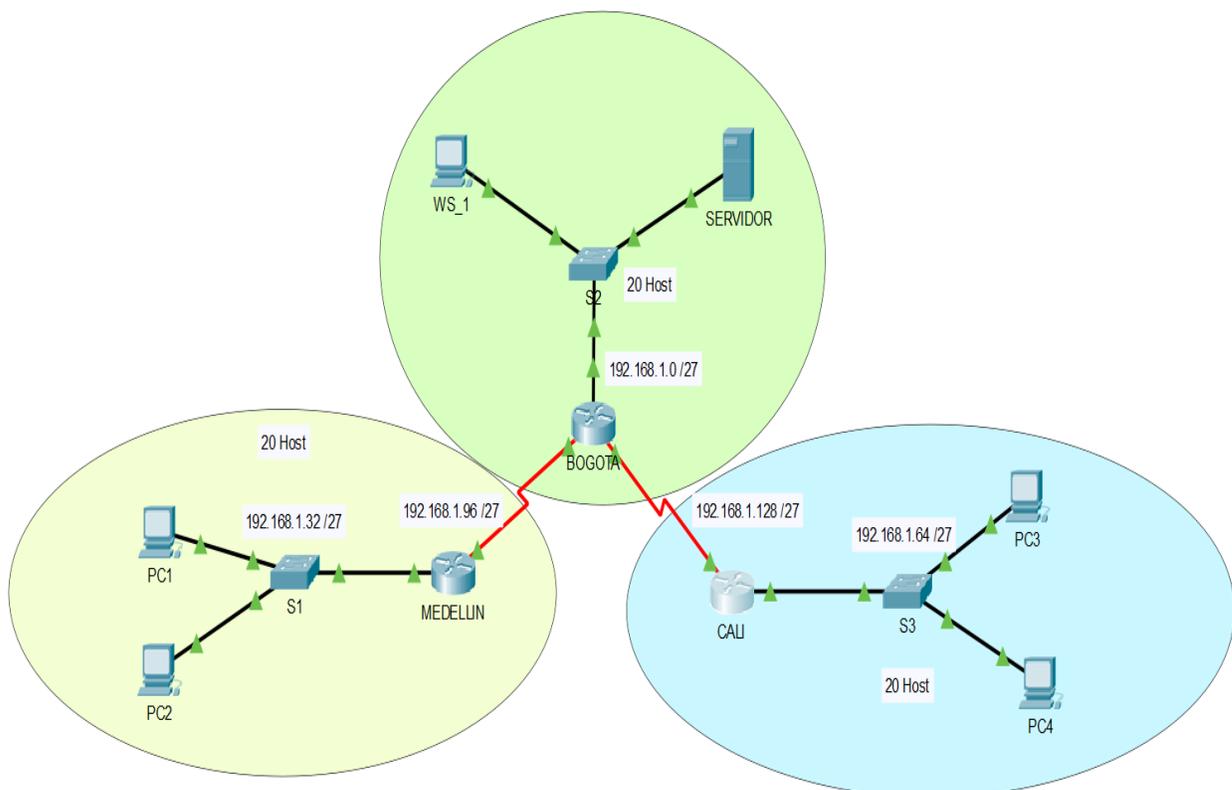


Ilustración 14 Esquema de RED

- b. Después de cargada la configuración en los dispositivos, verificar la tabla de enrutamiento en cada uno de los routers para comprobar las redes y sus rutas.

Para ver la tabla de enrutamiento usaremos el comando: **show ip route**

### Tabla de Enrutamiento MEDELLIN

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

Gateway of last resort is not set

    192.168.1.0/24 is variably subnetted, 4 subnets, 2 masks
C       192.168.1.32/27 is directly connected, GigabitEthernet0/0
L       192.168.1.33/32 is directly connected, GigabitEthernet0/0
C       192.168.1.96/27 is directly connected, Serial0/0/0
L       192.168.1.99/32 is directly connected, Serial0/0/0

MEDELLIN#
```

*Ilustración 15 Tabla de Enrutamiento MEDELLIN*

### Tabla de Enrutamiento BOGOTA

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

Gateway of last resort is not set

    192.168.1.0/24 is variably subnetted, 6 subnets, 2 masks
C       192.168.1.0/27 is directly connected, GigabitEthernet0/0
L       192.168.1.1/32 is directly connected, GigabitEthernet0/0
C       192.168.1.96/27 is directly connected, Serial0/0/0
L       192.168.1.98/32 is directly connected, Serial0/0/0
C       192.168.1.128/27 is directly connected, Serial0/0/1
L       192.168.1.130/32 is directly connected, Serial0/0/1

BOGOTA#
```

*Ilustración 16 Tabla de Enrutamiento BOGOTA*

## Tabla de Enrutamiento CALI

```

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

Gateway of last resort is not set

    192.168.1.0/24 is variably subnetted, 7 subnets, 2 masks
S       192.168.1.0/27 [1/0] via 192.168.1.130
D       192.168.1.32/27 [90/2684416] via 192.168.1.130, 02:25:51,
Serial0/0/0
C       192.168.1.64/27 is directly connected, GigabitEthernet0/0
L       192.168.1.65/32 is directly connected, GigabitEthernet0/0
S       192.168.1.96/27 [1/0] via 192.168.1.130
C       192.168.1.128/27 is directly connected, Serial0/0/0
L       192.168.1.131/32 is directly connected, Serial0/0/0
    
```

*Ilustración 17 Tabla de Enrutamiento CALI*

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

## Balanceo de carga Router MEDELLIN

```

Gateway of last resort is not set

    192.168.1.0/24 is variably subnetted, 4 subnets, 2 masks
C       192.168.1.32/27 is directly connected, GigabitEthernet0/0
L       192.168.1.33/32 is directly connected, GigabitEthernet0/0
C       192.168.1.96/27 is directly connected, Serial0/0/0
L       192.168.1.99/32 is directly connected, Serial0/0/0

MEDELLIN#
    
```

*Ilustración 18 Balanceo de carga Router MEDELLIN*

## Balanceo de carga Router BOGOTA

```

Gateway of last resort is not set

    192.168.1.0/24 is variably subnetted, 6 subnets, 2 masks
C       192.168.1.0/27 is directly connected, GigabitEthernet0/0
L       192.168.1.1/32 is directly connected, GigabitEthernet0/0
C       192.168.1.96/27 is directly connected, Serial0/0/0
L       192.168.1.98/32 is directly connected, Serial0/0/0
C       192.168.1.128/27 is directly connected, Serial0/0/1
L       192.168.1.130/32 is directly connected, Serial0/0/1

BOGOTA>
    
```

*Ilustración 19 Balanceo de carga Router BOGOTA*

## Balanceo de carga Router CALI

```

Gateway of last resort is not set

    192.168.1.0/24 is variably subnetted, 7 subnets, 2 masks
S       192.168.1.0/27 [1/0] via 192.168.1.130
D       192.168.1.32/27 [90/2684416] via 192.168.1.130, 02:25:51, Serial0/0/0
C       192.168.1.64/27 is directly connected, GigabitEthernet0/0
L       192.168.1.65/32 is directly connected, GigabitEthernet0/0
S       192.168.1.96/27 [1/0] via 192.168.1.130
C       192.168.1.128/27 is directly connected, Serial0/0/0
L       192.168.1.131/32 is directly connected, Serial0/0/0
    
```

*Ilustración 20 Balanceo de carga Router CALI*

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

## Router MEDELLIN

```

MEDELLIN#sh cdp neighbors
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
S1                Gig 0/0        137        S           2960      Fas 0/1
BOGOTA           Ser 0/0/0      137        R           C1900     Ser 0/0/0
MEDELLIN#
    
```

*Ilustración 21 diagnóstico de vecinos MEDELLIN*

- MEDELLIN#sh cdp neighbors  
 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  
 S1 Gig 0/0 125 S 2960 Fas 0/1  
 BOGOTA Ser 0/0/0 126 R C1900 Ser 0/0/0  
 MEDELLIN#

- MEDELLIN#show cdp neighbors detail

```

Device ID: BOGOTA
Entry address(es):
IP address : 192.168.1.98
Platform: cisco C1900, Capabilities: Router
Interface: Serial0/0/0, Port ID (outgoing port): Serial0/0/0
Holdtime: 177
    
```

Version :

Cisco IOS Software, C1900 Software (C1900-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: S1

Entry address(es):

Platform: cisco 2960, Capabilities: Switch

Interface: GigabitEthernet0/0, Port ID (outgoing port): FastEthernet0/1

Holdtime: 177

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

MEDELLIN#

## Router BOGOTA

```

BOGOTA#sh cdp neighbors
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
CALI             Ser 0/0/1      141        R           C1900     Ser 0/0/0
S2              Gig 0/0        141        S           2960     Fas 0/1
MEDELLIN        Ser 0/0/0      141        R           C1900     Ser 0/0/0
BOGOTA#
    
```

*Ilustración 22 diagnóstico de vecinos BOGOTA*

- BOGOTA#sh cdp neighbors

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
CALI Ser 0/0/1 159 R C1900 Ser 0/0/0
S2 Gig 0/0 159 S 2960 Fas 0/1
MEDELLIN Ser 0/0/0 159 R C1900 Ser 0/0/0
BOGOTA#
```

- BOGOTA>show cdp neighbors detail

```
Device ID: MEDELLIN
Entry address(es):
IP address : 192.168.1.99
Platform: cisco C1900, Capabilities: Router
Interface: Serial0/0/0, Port ID (outgoing port): Serial0/0/0
Holdtime: 145
```

```
Version :
Cisco IOS Software, C1900 Software (C1900-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: CALI
Entry address(es):
IP address : 192.168.1.131
Platform: cisco C1900, Capabilities: Router
Interface: Serial0/0/1, Port ID (outgoing port): Serial0/0/0
Holdtime: 145
```

```
Version :
Cisco IOS Software, C1900 Software (C1900-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: S2

Entry address(es):

Platform: cisco 2960, Capabilities: Switch

Interface: GigabitEthernet0/0, Port ID (outgoing port): FastEthernet0/1

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

BOGOTA>

## Router CALI

```
CALI#sh cdp neighbors
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
S3               Gig 0/0       161        S           2960      Fas 0/1
BOGOTA          Ser 0/0/0     161        R           C1900     Ser 0/0/1
CALI#
```

*Ilustración 23 diagnóstico de vecinos CALI*

- CALI#sh cdp neighbors  
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  
S3 Gig 0/0 161 S 2960 Fas 0/1  
BOGOTA Ser 0/0/0 161 R C1900 Ser 0/0/1  
CALI#

- CALI#show cdp neighbors detail

Device ID: S3

Entry address(es):

Platform: cisco 2960, Capabilities: Switch

Interface: GigabitEthernet0/0, Port ID (outgoing port): FastEthernet0/1

Holdtime: 136

Version :

Cisco IOS Software, C2960 Software (C2960-LANBASE-M), Version 12.2(25)FX, RELEASE SOFTWARE (fc1)

Copyright (c) 1986-2005 by Cisco Systems, Inc.

Compiled Wed 12-Oct-05 22:05 by pt\_team

advertisement version: 2

Duplex: full

-----

Device ID: BOGOTA

Entry address(es):

IP address : 192.168.1.130

Platform: cisco C1900, Capabilities: Router

Interface: Serial0/0/0, Port ID (outgoing port): Serial0/0/1

Holdtime: 136

Version :

Cisco IOS Software, C1900 Software (C1900-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

CALI#

- Configuración IP Route

## MEDELLIN

```
MEDELLIN#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
MEDELLIN(config)#ip route 192.168.1.0 255.255.255.224 192.168.1.98
MEDELLIN(config)#ip route 192.168.1.128 255.255.255.224 192.168.1.98
MEDELLIN(config)#ip route 192.168.1.64 255.255.255.224 192.168.1.98
```

```
MEDELLIN#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
MEDELLIN(config)#ip route 192.168.1.0 255.255.255.224 192.168.1.98
MEDELLIN(config)#ip route 192.168.1.128 255.255.255.224 192.168.1.98
MEDELLIN(config)#ip route 192.168.1.64 255.255.255.224 192.168.1.98
```

*Ilustración 24 Configuración IP Route MEDELLIN*

## BOGOTA

```
BOGOTA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
BOGOTA(config)#ip route 192.168.1.64 255.255.255.224 192.168.1.131
BOGOTA(config)#ip route 192.168.1.32 255.255.255.224 192.168.1.97
```

```
BOGOTA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
BOGOTA(config)#ip route 192.168.1.64 255.255.255.224 192.168.1.131
BOGOTA(config)#ip route 192.168.1.32 255.255.255.224 192.168.1.97
BOGOTA(config)#
```

*Ilustración 25 Configuración IP Route BOGOTA*

## CALI

```
CALI(config)#ip route 192.168.1.0 255.255.255.224 192.168.1.130
CALI(config)#ip route 192.168.1.96 255.255.255.224 192.168.1.130
```

```
CALI(config)#ip route 192.168.1.0 255.255.255.224 192.168.1.130
CALI(config)#ip route 192.168.1.96 255.255.255.224 192.168.1.130
```

*Ilustración 26 Configuración IP Route CALI*

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

### Ping de MEDELLIN a BOGOTA

```
MEDELLIN#ping 192.168.1.99
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.99, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 2/4/13 ms
```

*Ilustración 27 Ping de MEDELLIN a BOGOTA*

### Ping MEDELLIN a CALI

```
MEDELLIN#ping 192.168.1.131
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.131, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 2/8/24 ms
```

*Ilustración 28 Ping MEDELLIN a CALI*

### Ping BOGOTA a CALI

```
BOGOTA#ping 192.168.1.131
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.131, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/3/13 ms
BOGOTA#
```

*Ilustración 29 Ping BOGOTA a CALI*

### Ping CALI a MEDELLIN

```
CALI#ping 192.168.1.99
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.99, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 2/4/11 ms
```

*Ilustración 30 Ping CALI a MEDELLIN*

### Parte 3: Configuración de Enrutamiento.

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

#### MEDELLIN

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

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

*Ilustración 31 Configuración de Enrutamiento MEDELLIN*

#### BOGOTA

```
BOGOTA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
BOGOTA(config)#router eigrp 200
BOGOTA(config-router)#network 192.168.1.96 0.0.0.31
BOGOTA(config-router)#
%DUAL-5-NBRCHANGE: IP-EIGRP 200: Neighbor 192.168.1.99 (Serial0/0/0) is
up: new adjacency

BOGOTA(config-router)#network 192.168.1.0 0.0.0.31
BOGOTA(config-router)#network 192.168.1.128 0.0.0.31
BOGOTA(config-router)#network 192.168.1.96 0.0.0.31
BOGOTA(config-router)#no auto-summary
```

```

BOGOTA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
BOGOTA(config)#router eigrp 200
BOGOTA(config-router)#network 192.168.1.96 0.0.0.31
BOGOTA(config-router)#
%DUAL-5-NBRCHANGE: IP-EIGRP 200: Neighbor 192.168.1.99 (Serial0/0/0) is up: new adjacency

BOGOTA(config-router)#network 192.168.1.0 0.0.0.31
BOGOTA(config-router)#network 192.168.1.128 0.0.0.31
BOGOTA(config-router)#network 192.168.1.96 0.0.0.31
BOGOTA(config-router)#no auto-summary
BOGOTA(config-router)#
    
```

*Ilustración 32 Configuración de Enrutamiento BOGOTA*

## CALI

```

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

CALI(config-router)#network 192.168.1.64 0.0.0.31
CALI(config-router)#no auto-summary
CALI(config-router)#
    
```

```

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

CALI(config-router)#network 192.168.1.64 0.0.0.31
CALI(config-router)#no auto-summary
CALI(config-router)#
    
```

*Ilustración 33 Configuración de Enrutamiento CALI*

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

## MEDELLIN

```

MEDELLIN#sh ip eigrp neighbors
IP-EIGRP neighbors for process 200
H Address Interface Hold Uptime SRTT RTO Q Seq
(sec) (ms) Cnt Num
    
```

```
0 192.168.1.98 Se0/0/0 14 00:11:25 40 1000 0 6
MEDELLIN#
```

```
MEDELLIN#sh ip eigrp neighbors
IP-EIGRP neighbors for process 200
H   Address           Interface           Hold Uptime       SRTT   RTO   Q   Seq
   (sec)              (ms)              (ms)              Cnt   Num
0   192.168.1.98      Se0/0/0            14   00:11:25   40   1000   0   6
MEDELLIN#
```

*Ilustración 34 Verificar vecindad router MEDELLIN*

## BOGOTA

```
BOGOTA>enable
Password:
BOGOTA#sh ip eigrp neighbors
IP-EIGRP neighbors for process 200
H Address Interface Hold Uptime SRTT RTO Q Seq
(sec) (ms) Cnt Num
0 192.168.1.99 Se0/0/0 13 01:18:06 40 1000 0 5
1 192.168.1.131 Se0/0/1 11 01:14:13 40 1000 0 7
```

```
BOGOTA>enable
Password:
BOGOTA#sh ip eigrp neighbors
IP-EIGRP neighbors for process 200
H   Address           Interface           Hold Uptime       SRTT   RTO   Q   Seq
   (sec)              (ms)              (ms)              Cnt   Num
0   192.168.1.99      Se0/0/0            13   01:18:06   40   1000   0   5
1   192.168.1.131    Se0/0/1            11   01:14:13   40   1000   0   7
```

*Ilustración 35 Verificar vecindad router BOGOTA*

## CALI

```
CALI#sh ip eigrp neighbors
IP-EIGRP neighbors for process 200
H Address Interface Hold Uptime SRTT RTO Q Seq
(sec) (ms) Cnt Num
0 192.168.1.130 Se0/0/0 12 01:14:28 40 1000 0 8
```

```

CALI#sh ip eigrp neighbors
IP-EIGRP neighbors for process 200
H   Address          Interface          Hold Uptime      SRTT   RTO   Q   Seq
   (sec)              (ms)              (ms)              Cnt   Num
0   192.168.1.130     Se0/0/0           12   01:14:28   40    1000  0   8
    
```

*Ilustración 36 Verificar vecindad router CALI*

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

Ahora vamos a comprobar las tablas de enrutamiento usando el comando: sh ip route

### Router MEDELLIN

```

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

Gateway of last resort is not set

```

192.168.1.0/24 is variably subnetted, 7 subnets, 2 masks
S 192.168.1.0/27 [1/0] via 192.168.1.98
C 192.168.1.32/27 is directly connected, GigabitEthernet0/0
L 192.168.1.33/32 is directly connected, GigabitEthernet0/0
S 192.168.1.64/27 [1/0] via 192.168.1.98
C 192.168.1.96/27 is directly connected, Serial0/0/0
L 192.168.1.99/32 is directly connected, Serial0/0/0
S 192.168.1.128/27 [1/0] via 192.168.1.98
    
```

```

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

Gateway of last resort is not set

192.168.1.0/24 is variably subnetted, 7 subnets, 2 masks
S    192.168.1.0/27 [1/0] via 192.168.1.98
C    192.168.1.32/27 is directly connected, GigabitEthernet0/0
L    192.168.1.33/32 is directly connected, GigabitEthernet0/0
S    192.168.1.64/27 [1/0] via 192.168.1.98
C    192.168.1.96/27 is directly connected, Serial0/0/0
L    192.168.1.99/32 is directly connected, Serial0/0/0
S    192.168.1.128/27 [1/0] via 192.168.1.98

```

*Ilustración 37 tablas de enrutamiento MEDELLIN*

## Router BOGOTA

```

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

Gateway of last resort is not set

192.168.1.0/24 is variably subnetted, 8 subnets, 2 masks
C 192.168.1.0/27 is directly connected, GigabitEthernet0/0
L 192.168.1.1/32 is directly connected, GigabitEthernet0/0
S 192.168.1.32/27 [1/0] via 192.168.1.97
S 192.168.1.64/27 [1/0] via 192.168.1.131
C 192.168.1.96/27 is directly connected, Serial0/0/0
L 192.168.1.98/32 is directly connected, Serial0/0/0
C 192.168.1.128/27 is directly connected, Serial0/0/1
L 192.168.1.130/32 is directly connected, Serial0/0/1

```

```

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

Gateway of last resort is not set

    192.168.1.0/24 is variably subnetted, 8 subnets, 2 masks
C       192.168.1.0/27 is directly connected, GigabitEthernet0/0
L       192.168.1.1/32 is directly connected, GigabitEthernet0/0
S       192.168.1.32/27 [1/0] via 192.168.1.97
S       192.168.1.64/27 [1/0] via 192.168.1.131
C       192.168.1.96/27 is directly connected, Serial0/0/0
L       192.168.1.98/32 is directly connected, Serial0/0/0
C       192.168.1.128/27 is directly connected, Serial0/0/1
L       192.168.1.130/32 is directly connected, Serial0/0/1
    
```

*Ilustración 38 tablas de enrutamiento BOGOTA*

## Router CALI

```

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

Gateway of last resort is not set

    192.168.1.0/24 is variably subnetted, 7 subnets, 2 masks
S 192.168.1.0/27 [1/0] via 192.168.1.130
D 192.168.1.32/27 [90/2684416] via 192.168.1.130, 02:34:33, Serial0/0/0
C 192.168.1.64/27 is directly connected, GigabitEthernet0/0
L 192.168.1.65/32 is directly connected, GigabitEthernet0/0
S 192.168.1.96/27 [1/0] via 192.168.1.130
C 192.168.1.128/27 is directly connected, Serial0/0/0
L 192.168.1.131/32 is directly connected, Serial0/0/0
    
```

```

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

Gateway of last resort is not set

    192.168.1.0/24 is variably subnetted, 7 subnets, 2 masks
S       192.168.1.0/27 [1/0] via 192.168.1.130
D       192.168.1.32/27 [90/2684416] via 192.168.1.130, 02:34:33, Serial0/0/0
C       192.168.1.64/27 is directly connected, GigabitEthernet0/0
L       192.168.1.65/32 is directly connected, GigabitEthernet0/0
S       192.168.1.96/27 [1/0] via 192.168.1.130
C       192.168.1.128/27 is directly connected, Serial0/0/0
L       192.168.1.131/32 is directly connected, Serial0/0/0

```

*Ilustración 39 tablas de enrutamiento CALI*

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

### Ping PC3 Lan CALI a PC1 MEDELLIN

```

C:\>ping 192.168.1.35

Pinging 192.168.1.35 with 32 bytes of data:

Reply from 192.168.1.35: bytes=32 time=3ms TTL=125
Reply from 192.168.1.35: bytes=32 time=2ms TTL=125
Reply from 192.168.1.35: bytes=32 time=2ms TTL=125
Reply from 192.168.1.35: bytes=32 time=2ms TTL=125

Ping statistics for 192.168.1.35:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 3ms, Average = 2ms

```

*Ilustración 40 Ping PC3 Lan CALI a PC1 MEDELLIN*

### Ping PC4 Lan CALI a SERVIDOR Lan BOGOTA

```
C:\>ping 192.168.1.8

Pinging 192.168.1.8 with 32 bytes of data:

Reply from 192.168.1.8: bytes=32 time=2ms TTL=126
Reply from 192.168.1.8: bytes=32 time=1ms TTL=126
Reply from 192.168.1.8: bytes=32 time=1ms TTL=126
Reply from 192.168.1.8: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.1.8:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 2ms, Average = 1ms

C:\>
```

*Ilustración 41 Ping PC4 Lan CALI a SERVIDOR Lan BOGOTA*

#### **Ping PC2 Lan MEDELLIN a WS\_1 Lan BOGOTA**

```
C:\>ping 192.168.1.7

Pinging 192.168.1.7 with 32 bytes of data:

Reply from 192.168.1.7: bytes=32 time=11ms TTL=126
Reply from 192.168.1.7: bytes=32 time=1ms TTL=126
Reply from 192.168.1.7: bytes=32 time=1ms TTL=126
Reply from 192.168.1.7: bytes=32 time=2ms TTL=126

Ping statistics for 192.168.1.7:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 11ms, Average = 3ms
```

*Ilustración 42 Ping PC2 Lan MEDELLIN a WS\_1 Lan BOGOTA*

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

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

Las condiciones para crear las ACL son las siguientes:

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

b. El equipo WS1 y el servidor se encuentran en la subred de administración. Solo el servidor de la subred de administración debe tener acceso a cualquier otro dispositivo en cualquier parte de la red.

c. Las estaciones de trabajo en las LAN de MEDELLIN y CALI no deben tener acceso a ningún dispositivo fuera de su subred, excepto para interconectar con el servidor.

R/ Para implementar la seguridad de la red ejecutaremos los comandos `Access-list` y `deny`, `permit` en los router MEDELLIN y CALI:

### Router MEDELLIN

```
MEDELLIN#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
MEDELLIN(config)#Access-list 1 permit host 192.168.1.8
MEDELLIN(config)#Access-list 1 deny 192.168.1.0 0.0.0.31
MEDELLIN(config)#Access-list 1 deny 192.168.1.64 0.0.0.31
MEDELLIN(config)#Access-list 1 permit any
MEDELLIN(config)#int gigabitEthernet 0/0
MEDELLIN(config-if)#ip access-group 1 out
```

```
MEDELLIN#configure terminal
Enter configuration commands, one per line. End with
CNTL/Z.
MEDELLIN(config)#Access-list 1 permit host 192.168.1.8
MEDELLIN(config)#Access-list 1 deny 192.168.1.0 0.0.0.31
MEDELLIN(config)#Access-list 1 deny 192.168.1.64 0.0.0.31
MEDELLIN(config)#Access-list 1 permit any
MEDELLIN(config)#int gigabitEthernet 0/0
MEDELLIN(config-if)#ip access-group 1 out
```

*Ilustración 43 Control de Acceso MEDELLIN*

### Router CALI

```
CALI#configure terminal
CALI(config-if)#Access-list 1 permit host 192.168.1.8
CALI(config)#Access-list 1 deny 192.168.1.0 0.0.0.31
CALI(config)#Access-list 1 deny 192.168.1.32 0.0.0.31
CALI(config)#Access-list 1 permit any
CALI(config)#int gigabitEthernet 0/0
CALI(config-if)#ip access-group 1 out
```

CALI(config-if)#

```

CALI(config-if)#Access-list 1 permit host 192.168.1.8
CALI(config)#Access-list 1 deny 192.168.1.0 0.0.0.31
CALI(config)#Access-list 1 deny 192.168.1.32 0.0.0.31
CALI(config)#Access-list 1 permit any
CALI(config)#int gigabitEthernet 0/0
CALI(config-if)#ip access-group 1 out
CALI(config-if)#
    
```

*Ilustración 44 Control de Acceso CALI*

De esta manera se configura la Lista de acceso para nuestra red.

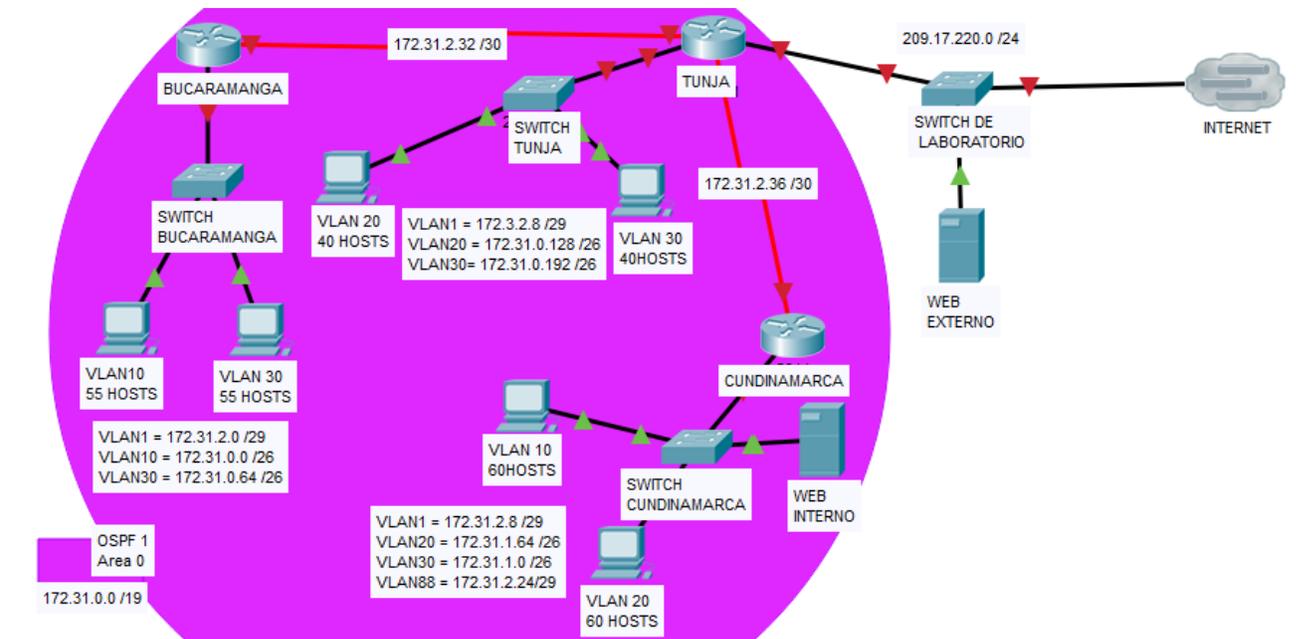
**Parte 5: Comprobación de la red instalada.**

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

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

## Escenario 2

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



## Desarrollo

Los siguientes son los requerimientos necesarios:

1. Todos los routers deberán tener los siguiente:

- **Configuración básica.**

Configuración básica Router BUCARAMANGA

```

Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname BUCARAMANGA
BUCARAMANGA(config)#no ip domain-lookup
BUCARAMANGA(config)#banner motd #Cuidado Acceso Restringido#
    
```

```
BUCARAMANGA(config)#enable secret class123
BUCARAMANGA(config)#line console 0
BUCARAMANGA(config-line)#password cisco123
BUCARAMANGA(config-line)#login
BUCARAMANGA(config-line)#logging synchronous
BUCARAMANGA(config-line)#line vty 0 15
BUCARAMANGA(config-line)#password cisco123
BUCARAMANGA(config-line)#login
BUCARAMANGA(config-line)#logging synchronous
BUCARAMANGA(config)#int f0/0.1
BUCARAMANGA(config-subif)#encapsulation dot1q 1
BUCARAMANGA(config-subif)#ip address 172.31.2.1 255.255.255.248
BUCARAMANGA(config-subif)#int f0/0.10
BUCARAMANGA(config-subif)#encapsulation dot1q 10
BUCARAMANGA(config-subif)#ip address 172.31.0.1 255.255.255.192
BUCARAMANGA(config-subif)#int f0/0.30
BUCARAMANGA(config-subif)#encapsulation dot1q 30
BUCARAMANGA(config-subif)#ip address 172.31.0.65 255.255.255.192
BUCARAMANGA(config-subif)#int f0/0
BUCARAMANGA(config-if)#no shutdown
BUCARAMANGA(config-if)#int s0/0/0
BUCARAMANGA(config-if)#ip address 172.31.2.34 255.255.255.252
BUCARAMANGA(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down
BUCARAMANGA(config-if)#
BUCARAMANGA(config-if)#router ospf 1
BUCARAMANGA(config-router)#network 172.31.0.0 0.0.0.63 area 0
BUCARAMANGA(config-router)#network 172.31.0.64 0.0.0.63 area 0
BUCARAMANGA(config-router)#network 172.31.2.0 0.0.0.7 area 0
BUCARAMANGA(config-router)#network 172.31.2.32 0.0.0.3 area 0
BUCARAMANGA(config-router)#end
```

```

BUCARAMANGA#
BUCARAMANGA#enable
BUCARAMANGA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
BUCARAMANGA(config)#hostname BUCARAMANGA
BUCARAMANGA(config)#no ip domain-lookup
BUCARAMANGA(config)#banner motd #Cuidado Acceso Restringido#
BUCARAMANGA(config)#enable secret class
BUCARAMANGA(config)#line console 0
BUCARAMANGA(config-line)#password cisco
BUCARAMANGA(config-line)#login
BUCARAMANGA(config-line)#logging synchronous
BUCARAMANGA(config-line)#line vty 0 15
BUCARAMANGA(config-line)#password cisco
BUCARAMANGA(config-line)#login
BUCARAMANGA(config-line)#logging synchronous
BUCARAMANGA(config-line)#int f0/0.1
BUCARAMANGA(config-subif)#
%LINK-5-CHANGED: Interface FastEthernet0/0.1, changed state to up

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

*Ilustración 45 Configuración básica Router BUCARAMANGA*

## Configuración básica Router TUNJA

```

Router#enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname TUNJA
TUNJA(config)#no ip domain-lookup
TUNJA(config)#banner motd #Cuidado Acceso Restringido#
TUNJA(config)#enable secret class
TUNJA(config)#line console 0
TUNJA(config-line)#password cisco
TUNJA(config-line)#login
TUNJA(config-line)#logging synchronous
TUNJA(config-line)#line vty 0 15
TUNJA(config-line)#password cisco
TUNJA(config-line)#login
TUNJA(config-line)#logging synchronous
TUNJA(config-line)#int f0/0.1
TUNJA(config-subif)#encapsulation dot1q 1
TUNJA(config-subif)#ip address 172.3.2.9 255.255.255.248
TUNJA(config-subif)#int f0/0.20
    
```

```
TUNJA(config-subif)#encapsulation dot1q 20
TUNJA(config-subif)#ip address 172.31.0.129 255.255.255.192
TUNJA(config-subif)#int f0/0.30
TUNJA(config-subif)#encapsulation dot1q 30
TUNJA(config-subif)#ip address 172.31.0.193 255.255.255.192
TUNJA(config-subif)#int f0/0
TUNJA(config-if)#no shutdown
```

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

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

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

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

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

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

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

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

```
TUNJA(config-if)#int s0/0/0
TUNJA(config-if)#ip address 172.31.2.33 255.255.255.252
TUNJA(config-if)#no shutdown
```

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

```
TUNJA(config-if)#int s0/0/1
TUNJA(config-if)#
```

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

```
TUNJA(config-if)#ip address 172.31.2.37 255.255.255.252  
TUNJA(config-if)#no shutdown
```

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

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

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

```
TUNJA(config-if)#router ospf 1  
TUNJA(config-router)#network 172.3.2.8 0.0.0.7 area 0  
TUNJA(config-router)#network 172.31.0.128 0.0.0.63 area 0  
TUNJA(config-router)#network 172.31.0.192 0.0.0.63 area 0  
TUNJA(config-router)#network 172.31.2.32 0.0.0.3 area 0  
TUNJA(config-router)#network 172.31.2.36 0.0.0.3 area 0  
00:18:34: %OSPF-5-ADJCHG: Process 1, Nbr 172.31.2.34 on Serial0/0/0 from  
LOADING to FULL, Loading Done
```

```
TUNJA(config-router)#network 172.31.2.36 0.0.0.3 area 0  
TUNJA(config-router)#end
```

```

TUNJA
Physical Config CLI Attributes
IOS Command Line Interface
TUNJA(config-line)#password cisco
TUNJA(config-line)#login
TUNJA(config-line)#logging synchronous
TUNJA(config-line)#int f0/0.1
TUNJA(config-subif)#encapsulation dot1q 1
TUNJA(config-subif)#ip address 172.3.2.9 255.255.255.248
TUNJA(config-subif)#int f0/0.20
TUNJA(config-subif)#encapsulation dot1q 20
TUNJA(config-subif)#ip address 172.31.0.129 255.255.255.192
TUNJA(config-subif)#int f0/0.30
TUNJA(config-subif)#encapsulation dot1q 30
TUNJA(config-subif)#ip address 172.31.0.193 255.255.255.192
TUNJA(config-subif)#int f0/0
TUNJA(config-if)#no shutdown

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

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

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

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

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

*Ilustración 46 Configuración básica Router TUNJA*

## Configuración básica Router CUNDINAMARCA

```

Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname CUNDINAMARCA
CUNDINAMARCA(config)#no ip domain-lookup
CUNDINAMARCA(config)#banner motd #Cuidado Acceso Restringido#
CUNDINAMARCA(config)#enable secret class
CUNDINAMARCA(config)#line console 0
CUNDINAMARCA(config-line)#password cisco
CUNDINAMARCA(config-line)#login
CUNDINAMARCA(config-line)#logging synchronous
CUNDINAMARCA(config-line)#line vty 0 15
CUNDINAMARCA(config-line)#password cisco
CUNDINAMARCA(config-line)#login
CUNDINAMARCA(config-line)#logging synchronous
    
```

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

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

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

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

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

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

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

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

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

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

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

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

```
CUNDINAMARCA(config-if)#int s0/0/0
```

```
CUNDINAMARCA(config-if)#ip address 172.31.2.38 255.255.255.252
```

```
CUNDINAMARCA(config-if)#no shutdown
```

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

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

```
CUNDINAMARCA(config-if)#router ospf 1
```

```
CUNDINAMARCA(config-router)#
```

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state
to up
CUNDINAMARCA(config-router)#network 172.31.1.0 0.0.0.63 area 0
CUNDINAMARCA(config-router)#network 172.31.1.64 0.0.0.63 area 0
CUNDINAMARCA(config-router)#network 172.31.2.8 0.0.0.7 area 0
CUNDINAMARCA(config-router)#network 172.31.2.24 0.0.0.7 area 0
CUNDINAMARCA(config-router)#network 172.31.2.36 0.0.0.3 area 0
CUNDINAMARCA(config-router)#end
```

```
CUNDINAMARCA
Physical Config CLI Attributes
IOS Command Line Interface
CUNDINAMARCA(config-if)#no shutdown
CUNDINAMARCA(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up
CUNDINAMARCA(config-if)#router ospf 1
CUNDINAMARCA(config-router)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up
CUNDINAMARCA(config-router)#network 172.31.1.0 0.0.0.63 area 0
CUNDINAMARCA(config-router)#network 172.31.1.64 0.0.0.63 area 0
CUNDINAMARCA(config-router)#network 172.31.2.8 0.0.0.7 area 0
CUNDINAMARCA(config-router)#network 172.31.2.24 0.0.0.7 area 0
CUNDINAMARCA(config-router)#network 172.31.2.36 0.0.0.3 area 0
CUNDINAMARCA(config-router)#end
CUNDINAMARCA#
%SYS-5-CONFIG_I: Configured from console by console
CUNDINAMARCA#
00:33:33: %OSPF-5-ADJCHG: Process 1, Nbr 209.165.220.1 on Serial0/0/0 from
LOADING to FULL, Loading Done
CUNDINAMARCA#
```

*Ilustración 47 Configuración básica Router CUNDINAMARCA*

## Configuración básica SWITCH SWBUCARAMANGA

```
SWITCH#enable
SWITCH#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
SWITCH(config)#hostname SWBUCARAMANGA
SWBUCARAMANGA(config)#vlan 1
SWBUCARAMANGA(config-vlan)#vlan 10
SWBUCARAMANGA(config-vlan)#vlan 30
SWBUCARAMANGA(config-vlan)#int f0/20
```

```

SWBUCARAMANGA(config-if)#switchport mode access
SWBUCARAMANGA(config-if)#switchport access vlan 10
SWBUCARAMANGA(config-if)#int f0/24
SWBUCARAMANGA(config-if)#switchport mode access
SWBUCARAMANGA(config-if)#switchport access vlan 30
SWBUCARAMANGA(config-if)#int f0/1
SWBUCARAMANGA(config-if)#switchport mode trunk
SWBUCARAMANGA(config-if)#int vlan 1
SWBUCARAMANGA(config-if)#ip address 172.31.2.3 255.255.255.248
SWBUCARAMANGA(config-if)#no shutdown
SWBUCARAMANGA(config-if)#ip default-gateway 172.31.2.1
    
```

```

SWITCH BUCARAMANGA
Physical Config CLI Attributes
IOS Command Line Interface
SWITCH#
%SYS-5-CONFIG_I: Configured from console by console

SWITCH#enable
SWITCH#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
SWITCH(config)#hostname SWBUCARAMANGA
SWBUCARAMANGA(config)#vlan 1
SWBUCARAMANGA(config-vlan)#vlan 10
SWBUCARAMANGA(config-vlan)#vlan 30
SWBUCARAMANGA(config-vlan)#int f0/20
SWBUCARAMANGA(config-if)#switchport mode access
SWBUCARAMANGA(config-if)#switchport access vlan 10
SWBUCARAMANGA(config-if)#int f0/24
SWBUCARAMANGA(config-if)#switchport mode access
SWBUCARAMANGA(config-if)#switchport access vlan 30
SWBUCARAMANGA(config-if)#int f0/1
SWBUCARAMANGA(config-if)#switchport mode trunk
SWBUCARAMANGA(config-if)#int vlan 1
SWBUCARAMANGA(config-if)#ip address 172.31.2.3 255.255.255.248
SWBUCARAMANGA(config-if)#no shutdown
SWBUCARAMANGA(config-if)#ip default-gateway 172.31.2.1
SWBUCARAMANGA(config)#
    
```

*Ilustración 48 Configuración básica SWITCH SWBUCARAMANGA*

### Configuración básica SWITCH SWTUNJA

```

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

```

SWITCH(config)#hostname SWTUNJA
SWTUNJA(config)#vlan 1
SWTUNJA(config-vlan)#vlan 20
SWTUNJA(config-vlan)#vlan 30
SWTUNJA(config-vlan)#int f0/20
SWTUNJA(config-if)#switchport mode access
SWTUNJA(config-if)#switchport access vlan 20
SWTUNJA(config-if)#int f0/24
SWTUNJA(config-if)#switchport mode access
SWTUNJA(config-if)#switchport access vlan 30
SWTUNJA(config-if)#int f0/1
SWTUNJA(config-if)#switchport mode trunk
SWTUNJA(config-if)#int vlan 1
SWTUNJA(config-if)#ip address 172.3.2.11 255.255.255.248
SWTUNJA(config-if)#no shutdown
SWTUNJA(config-if)#ip default-gateway 172.3.2.9
    
```

```

SWTUNJA
Physical Config CLI Attributes
IOS Command Line Interface
^
% Invalid input detected at '^' marker.
SWITCH#enable
SWITCH#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
SWITCH(config)#hostname SWTUNJA
SWTUNJA(config)#vlan 1
SWTUNJA(config-vlan)#vlan 20
SWTUNJA(config-vlan)#vlan 30
SWTUNJA(config-vlan)#int f0/20
SWTUNJA(config-if)#switchport mode access
SWTUNJA(config-if)#switchport access vlan 20
SWTUNJA(config-if)#int f0/24
SWTUNJA(config-if)#switchport mode access
SWTUNJA(config-if)#switchport access vlan 30
SWTUNJA(config-if)#int f0/1
SWTUNJA(config-if)#switchport mode trunk
SWTUNJA(config-if)#int vlan 1
SWTUNJA(config-if)#ip address 172.3.2.11 255.255.255.248
SWTUNJA(config-if)#no shutdown
SWTUNJA(config-if)#ip default-gateway 172.3.2.9
SWTUNJA(config)#
    
```

*Ilustración 49 Configuración básica SWITCH SWTUNJA*

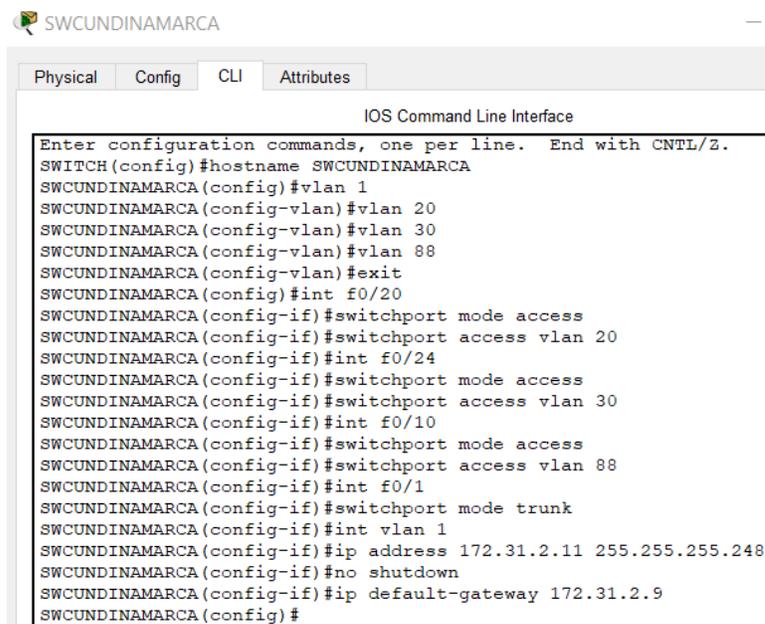
## Configuración básica SWITCH SWCUNDINAMARCA

```

SWITCH#enable
SWITCH#configure terminal
    
```

```

Enter configuration commands, one per line. End with CNTL/Z.
SWITCH(config)#hostname SWCUNDINAMARCA
SWCUNDINAMARCA(config)#vlan 1
SWCUNDINAMARCA(config-vlan)#vlan 20
SWCUNDINAMARCA(config-vlan)#vlan 30
SWCUNDINAMARCA(config-vlan)#vlan 88
SWCUNDINAMARCA(config-vlan)#exit
SWCUNDINAMARCA(config)#int f0/20
SWCUNDINAMARCA(config-if)#switchport mode access
SWCUNDINAMARCA(config-if)#switchport access vlan 20
SWCUNDINAMARCA(config-if)#int f0/24
SWCUNDINAMARCA(config-if)#switchport mode access
SWCUNDINAMARCA(config-if)#switchport access vlan 30
SWCUNDINAMARCA(config-if)#int f0/10
SWCUNDINAMARCA(config-if)#switchport mode access
SWCUNDINAMARCA(config-if)#switchport access vlan 88
SWCUNDINAMARCA(config-if)#int f0/1
SWCUNDINAMARCA(config-if)#switchport mode trunk
SWCUNDINAMARCA(config-if)#int vlan 1
SWCUNDINAMARCA(config-if)#ip address 172.31.2.11 255.255.255.248
SWCUNDINAMARCA(config-if)#no shutdown
SWCUNDINAMARCA(config-if)#ip default-gateway 172.31.2.9
    
```



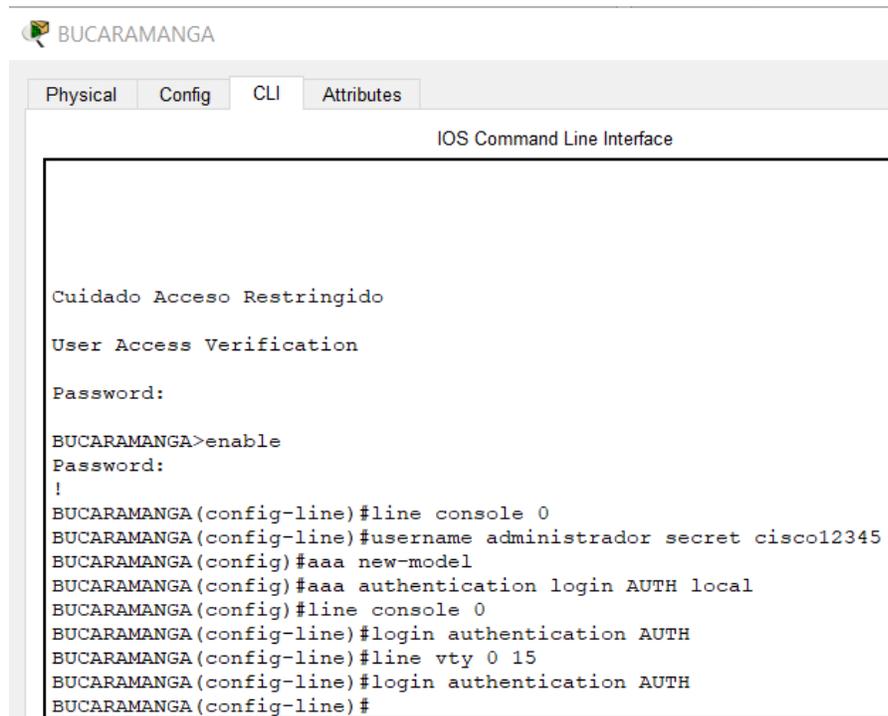
*Ilustración 50 Configuración básica SWITCH SWCUNDINAMARCA*

• Autenticación local con AAA.

**Autenticación BUCARAMANGA**

```

BUCARAMANGA(config-line)#line console 0
BUCARAMANGA(config-line)#username administrador secret cisco12345
BUCARAMANGA(config)#aaa new-model
BUCARAMANGA(config)#aaa authentication login AUTH local
BUCARAMANGA(config)#line console 0
BUCARAMANGA(config-line)#login authentication AUTH
BUCARAMANGA(config-line)#line vty 0 15
BUCARAMANGA(config-line)#login authentication AUTH
BUCARAMANGA(config-line)#
    
```



*Ilustración 51 Autenticación BUCARAMANGA*

**Autenticación TUNJA**

```

TUNJA>enable
Password:
TUNJA#configure terminal
    
```

```

Enter configuration commands, one per line. End with CNTL/Z.
TUNJA(config)#line console 0
TUNJA(config-line)#username administrador secret cisco12345
TUNJA(config)#aaa new-model
TUNJA(config)#aaa authentication login AUTH local
TUNJA(config)#line console 0
TUNJA(config-line)#login authentication AUTH
TUNJA(config-line)#line vty 0 15
TUNJA(config-line)#login authentication AUTH
TUNJA(config-line)#
    
```

```

TUNJA
Physical Config CLI Attributes
IOS Command Line Interface
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/1, ch
00:34:26: %OSPF-5-ADJCHG: Process 1, Nbr 172.31.2.38 on Serial
FULL, Loading Done
Cuidado Acceso Restringido
User Access Verification
Password:
TUNJA>enable
Password:
TUNJA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
TUNJA(config)#line console 0
TUNJA(config-line)#username administrador secret cisco12345
TUNJA(config)#aaa new-model
TUNJA(config)#aaa authentication login AUTH local
TUNJA(config)#line console 0
TUNJA(config-line)#login authentication AUTH
TUNJA(config-line)#line vty 0 15
TUNJA(config-line)#login authentication AUTH
TUNJA(config-line)#
    
```

*Ilustración 52 Autenticación TUNJA*

## Autenticación CUNDINAMARCA

```

CUNDINAMARCA>enable
Password:
CUNDINAMARCA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
CUNDINAMARCA(config)#line console 0
    
```

```
CUNDINAMARCA(config-line)#username administrador secret cisco12345
CUNDINAMARCA(config)#aaa new-model
CUNDINAMARCA(config)#aaa authentication login AUTH local
CUNDINAMARCA(config)#line console 0
CUNDINAMARCA(config-line)#login authentication AUTH
CUNDINAMARCA(config-line)#line vty 0 15
CUNDINAMARCA(config-line)#login authentication AUTH
```

The screenshot shows the CUNDINAMARCA IOS Command Line Interface. At the top, there are tabs for Physical, Config, CLI, and Attributes. The main window displays the following text:

```
Cuidado Acceso Restringido
User Access Verification
Password:
CUNDINAMARCA>enable
Password:
CUNDINAMARCA#line console 0
      ^
% Invalid input detected at '^' marker.
CUNDINAMARCA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
CUNDINAMARCA(config)#line console 0
CUNDINAMARCA(config-line)#username administrador secret cisco12345
CUNDINAMARCA(config)#aaa new-model
CUNDINAMARCA(config)#aaa authentication login AUTH local
CUNDINAMARCA(config)#line console 0
CUNDINAMARCA(config-line)#login authentication AUTH
CUNDINAMARCA(config-line)#line vty 0 15
CUNDINAMARCA(config-line)#login authentication AUTH
CUNDINAMARCA(config-line)#
```

*Ilustración 53 Autenticación CUNDINAMARCA*

- **Cifrado de contraseñas.**

```
BUCARAMANGA(config-line)#service password-encryption
```

```
TUNJA(config-line)#service password-encryption
```

```
CUNDINAMARCA(config-line)#service password-encryption
```

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

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

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

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

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

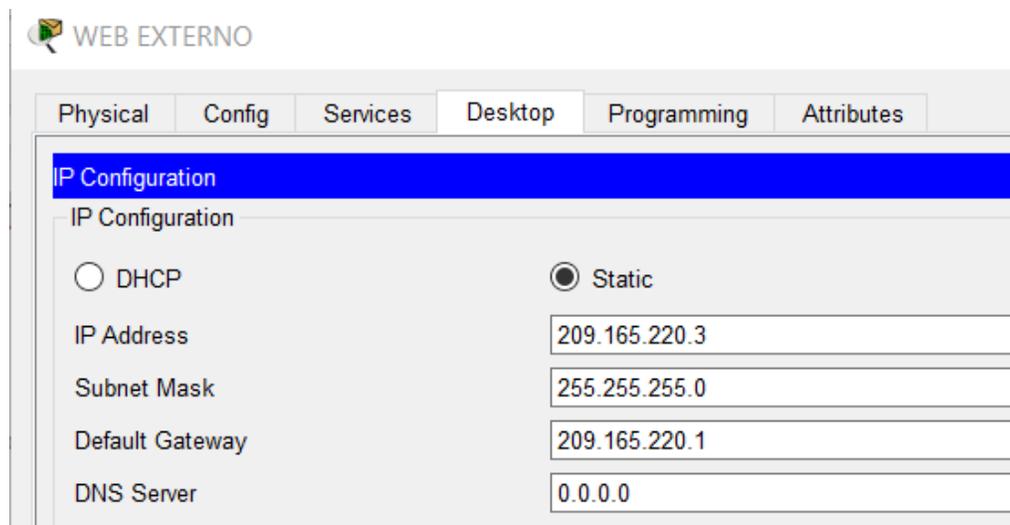
```
BUCARAMANGA(config-line)#login block-for 5 attempts 4 within 60
```

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

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

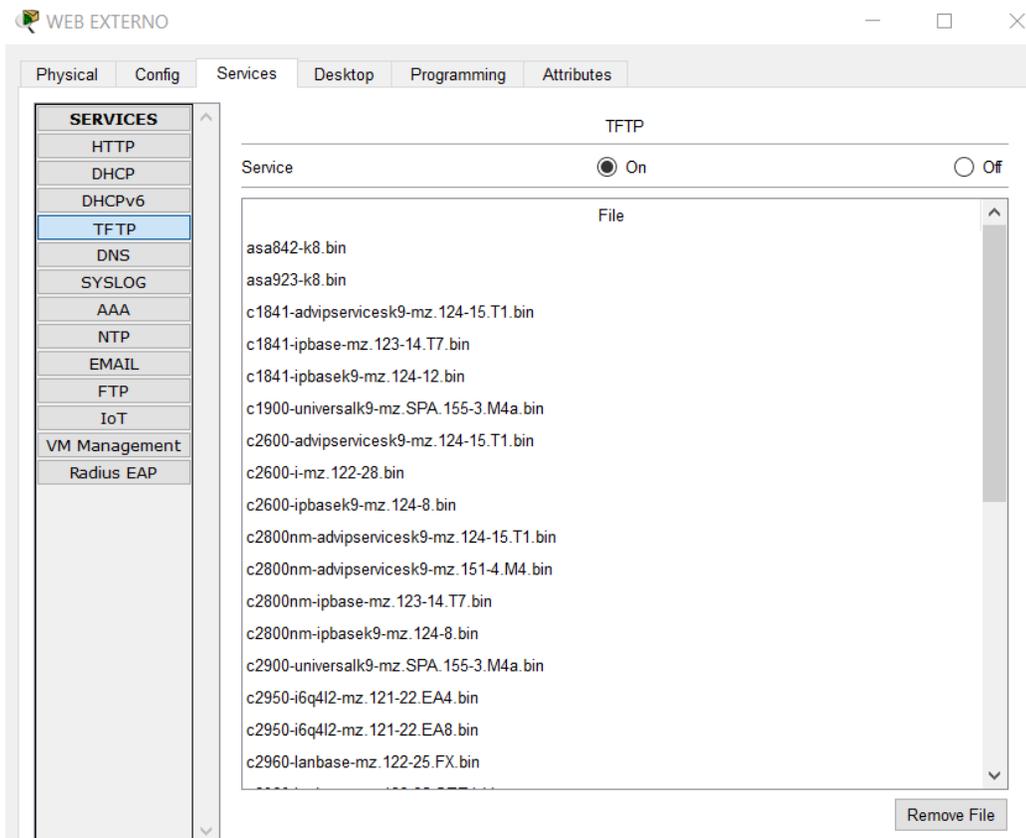
- **Establezca un servidor TFTP y almacene todos los archivos necesarios de los routers.**

### Configuramos la ip fija en el Servidor



*Ilustración 54 Configuramos la ip fija en el Servidor*

Activamos el servicio TFTP



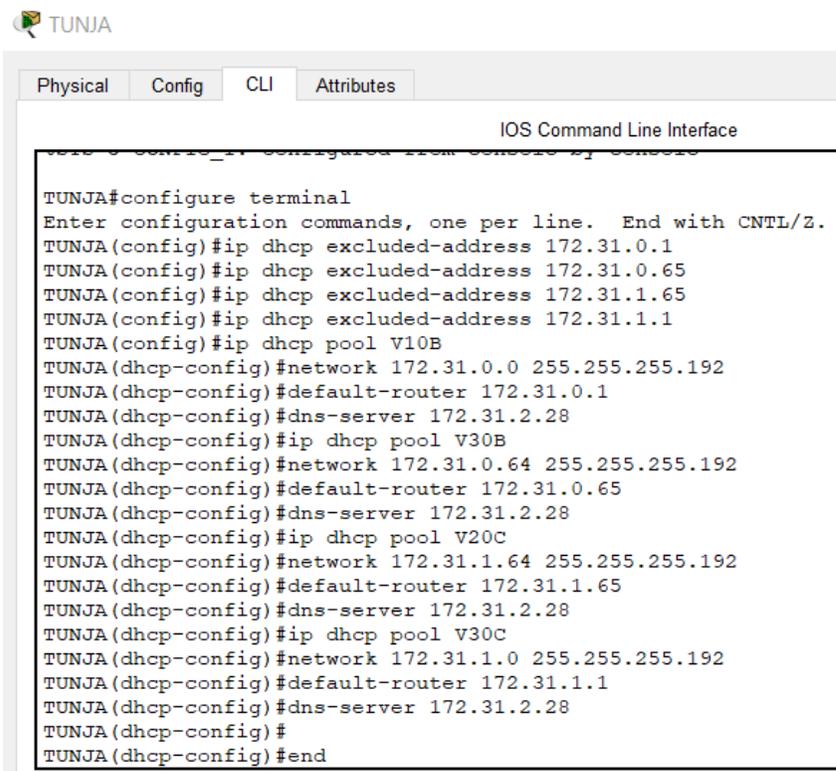
*Ilustración 55 Activamos el servicio TFTP*

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

**Configuramos el DHCP en el Router TUNJA**

```
TUNJA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
TUNJA(config)#ip dhcp excluded-address 172.31.0.1
TUNJA(config)#ip dhcp excluded-address 172.31.0.65
TUNJA(config)#ip dhcp excluded-address 172.31.1.65
TUNJA(config)#ip dhcp excluded-address 172.31.1.1
TUNJA(config)#ip dhcp pool V10B
TUNJA(dhcp-config)#network 172.31.0.0 255.255.255.192
TUNJA(dhcp-config)#default-router 172.31.0.1
TUNJA(dhcp-config)#dns-server 172.31.2.28
TUNJA(dhcp-config)#ip dhcp pool V30B
TUNJA(dhcp-config)#network 172.31.0.64 255.255.255.192
```

```
TUNJA(dhcp-config)#default-router 172.31.0.65
TUNJA(dhcp-config)#dns-server 172.31.2.28
TUNJA(dhcp-config)#ip dhcp pool V20C
TUNJA(dhcp-config)#network 172.31.1.64 255.255.255.192
TUNJA(dhcp-config)#default-router 172.31.1.65
TUNJA(dhcp-config)#dns-server 172.31.2.28
TUNJA(dhcp-config)#ip dhcp pool V30C
TUNJA(dhcp-config)#network 172.31.1.0 255.255.255.192
TUNJA(dhcp-config)#default-router 172.31.1.1
TUNJA(dhcp-config)#dns-server 172.31.2.28
```



The screenshot shows the TUNJA router's configuration interface. It has tabs for Physical, Config, CLI, and Attributes. The CLI tab is active, displaying the IOS Command Line Interface. The terminal output shows the following commands being entered:

```
TUNJA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
TUNJA(config)#ip dhcp excluded-address 172.31.0.1
TUNJA(config)#ip dhcp excluded-address 172.31.0.65
TUNJA(config)#ip dhcp excluded-address 172.31.1.65
TUNJA(config)#ip dhcp excluded-address 172.31.1.1
TUNJA(config)#ip dhcp pool V10B
TUNJA(dhcp-config)#network 172.31.0.0 255.255.255.192
TUNJA(dhcp-config)#default-router 172.31.0.1
TUNJA(dhcp-config)#dns-server 172.31.2.28
TUNJA(dhcp-config)#ip dhcp pool V30B
TUNJA(dhcp-config)#network 172.31.0.64 255.255.255.192
TUNJA(dhcp-config)#default-router 172.31.0.65
TUNJA(dhcp-config)#dns-server 172.31.2.28
TUNJA(dhcp-config)#ip dhcp pool V20C
TUNJA(dhcp-config)#network 172.31.1.64 255.255.255.192
TUNJA(dhcp-config)#default-router 172.31.1.65
TUNJA(dhcp-config)#dns-server 172.31.2.28
TUNJA(dhcp-config)#ip dhcp pool V30C
TUNJA(dhcp-config)#network 172.31.1.0 255.255.255.192
TUNJA(dhcp-config)#default-router 172.31.1.1
TUNJA(dhcp-config)#dns-server 172.31.2.28
TUNJA(dhcp-config)#
TUNJA(dhcp-config)#end
```

*Ilustración 56 Configuramos el DHCP en el Router TUNJA*

## Configuramos el DHCP en el Router BUCARAMANGA

```
BUCARAMANGA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
BUCARAMANGA(config)#int f0/0.10
BUCARAMANGA(config-subif)#ip helper-address 172.31.2.33
BUCARAMANGA(config-subif)#int f0/0.30
```

```
BUCARAMANGA(config-subif)#ip helper-address 172.31.2.33
BUCARAMANGA(config-subif)#end
```

```

BUCARAMANGA
Physical Config CLI Attributes
IOS Command Line Interface
Enter configuration commands, one per line. End with CNTL/Z.
BUCARAMANGA(config)#line console 0
BUCARAMANGA(config-line)#login block-for 5 attempts 4 within 60 seconds
BUCARAMANGA(config)#
BUCARAMANGA(config)#end
BUCARAMANGA#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BUCARAMANGA#
%SYS-5-CONFIG_I: Configured from console by console

BUCARAMANGA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
BUCARAMANGA(config)#int f0/0.10
BUCARAMANGA(config-subif)#ip helper-address 172.31.2.33
BUCARAMANGA(config-subif)#int f0/0.30
BUCARAMANGA(config-subif)#ip helper-address 172.31.2.33
BUCARAMANGA(config-subif)#end
BUCARAMANGA#
%SYS-5-CONFIG_I: Configured from console by console

BUCARAMANGA#
    
```

*Ilustración 57 Configuramos el DHCP en el Router BUCARAMANGA*

## Configuramos el DHCP en el Router CUNDINAMARCA

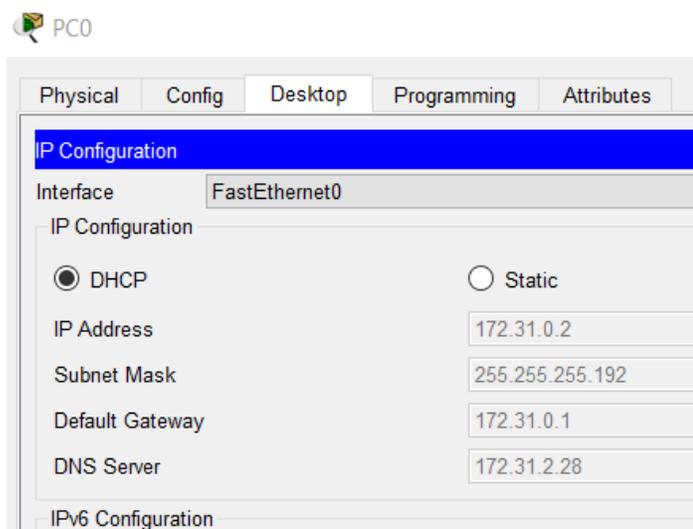
```
CUNDINAMARCA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
CUNDINAMARCA(config)#int f0/0.20
CUNDINAMARCA(config-subif)#ip helper-address 172.31.2.37
CUNDINAMARCA(config-subif)#int f0/0.30
CUNDINAMARCA(config-subif)#ip helper-address 172.31.2.37
CUNDINAMARCA(config-subif)#end
```

```

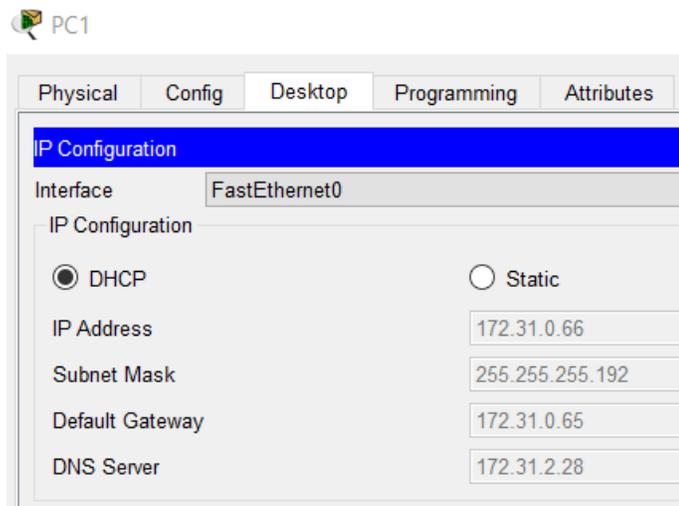
CUNDINAMARCA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
CUNDINAMARCA(config)#int f0/0.20
CUNDINAMARCA(config-subif)#ip helper-address 172.31.2.37
CUNDINAMARCA(config-subif)#int f0/0.30
CUNDINAMARCA(config-subif)#ip helper-address 172.31.2.37
CUNDINAMARCA(config-subif)#end
CUNDINAMARCA#
%SYS-5-CONFIG_I: Configured from console by console
    
```

*Ilustración 58 Configuramos el DHCP en el Router CUNDINAMARCA*

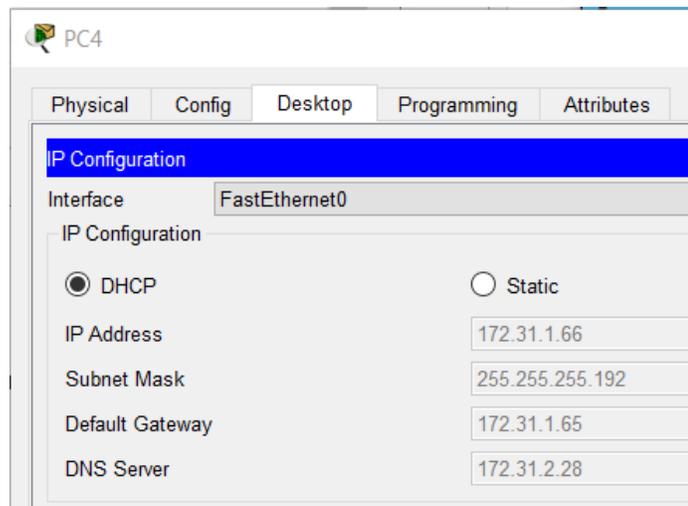
Activamos DHCP en los equipos de las redes Bucaramanga y Cundinamarca y verificamos que les sea asignada la dirección correspondiente.



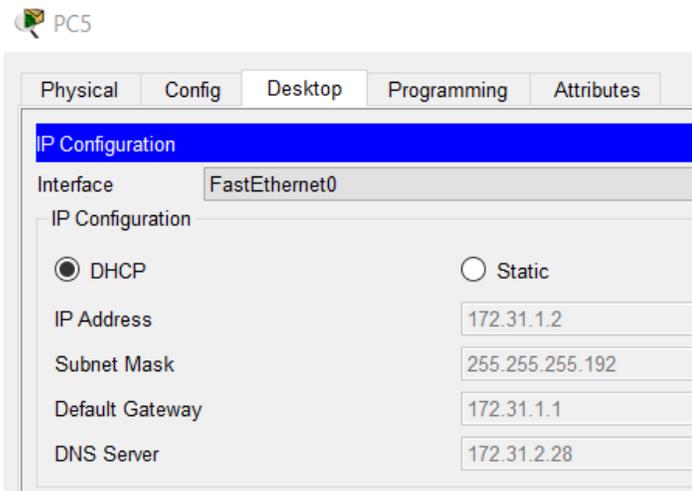
*Ilustración 59 DHCP en los equipos*



*Ilustración 60 DHCP en los equipos*



*Ilustración 61 DHCP en los equipos*



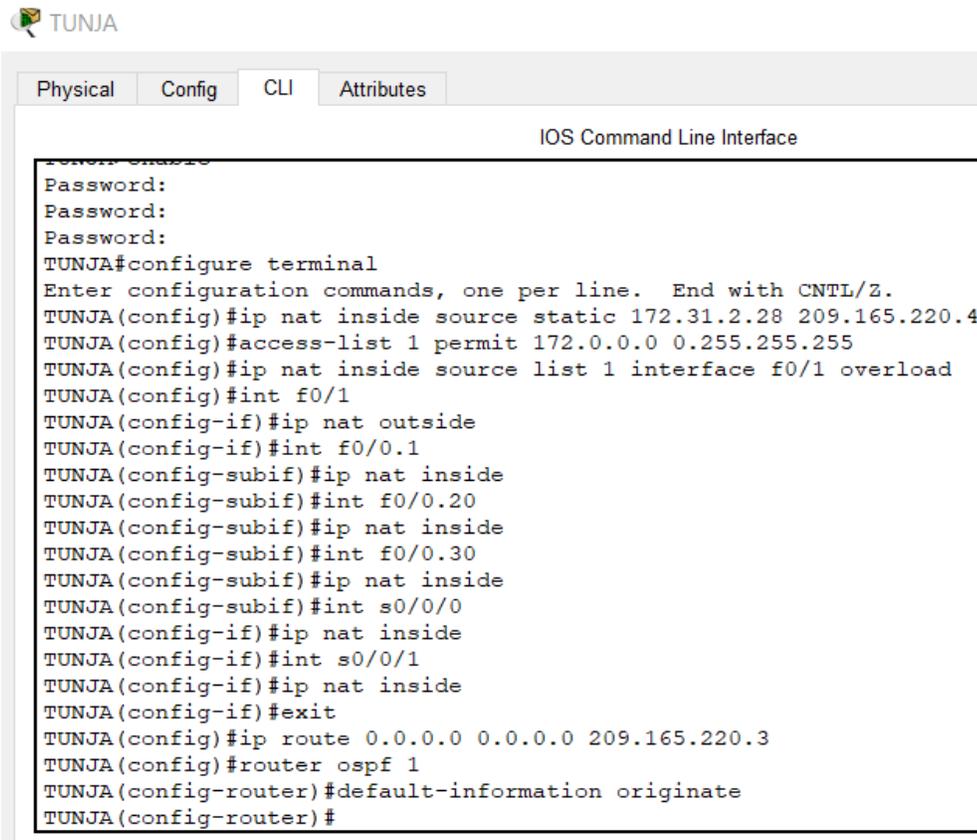
*Ilustración 62 DHCP en los equipos*

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

### Configuración NAT Router TUNJA

```
TUNJA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
TUNJA(config)#ip nat inside source static 172.31.2.28 209.165.220.4
TUNJA(config)#access-list 1 permit 172.0.0.0 0.255.255.255
TUNJA(config)#ip nat inside source list 1 interface f0/1 overload
TUNJA(config)#int f0/1
```

```
TUNJA(config-if)#ip nat outside
TUNJA(config-if)#int f0/0.1
TUNJA(config-subif)#ip nat inside
TUNJA(config-subif)#int f0/0.20
TUNJA(config-subif)#ip nat inside
TUNJA(config-subif)#int f0/0.30
TUNJA(config-subif)#ip nat inside
TUNJA(config-subif)#int s0/0/0
TUNJA(config-if)#ip nat inside
TUNJA(config-if)#int s0/0/1
TUNJA(config-if)#ip nat inside
TUNJA(config-if)#exit
TUNJA(config)#ip route 0.0.0.0 0.0.0.0 209.165.220.3
TUNJA(config)#router ospf 1
TUNJA(config-router)#default-information originate
TUNJA(config-router)#
```



*Ilustración 63 Configuración NAT Router TUNJA*

## Verificamos la configuración en Router TUNJA usando el comando show ip route

```
TUNJA#show ip route
```

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

```
Gateway of last resort is 209.165.220.3 to network 0.0.0.0
```

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

```
C 172.3.2.8 is directly connected, FastEthernet0/0.1
```

```
172.31.0.0/16 is variably subnetted, 10 subnets, 3 masks
```

```
O 172.31.0.0/26 [110/65] via 172.31.2.34, 04:28:42, Serial0/0/0
```

```
O 172.31.0.64/26 [110/65] via 172.31.2.34, 04:28:42, Serial0/0/0
```

```
C 172.31.0.128/26 is directly connected, FastEthernet0/0.20
```

```
C 172.31.0.192/26 is directly connected, FastEthernet0/0.30
```

```
O 172.31.1.0/26 [110/65] via 172.31.2.38, 04:28:42, Serial0/0/1
```

```
O 172.31.1.64/26 [110/65] via 172.31.2.38, 04:28:42, Serial0/0/1
```

```
O 172.31.2.8/29 [110/65] via 172.31.2.38, 04:28:42, Serial0/0/1
```

```
O 172.31.2.24/29 [110/65] via 172.31.2.38, 04:28:42, Serial0/0/1
```

```
C 172.31.2.32/30 is directly connected, Serial0/0/0
```

```
C 172.31.2.36/30 is directly connected, Serial0/0/1
```

```
C 209.165.220.0/24 is directly connected, FastEthernet0/1
```

```
S* 0.0.0.0/0 [1/0] via 209.165.220.3
```

## Verificamos la configuración en Router BUCARAMANGA usando el comando show ip route

```
BUCARAMANGA#show ip route
```

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

P - periodic downloaded static route

Gateway of last resort is 172.31.2.33 to network 0.0.0.0

172.3.0.0/29 is subnetted, 1 subnets

O 172.3.2.8 [110/65] via 172.31.2.33, 01:21:14, Serial0/0/0

172.31.0.0/16 is variably subnetted, 10 subnets, 3 masks

C 172.31.0.0/26 is directly connected, FastEthernet0/0.10

C 172.31.0.64/26 is directly connected, FastEthernet0/0.30

O 172.31.0.128/26 [110/65] via 172.31.2.33, 01:21:14, Serial0/0/0

O 172.31.0.192/26 [110/65] via 172.31.2.33, 01:21:14, Serial0/0/0

O 172.31.1.0/26 [110/129] via 172.31.2.33, 01:21:14, Serial0/0/0

O 172.31.1.64/26 [110/129] via 172.31.2.33, 01:21:14, Serial0/0/0

O 172.31.2.8/29 [110/129] via 172.31.2.33, 01:21:14, Serial0/0/0

O 172.31.2.24/29 [110/129] via 172.31.2.33, 01:21:14, Serial0/0/0

C 172.31.2.32/30 is directly connected, Serial0/0/0

O 172.31.2.36/30 [110/128] via 172.31.2.33, 01:21:14, Serial0/0/0

O\*E2 0.0.0.0/0 [110/1] via 172.31.2.33, 01:21:14, Serial0/0/0



```

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

Gateway of last resort is 172.31.2.33 to network 0.0.0.0

    172.3.0.0/29 is subnetted, 1 subnets
O    172.3.2.8 [110/65] via 172.31.2.33, 01:21:14, Serial0/0/0
172.31.0.0/16 is variably subnetted, 10 subnets, 3 masks
C    172.31.0.0/26 is directly connected, FastEthernet0/0.10
C    172.31.0.64/26 is directly connected, FastEthernet0/0.30
O    172.31.0.128/26 [110/65] via 172.31.2.33, 01:21:14, Serial0/0/0
O    172.31.0.192/26 [110/65] via 172.31.2.33, 01:21:14, Serial0/0/0
O    172.31.1.0/26 [110/129] via 172.31.2.33, 01:21:14, Serial0/0/0
O    172.31.1.64/26 [110/129] via 172.31.2.33, 01:21:14, Serial0/0/0
    
```

*Ilustración 64 configuración en Router BUCARAMANGA*

Verificamos la configuración en Router CUNDINAMARCA usando el comando show ip route

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

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

```
172.3.0.0/29 is subnetted, 1 subnets
O 172.3.2.8 [110/65] via 172.31.2.37, 01:24:20, Serial0/0/0
172.31.0.0/16 is variably subnetted, 10 subnets, 3 masks
O 172.31.0.0/26 [110/129] via 172.31.2.37, 01:24:20, Serial0/0/0
O 172.31.0.64/26 [110/129] via 172.31.2.37, 01:24:20, Serial0/0/0
O 172.31.0.128/26 [110/65] via 172.31.2.37, 01:24:20, Serial0/0/0
O 172.31.0.192/26 [110/65] via 172.31.2.37, 01:24:20, Serial0/0/0
C 172.31.1.0/26 is directly connected, FastEthernet0/0.30
C 172.31.1.64/26 is directly connected, FastEthernet0/0.20
C 172.31.2.8/29 is directly connected, FastEthernet0/0.1
C 172.31.2.24/29 is directly connected, FastEthernet0/0.88
O 172.31.2.32/30 [110/128] via 172.31.2.37, 01:24:20, Serial0/0/0
C 172.31.2.36/30 is directly connected, Serial0/0/0
O*E2 0.0.0.0/0 [110/1] via 172.31.2.37, 01:24:20, Serial0/0/0
```

```

CUNDINAMARCA
Physical Config CLI Attributes
IOS Command Line Interface
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is 172.31.2.37 to network 0.0.0.0

    172.3.0.0/29 is subnetted, 1 subnets
O       172.3.2.8 [110/65] via 172.31.2.37, 01:24:20, Serial0/0/0
    172.31.0.0/16 is variably subnetted, 10 subnets, 3 masks
O       172.31.0.0/26 [110/129] via 172.31.2.37, 01:24:20, Serial0/0/0
O       172.31.0.64/26 [110/129] via 172.31.2.37, 01:24:20, Serial0/0/0
O       172.31.0.128/26 [110/65] via 172.31.2.37, 01:24:20, Serial0/0/0
O       172.31.0.192/26 [110/65] via 172.31.2.37, 01:24:20, Serial0/0/0
C       172.31.1.0/26 is directly connected, FastEthernet0/0.30
C       172.31.1.64/26 is directly connected, FastEthernet0/0.20
C       172.31.2.8/29 is directly connected, FastEthernet0/0.1
C       172.31.2.24/29 is directly connected, FastEthernet0/0.88
O       172.31.2.32/30 [110/128] via 172.31.2.37, 01:24:20, Serial0/0/0
C       172.31.2.36/30 is directly connected, Serial0/0/0
O*E2 0.0.0.0/0 [110/1] via 172.31.2.37, 01:24:20, Serial0/0/0
    
```

*Ilustración 65 configuración en Router CUNDINAMARCA*

**Verificamos la configuración NAT Router TUNJA usando el comando show ip nat translation**

```

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

```

TUNJA
Physical Config CLI Attributes
IOS Command Line Interface
TUNJA#show ip nat translation
Pro Inside global Inside local Outside local Outside global
--- 209.165.220.4 172.31.2.28 --- ---

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

*Ilustración 66 configuración NAT Router TUNJA*

El enrutamiento deberá tener autenticación.

Procedemos a configurar los router para tener autenticación

### Autenticación Router BUCARAMANGA

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

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

*Ilustración 67 Autenticación Router BUCARAMANGA*

### Autenticación Router CUNDINAMARCA

```
CUNDINAMARCA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
CUNDINAMARCA(config)#int s0/0/0
CUNDINAMARCA(config-if)#ip ospf authentication message-digest
CUNDINAMARCA(config-if)#ip ospf message-digest-key 1 md5 cisco123
CUNDINAMARCA(config-if)#
22:01:39: %OSPF-5-ADJCHG: Process 1, Nbr 209.165.220.1 on Serial0/0/0 from
FULL to DOWN, Neighbor Down: Dead timer expired

22:01:39: %OSPF-5-ADJCHG: Process 1, Nbr 209.165.220.1 on Serial0/0/0 from
FULL to DOWN, Neighbor Down: Interface down or detached
```

```

CUNDINAMARCA
Physical Config CLI Attributes
IOS Command Line Interface

Cuidado Acceso Restringido

User Access Verification

Username: administrador
Password:
CUNDINAMARCA>enable
Password:
CUNDINAMARCA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
CUNDINAMARCA(config)#int s0/0/0
CUNDINAMARCA(config-if)#ip ospf authentication message-digest
CUNDINAMARCA(config-if)#ip ospf message-digest-key 1 md5 cisco123
CUNDINAMARCA(config-if)#
22:01:39: %OSPF-5-ADJCHG: Process 1, Nbr 209.165.220.1 on Serial0/0/0 from FULL to DOWN,
Neighbor Down: Dead timer expired

22:01:39: %OSPF-5-ADJCHG: Process 1, Nbr 209.165.220.1 on Serial0/0/0 from FULL to DOWN,
Neighbor Down: Interface down or detached
    
```

*Ilustración 68 Autenticación Router CUNDINAMARCA*

## Autenticación Router TUNJA

```

TUNJA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
TUNJA(config)#int s0/0/0
TUNJA(config-if)#ip ospf authentication message-digest
TUNJA(config-if)#ip ospf message-digest-key 1 md5 cisco123
TUNJA(config-if)#
22:05:23: %OSPF-5-ADJCHG: Process 1, Nbr 172.31.2.34 on Serial0/0/0 from
LOADING to FULL, Loading Done

TUNJA(config-if)#int s0/0/1
TUNJA(config-if)#ip ospf authentication message-digest
TUNJA(config-if)#ip ospf message-digest-key 1 md5 cisco123
TUNJA(config-if)#
22:05:53: %OSPF-5-ADJCHG: Process 1, Nbr 172.31.2.38 on Serial0/0/1 from
LOADING to FULL, Loading Done

TUNJA(config-if)#
    
```

```

TUNJA
Physical Config CLI Attributes
IOS Command Line Interface

User Access Verification
Username: administrador
Password:
TUNJA>enable
Password:
Password:
TUNJA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
TUNJA(config)#int s0/0/0
TUNJA(config-if)#ip ospf authentication message-digest
TUNJA(config-if)#ip ospf message-digest-key 1 md5 cisco123
TUNJA(config-if)#
22:05:23: %OSPF-5-ADJCHG: Process 1, Nbr 172.31.2.34 on Serial0/0/0 from LOADING to FULL, Loading
Done
TUNJA(config-if)#int s0/0/1
TUNJA(config-if)#ip ospf authentication message-digest
TUNJA(config-if)#ip ospf message-digest-key 1 md5 cisco123
TUNJA(config-if)#
22:05:53: %OSPF-5-ADJCHG: Process 1, Nbr 172.31.2.38 on Serial0/0/1 from LOADING to FULL, Loading
Done
TUNJA(config-if)#
    
```

*Ilustración 69 Autenticación Router TUNJA*

**5. Listas de control de acceso:**

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

**Control de acceso router CUNDINAMARCA**

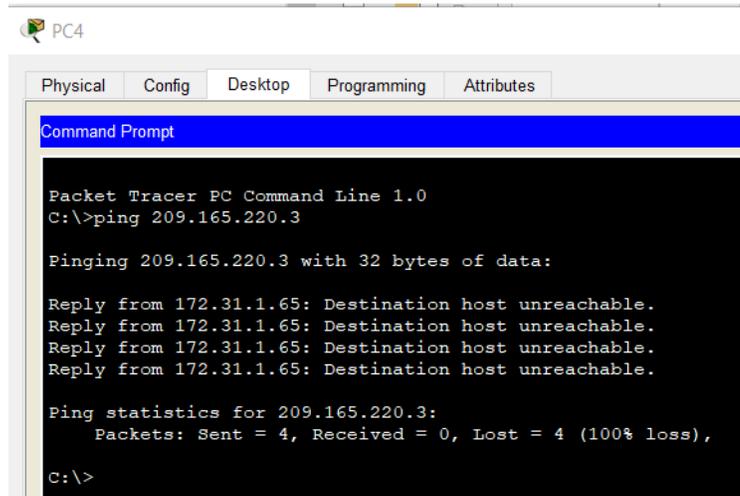
```

CUNDINAMARCA(config-subif)#configure terminal
CUNDINAMARCA(config)#access-list 111 deny ip 172.31.1.64 0.0.0.63
209.165.220.0 0.0.0.255
CUNDINAMARCA(config)#access-list 111 permit ip any any
CUNDINAMARCA(config)#int f0/0.20
CUNDINAMARCA(config-subif)#ip access-group 111 in
CUNDINAMARCA(config-subif)#

CUNDINAMARCA(config)#access-list 111 deny ip 172.31.1.64 0.0.0.63 209.165.220.0 0.0.0.255
CUNDINAMARCA(config)#access-list 111 permit ip any any
CUNDINAMARCA(config)#int f0/0.20
CUNDINAMARCA(config-subif)#ip access-group 111 in
CUNDINAMARCA(config-subif)#
    
```

*Ilustración 70 Control de acceso router CUNDINAMARCA*

## Prueba de control de acceso



*Ilustración 71 Prueba de control de acceso*

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

### Control de acceso router CUNDINAMARCA

```

CUNDINAMARCA(config-subif)#access-list 112 permit ip 172.31.1.0 0.0.0.63
209.165.220.0 0.0.0.255
CUNDINAMARCA(config)#access-list 112 deny ip any any
CUNDINAMARCA(config)#int f0/0.30
CUNDINAMARCA(config-subif)#ip access-group 112 in
CUNDINAMARCA(config-subif)#
    
```

```

CUNDINAMARCA(config-subif)#access-list 112 permit ip 172.31.1.0 0.0.0.63 209.165.220.0
0.0.0.255
CUNDINAMARCA(config)#access-list 112 deny ip any any
CUNDINAMARCA(config)#int f0/0.30
CUNDINAMARCA(config-subif)#ip access-group 112 in
CUNDINAMARCA(config-subif)#
    
```

*Ilustración 72 Control de acceso router CUNDINAMARCA*

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

### Control de acceso router TUNJA

```
TUNJA#configure terminal
```

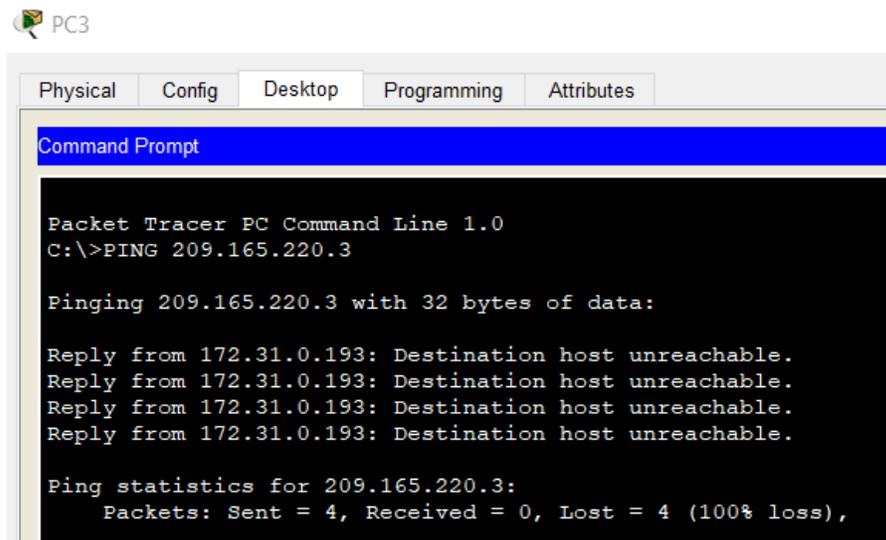
```

Enter configuration commands, one per line. End with CNTL/Z.
TUNJA(config)#access-list 111 permit tcp 172.31.0.192 0.0.0.63 209.165.220.0
0.0.0.255 eq 80
TUNJA(config)#access-list 111 permit tcp 172.31.0.192 0.0.0.63 209.165.220.0
0.0.0.255 eq 21
TUNJA(config)#access-list 111 permit tcp 172.31.0.192 0.0.0.63 209.165.220.0
0.0.0.255 eq 20
TUNJA(config)#int f0/0.30
TUNJA(config-subif)#ip access-group 111 in
TUNJA(config-subif)#
    
```

```

TUNJA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
TUNJA(config)#access-list 111 permit tcp 172.31.0.192 0.0.0.63 209.165.220.0 0.0.0.255 eq 80
TUNJA(config)#access-list 111 permit tcp 172.31.0.192 0.0.0.63 209.165.220.0 0.0.0.255 eq 21
TUNJA(config)#access-list 111 permit tcp 172.31.0.192 0.0.0.63 209.165.220.0 0.0.0.255 eq 20
TUNJA(config)#int f0/0.30
TUNJA(config-subif)#ip access-group 111 in
TUNJA(config-subif)#
    
```

*Ilustración 73 Control de acceso router TUNJA*



*Ilustración 74 Control de acceso*

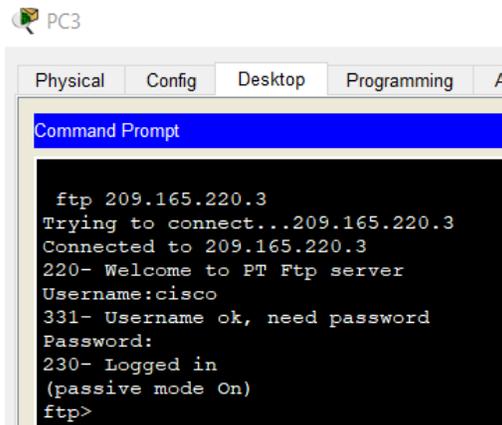


Ilustración 75 Control de acceso

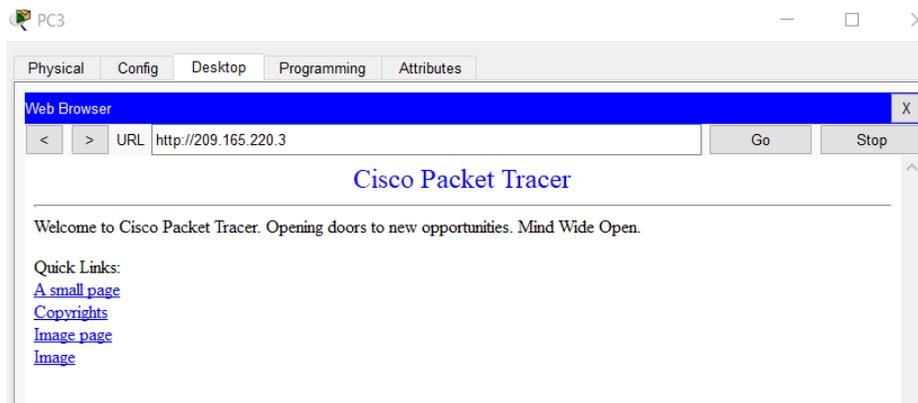


Ilustración 76 Control de acceso

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

### Control de acceso router TUNJA

```
TUNJA(config-subif)#access-list 112 permit ip 172.31.0.128 0.0.0.63 172.31.1.64
0.0.0.63
TUNJA(config)#access-list 112 permit ip 172.31.0.128 0.0.0.63 172.31.0.0 0.0.0.63
TUNJA(config)#int f0/0.20
TUNJA(config-subif)#ip access-group 112 in
TUNJA(config-subif)#
```

```

PC2
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 172.31.0.2

Pinging 172.31.0.2 with 32 bytes of data:

Reply from 172.31.0.2: bytes=32 time=1ms TTL=126
Reply from 172.31.0.2: bytes=32 time=12ms TTL=126
Reply from 172.31.0.2: bytes=32 time=12ms TTL=126
Reply from 172.31.0.2: bytes=32 time=2ms TTL=126

Ping statistics for 172.31.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 12ms, Average = 6ms
    
```

*Ilustración 77 Control de acceso router TUNJA*

```

PC2
Physical Config Desktop Programming Attributes
Command Prompt
C:\>
C:\>ping 172.31.0.66

Pinging 172.31.0.66 with 32 bytes of data:

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

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

C:\>ping 172.31.2.28

Pinging 172.31.2.28 with 32 bytes of data:

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

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

C:\>
    
```

*Ilustración 78 Control de acceso*

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

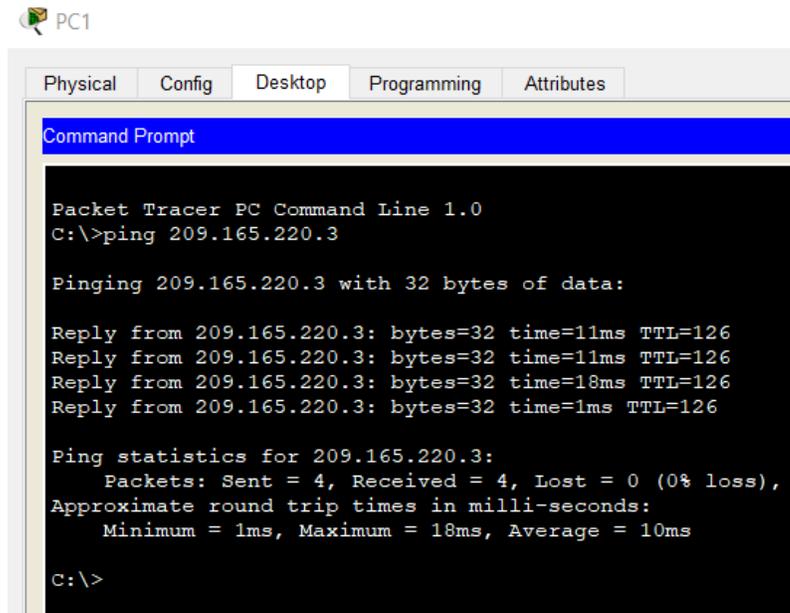
### Control de acceso router BUCARAMANGA

**BUCARAMANGA#configure terminal**

```
Enter configuration commands, one per line. End with CNTL/Z.  
BUCARAMANGA(config)#access-list 111 permit ip 172.31.0.64 0.0.0.63  
209.165.220.0 0.0.0.255  
BUCARAMANGA(config)#int f0/0.30  
BUCARAMANGA(config-subif)#ip access-group 111 in  
BUCARAMANGA(config-subif)#
```

```
BUCARAMANGA#configure terminal  
Enter configuration commands, one per line. End with CNTL/Z.  
BUCARAMANGA(config)#access-list 111 permit ip 172.31.0.64 0.0.0.63 209.165.220.0  
0.0.0.255  
BUCARAMANGA(config)#int f0/0.30  
BUCARAMANGA(config-subif)#ip access-group 111 in  
BUCARAMANGA(config-subif)#
```

*Ilustración 79 Control de acceso router BUCARAMANGA*



*Ilustración 80 Control de acceso*

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

### Control de acceso router BUCARAMANGA

```
BUCARAMANGA(config-subif)#access-list 112 permit ip 172.31.0.0 0.0.0.63  
172.31.1.64 0.0.0.63
```

```
BUCARAMANGA(config)#access-list 112 permit ip 172.31.0.0 0.0.0.63
172.31.0.128 0.0.0.63
BUCARAMANGA(config)#int f0/0.10
BUCARAMANGA(config-subif)#ip access-group 112 in
BUCARAMANGA(config-subif)#
```

```
BUCARAMANGA(config-subif)#access-list 112 permit ip 172.31.0.0 0.0.0.63 172.31.1.64 0.0.0.63
BUCARAMANGA(config)#access-list 112 permit ip 172.31.0.0 0.0.0.63 172.31.0.128 0.0.0.63
BUCARAMANGA(config)#int f0/0.10
BUCARAMANGA(config-subif)#ip access-group 112 in
BUCARAMANGA(config-subif)#
```

*Ilustración 81 Control de acceso router BUCARAMANGA*

The screenshot shows a PC Command Prompt window titled 'Command Prompt' with tabs for Physical, Config, Desktop, Programming, and Attributes. The window displays the output of two ping commands. The first command is 'C:\>ping 172.31.1.66', which shows four successful replies with 32 bytes of data, response times of 11ms and 12ms, and a TTL of 125. The second command is 'C:\>ping 172.31.0.130', which shows four successful replies with 32 bytes of data, response times of 1ms and 2ms, and a TTL of 126. Both commands show 0% loss and provide statistics for sent, received, and lost packets, as well as approximate round trip times in milliseconds.

```
PCO
Physical Config Desktop Programming Attributes
Command Prompt
Packet Tracer PC Command Line 1.0
C:\>ping 172.31.1.66

Pinging 172.31.1.66 with 32 bytes of data:

Reply from 172.31.1.66: bytes=32 time=11ms TTL=125
Reply from 172.31.1.66: bytes=32 time=11ms TTL=125
Reply from 172.31.1.66: bytes=32 time=11ms TTL=125
Reply from 172.31.1.66: bytes=32 time=12ms TTL=125

Ping statistics for 172.31.1.66:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 11ms, Maximum = 12ms, Average = 11ms

C:\>ping 172.31.0.130

Pinging 172.31.0.130 with 32 bytes of data:

Reply from 172.31.0.130: bytes=32 time=2ms TTL=126
Reply from 172.31.0.130: bytes=32 time=1ms TTL=126
Reply from 172.31.0.130: bytes=32 time=1ms TTL=126
Reply from 172.31.0.130: bytes=32 time=2ms TTL=126

Ping statistics for 172.31.0.130:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 2ms, Average = 1ms

C:\>
```

*Ilustración 82 Control de acceso*

```

PCO
Physical Config Desktop Programming Attributes
Command Prompt
Ping statistics for 172.31.1.66:
  Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
  Approximate round trip times in milli-seconds:
    Minimum = 11ms, Maximum = 12ms, Average = 11ms

C:\>ping 172.31.0.130

Pinging 172.31.0.130 with 32 bytes of data:

Reply from 172.31.0.130: bytes=32 time=2ms TTL=126
Reply from 172.31.0.130: bytes=32 time=1ms TTL=126
Reply from 172.31.0.130: bytes=32 time=1ms TTL=126
Reply from 172.31.0.130: bytes=32 time=2ms TTL=126

Ping statistics for 172.31.0.130:
  Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
  Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 2ms, Average = 1ms

C:\>ping 200.165.220.3

Pinging 200.165.220.3 with 32 bytes of data:

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

Ping statistics for 200.165.220.3:
  Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
    
```

*Ilustración 83 Control de acceso*

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

### Control de acceso router BUCARAMANGA

```

BUCARAMANGA(config-subif)#access-list 113 deny ip 172.31.2.0 0.0.0.7
172.31.0.0 0.0.0.63
BUCARAMANGA(config)#access-list 113 deny ip 172.31.0.64 0.0.0.63 172.31.0.0
0.0.0.63
BUCARAMANGA(config)#access-list 113 permit ip any any
BUCARAMANGA(config)#int f0/0.10
BUCARAMANGA(config-subif)#ip access-group 113 out
BUCARAMANGA(config-subif)#

BUCARAMANGA(config-subif)#access-list 113 deny ip 172.31.2.0 0.0.0.7 172.31.0.0 0.0.0.63
BUCARAMANGA(config)#access-list 113 deny ip 172.31.0.64 0.0.0.63 172.31.0.0 0.0.0.63
BUCARAMANGA(config)#access-list 113 permit ip any any
BUCARAMANGA(config)#int f0/0.10
BUCARAMANGA(config-subif)#ip access-group 113 out
BUCARAMANGA(config-subif)#
    
```

*Ilustración 84 Control de acceso router BUCARAMANGA*

## Control de acceso router TUNJA

```
TUNJA(config)#access-list 113 deny ip 172.3.2.8 0.0.0.7 172.31.0.128 0.0.0.63
TUNJA(config)#access-list 113 deny ip 172.3.0.192 0.0.0.63 172.31.0.128
0.0.0.63
TUNJA(config)#access-list 113 permit ip any any
TUNJA(config)#int f0/0.20
TUNJA(config-subif)#ip access-group 113 out
TUNJA(config-subif)#
```

```
TUNJA(config)#access-list 113 deny ip 172.3.2.8 0.0.0.7 172.31.0.128 0.0.0.63
TUNJA(config)#access-list 113 deny ip 172.3.0.192 0.0.0.63 172.31.0.128 0.0.0.63
TUNJA(config)#access-list 113 permit ip any any
TUNJA(config)#int f0/0.20
TUNJA(config-subif)#ip access-group 113 out
TUNJA(config-subif)#
```

*Ilustración 85 Control de acceso router TUNJA*

## Control de acceso router CUNDINAMARCA

```
CUNDINAMARCA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
CUNDINAMARCA(config)#access-list 113 deny ip 172.31.2.8 0.0.0.7 172.31.1.64
0.0.0.63
CUNDINAMARCA(config)#access-list 113 deny ip 172.31.1.0 0.0.0.63 172.31.1.64
0.0.0.63
CUNDINAMARCA(config)#access-list 113 deny ip 172.31.2.24 0.0.0.7 172.31.1.64
0.0.0.63
CUNDINAMARCA(config)#access-list 113 permit ip any any
CUNDINAMARCA(config)#int f0/0.20
CUNDINAMARCA(config-subif)#ip access-group 113 out
CUNDINAMARCA(config-subif)#
```

```
CUNDINAMARCA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
CUNDINAMARCA(config)#access-list 113 deny ip 172.31.2.8 0.0.0.7 172.31.1.64 0.0.0.63
CUNDINAMARCA(config)#access-list 113 deny ip 172.31.1.0 0.0.0.63 172.31.1.64 0.0.0.63
CUNDINAMARCA(config)#access-list 113 deny ip 172.31.2.24 0.0.0.7 172.31.1.64 0.0.0.63
CUNDINAMARCA(config)#access-list 113 permit ip any any
CUNDINAMARCA(config)#int f0/0.20
CUNDINAMARCA(config-subif)#ip access-group 113 out
CUNDINAMARCA(config-subif)#
```

*Ilustración 86 Control de acceso router CUNDINAMARCA*

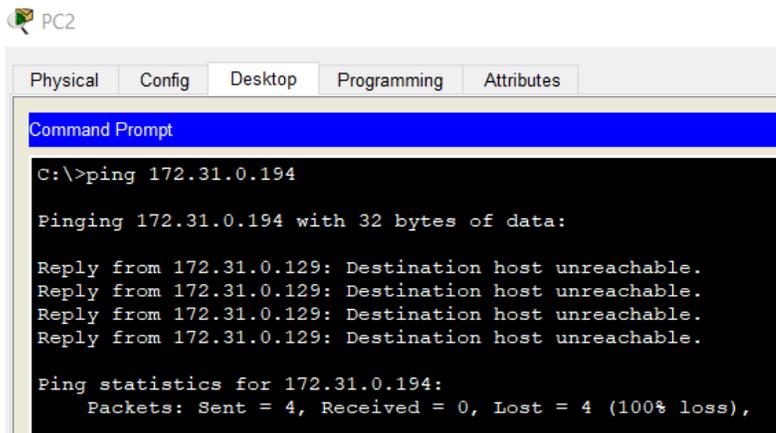


Ilustración 87 Control de acceso

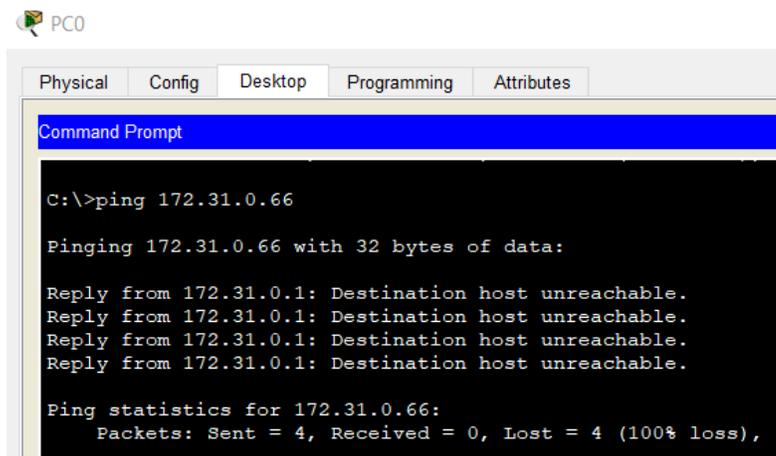


Ilustración 88 Control de acceso

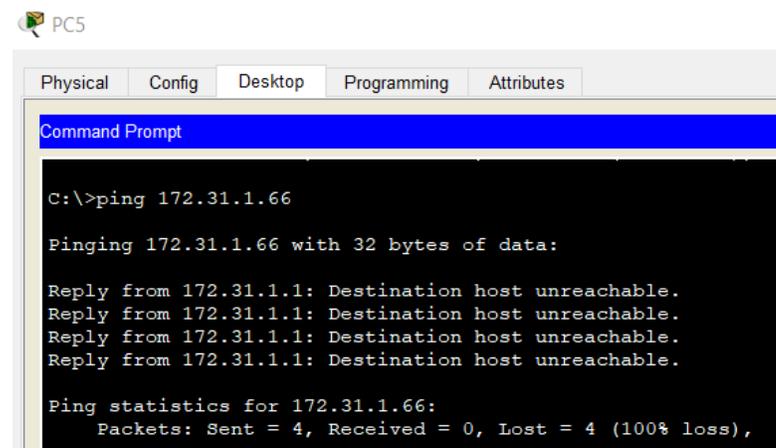


Ilustración 89 Control de acceso

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

### Control de acceso router BUCARAMANGA

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

```
CUNDINAMARCA#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
CUNDINAMARCA(config)#access-list 113 deny ip 172.31.2.8 0.0.0.7 172.31.1.64 0.0.0.63
CUNDINAMARCA(config)#access-list 113 deny ip 172.31.1.0 0.0.0.63 172.31.1.64 0.0.0.63
CUNDINAMARCA(config)#access-list 113 deny ip 172.31.2.24 0.0.0.7 172.31.1.64 0.0.0.63
CUNDINAMARCA(config)#access-list 113 permit ip any any
CUNDINAMARCA(config)#int f0/0.20
CUNDINAMARCA(config-subif)#ip access-group 113 out
CUNDINAMARCA(config-subif)#
```

*Ilustración 90 Control de acceso router BUCARAMANGA*

### Control de acceso router TUNJA

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

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

*Ilustración 91 Control de acceso router TUNJA*

### Control de acceso router CUNDINAMARCA

```
CUNDINAMARCA(config)#access-list 3 permit 172.31.2.0 0.0.0.7
CUNDINAMARCA(config)#access-list 3 permit 172.3.2.8 0.0.0.7
```

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

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

Ctrl+F6 to exit CLI focus

*Ilustración 92 Control de acceso router CUNDINAMARCA*



*Ilustración 93 Control de acceso Telnet*

### Aspectos a tener en cuenta

- Habilitar VLAN en cada switch y permitir su enrutamiento.
- Enrutamiento OSPF con autenticación en cada router.
- Servicio DHCP en el router Tunja, mediante el helper address, para los routers Bucaramanga y Cundinamarca.
- Configuración de NAT estático y de sobrecarga.
- Establecer una lista de control de acceso de acuerdo con los criterios señalados.
- Habilitar las opciones en puerto consola y terminal virtual

## CONCLUSIONES

Luego de culminar esta actividad y de resolver los 2 escenarios podemos afirmar que los distintos conceptos ofrecidos por los cursos CCNA1 y CCNA2 fueron asimilados y aplicados según los requerimientos. Los objetivos fueron alcanzados satisfactoriamente y los conceptos de direccionamiento IP, Configuración Básica de Routers y detección de vecinos, seguridad en la red, balanceo de carga, Configuración de protocolo de enrutamiento EIGRP, creación de Vlans, Configuración de NAT estático y de sobrecarga y configuración de listas de control de acceso se aplicaron de manera adecuada con la aplicación Packet tracer.

## ANEXOS

Simulaciones en Google drive

<https://drive.google.com/drive/folders/1MWcJciK04lqnovhedahh9ldBmQ1k8ZY6?usp=sharing>

### Bibliografía

- CISCO. (2005). *Configuración dinámica de las opciones del servidor DHCP*. Obtenido de [https://www.cisco.com/c/es\\_mx/support/docs/ip/dynamic-address-allocation-resolution/22920-dhcp-ser.html](https://www.cisco.com/c/es_mx/support/docs/ip/dynamic-address-allocation-resolution/22920-dhcp-ser.html)
- CISCO. (2012). *Lo que usted necesita saber sobre routers y switches*. Obtenido de [https://www.cisco.com/c/dam/global/es\\_mx/assets/ofertas/desconectadosanonimos/routing/pdfs/brochure\\_redes.pdf](https://www.cisco.com/c/dam/global/es_mx/assets/ofertas/desconectadosanonimos/routing/pdfs/brochure_redes.pdf)
- CISCO. (2018). *Catalyst 2960 and 2960-S Switches Software Configuration Guide, Release 12.2(58)SE*. Obtenido de [https://www.cisco.com/c/en/us/td/docs/switches/lan/catalyst2960/software/release/12-2\\_58\\_se/configuration/guide/2960scg/swsdm.html](https://www.cisco.com/c/en/us/td/docs/switches/lan/catalyst2960/software/release/12-2_58_se/configuration/guide/2960scg/swsdm.html)
- Cobos Domínguez, A. (2017). *¿Qué es la Certificación Cisco CCNA y cuáles son sus ventajas?* Obtenido de <https://openwebinars.net/blog/que-es-la-certificacion-cisco-ccna-y-cuales-son-sus-ventajas/>