

SOLUCIÓN DE DOS ESTUDIOS DE CASO SOPORTADOS EN TECNOLOGÍA
CISCO

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RESUMEN

El presente trabajo se desarrolló bajo la metodología autónoma donde es necesario utilizar y emplear los medios y mediaciones tecnológicas tanto proporcionados por Cisco a través de la página NetCad, como también los proporcionado por la Universidad UNAD para llevar a cabo la elaboración y el diseño de las redes y subredes virtuales de acuerdo a los escenarios propuestos en la guía de actividad y así el poner en práctica lo aprendido en los demás talleres y al mismo tiempo conocer las herramientas, protocolos y recursos que los elementos Cisco proporciona para la configuración de redes de información. A través de la comprobación total de los dispositivos instalados en las redes virtuales y a su vez la implementación de protocolos de seguridad en dichas dispositivos, se obtuvo un resultado satisfactorio tanto a nivel personal como también profesional.

Palabras Clave: Redes, Cisco, Subredes, Vlan, Router y Switch.

ABSTRACT

The present work was developed under the autonomous methodology where it is necessary to use and use the technological means and mediations provided by Cisco through the NetCad page, as well as those provided by the UNAD University to carry out the development and design of the virtual networks and subnets according to the scenarios proposed in the activity guide and thus put into practice what has been learned in the other workshops and at the same time know the tools, protocols and resources that Cisco provides for the configuration of information networks . Through the total verification of the devices installed in the virtual networks and in turn the implementation of security protocols in said devices, a satisfactory result was obtained both personally and professionally.

INTRODUCCIÓN

La seguridad de la información y de los diferentes equipos de cómputo es algo a tener muy en cuenta hoy día principalmente si somos los encargados de la seguridad de la red en la empresa en la cual laboramos. En muchos casos la puesta en seguridad o bloqueo de algún equipo puede ocasionar el bloqueo masivo de comunicación hacia y desde el mismo por lo que es indispensable contar con herramientas y recursos tecnológico que permitan la administración segura del tráfico en las redes de comunicación y que de igual manera permita su completa comunicación y accesos a los recursos a los cuales requiere dentro de la red, a presente actividad nos permite poner en práctica los conocimientos de redes y diferentes protocolos de enrutamiento y restricción de accesos y permisos a diferentes entornos de la red con lo cual se puede diseñar redes más eficientes y seguras.

OBJETIVOS

Objetivo general

- Conocer las herramientas protocolos y recursos que los elementos cisco proporcionas para la configuración de redes de información.

Objetivo específicos

- Poner en práctica los diferentes sistemas de subredes como el subneteo y redes Vlan
- Configurar accesos mediante protocolos ACL
- Realizar enrutamientos de los routers
- Crear diferentes servicios en los servidores como WB, DHCL, TFTP etc.
- Realizar configuraciones seguras en los routers

DESCRIPCIÓN DE ESCENARIOS PROPUESTOS PARA LA PRUEBA DE HABILIDADES

1 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

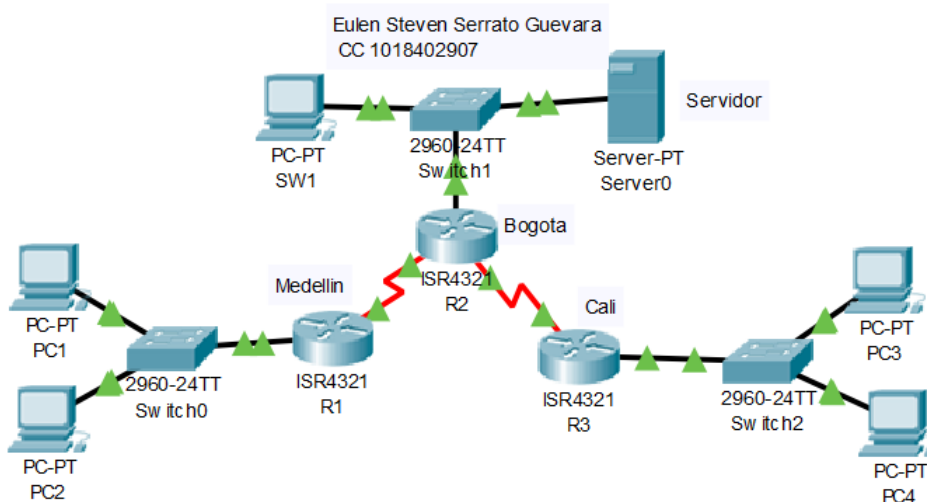


Ilustración 1 Ejemplo Escenario 1

DESARROLLO ESCENARIO 1

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).
- Realizar la conexión física de los equipos con base en la topología de red
Configurar la topología de red, de acuerdo con las siguientes especificaciones.

1.1 Parte 1: Asignación de direcciones IP:

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

$$2^3 = 8$$

Se toman 3 bits de la parte de Hots

La máscara de subred sería 255.255.255.224

b. Asignar una dirección IP a la red.

Las direcciones IP sería las siguientes:

Tabla 1 Tabla de Direccionamiento IP

Red		Direccionamiento IP	
		Binario	Dirección IP
0	Red	11111111.11111111.11111111'.11100000	192.168.1.0
	Primero	11111111.11111111.11111111'.11100001	192.168.1.1
	Ultimo	11111111.11111111.11111111'.11111110	192.168.1.30
	Broadcast	11111111.11111111.11111111'.11111111	192.168.1.31
1	Red	11111111.11111111.11111111'.10000000	192.168.1.32
	Primero	11111111.11111111.11111111'.10000001	192.168.1.33
	Ultimo	11111111.11111111.11111111'.10001110	192.168.1.62
	Broadcast	11111111.11111111.11111111'.10001111	192.168.1.63
2	Red	11111111.11111111.11111111'.10010000	192.168.1.64
	Primero	11111111.11111111.11111111'.10010001	192.168.1.65
	Ultimo	11111111.11111111.11111111'.10011110	192.168.1.94
	Broadcast	11111111.11111111.11111111'.10011111	192.168.1.95
3	Red	11111111.11111111.11111111'.10100000	192.168.1.96
	Primero	11111111.11111111.11111111'.10100001	192.168.1.97
	Ultimo	11111111.11111111.11111111'.10101110	192.168.1.126
	Broadcast	11111111.11111111.11111111'.10101111	192.168.1.127

4	Red	11111111.11111111.11111111'.101100000	192.168.1.128
	Primero	11111111.11111111.11111111'.101100001	192.168.1.129
	Ultimo	11111111.11111111.11111111'.101111110	192.168.1.158
	Broadcast	11111111.11111111.11111111'.101111111	192.168.1.159
5	Red	11111111.11111111.11111111'.110000000	192.168.1.160
	Primero	11111111.11111111.11111111'.110000001	192.168.1.161
	Ultimo	11111111.11111111.11111111'.110011110	192.168.1.190
	Broadcast	11111111.11111111.11111111'.110011111	192.168.1.191
6	Red	11111111.11111111.11111111'.110100000	192.168.1.192
	Primero	11111111.11111111.11111111'.110100001	192.168.1.193
	Ultimo	11111111.11111111.11111111'.110111110	192.168.1.222
	Broadcast	11111111.11111111.11111111'.110111111	192.168.1.223
7	Red	11111111.11111111.11111111'.111000000	192.168.1.224
	Primero	11111111.11111111.11111111'.111000001	192.168.1.225
	Ultimo	11111111.11111111.11111111'.111011110	192.168.1.254
	Broadcast	11111111.11111111.11111111'.111011111	192.168.1.255

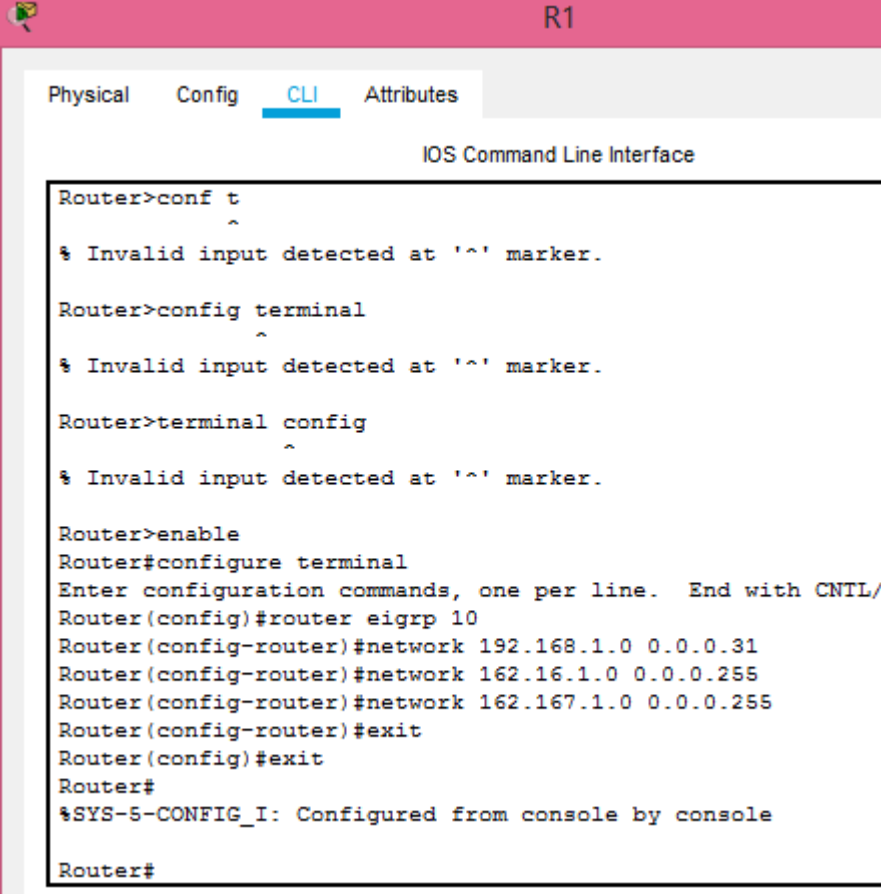
1.2 Parte 2: Configuración Básica.

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

Tabla 2 Configuración Básica de Routers

	R1	R2	R3
Nombre de Host	MEDELLIN	BOGOTA	CALI
Dirección de Ip en interfaz Serial 0/0	162.16.1.1	162.167.1.2	162.167.1.1
Dirección de Ip en interfaz Serial 0/1		162.16.1.2	
Dirección de Ip en interfaz FA 0/0	192.168.1.33	192.168.1.1	192.168.1.65
Protocolo de enrutamiento	Eigrp	Eigrp	Eigrp
Sistema Autónomo	200	200	200
Afirmaciones de red	192.168.1.0	192.168.1.0	192.168.1.0

Configuración R1



```
Router>conf t
      ^
% Invalid input detected at '^' marker.

Router>config terminal
      ^
% Invalid input detected at '^' marker.

Router>terminal config
      ^
% Invalid input detected at '^' marker.

Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/
Router(config)#router eigrp 10
Router(config-router)#network 192.168.1.0 0.0.0.31
Router(config-router)#network 162.16.1.0 0.0.0.255
Router(config-router)#network 162.167.1.0 0.0.0.255
Router(config-router)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#
```

Ilustración 2 Configuración R1 Paso 1

```
Router(config)#enable
% Incomplete command.
Router(config)#configure terminal
^
% Invalid input detected at '^' marker.

Router(config)#ip route 192.168.1.0 255.255.255.224 162.161.16.1.2
^
% Invalid input detected at '^' marker.

Router(config)#ip route 192.168.1.0 255.255.255.224 162.161.1.2
%LINK-3-UPDOWN: Interface Serial0/1/1, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/1, changed
state to down

%LINK-5-CHANGED: Interface Serial0/1/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protoco
Router(config)#ip route 192.168.1.0 255.255.255.224 163.16.1.2
Router(config)#ip route 192.168.1.64 255.255.255.224 163.167.1.2
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

Ctrl+F6 to exit CLI focus

Copy Paste

Ilustración 3 Configuración R1 Paso 2

R2

Physical Config **CLI** Attributes

IOS Command Line Interface

```

Router(config-if)#ip address 162.167.1.1 255.255.0.0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial0/1/0
Router(config-if)#ip address 162.167.1.2 255.255.0.0
Router(config-if)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 192.168.1.32 255.255.255.224 162.16.1.1
Router(config)#ip route 192.168.1.64 255.255.255.224 162.16.1.2
%Invalid next hop address (it's this router)
Router(config)#ip route 192.168.1.64 255.255.255.224 162.167.1.2
%Invalid next hop address (it's this router)
Router(config)#ip route 192.168.1.64 255.255.255.224 162.167.1.1
Router(config)#

```

Ctrl+F6 to exit CLI focus

Copy Paste

Ilustración 4 Configuración R2

R3

Physical Config **CLI** Attributes

IOS Command Line Interface

```

Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface Serial0/1/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial0/1/0
Router(config-if)#exit
Router(config)#
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 192.168.1.0 255.255.255.224 162.167.1.2
Router(config)#ip route 192.168.1.32 255.255.255.224 162.16.1.1
Router(config)#

```

Ctrl+F6 to exit CLI focus

Copy Paste

Ilustración 5 Configuración R3

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.

Tabla 3 Tabla de Enrutamiento R1

```

R1
Physical Config CLI Attributes
IOS Command Line Interface
Router#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B -
BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS
inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is not set

162.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C 162.16.0.0/16 is directly connected, Serial0/1/1
L 162.16.1.1/32 is directly connected, Serial0/1/1
162.167.0.0/24 is subnetted, 1 subnets
S 162.167.1.0/24 [1/0] via 162.16.1.2
192.168.1.0/24 is variably subnetted, 4 subnets, 3 masks
C 192.168.1.0/24 is directly connected, GigabitEthernet0/0/0
S 192.168.1.0/27 [1/0] via 162.16.1.2
L 192.168.1.63/32 is directly connected, GigabitEthernet0/0/0
S 192.168.1.64/27 [1/0] via 162.16.1.2
Router#
    
```

Tabla 4 Tabla de enrutamiento R2

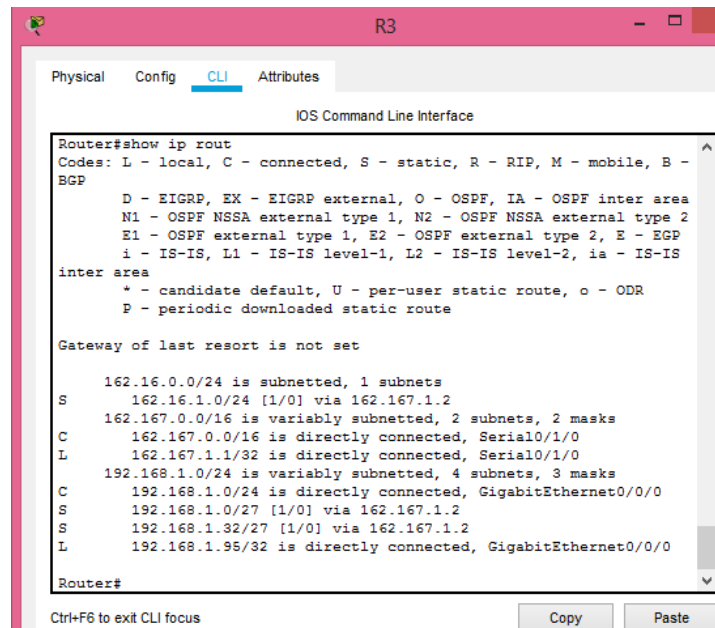
```

R2
Physical Config CLI Attributes
IOS Command Line Interface
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B -
BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS
inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is not set

162.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C 162.16.0.0/16 is directly connected, Serial0/1/1
L 162.16.1.2/32 is directly connected, Serial0/1/1
162.167.0.0/16 is variably subnetted, 2 subnets, 2 masks
C 162.167.0.0/16 is directly connected, Serial0/1/0
L 162.167.1.2/32 is directly connected, Serial0/1/0
192.168.1.0/24 is variably subnetted, 4 subnets, 3 masks
C 192.168.1.0/24 is directly connected, GigabitEthernet0/0/0
L 192.168.1.31/32 is directly connected, GigabitEthernet0/0/0
S 192.168.1.32/27 [1/0] via 162.16.1.1
S 192.168.1.64/27 [1/0] via 162.167.1.1
Router#
    
```

Tabla 5 Tabla de enrutamiento R3



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

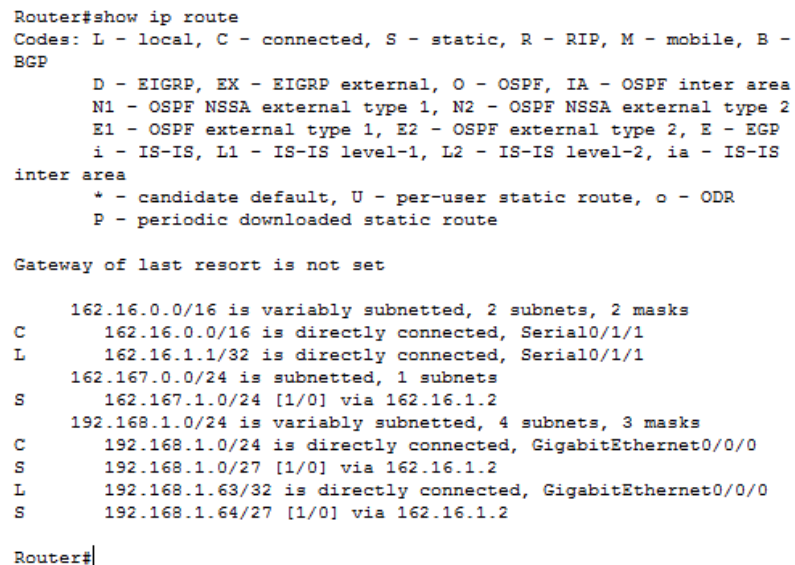
Gateway of last resort is not set

     162.16.0.0/24 is subnetted, 1 subnets
S       162.16.1.0/24 [1/0] via 162.167.1.2
     162.167.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       162.167.0.0/16 is directly connected, Serial0/1/0
L       162.167.1.1/32 is directly connected, Serial0/1/0
     192.168.1.0/24 is variably subnetted, 4 subnets, 3 masks
C       192.168.1.0/24 is directly connected, GigabitEthernet0/0/0
S       192.168.1.0/27 [1/0] via 162.167.1.2
S       192.168.1.32/27 [1/0] via 162.167.1.2
L       192.168.1.96/32 is directly connected, GigabitEthernet0/0/0

Router#
```

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

Verificamos la métrica utilizada



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

Gateway of last resort is not set

     162.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       162.16.0.0/16 is directly connected, Serial0/1/1
L       162.16.1.1/32 is directly connected, Serial0/1/1
     162.167.0.0/24 is subnetted, 1 subnets
S       162.167.1.0/24 [1/0] via 162.16.1.2
     192.168.1.0/24 is variably subnetted, 4 subnets, 3 masks
C       192.168.1.0/24 is directly connected, GigabitEthernet0/0/0
S       192.168.1.0/27 [1/0] via 162.16.1.2
L       192.168.1.63/32 is directly connected, GigabitEthernet0/0/0
S       192.168.1.64/27 [1/0] via 162.16.1.2

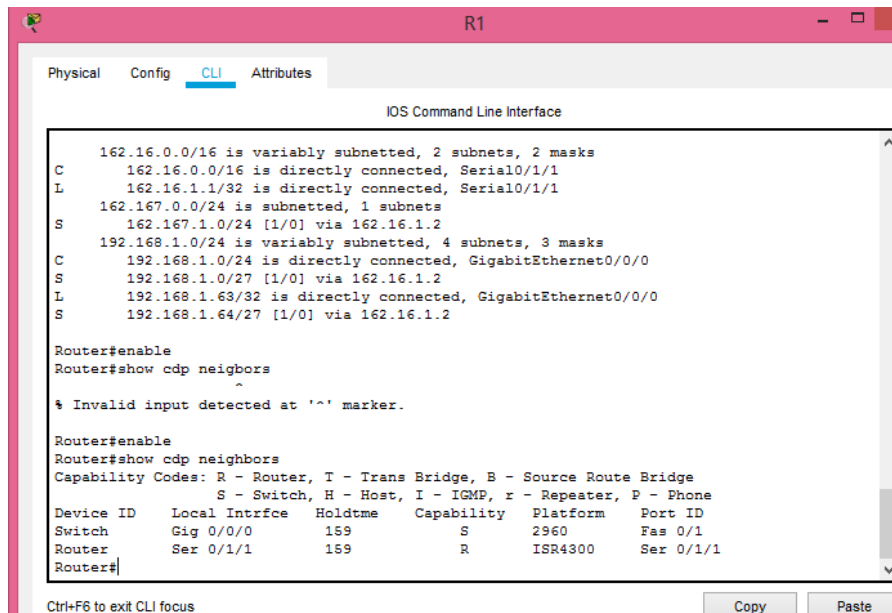
Router#
```

Ilustración 6 Verificación Métrica

Notamos que es la misma

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

Diagnóstico De Vecinos R1



```
IOS Command Line Interface

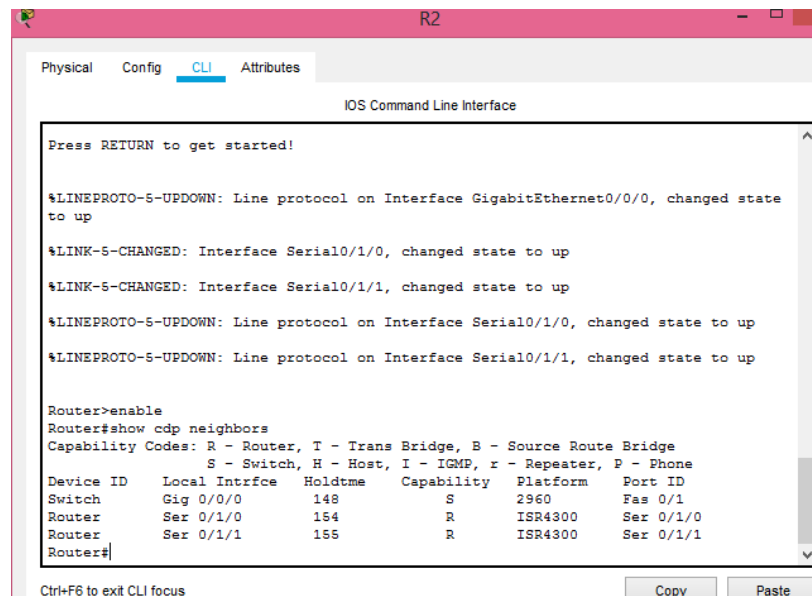
162.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C   162.16.0.0/16 is directly connected, Serial0/1/1
L   162.16.1.1/32 is directly connected, Serial0/1/1
162.167.0.0/24 is subnetted, 1 subnets
S   162.167.1.0/24 [1/0] via 162.16.1.2
192.168.1.0/24 is variably subnetted, 4 subnets, 3 masks
C   192.168.1.0/24 is directly connected, GigabitEthernet0/0/0
S   192.168.1.0/27 [1/0] via 162.16.1.2
L   192.168.1.63/32 is directly connected, GigabitEthernet0/0/0
S   192.168.1.64/27 [1/0] via 162.16.1.2

Router#enable
Router#show cdp neighbors
^
% Invalid input detected at '^' marker.

Router#enable
Router#show 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
Switch          Gig 0/0/0      159      S          2960       Fas 0/1
Router          Ser 0/1/1      159      R          ISR4300    Ser 0/1/1
Router#
```

Ilustración 7 Diagnósticos R1

Diagnóstico De Vecinos R2



```
IOS Command Line Interface

Press RETURN to get started!

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/0, changed state to up
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to up
%LINK-5-CHANGED: Interface Serial0/1/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/1, changed state to up

Router>enable
Router#show 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
Switch          Gig 0/0/0      148      S          2960       Fas 0/1
Router          Ser 0/1/0      154      R          ISR4300    Ser 0/1/0
Router          Ser 0/1/1      155      R          ISR4300    Ser 0/1/1
Router#
```

Ilustración 8 Diagnóstico R2

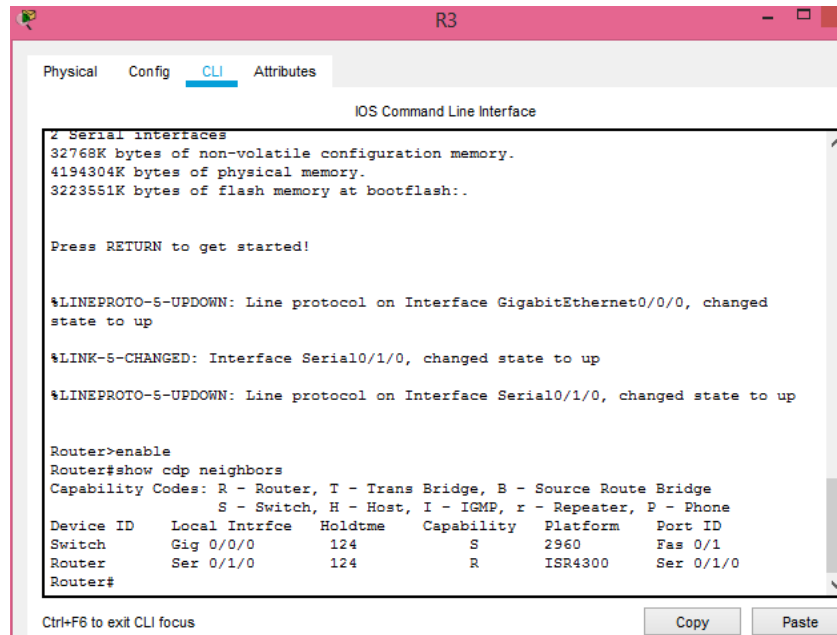


Ilustración 9 Diagnóstico R3

e. Realizar una prueba de conectividad en cada tramo de la ruta usando Ping. Pin desde SW1

```
SW1
Physical Config Desktop Programming Attributes
Command Prompt
Packet Tracer PC Command Line 1.0
C:\>ping 192.168.1.33

Pinging 192.168.1.33 with 32 bytes of data:

Reply from 192.168.1.33: bytes=32 time=14ms TTL=126
Reply from 192.168.1.33: bytes=32 time=1ms TTL=126
Reply from 192.168.1.33: bytes=32 time=13ms TTL=126
Reply from 192.168.1.33: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.1.33:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 14ms, Average = 7ms

C:\>ping 192.168.1.65

Pinging 192.168.1.65 with 32 bytes of data:

Request timed out.
Reply from 192.168.1.65: bytes=32 time=2ms TTL=126
Reply from 192.168.1.65: bytes=32 time=1ms TTL=126
Reply from 192.168.1.65: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.1.65:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
```

Ilustración 10 Prueba de Conectividad desde SW1

Pin desde PC1

```
PC1
Physical Config Desktop Programming Attributes
Command Prompt
Pinging 192.168.1.65 with 32 bytes of data:

Reply from 192.168.1.65: bytes=32 time=32ms TTL=125
Reply from 192.168.1.65: bytes=32 time=3ms TTL=125
Reply from 192.168.1.65: bytes=32 time=30ms TTL=125
Reply from 192.168.1.65: bytes=32 time=2ms TTL=125

Ping statistics for 192.168.1.65:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 32ms, Average = 16ms

C:\>ping 192.168.1.10

Pinging 192.168.1.10 with 32 bytes of data:

Reply from 192.168.1.10: bytes=32 time=23ms TTL=126
Reply from 192.168.1.10: bytes=32 time=1ms TTL=126
Reply from 192.168.1.10: bytes=32 time=7ms TTL=126
Reply from 192.168.1.10: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.1.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 23ms, Average = 8ms

C:\>|
```

Ilustración 11 Prueba Conectividad desde PC1

Pin desde PC2

```
PC2
Physical Config Desktop Programming Attributes
Command Prompt
Pinging 192.168.1.10 with 32 bytes of data:
Request timed out.
Reply from 192.168.1.10: bytes=32 time=1ms TTL=126
Reply from 192.168.1.10: bytes=32 time=1ms TTL=126
Reply from 192.168.1.10: bytes=32 time=13ms TTL=126

Ping statistics for 192.168.1.10:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 13ms, Average = 5ms

C:\>ping 192.168.1.65

Pinging 192.168.1.65 with 32 bytes of data:

Reply from 192.168.1.65: bytes=32 time=19ms TTL=125
Reply from 192.168.1.65: bytes=32 time=2ms TTL=125
Reply from 192.168.1.65: bytes=32 time=16ms TTL=125
Reply from 192.168.1.65: bytes=32 time=2ms TTL=125

Ping statistics for 192.168.1.65:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 19ms, Average = 9ms

C:\>
```

Ilustración 12 Prueba de Conectividad desde PC2

Pin desde PC3

```
PC3
Physical Config Desktop Programming Attributes
Command Prompt
Pinging 192.168.1.33 with 32 bytes of data:

Reply from 192.168.1.33: bytes=32 time=2ms TTL=125
Reply from 192.168.1.33: bytes=32 time=2ms TTL=125
Reply from 192.168.1.33: bytes=32 time=16ms TTL=125
Reply from 192.168.1.33: bytes=32 time=2ms TTL=125

Ping statistics for 192.168.1.33:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 16ms, Average = 5ms

C:\>ping 192.168.1.10

Pinging 192.168.1.10 with 32 bytes of data:

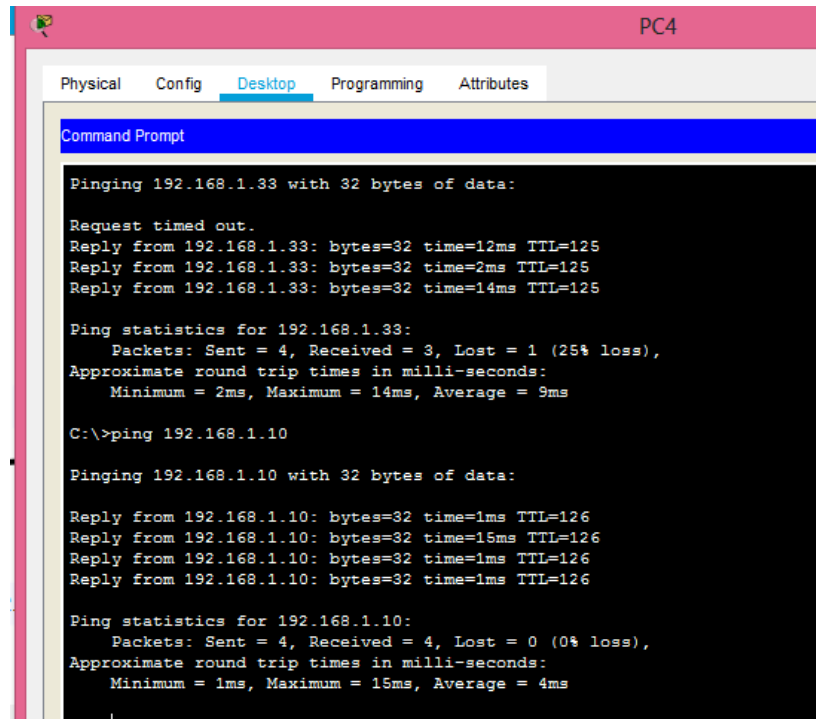
Reply from 192.168.1.10: bytes=32 time=2ms TTL=126
Reply from 192.168.1.10: bytes=32 time=1ms TTL=126
Reply from 192.168.1.10: bytes=32 time=13ms TTL=126
Reply from 192.168.1.10: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.1.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 13ms, Average = 4ms

C:\>
```

Ilustración 13 Prueba de Conectividad desde PC3

Pin desde PC4



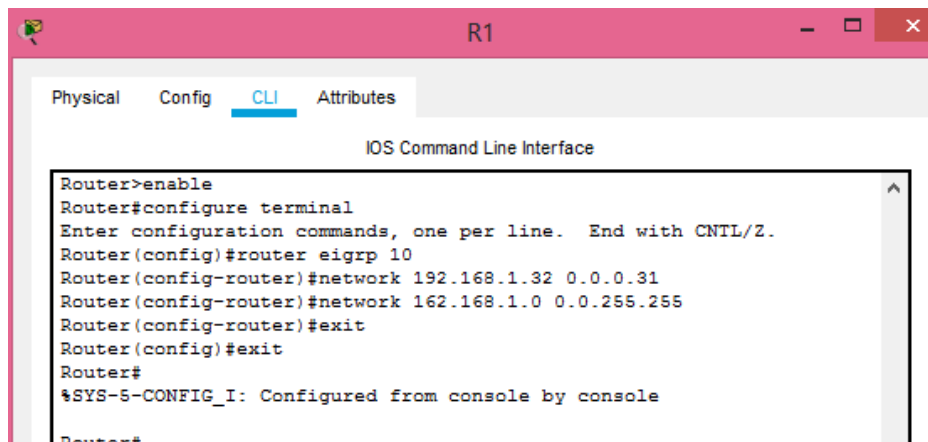
```
PC4
Physical Config Desktop Programming Attributes
Command Prompt
Pinging 192.168.1.33 with 32 bytes of data:
Request timed out.
Reply from 192.168.1.33: bytes=32 time=12ms TTL=125
Reply from 192.168.1.33: bytes=32 time=2ms TTL=125
Reply from 192.168.1.33: bytes=32 time=14ms TTL=125
Ping statistics for 192.168.1.33:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 14ms, Average = 9ms
C:\>ping 192.168.1.10
Pinging 192.168.1.10 with 32 bytes of data:
Reply from 192.168.1.10: bytes=32 time=1ms TTL=126
Reply from 192.168.1.10: bytes=32 time=15ms TTL=126
Reply from 192.168.1.10: bytes=32 time=1ms TTL=126
Reply from 192.168.1.10: bytes=32 time=1ms TTL=126
Ping statistics for 192.168.1.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 15ms, Average = 4ms
```

Ilustración 14 Prueba de Conectividad desde PC4

1.3 Parte 3: Configuración de Enrutamiento.

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

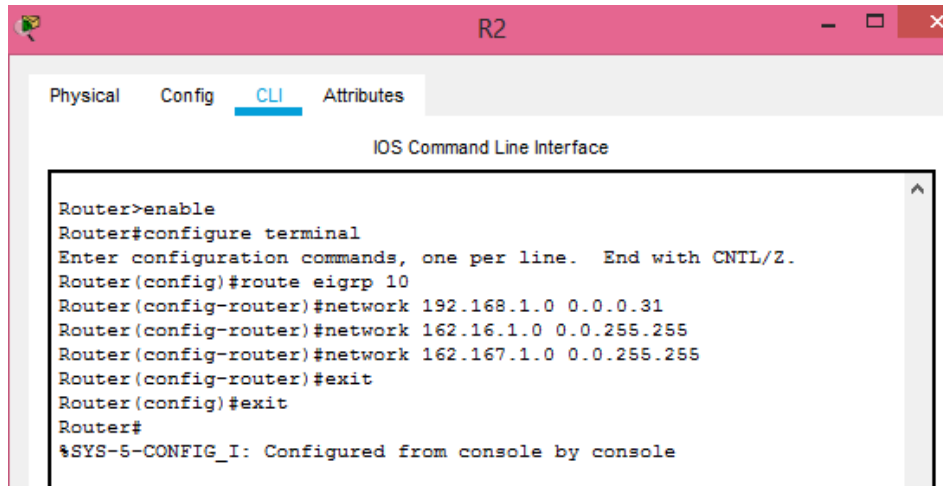
Router R1



```
R1
Physical Config CLI Attributes
IOS Command Line Interface
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router eigrp 10
Router(config-router)#network 192.168.1.32 0.0.0.31
Router(config-router)#network 162.168.1.0 0.0.255.255
Router(config-router)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#
```

Ilustración 15 Configuración Router R1

Router R2

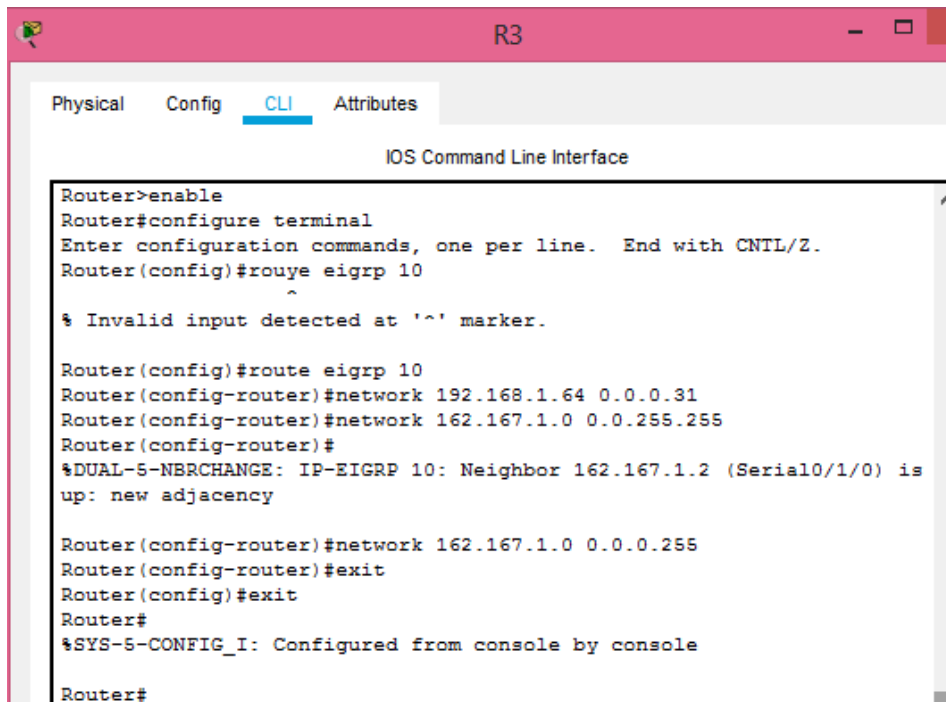


The screenshot shows the CLI interface of Router R2. The window title is 'R2'. The tabs are 'Physical', 'Config', 'CLI' (selected), and 'Attributes'. The text in the terminal window is as follows:

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#route eigrp 10
Router(config-router)#network 192.168.1.0 0.0.0.31
Router(config-router)#network 162.16.1.0 0.0.255.255
Router(config-router)#network 162.167.1.0 0.0.255.255
Router(config-router)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

Ilustración 16 Configuración Router R2

Router R3



The screenshot shows the CLI interface of Router R3. The window title is 'R3'. The tabs are 'Physical', 'Config', 'CLI' (selected), and 'Attributes'. The text in the terminal window is as follows:

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#rouye eigrp 10
      ^
% Invalid input detected at '^' marker.

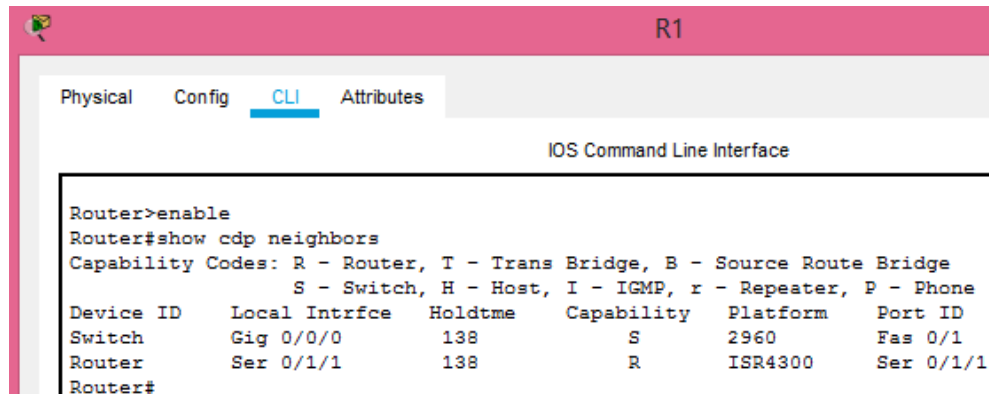
Router(config)#route eigrp 10
Router(config-router)#network 192.168.1.64 0.0.0.31
Router(config-router)#network 162.167.1.0 0.0.255.255
Router(config-router)#
%DUAL-5-NBRCHANGE: IP-EIGRP 10: Neighbor 162.167.1.2 (Serial0/1/0) is
up: new adjacency

Router(config-router)#network 162.167.1.0 0.0.0.255
Router(config-router)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#
```

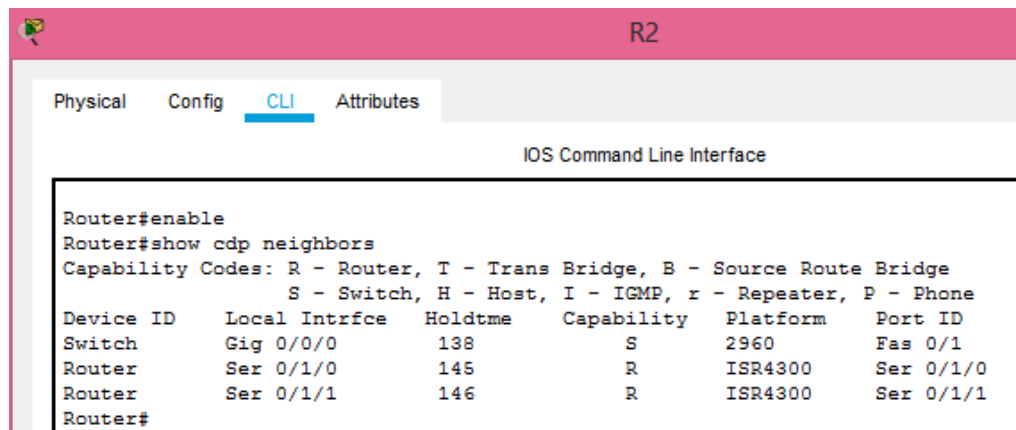
Ilustración 17 Configuración Router R3

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



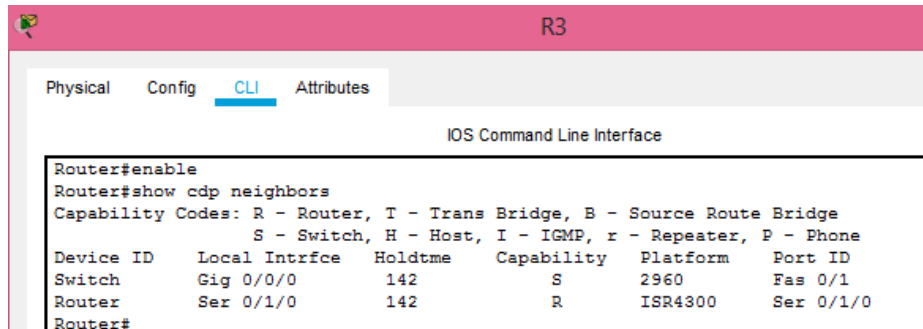
```
Router>enable
Router#show cdp neighbors
Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge
                  S - Switch, H - Host, I - IGMP, r - Repeater, P - Phone
Device ID    Local Intrfce  Holdtme   Capability   Platform   Port ID
Switch      Gig 0/0/0        138      S            2960       Fas 0/1
Router      Ser 0/1/1        138      R            ISR4300    Ser 0/1/1
Router#
```

Ilustración 18 R1 configurados con EIGRP



```
Router#enable
Router#show 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
Switch      Gig 0/0/0        138      S            2960       Fas 0/1
Router      Ser 0/1/0        145      R            ISR4300    Ser 0/1/0
Router      Ser 0/1/1        146      R            ISR4300    Ser 0/1/1
Router#
```

Ilustración 19 R2 configurados con EIGRP



```
Router#enable
Router#show 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
Switch      Gig 0/0/0        142      S            2960       Fas 0/1
Router      Ser 0/1/0        142      R            ISR4300    Ser 0/1/0
Router#
```

Ilustración 20 R3 configurados con EIGRP

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

Tabla 6 Comprobación Tabla de Enrutamiento R1

```

R1
Physical Config CLI Attributes
IOS Command Line Interface
Router#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS
inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

162.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C    162.16.0.0/16 is directly connected, Serial0/1/1
L    162.16.1.1/32 is directly connected, Serial0/1/1
L    162.167.0.0/24 is subnetted, 1 subnets
S    162.167.1.0/24 [1/0] via 162.16.1.2
S    192.168.1.0/24 is variably subnetted, 4 subnets, 3 masks
C    192.168.1.0/24 is directly connected, GigabitEthernet0/0/0
S    192.168.1.0/27 [1/0] via 162.16.1.2
L    192.168.1.63/32 is directly connected, GigabitEthernet0/0/0
S    192.168.1.64/27 [1/0] via 162.16.1.2

```

Tabla 7 Comprobación Tabla de Enrutamiento R2

```

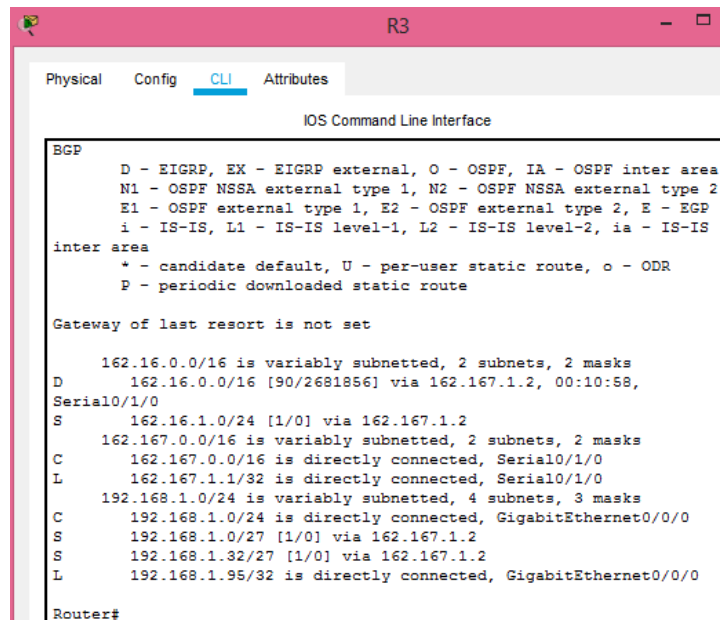
R2
Physical Config CLI Attributes
IOS Command Line Interface
Router#enable
Router#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

162.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C    162.16.0.0/16 is directly connected, Serial0/1/1
L    162.16.1.2/32 is directly connected, Serial0/1/1
L    162.167.0.0/16 is variably subnetted, 2 subnets, 2 masks
C    162.167.0.0/16 is directly connected, Serial0/1/0
L    162.167.1.2/32 is directly connected, Serial0/1/0
S    192.168.1.0/24 is variably subnetted, 4 subnets, 3 masks
C    192.168.1.0/24 is directly connected, GigabitEthernet0/0/0
L    192.168.1.31/32 is directly connected, GigabitEthernet0/0/0
S    192.168.1.32/27 [1/0] via 162.16.1.1
S    192.168.1.64/27 [1/0] via 162.167.1.1

```

Tabla 8 Comprobación Tabla de Enrutamiento R3



```
R3
Physical Config CLI Attributes
IOS Command Line Interface

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

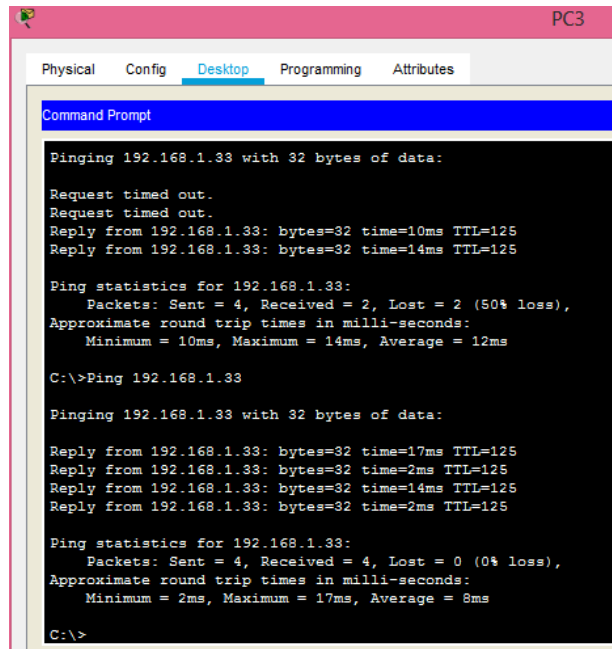
Gateway of last resort is not set

      162.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
D       162.16.0.0/16 [90/2681856] via 162.167.1.2, 00:10:58,
Serial0/1/0
S       162.16.1.0/24 [1/0] via 162.167.1.2
      162.167.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       162.167.0.0/16 is directly connected, Serial0/1/0
L       162.167.1.1/32 is directly connected, Serial0/1/0
      192.168.1.0/24 is variably subnetted, 4 subnets, 3 masks
C       192.168.1.0/24 is directly connected, GigabitEthernet0/0/0
S       192.168.1.0/27 [1/0] via 162.167.1.2
S       192.168.1.32/27 [1/0] via 162.167.1.2
L       192.168.1.95/32 is directly connected, GigabitEthernet0/0/0

Router#
```

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.

Prueba de conexión lan Cali a Host PC1 Medellín



```
PC3
Physical  Config  Desktop  Programming  Attributes
Command Prompt
Pinging 192.168.1.33 with 32 bytes of data:
Request timed out.
Request timed out.
Reply from 192.168.1.33: bytes=32 time=10ms TTL=125
Reply from 192.168.1.33: bytes=32 time=14ms TTL=125

Ping statistics for 192.168.1.33:
    Packets: Sent = 4, Received = 2, Lost = 2 (50% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 10ms, Maximum = 14ms, Average = 12ms

C:\>Ping 192.168.1.33

Pinging 192.168.1.33 with 32 bytes of data:

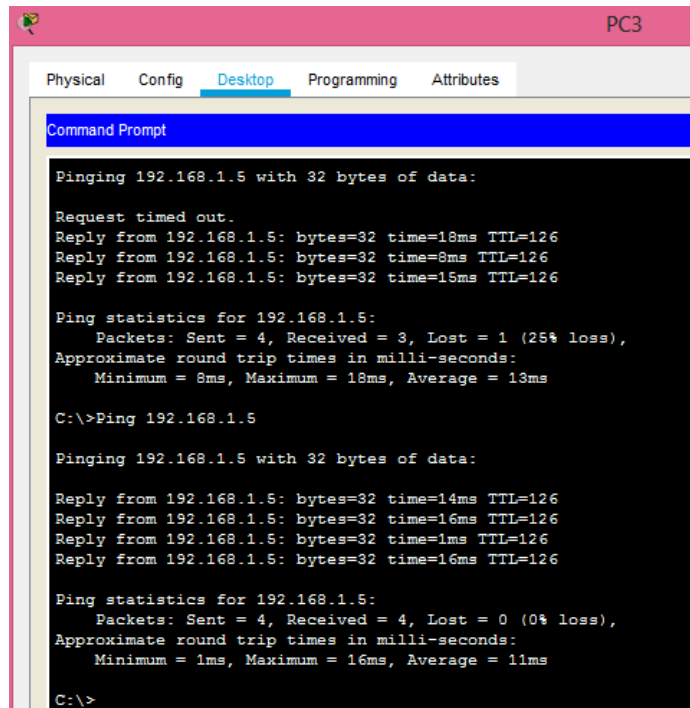
Reply from 192.168.1.33: bytes=32 time=17ms TTL=125
Reply from 192.168.1.33: bytes=32 time=2ms TTL=125
Reply from 192.168.1.33: bytes=32 time=14ms TTL=125
Reply from 192.168.1.33: bytes=32 time=2ms TTL=125

Ping statistics for 192.168.1.33:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 17ms, Average = 8ms

C:\>
```

Ilustración 21 Prueba de Conexión Lan Calia Host PC1 Medellín

Prueba de Conexión al servidor



```
PC3
Physical  Config  Desktop  Programming  Attributes
Command Prompt
Pinging 192.168.1.5 with 32 bytes of data:
Request timed out.
Reply from 192.168.1.5: bytes=32 time=18ms TTL=126
Reply from 192.168.1.5: bytes=32 time=8ms TTL=126
Reply from 192.168.1.5: bytes=32 time=15ms TTL=126

Ping statistics for 192.168.1.5:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 8ms, Maximum = 18ms, Average = 13ms

C:\>Ping 192.168.1.5

Pinging 192.168.1.5 with 32 bytes of data:

Reply from 192.168.1.5: bytes=32 time=14ms TTL=126
Reply from 192.168.1.5: bytes=32 time=16ms TTL=126
Reply from 192.168.1.5: bytes=32 time=1ms TTL=126
Reply from 192.168.1.5: bytes=32 time=16ms TTL=126

Ping statistics for 192.168.1.5:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 16ms, Average = 11ms

C:\>
```

Ilustración 22 Prueba de Conexión al Servidor

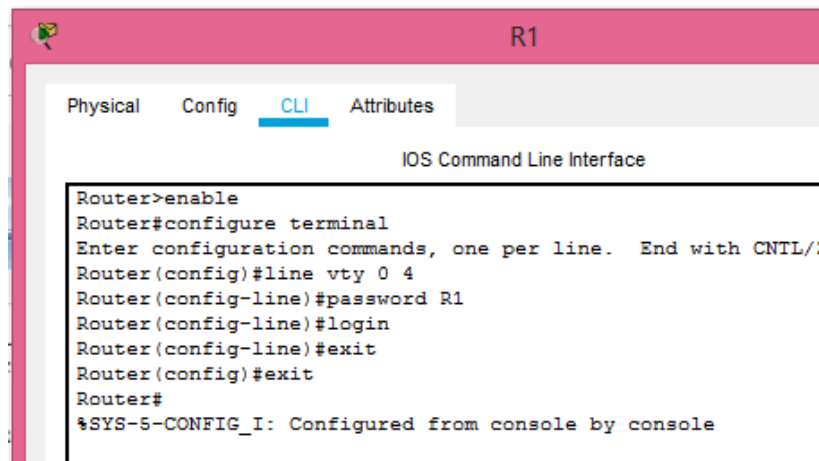
1.4 Parte 4: Configuración de las listas de Control de Acceso.

En este momento cualquier usuario de la red tiene acceso a todos sus dispositivos y estaciones de trabajo.

El jefe de redes le solicita implementar seguridad en la red. Para esta labor se decide configurar listas de control de acceso (ACL) a los routers.

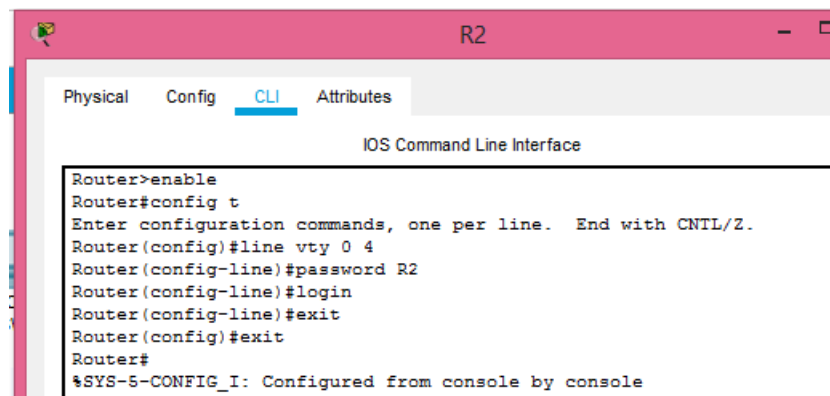
Las condiciones para crear las ACL son las siguientes:

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

A screenshot of a network simulator window titled 'R1'. The window has tabs for 'Physical', 'Config', 'CLI', and 'Attributes', with 'CLI' selected. Below the tabs is the text 'IOS Command Line Interface'. The terminal shows the following commands and output:

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/:
Router(config)#line vty 0 4
Router(config-line)#password R1
Router(config-line)#login
Router(config-line)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

Ilustración 23 Establecer Conexión Telnet R1

A screenshot of a network simulator window titled 'R2'. The window has tabs for 'Physical', 'Config', 'CLI', and 'Attributes', with 'CLI' selected. Below the tabs is the text 'IOS Command Line Interface'. The terminal shows the following commands and output:

```
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#line vty 0 4
Router(config-line)#password R2
Router(config-line)#login
Router(config-line)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

Ilustración 24 Establecer Conexión Telnet R2

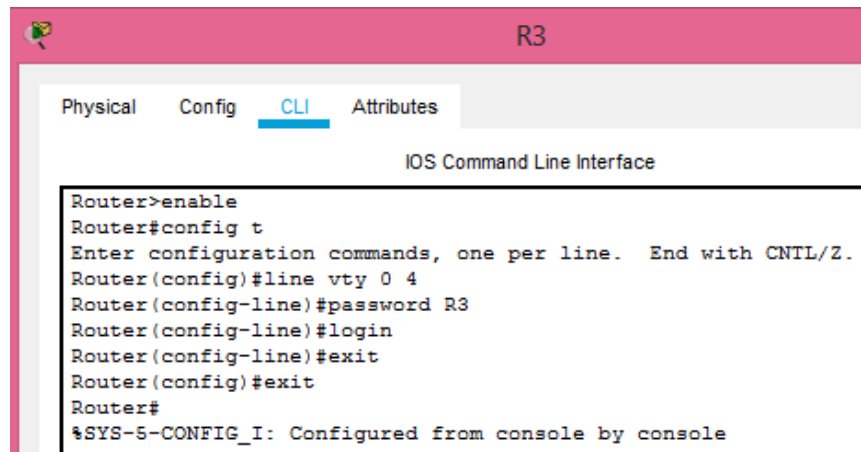
A screenshot of the R3 router's CLI interface. The window title is 'R3'. At the top, there are tabs for 'Physical', 'Config', 'CLI' (which is selected and highlighted in blue), and 'Attributes'. Below the tabs, the text 'IOS Command Line Interface' is displayed. The main area shows a terminal session where the user has entered the following commands: 'enable', 'config t', 'line vty 0 4', 'password R3', 'login', 'exit', and 'exit'. The output shows the configuration being applied, ending with a system message: '%SYS-5-CONFIG_I: Configured from console by console'.

Ilustración 25 Establecer Conexión Telnet R3

Prueba de acceso

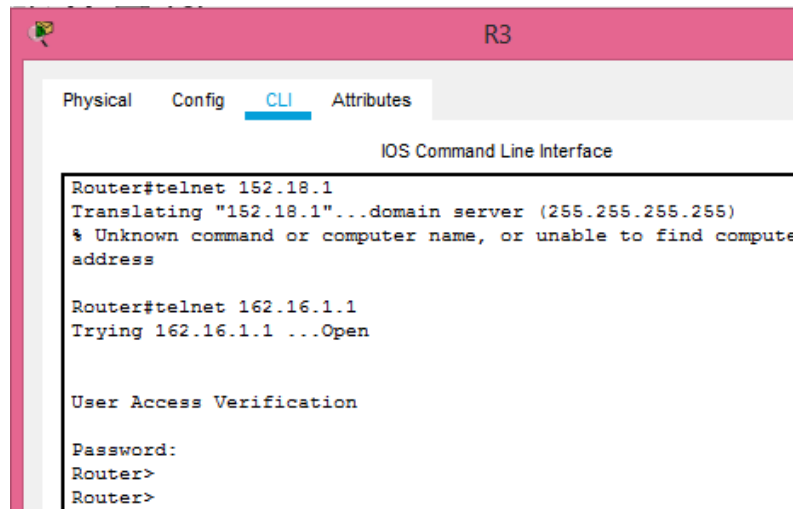
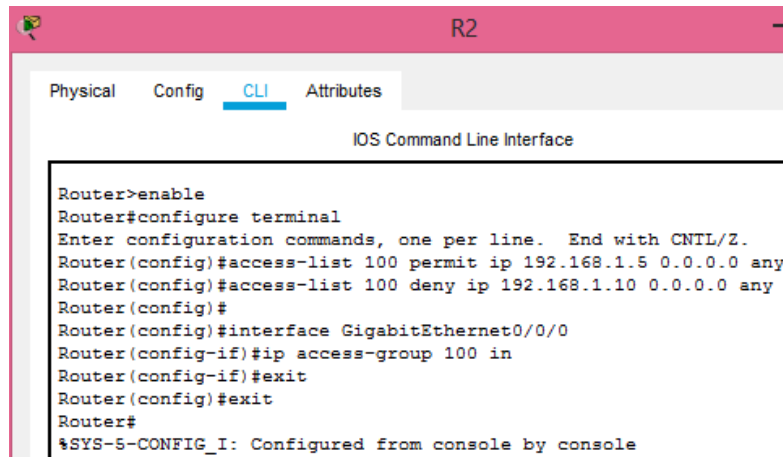
A screenshot of the R3 router's CLI interface showing a telnet test. The window title is 'R3'. At the top, there are tabs for 'Physical', 'Config', 'CLI' (selected and highlighted in blue), and 'Attributes'. Below the tabs, the text 'IOS Command Line Interface' is displayed. The main area shows a terminal session where the user has entered the following commands: 'telnet 152.18.1', 'telnet 162.16.1.1', and 'password R3'. The output shows the router attempting to connect to 152.18.1 (which fails with an 'Unknown command or computer name' error) and then successfully connecting to 162.16.1.1. The prompt changes to 'User Access Verification' and then 'Password:'. The user enters 'R3' and the prompt returns to 'Router#'.

Ilustración 26 Prueba de Acceso R3

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.

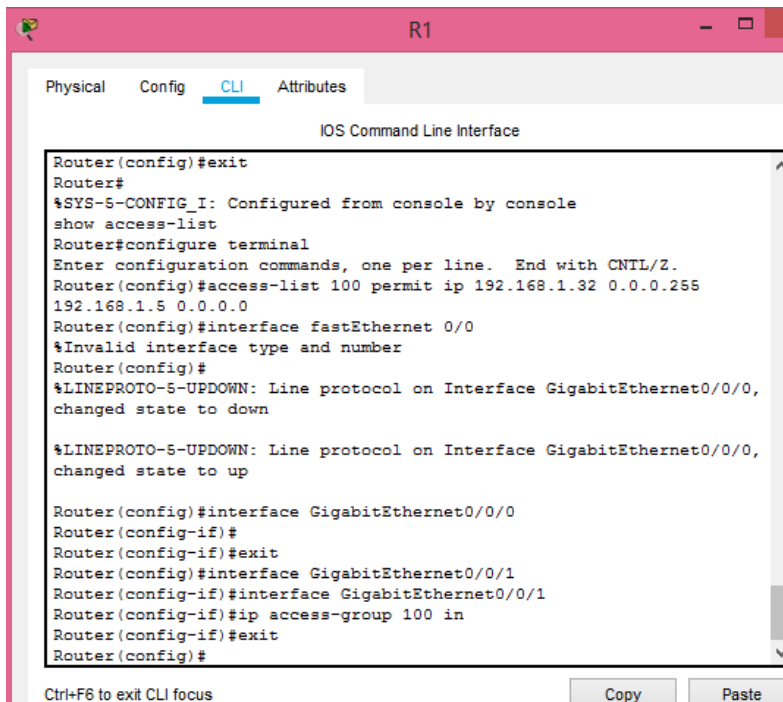
A screenshot of a network simulator window titled 'R2'. The window has tabs for 'Physical', 'Config', 'CLI', and 'Attributes', with 'CLI' selected. The main area is labeled 'IOS Command Line Interface' and contains a terminal window with the following text:

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#access-list 100 permit ip 192.168.1.5 0.0.0.0 any
Router(config)#access-list 100 deny ip 192.168.1.10 0.0.0.0 any
Router(config)#
Router(config)#interface GigabitEthernet0/0/0
Router(config-if)#ip access-group 100 in
Router(config-if)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

Ilustración 27 Prueba de Acceso R2

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.

Configuración

A screenshot of a network simulator window titled 'R1'. The window has tabs for 'Physical', 'Config', 'CLI', and 'Attributes', with 'CLI' selected. The main area is labeled 'IOS Command Line Interface' and contains a terminal window with the following text:

```
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
show access-list
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#access-list 100 permit ip 192.168.1.32 0.0.0.255
192.168.1.5 0.0.0.0
Router(config)#interface fastEthernet 0/0
%Invalid interface type and number
Router(config)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/0,
changed state to down

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

Router(config)#interface GigabitEthernet0/0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface GigabitEthernet0/0/1
Router(config-if)#interface GigabitEthernet0/0/1
Router(config-if)#ip access-group 100 in
Router(config-if)#exit
Router(config)#
```

At the bottom of the window, there is a status bar with 'Ctrl+F6 to exit CLI focus' on the left and 'Copy' and 'Paste' buttons on the right.

Ilustración 28 Configuración Access Group R1

```
Router#show access-list
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#access-list permit ip 192.168.1.64 0.0.0.255
192.168.1.5 0.0.0.0
% Invalid input detected at '^' marker.

Router(config)#access-list 100 permit ip 192.168.1.64 0.0.0.255
192.168.1.5 0.0.0.0
Router(config)#
Router(config)#interface GigabitEthernet0/0/0
Router(config-if)#ip access-group 100 in
Router(config-if)#exit
Router(config)#exit
Router#
%SYS-S-CONFIG_I: Configured from console by console

Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface GigabitEthernet0/0/0
Router(config-if)#
```

Ilustración 29 Configuración Access Group R3

1.5 Parte 5: Comprobación de la red instalada.

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

Comprobación acceso de la Red Medellin a el servidor y negación de accesos a la red Cali

```
PC1
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 192.168.1.5
Pinging 192.168.1.5 with 32 bytes of data:
Reply from 192.168.1.5: bytes=32 time=14ms TTL=126
Reply from 192.168.1.5: bytes=32 time=1ms TTL=126
Reply from 192.168.1.5: bytes=32 time=12ms TTL=126
Reply from 192.168.1.5: bytes=32 time=1ms TTL=126
Ping statistics for 192.168.1.5:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 14ms, Average = 7ms
C:\>ping 192.168.1.65
Pinging 192.168.1.65 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Ping statistics for 192.168.1.65:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

Ilustración 30 Comprobación Red Instalada PC1

Comprobación acceso de la Red Cali a el servidor y negación de accesos a la red Medellin

```
PC3
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 192.168.1.5
Pinging 192.168.1.5 with 32 bytes of data:
Reply from 192.168.1.5: bytes=32 time=2ms TTL=126
Reply from 192.168.1.5: bytes=32 time=10ms TTL=126
Reply from 192.168.1.5: bytes=32 time=1ms TTL=126
Reply from 192.168.1.5: bytes=32 time=17ms TTL=126
Ping statistics for 192.168.1.5:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 17ms, Average = 7ms
C:\>ping 192.168.1.34
Pinging 192.168.1.34 with 32 bytes of data:
Reply from 192.168.1.95: Destination host unreachable.
Reply from 192.168.1.95: Destination host unreachable.
Reply from 192.168.1.95: Destination host unreachable.
Reply from 192.168.1.95: Destination host unreachable.
Ping statistics for 192.168.1.34:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>
```

Ilustración 31 Comprobación Red Instalada PC3

Comprobación acceso de la host SW1 a el servidor y negación de accesos a la redes Medellin y Cali

```
SW1
Physical Config Desktop Programming Attributes
Command Prompt
Packet Tracer PC Command Line 1.0
C:\>ping 192.168.1.34

Pinging 192.168.1.34 with 32 bytes of data:

Request timed out.
Reply from 192.168.1.31: Destination host unreachable.
Reply from 192.168.1.31: Destination host unreachable.
Reply from 192.168.1.31: Destination host unreachable.

Ping statistics for 192.168.1.34:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 192.168.1.65

Pinging 192.168.1.65 with 32 bytes of data:

Reply from 192.168.1.31: Destination host unreachable.
Reply from 192.168.1.31: Destination host unreachable.
Reply from 192.168.1.31: Destination host unreachable.
Reply from 192.168.1.31: Destination host unreachable.

Ping statistics for 192.168.1.65:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
```

Ilustración 32 Comprobación Acceso de la Host SW1

```
SW1
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 192.168.1.5

Pinging 192.168.1.5 with 32 bytes of data:

Reply from 192.168.1.5: bytes=32 time<1ms TTL=128
Reply from 192.168.1.5: bytes=32 time=1ms TTL=128
Reply from 192.168.1.5: bytes=32 time<1ms TTL=128
Reply from 192.168.1.5: bytes=32 time=3ms TTL=128

Ping statistics for 192.168.1.5:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 3ms, Average = 1ms
```

Ilustración 33 Comprobación Acceso de la Host SW1

Prueba de conexión del Servidor

```

Server0
Physical  Config  Services  Desktop  Programming  Attributes

Command Prompt

Packet Tracer SERVER Command Line 1.0
C:\>ping 192.168.1.34

Pinging 192.168.1.34 with 32 bytes of data:

Request timed out.
Reply from 192.168.1.34: bytes=32 time=10ms TTL=126
Reply from 192.168.1.34: bytes=32 time=1ms TTL=126
Reply from 192.168.1.34: bytes=32 time=15ms TTL=126

Ping statistics for 192.168.1.34:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 15ms, Average = 8ms

C:\>

```

Ilustración 34 Prueba Conexión Servidor Server0

```

Server0
Physical  Config  Services  Desktop  Programming  Attributes

Command Prompt

C:\>ping 192.168.1.66

Pinging 192.168.1.66 with 32 bytes of data:

Request timed out.
Reply from 192.168.1.66: bytes=32 time=12ms TTL=126
Reply from 192.168.1.66: bytes=32 time=1ms TTL=126
Reply from 192.168.1.66: bytes=32 time=16ms TTL=126

Ping statistics for 192.168.1.66:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 16ms, Average = 9ms

C:\>ping 192.168.1.10

Pinging 192.168.1.10 with 32 bytes of data:

Reply from 192.168.1.10: bytes=32 time=11ms TTL=128
Reply from 192.168.1.10: bytes=32 time<1ms TTL=128
Reply from 192.168.1.10: bytes=32 time<1ms TTL=128
Reply from 192.168.1.10: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.1.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:

```

Ilustración 35 Prueba Conexión Servidor Server0

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

1.6 Parte 6: Configuración Final.

Tabla 9 Tabla de Condiciones de Prueba

	ORIGEN	DESTINO	RESULTADO
TELNET	Router MEDELLIN	Router CALI	permitido
	WS_1 Router	BOGOTA	permitido
	Servidor	Router CALI	permitido
	Servidor	Router MEDELLIN	permitido
TELNET	LAN del Router	MEDELLIN Router CALI	permitido
	LAN del Router CALI	Router CALI	permitido
	LAN del Router MEDELLIN	Router MEDELLIN	permitido
	LAN del Router CALI	Router MEDELLIN	permitido
PING	LAN del Router CALI	WS_1	Denegado
	LAN del Router MEDELLIN	WS_1	Denegado
	LAN del Router MEDELLIN	LAN del Router CALI	Denegado
PING	LAN del Router CALI	Servidor	permitido
	LAN del Router MEDELLIN	Servidor	permitido
	Servidor	LAN del Router MEDELLIN	permitido
	Servidor	LAN del Router CALI	permitido
	Router CALI	LAN del Router MEDELLIN	Denegado
	Router MEDELLIN	LAN del Router CALI	Denegado

Escenario 2

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

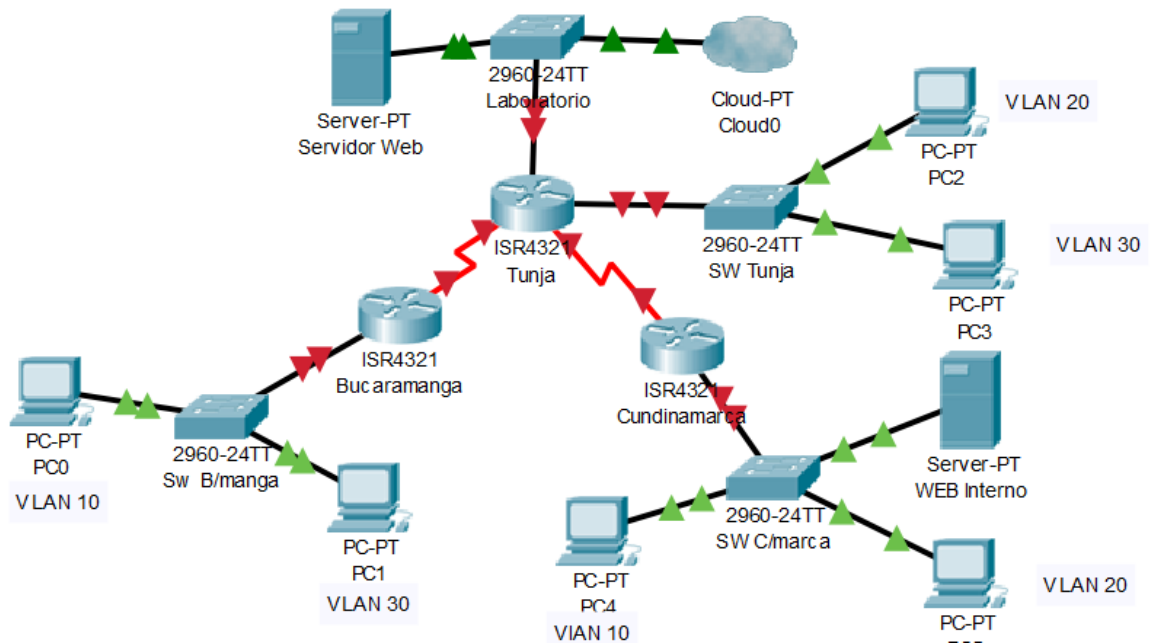


Ilustración 36 Ejemplo de Escenario 2

Desarrollo Escenario 2

Los siguientes son los requerimientos necesarios:

1. Todos los routers deberán tener los siguiente:

- Configuración básica.

The screenshot shows the CLI interface for SW BUCARAMANGA. The 'CLI' tab is selected. The terminal output shows the following commands and responses:

```

Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#vlan 10
Switch(config-vlan)#vlan 30
Switch(config-vlan)#int f0/2
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 30
Switch(config-if)#int f0/3
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 10
Switch(config-if)#do wr
Building configuration...
[OK]
Switch(config-if)#int f0/1
Switch(config-if)#switchport mode trunk
Switch(config-if)#do wr
Building configuration...
[OK]
Switch(config-if)#
Switch(config-if)#
Switch(config-if)#
Switch(config-if)#
Switch(config-if)#
Switch(config-if)#exit
Switch(config)#

```

Ilustración 37 Configuración Básica SW Bucaramanga

The screenshot shows the CLI interface for SW CUNDINAMARCA. The 'CLI' tab is selected. The terminal output shows the following commands and responses:

```

Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#vlan 10
Switch(config-vlan)#vlan 20
Switch(config-vlan)#int f0/3
Switch(config-if)#switchport mode access
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 20
Switch(config-if)#int f0/4
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 10
Switch(config-if)#int f0/1
Switch(config-if)#switchport mode trunk
Switch(config-if)#do wr
Building configuration...
[OK]
Switch(config-if)#exit
Switch(config)#

```

Note: There is an error message in the original image: "% Invalid input detected at '^' marker." which appears to be a typo for the '^' character used in the command sequence.

Ilustración 38 Configuración Básica SW Cundinamarca

```

SW Tunja
Physical Config CLI Attributes
IOS Command Line Interface
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL
Switch(config)#vlan 20
Switch(config-vlan)#vlan 30
Switch(config-vlan)#int fa0/2
Switch(config-if)#switchport mode access
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 20
Switch(config-if)#int fa0/3
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 30
Switch(config-if)#int fa0/1
Switch(config-if)#switchport mode trunk
Switch(config-if)#do wr
Building configuration...
[OK]
Switch(config-if)#exit
Switch(config)#exit
Switch#
%SYS-5-CONFIG_I: Configured from console by console

```

Ilustración 39 Configuración Básica SW Tunja

```

Cundinamarca
Physical Config CLI Attributes
IOS Command Line Interface
Router>ena
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#interface GigabitEthernet0/0/1
Router(config-if)#interface GigabitEthernet0/0/1.10
Router(config-subif)#encapsulation Dot1Q 10
Router(config-subif)#ip address 172.31.1.66 255.255.255.192
Router(config-subif)#interface GigabitEthernet0/0/1.20
Router(config-subif)#encapsulation Dot1Q 20
Router(config-subif)#ip address 172.31.1.2 255.255.255.192
Router(config-subif)#
Router(config-subif)#end
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface GigabitEthernet0/0/1
Router(config-if)#
%SYS-5-CONFIG_I: Configured from console by console
no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/1,
changed state to up

```

Ctrl+F6 to exit CLI focus

Copy Paste

Ilustración 40 Configuración Básica SW Cundinamarca

- Autenticación local con AAA.
- Cifrado de contraseñas.

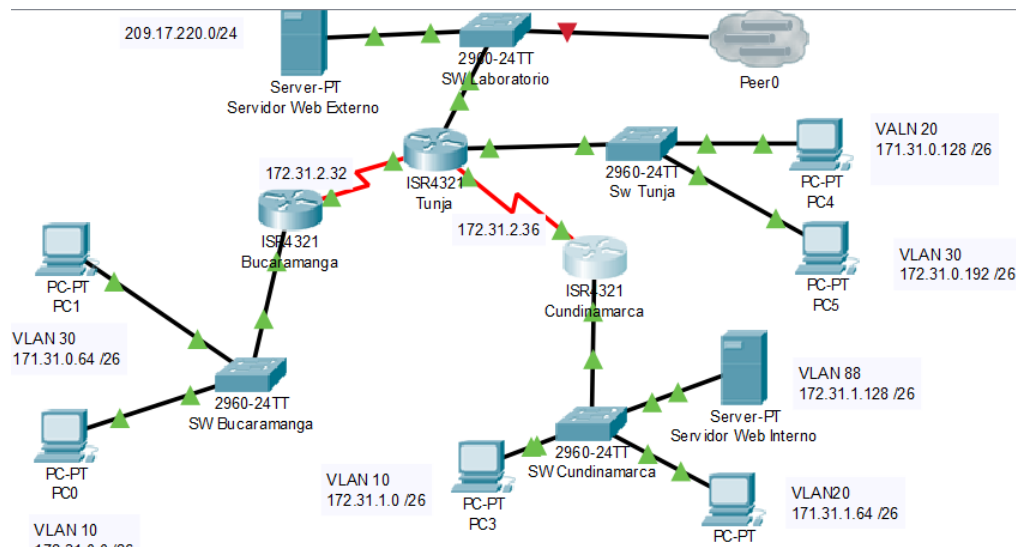


Ilustración 41 Ejemplo de Escenario 2

- 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.

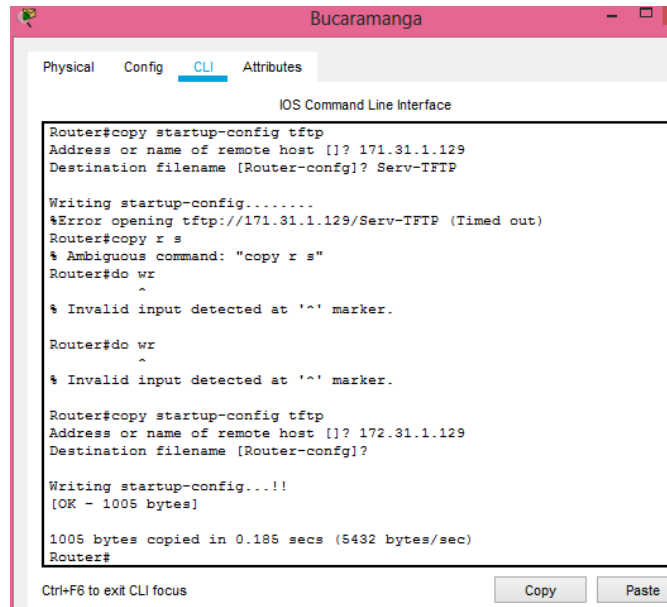


Ilustración 42 Establecer Servidor TFTP

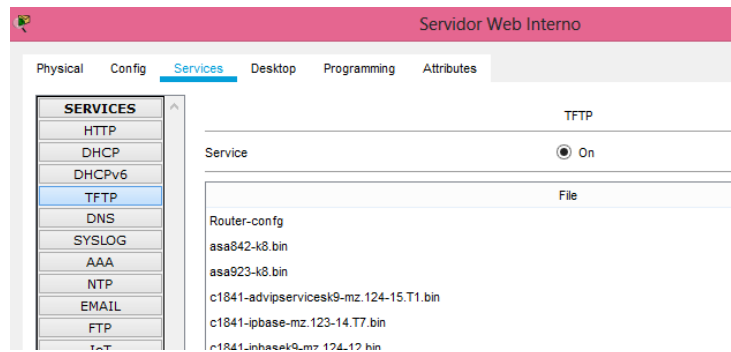


Ilustración 43 Servidor Web Interno

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

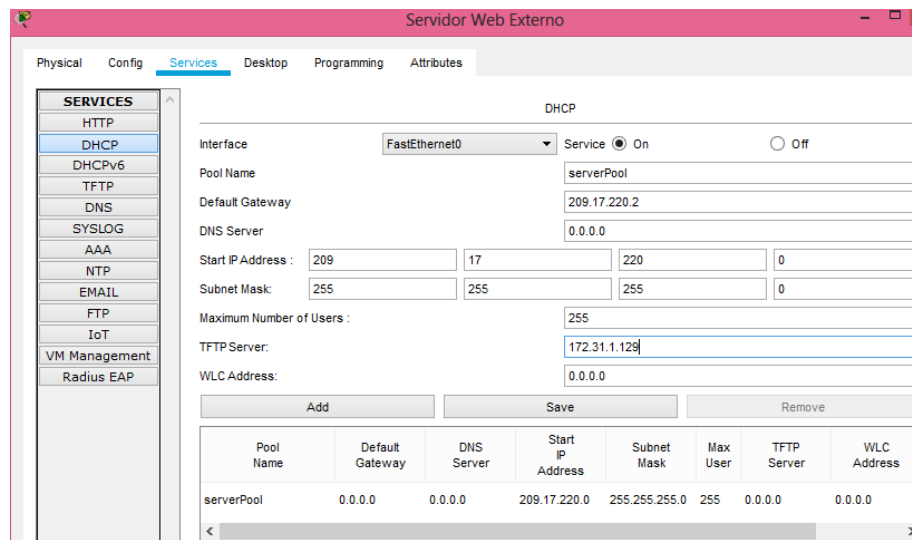


Ilustración 44 DHCP Servidor Web Externo

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

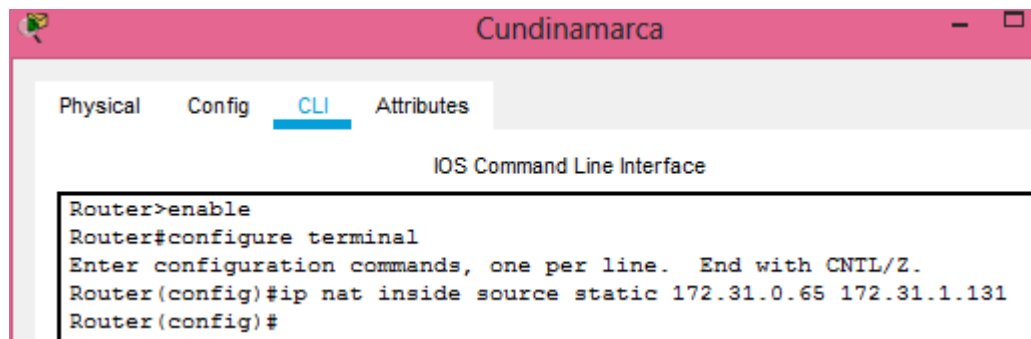
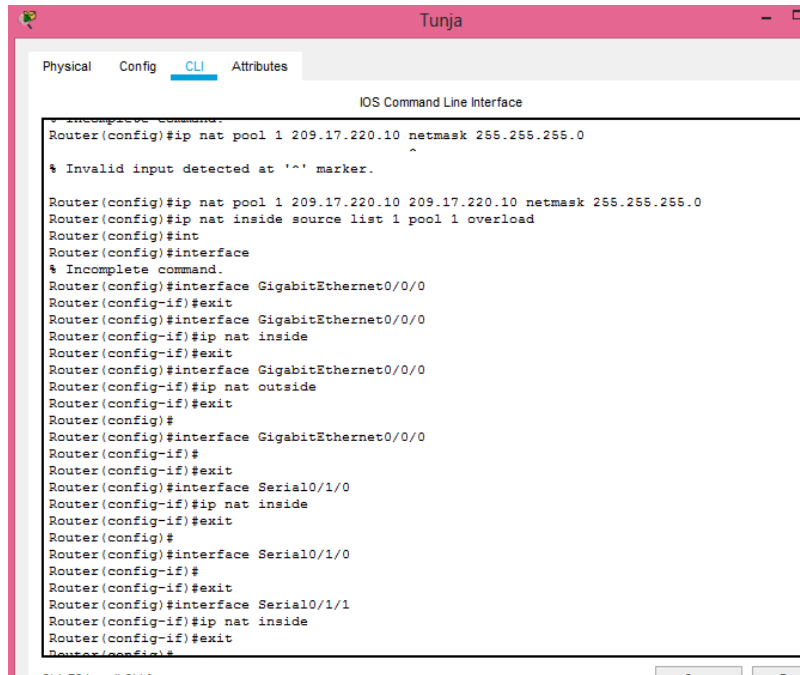


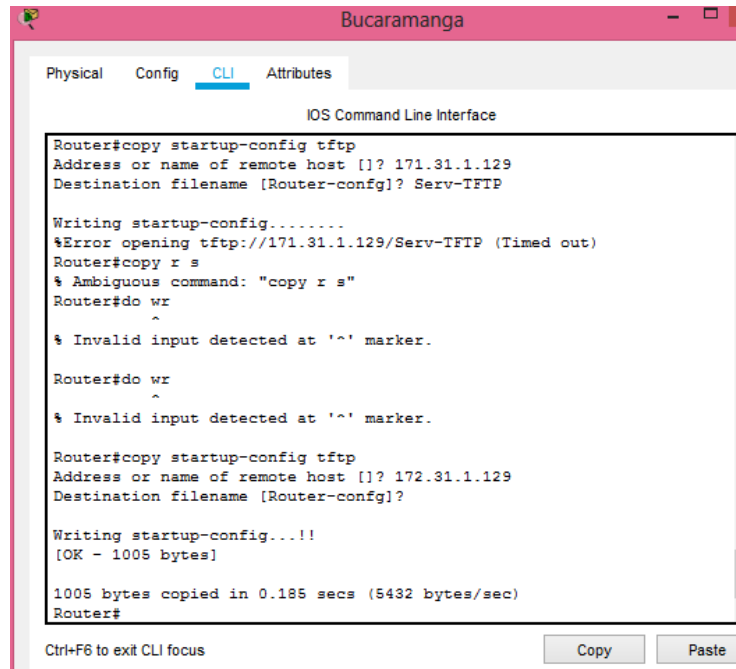
Ilustración 45 NAT Estático



```
Router(config)#ip nat pool 1 209.17.220.10 netmask 255.255.255.0
^
% Invalid input detected at '^' marker.
Router(config)#ip nat pool 1 209.17.220.10 209.17.220.10 netmask 255.255.255.0
Router(config)#ip nat inside source list 1 pool 1 overload
Router(config)#int
Router(config)#interface
% Incomplete command.
Router(config)#interface GigabitEthernet0/0/0
Router(config-if)#exit
Router(config)#interface GigabitEthernet0/0/0
Router(config-if)#ip nat inside
Router(config-if)#exit
Router(config)#interface GigabitEthernet0/0/0
Router(config-if)#ip nat outside
Router(config-if)#exit
Router(config)#
Router(config)#interface GigabitEthernet0/0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial0/1/0
Router(config-if)#ip nat inside
Router(config-if)#exit
Router(config)#
Router(config)#interface Serial0/1/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial0/1/1
Router(config-if)#ip nat inside
Router(config-if)#exit
Router(config)#
```

Ilustración 46 NAT Estático

4. El enrutamiento deberá tener autenticación.



```
Router#copy startup-config tftp
Address or name of remote host []? 171.31.1.129
Destination filename [Router-config]? Serv-TFTP

Writing startup-config.....
%Error opening tftp://171.31.1.129/Serv-TFTP (Timed out)
Router#copy r s
% Ambiguous command: "copy r s"
Router#do wr
^
% Invalid input detected at '^' marker.

Router#do wr
^
% Invalid input detected at '^' marker.

Router#copy startup-config tftp
Address or name of remote host []? 172.31.1.129
Destination filename [Router-config]?

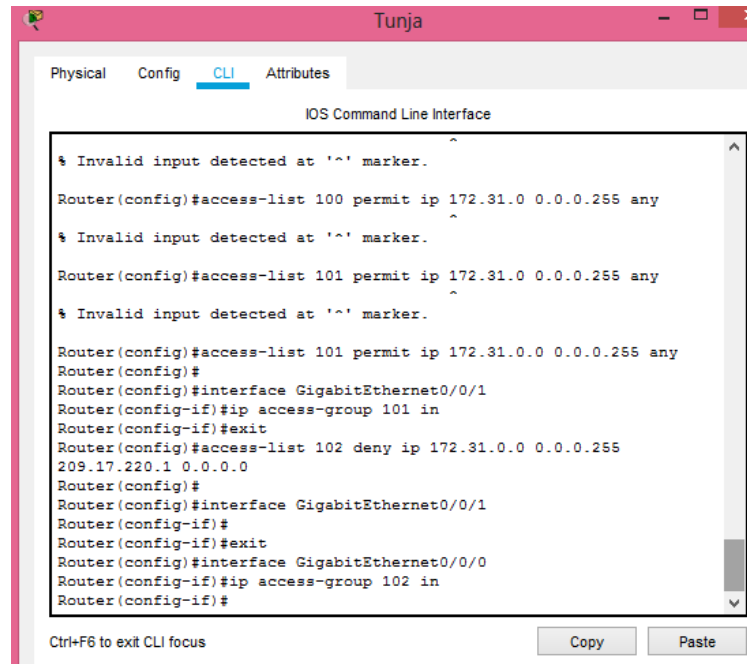
Writing startup-config...!!
[OK - 1005 bytes]

1005 bytes copied in 0.185 secs (5432 bytes/sec)
Router#
```

Ilustración 47 Autenticación del Router Bucaramanga

5. Listas de control de acceso:

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



```
IOS Command Line Interface

% Invalid input detected at '^' marker.
Router(config)#access-list 100 permit ip 172.31.0.0 0.0.0.255 any
% Invalid input detected at '^' marker.
Router(config)#access-list 101 permit ip 172.31.0.0 0.0.0.255 any
% Invalid input detected at '^' marker.
Router(config)#access-list 101 permit ip 172.31.0.0 0.0.0.255 any
Router(config)#
Router(config)#interface GigabitEthernet0/0/1
Router(config-if)#ip access-group 101 in
Router(config-if)#exit
Router(config)#access-list 102 deny ip 172.31.0.0 0.0.0.255
209.17.220.1 0.0.0.0
Router(config)#
Router(config)#interface GigabitEthernet0/0/1
Router(config-if)#
Router(config-if)#exit
Router(config)#interface GigabitEthernet0/0/0
Router(config-if)#ip access-group 102 in
Router(config-if)#
```

Ilustración 48 Configuración Vlan20 Router Tunja

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


```

IOS Command Line Interface

% Invalid input detected at '^' marker.
Router(config)#access-list 100 permit ip 172.31.0 0.0.0.255 any
% Invalid input detected at '^' marker.
Router(config)#access-list 101 permit ip 172.31.0 0.0.0.255 any
% Invalid input detected at '^' marker.
Router(config)#access-list 101 permit ip 172.31.0.0 0.0.0.255 any
Router(config)#
Router(config)#interface GigabitEthernet0/0/1
Router(config-if)#ip access-group 101 in
Router(config-if)#exit
Router(config)#access-list 102 deny ip 172.31.0.0 0.0.0.255
209.17.220.1 0.0.0.0
Router(config)#
Router(config)#interface GigabitEthernet0/0/1
Router(config-if)#
Router(config-if)#exit
Router(config)#interface GigabitEthernet0/0/0
Router(config-if)#ip access-group 102 in
Router(config-if)#

```

Ilustración 49 Configuración Vlan10 Router Tunja

- Los hosts de VLAN 30 en Tunja solo acceden a servidores web y ftp de internet.
- Los hosts de VLAN 20 en Tunja solo acceden a la VLAN 20 de Cundinamarca y VLAN 10 de Bucaramanga.

```

IOS Command Line Interface

% Invalid input detected at '^' marker.
Router(config)#access-list 101 permit 171.31.0.128 0.0.0.255 any any
% Invalid input detected at '^' marker.
Router(config)#access-list 101 permit ip 171.31.0.128 0.0.0.255 any
any
% Invalid input detected at '^' marker.
Router(config)#access-list 101 permit ip 171.31.0.128 0.0.0.255 any
Router(config)#
Router(config)#interface GigabitEthernet0/0/0
Router(config-if)#ip access-gouup 101 in
% Invalid input detected at '^' marker.
Router(config-if)#ip access-gouup 101 in
% Invalid input detected at '^' marker.
Router(config-if)#ip access-group 101 in
Router(config-if)#

```

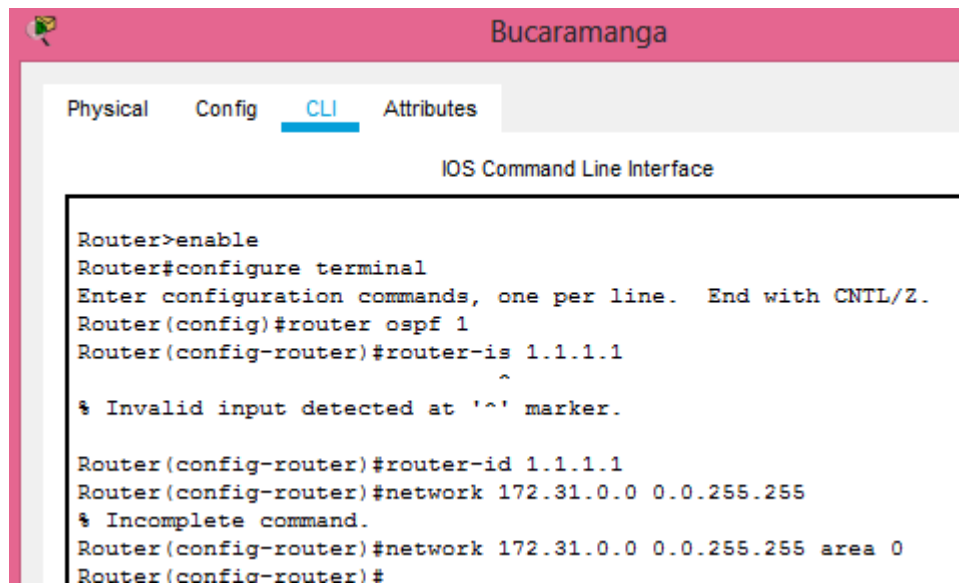
Ilustración 50 Hosts de VLAN 20

```
Router(config)#access-list 102 permit ip 172.31.0.128 0.0.0.255
172.31.1.64 0.0.0.255
Router(config)#| ^
```

Ilustración 51 Hosts de VLAN 20 Parte 2

Aspectos a tener en cuenta

- Habilitar VLAN en cada switch y permitir su enrutamiento.
- Enrutamiento OSPF con autenticación en cada router.



The screenshot shows a network simulator window titled "Bucaramanga". It has tabs for "Physical", "Config", "CLI", and "Attributes", with "CLI" selected. The main area is titled "IOS Command Line Interface" and displays the following terminal output:

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router ospf 1
Router(config-router)#router-is 1.1.1.1
^
% Invalid input detected at '^' marker.

Router(config-router)#router-id 1.1.1.1
Router(config-router)#network 172.31.0.0 0.0.255.255
% Incomplete command.
Router(config-router)#network 172.31.0.0 0.0.255.255 area 0
Router(config-router)#
```

Ilustración 52 Hosts de VLAN 20 Parte 3

```

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

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

Gateway of last resort is not set

      172.31.0.0/16 is variably subnetted, 6 subnets, 3 masks
C       172.31.0.0/26 is directly connected, GigabitEthernet0/0/0.10
L       172.31.0.2/32 is directly connected, GigabitEthernet0/0/0.10
C       172.31.0.64/26 is directly connected, GigabitEthernet0/0/0.30
L       172.31.0.66/32 is directly connected, GigabitEthernet0/0/0.30
C       172.31.2.32/30 is directly connected, Serial0/1/0
L       172.31.2.33/32 is directly connected, Serial0/1/0

Router#

```

Ctrl+F6 to exit CLI focus

Ilustración 53 Hosts de VLAN 20 Parte 4

```

Router12
Router#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
        D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
        N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
        E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
        i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
        * - candidate default, U - per-user static route, o - ODR
        P - periodic downloaded static route

Gateway of last resort is not set

      109.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       109.17.220.0/24 is directly connected, GigabitEthernet0/0/0.90
L       109.17.220.2/32 is directly connected, GigabitEthernet0/0/0.90
      172.31.0.0/16 is variably subnetted, 10 subnets, 3 masks
O       172.31.0.0/26 [110/65] via 172.31.2.33, 00:03:08, Serial0/1/0
O       172.31.0.64/26 [110/65] via 172.31.2.33, 00:03:08, Serial0/1/0
C       172.31.0.128/26 is directly connected, GigabitEthernet0/0/1.20
L       172.31.0.130/32 is directly connected, GigabitEthernet0/0/1.20
C       172.31.0.192/26 is directly connected, GigabitEthernet0/0/1.30
L       172.31.0.194/32 is directly connected, GigabitEthernet0/0/1.30
C       172.31.2.32/30 is directly connected, Serial0/1/0
L       172.31.2.34/32 is directly connected, Serial0/1/0

--More--

```

Ctrl+F6 to exit CLI focus

Ilustración 54 Router 12

```

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

Gateway of last resort is not set

172.31.0.0/16 is variably subnetted, 13 subnets, 3 masks
O   172.31.0.0/26 [110/129] via 172.31.2.37, 00:00:24, Serial0/1/1
O   172.31.0.64/26 [110/129] via 172.31.2.37, 00:00:24, Serial0/1/1
O   172.31.0.128/26 [110/65] via 172.31.2.37, 00:00:24, Serial0/1/1
O   172.31.0.192/26 [110/65] via 172.31.2.37, 00:00:24, Serial0/1/1
C   172.31.1.0/26 is directly connected, GigabitEthernet0/0/0.10
L   172.31.1.2/32 is directly connected, GigabitEthernet0/0/0.10
C   172.31.1.64/26 is directly connected, GigabitEthernet0/0/0.20
L   172.31.1.66/32 is directly connected, GigabitEthernet0/0/0.20
C   172.31.1.128/26 is directly connected, GigabitEthernet0/0/0.88
L   172.31.1.130/32 is directly connected, GigabitEthernet0/0/0.88
O   172.31.2.32/30 [110/128] via 172.31.2.37, 00:00:24, Serial0/1/1

```

Ilustración 55 Router Cundinamarca

- Servicio DHCP en el router Tunja, mediante el helper address, para los routers Bucaramanga y Cundinamarca.

Services configuration for DHCP on interface FastEthernet0:

- Interface: FastEthernet0
- Service: On Off
- Pool Name: serverPool
- Default Gateway: 209.17.220.2
- DNS Server: 0.0.0.0
- Start IP Address: 209.17.220.0
- Subnet Mask: 255.255.255.0
- Maximum Number of Users: 255
- TFTP Server: 172.31.1.129
- WLC Address: 0.0.0.0

Pool Name	Default Gateway	DNS Server	Start IP Address	Subnet Mask	Max User	TFTP Server	WLC Address
serverPool	0.0.0.0	0.0.0.0	209.17.220.0	255.255.255.0	255	0.0.0.0	0.0.0.0

Ilustración 56 Servidor Web Externo

- Configuración de NAT estático y de sobrecarga.

```

Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip nat inside source static 172.31.0.65 172.31.1.131
Router(config)#

```

Ilustración 57 Configuración de NAT Estático y de Sobrecarga Router Cundinamarca

```

Router(config)#ip nat pool 1 209.17.220.10 netmask 255.255.255.0
% Invalid input detected at '^' marker.

Router(config)#ip nat pool 1 209.17.220.10 209.17.220.10 netmask 255.255.255.0
Router(config)#ip nat inside source list 1 pool 1 overload
Router(config)#int
Router(config)#interface
% Incomplete command.
Router(config)#interface GigabitEthernet0/0/0
Router(config-if)#exit
Router(config)#interface GigabitEthernet0/0/0
Router(config-if)#ip nat inside
Router(config-if)#exit
Router(config)#interface GigabitEthernet0/0/0
Router(config-if)#ip nat outside
Router(config-if)#exit
Router(config)#
Router(config)#interface GigabitEthernet0/0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial0/1/0
Router(config-if)#ip nat inside
Router(config-if)#exit
Router(config)#
Router(config)#interface Serial0/1/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial0/1/1
Router(config-if)#ip nat inside
Router(config-if)#exit
Router(config)#

```

Ilustración 58 Configuración de NAT Estático y de Sobrecarga Router Tunja

Conclusión

Por medio de la elaboración del presente trabajo se pudo comprobar la importancia de las subredes en un entorno de trabajo o red de información, de igual manera se entendió la importancia en la seguridad de las mismas, por lo que se pudo poner en práctica los conocimientos adquiridos en el curso de redes de CISCO.

Se pudo realizar redes virtuales con sus respectivos protocolos de comunicación y de seguridad, tanto propios de CISCO como los externos, para obtener un óptimo rendimiento de la red.

Estos conocimientos son de gran importancia ya que nos toparemos con problemas como los presentados en el presente trabajo en el campo laboral.

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