



**DIPLOMADO DE PROFUNDIZACIÓN CISCO
DISEÑO E IMPLEMENTACIÓN DE SOLUCIONES
INTEGRADAS LAN /WAN**

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**UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA
ESCUELA DE CIENCIAS BÁSICAS TECNOLOGÍA E INGENIERÍAS
INGENIERÍA DE SISTEMAS
CEAD GIRARDOT
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PRUEBA DE HABILIDADES PRACTICAS CCNA

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**UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA
ESCUELA DE CIENCIAS BÁSICAS TECNOLOGÍA E INGENIERÍAS
INGENIERÍA DE SISTEMAS**

CEAD GIRARDOT

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Introducción

El presente trabajo se hace en respuesta a la previa solicitud hecha por el señor **Director Juan Carlos Vesga**, como trabajo final para la aprobación del Diplomado de profundización CISCO, diseño e implementación de soluciones integradas LAN / WAN como opción de grado.

Los siguientes escenarios son desarrollados mediante el software Packet Tracer, el cual simula la red del caso, en este proceso se utilizaron los conocimientos obtenidos durante todo el desarrollo del Diplomado, algunos de esos conocimientos, son comandos para la protección de acceso, conceptos aplicables para la configuración de redes mediante los protocolos y protocolos de seguridad entre otros.

Objetivos

- ✚ Conceptualizar la temática planteada en las unidades del curso de profundización.
- ✚ Aplicar dichas temáticas en cada uno de los escenarios propuestos.
- ✚ Utilizar la herramienta de simulación Packet Tracer de acuerdo a los requisitos establecidos.

Desarrollo de Actividades

Escenario 1

Una empresa posee sucursales distribuidas en las ciudades de Bogotá y Medellín, 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

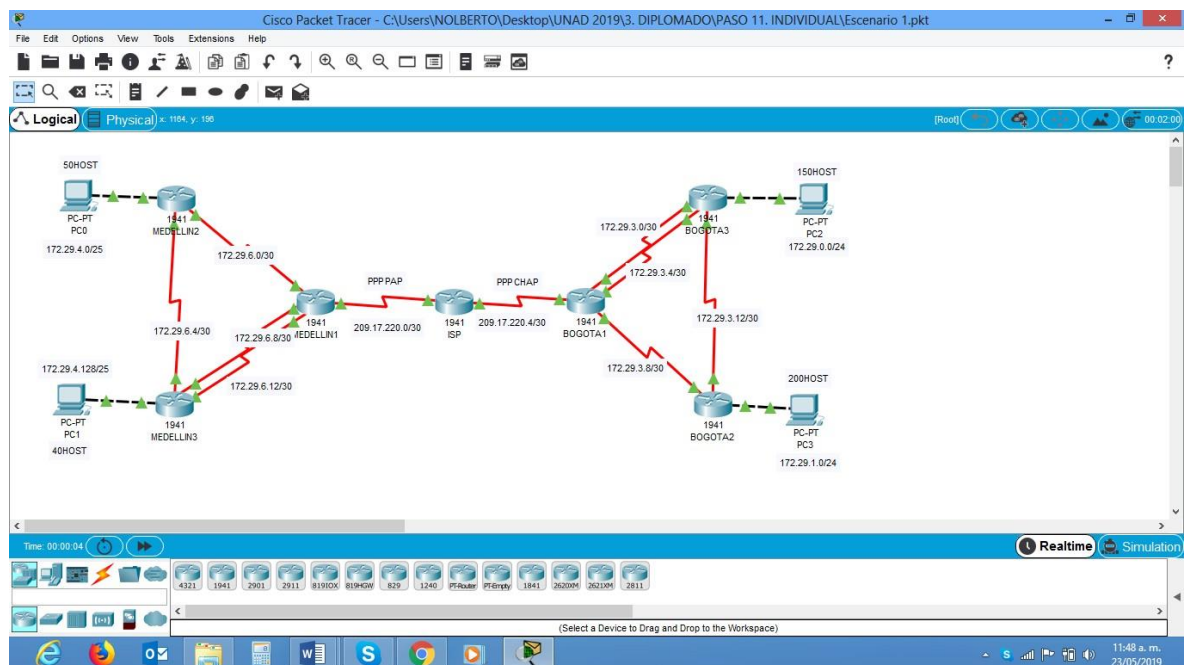
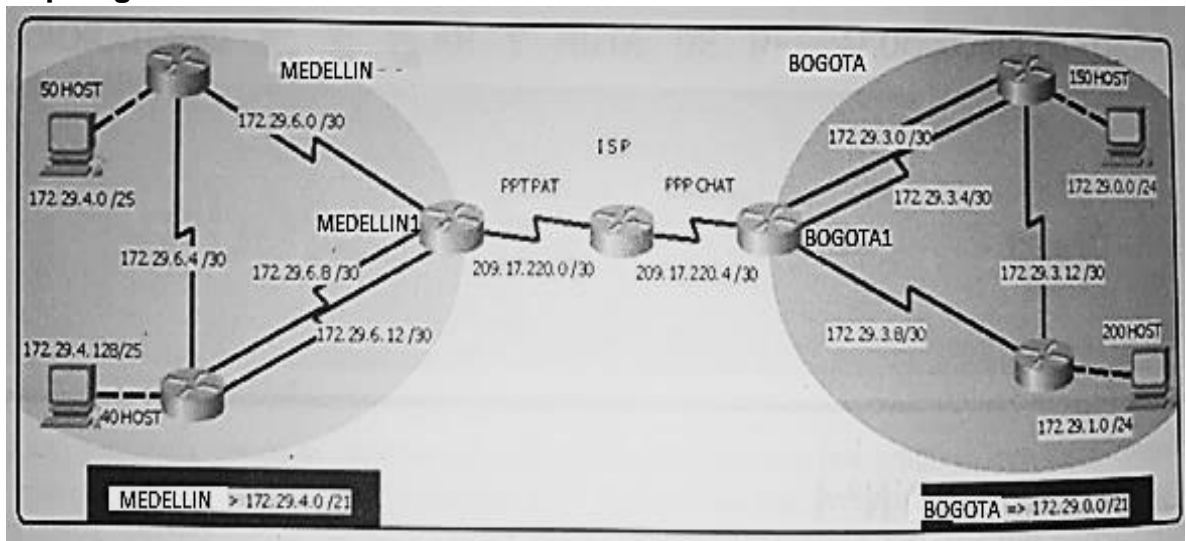


Ilustración 1 Topología Ejercicio 1

Configuración básica de dispositivos

Configuración Básica ISP

Hostname: **ISP**
Enable secret: **itsasecret**
Password Line Console 0: **cisco**
Password Line vty 0 15: **cisco**
Service password-encryption
Banner motd "Acceso solo al personal autorizado"

Configuración Básica MEDELLIN1

Hostname MEDELLIN
Enable secret: **itsasecret**
Password Line Console 0: **cisco**
Password Line vty 0 15: **cisco**
Service password-encryption
Banner motd "Acceso solo al personal autorizado"

Configuración Básica MEDELLIN2

Hostname MEDELLIN2
Enable secret: **itsasecret**
Password Line Console 0: **cisco**
Password Line vty 0 15: **cisco**
Service password-encryption
Banner motd "Acceso solo al personal autorizado"

Configuración Básica MEDELLIN3

Hostname MEDELLIN3
Enable secret: **itsasecret**
Password Line Console 0: **cisco**
Password Line vty 0 15: **cisco**
Service password-encryption
Banner motd "Acceso solo al personal autorizado"

Configuración Básica BOGOTA1

Hostname BOGOTA
Enable secret: **itsasecret**
Password Line Console 0: **cisco**
Password Line vty 0 15: **cisco**
Service password-encryption
Banner motd "Acceso solo al personal autorizado"

Configuración Básica BOGOTA2

```
Hostname BOGOTA2
Enable secret: itsasecret
Password Line Console 0: cisco
Password Line vty 0 15: cisco
Service password-encryption
Banner motd "Acceso solo al personal autorizado"
```

Configuración Básica BOGOTA3

```
Hostname BOGOTA3
Enable secret: itsasecret
Password Line Console 0: cisco
Password Line vty 0 15: cisco
Service password-encryption
Banner motd "Acceso solo al personal autorizado"
```

Configuración del protocolo RIP

Configuración RIPv2 en MEDELLIN1

```
Router rip
Version 2
No auto-summary
Do show ip route connected
Network 172.29.6.0
Network 172.29.6.8
Network 172.29.6.12
Passive-interface s0/0/0 (WAN A ISP).
```

Configuración RIPv2 en MEDELLIN2

```
Router rip
Version 2
No auto-summary
Do show ip route connected
Network 172.29.4.0
Network 172.29.6.0
Network 172.29.6.4
Passive-interface g0/0
```

Configuración RIPv2 en MEDELLIN3

```
Router rip
Version 2
No auto-summary
Do show ip route connected
Network 172.29.4.128
Network 172.29.6.4
Network 172.29.6.8
Network 172.29.6.12
Passive-interface g0/0
```

Configuración RIPv2 en BOGOTA1

```
Router rip
Version 2
No auto-summary
Do show ip route connected
Network 172.29.3.0
Network 172.29.3.4
Network 172.29.3.8
Passive-interface s0/0/0
```

Configuración RIPv2 en BOGOTA2

```
Router rip
Version 2
No auto-summary
Do show ip route connected
Network 172.29.1.0
Network 172.29.3.8
Network 172.29.3.12
Passive-interface g0/0
```

Configuración RIPv2 en BOGOTA3

```
Router rip
Version 2
No auto-summary
Do show ip route connected
Network 172.29.0.0
Network 172.29.3.0
Network 172.29.3.4
Network 172.29.3.12
Passive-interface g0/0
```

Configuración de Rutas Estáticas

Configuración Rutas Estáticas de MEDELLIN1 a ISP

Configure terminal

```
Ip route 0.0.0.0 0.0.0.0 209.17.220.1
```

Configuración Rutas Estáticas de BOGOTA1 a ISP

Configure terminal

```
Ip route 0.0.0.0 0.0.0.0 209.17.220.5
```

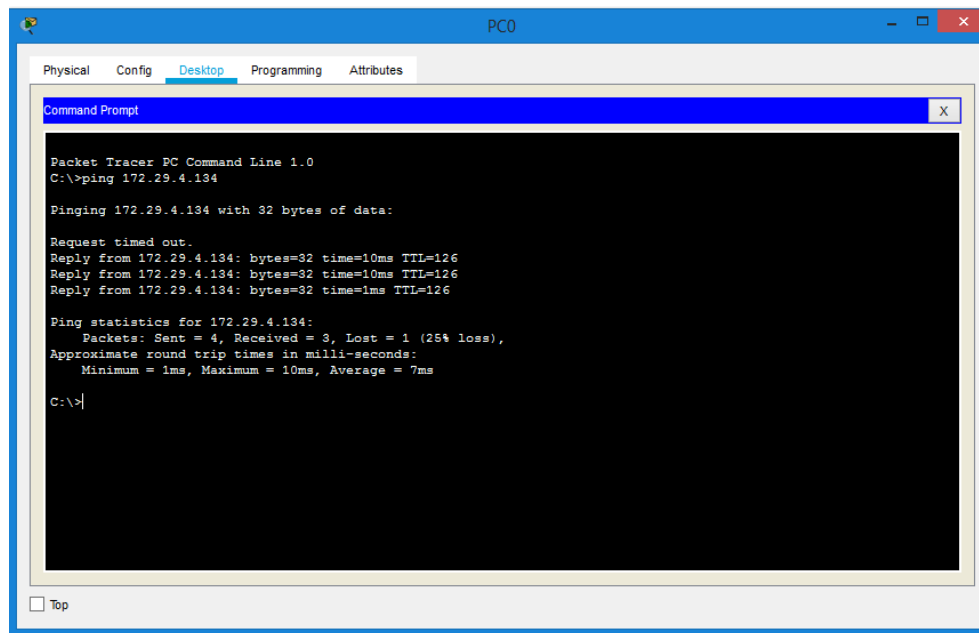
Configuración Rutas Estáticas de ISP

```
Ip route 172.29.4.0 255.255.252.0 209.17.220.2
```

```
Ip route 172.29.0.0 255.255.252.0 209.17.220.6
```

Pruebas de conectividad (mediante PING)

Ping de PC0 a PC1



The screenshot shows a Packet Tracer PC Command Line window for PC0. The window title is "PC0" and it has tabs for "Physical", "Config", "Desktop", "Programming", and "Attributes". The "Desktop" tab is active, showing a "Command Prompt" window. The Command Prompt displays the following text:

```
Packet Tracer PC Command Line 1.0
C:\>ping 172.29.4.134

Pinging 172.29.4.134 with 32 bytes of data:

Request timed out.
Reply from 172.29.4.134: bytes=32 time=10ms TTL=126
Reply from 172.29.4.134: bytes=32 time=10ms TTL=126
Reply from 172.29.4.134: bytes=32 time=1ms TTL=126

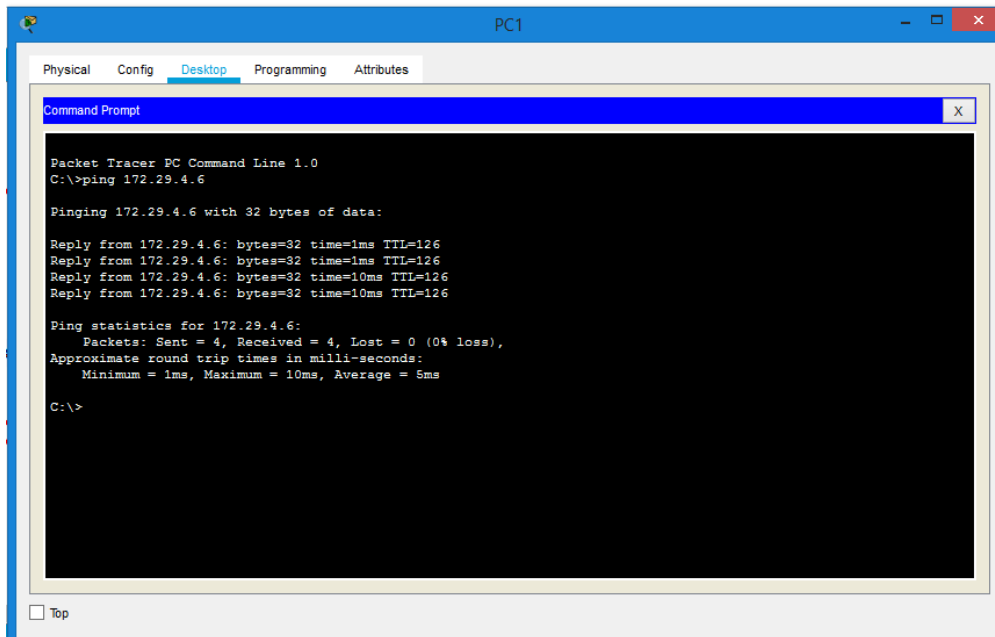
Ping statistics for 172.29.4.134:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 10ms, Average = 7ms

C:\>|
```

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

Ilustración 2, Ping de PC0 a PC1

Ping de PC1 a PC0



The screenshot shows a Packet Tracer PC Command Line window for PC1. The user has entered the command 'ping 172.29.4.6'. The output shows four successful replies with 32 bytes of data, response times of 1ms and 10ms, and a TTL of 126. The statistics indicate 4 packets sent, 4 received, and 0% loss.

```
Packet Tracer PC Command Line 1.0
C:\>ping 172.29.4.6

Pinging 172.29.4.6 with 32 bytes of data:

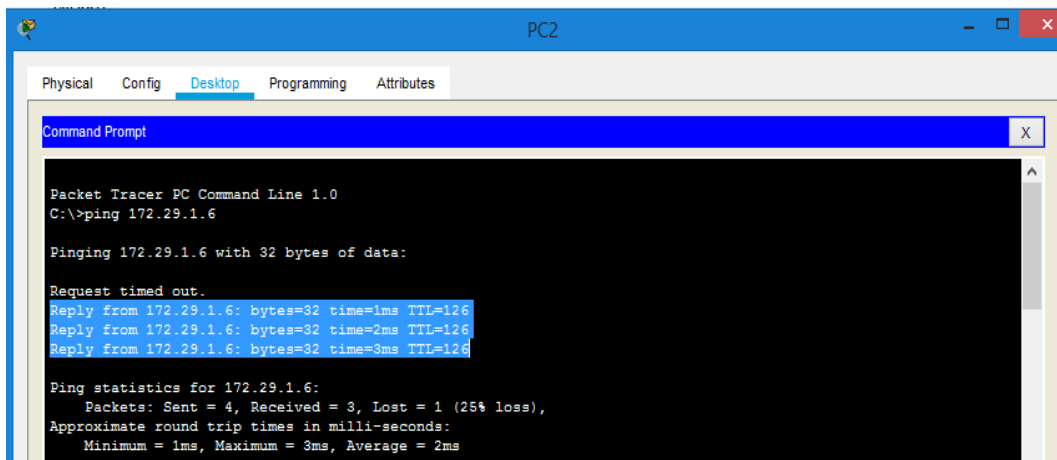
Reply from 172.29.4.6: bytes=32 time=1ms TTL=126
Reply from 172.29.4.6: bytes=32 time=1ms TTL=126
Reply from 172.29.4.6: bytes=32 time=10ms TTL=126
Reply from 172.29.4.6: bytes=32 time=10ms TTL=126

Ping statistics for 172.29.4.6:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 10ms, Average = 5ms

C:\>
```

Ilustración 3, Ping de PC1 a PC0

Ping de PC2 a PC3



The screenshot shows a Packet Tracer PC Command Line window for PC2. The user has entered the command 'ping 172.29.1.6'. The output shows one request timed out and three successful replies with 32 bytes of data, response times of 1ms, 2ms, and 3ms, and a TTL of 126. The statistics indicate 4 packets sent, 3 received, and 25% loss.

```
Packet Tracer PC Command Line 1.0
C:\>ping 172.29.1.6

Pinging 172.29.1.6 with 32 bytes of data:

Request timed out.
Reply from 172.29.1.6: bytes=32 time=1ms TTL=126
Reply from 172.29.1.6: bytes=32 time=2ms TTL=126
Reply from 172.29.1.6: bytes=32 time=3ms TTL=126

Ping statistics for 172.29.1.6:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 3ms, Average = 2ms
```

Ilustración 4, Ping de PC2 a PC3

Ping de ISP a PC0

The screenshot displays a network simulation interface. On the left, a network diagram shows a topology with several hosts and routers. Hosts include 50HOST, PC-PT PC0 (IP 172.29.4.0/25), PC-PT FC1 (IP 172.29.4.128/25), and 40HOST. Routers are labeled MEDELLIN2, MEDELLIN1, MEDELLIN3, and ISP. IP addresses and interface identifiers are shown for various connections. On the right, a terminal window titled 'ISP' shows the following output:

```
IOS Command Line Interface

memory:
Processor board ID FTX152400KS
2 Gigabit Ethernet interface(s)
2 Low-speed serial(sync/async) network interface(s)
DRAM configuration is 64 bits wide with parity disabled.
265K bytes of non-volatile configuration memory.
249866K bytes of ATA System CompactFlash 0 (Read/Write)

Press RETURN to get started!

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

ISP>ping 172.29.4.6
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to 172.29.4.6, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 2/3/7 ms
ISP>
```

Ilustración 5, Ping de ISP a pPC0

Ping de ISP a BOGOTA1

The screenshot displays a network simulation interface. On the left, a network diagram shows a topology with several hosts and routers. Hosts include 50HOST, PC-PT PC0 (IP 172.29.4.0/25), PC-PT FC1 (IP 172.29.4.128/25), 40HOST, and 150HOST. Routers are labeled MEDELLIN2, MEDELLIN1, ISP, BOGOTA1, BOGOTA2, and BOGOTA3. IP addresses and interface identifiers are shown for various connections. On the right, a terminal window titled 'ISP' shows the following output:

```
IOS Command Line Interface

2 Low-speed serial(sync/async) network interface(s)
DRAM configuration is 64 bits wide with parity disabled.
265K bytes of non-volatile configuration memory.
249866K bytes of ATA System CompactFlash 0 (Read/Write)

Press RETURN to get started!

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

ISP>enable
ISP#ping 209.17.220.6
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to 209.17.220.6, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 2/3/19 ms
ISP>
```

Ilustración 6, Ping de ISP a BOGOTA1

Ping de ISP a PC2

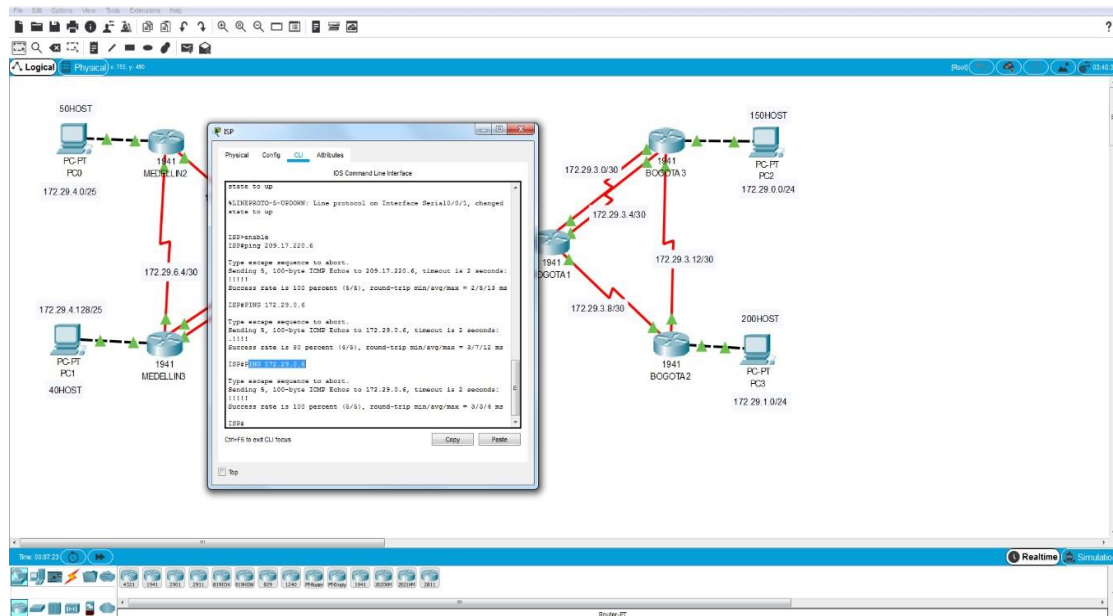


Ilustración 7, Ping de IPS a PC2

Ping de PC2 a ISP

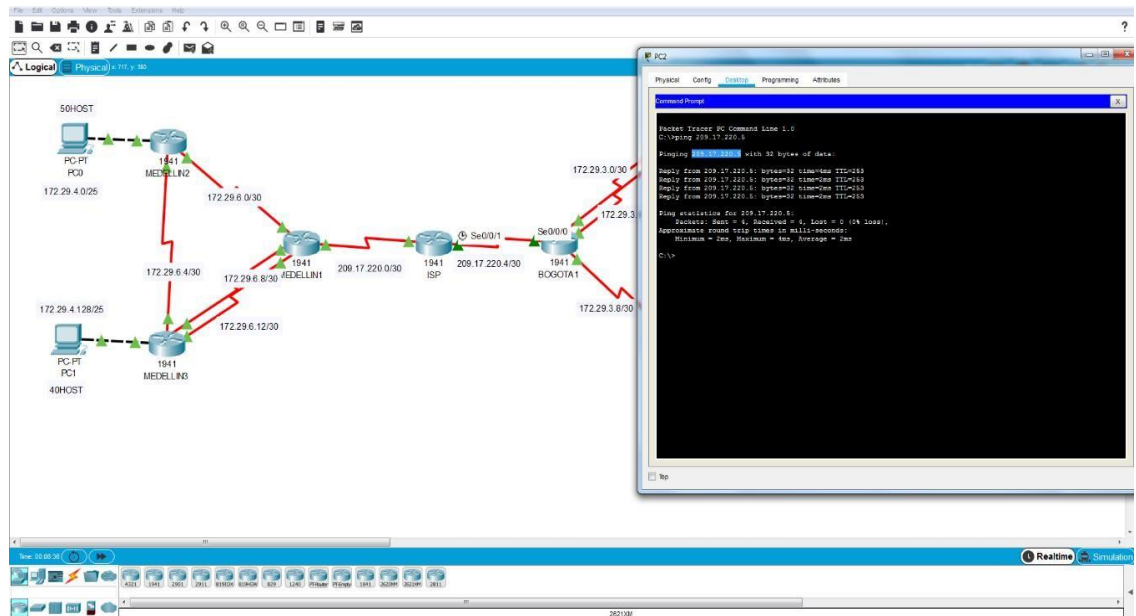


Ilustración 8, Ping de PC2 a ISP

Ping de PC2 a PC0 (EXTREMO A EXTREMO)

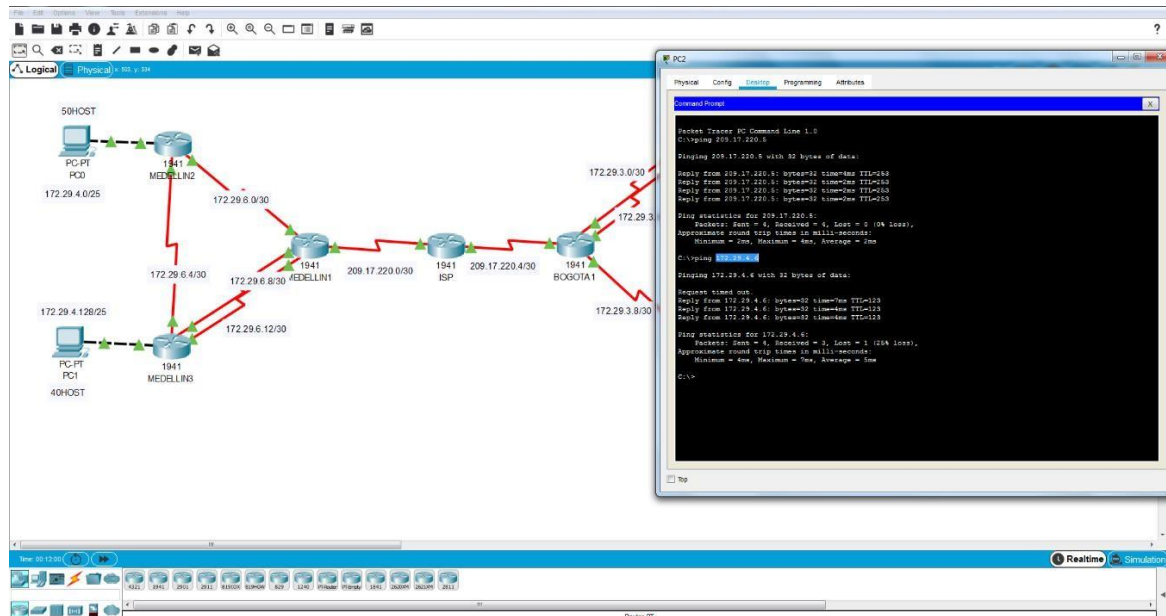


Ilustración 9, Ping de PC2 a PC0 (extremo a extremo)

Ping de PC0 a PC2 (EXTREMO A EXTREMO)

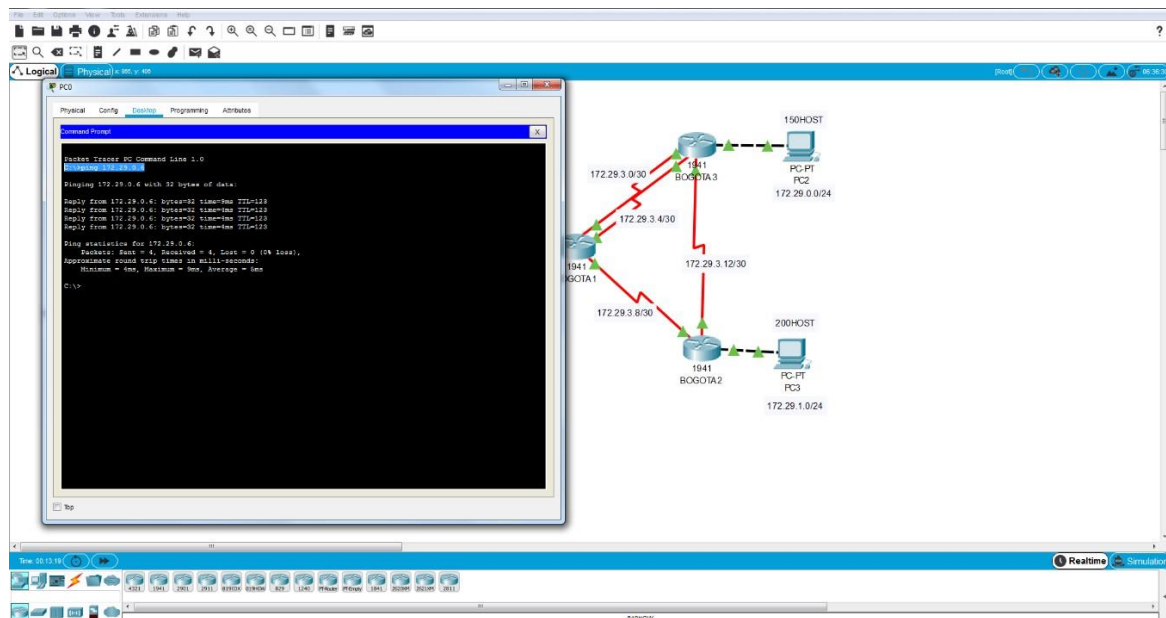
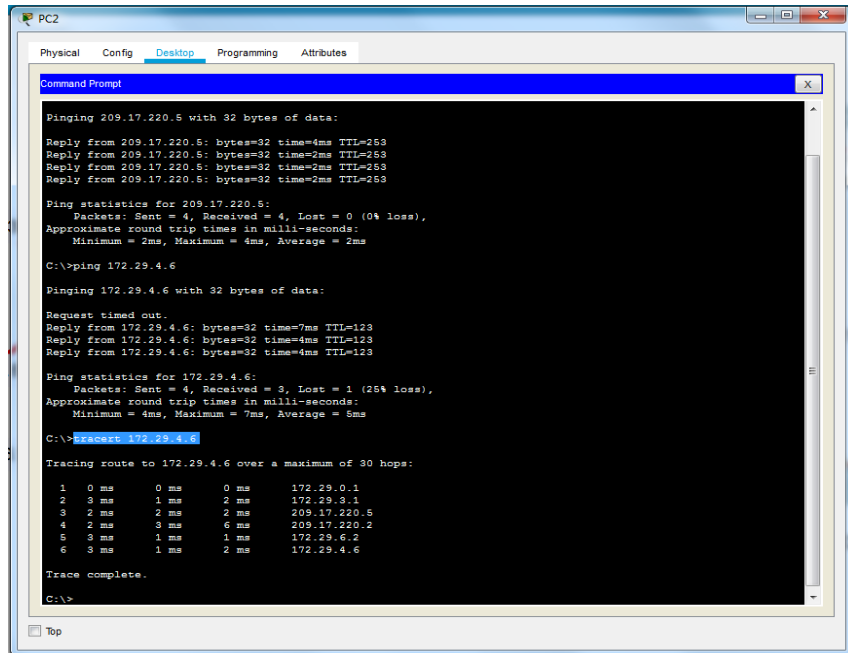


Ilustración 10, Ping de PC0 a PC2 (extremo a extremo)

Pruebas extremo a extremo con traceroute.

Tracert route de PC2 a PC0



```
PC2
Physical Config Desktop Programming Attributes
Command Prompt
Pinging 209.17.220.5 with 32 bytes of data:
Reply from 209.17.220.5: bytes=32 time=4ms TTL=253
Reply from 209.17.220.5: bytes=32 time=2ms TTL=253
Reply from 209.17.220.5: bytes=32 time=2ms TTL=253
Reply from 209.17.220.5: bytes=32 time=2ms TTL=253

Ping statistics for 209.17.220.5:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 4ms, Average = 2ms

C:\>ping 172.29.4.6

Pinging 172.29.4.6 with 32 bytes of data:
Request timed out.
Reply from 172.29.4.6: bytes=32 time=7ms TTL=123
Reply from 172.29.4.6: bytes=32 time=4ms TTL=123
Reply from 172.29.4.6: bytes=32 time=4ms TTL=123

Ping statistics for 172.29.4.6:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 4ms, Maximum = 7ms, Average = 5ms

C:\>tracert 172.29.4.6

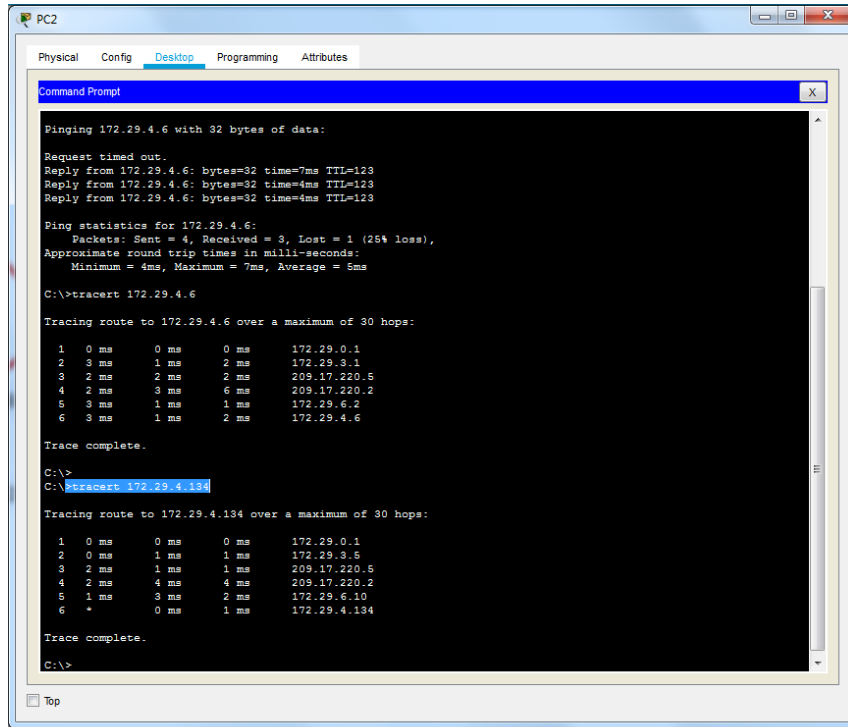
Tracing route to 172.29.4.6 over a maximum of 30 hops:
  0  0 ms    0 ms    0 ms    172.29.0.1
  1  3 ms    1 ms    2 ms    172.29.3.1
  2  2 ms    2 ms    2 ms    209.17.220.5
  3  2 ms    3 ms    6 ms    209.17.220.2
  4  3 ms    1 ms    1 ms    172.29.6.2
  5  3 ms    1 ms    2 ms    172.29.4.6

Trace complete.

C:\>
```

Ilustración 11, Tracert Route de PC2 a PC0

Tracert route de PC2 a PC1.



```
PC2
Physical Config Desktop Programming Attributes
Command Prompt
Pinging 172.29.4.6 with 32 bytes of data:
Request timed out.
Reply from 172.29.4.6: bytes=32 time=7ms TTL=123
Reply from 172.29.4.6: bytes=32 time=4ms TTL=123
Reply from 172.29.4.6: bytes=32 time=4ms TTL=123

Ping statistics for 172.29.4.6:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 4ms, Maximum = 7ms, Average = 5ms

C:\>tracert 172.29.4.6

Tracing route to 172.29.4.6 over a maximum of 30 hops:
  1  0 ms    0 ms    0 ms    172.29.0.1
  2  3 ms    1 ms    2 ms    172.29.3.1
  3  2 ms    2 ms    2 ms    209.17.220.5
  4  2 ms    3 ms    6 ms    209.17.220.2
  5  3 ms    1 ms    1 ms    172.29.6.2
  6  3 ms    1 ms    2 ms    172.29.4.6

Trace complete.

C:\>
C:\>tracert 172.29.4.134

Tracing route to 172.29.4.134 over a maximum of 30 hops:
  1  0 ms    0 ms    0 ms    172.29.0.1
  2  0 ms    1 ms    1 ms    172.29.3.5
  3  2 ms    1 ms    1 ms    209.17.220.5
  4  2 ms    4 ms    4 ms    209.17.220.2
  5  1 ms    3 ms    2 ms    172.29.6.10
  6  *      0 ms    1 ms    172.29.4.134

Trace complete.

C:\>
```

Ilustración 12, Tracert Route de PC2 a PC1

Configuración de autenticación PAP

Configuración Básica ISP

Hostname ISP

Configuración Básica MEDELLIN1

Hostname MEDELLIN

Configuración Básica BOGOTA1

Hostname BOGOTA

Autenticación PPP PAP EN ISP

```
Username MEDELLIN password cisco
Interface s0/0/0
Encapsulation ppp
Ppp authentication pap
Ppp pap sent-username ISP password cisco
```

Autenticación PPP PAP EN MEDELLIN1

```
Username ISP password cisco
Interface s0/0/0
Encapsulation ppp
Ppp authentication pap
Ppp pap sent-username MEDELLIN password cisco
```

Configuración de autenticación CHAP

Autenticación PPP CHAP EN ISP

```
Username BOGOTA password cisco
Interface s0/0/1
Encapsulation ppp
Ppp authentication chap
```

Autenticación PPP CHAP EN BOGOTA1

```
Username ISP password cisco
Interface s0/0/0
Encapsulation ppp
Ppp authentication chap
```

Configuración DHCP

Configuración DHCP EN MEDELLIN2

```
Ip dhcp excluded-address 172.29.4.1 172.29.4.5  
Ip dhcp excluded-address 172.29.4.129 172.29.4.133
```

Ip dhcp pool MED2

```
Network 172.29.4.0 255.255.255.128  
Default-router 172.29.4.1  
Dns-server 8.8.8.8
```

Ip dhcp pool MED3

```
Network 172.29.4.128 255.255.255.128  
Default-router 172.29.4.129  
Dns-server 8.8.8.8
```

Configuración DHCP EN MEDELLIN3

```
Configure terminal  
Interface g0/0  
Ip helper-address 172.29.6.5
```

Configuración DHCP EN BOGOTA2

```
Ip dhcp excluded-address 172.29.1.1 172.29.1.5  
Ip dhcp excluded-address 172.29.0.1 172.29.0.5  
Ip dhcp pool BOG2  
Network 172.29.1.0 255.255.255.0  
Default-router 172.29.1.1  
Dns-server 8.8.8.8  
Ip dhcp pool BOG3  
Network 172.29.0.0 255.255.255.0  
Default-router 172.29.0.1  
Dns-server 8.8.8.8
```

Configuración DHCP EN BOGOTA3

```
Configure terminal  
Interface g0/0  
Ip helper-address 172.29.3.13
```

Verificación del servicio DHCP en funcionamiento en ambos extremos.

Verificación del servicio DHCP en funcionamiento en PC0

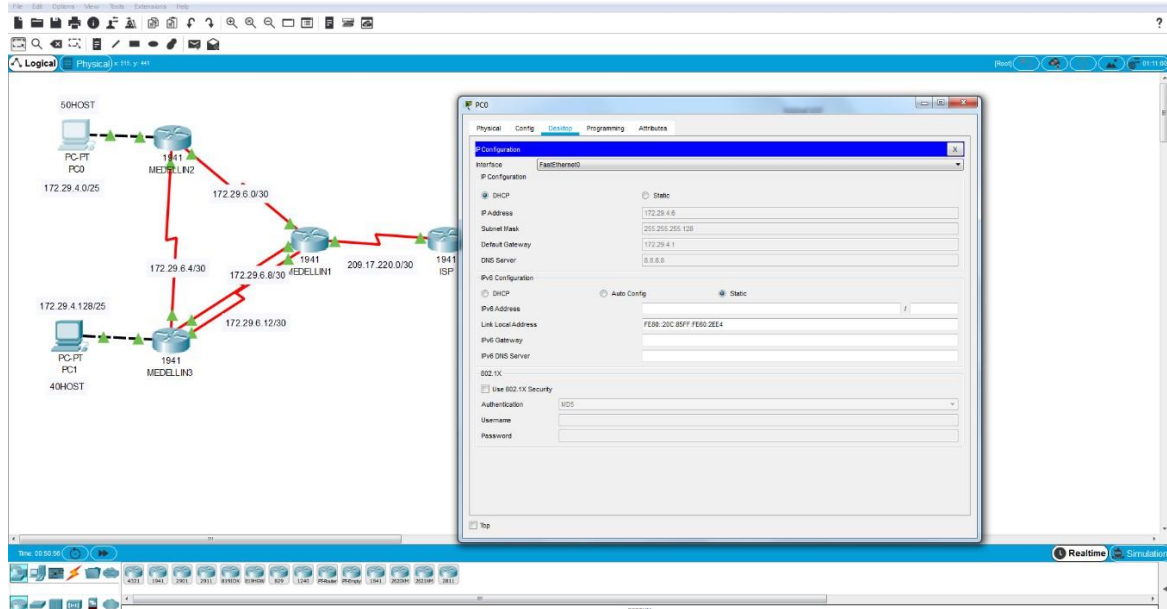


Ilustración 13, Verificación del servicio DHCP en funcionamiento en PC0

Verificación del servicio DHCP en funcionamiento en PC1

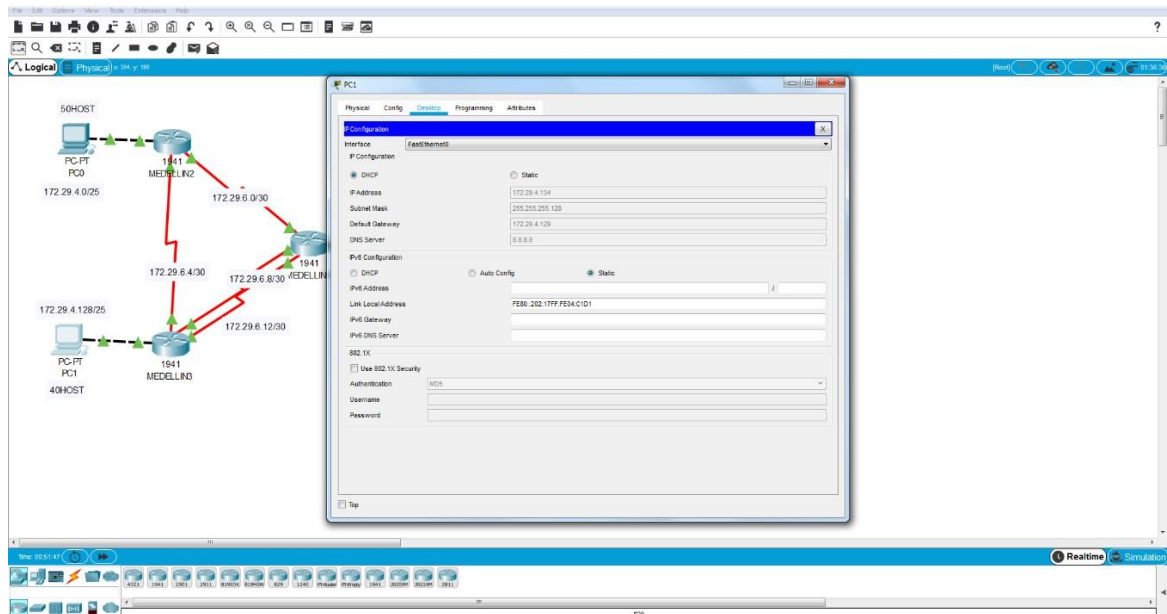


Ilustración 14, Verificación del servicio DHCP en funcionamiento en PC1

Verificación del servicio DHCP en funcionamiento en PC2

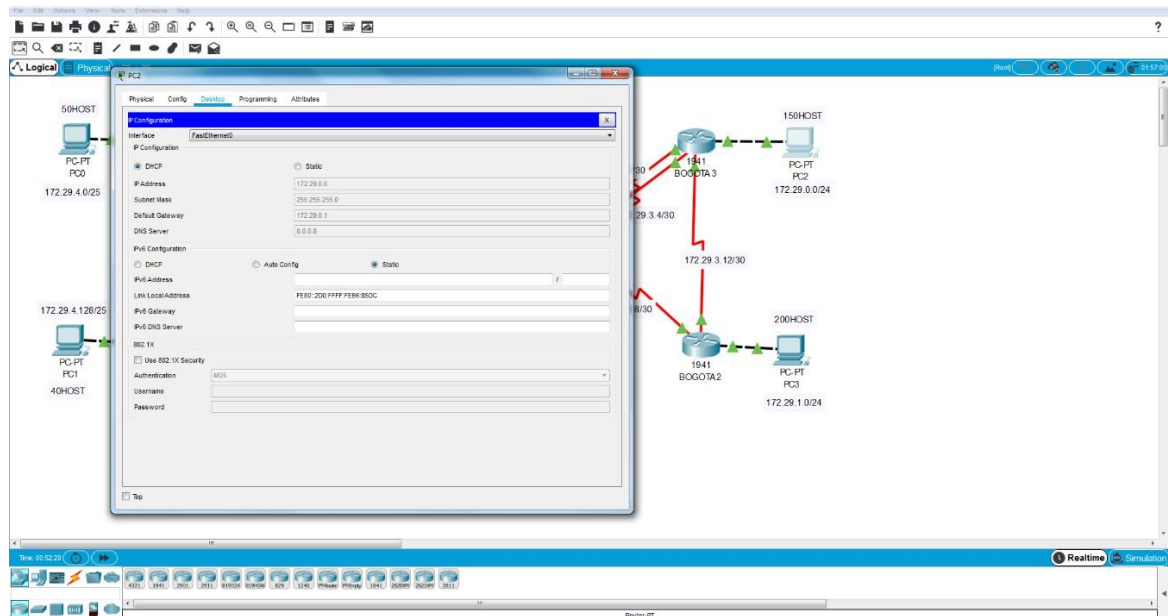


Ilustración 15, Verificación del servicio DHCP en funcionamiento en PC2

Verificación del servicio DHCP en funcionamiento en PC3

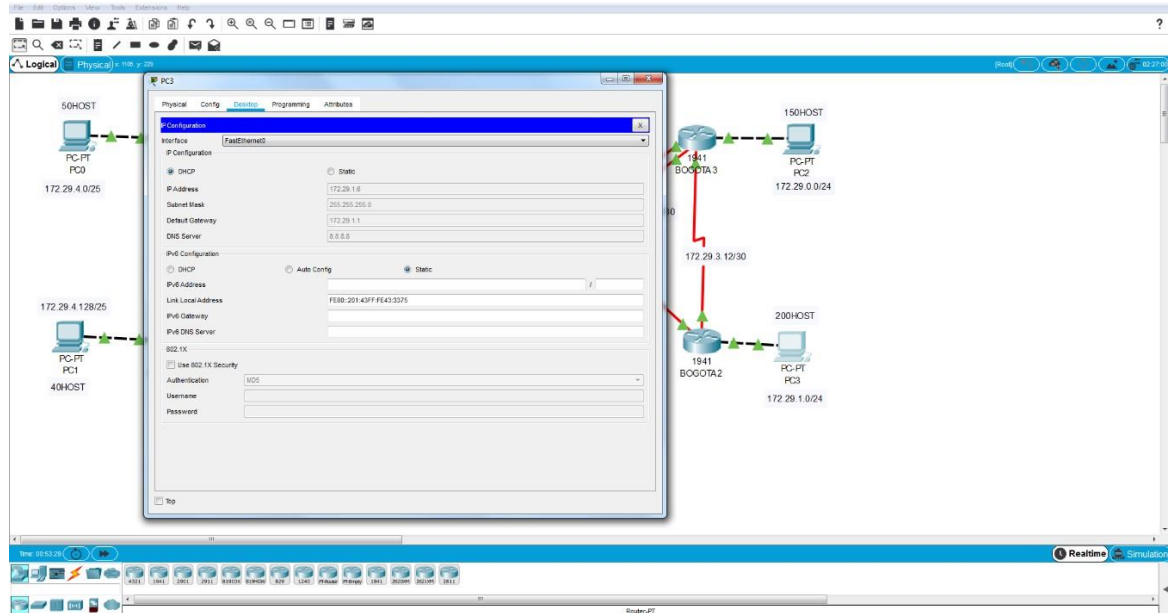


Ilustración 16, Verificación del servicio DHCP en funcionamiento en PC3

Configuración de NAT

NAT en MEDELLIN1

Configure terminal

Ip nat inside source list 1 interface s0/0/0 overload

Access-list 1 permit 172.29.4.0 0.0.3.255

Int s0/0/0

Ip nat outside

Int s0/0/1

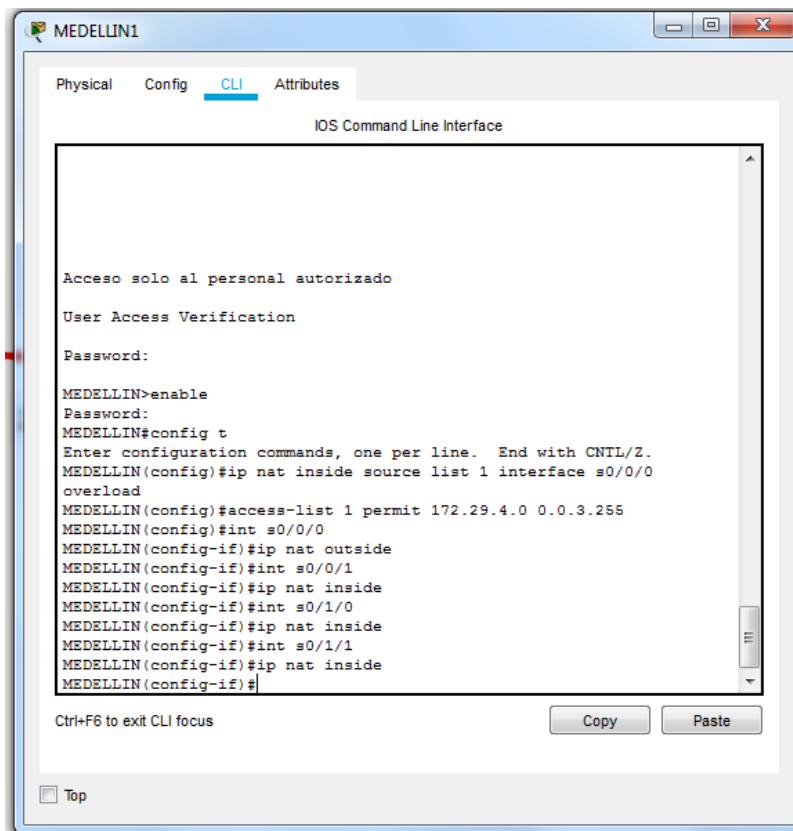
Ip nat inside

Int s0/1/0

Ip nat inside

Int s0/1/1

Ip nat inside



The screenshot shows a terminal window titled 'MEDELLIN1' 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 sequence of commands and responses:

```
Acceso solo al personal autorizado
User Access Verification
Password:
MEDELLIN>enable
Password:
MEDELLIN#config t
Enter configuration commands, one per line. End with CNTL/Z.
MEDELLIN(config)#ip nat inside source list 1 interface s0/0/0
overload
MEDELLIN(config)#access-list 1 permit 172.29.4.0 0.0.3.255
MEDELLIN(config)#int s0/0/0
MEDELLIN(config-if)#ip nat outside
MEDELLIN(config-if)#int s0/0/1
MEDELLIN(config-if)#ip nat inside
MEDELLIN(config-if)#int s0/1/0
MEDELLIN(config-if)#ip nat inside
MEDELLIN(config-if)#int s0/1/1
MEDELLIN(config-if)#ip nat inside
MEDELLIN(config-if)#
```

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

Ilustración 17, NAT en MEDELLIN1

NAT en BOGOTA1

Configure terminal

Ip nat inside source list 1 interface s0/0/0 overload

Access-list 1 permit 172.29.0.0 0.0.3.255

Int s0/0/0

Ip nat outside

Int s0/0/1

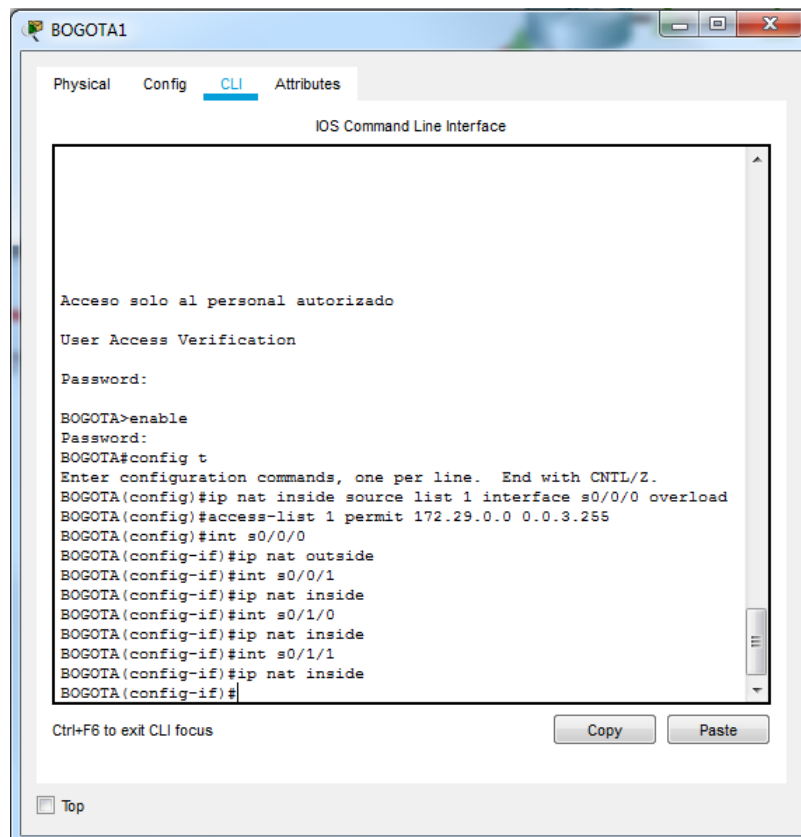
Ip nat inside

Int s0/1/0

Ip nat inside

Int s0/1/1

Ip nat inside



```
BOGOTA1
Physical Config CLI Attributes
IOS Command Line Interface

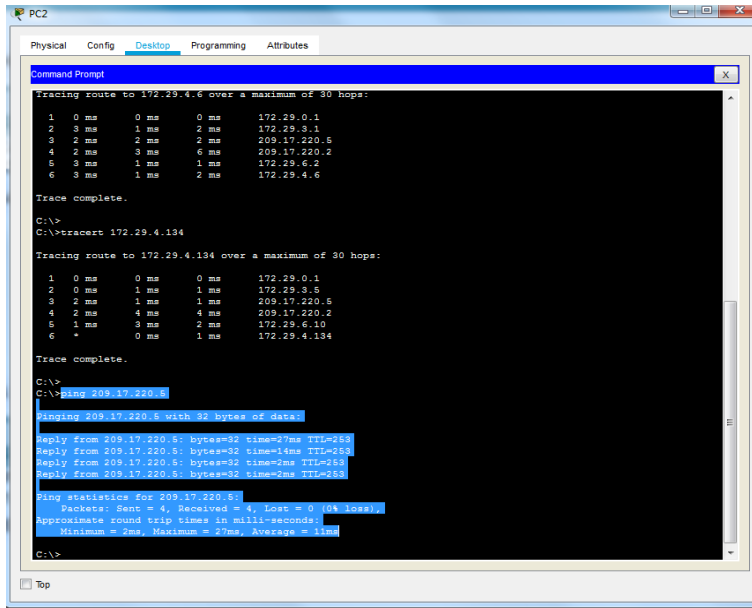
Acceso solo al personal autorizado
User Access Verification
Password:

BOGOTA>enable
Password:
BOGOTA#config t
Enter configuration commands, one per line. End with CNTL/Z.
BOGOTA(config)#ip nat inside source list 1 interface s0/0/0 overload
BOGOTA(config)#access-list 1 permit 172.29.0.0 0.0.3.255
BOGOTA(config)#int s0/0/0
BOGOTA(config-if)#ip nat outside
BOGOTA(config-if)#int s0/0/1
BOGOTA(config-if)#ip nat inside
BOGOTA(config-if)#int s0/1/0
BOGOTA(config-if)#ip nat inside
BOGOTA(config-if)#int s0/1/1
BOGOTA(config-if)#ip nat inside
BOGOTA(config-if)#
BOGOTA(config-if)#

Ctrl+F6 to exit CLI focus
Copy Paste
Top
```

Ilustración 18, NAT en BOGOTA1

Ping pc2 a isp



```
PC2
Physical Config Desktop Programming Attributes
Command Prompt
Tracing route to 172.29.4.6 over a maximum of 30 hops:
  0  0 ms  0 ms  0 ms  172.29.0.1
  1  3 ms  1 ms  2 ms  172.29.3.1
  2  2 ms  2 ms  2 ms  209.17.220.5
  3  2 ms  3 ms  6 ms  209.17.220.2
  4  3 ms  1 ms  1 ms  172.29.6.2
  5  3 ms  1 ms  2 ms  172.29.4.6
Trace complete.

C:\>
C:\>tracert 172.29.4.134

Tracing route to 172.29.4.134 over a maximum of 30 hops:
  0  0 ms  0 ms  0 ms  172.29.0.1
  1  0 ms  1 ms  1 ms  172.29.3.6
  2  2 ms  1 ms  1 ms  209.17.220.5
  3  2 ms  1 ms  2 ms  172.29.6.10
  4  1 ms  0 ms  1 ms  172.29.4.134
Trace complete.

C:\>
C:\>ping 209.17.220.5

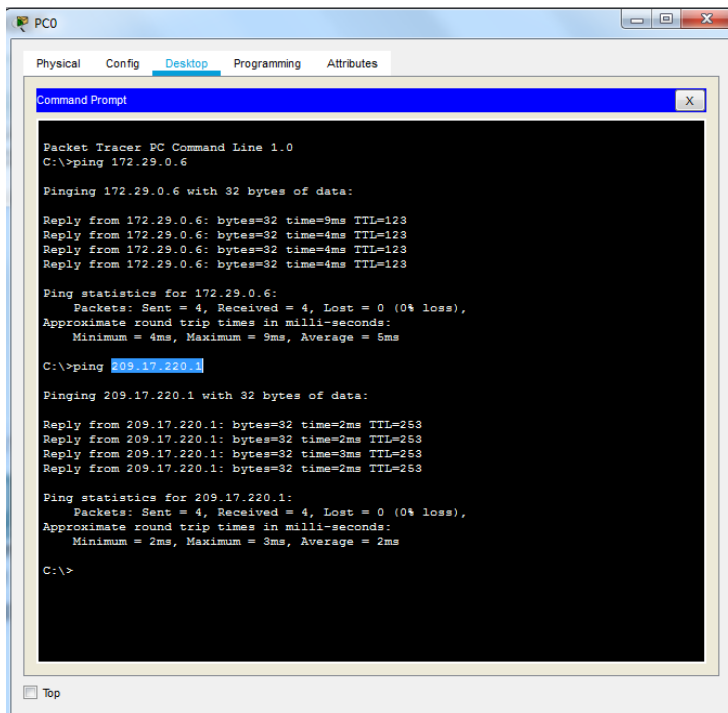
Pinging 209.17.220.5 with 32 bytes of data:
Reply from 209.17.220.5: bytes=32 time=2ms TTL=253
Reply from 209.17.220.5: bytes=32 time=4ms TTL=253
Reply from 209.17.220.5: bytes=32 time=2ms TTL=253
Reply from 209.17.220.5: bytes=32 time=2ms TTL=253

Ping statistics for 209.17.220.5:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 4ms, Average = 3ms

C:\>
```

Ilustración 19, Ping PC2 a ISP (Ping satisfactorio)

Ping satisfactorio. Ping PC0 a isp



```
PC0
Physical Config Desktop Programming Attributes
Command Prompt
Packet Tracer PC Command Line 1.0
C:\>ping 172.29.0.6

Pinging 172.29.0.6 with 32 bytes of data:

Reply from 172.29.0.6: bytes=32 time=9ms TTL=123
Reply from 172.29.0.6: bytes=32 time=4ms TTL=123
Reply from 172.29.0.6: bytes=32 time=4ms TTL=123
Reply from 172.29.0.6: bytes=32 time=4ms TTL=123

Ping statistics for 172.29.0.6:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 4ms, Maximum = 9ms, Average = 5ms

C:\>ping 209.17.220.1

Pinging 209.17.220.1 with 32 bytes of data:

Reply from 209.17.220.1: bytes=32 time=2ms TTL=253
Reply from 209.17.220.1: bytes=32 time=2ms TTL=253
Reply from 209.17.220.1: bytes=32 time=3ms TTL=253
Reply from 209.17.220.1: bytes=32 time=2ms TTL=253

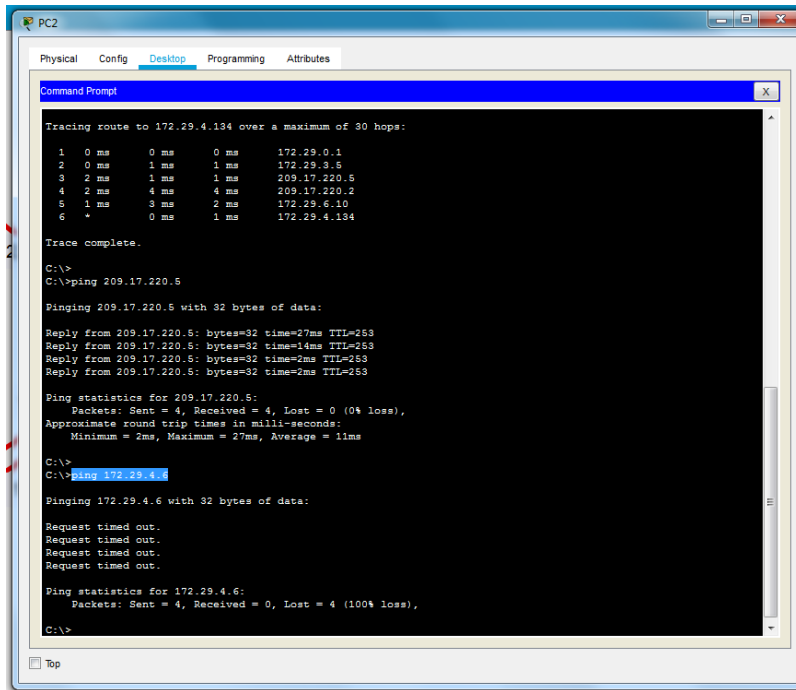
Ping statistics for 209.17.220.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 3ms, Average = 2ms

C:\>
```

Ilustración 20, Ping PC0 a ISP (Ping satisfactorio)

Ping satisfactorio.

Ping de PC2 a PC0



```
PC2
Physical Config Desktop Programming Attributes
Command Prompt
Tracing route to 172.29.4.134 over a maximum of 30 hops:
  0  0 ms  0 ms  0 ms  172.29.0.1
  1  0 ms  1 ms  1 ms  172.29.9.5
  2  2 ms  1 ms  1 ms  209.17.220.5
  3  2 ms  4 ms  4 ms  209.17.220.2
  4  1 ms  3 ms  2 ms  172.29.6.10
  5  *      0 ms  1 ms  172.29.4.134
Trace complete.
C:\>
C:\>ping 209.17.220.5
Pinging 209.17.220.5 with 32 bytes of data:
Reply from 209.17.220.5: bytes=32 time=27ms TTL=253
Reply from 209.17.220.5: bytes=32 time=14ms TTL=253
Reply from 209.17.220.5: bytes=32 time=2ms TTL=253
Reply from 209.17.220.5: bytes=32 time=2ms TTL=253
Ping statistics for 209.17.220.5:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 27ms, Average = 11ms
C:\>
C:\>ping 172.29.4.6
Pinging 172.29.4.6 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Ping statistics for 172.29.4.6:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>
```

Ilustración 21, Ping de PC2 a PC0 (Ping fallido)

Ping fallido, porque NAT lo bloquea.

Escenario 2

Una empresa de tecnología posee tres sucursales distribuidas en las ciudades de Miami, Bogotá y Buenos Aires, en donde el estudiante será el administrador de la red, el cual deberá configurar e interconectar entre si 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

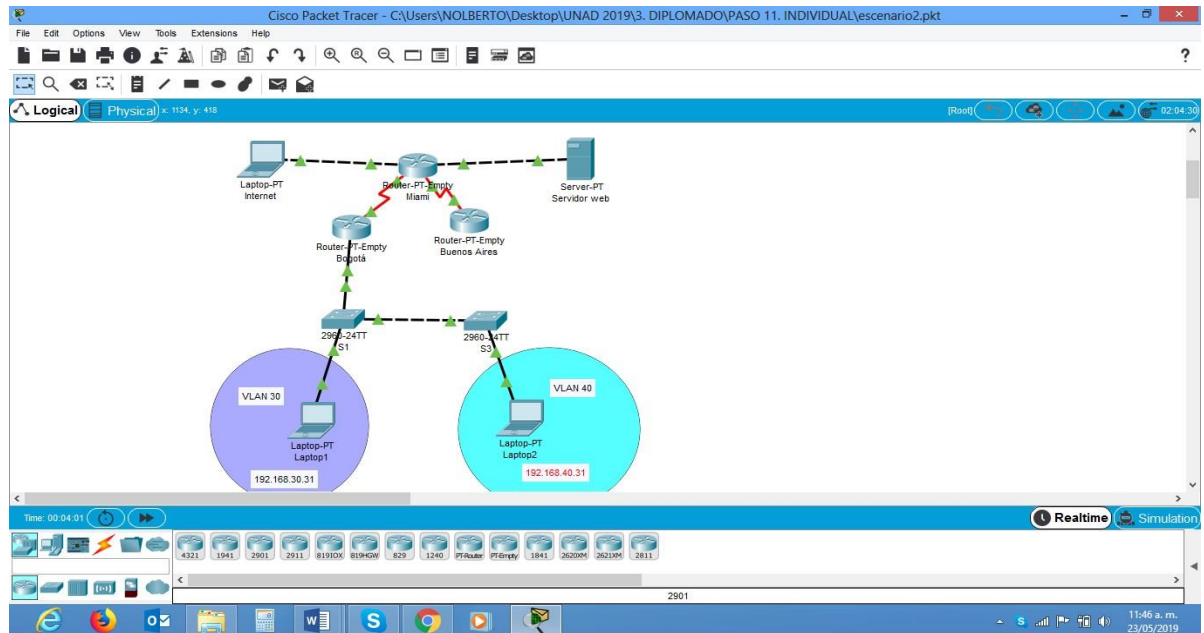
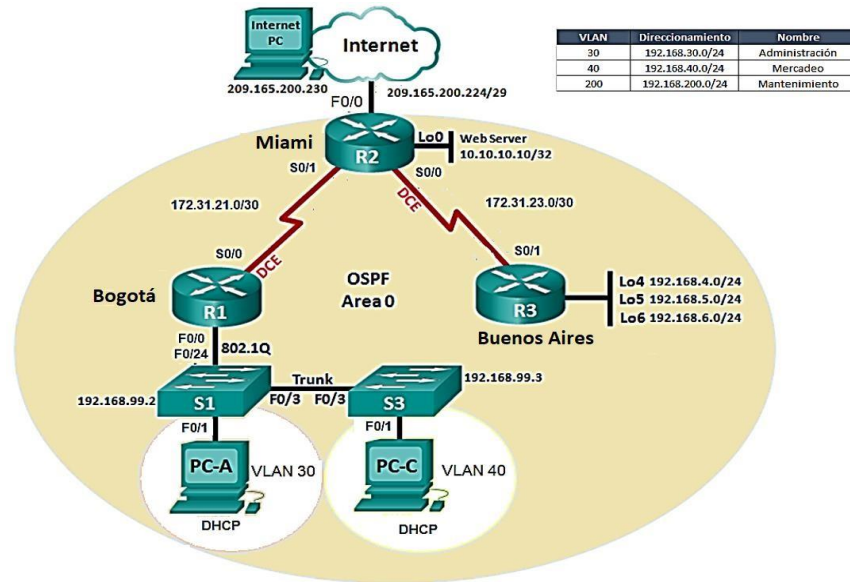


Ilustración 22, Topología Ejercicio 2

Verificar información de OSPF

Visualizar tablas de enrutamiento y routers conectados por OSPFv2

Router Bogotá

```
bogota#show ip ospf database
      OSPF Router with ID (1.1.1.1) (Process ID 1)

      Router Link States (Area 0)

Link ID        ADV Router    Age           Seq#           Checksum Link count
1.1.1.1        1.1.1.1      510           0x80000013    0x001f39 5
5.5.5.5        5.5.5.5      1397          0x8000000f    0x00e46a 6
8.8.8.8        8.8.8.8      504           0x80000010    0x00ca45 2
bogota#
```

Ilustración 23, Tabla de enrutamiento y routers conectados por OSPFv2 (Router Bogotá)

Router Buenos Aires

```
BuenosAires#show ip ospf database
      OSPF Router with ID (8.8.8.8) (Process ID 1)

      Router Link States (Area 0)

Link ID        ADV Router    Age           Seq#           Checksum Link count
8.8.8.8        8.8.8.8      549           0x80000010    0x00ca45 2
5.5.5.5        5.5.5.5      1443          0x8000000f    0x00e46a 6
1.1.1.1        1.1.1.1      556           0x80000013    0x001f39 5
BuenosAires#
```

Ilustración 24, Tabla de enrutamiento y routers conectados por OSPFv2 (Router Buenos Aires)

Router Miami

```
miami#show ip ospf database
      OSPF Router with ID (5.5.5.5) (Process ID 1)

      Router Link States (Area 0)

Link ID        ADV Router    Age           Seq#           Checksum Link count
5.5.5.5        5.5.5.5      1475          0x8000000f    0x00e46a 6
1.1.1.1        1.1.1.1      590           0x80000013    0x001f39 5
8.8.8.8        8.8.8.8      583           0x80000010    0x00ca45 2
miami#
```

Ilustración 25, Tabla de enrutamiento y routers conectados por OSPFv2 (Router Miami)

Visualizar lista resumida de interfaces por OSPF en donde se ilustre el costo de cada interface

Router Bogotá

```
FastEthernet4/0.200 is up, line protocol is up
  Internet address is 192.168.200.1/24, Area 0
  Process ID 1, Router ID 1.1.1.1, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 1.1.1.1, Interface address 192.168.200.1
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:02
  Index 3/3, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
Serial0/0 is up, line protocol is up
  Internet address is 172.31.21.1/30, Area 0
  Process ID 1, Router ID 1.1.1.1, Network Type POINT-TO-POINT, Cost: 9500
  Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
  No designated router on this network
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:04
  Index 4/4, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1, Adjacent neighbor count is 1
    Adjacent with neighbor 5.5.5.5
  Suppress hello for 0 neighbor(s)
bogota#
```

Ilustración 26, Lista resumida de interfaces por OSPF (Router Bogotá)

Router Buenos Aires

```
BuenosAires#show ip ospf interface
Serial1/0 is up, line protocol is up
  Internet address is 172.31.23.2/30, Area 0
  Process ID 1, Router ID 8.8.8.8, Network Type POINT-TO-POINT, Cost: 390
  Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
  No designated router on this network
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:03
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1, Adjacent neighbor count is 1
    Adjacent with neighbor 5.5.5.5
  Suppress hello for 0 neighbor(s)
BuenosAires#
```

Ilustración 27, Lista resumida de interfaces por OSPF (Router Buenos Aires)

Router Miami

```
Serial0/0 is up, line protocol is up
  Internet address is 172.31.23.1/30, Area 0
  Process ID 1, Router ID 5.5.5.5, Network Type POINT-TO-POINT, Cost: 9500
  Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
  No designated router on this network
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:00
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1 , Adjacent neighbor count is 1
    Adjacent with neighbor 8.8.8.8
  Suppress hello for 0 neighbor(s)
Serial1/0 is up, line protocol is up
  Internet address is 172.31.21.2/30, Area 0
  Process ID 1, Router ID 5.5.5.5, Network Type POINT-TO-POINT, Cost: 390
  Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
  No designated router on this network
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:00
  Index 2/2, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1 , Adjacent neighbor count is 1
    Adjacent with neighbor 1.1.1.1
  Suppress hello for 0 neighbor(s)
```

Ilustración 28, Lista resumida de interfaces por OSPF (Router Miami)

Visualizar el OSPF Process ID, Router ID, Address summarizations, Routing Networks, and passive interfaces configuradas en cada router.

Router Bogotá

```
router ospf 1
  router-id 1.1.1.1
  log-adjacency-changes
  passive-interface FastEthernet4/0
  network 192.168.30.0 0.0.0.255 area 0
  network 192.168.40.0 0.0.0.255 area 0
  network 192.168.200.0 0.0.0.255 area 0
  network 172.31.21.0 0.0.0.3 area 0
!
```

Ilustración 29, OSPF Process ID (Router Bogotá)

Router Buenos Aires

```
router ospf 1
  router-id 8.8.8.8
  log-adjacency-changes
  network 172.31.23.0 0.0.0.3 area 0
!
```

Ilustración 30, OSPF Process ID (Router Buenos Aires)

Router Miami

```
router ospf 1
  router-id 5.5.5.5
  log-adjacency-changes
  network 172.31.21.0 0.0.0.3 area 0
  network 172.31.23.0 0.0.0.3 area 0
  network 209.165.200.0 0.0.0.255 area 0
  network 10.0.0.0 0.0.0.3 area 0
!
```

Ilustración 31, OSPF Process ID (Router Miami)

Configurar VLANs, Puertos troncales, puertos de acceso, encapsulamiento, Inter-VLAN Routing y Seguridad en los Switches acorde a la topología de red establecida.

Configuración de VLANs

S1 y S3

```
enable
vlan database
vlan 30 name Administracion
```

```
enable
vlan database
vlan 40 name Mercadeo
```

```
enable
```

```
vlan database
vlan 200 name Mantenimiento
```

SUBINTERFACES

Router Bogota

Subinterface vlan 30

```
enable
configure terminal
interface fastEthernet 4/0.30
no encapsulation dot1Q 30
ip address 192.168.30.1 255.255.255.0
```

Subinterface vlan 40

```
enable
configure terminal
interface fastEthernet 4/0.40
no encapsulation dot1Q 40
ip address 192.168.40.1 255.255.255.0
```

Subinterface vlan 200

```
enable
configure terminal
interface fastEthernet 4/0.200
no encapsulation dot1Q 200
ip address 192.168.200.1 255.255.255.0
```

Configuración Puertos Switch

Switch 1

```
Enable
Configure terminal
interface fastEthernet 0/3
switchport mode trunk
```

```
Enable
Configure terminal
```

```
interface fastEthernet 0/24
switchport mode trunk
```

Se le asigna la vlan 30 a la interface fastethernet 0/1

```
Enable
Configure terminal
interface fastEthernet 0/1
switchport access vlan 30
```

Switch 3

```
Enable
Configure terminal
interface fastEthernet 0/3
switchport mode trunk
```

Se le asigna la vlan 40 a la interface fastethernet 0/1

```
Enable
Configure terminal
interface fastEthernet 0/1
switchport access vlan 40
```

Seguridad en todos los dispositivos

```
enable
config terminal
enable secret 1234
```

```
enable
config terminal
line con 0
password 1234
exec-timeout 5 0
login
logging synchronous
```

```
enable
config terminal
line vty 0 4
password 1234
exec-timeout 5 0
login
logging synchronous
```

En el Switch 3 deshabilitar DNS lookup

```
enable
configure terminal
no ip domain-lookup
```

Asignar direcciones IP a los Switches acorde a los lineamientos.

```
Switch3
Enable
configure terminal
interface vlan 1
ip address 192.168.99.3 255.255.255.0
```

```
Switch1
enable
configure terminal
interface vlan 1
ip address 192.168.99.2 255.255.255.0
```

Desactivar todas las interfaces que no sean utilizadas en el esquema de red.

```
S1

enable
configure terminal
interface fastethernet 0/2
shutdown
exit
interface range fastethernet 0/4-23
shutdown
```

```
S3

enable
configure terminal
interface fastethernet 0/2
shutdown
exit
interface range fastethernet 0/4-24
```

shutdown

Implement DHCP and NAT for IPv4

Configurar R1 como servidor DHCP para las VLANs 30 y 40.

Reservar las primeras 30 direcciones IP de las VLAN 30 y 40 para configuraciones estáticas.

Configurar DHCP pool para VLAN 30	Name: ADMINISTRACION DNS-Server: 10.10.10.11 Domain-Name: ccna-unad.com Establecer default gateway.
Configurar DHCP pool para VLAN 40	Name: MERCADEO DNS-Server: 10.10.10.11 Domain-Name: ccna-unad.com Establecer default gateway.

Router Bogotá

```
enable
configure terminal
ip dhcp excluded-address 192.168.30.1 192.168.30.30
ip dhcp excluded-address 192.168.40.1 192.168.40.30
ip dhcp pool ADMINISTRACION
default-router 192.168.30.1
network 192.168.30.0 255.255.255.0
dns-server 10.10.10.11
domain-name ccna-unad.com
exit
ip dhcp pool MERCADEO
default-router 192.168.40.1
dns-server 10.10.10.11
domain-name ccna-unad.com
network 192.168.40.0 255.255.255.0
```

Configurar NAT en R2 para permitir que los host puedan salir a internet

Router Miami

```
enable
configure terminal
```

```
interface fastEthernet 4/0
ip nat outside
exit
interface fastEthernet 5/0
ip nat inside
```

Configurar al menos dos listas de acceso de tipo estándar a su criterio en para restringir o permitir tráfico desde R1 o R3 hacia R2.

Primera ACL estándar en el router Bogotá, para denegar todo el tráfico que vaya de buenos aires a la VLAN 30

Bogotá

```
enable
configure terminal
ip access-list standard listaEstandar1
deny host 172.31.23.2
permit any
end
configure terminal
interface fastEthernet 4/0.30
ip access-group listaEstandar1 out
```

Segunda ACL estandar en el router miami, para denegar todo el tráfico que vaya del pc ubicado en la vlan 30 al pc internet.

Miami

```
enable
configure terminal
ip access-list standard listaEstandar2
deny host 192.168.30.31
permit any
end
configure terminal
interface fastEthernet 4/0
ip access-group listaEstandar2 out
```

Configurar al menos dos listas de acceso de tipo extendido o nombradas a su criterio en para restringir o permitir tráfico desde R1 o R3 hacia R2.

Primera ACL extendida, se deniega el acceso al servidor web para el pc en la vlan 30

En el router de miami

```
enable
configure terminal
ip access-list extended extendida1
deny tcp host 192.168.30.31 host 10.0.0.2 eq 80
permit ip any any
end
configure terminal
interface fastEthernet 5/0
ip access-group extendida1 out
```

Segunda ACL extendida

Bloquear el trafico de Buenos aires a el pc Internet

En el router de miami

```
enable
configure terminal
ip access-list extended extendida2
deny ip host 172.31.23.2 host 209.165.200.230
permit ip any any
end
configure terminal
interface fastEthernet 4/0
ip access-group extendida2 out
```

Verificar procesos de comunicación y redireccionamiento de tráfico en los routers mediante el uso de Ping y Traceroute.

Ping entre vlans

```
Command Prompt

Packet Tracer PC Command Line 1.0
C:\>ping 192.168.40.31

Pinging 192.168.40.31 with 32 bytes of data:

Reply from 192.168.40.31: bytes=32 time=2ms TTL=127
Reply from 192.168.40.31: bytes=32 time<1ms TTL=127
Reply from 192.168.40.31: bytes=32 time<1ms TTL=127
Reply from 192.168.40.31: bytes=32 time=10ms TTL=127

Ping statistics for 192.168.40.31:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 10ms, Average = 3ms

C:\>
```

Ilustración 32, Ping entre Vlans

Trace entre vlans

```
C:\>tracert 192.168.40.31

Tracing route to 192.168.40.31 over a maximum of 30 hops:

  1    0 ms      0 ms      0 ms      192.168.30.1
  2    0 ms      0 ms      0 ms      192.168.40.31

Trace complete.
```

Ilustración 33, Trace entre Vlans

Ping VLAN con internet

```
C:\>ping 209.165.200.230

Pinging 209.165.200.230 with 32 bytes of data:

Reply from 209.165.200.230: bytes=32 time=2ms TTL=126
Reply from 209.165.200.230: bytes=32 time=10ms TTL=126
Reply from 209.165.200.230: bytes=32 time=1ms TTL=126
Reply from 209.165.200.230: bytes=32 time=11ms TTL=126

Ping statistics for 209.165.200.230:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 11ms, Average = 6ms

C:\>
```

Ilustración 34, Ping VLAN con internet

Tracert entre vlan con internet

```
C:\>tracert 209.165.200.230

Tracing route to 209.165.200.230 over a maximum of 30 hops:

  0  0 ms    0 ms    0 ms    192.168.40.1
  1  1 ms    0 ms    1 ms    172.31.21.2
  2  10 ms   18 ms   0 ms    209.165.200.230

Trace complete.

C:\>
```

Ilustración 35, Tracert entre VLAN con internet

Conclusiones

- ✚ Se realizaron completamente los dos escenarios de igual forma se hizo la revisión de procesos de configuración de un sistema operativo de red e identificación de su funcionalidad y propósito.
- ✚ Se emplearon comandos muy básicos como ping, ip confi, tracert, etc, para la alineación de dispositivos.
- ✚ Se emplearon los comandos precisos para las redes LAN / WAN, para la ejecución de la configuración de la interfaz.

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