

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

PRUEBA DE HABILIDADES PRÁCTICAS CCNA

JORGE JUAN COTES RAMÍREZ

UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA – UNAD

ECBTI

INGENIERÍA ELECTRÓNICA

VALLEDUPAR

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JORGE JUAN COTES RAMÍREZ

Diplomado de Profundización

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NOTA DE ACEPTACIÓN

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Presidente del jurado

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Jurado

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Jurado

Valledupar, 13 de junio de 2018

## DEDICATORIA

A mis padres quienes me apoyaron  
todo el tiempo.

## AGRADECIMIENTOS

Deseo expresar mi agradecimiento al director de este diplomado ING. JUAN CARLOS VESGA por su acompañamiento y por las indicaciones que ha brindado en el transcurso de este curso de Cisco, por el respeto a nuestras sugerencias e ideas y por la dirección.

Gracias al tutor ING. GIOVANNI ALBERTO BRACHO que a lo largo de este diplomado de profundización me ayudo en el progreso y resolución de dudas y me impartió sus conocimientos, contribuyendo con mi educación.

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## RESUMEN

En esta instancia trabajamos con, el módulo CISCO CCNA2 R&S: PRINCIPIOS BÁSICOS DE ROUTING Y SWITCHING expresando lo aprendido en el desarrollo de la Prueba de Habilidades Prácticas donde se presentan aspectos básicos centrados en el aprendizaje de la arquitectura, los componentes y el funcionamiento de los routers y switches en una red pequeña. Del mismo modo, en esta prueba, se aprenderá a configurar un router y un switch para obtener funcionalidad básica.

Describiré las tecnologías de switching mejoradas, como las VLAN, el protocolo de enlace troncal de VLAN (VTP), el protocolo de árbol de expansión rápido (RSTP), el protocolo de árbol de expansión por VLAN (PVSTP) y 802.1q.

CCNA 1, CCNA 2, Principios Básicos de Routing y Switching.

## INTRODUCCIÓN

La universidad nacional abierta y a distancia UNAD ha dispuesto para los estudiantes de pregrado el curso de profundización en redes LAN y WAN, surgido como convenio entre esta universidad y la empresa de tecnología estadounidense CISCO, como complemento a sus conocimientos en el área de redes de telecomunicaciones y a su vez como opción de grado. Por ende, la siguiente actividad tiene como finalidad dar cumplimiento al DIPLOMADO DE PROFUNDIZACIÓN CISCO (DISEÑO E IMPLEMENTACIÓN DE SOLUCIONES INTEGRADAS LAN / WAN), en el estudio de la Configuración de Sistemas de Red soportados en VLANs, Configuración y control de ACL para IPv4, Implementación de DHCP y NAT para IPv4, configuración OSPFv2.

Para el desarrollo de la presente actividad, es clave el uso de una herramienta de simulación, conocida como Packet Tracer, desarrollada igualmente por la compañía CISCO que además de simular la creación de una red, ayuda a planear y descubrir posibles errores en la práctica real de estas actividades.

No sólo se trata de una herramienta de simulación, es un material educativo que contiene los protocolos y estándares más recientes que se usan en la creación de redes para entidades públicas o privadas hoy en día, así se garantiza el conocimiento inmediato paralelo al desarrollo de estas nuevas tecnologías de Routing y Switching.

## 1. OBJETIVOS

### 1.1 OBJETIVO GENERAL

Aprender y cursar de manera satisfactoria el DIPLOMADO DE PROFUNDIZACIÓN CISCO (DISEÑO E IMPLEMENTACIÓN DE SOLUCIONES INTEGRADAS LAN / WAN), obteniendo aprendizaje y la puesta en marcha del estudio de la Configuración de Sistemas de Red soportados en VLANs, Configuración y control de ACL para IPv4, Implementación de DHCP y NAT para IPv4, configuración OSPFv2.

### 1.2 OBJETIVOS ESPECÍFICOS

- Describir, Configurar y controlar ACL para IPv4 y descubrir los tipos de medios utilizados para transportar datos a través de la red.
- Configurar routers y switches, y resolver problemas relacionados, así como solucionar problemas frecuentes de OSPF de área única y OSPF multiárea, de LAN virtuales y de routing entre VLAN en redes IPv4.
- Describir las tecnologías de switching mejoradas, como las VLAN, el protocolo de enlace troncal de VLAN (VTP), el protocolo de árbol de expansión rápido (RSTP), el protocolo de árbol de expansión por VLAN (PVSTP) y 802.1q.

## 2. PLANTEAMIENTO DEL PROBLEMA

### 2.1 DEFINICIÓN DEL PROBLEMA

La evaluación denominada “Prueba de Habilidades Prácticas”, forma parte de las actividades evaluativas del Diplomado de Profundización CCNA, la cual busca identificar el grado de desarrollo de competencias y habilidades que fueron adquiridas a lo largo del diplomado y a través de la cual se pondrá a prueba los niveles de comprensión y solución de problemas relacionados con diversos aspectos de Networking.

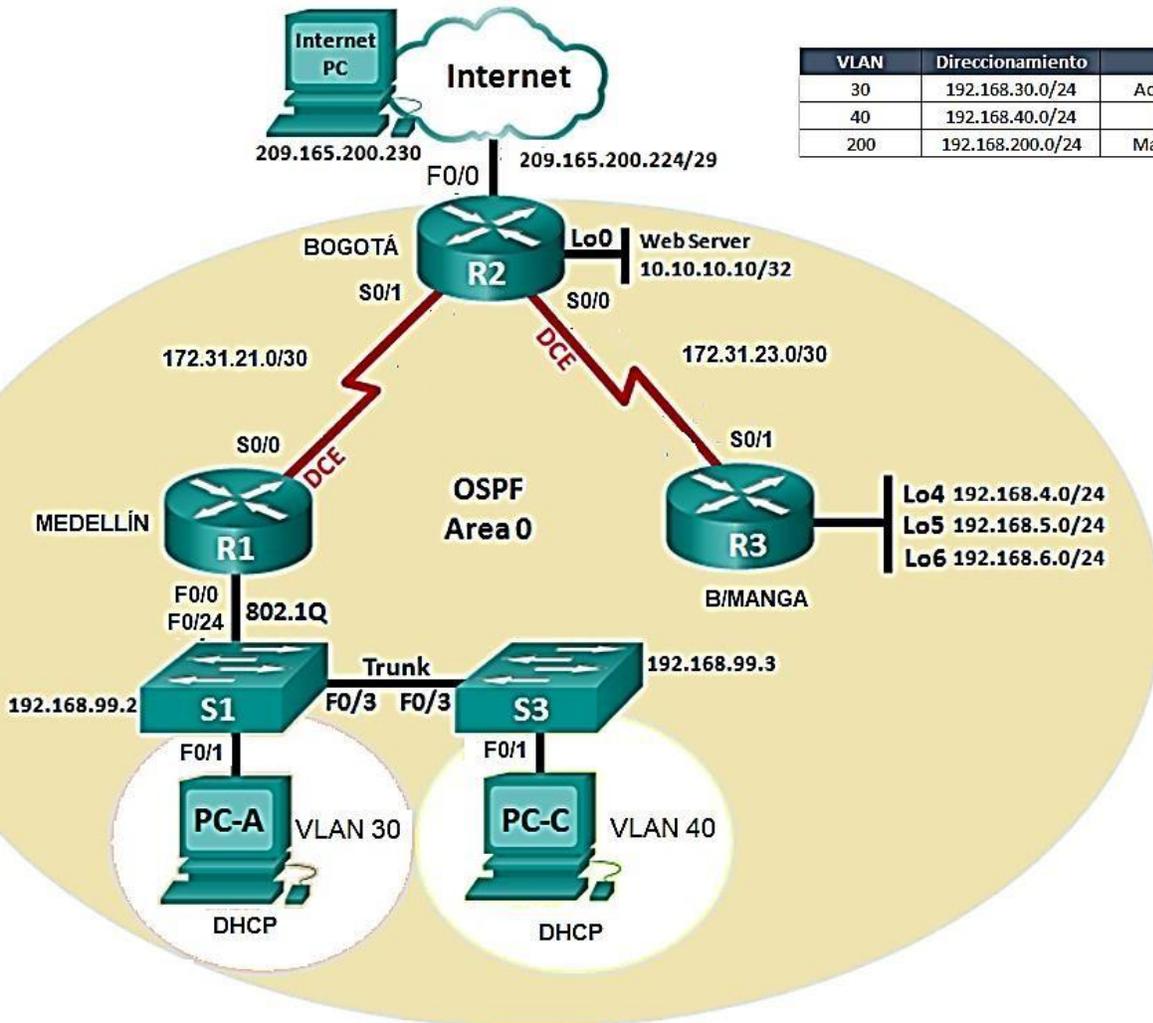
### 2.2 JUSTIFICACIÓN

Debido a que el diplomado de profundización se presenta como una opción de grado este representa el aprendizaje de tecnologías basadas en la academia Cisco y permite de alguna manera actualizarnos y estar a la vanguardia de lo que al mundo de las redes se refiere a nivel profesional; claro está que los contenidos son altamente enriquecedores además nos muestran las herramientas y los pasos para comenzar a diseñar nuestras propias topologías de redes.

### 3. DESCRIPCIÓN DEL ESCENARIO

**Escenario:** Una empresa de Tecnología posee tres sucursales distribuidas en las ciudades de Bogotá, Medellín y Bucaramanga, 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



1. Configurar el direccionamiento IP acorde con la topología de red para cada uno de los dispositivos que forman parte del escenario
2. Configurar el protocolo de enrutamiento OSPFv2 bajo los siguientes criterios:

### OSPFv2 area 0

Configuration Item or Task	Specification
Router ID R1	1.1.1.1
Router ID R2	2.2.2.2
Router ID R3	3.3.3.3
Configurar todas las interfaces LAN como pasivas	
Establecer el ancho de banda para enlaces seriales en	128 Kb/s
Ajustar el costo en la métrica de S0/0 a	7500

### Verificar información de OSPF

- Visualizar tablas de enrutamiento y routers conectados por OSPFv2
  - Visualizar lista resumida de interfaces por OSPF en donde se ilustre el costo de cada interface
  - Visualizar el OSPF Process ID, Router ID, Address summarizations, Routing Networks, and passive interfaces configuradas en cada router.
3. Configurar VLANs, Puertos troncales, puertos de acceso, encapsulamiento, Inter-VLAN Routing y Seguridad en los Switches acorde a la topología de red establecida.
  4. En el Switch 3 deshabilitar DNS lookup
  5. Asignar direcciones IP a los Switches acorde a los lineamientos.
  6. Desactivar todas las interfaces que no sean utilizadas en el esquema de red.
  7. Implementar DHCP and NAT for IPv4
  8. Configurar R1 como servidor DHCP para las VLANs 30 y 40.
  9. 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.

10. Configurar NAT en R2 para permitir que los hosts puedan salir a internet
11. 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.
12. 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.
13. Verificar procesos de comunicación y redireccionamiento de tráfico en los routers mediante el uso de Ping y Traceroute.



## Inicializando y Cargando los Routers y Switches

Se procede a borrar las configuraciones de inicio y a recargar los dispositivos.

Para los Routers las tareas que realizo a continuación son: borrar el archivo de configuración de inicio en todos los enrutadores. Del mismo modo se procede a recargarlos.

### Router R1

```
Router> enable
Router# erase startup-config
Erasing the nvram filesystem will remove all configuration files!
Continue? [confirm]
[OK]
Erase of nvram: complete
%SYS-7-NV_BLOCK_INIT: Initialized the geometry of nvram
Router#
Router# reload
Proceed with reload? [confirm]
System Bootstrap, Version 15.1(4)M4, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 2010 by cisco Systems, Inc.
Total memory size = 512 MB - On-board = 512 MB, DIMM0 = 0 MB
CISCO1941/K9 platform with 524288 Kbytes of main memory
Main memory is configured to 64/-1(On-board/DIMM0) bit mode with
ECC disabled

Readonly ROMMON initialized

program load complete, entry point: 0x80803000, size: 0x1b340
program load complete, entry point: 0x80803000, size: 0x1b340

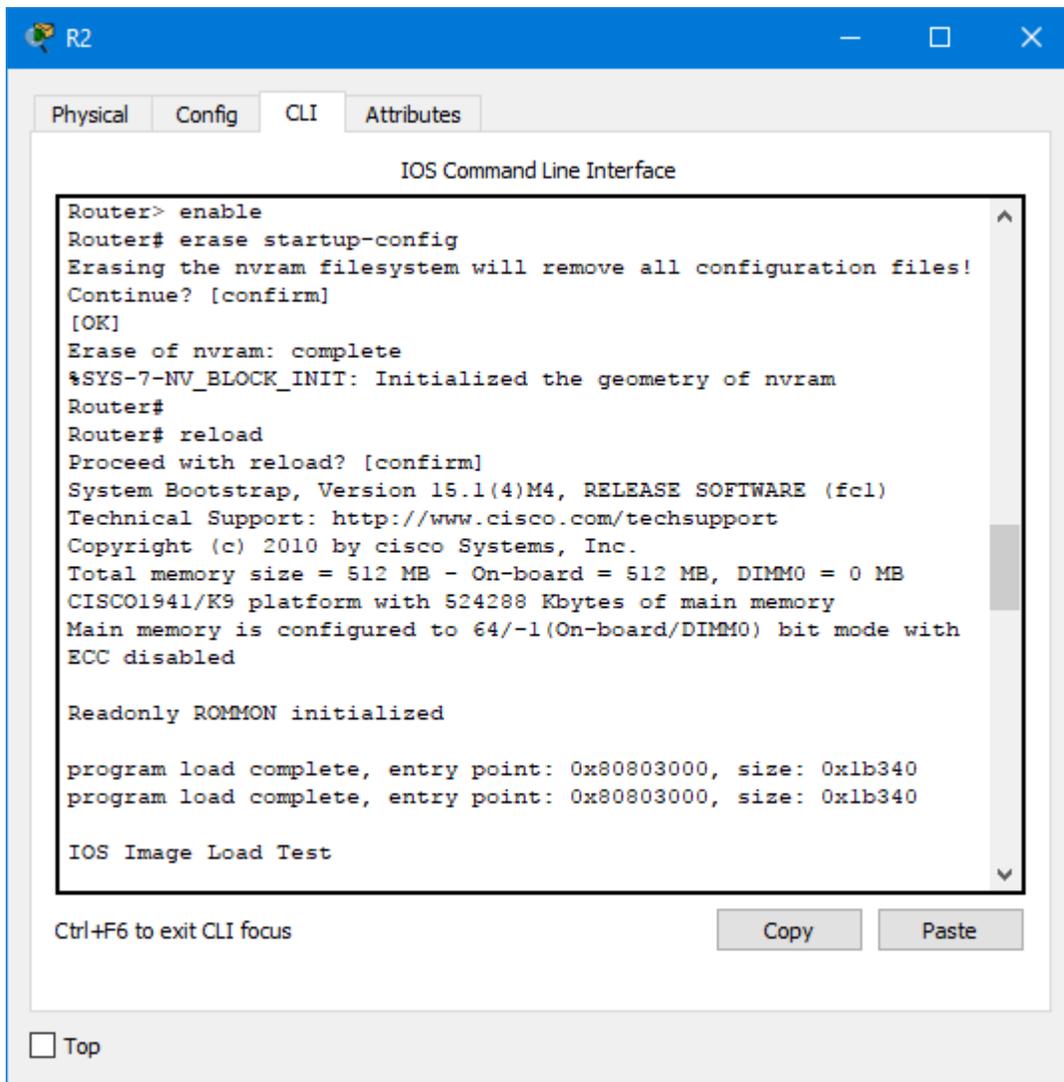
IOS Image Load Test
```

Ctrl+F6 to exit CLI focus

Copy Paste

Top

## Router R2



The screenshot shows a Windows-style window titled "R2" with a blue header bar. Below the header are four tabs: "Physical", "Config", "CLI", and "Attributes". The "CLI" tab is selected, and the window displays the "IOS Command Line Interface". The terminal output shows the following sequence of commands and responses:

```
Router> enable
Router# erase startup-config
Erasing the nvram filesystem will remove all configuration files!
Continue? [confirm]
[OK]
Erase of nvram: complete
%SYS-7-NV_BLOCK_INIT: Initialized the geometry of nvram
Router#
Router# reload
Proceed with reload? [confirm]
System Bootstrap, Version 15.1(4)M4, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 2010 by cisco Systems, Inc.
Total memory size = 512 MB - On-board = 512 MB, DIMM0 = 0 MB
CISCO1941/K9 platform with 524288 Kbytes of main memory
Main memory is configured to 64/-1(On-board/DIMM0) bit mode with
ECC disabled

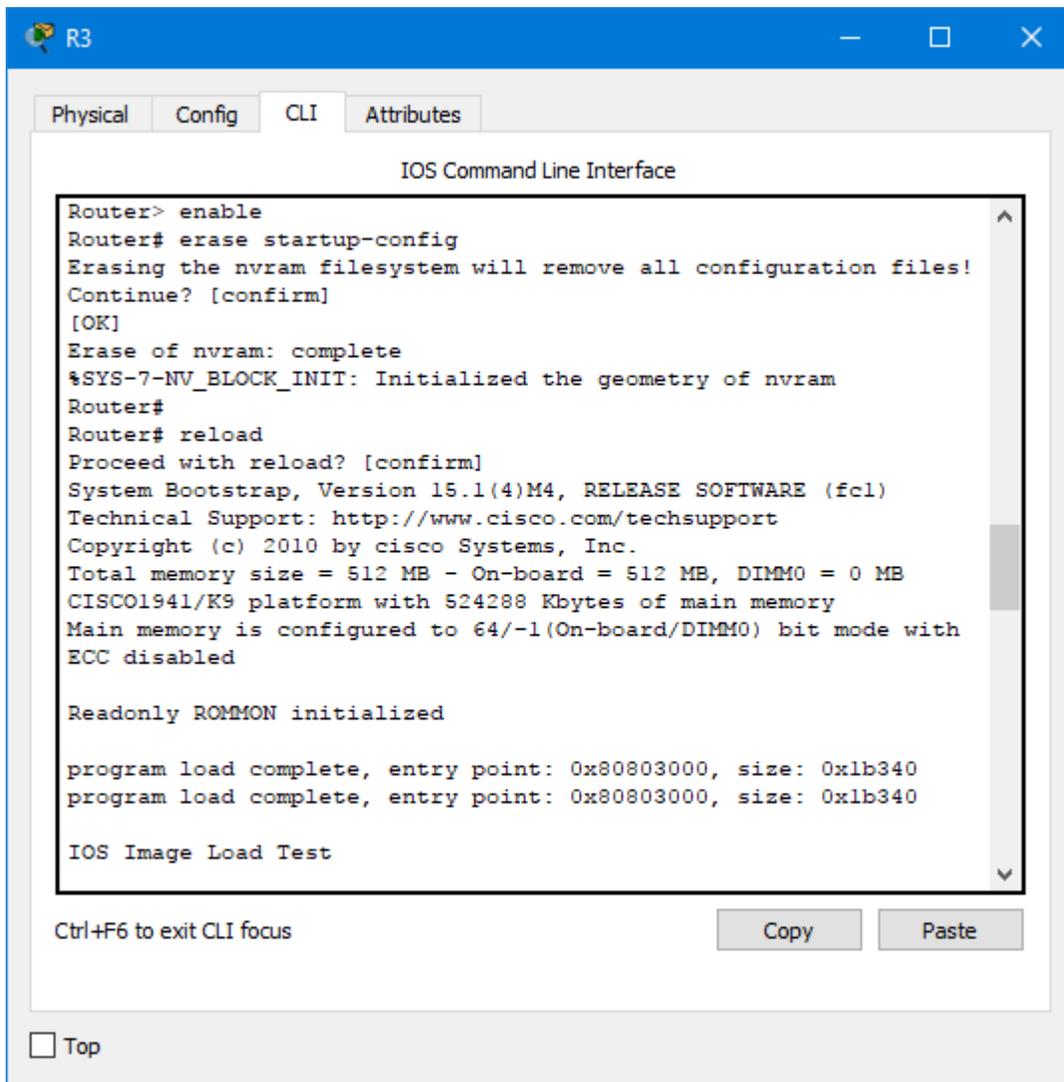
Readonly ROMMON initialized

program load complete, entry point: 0x80803000, size: 0x1b340
program load complete, entry point: 0x80803000, size: 0x1b340

IOS Image Load Test
```

At the bottom of the CLI window, there is a text prompt "Ctrl+F6 to exit CLI focus" and two buttons labeled "Copy" and "Paste". Below the CLI window, there is a checkbox labeled "Top" which is currently unchecked.

## Router R3



The screenshot shows a Windows-style window titled "R3" with a blue header bar. Below the header are four tabs: "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:

```
Router> enable
Router# erase startup-config
Erasing the nvram filesystem will remove all configuration files!
Continue? [confirm]
[OK]
Erase of nvram: complete
%SYS-7-NV_BLOCK_INIT: Initialized the geometry of nvram
Router#
Router# reload
Proceed with reload? [confirm]
System Bootstrap, Version 15.1(4)M4, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 2010 by cisco Systems, Inc.
Total memory size = 512 MB - On-board = 512 MB, DIMM0 = 0 MB
CISCO1941/K9 platform with 524288 Kbytes of main memory
Main memory is configured to 64/-1(On-board/DIMM0) bit mode with
ECC disabled

Readonly ROMMON initialized

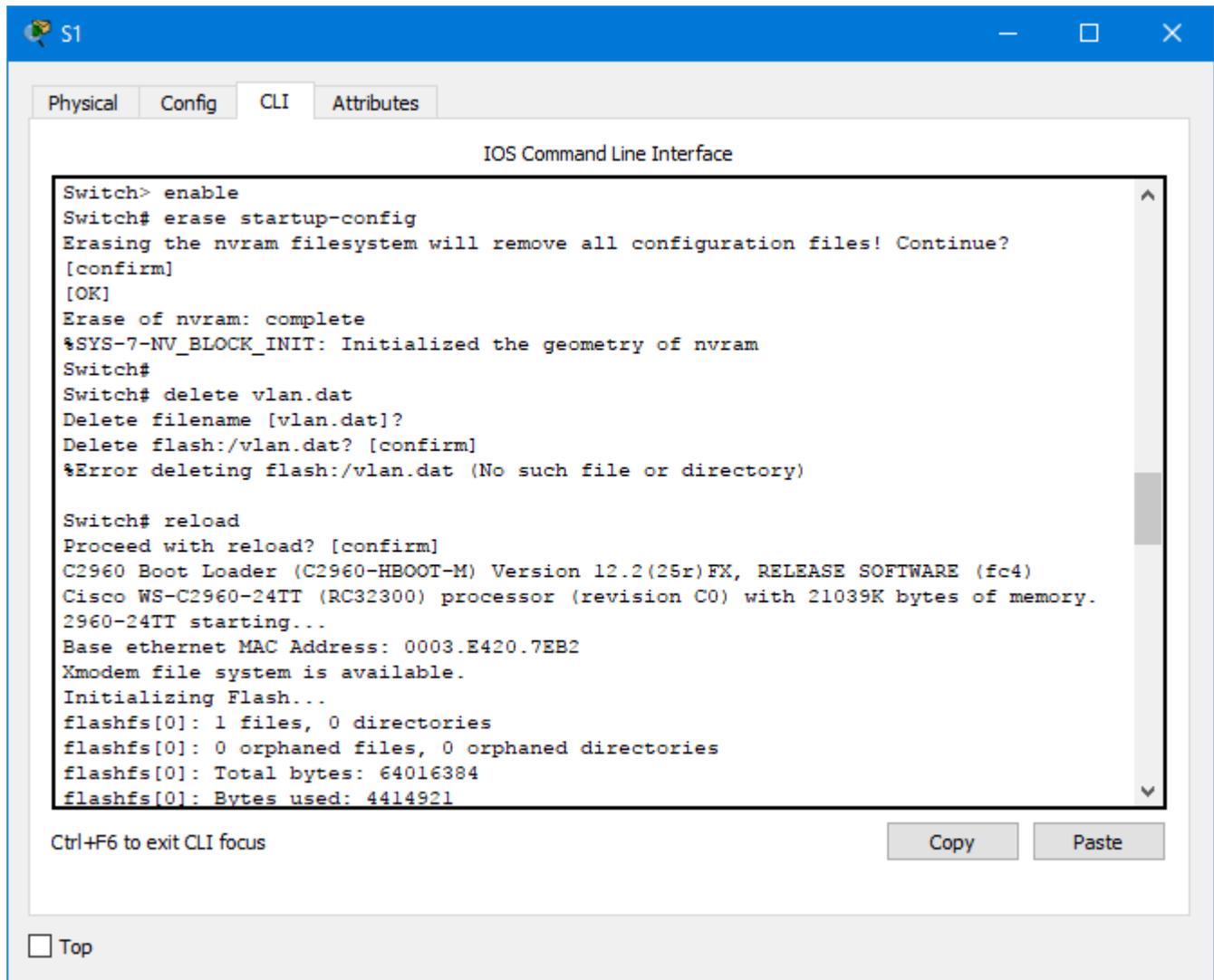
program load complete, entry point: 0x80803000, size: 0x1b340
program load complete, entry point: 0x80803000, size: 0x1b340

IOS Image Load Test
```

At the bottom of the CLI window, there is a text label "Ctrl+F6 to exit CLI focus" and two buttons: "Copy" and "Paste". Below the CLI window, there is a "Top" button with a small square icon to its left.

Se procede a borrar el archivo startup-config en todos los switches y se elimina la antigua base de datos VLAN.

### Switch S1



```
Switch> enable
Switch# erase startup-config
Erasing the nvram filesystem will remove all configuration files! Continue?
[confirm]
[OK]
Erase of nvram: complete
%SYS-7-NV_BLOCK_INIT: Initialized the geometry of nvram
Switch#
Switch# delete vlan.dat
Delete filename [vlan.dat]?
Delete flash:/vlan.dat? [confirm]
%Error deleting flash:/vlan.dat (No such file or directory)

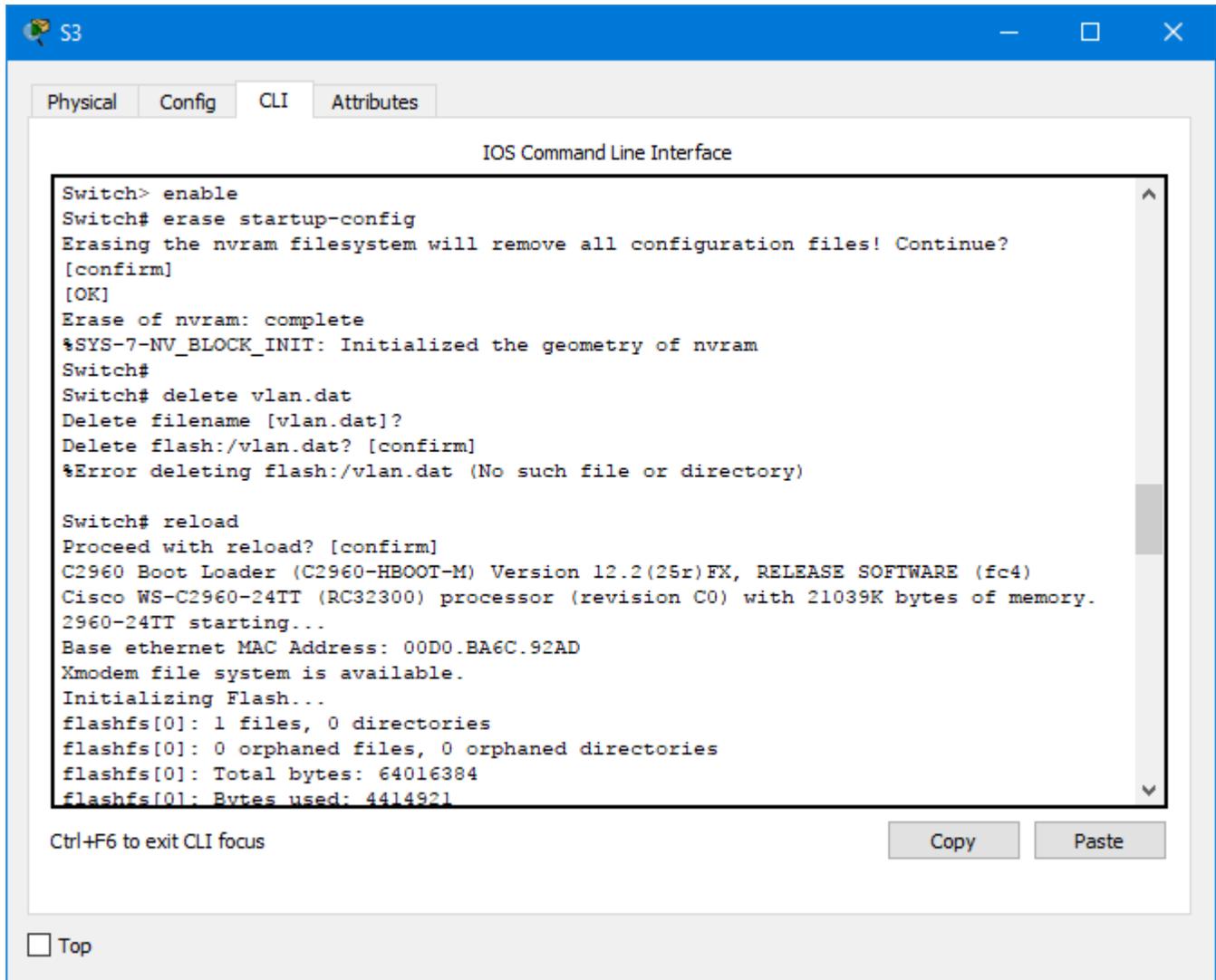
Switch# reload
Proceed with reload? [confirm]
C2960 Boot Loader (C2960-HBOOT-M) Version 12.2(25r)EX, RELEASE SOFTWARE (fc4)
Cisco WS-C2960-24TT (RC32300) processor (revision C0) with 21039K bytes of memory.
2960-24TT starting...
Base ethernet MAC Address: 0003.E420.7EB2
Xmodem file system is available.
Initializing Flash...
flashfs[0]: 1 files, 0 directories
flashfs[0]: 0 orphaned files, 0 orphaned directories
flashfs[0]: Total bytes: 64016384
flashfs[0]: Bytes used: 4414921
```

Ctrl+F6 to exit CLI focus

Copy Paste

Top

## Switch S2



```
Switch> enable
Switch# erase startup-config
Erasing the nvram filesystem will remove all configuration files! Continue?
[confirm]
[OK]
Erase of nvram: complete
%SYS-7-NV_BLOCK_INIT: Initialized the geometry of nvram
Switch#
Switch# delete vlan.dat
Delete filename [vlan.dat]?
Delete flash:/vlan.dat? [confirm]
%Error deleting flash:/vlan.dat (No such file or directory)

Switch# reload
Proceed with reload? [confirm]
C2960 Boot Loader (C2960-HBOOT-M) Version 12.2(25r)FX, RELEASE SOFTWARE (fc4)
Cisco WS-C2960-24TT (RC32300) processor (revision C0) with 21039K bytes of memory.
2960-24TT starting...
Base ethernet MAC Address: 00D0.BA6C.92AD
Xmodem file system is available.
Initializing Flash...
flashfs[0]: 1 files, 0 directories
flashfs[0]: 0 orphaned files, 0 orphaned directories
flashfs[0]: Total bytes: 64016384
flashfs[0]: Bytes used: 4414921
```

Ctrl+F6 to exit CLI focus

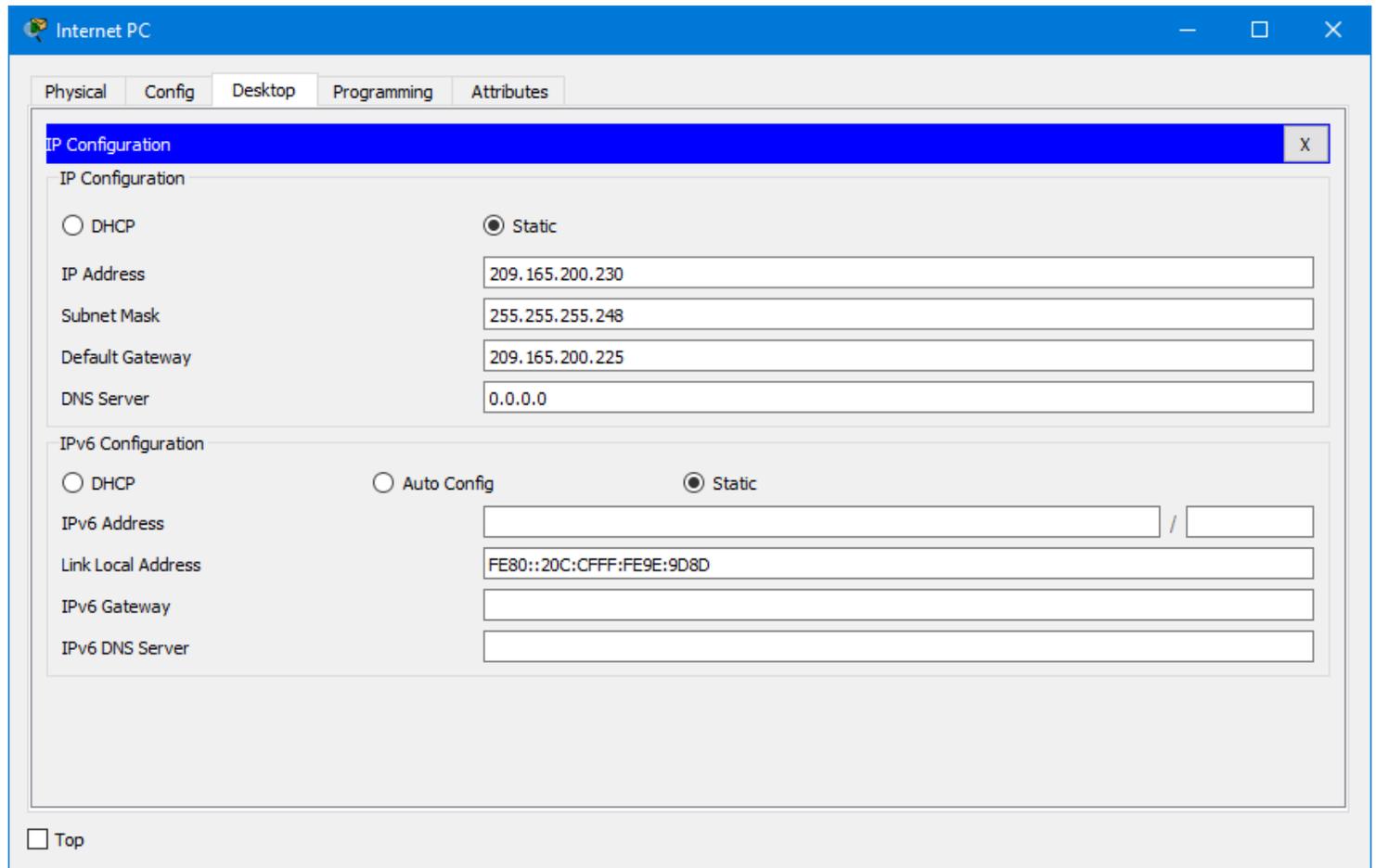
Copy Paste

Top

## Configuración Básica de los Dispositivos “Direccionamiento IPV4”

Tareas de configuración para la Internet PC incluyendo: IP Address, Subnet Mask, Default Gateway.

### Configurando la Internet PC.



The screenshot shows the 'Internet PC' configuration window with the 'Config' tab selected. The 'IP Configuration' section is active, showing the following settings:

Field	Value
IP Configuration	<input type="radio"/> DHCP <input checked="" type="radio"/> Static
IP Address	209.165.200.230
Subnet Mask	255.255.255.248
Default Gateway	209.165.200.225
DNS Server	0.0.0.0

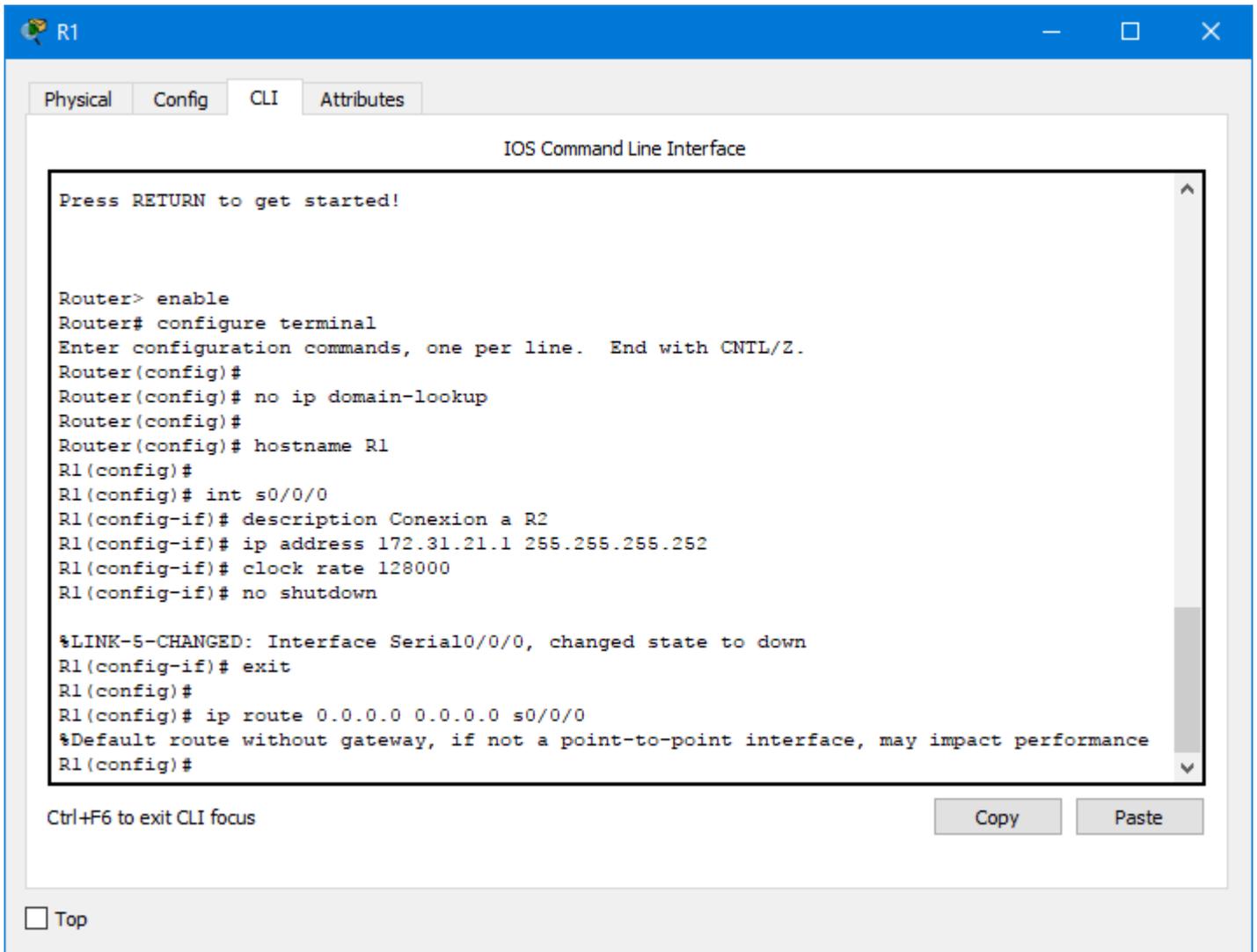
The 'IPv6 Configuration' section is also visible, showing the following settings:

Field	Value
IPv6 Configuration	<input type="radio"/> DHCP <input type="radio"/> Auto Config <input checked="" type="radio"/> Static
IPv6 Address	[Empty] / [Empty]
Link Local Address	FE80::20C:CFFF:FE9E:9D8D
IPv6 Gateway	[Empty]
IPv6 DNS Server	[Empty]

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

Tareas de configuración para R1 incluyendo: Disable DNS lookup, Nombre, Interface S0/0/0, Default route.

## Configurando R1.



The screenshot shows a window titled "R1" with a blue header bar. Below the header are four tabs: "Physical", "Config", "CLI", and "Attributes". The "CLI" tab is active, displaying the "IOS Command Line Interface". The interface contains a text area with the following text:

```
Press RETURN to get started!

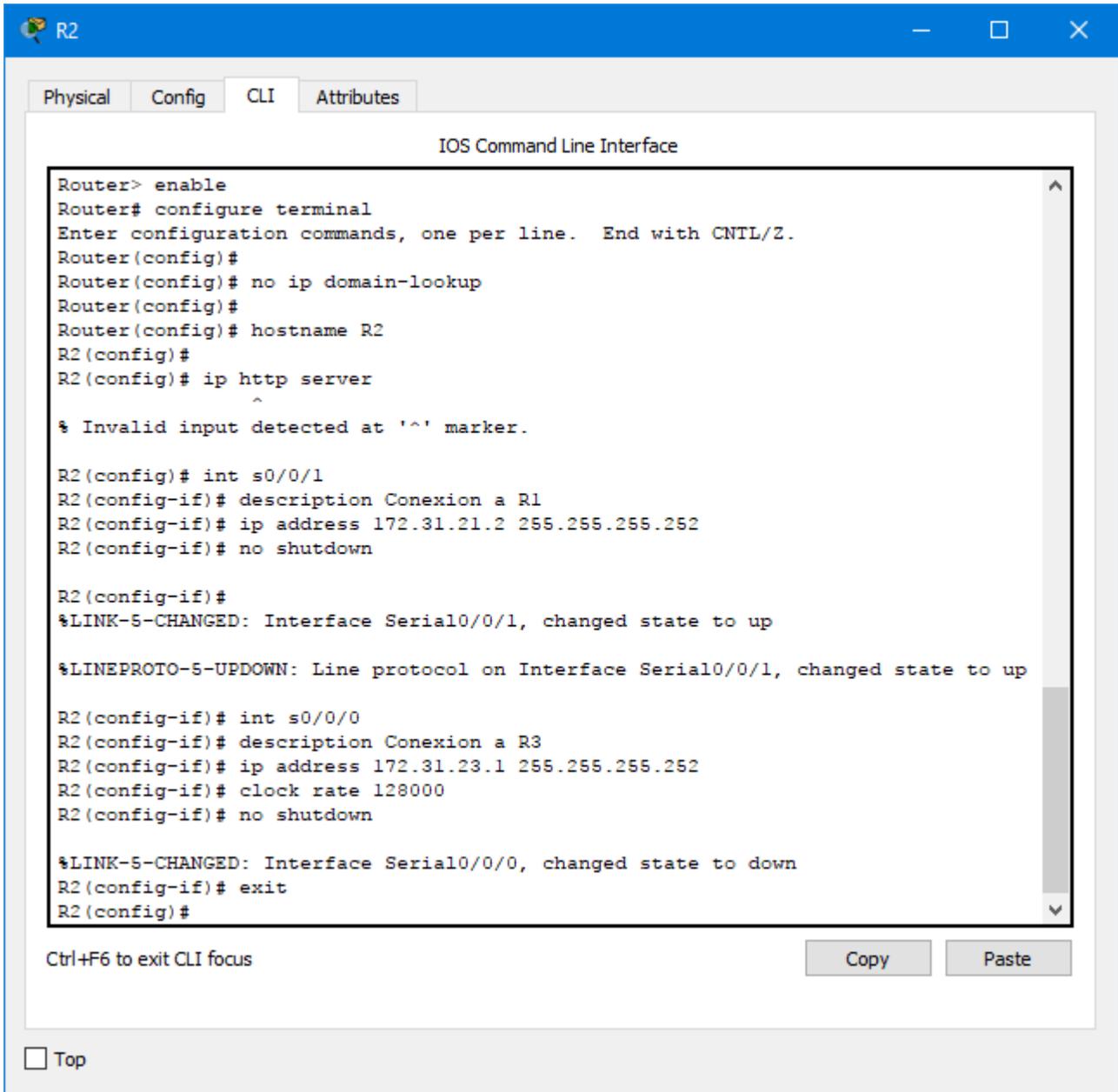
Router> enable
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)# no ip domain-lookup
Router(config)#
Router(config)# hostname R1
R1(config)#
R1(config)# int s0/0/0
R1(config-if)# description Conexion a R2
R1(config-if)# ip address 172.31.21.1 255.255.255.252
R1(config-if)# clock rate 128000
R1(config-if)# no shutdown

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down
R1(config-if)# exit
R1(config)#
R1(config)# ip route 0.0.0.0 0.0.0.0 s0/0/0
%Default route without gateway, if not a point-to-point interface, may impact performance
R1(config)#
```

At the bottom of the text area, there is a message: "Ctrl+F6 to exit CLI focus". To the right of this message are two buttons: "Copy" and "Paste". Below the text area, there is a checkbox labeled "Top".

Tareas de configuración para R2 incluyendo: Disable DNS lookup, Nombre, Interface S0/0/0, Interface S0/0/1, Interface G0/0 (Internet Simulado), Default route.

## Configurando R2.



```
Router> enable
Router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#
Router(config)# no ip domain-lookup
Router(config)#
Router(config)# hostname R2
R2(config)#
R2(config)# ip http server
^
% Invalid input detected at '^' marker.

R2(config)# int s0/0/1
R2(config-if)# description Conexion a R1
R2(config-if)# ip address 172.31.21.2 255.255.255.252
R2(config-if)# no shutdown

R2(config-if)#
%LINK-5-CHANGED: Interface Serial10/0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial10/0/1, changed state to up

R2(config-if)# int s0/0/0
R2(config-if)# description Conexion a R3
R2(config-if)# ip address 172.31.23.1 255.255.255.252
R2(config-if)# clock rate 128000
R2(config-if)# no shutdown

%LINK-5-CHANGED: Interface Serial10/0/0, changed state to down
R2(config-if)# exit
R2(config)#
```

Ctrl+F6 to exit CLI focus

Copy Paste

Top

R2

Physical Config CLI Attributes

IOS Command Line Interface

```
R2(config)#
R2(config)# int g0/0
R2(config-if)# description Conexion a ISP
R2(config-if)# ip address 209.165.200.225 255.255.255.248
R2(config-if)# no shutdown

R2(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up

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

R2(config-if)# int loopback 0

R2(config-if)#
%LINK-5-CHANGED: Interface Loopback0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up

R2(config-if)# description Web Server Simulado
R2(config-if)# ip address 10.10.10.10 255.255.255.255
R2(config-if)# exit
R2(config)#
R2(config)# ip route 0.0.0.0 0.0.0.0 g0/0
%Default route without gateway, if not a point-to-point interface, may impact performance
R2(config)#
```

Ctrl+F6 to exit CLI focus

Copy Paste

Top

Web Server

Physical Config Services Desktop Programming Attributes

IP Configuration

IP Configuration

DHCP  Static

IP Address 10.10.10.10

Subnet Mask 255.255.255.0

Default Gateway 10.10.10.1

DNS Server 0.0.0.0

IPv6 Configuration

DHCP  Auto Config  Static

IPv6 Address /

Link Local Address FE80::2E0:A3FF:FE8E:3A8D

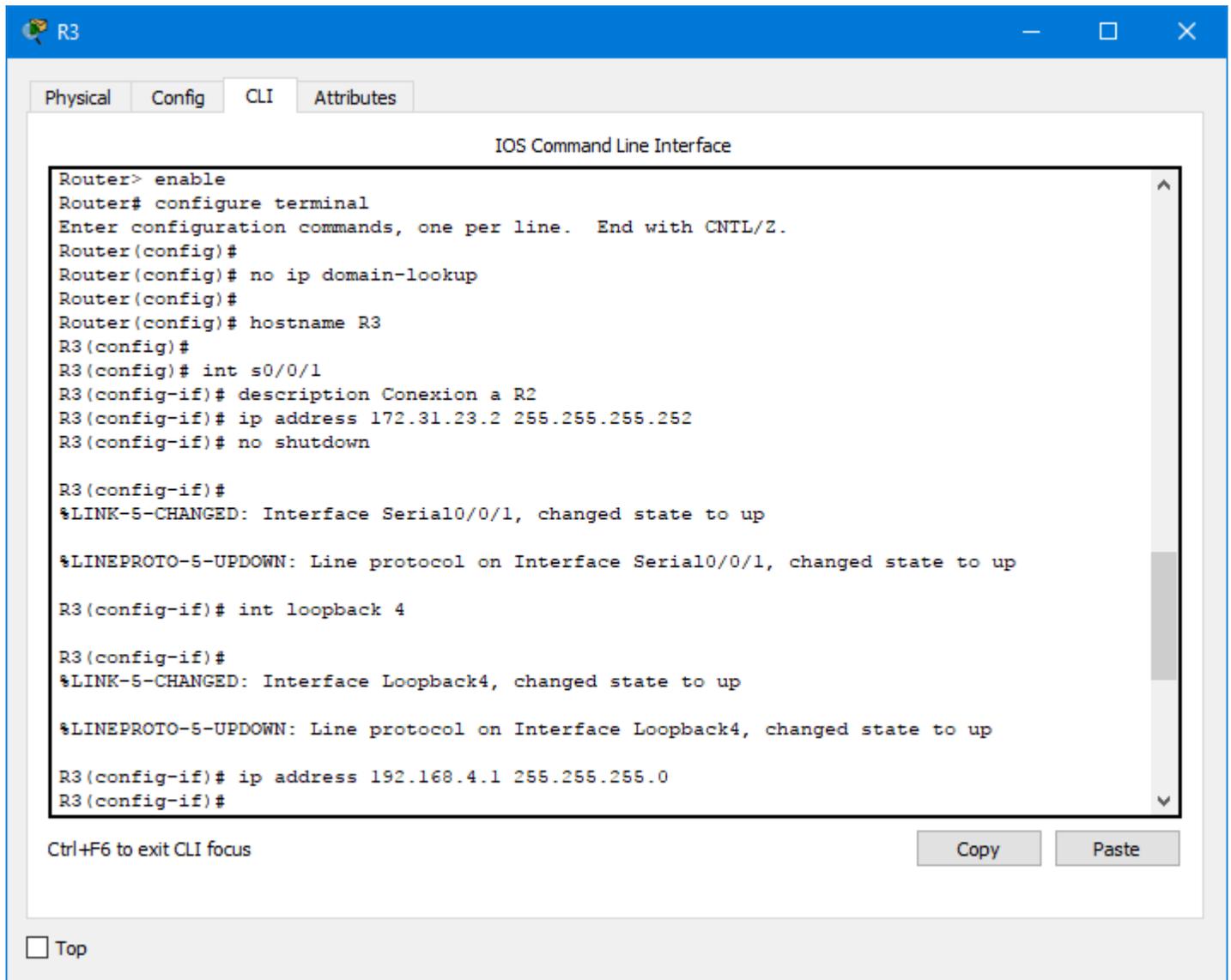
IPv6 Gateway

IPv6 DNS Server

Top

Tareas de configuración para R3 incluyendo: Disable DNS lookup, Nombre, Interface Loopback 4, Interface Loopback 5, Interface Loopback 6, Default route.

### Configurando R3.



```
Router> enable
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)# no ip domain-lookup
Router(config)#
Router(config)# hostname R3
R3(config)#
R3(config)# int s0/0/1
R3(config-if)# description Conexion a R2
R3(config-if)# ip address 172.31.23.2 255.255.255.252
R3(config-if)# no shutdown

R3(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to up

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

R3(config-if)# int loopback 4

R3(config-if)#
%LINK-5-CHANGED: Interface Loopback4, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback4, changed state to up

R3(config-if)# ip address 192.168.4.1 255.255.255.0
R3(config-if)#
```

Ctrl+F6 to exit CLI focus

Copy Paste

Top

R3

Physical Config CLI Attributes

IOS Command Line Interface

```
R3(config-if)# ip address 192.168.4.1 255.255.255.0
R3(config-if)#
R3(config-if)# int loopback 5

R3(config-if)#
%LINK-5-CHANGED: Interface Loopback5, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback5, changed state to up

R3(config-if)# ip address 192.168.5.1 255.255.255.0
R3(config-if)#
R3(config-if)# int loopback 6

R3(config-if)#
%LINK-5-CHANGED: Interface Loopback6, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback6, changed state to up

R3(config-if)# ip address 192.168.6.1 255.255.255.0
R3(config-if)# exit
R3(config)#
R3(config)# ip route 0.0.0.0 0.0.0.0 s0/0/1
%Default route without gateway, if not a point-to-point interface, may impact performance
R3(config)#
```

Ctrl+F6 to exit CLI focus

Copy Paste

Top

Tareas de configuración para S1 incluyendo: Disable DNS lookup, Nombre.

## Configurando S1.

```
IOS Command Line Interface
Copyright (c) 1986-2005 by Cisco Systems, Inc.
Compiled Wed 12-Oct-05 22:05 by pt_team

Press RETURN to get started!

%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1,
changed state to up
%LINK-5-CHANGED: Interface FastEthernet0/3, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3,
changed state to up

Switch> enable
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#
Switch(config)# no ip domain-lookup
Switch(config)#
Switch(config)# hostname S1
S1(config)#
```

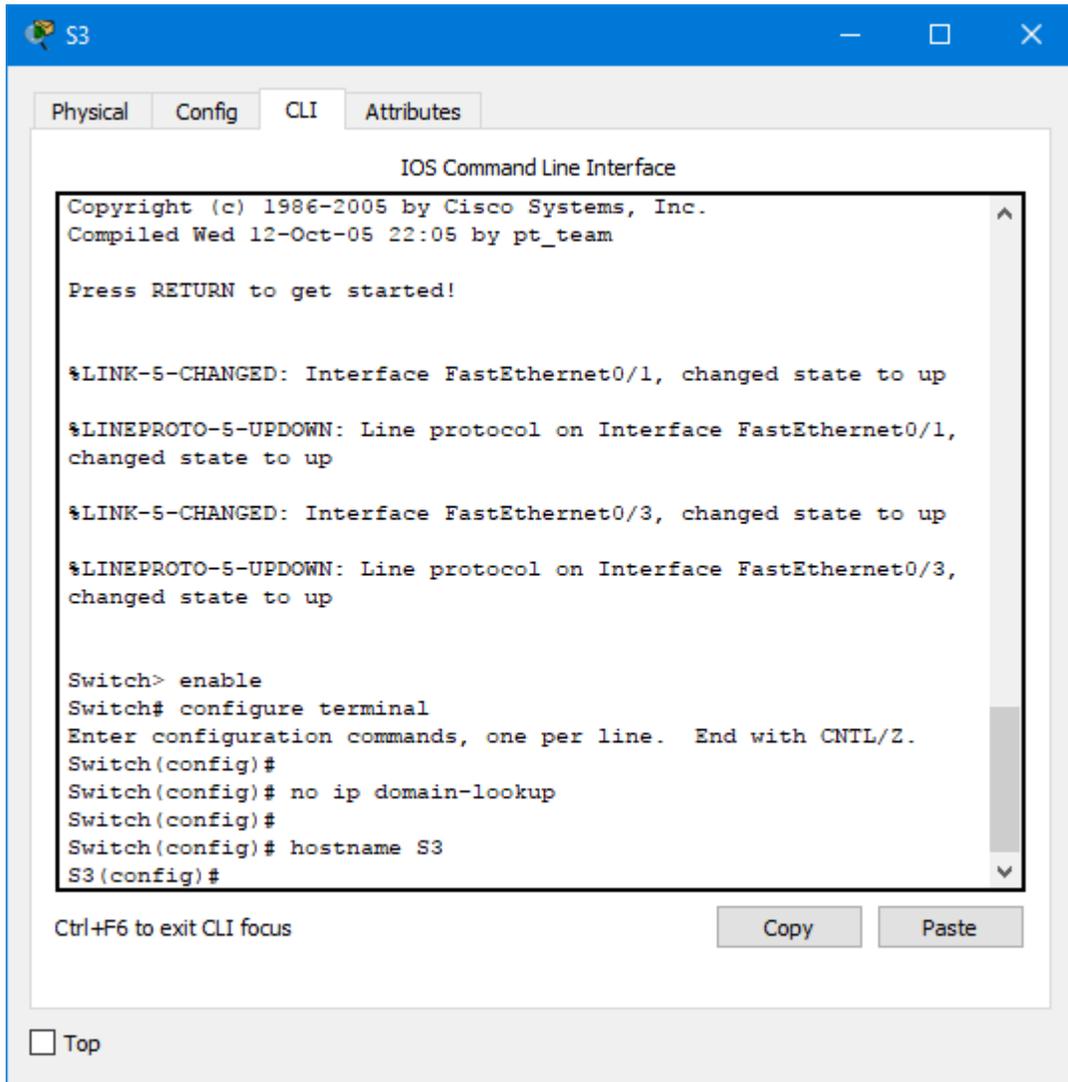
Ctrl+F6 to exit CLI focus

Copy Paste

Top

Tareas de configuración para S3 incluyendo: Disable DNS lookup, Nombre.

### Configurando S3.



The screenshot shows a Cisco IOS Command Line Interface window for device S3. The window has tabs for Physical, Config, CLI, and Attributes. The CLI tab is active, displaying the following text:

```
IOS Command Line Interface
Copyright (c) 1986-2005 by Cisco Systems, Inc.
Compiled Wed 12-Oct-05 22:05 by pt_team

Press RETURN to get started!

%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1,
changed state to up
%LINK-5-CHANGED: Interface FastEthernet0/3, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3,
changed state to up

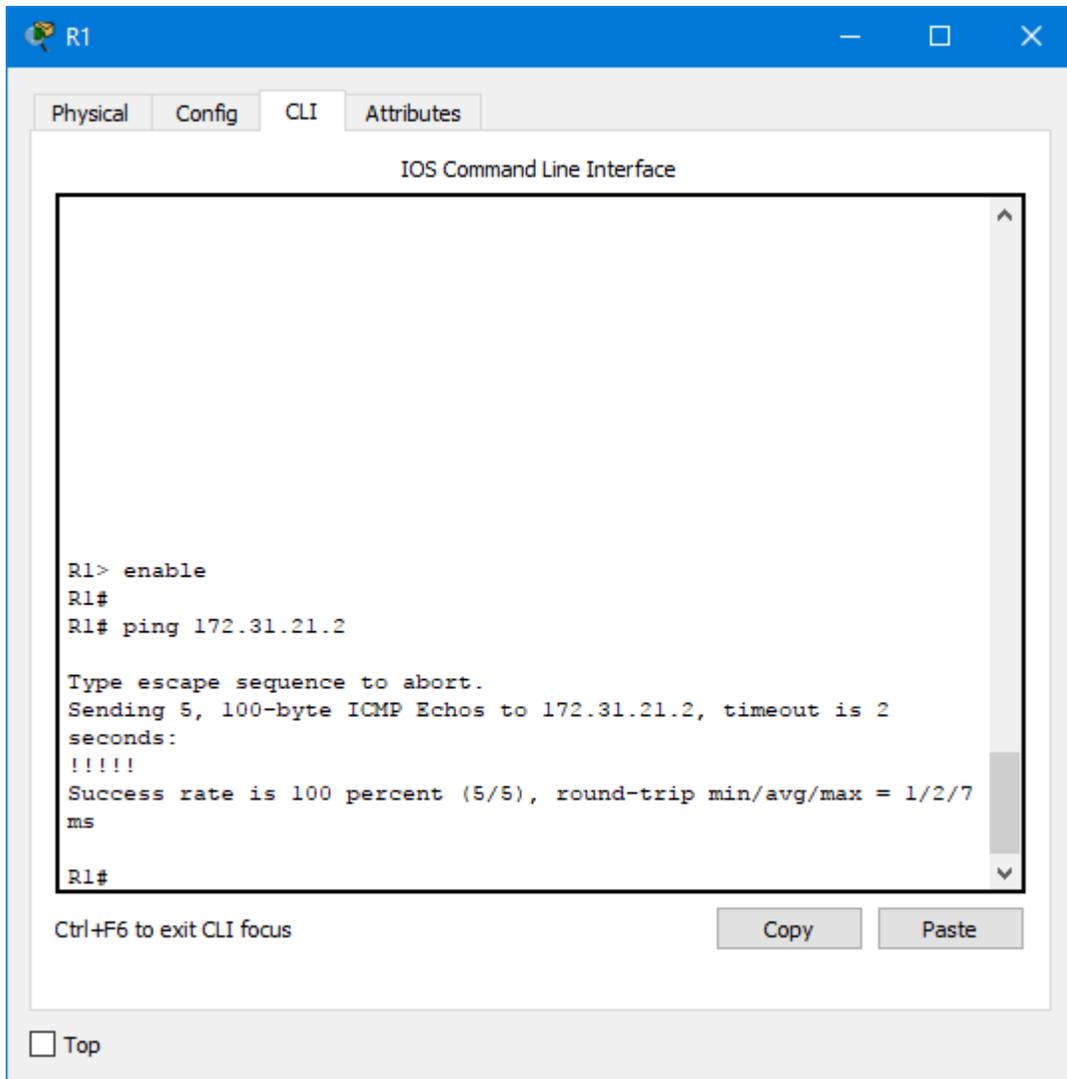
Switch> enable
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#
Switch(config)# no ip domain-lookup
Switch(config)#
Switch(config)# hostname S3
S3(config)#
```

Below the terminal output, there is a prompt "Ctrl+F6 to exit CLI focus" and two buttons labeled "Copy" and "Paste". At the bottom left of the window, there is a "Top" button with a small square icon to its left.

## Verificación de la Conectividad de la Red

Se usa el comando ping para probar la conectividad entre dispositivos de red.

### Ping desde R1 a R2, S0/0/0



```
R1> enable
R1#
R1# ping 172.31.21.2

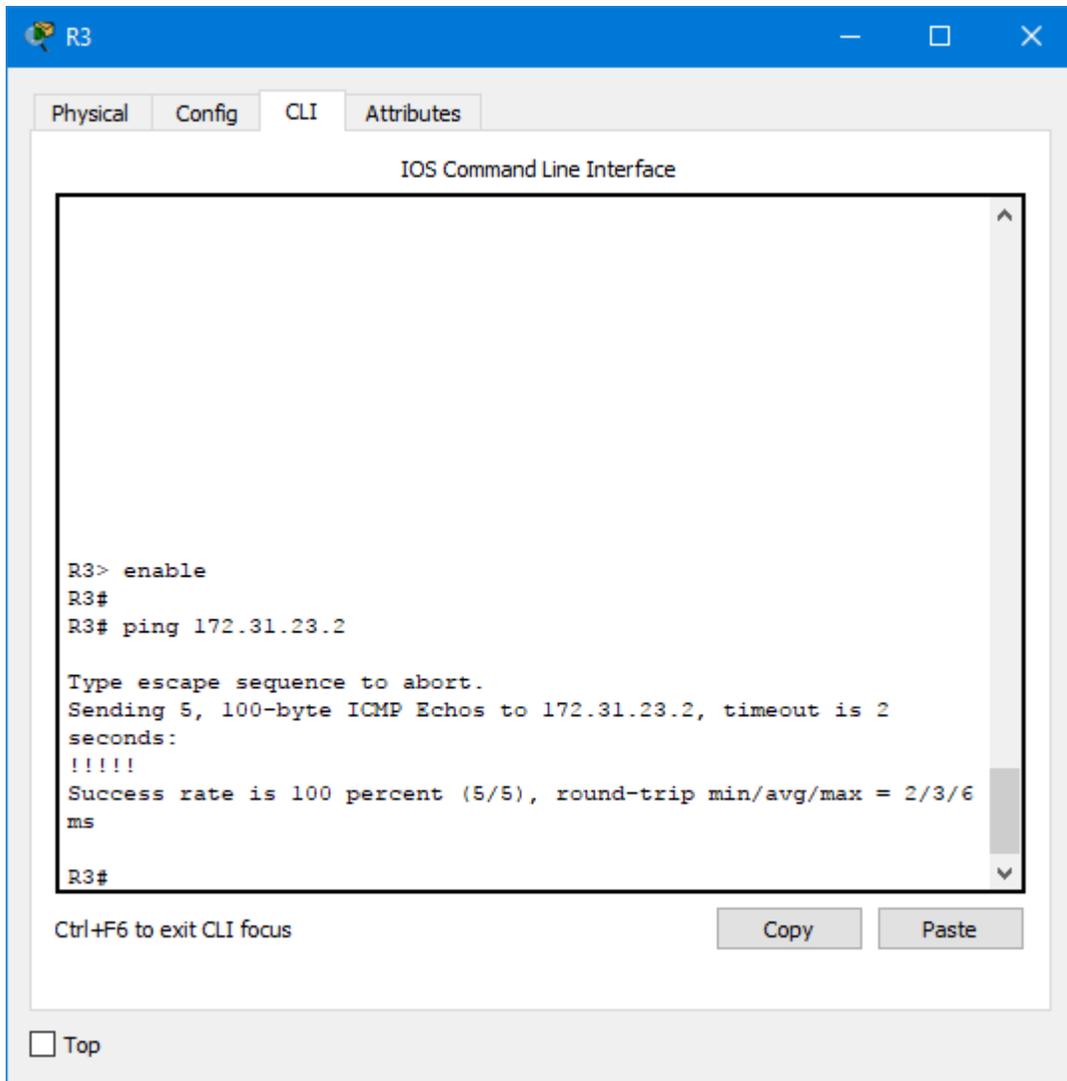
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.31.21.2, timeout is 2
seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/7
ms
R1#
```

Ctrl+F6 to exit CLI focus

Copy Paste

Top

## Ping desde R3 a R2, S0/0/1



```
R3> enable
R3#
R3# ping 172.31.23.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.31.23.2, timeout is 2
seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 2/3/6
ms

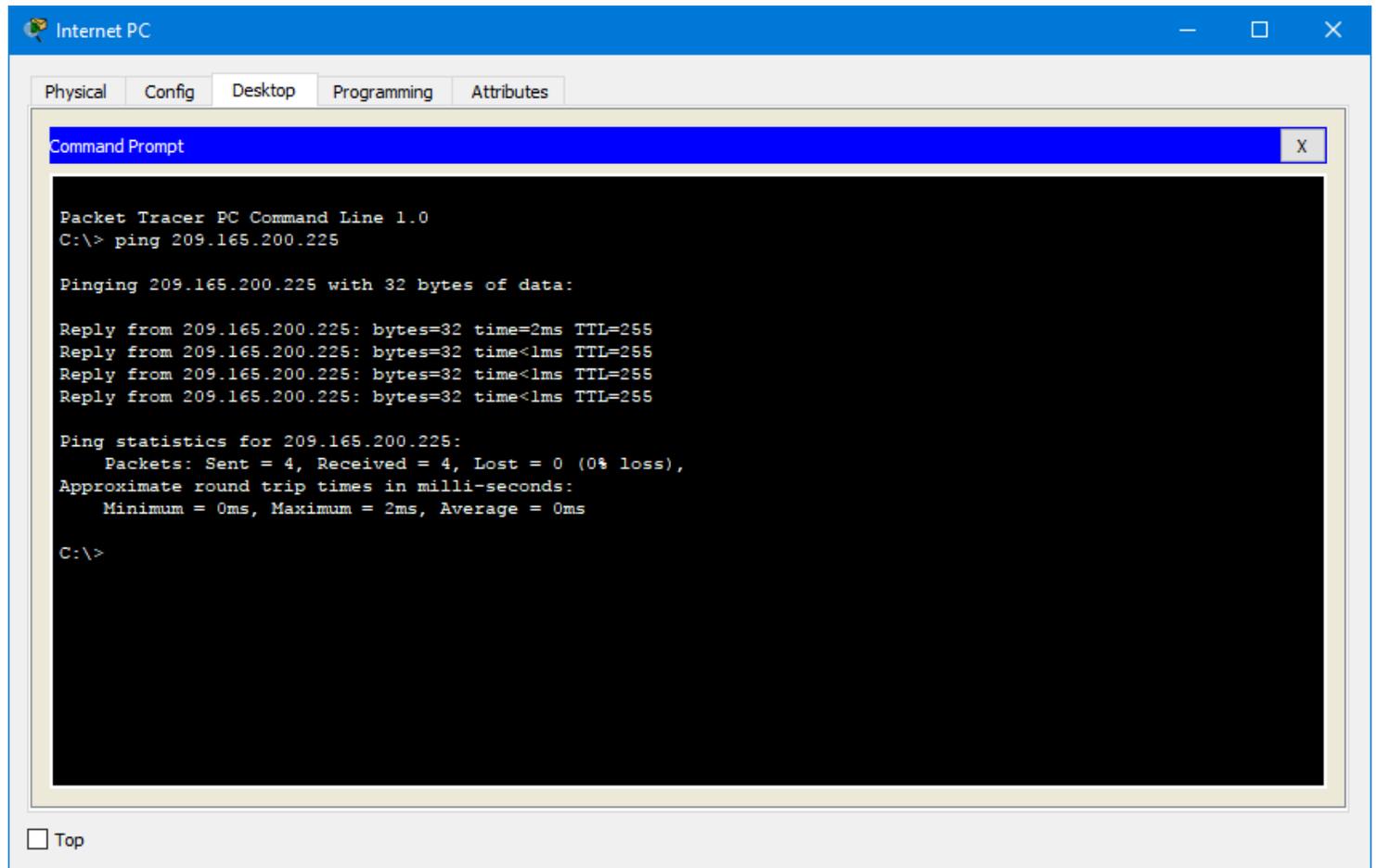
R3#
```

Ctrl+F6 to exit CLI focus

Copy Paste

Top

## Ping desde Internet PC a Puerta de Enlace Predeterminada



The screenshot shows a Packet Tracer PC Command Prompt window titled "Internet PC". The window has tabs for "Physical", "Config", "Desktop", "Programming", and "Attributes", with "Desktop" selected. The Command Prompt displays the following text:

```
Packet Tracer PC Command Line 1.0
C:\> ping 209.165.200.225

Pinging 209.165.200.225 with 32 bytes of data:

Reply from 209.165.200.225: bytes=32 time=2ms TTL=255
Reply from 209.165.200.225: bytes=32 time<1ms TTL=255
Reply from 209.165.200.225: bytes=32 time<1ms TTL=255
Reply from 209.165.200.225: bytes=32 time<1ms TTL=255

Ping statistics for 209.165.200.225:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 2ms, Average = 0ms

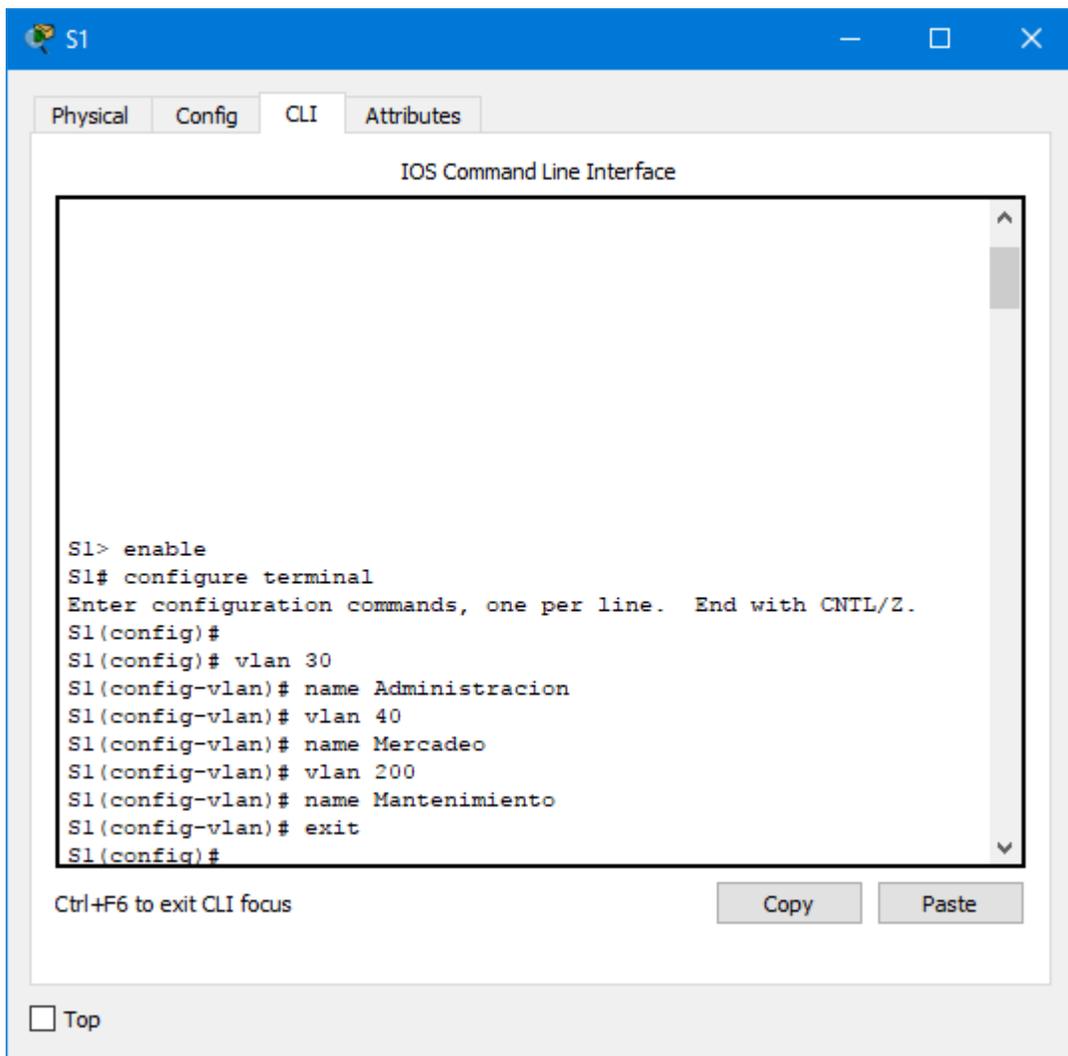
C:\>
```

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

## Configuración de Switch Security, VLANs e Inter VLAN Routing

Tareas de configuración para S1 incluyendo: Crear la base de datos VLAN, asignar la dirección IP de administración, asignar la puerta de enlace predeterminada, forzar la conexión troncal en la interfaz F0/3, forzar la conexión troncal en la interfaz F0/24, configurar todos los demás puertos como puertos de acceso, asignar F0/1 a la VLAN 30, apagar todos los puertos no utilizados.

### Configurando S1.



```
S1> enable
S1# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
S1(config)#
S1(config)# vlan 30
S1(config-vlan)# name Administracion
S1(config-vlan)# vlan 40
S1(config-vlan)# name Mercadeo
S1(config-vlan)# vlan 200
S1(config-vlan)# name Mantenimiento
S1(config-vlan)# exit
S1(config)#
```

Ctrl+F6 to exit CLI focus

Copy Paste

Top

S1

Physical Config CLI Attributes

IOS Command Line Interface

```
S1> enable
S1# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
S1(config)#
S1(config)# int vlan 200
S1(config-if)#
%LINK-5-CHANGED: Interface Vlan200, changed state to up

S1(config-if)# ip address 192.168.200.2 255.255.255.0
S1(config-if)# no shutdown
S1(config-if)# exit
S1(config)# ip default-gateway 192.168.200.1
S1(config)#
S1(config)# int f0/3
S1(config-if)# switchport mode trunk

S1(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed
state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed
state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan200, changed state to up

S1(config-if)# switchport trunk native vlan 1
S1(config-if)#
```

Ctrl+F6 to exit CLI focus

Copy Paste

Top

The image shows a window titled "S1" 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:

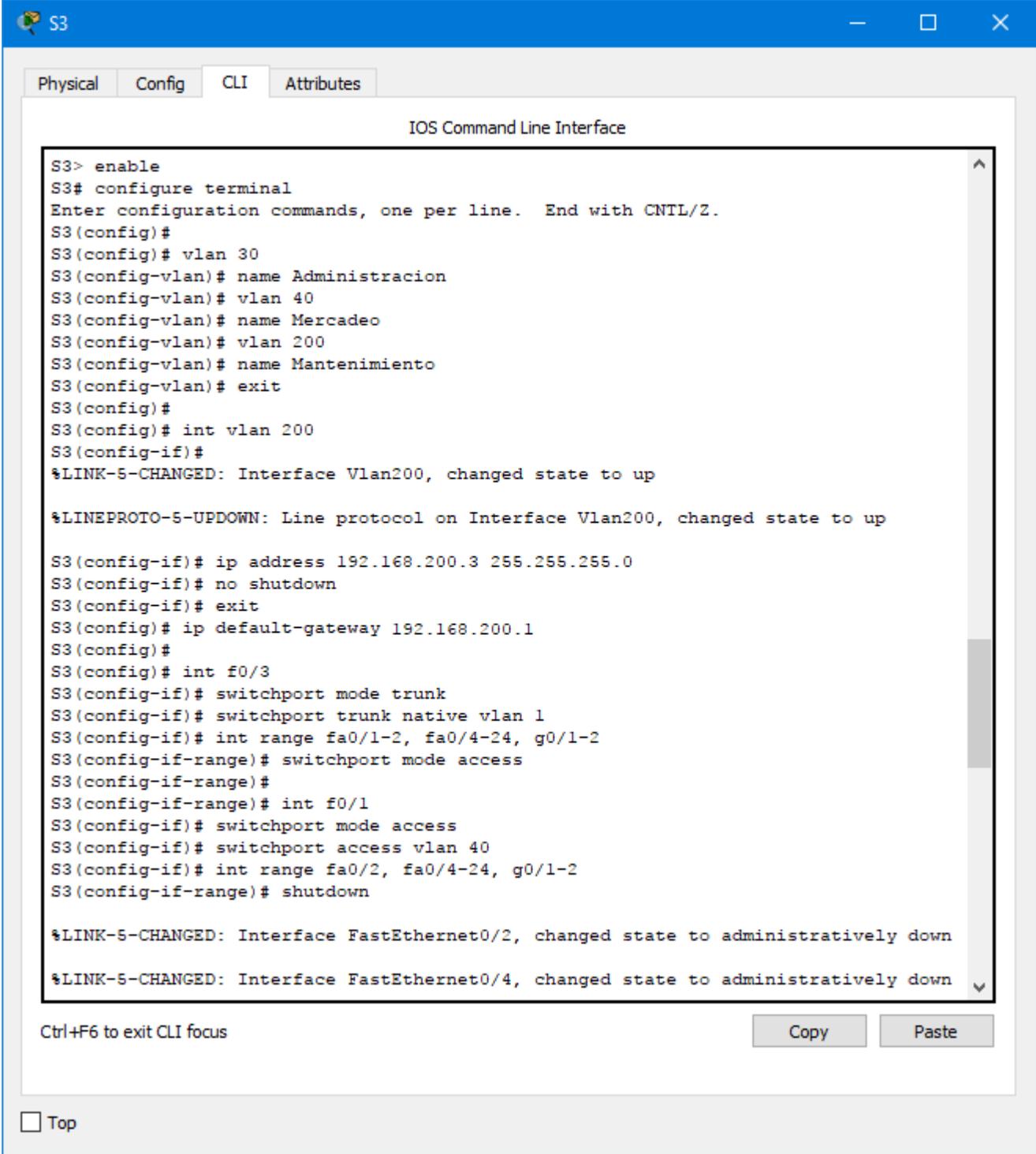
```
S1> enable
S1# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
S1(config)#
S1(config)# int f0/24
S1(config-if)# switchport mode trunk
S1(config-if)# switchport trunk native vlan 1
S1(config-if)# int range fa0/1-2, fa0/4-23, g0/1-2
S1(config-if-range)# switchport mode access
S1(config-if-range)#
S1(config-if-range)# int f0/1
S1(config-if)# switchport mode access
S1(config-if)# switchport access vlan 30
S1(config-if)# int range fa0/2, fa0/4-23, g0/1-2
S1(config-if-range)# shutdown

%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/4, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/5, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/6, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/7, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/8, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/9, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/10, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/11, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/12, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/13, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/14, changed state to administratively down
```

At the bottom of the CLI window, there is a prompt "Ctrl+F6 to exit CLI focus" and two buttons labeled "Copy" and "Paste". Below the CLI window, there is a checkbox labeled "Top".

Tareas de configuración para S3 incluyendo: Crear la base de datos VLAN, asignar la dirección IP, asignar la puerta de enlace predeterminada, forzar la conexión troncal en la interfaz F0/3, configurar todos los demás puertos como puertos de acceso, asignar F0/1 a la VLAN 40, apagar todos los puertos no utilizados.

### Configurando S3.



```
S3> enable
S3# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
S3(config)#
S3(config)# vlan 30
S3(config-vlan)# name Administracion
S3(config-vlan)# vlan 40
S3(config-vlan)# name Mercadeo
S3(config-vlan)# vlan 200
S3(config-vlan)# name Mantenimiento
S3(config-vlan)# exit
S3(config)#
S3(config)# int vlan 200
S3(config-if)#
%LINK-5-CHANGED: Interface Vlan200, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan200, changed state to up

S3(config-if)# ip address 192.168.200.3 255.255.255.0
S3(config-if)# no shutdown
S3(config-if)# exit
S3(config)# ip default-gateway 192.168.200.1
S3(config)#
S3(config)# int f0/3
S3(config-if)# switchport mode trunk
S3(config-if)# switchport trunk native vlan 1
S3(config-if)# int range fa0/1-2, fa0/4-24, g0/1-2
S3(config-if-range)# switchport mode access
S3(config-if-range)#
S3(config-if-range)# int f0/1
S3(config-if)# switchport mode access
S3(config-if)# switchport access vlan 40
S3(config-if)# int range fa0/2, fa0/4-24, g0/1-2
S3(config-if-range)# shutdown

%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/4, changed state to administratively down
```

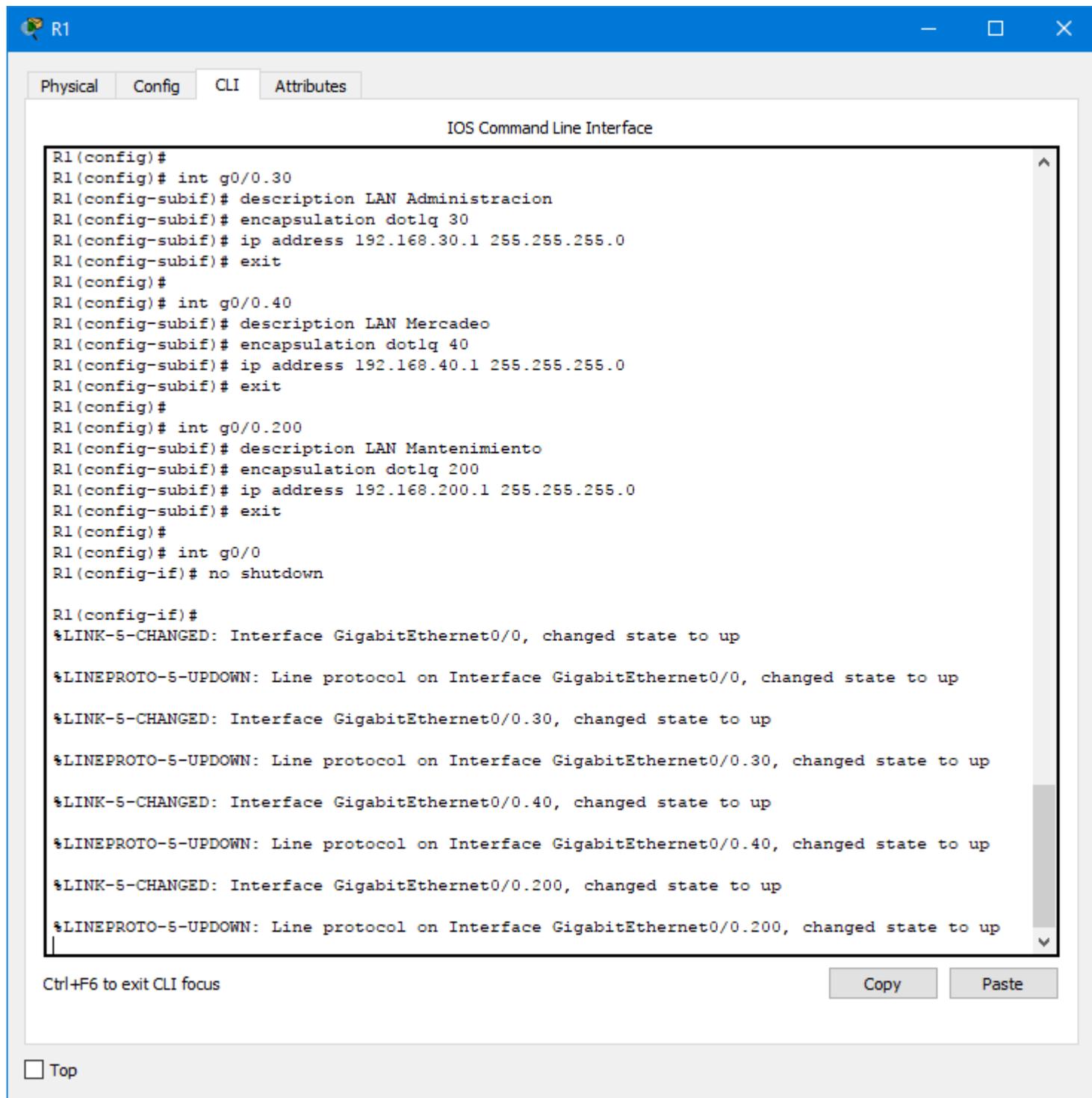
Ctrl+F6 to exit CLI focus

Copy Paste

Top

Tareas de configuración para R1 incluyendo: Configurar la subinterfaz 802.1Q .31 en G0/0, configurar la subinterfaz 802.1Q .33 en G0/0, configurar la subinterfaz 802.1Q .99 en G0/0, activar la interfaz G0/0.

## Configurando R1.



The screenshot shows the R1 IOS Command Line Interface (CLI) with the following configuration commands and output:

```
R1(config)#
R1(config)# int g0/0.30
R1(config-subif)# description LAN Administracion
R1(config-subif)# encapsulation dot1q 30
R1(config-subif)# ip address 192.168.30.1 255.255.255.0
R1(config-subif)# exit
R1(config)#
R1(config)# int g0/0.40
R1(config-subif)# description LAN Mercadeo
R1(config-subif)# encapsulation dot1q 40
R1(config-subif)# ip address 192.168.40.1 255.255.255.0
R1(config-subif)# exit
R1(config)#
R1(config)# int g0/0.200
R1(config-subif)# description LAN Mantenimiento
R1(config-subif)# encapsulation dot1q 200
R1(config-subif)# ip address 192.168.200.1 255.255.255.0
R1(config-subif)# exit
R1(config)#
R1(config)# int g0/0
R1(config-if)# no shutdown

R1(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up
%LINK-5-CHANGED: Interface GigabitEthernet0/0.30, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.30, changed state to up
%LINK-5-CHANGED: Interface GigabitEthernet0/0.40, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.40, changed state to up
%LINK-5-CHANGED: Interface GigabitEthernet0/0.200, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.200, changed state to up
```

Ctrl+F6 to exit CLI focus

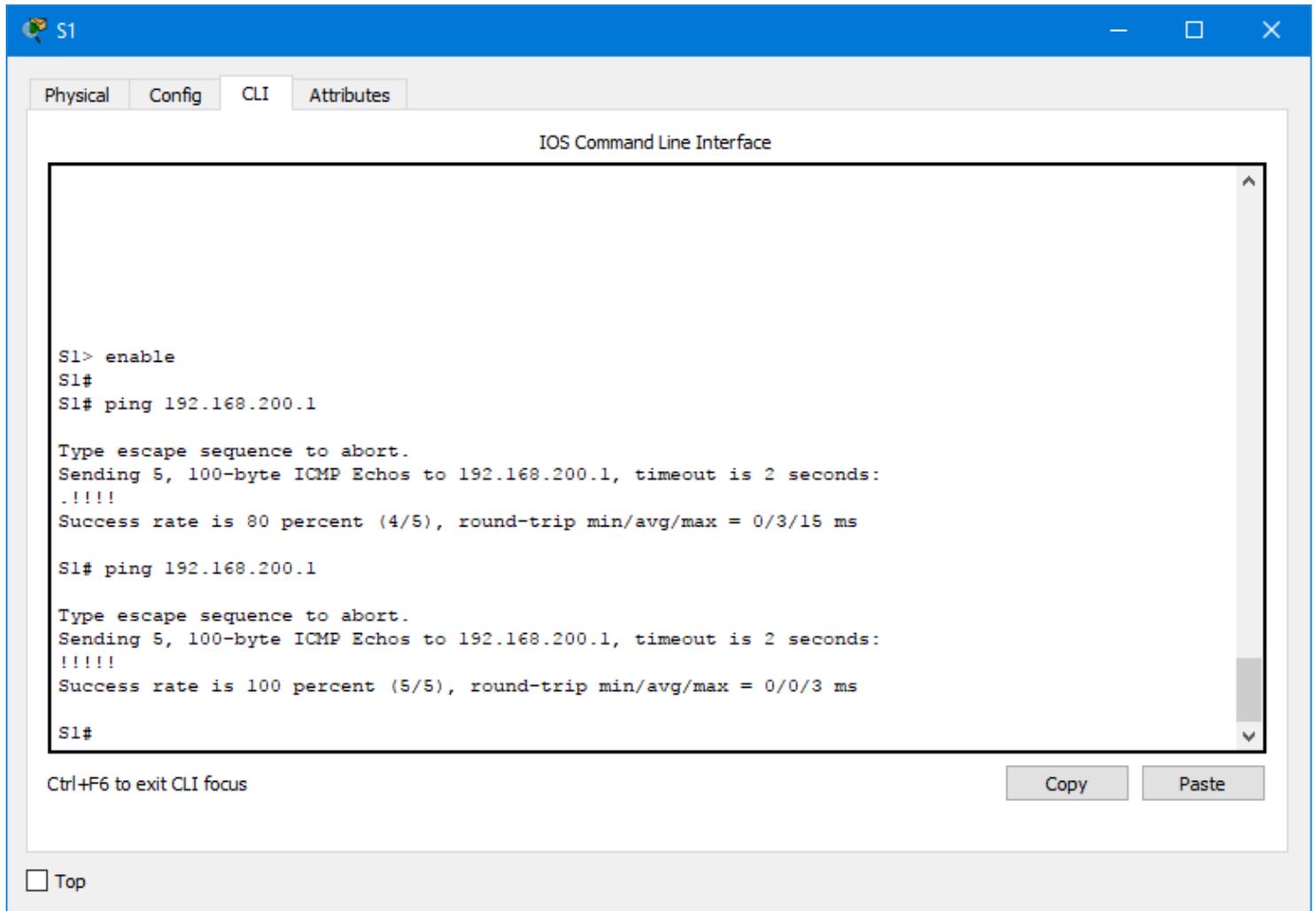
Copy Paste

Top

## Verificación de la Conectividad de la Red

Se usa el comando ping para probar la conectividad entre los Switches y R1.

### Ping desde S1 a R1, Dirección VLAN 200



```
S1> enable
S1#
S1# ping 192.168.200.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.200.1, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/3/15 ms

S1# ping 192.168.200.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.200.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/3 ms

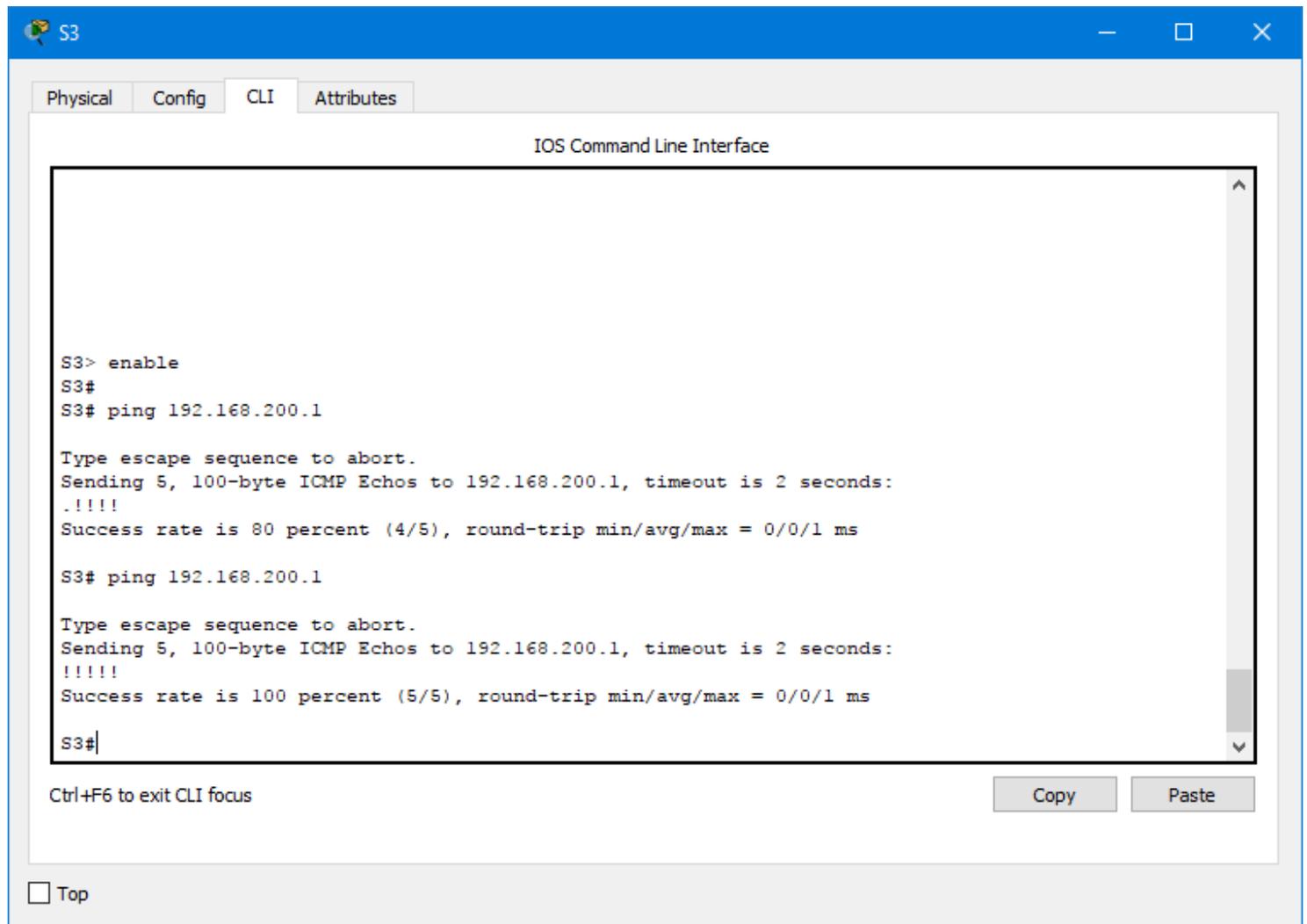
S1#
```

Ctrl+F6 to exit CLI focus

Copy Paste

Top

## Ping desde S3 a R1, Dirección VLAN 200



The screenshot shows the CLI of switch S3. The interface has tabs for Physical, Config, CLI, and Attributes. The CLI window displays the following text:

```
S3> enable
S3#
S3# ping 192.168.200.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.200.1, timeout is 2 seconds:
!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/0/1 ms

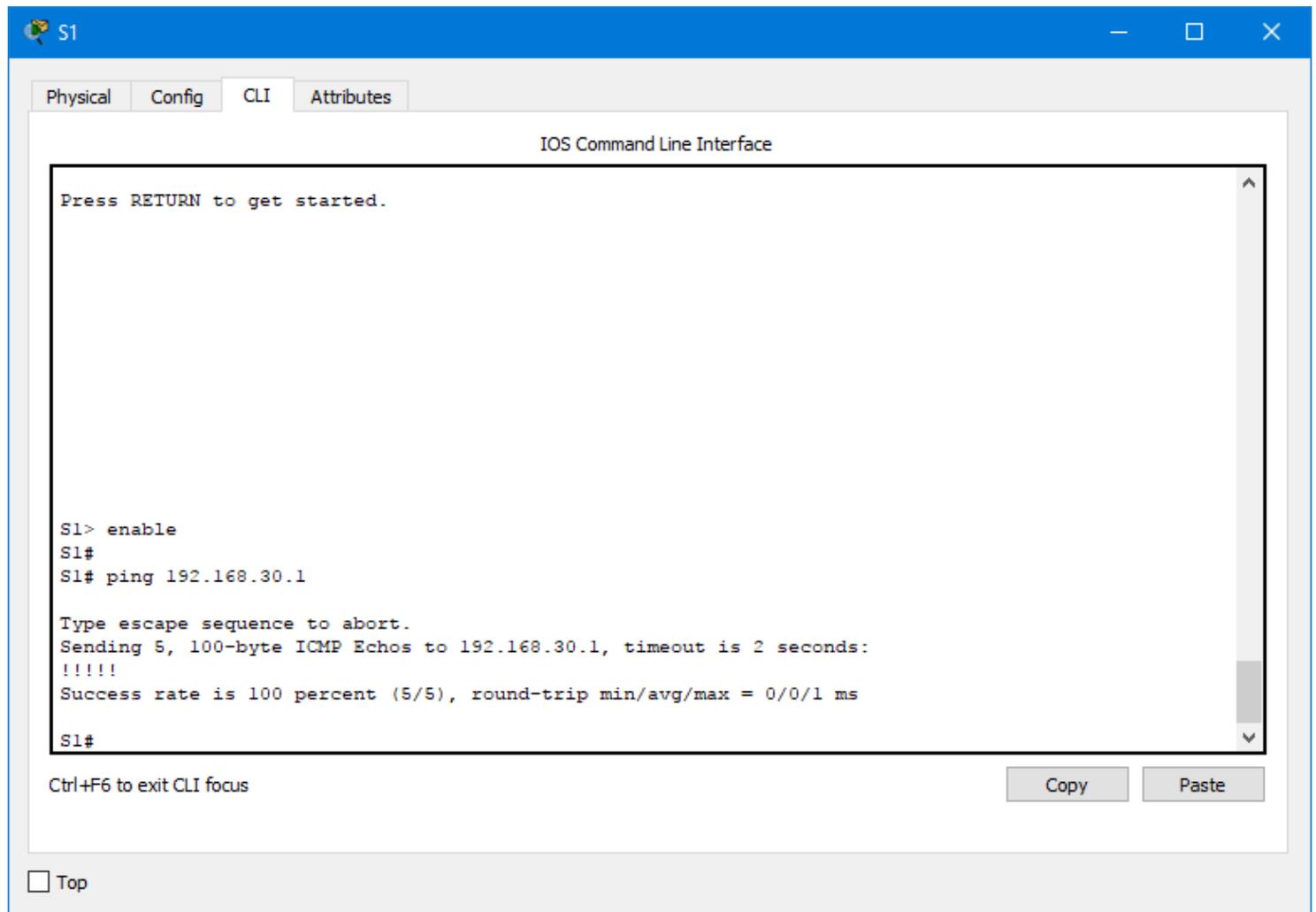
S3# ping 192.168.200.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.200.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms

S3#|
```

Below the CLI window, there is a status bar with the text "Ctrl+F6 to exit CLI focus" and two buttons: "Copy" and "Paste". At the bottom left, there is a checkbox labeled "Top".

## Ping desde S1 a R1, Dirección VLAN 30

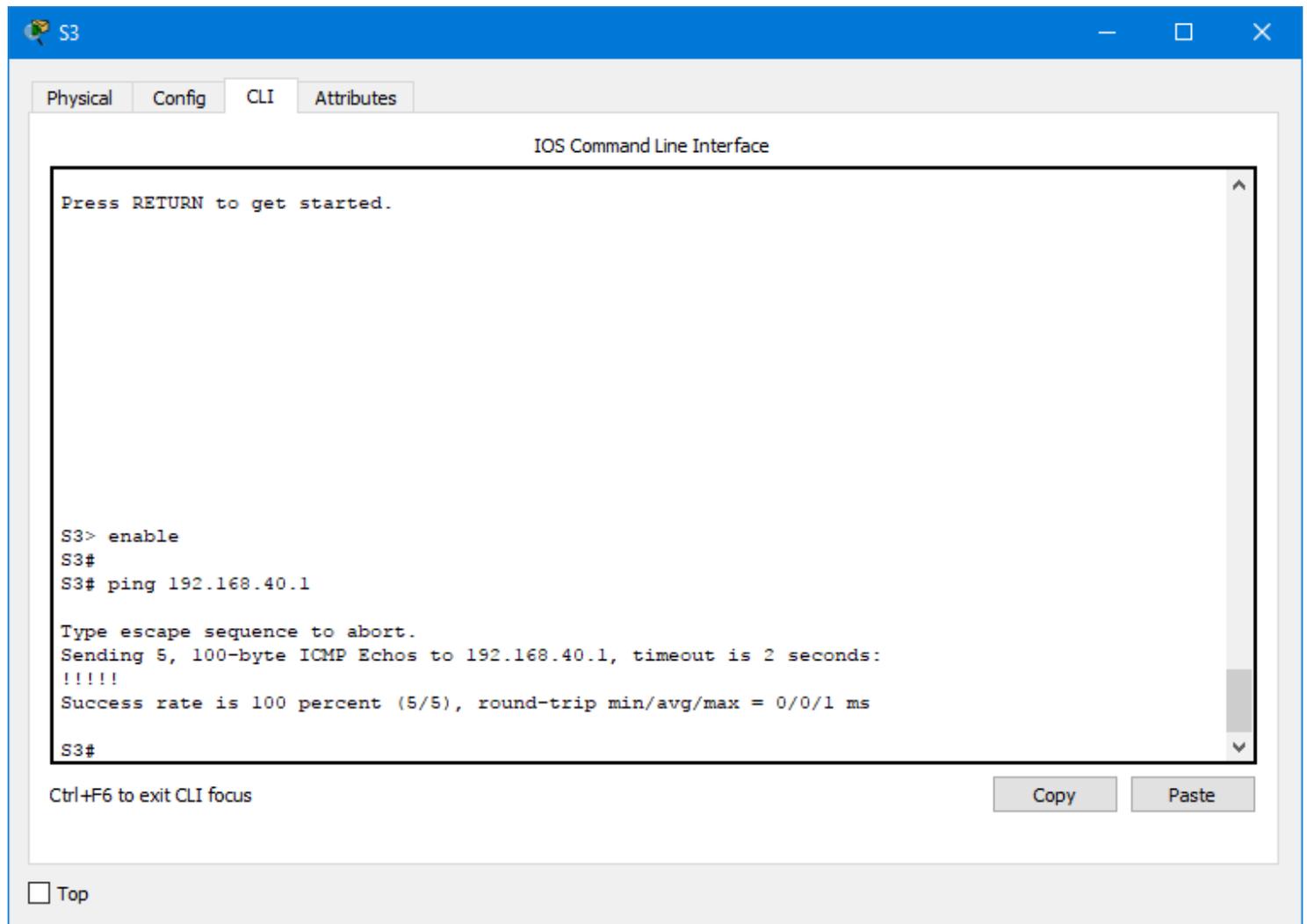


The screenshot shows a window titled 'S1' with a blue header bar. Below the header are four tabs: 'Physical', 'Config', 'CLI', and 'Attributes'. The 'CLI' tab is active, displaying the 'IOS Command Line Interface'. The interface contains the following text:

```
Press RETURN to get started.  
  
S1> enable  
S1#  
S1# ping 192.168.30.1  
  
Type escape sequence to abort.  
Sending 5, 100-byte ICMP Echos to 192.168.30.1, timeout is 2 seconds:  
!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms  
  
S1#
```

At the bottom of the CLI window, there is a prompt 'Ctrl+F6 to exit CLI focus' on the left and two buttons labeled 'Copy' and 'Paste' on the right. Below the CLI window is a checkbox labeled 'Top'.

## Ping desde S3 a R1, Dirección VLAN 40



The screenshot shows a window titled 'S3' with a blue header bar. Below the header are four tabs: 'Physical', 'Config', 'CLI', and 'Attributes'. The 'CLI' tab is selected, and the window displays the 'IOS Command Line Interface'. The interface shows the following text:

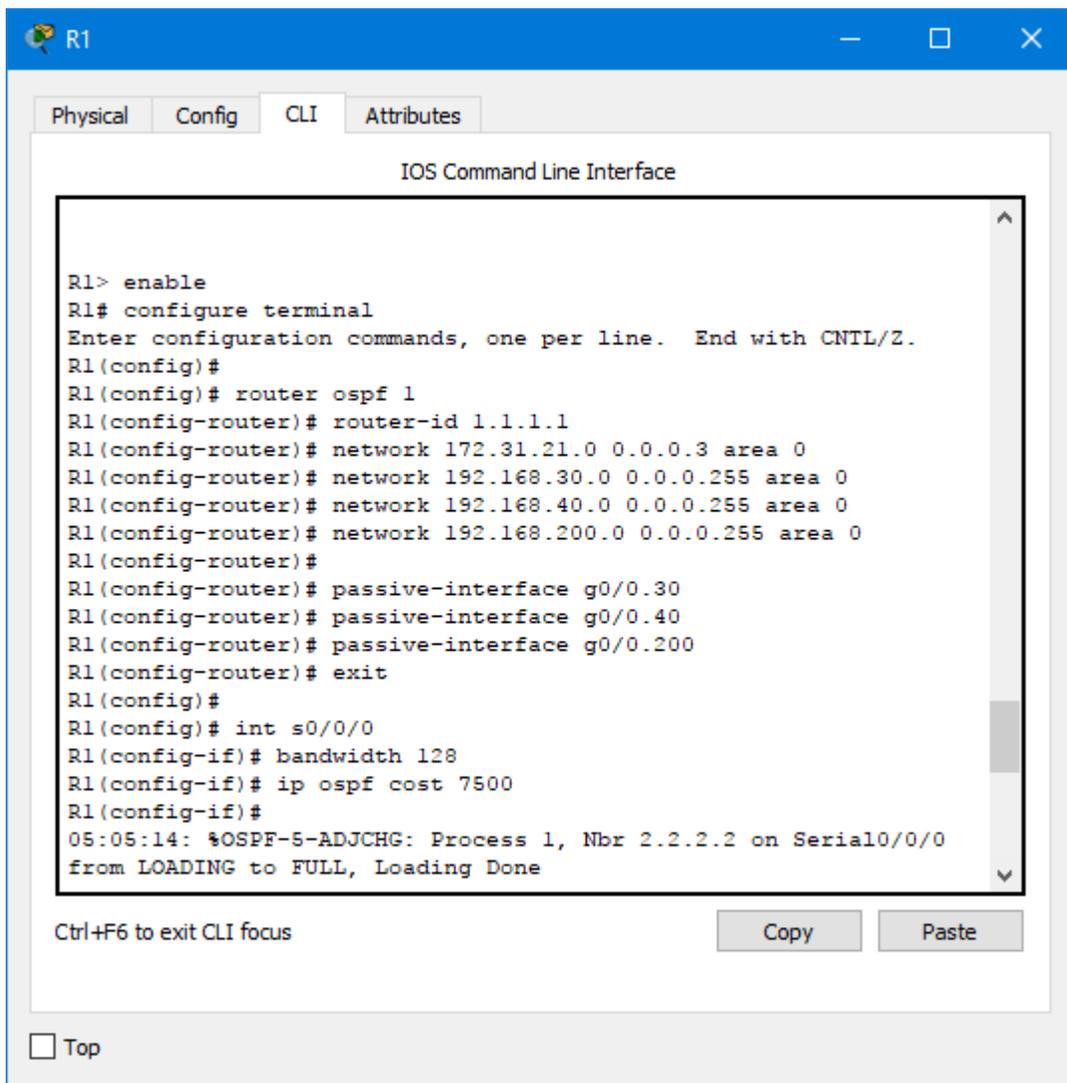
```
Press RETURN to get started.  
  
S3> enable  
S3#  
S3# ping 192.168.40.1  
  
Type escape sequence to abort.  
Sending 5, 100-byte ICMP Echos to 192.168.40.1, timeout is 2 seconds:  
!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms  
S3#
```

At the bottom of the CLI window, there is a prompt 'Ctrl+F6 to exit CLI focus' and two buttons labeled 'Copy' and 'Paste'. Below the CLI window, there is a checkbox labeled 'Top'.

## Configurar el Protocolo de Enrutamiento Dinámico OSPFv2

Tareas de configuración para R1 incluyendo: ID de proceso OSPF, ID de enrutador, anunciar redes conectadas directamente, establecer todas las interfaces LAN como pasivas, cambiar el ancho de banda de referencia de costo predeterminado para admitir cálculos de interfaz Gigabit, establecer el ancho de banda de la interfaz en serie, ajustar el costo métrico de S0/0/0.

### Configurando OSPFv2 en R1.



```
R1> enable
R1# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#
R1(config)# router ospf 1
R1(config-router)# router-id 1.1.1.1
R1(config-router)# network 172.31.21.0 0.0.0.3 area 0
R1(config-router)# network 192.168.30.0 0.0.0.255 area 0
R1(config-router)# network 192.168.40.0 0.0.0.255 area 0
R1(config-router)# network 192.168.200.0 0.0.0.255 area 0
R1(config-router)#
R1(config-router)# passive-interface g0/0.30
R1(config-router)# passive-interface g0/0.40
R1(config-router)# passive-interface g0/0.200
R1(config-router)# exit
R1(config)#
R1(config)# int s0/0/0
R1(config-if)# bandwidth 128
R1(config-if)# ip ospf cost 7500
R1(config-if)#
05:05:14: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on Serial0/0/0
from LOADING to FULL, Loading Done
```

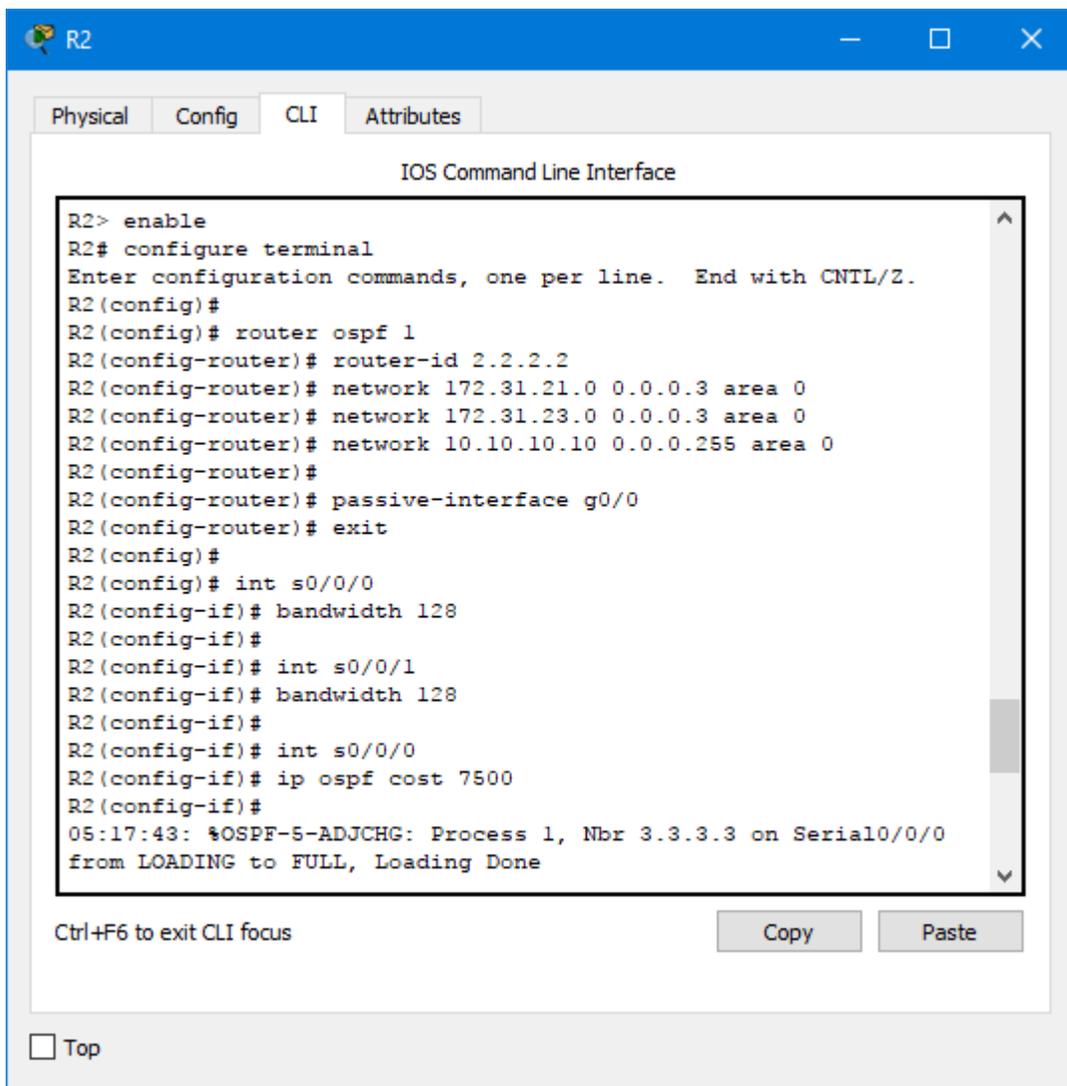
Ctrl+F6 to exit CLI focus

Copy Paste

Top

Tareas de configuración para R2 incluyendo: ID de proceso OSPF, ID de enrutador, anunciar redes conectadas directamente, configurar la interfaz LAN (Loopback) como pasiva, establecer todas las interfaces LAN como pasivas, cambiar el ancho de banda de referencia de costo predeterminado para admitir cálculos de interfaz Gigabit, establecer el ancho de banda en todas las interfaces seriales, ajustar el costo métrico de S0/0/0.

## Configurando OSPFv2 en R2.



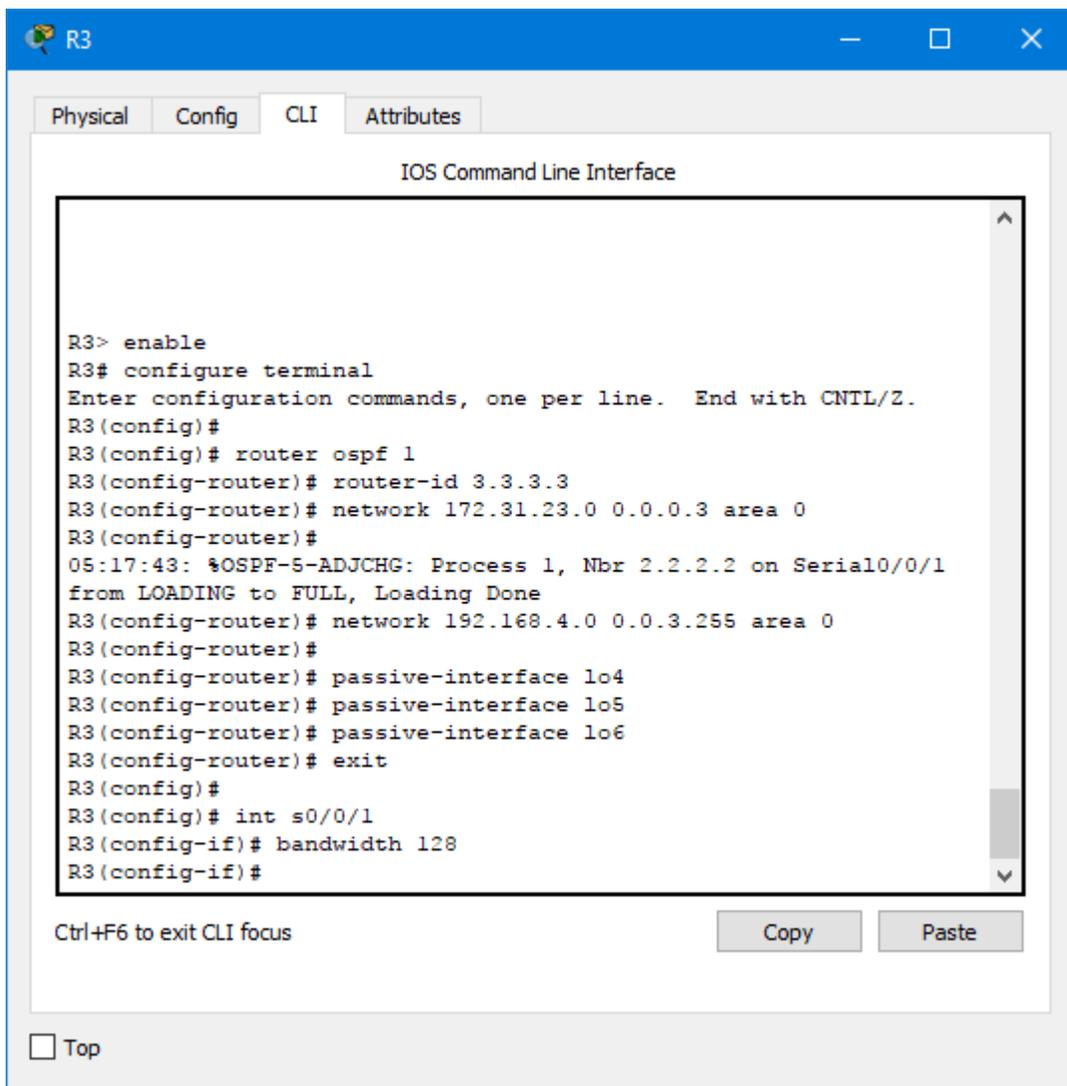
The screenshot shows a window titled 'R2' with tabs for 'Physical', 'Config', 'CLI', and 'Attributes'. The 'CLI' tab is active, displaying the 'IOS Command Line Interface'. The terminal output shows the following commands and their results:

```
R2> enable
R2# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#
R2(config)# router ospf 1
R2(config-router)# router-id 2.2.2.2
R2(config-router)# network 172.31.21.0 0.0.0.3 area 0
R2(config-router)# network 172.31.23.0 0.0.0.3 area 0
R2(config-router)# network 10.10.10.10 0.0.0.255 area 0
R2(config-router)#
R2(config-router)# passive-interface g0/0
R2(config-router)# exit
R2(config)#
R2(config)# int s0/0/0
R2(config-if)# bandwidth 128
R2(config-if)#
R2(config-if)# int s0/0/1
R2(config-if)# bandwidth 128
R2(config-if)#
R2(config-if)# int s0/0/0
R2(config-if)# ip ospf cost 7500
R2(config-if)#
05:17:43: %OSPF-5-ADJCHG: Process 1, Nbr 3.3.3.3 on Serial0/0/0
from LOADING to FULL, Loading Done
```

Below the terminal output, there is a 'Ctrl+F6 to exit CLI focus' instruction and 'Copy' and 'Paste' buttons. At the bottom left, there is a checkbox labeled 'Top'.

Tareas de configuración para R3 incluyendo: ID de proceso OSPF, ID de enrutador, anunciar redes conectadas directamente, configurar la interfaz LAN (Loopback) como pasiva, establecer todas las interfaces LAN (loopback) como pasivas, cambiar el ancho de banda de referencia de costo predeterminado para admitir cálculos de interfaz Gigabit, establecer el ancho de banda en la interface serial.

### Configurando OSPFv2 en R3.



The screenshot shows a window titled 'R3' 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 commands and their results:

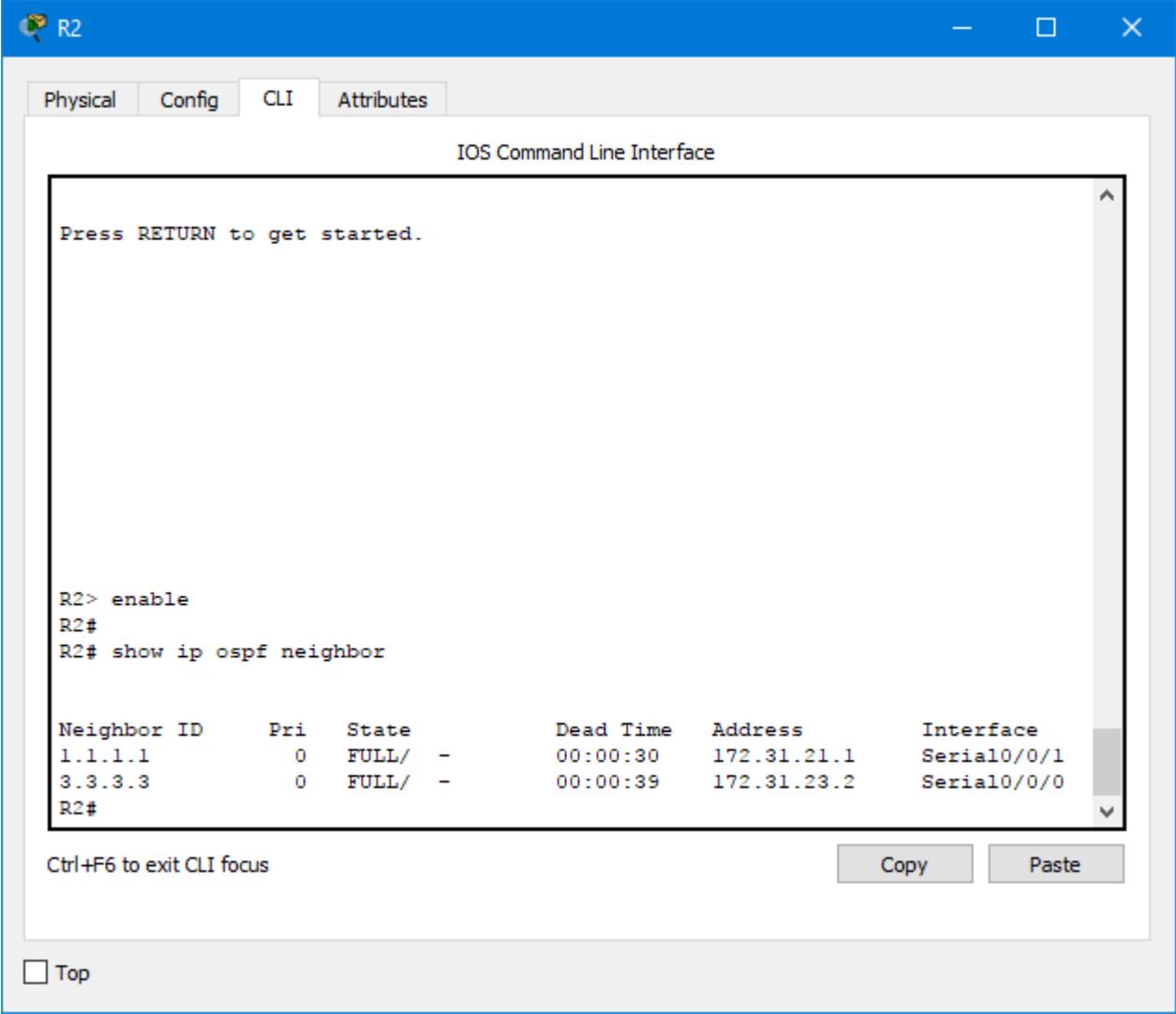
```
R3> enable
R3# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#
R3(config)# router ospf 1
R3(config-router)# router-id 3.3.3.3
R3(config-router)# network 172.31.23.0 0.0.0.3 area 0
R3(config-router)#
05:17:43: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on Serial0/0/1
from LOADING to FULL, Loading Done
R3(config-router)# network 192.168.4.0 0.0.3.255 area 0
R3(config-router)#
R3(config-router)# passive-interface lo4
R3(config-router)# passive-interface lo5
R3(config-router)# passive-interface lo6
R3(config-router)# exit
R3(config)#
R3(config)# int s0/0/1
R3(config-if)# bandwidth 128
R3(config-if)#
```

Below the terminal window, there is a 'Ctrl+F6 to exit CLI focus' instruction and 'Copy' and 'Paste' buttons. At the bottom left, there is a 'Top' button.

## Verificación de la Información de OSPF

Ejemplificamos realizando la verificación en el Router R2.

### Routers conectados por OSPFv2



The screenshot shows a Cisco IOS Command Line Interface (CLI) window for Router R2. The window title is "R2" and it has tabs for "Physical", "Config", "CLI", and "Attributes". The CLI prompt is "R2#". The user has entered the command "show ip ospf neighbor", which displays the following output:

```
Press RETURN to get started.
```

```
R2> enable  
R2#  
R2# show ip ospf neighbor
```

Neighbor ID	Pri	State	Dead Time	Address	Interface
1.1.1.1	0	FULL/ -	00:00:30	172.31.21.1	Serial0/0/1
3.3.3.3	0	FULL/ -	00:00:39	172.31.23.2	Serial0/0/0

R2#

Ctrl+F6 to exit CLI focus

Copy Paste

Top

## Resumen de las interfaces OSPF que incluye una columna para el Costo de cada Interfaz

```
R2# show ip ospf interface

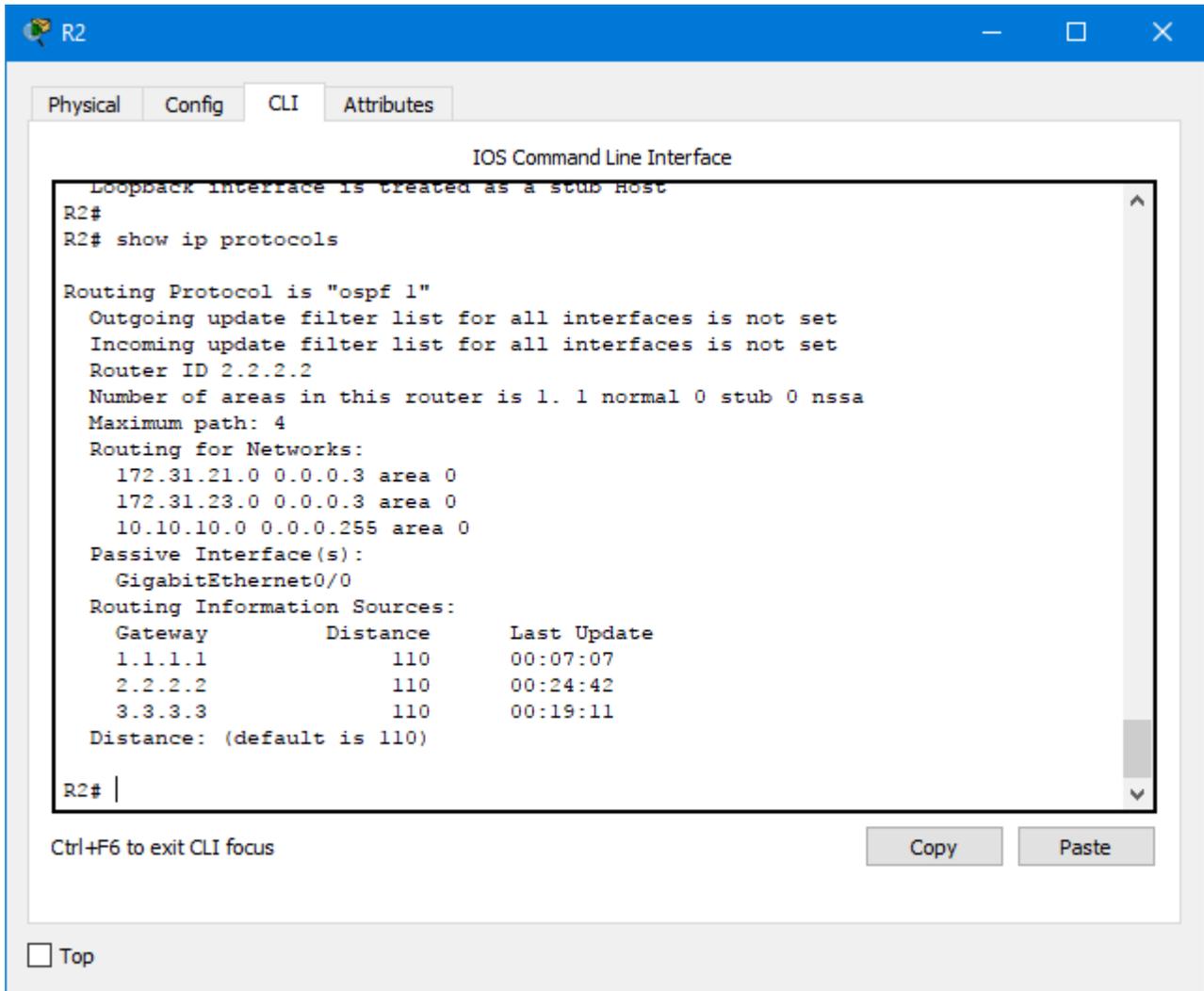
Serial0/0/1 is up, line protocol is up
  Internet address is 172.31.21.2/30, Area 0
  Process ID 1, Router ID 2.2.2.2, Network Type POINT-TO-POINT, Cost: 781
  Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
  No designated router on this network
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:02
  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 1.1.1.1
  Suppress hello for 0 neighbor(s)
Serial0/0/0 is up, line protocol is up
  Internet address is 172.31.23.1/30, Area 0
  Process ID 1, Router ID 2.2.2.2, Network Type POINT-TO-POINT, Cost: 7500
  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 00:00:07
  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 3.3.3.3
  Suppress hello for 0 neighbor(s)
Loopback0 is up, line protocol is up
  Internet address is 10.10.10.10/32, Area 0
  Process ID 1, Router ID 2.2.2.2, Network Type LOOPBACK, Cost: 1
  Loopback interface is treated as a stub Host
R2#
```

Ctrl+F6 to exit CLI focus

Copy Paste

Top

## OSPF Process ID, Router ID, Address summarizations, Routing Networks, y passive interfaces configuradas en un Router



The screenshot shows a Cisco IOS Command Line Interface (CLI) window titled "R2". The window has tabs for "Physical", "Config", "CLI", and "Attributes", with "CLI" selected. The main content area displays the output of the "show ip protocols" command. The output indicates that OSPF process 1 is running on Router ID 2.2.2.2. It shows three networks in area 0: 172.31.21.0/24, 172.31.23.0/24, and 10.10.10.0/24. The GigabitEthernet0/0 interface is configured as a passive interface. The Routing Information Sources table lists three sources: 1.1.1.1, 2.2.2.2, and 3.3.3.3, all with a distance of 110. The window also includes a "Ctrl+F6 to exit CLI focus" message, "Copy" and "Paste" buttons, and a "Top" button.

```
IOS Command Line Interface
Loopback interface is created as a stub host
R2#
R2# show ip protocols

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 2.2.2.2
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    172.31.21.0 0.0.0.3 area 0
    172.31.23.0 0.0.0.3 area 0
    10.10.10.0 0.0.0.255 area 0
  Passive Interface(s):
    GigabitEthernet0/0
  Routing Information Sources:
    Gateway         Distance      Last Update
    1.1.1.1          110          00:07:07
    2.2.2.2          110          00:24:42
    3.3.3.3          110          00:19:11
  Distance: (default is 110)

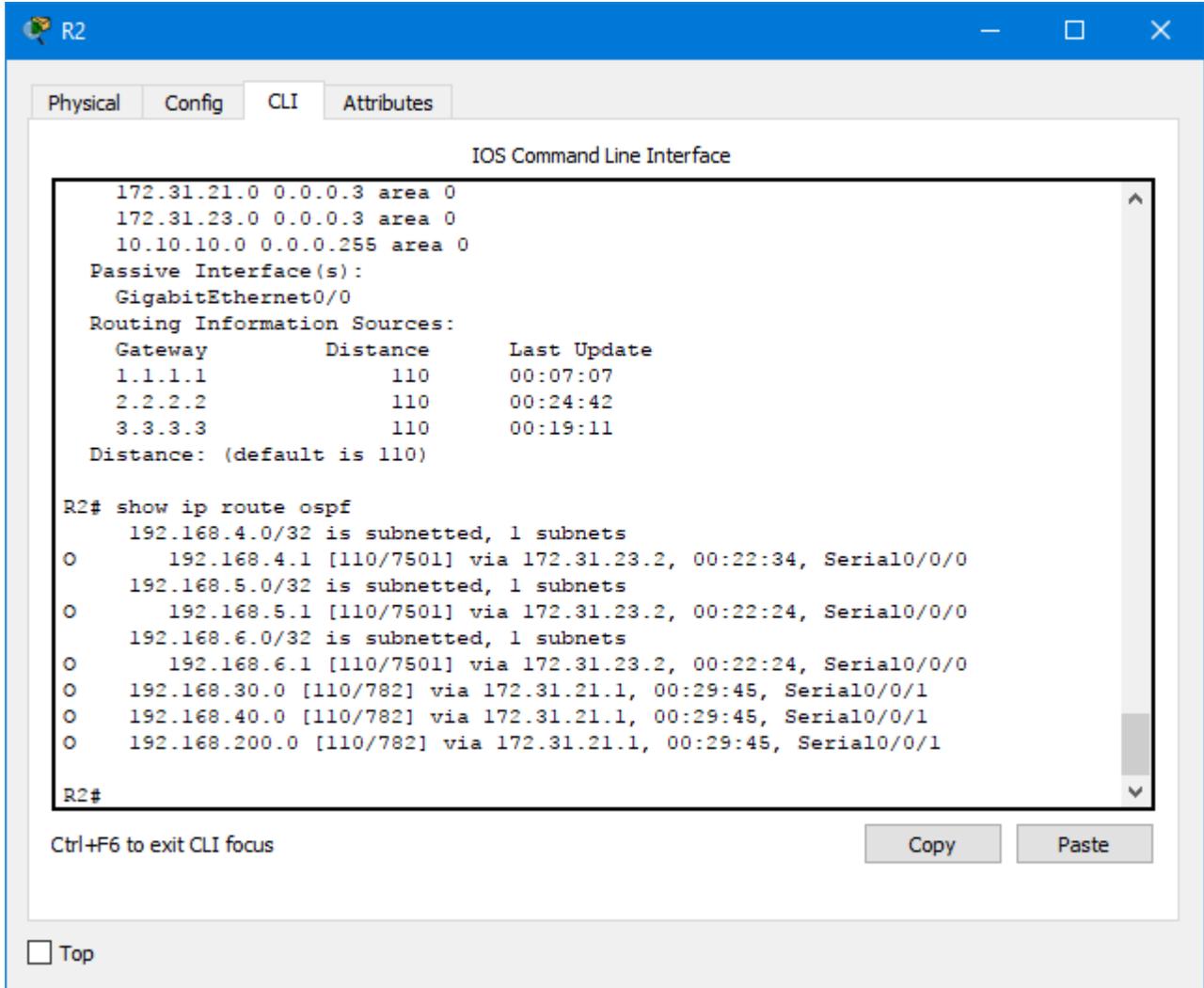
R2# |
```

Ctrl+F6 to exit CLI focus

Copy Paste

Top

## Mostrar solo las rutas OSPF



The screenshot shows a Cisco IOS Command Line Interface (CLI) window for a device named R2. The window has tabs for Physical, Config, CLI, and Attributes, with the CLI tab selected. The main content area displays the following text:

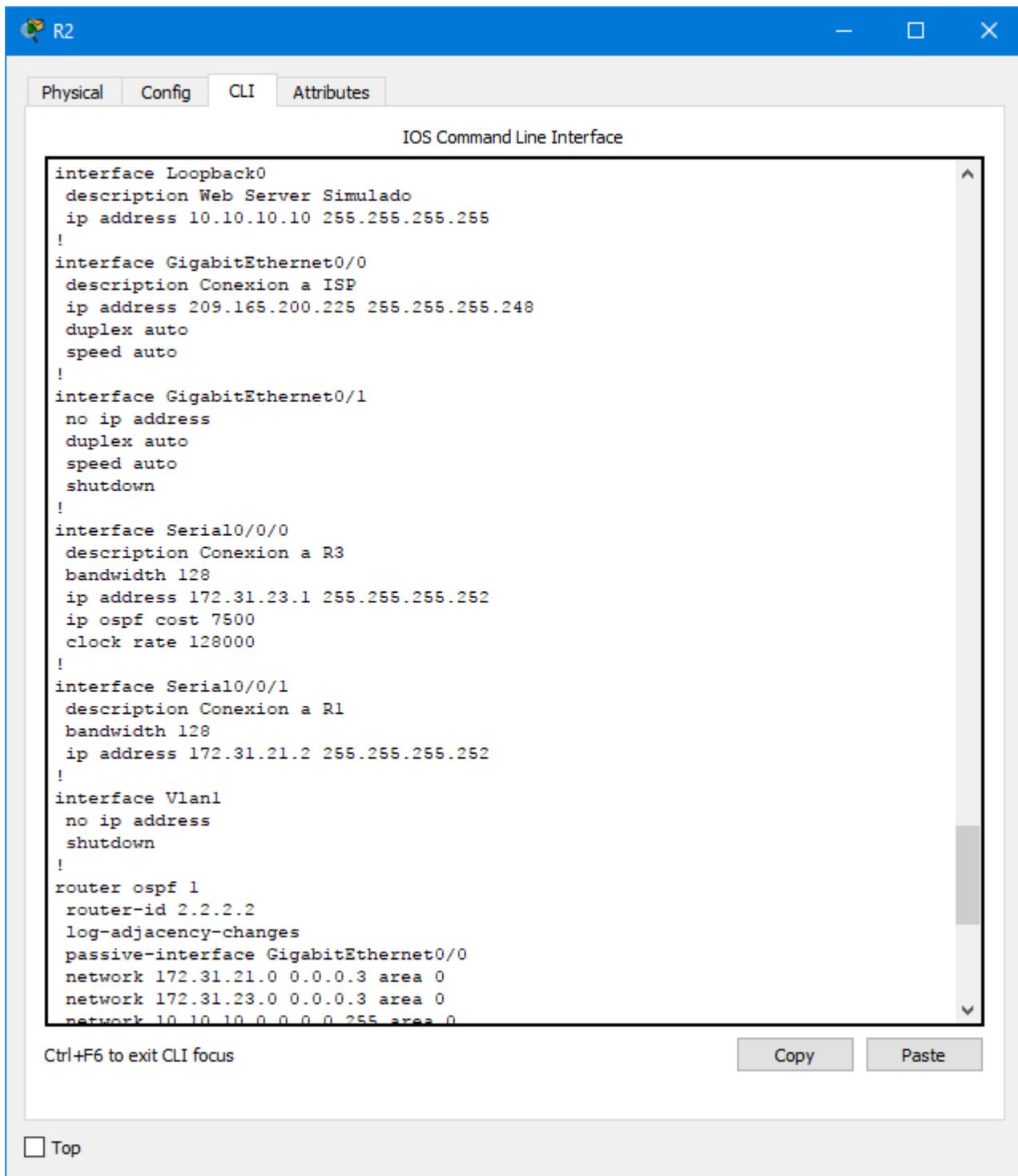
```
172.31.21.0 0.0.0.3 area 0
172.31.23.0 0.0.0.3 area 0
10.10.10.0 0.0.0.255 area 0
Passive Interface(s):
GigabitEthernet0/0
Routing Information Sources:
Gateway          Distance      Last Update
1.1.1.1          110          00:07:07
2.2.2.2          110          00:24:42
3.3.3.3          110          00:19:11
Distance: (default is 110)

R2# show ip route ospf
   192.168.4.0/32 is subnetted, 1 subnets
O       192.168.4.1 [110/7501] via 172.31.23.2, 00:22:34, Serial0/0/0
   192.168.5.0/32 is subnetted, 1 subnets
O       192.168.5.1 [110/7501] via 172.31.23.2, 00:22:24, Serial0/0/0
   192.168.6.0/32 is subnetted, 1 subnets
O       192.168.6.1 [110/7501] via 172.31.23.2, 00:22:24, Serial0/0/0
O       192.168.30.0 [110/782] via 172.31.21.1, 00:29:45, Serial0/0/1
O       192.168.40.0 [110/782] via 172.31.21.1, 00:29:45, Serial0/0/1
O       192.168.200.0 [110/782] via 172.31.21.1, 00:29:45, Serial0/0/1

R2#
```

Below the CLI output, there is a prompt "Ctrl+F6 to exit CLI focus" and two buttons labeled "Copy" and "Paste". At the bottom left of the window, there is a checkbox labeled "Top".

## Sección OSPF de la configuración en ejecución



The screenshot shows a network configuration window for R2. The window has a blue title bar with the text 'R2' and standard window controls. Below the title bar are four tabs: 'Physical', 'Config', 'CLI', and 'Attributes'. The 'CLI' tab is selected, and the main content area is titled 'IOS Command Line Interface'. The configuration text is as follows:

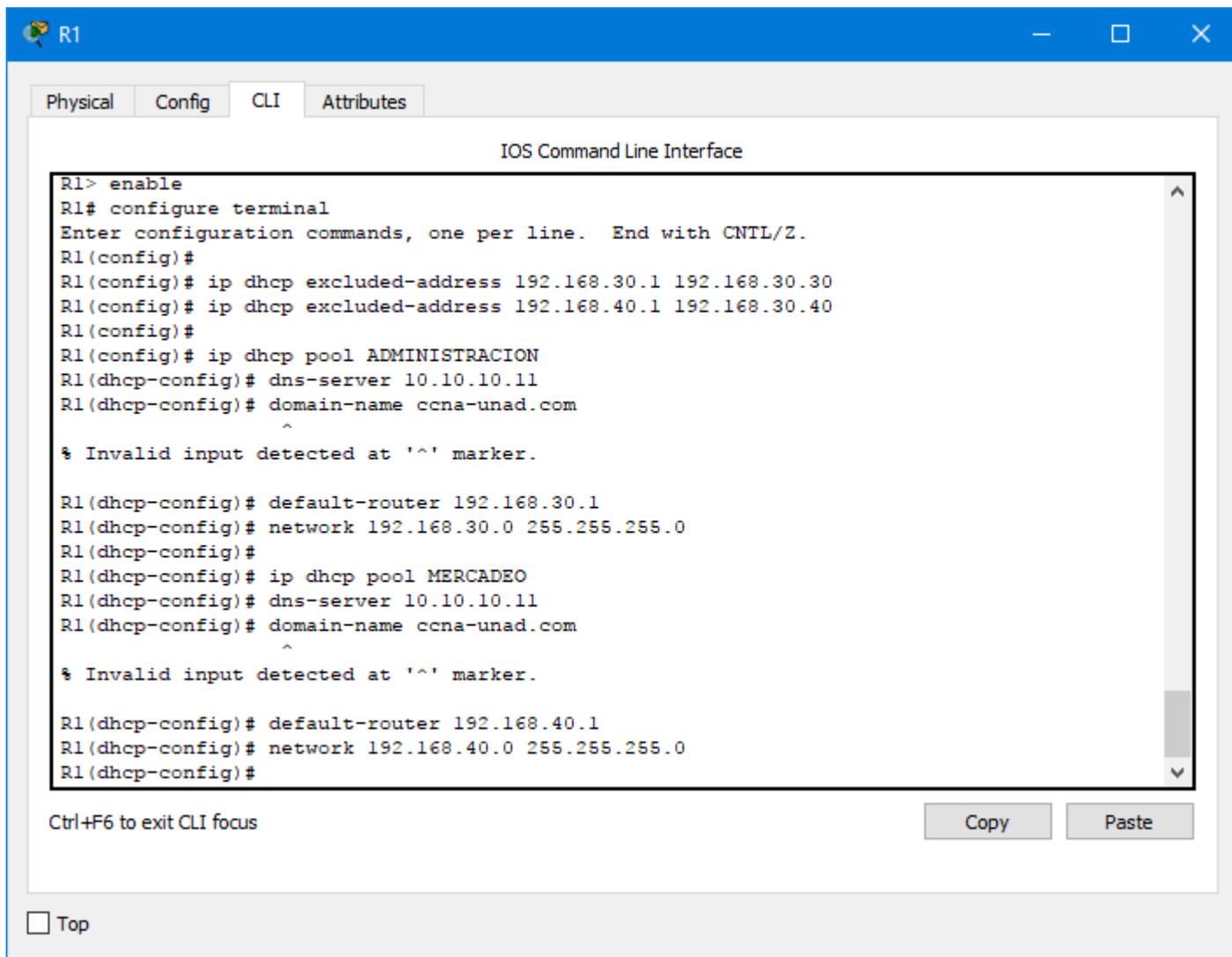
```
interface Loopback0
  description Web Server Simulado
  ip address 10.10.10.10 255.255.255.255
!
interface GigabitEthernet0/0
  description Conexion a ISP
  ip address 209.165.200.225 255.255.255.248
  duplex auto
  speed auto
!
interface GigabitEthernet0/1
  no ip address
  duplex auto
  speed auto
  shutdown
!
interface Serial10/0/0
  description Conexion a R3
  bandwidth 128
  ip address 172.31.23.1 255.255.255.252
  ip ospf cost 7500
  clock rate 128000
!
interface Serial10/0/1
  description Conexion a R1
  bandwidth 128
  ip address 172.31.21.2 255.255.255.252
!
interface Vlan1
  no ip address
  shutdown
!
router ospf 1
  router-id 2.2.2.2
  log-adjacency-changes
  passive-interface GigabitEthernet0/0
  network 172.31.21.0 0.0.0.3 area 0
  network 172.31.23.0 0.0.0.3 area 0
  network 10.10.10.0 0.0.0.255 area 0
```

At the bottom of the CLI window, there is a prompt 'Ctrl+F6 to exit CLI focus' and two buttons: 'Copy' and 'Paste'. Below the CLI window is a 'Top' button with a square icon.

## Implementación DHCP y NAT para IPv4

Tareas de configuración para R1 incluyendo: Reservar las primeras 30 direcciones IP en la VLAN 30 para configuraciones estáticas, reservar las primeras 30 direcciones IP en la VLAN 40 para configuraciones estáticas, crear una agrupación DHCP para la VLAN 30, crear una agrupación DHCP para la VLAN 40.

### Configurando R1 como el servidor DHCP para las VLAN 30 y 40.



```
R1> enable
R1# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#
R1(config)# ip dhcp excluded-address 192.168.30.1 192.168.30.30
R1(config)# ip dhcp excluded-address 192.168.40.1 192.168.30.40
R1(config)#
R1(config)# ip dhcp pool ADMINISTRACION
R1(dhcp-config)# dns-server 10.10.10.11
R1(dhcp-config)# domain-name ccna-unad.com
^
% Invalid input detected at '^' marker.

R1(dhcp-config)# default-router 192.168.30.1
R1(dhcp-config)# network 192.168.30.0 255.255.255.0
R1(dhcp-config)#
R1(dhcp-config)# ip dhcp pool MERCADEO
R1(dhcp-config)# dns-server 10.10.10.11
R1(dhcp-config)# domain-name ccna-unad.com
^
% Invalid input detected at '^' marker.

R1(dhcp-config)# default-router 192.168.40.1
R1(dhcp-config)# network 192.168.40.0 255.255.255.0
R1(dhcp-config)#
```

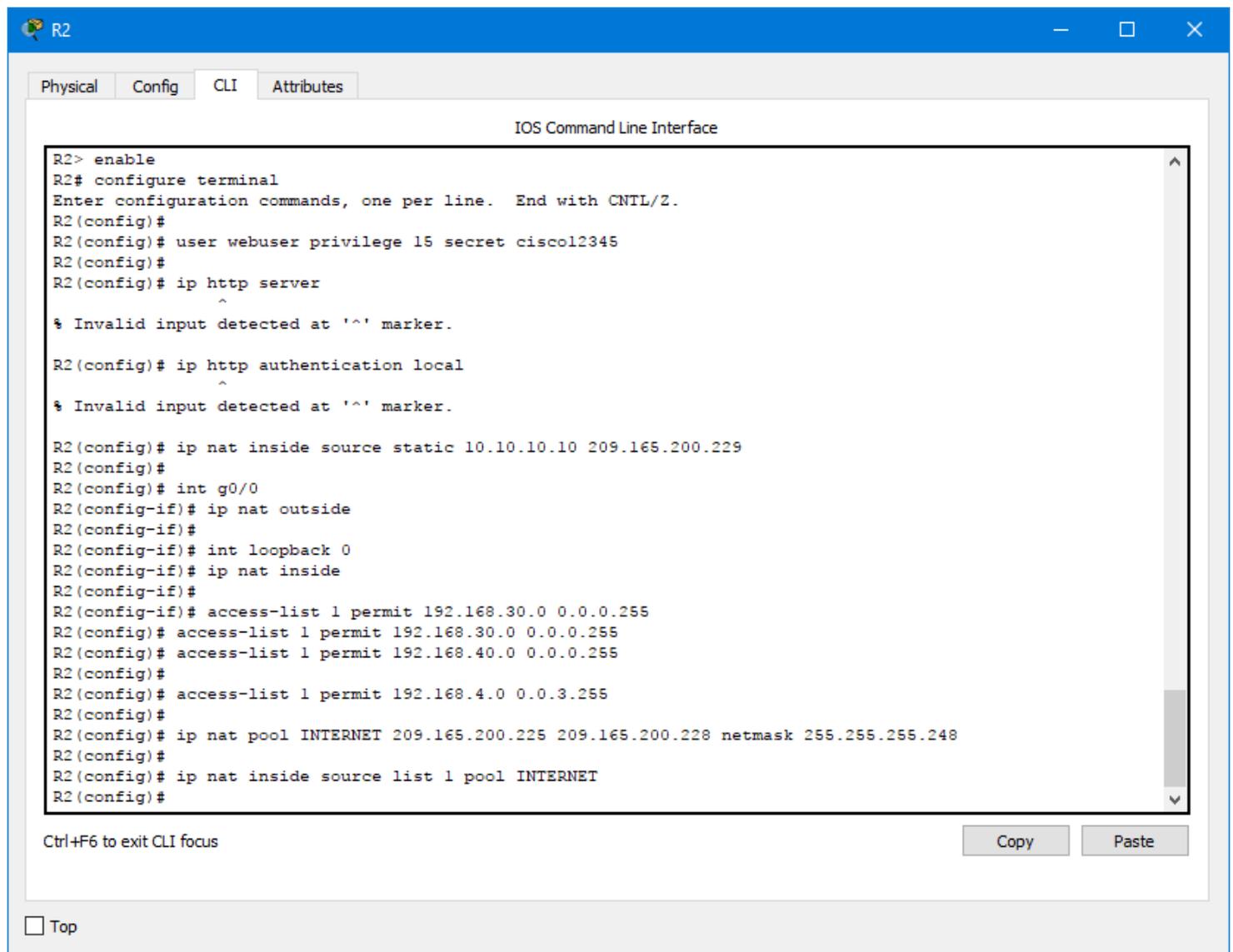
Ctrl+F6 to exit CLI focus

Copy Paste

Top

Tareas de configuración para R2 incluyendo: Crear una base de datos local con 1 cuenta de usuario, habilitar el servicio de servidor HTTP, configurar el servidor HTTP para usar la base de datos local para la autenticación, crear una NAT estática para el servidor web, asignar la interfaz interna y externa para la NAT estática, configurar la NAT dinámica dentro de la ACL privada, definir el grupo de direcciones IP públicas utilizables, definir la traducción dinámica de NAT.

## Configurando NAT Estático y Dinámico en R2.



```
R2> enable
R2# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#
R2(config)# user webuser privilege 15 secret cisco12345
R2(config)#
R2(config)# ip http server
      ^
% Invalid input detected at '^' marker.

R2(config)# ip http authentication local
      ^
% Invalid input detected at '^' marker.

R2(config)# ip nat inside source static 10.10.10.10 209.165.200.229
R2(config)#
R2(config)# int g0/0
R2(config-if)# ip nat outside
R2(config-if)#
R2(config-if)# int loopback 0
R2(config-if)# ip nat inside
R2(config-if)#
R2(config-if)# access-list 1 permit 192.168.30.0 0.0.0.255
R2(config)# access-list 1 permit 192.168.30.0 0.0.0.255
R2(config)# access-list 1 permit 192.168.40.0 0.0.0.255
R2(config)#
R2(config)# access-list 1 permit 192.168.4.0 0.0.3.255
R2(config)#
R2(config)# ip nat pool INTERNET 209.165.200.225 209.165.200.228 netmask 255.255.255.248
R2(config)#
R2(config)# ip nat inside source list 1 pool INTERNET
R2(config)#
```

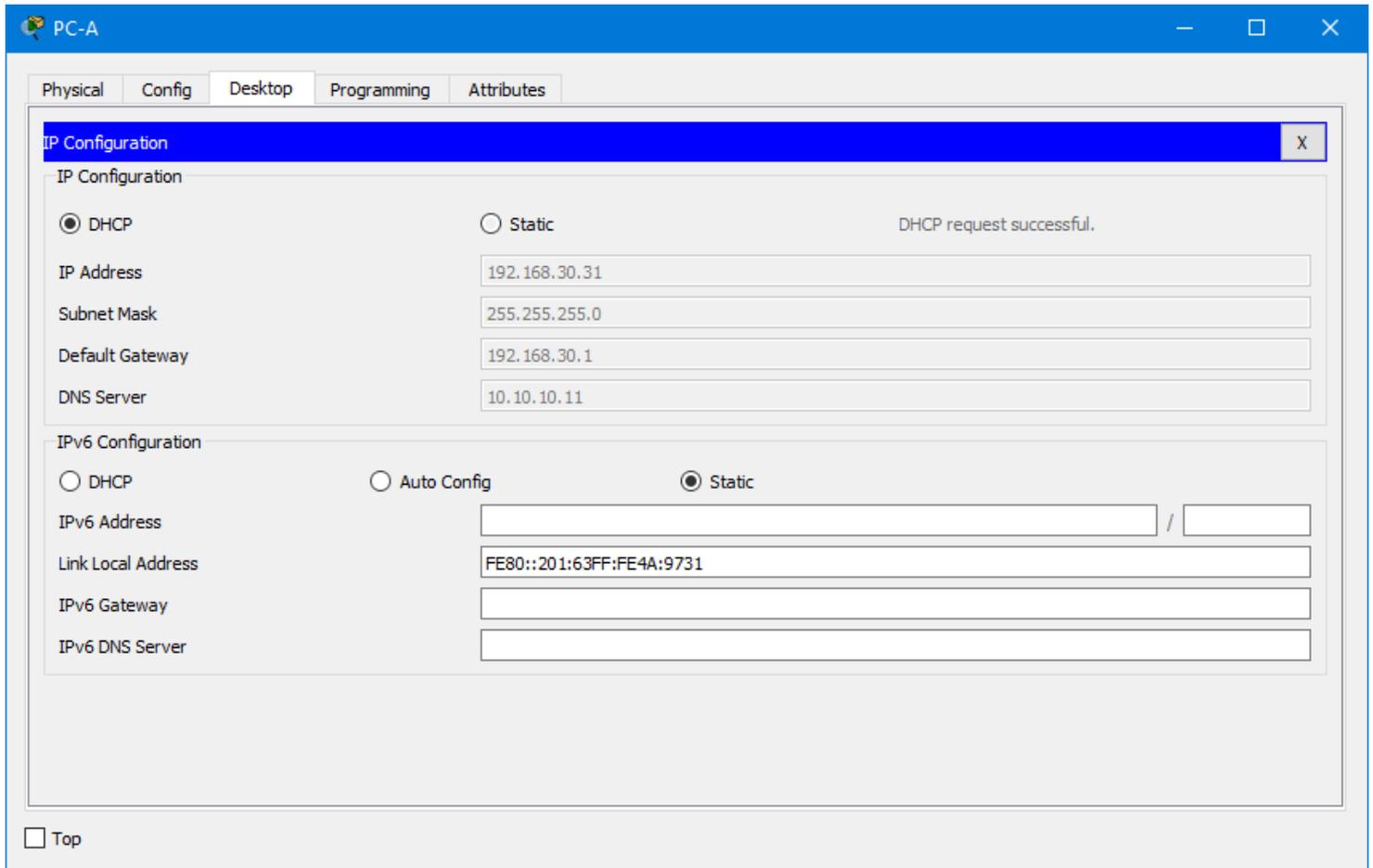
Ctrl+F6 to exit CLI focus

Copy Paste

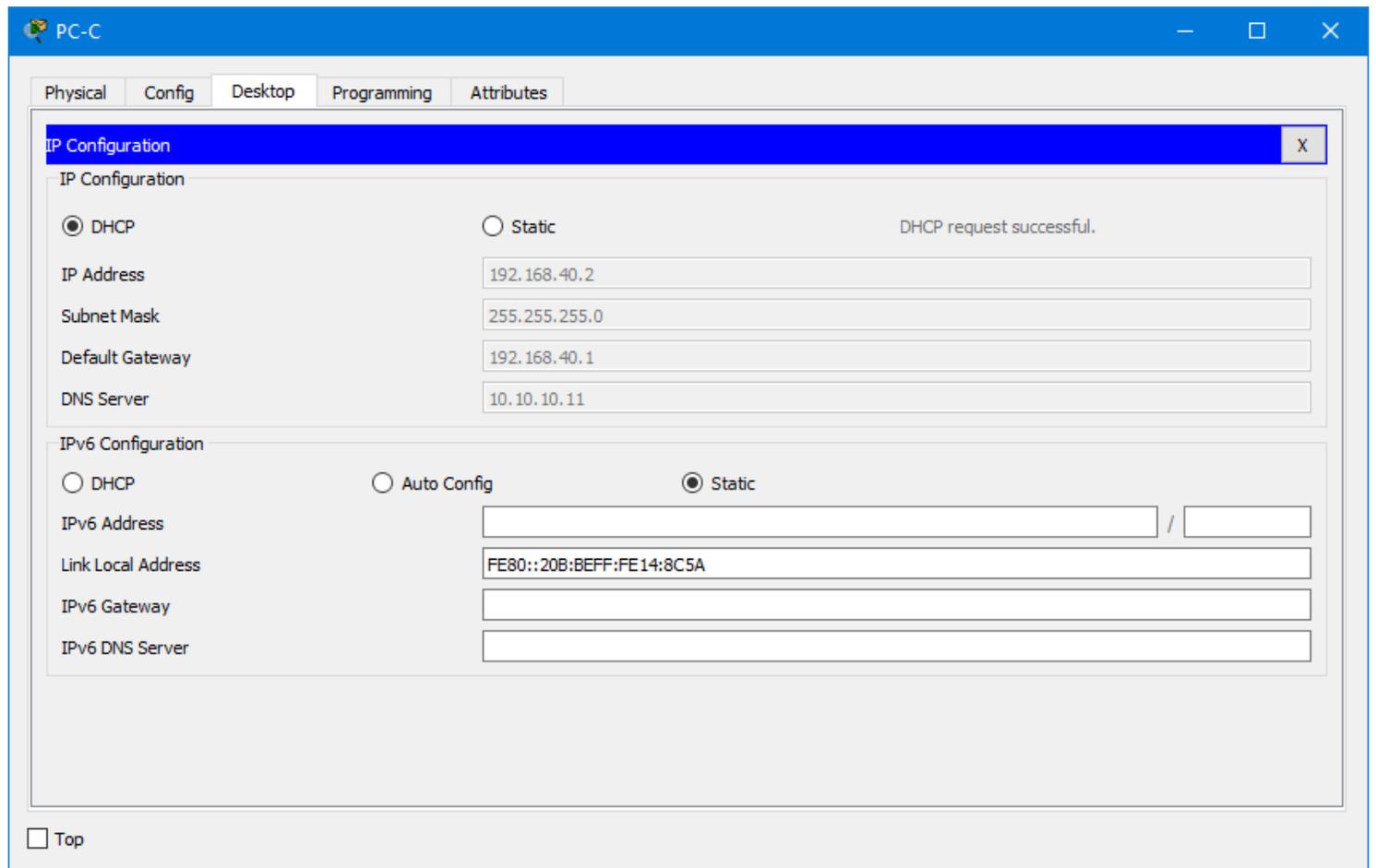
Top

## Verificando DHCP y NAT estática.

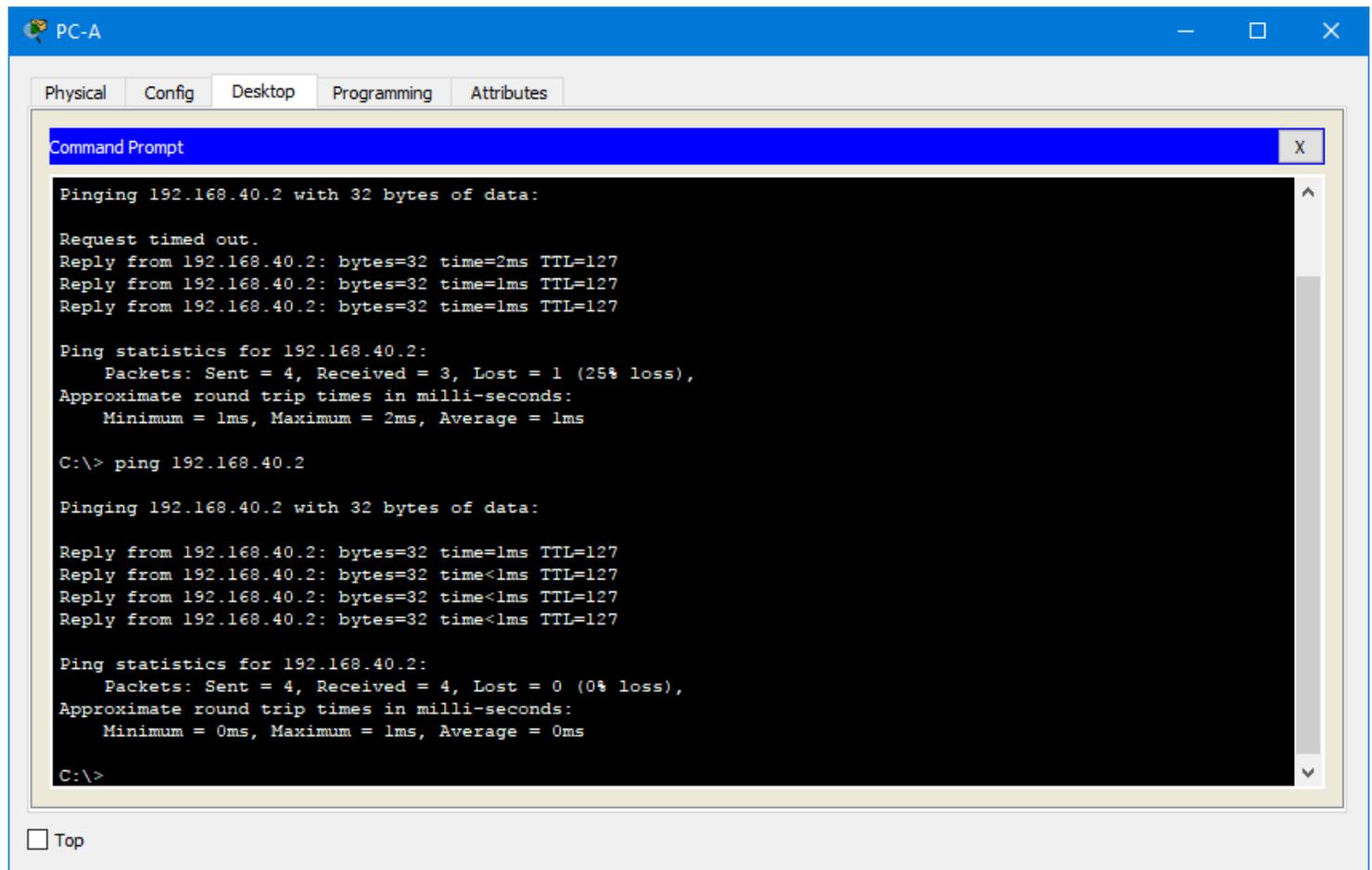
Verificando que la PC-A haya adquirido la información IP del servidor DHCP



## Verificando que la PC-C haya adquirido la información IP del servidor DHCP



## Verificando que la PC-A pueda hacer ping a la PC-C.



The screenshot shows a Windows-style window titled "PC-A" with a blue header bar. Below the header are tabs for "Physical", "Config", "Desktop", "Programming", and "Attributes". The "Desktop" tab is active, displaying a "Command Prompt" window. The Command Prompt has a black background with white text. It shows the execution of a ping command to 192.168.40.2. The first attempt shows a "Request timed out" followed by three successful replies. The second attempt shows four successful replies. Ping statistics are displayed for both attempts, showing a 25% loss for the first and 0% loss for the second.

```
Command Prompt
Pinging 192.168.40.2 with 32 bytes of data:
Request timed out.
Reply from 192.168.40.2: bytes=32 time=2ms TTL=127
Reply from 192.168.40.2: bytes=32 time=1ms TTL=127
Reply from 192.168.40.2: bytes=32 time=1ms TTL=127

Ping statistics for 192.168.40.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 2ms, Average = 1ms

C:\> ping 192.168.40.2

Pinging 192.168.40.2 with 32 bytes of data:

Reply from 192.168.40.2: bytes=32 time=1ms TTL=127
Reply from 192.168.40.2: bytes=32 time<1ms TTL=127
Reply from 192.168.40.2: bytes=32 time<1ms TTL=127
Reply from 192.168.40.2: bytes=32 time<1ms TTL=127

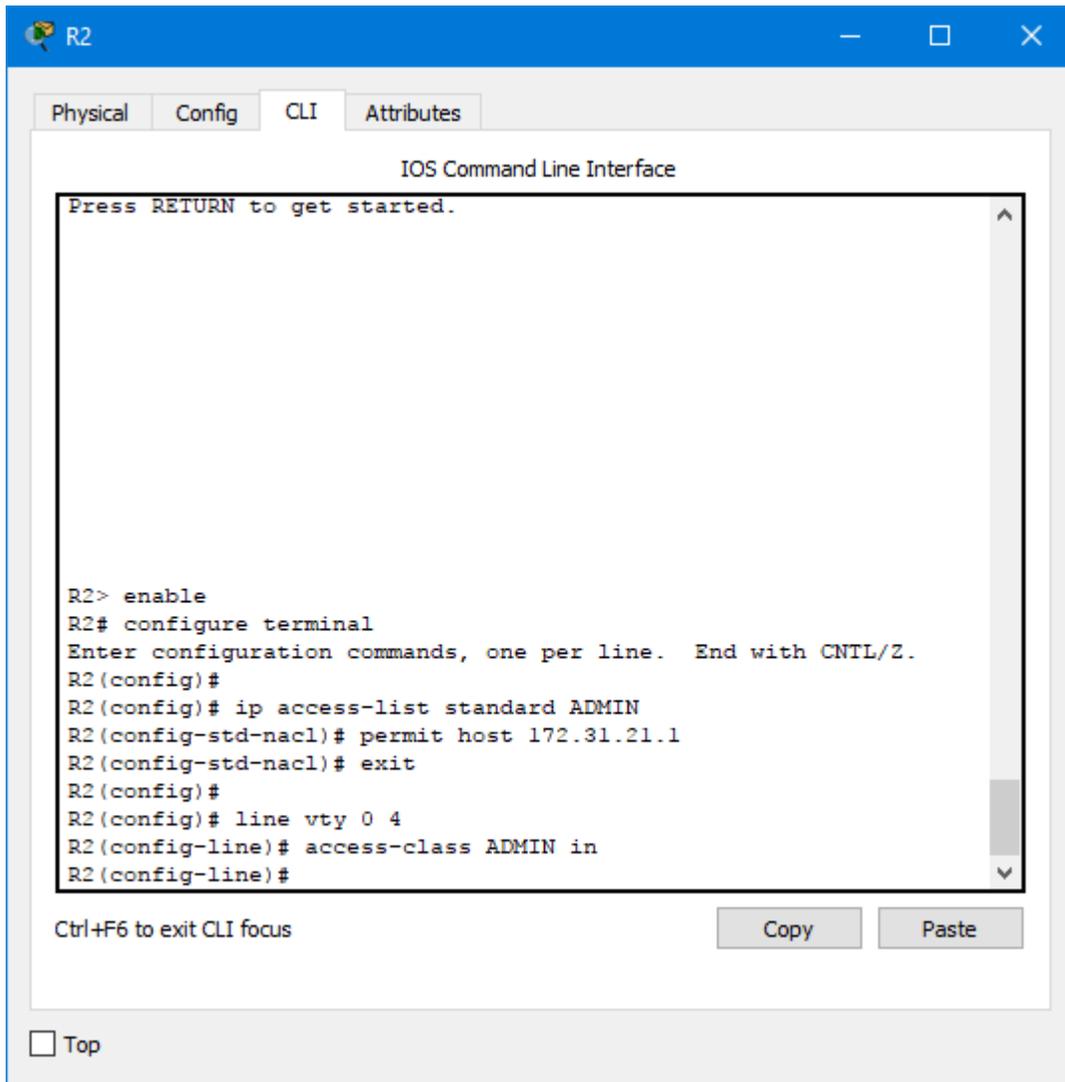
Ping statistics for 192.168.40.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>
```

Top

## Configurando y verificando listas de control de acceso (ACL)

### Restringiendo el acceso a las líneas VTY en R2

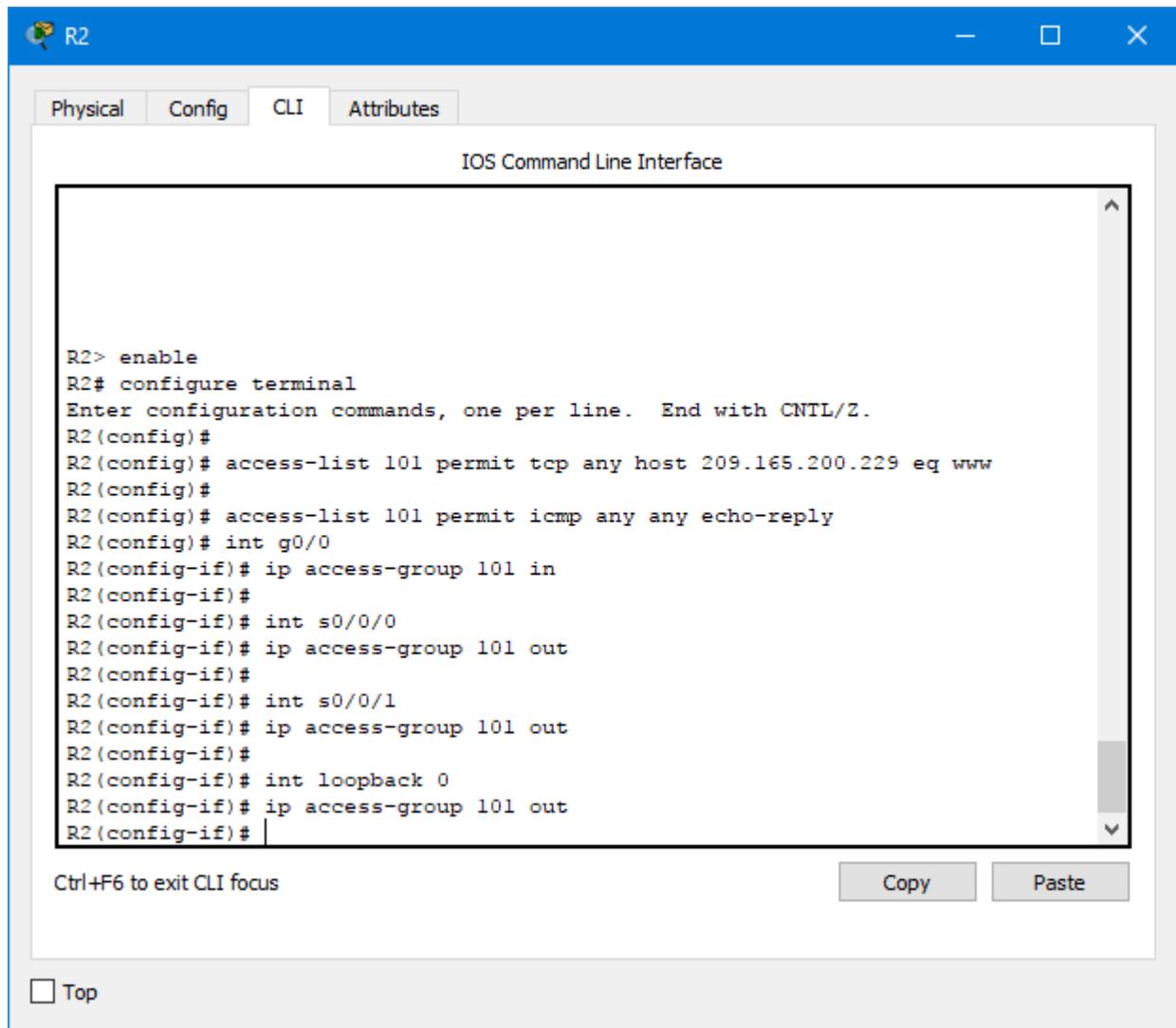


The screenshot shows a terminal window titled "R2" with tabs for "Physical", "Config", "CLI", and "Attributes". The "CLI" tab is active, displaying the "IOS Command Line Interface". The terminal text is as follows:

```
Press RETURN to get started.  
  
R2> enable  
R2# configure terminal  
Enter configuration commands, one per line. End with CNTL/Z.  
R2(config)#  
R2(config)# ip access-list standard ADMIN  
R2(config-std-nacl)# permit host 172.31.21.1  
R2(config-std-nacl)# exit  
R2(config)#  
R2(config)# line vty 0 4  
R2(config-line)# access-class ADMIN in  
R2(config-line)#
```

At the bottom of the terminal window, there is a prompt "Ctrl+F6 to exit CLI focus" and two buttons labeled "Copy" and "Paste". Below the terminal window, there is a checkbox labeled "Top" which is currently unchecked.

## Asegurando la Red del Tráfico de Internet



The screenshot shows a Cisco Packet Tracer window for router R2. The window has tabs for Physical, Config, CLI, and Attributes. The CLI tab is active, displaying the IOS Command Line Interface. The following commands have been entered:

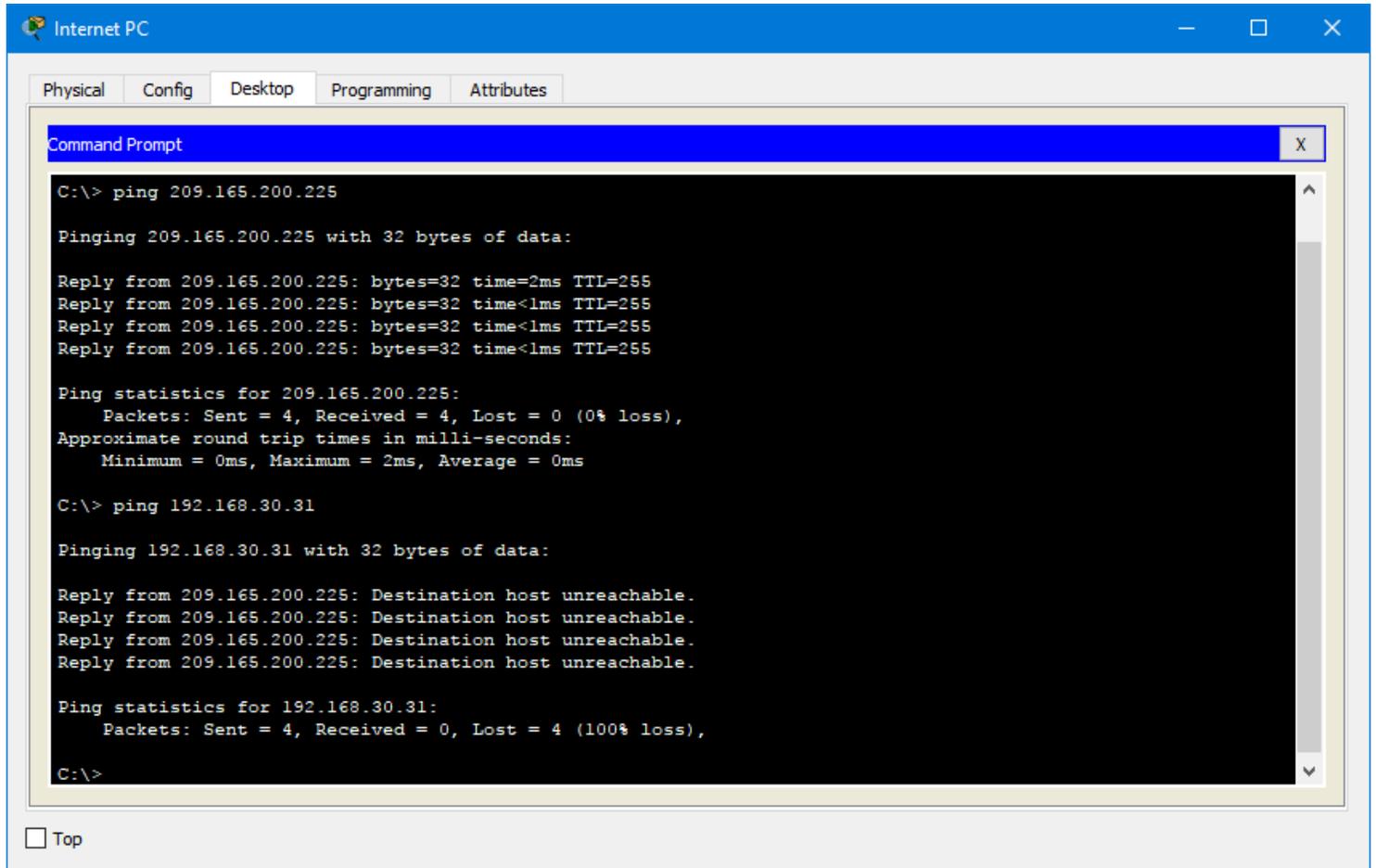
```
R2> enable
R2# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#
R2(config)# access-list 101 permit tcp any host 209.165.200.229 eq www
R2(config)#
R2(config)# access-list 101 permit icmp any any echo-reply
R2(config)# int g0/0
R2(config-if)# ip access-group 101 in
R2(config-if)#
R2(config-if)# int s0/0/0
R2(config-if)# ip access-group 101 out
R2(config-if)#
R2(config-if)# int s0/0/1
R2(config-if)# ip access-group 101 out
R2(config-if)#
R2(config-if)# int loopback 0
R2(config-if)# ip access-group 101 out
R2(config-if)#
```

At the bottom of the CLI window, there is a prompt "Ctrl+F6 to exit CLI focus" and two buttons: "Copy" and "Paste". Below the CLI window, there is a checkbox labeled "Top".

## Verificando que la ACL esté funcionando

*Desde la Internet PC:*

Ping PC-A (Ping debería ser inalcanzable)



```
Internet PC
Physical Config Desktop Programming Attributes
Command Prompt
C:\> ping 209.165.200.225

Pinging 209.165.200.225 with 32 bytes of data:

Reply from 209.165.200.225: bytes=32 time=2ms TTL=255
Reply from 209.165.200.225: bytes=32 time<lms TTL=255
Reply from 209.165.200.225: bytes=32 time<lms TTL=255
Reply from 209.165.200.225: bytes=32 time<lms TTL=255

Ping statistics for 209.165.200.225:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 2ms, Average = 0ms

C:\> ping 192.168.30.31

Pinging 192.168.30.31 with 32 bytes of data:

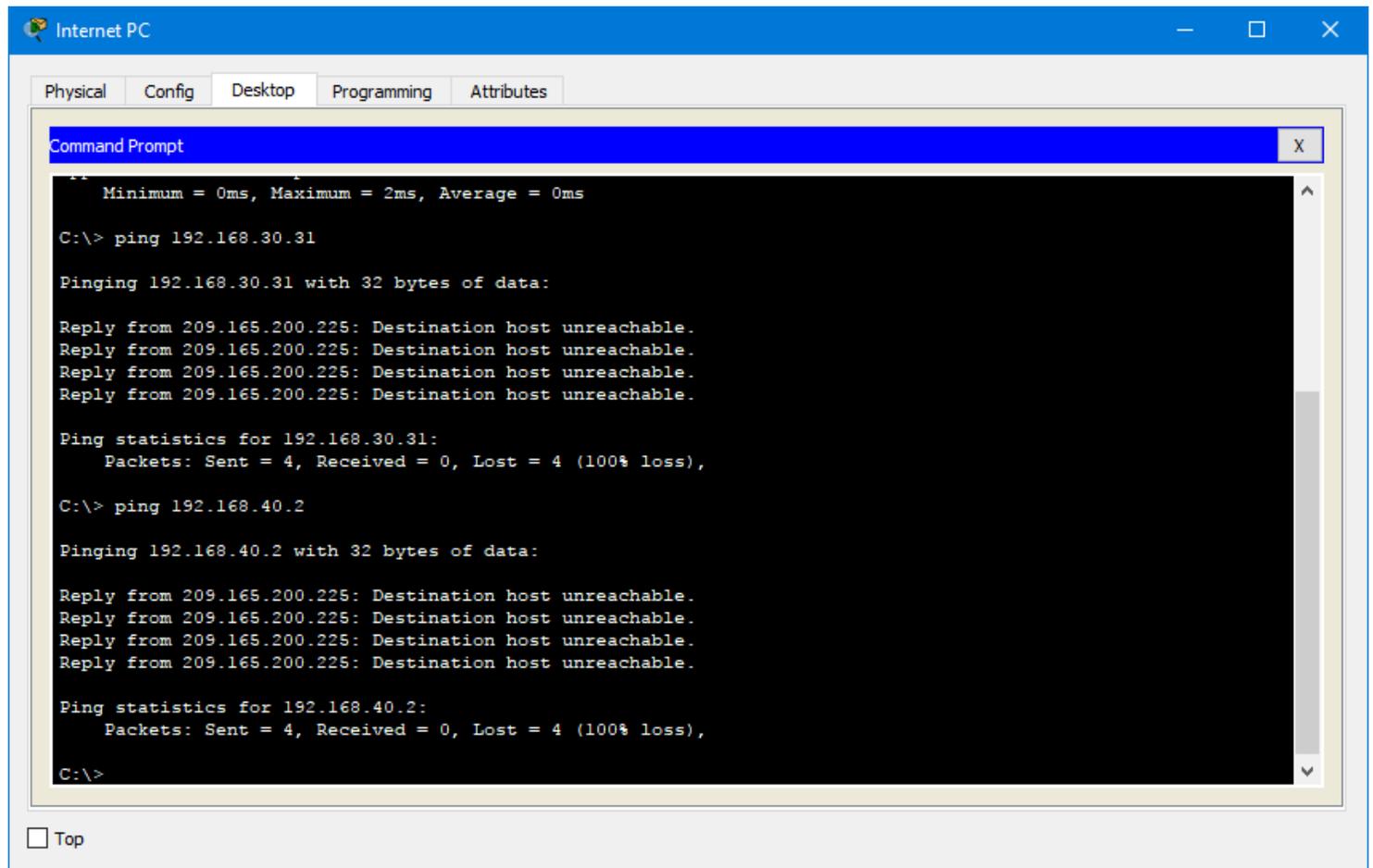
Reply from 209.165.200.225: Destination host unreachable.

Ping statistics for 192.168.30.31:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
```

Top

Ping PC-C (Ping debería ser inalcanzable)



The screenshot shows a window titled "Internet PC" with tabs for "Physical", "Config", "Desktop", "Programming", and "Attributes". The "Desktop" tab is active, displaying a "Command Prompt" window. The Command Prompt shows the following output:

```
Minimum = 0ms, Maximum = 2ms, Average = 0ms
C:\> ping 192.168.30.31

Pinging 192.168.30.31 with 32 bytes of data:

Reply from 209.165.200.225: Destination host unreachable.

Ping statistics for 192.168.30.31:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\> ping 192.168.40.2

Pinging 192.168.40.2 with 32 bytes of data:

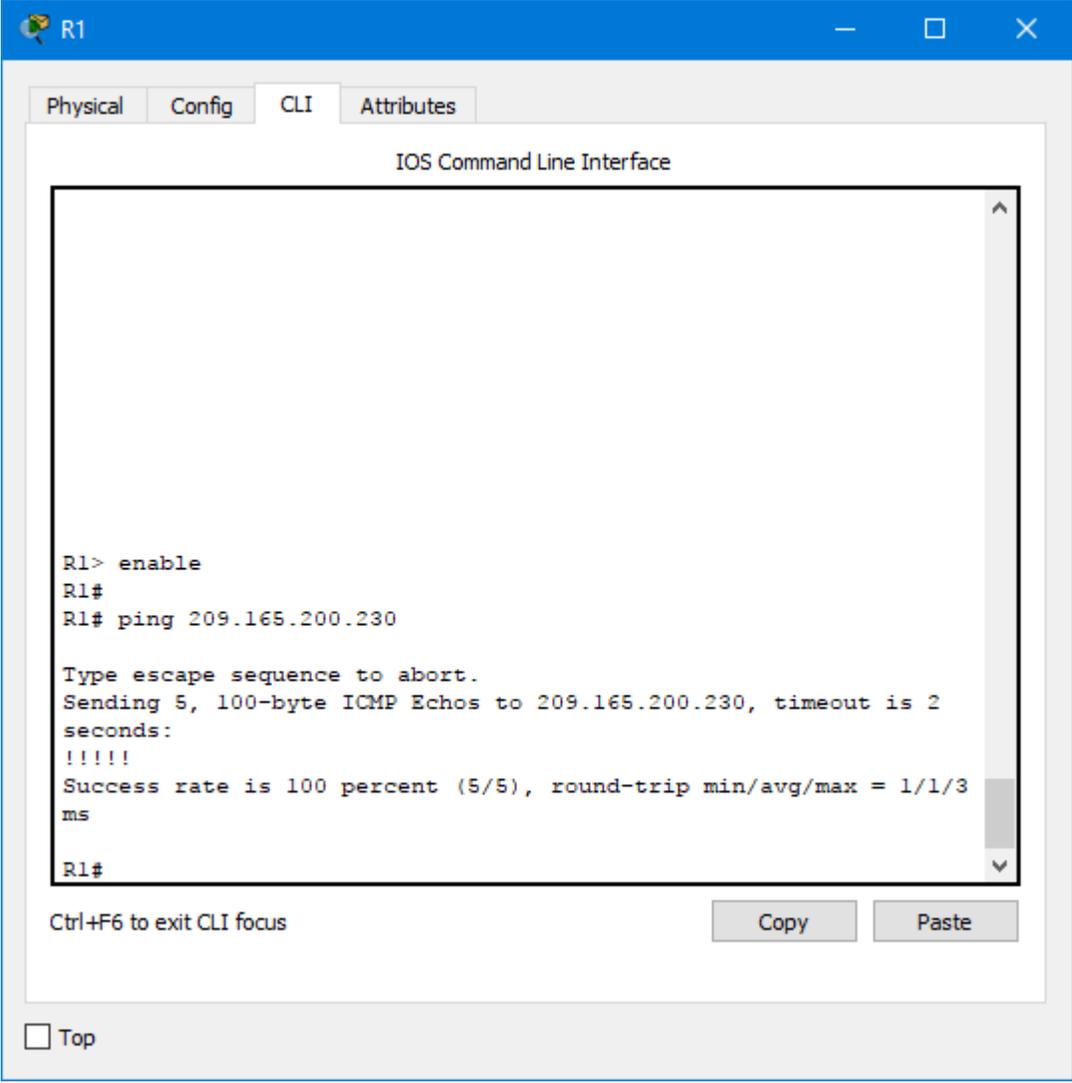
Reply from 209.165.200.225: Destination host unreachable.

Ping statistics for 192.168.40.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
```

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

Desde R1, Ping a la Internet PC (Ping debería tener éxito).



The screenshot shows a window titled 'R1' with a blue header bar. Below the header are four tabs: 'Physical', 'Config', 'CLI', and 'Attributes'. The 'CLI' tab is selected, and the window displays the 'IOS Command Line Interface'. The terminal text is as follows:

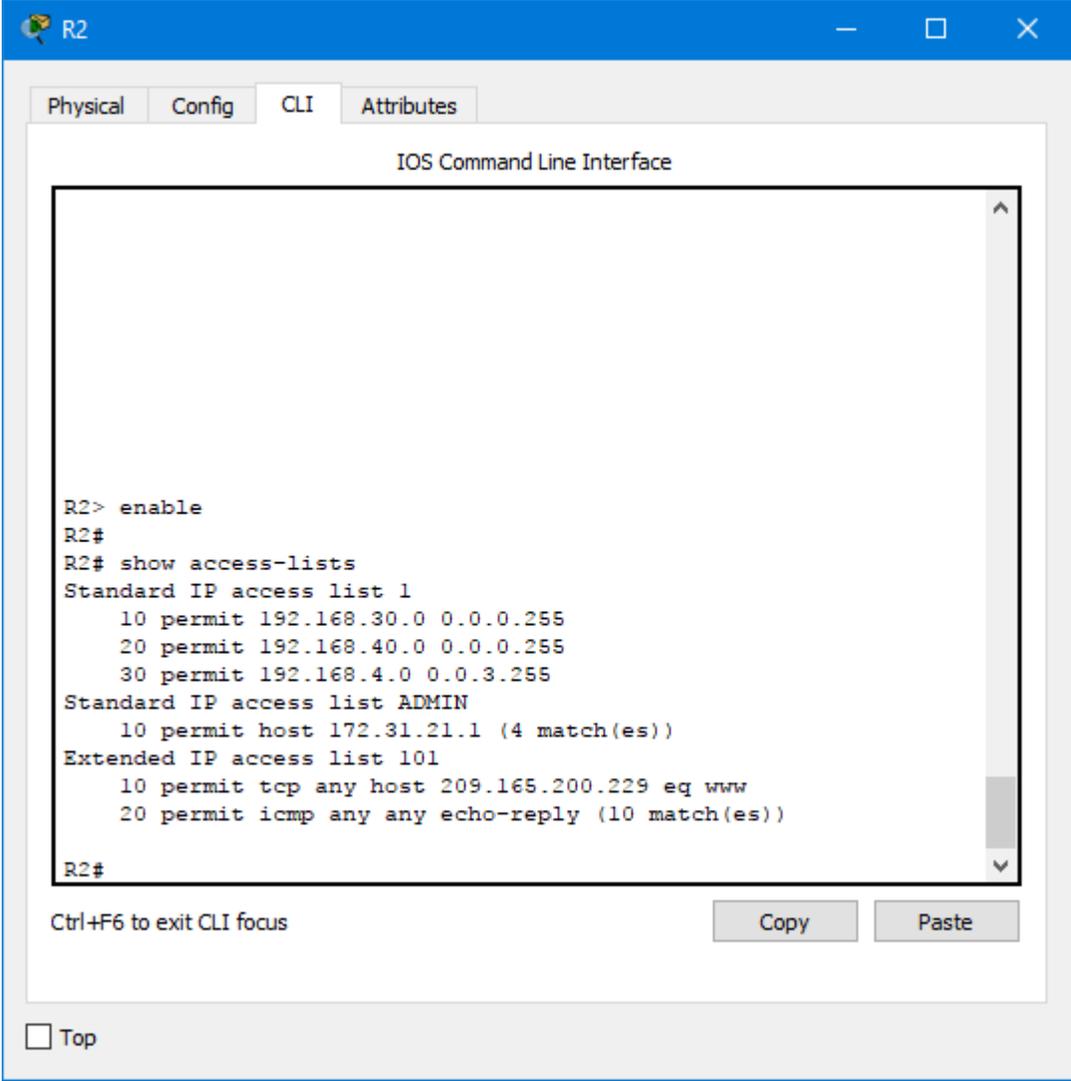
```
R1> enable
R1#
R1# ping 209.165.200.230

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.165.200.230, timeout is 2
seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/3
ms
R1#
```

At the bottom of the CLI window, there is a text label 'Ctrl+F6 to exit CLI focus' and two buttons labeled 'Copy' and 'Paste'. Below the CLI window, there is a checkbox labeled 'Top' which is currently unchecked.

## Verificación de la Información de las ACLs

**Coincidencias que han recibido las listas de acceso.**

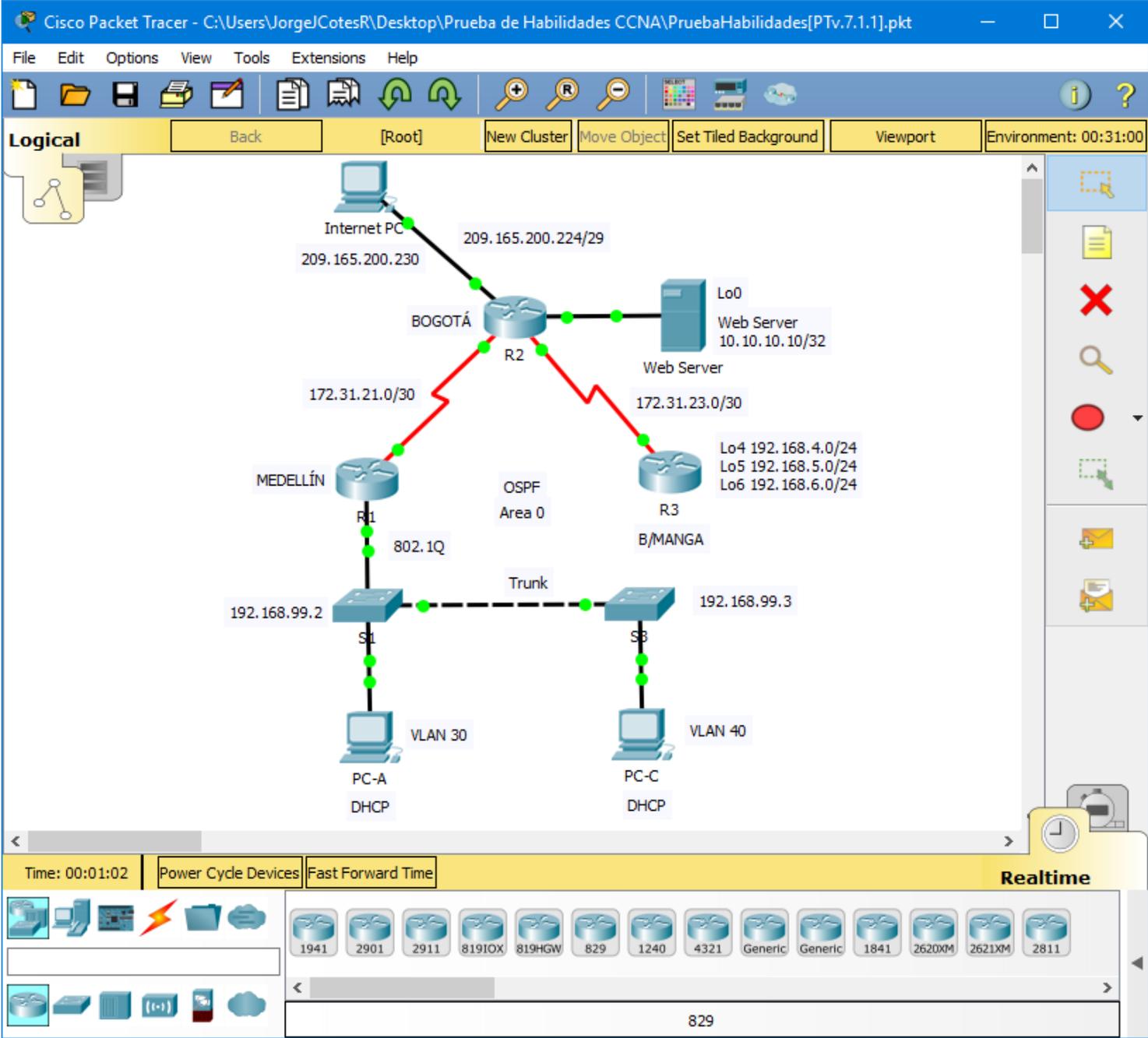


The screenshot shows a window titled 'R2' with tabs for 'Physical', 'Config', 'CLI', and 'Attributes'. The 'CLI' tab is active, displaying the 'IOS Command Line Interface'. The terminal output shows the following commands and results:

```
R2> enable
R2#
R2# show access-lists
Standard IP access list 1
 10 permit 192.168.30.0 0.0.0.255
 20 permit 192.168.40.0 0.0.0.255
 30 permit 192.168.4.0 0.0.3.255
Standard IP access list ADMIN
 10 permit host 172.31.21.1 (4 match(es))
Extended IP access list 101
 10 permit tcp any host 209.165.200.229 eq www
 20 permit icmp any any echo-reply (10 match(es))
R2#
```

Below the terminal output, there is a text label 'Ctrl+F6 to exit CLI focus' and two buttons: 'Copy' and 'Paste'. At the bottom left, there is a checkbox labeled 'Top'.

# Diagrama de la Topología de Red totalmente Funcional



## CONCLUSIONES

Como finalidad a la realización de los Principios Básicos de Routing y Switching de CCNA. El objetivo fue apropiarse y alcanzar los conceptos y tecnologías básicas de red. Este material nos ayudó a desarrollar las aptitudes necesarias para planificar e implementar redes pequeñas con una variedad de aplicaciones. Las habilidades específicas desarrolladas en la Actividad se describían en la solución dada a cada uno de las Topologías y todas las tareas propuestas.

Tal como indicó el desarrollo de la Prueba de habilidades prácticas CCNA, esta Práctica se centró en el aprendizaje de la arquitectura, los componentes y el funcionamiento de los routers y switches en una red. En esta actividad, aprendimos las habilidades prácticas y conceptuales que constituyen la base para entender lo básico de las redes en relación a routers y switches. Del mismo modo:

- Describimos las tecnologías de switching mejoradas, como las VLAN, el protocolo de enlace troncal de VLAN (VTP), el protocolo de árbol de expansión rápido (RSTP), el protocolo de árbol de expansión por VLAN (PVSTP) y 802.1q.
- Configuramos las operaciones básicas de una red conmutada pequeña y resolvimos problemas relacionados.
- Configuramos y verificamos el routing estático y el routing predeterminado.
- Configuramos VLAN y el routing entre VLAN, y resolvimos problemas relacionados.
- Configuramos y controlamos ACL para IPv4 e IPv6, y resolvimos problemas relacionados.
- Descubrimos los tipos de medios utilizados para transportar datos a través de la red.
- Al cabo de la finalización de la Actividad de manera puntual puede decirse que, podemos configurar routers y switches, y resolver problemas relacionados, así como solucionar problemas frecuentes de RIPv1, de RIPv2, de OSPF de área única y OSPF multiárea, de LAN virtuales y de routing entre VLAN en redes IPv4.

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