

Diplomado de profundización cisco (diseño e implementación de soluciones  
integradas lan / wan)

prueba de habilidades prácticas ccna

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INGENIERÍA DE SISTEMAS

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## **Glosario**

### **ADSL:**

Línea de Suscripción Asimétrica Digital. Tecnología que mejora el ancho de banda de los hilos del cableado telefónico convencional que transporta hasta 16Mbps (megabits por segundo) gracias a una serie de métodos de compresión

### **Bit:**

Dígito Binario. Unidad mínima de almacenamiento de la información cuyo valor puede ser 0 ó 1 (falso o verdadero respectivamente). Hay 8 bits en un byte.

### **DNS:**

Servidor de Nombres de Dominio. Servidor automatizado utilizado en el internet cuya tarea es convertir nombres fáciles de entender (cómo [www.clasesdeciscoconprofesorcarrasco.com](http://www.clasesdeciscoconprofesorcarrasco.com)) a direcciones numéricas de IP.

### **PROTOCOLO:**

Un protocolo es un conjunto de reglas usadas por computadoras para comunicarse unas con otras a través de una red. Un protocolo es una convención o estándar que controla o permite la conexión, comunicación, y transferencia de datos entre dos puntos finales

### **TRAZAS:**

La traza de un algoritmo (o programa) indica la secuencia de acciones (instrucciones) de su ejecución, así como, el valor de las variables del algoritmo (o programa) después de cada acción (instrucción).

## Resumen

Durante el desarrollo de la actividad que se desarrolló el diplomado de las habilidades prácticas de profundización de CCNA se busca que la empresa de tecnología con sucursales en las ciudades de Bogotá, Medellín Y Bucaramanga se puedan interconectar entre ellas atreves de dispositivos de red, se busca desde la solución configurar los protocolos de enrutamiento dinámico OSPF v2.

Se busco la configuración del router que está en la sede Medellín quien se le brindo los parámetros de inter-Vlan, DHCP para las Vlan que están dirigida desde la sede que son Administración y Mercadeo, además las listas de acceso que controlan el tráfico de un router a otro, la configuración que lleva establecida el router 2 como es la Nat para permitir el flujo de la navegación desde el R1 al R3 por la misma Vlan.

Se realiza pruebas con un resultado satisfactorio dando como principal configuración la seguridad de la red atraves de las contraseñas cifradas y el buen manejo de las líneas de consola.

## **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.

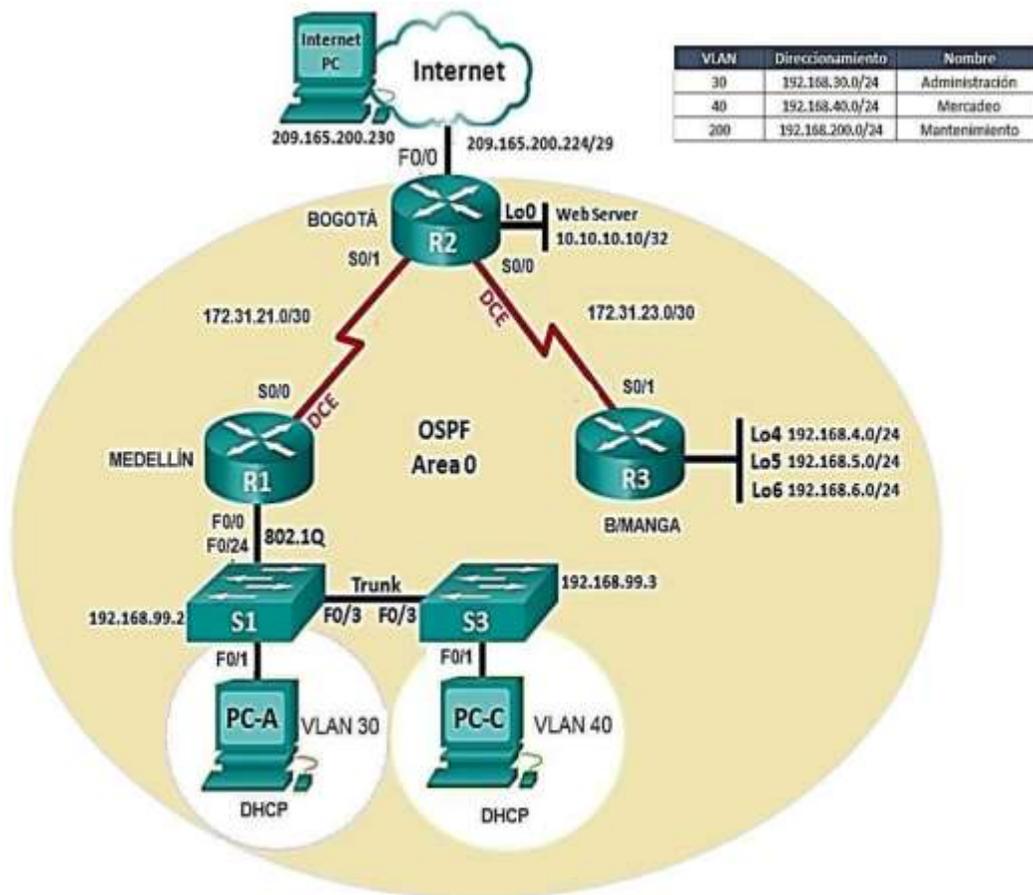
### **1.2 Objetivos específicos**

- 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. 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.

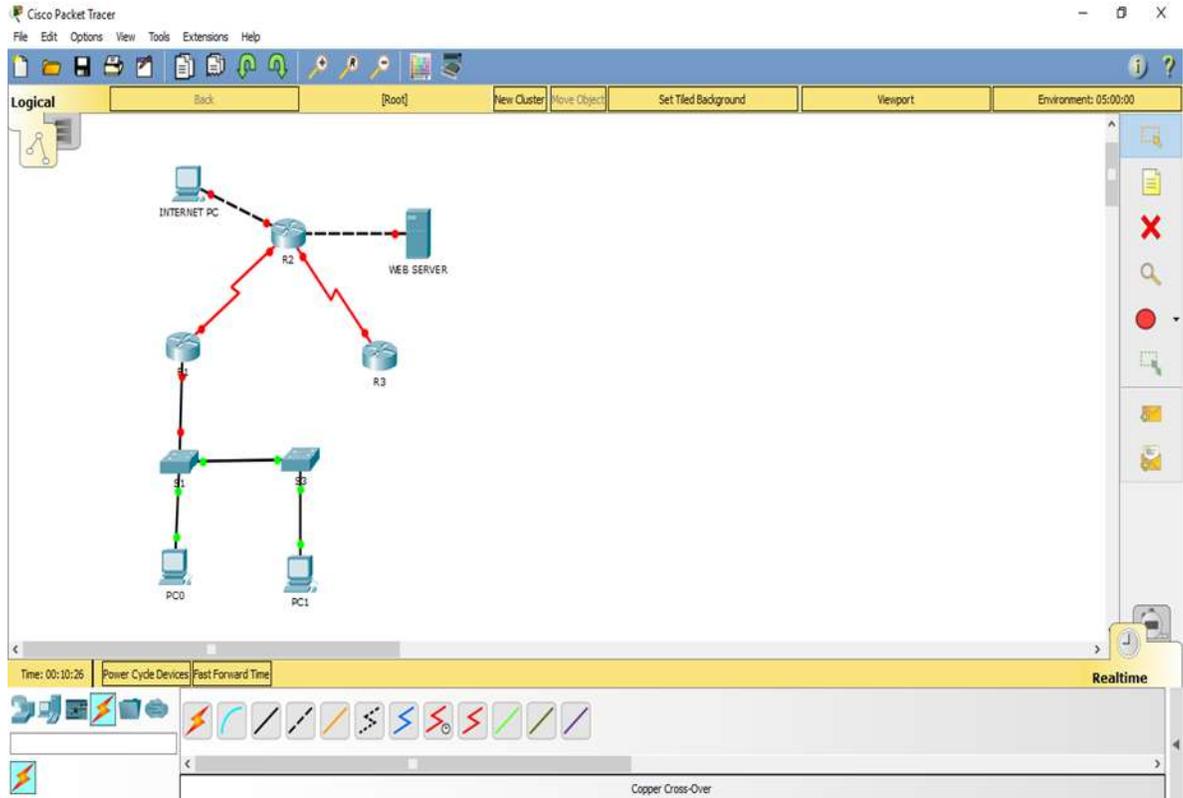
12. Configurar al menos dos listas de acceso de tipo extendido o nombradas a su criterio en para restringir o permitir tráfico desde R1 o R3 hacia R2.

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

### 3. DESARROLLO DEL PROYECTO

#### Solución Prueba de Habilidades Prácticas CCNA

#### Armado de la Red

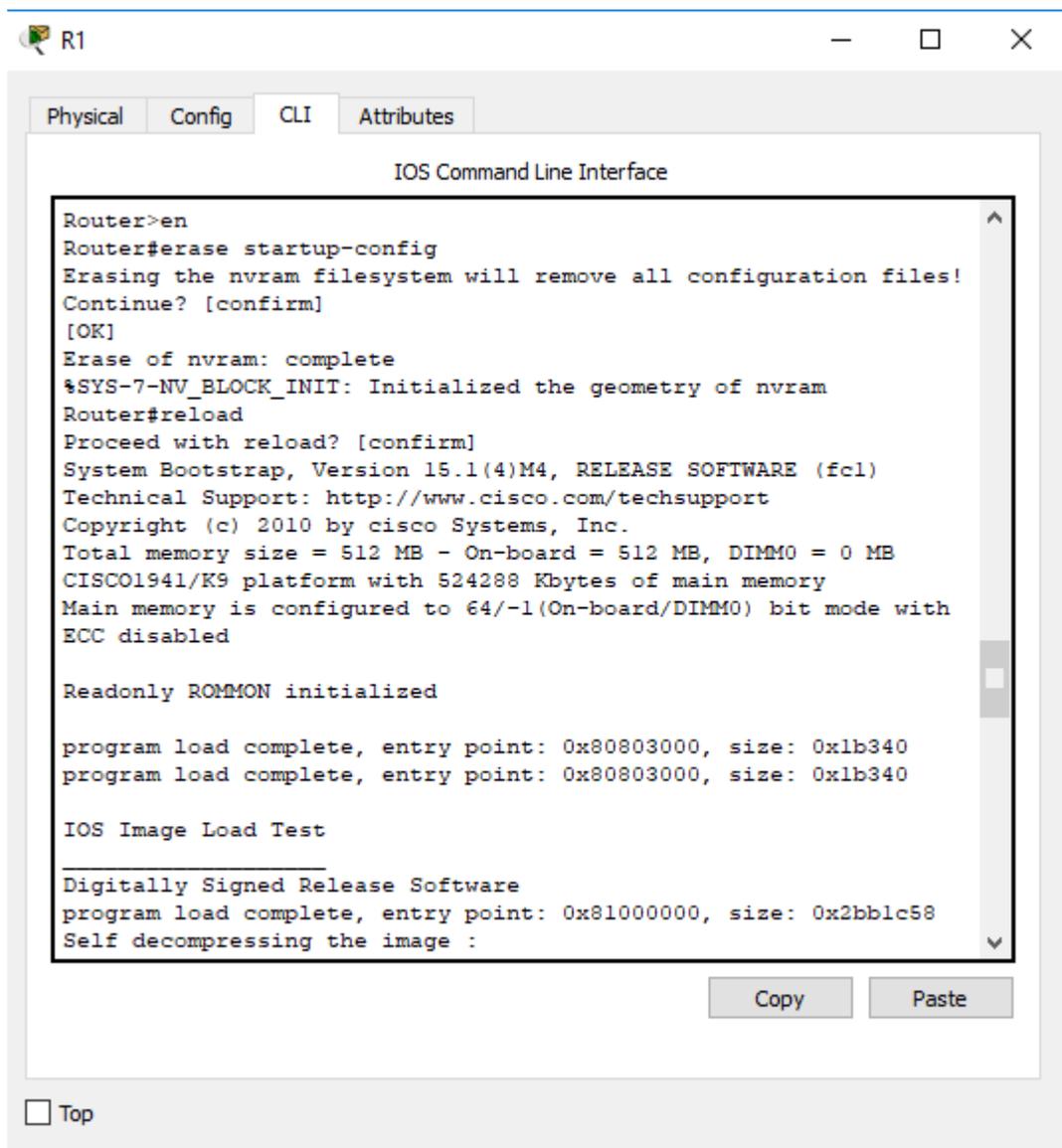


## Inicializando y Cargando los Routers y Switches

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>en
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#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

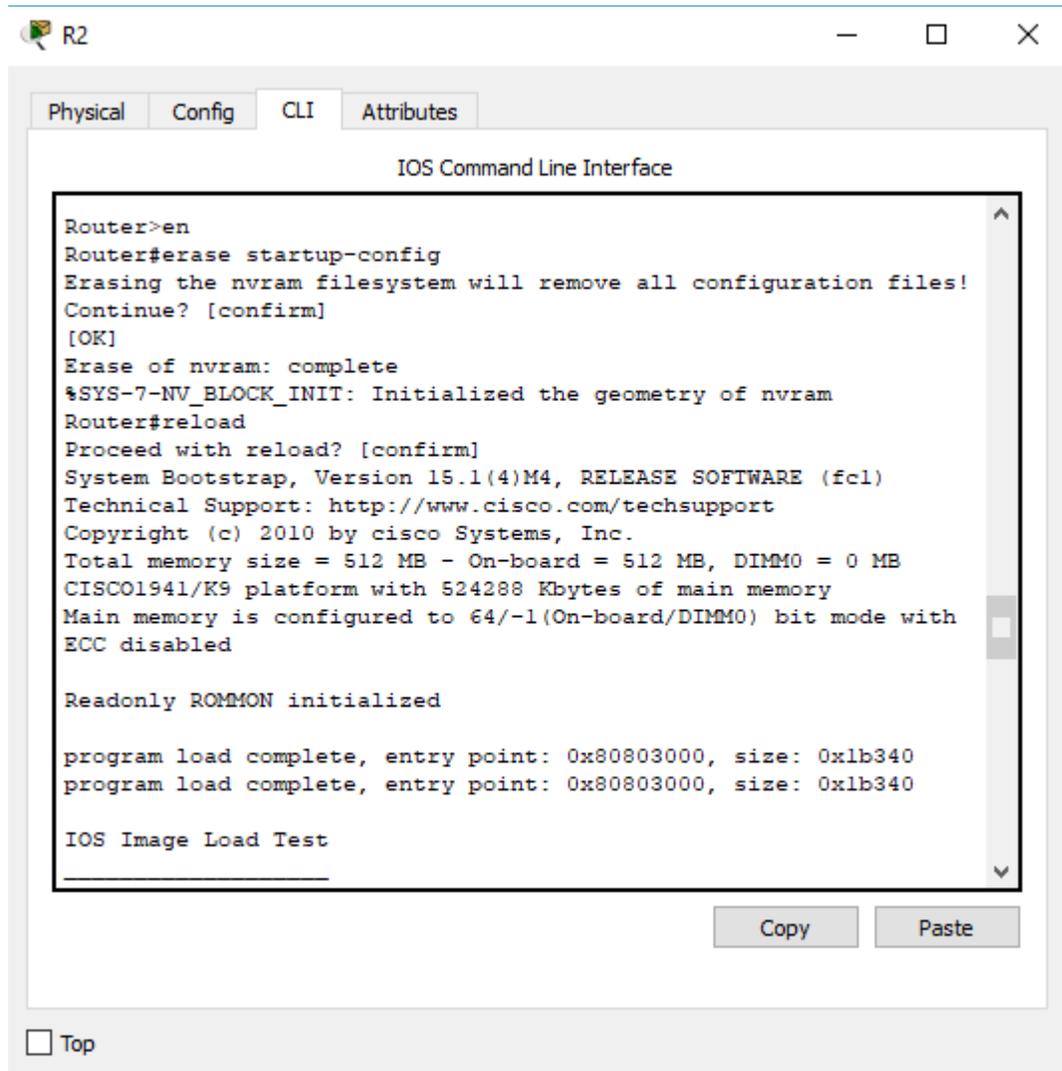
Readonly ROMMON initialized

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

IOS Image Load Test

-----
Digitally Signed Release Software
program load complete, entry point: 0x81000000, size: 0x2bb1c58
Self decompressing the image :
```

## Router R2



The screenshot shows a window titled "R2" with a standard Windows-style title bar (minimize, maximize, close). Below the title bar are four tabs: "Physical", "Config", "CLI", and "Attributes". The "CLI" tab is active, displaying the "IOS Command Line Interface".

```
Router>en
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#reload
Proceed with reload? [confirm]
System Bootstrap, Version 15.1(4)M4, RELEASE SOFTWARE (fcl)
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

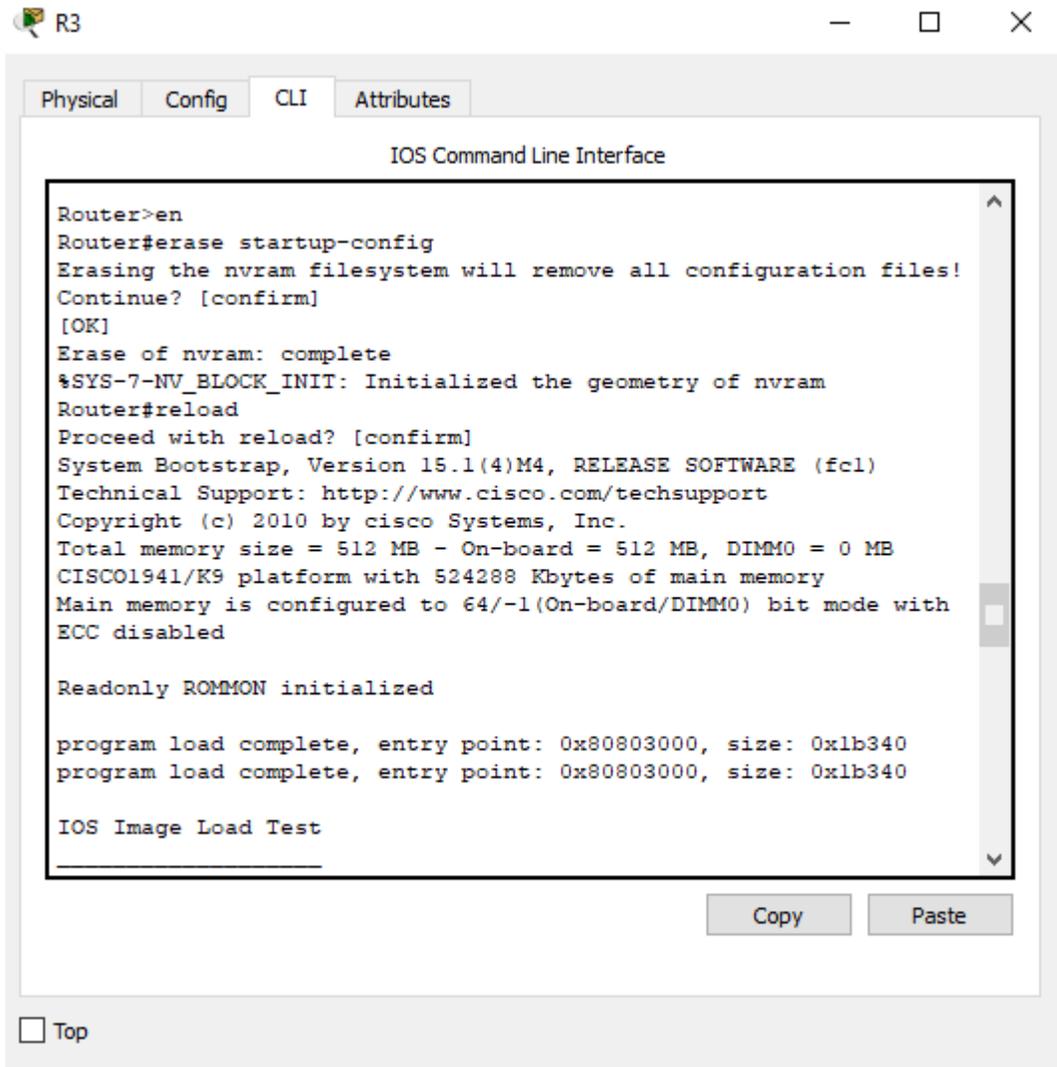
Readonly ROMMON initialized

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

IOS Image Load Test
_____
```

At the bottom right of the CLI window, there are two buttons: "Copy" and "Paste". At the bottom left of the window, there is a checkbox labeled "Top".

## Router R3



The screenshot shows a window titled "R3" with a standard Windows-style title bar (minimize, maximize, close). The window contains a tabbed interface with 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>en
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#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

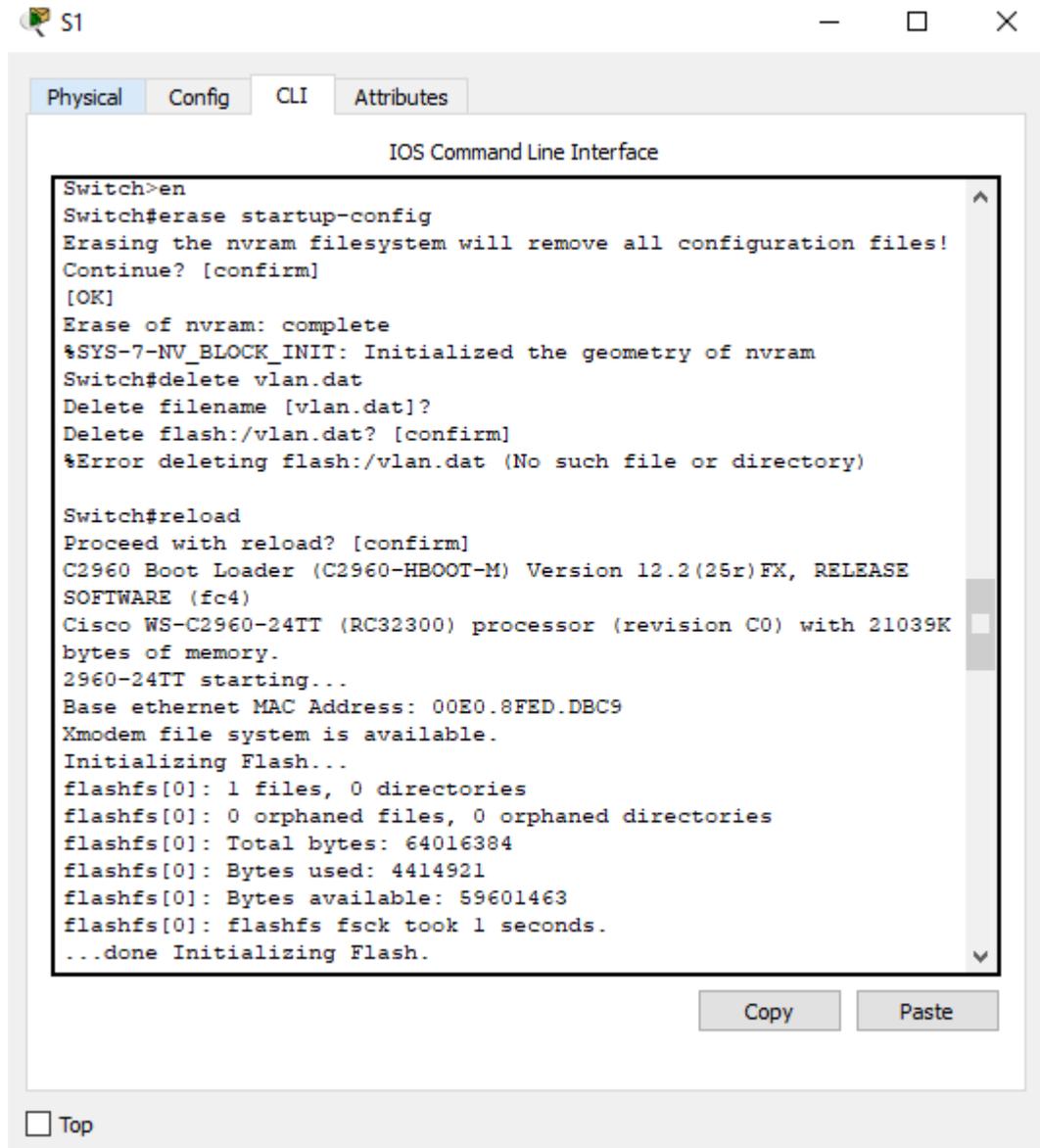
program load complete, entry point: 0x80803000, size: 0x1b340
program load complete, entry point: 0x80803000, size: 0x1b340

IOS Image Load Test
```

At the bottom of the CLI window, there are "Copy" and "Paste" buttons. Below the 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



The screenshot shows a terminal window titled "S1" with tabs for "Physical", "Config", "CLI", and "Attributes". The "CLI" tab is active, displaying the "IOS Command Line Interface". The user enters the command "en" to enter enable mode. Then, "erase startup-config" is entered, followed by "confirm" to proceed. The system confirms the erasure of the nvram. Next, "delete vlan.dat" is entered, followed by "confirm" to delete the file from the flash. The system reports an error because the file does not exist. Finally, "reload" is entered, followed by "confirm" to restart the switch. The boot process is shown, including the boot loader version, processor information, MAC address, and flash initialization details.

```
Switch>en
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#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: 00E0.8FED.DBC9
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
flashfs[0]: Bytes available: 59601463
flashfs[0]: flashfs fsck took 1 seconds.
...done Initializing Flash.
```

Copy Paste

Top

## Switch S2

S3



Physical

Config

CLI

Attributes

### IOS Command Line Interface

```
Switch>en
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#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: 0090.0C81.AE08
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
flashfs[0]: Bytes available: 59601463
flashfs[0]: flashfs fsck took 1 seconds.
...done Initializing Flash.
```

Copy

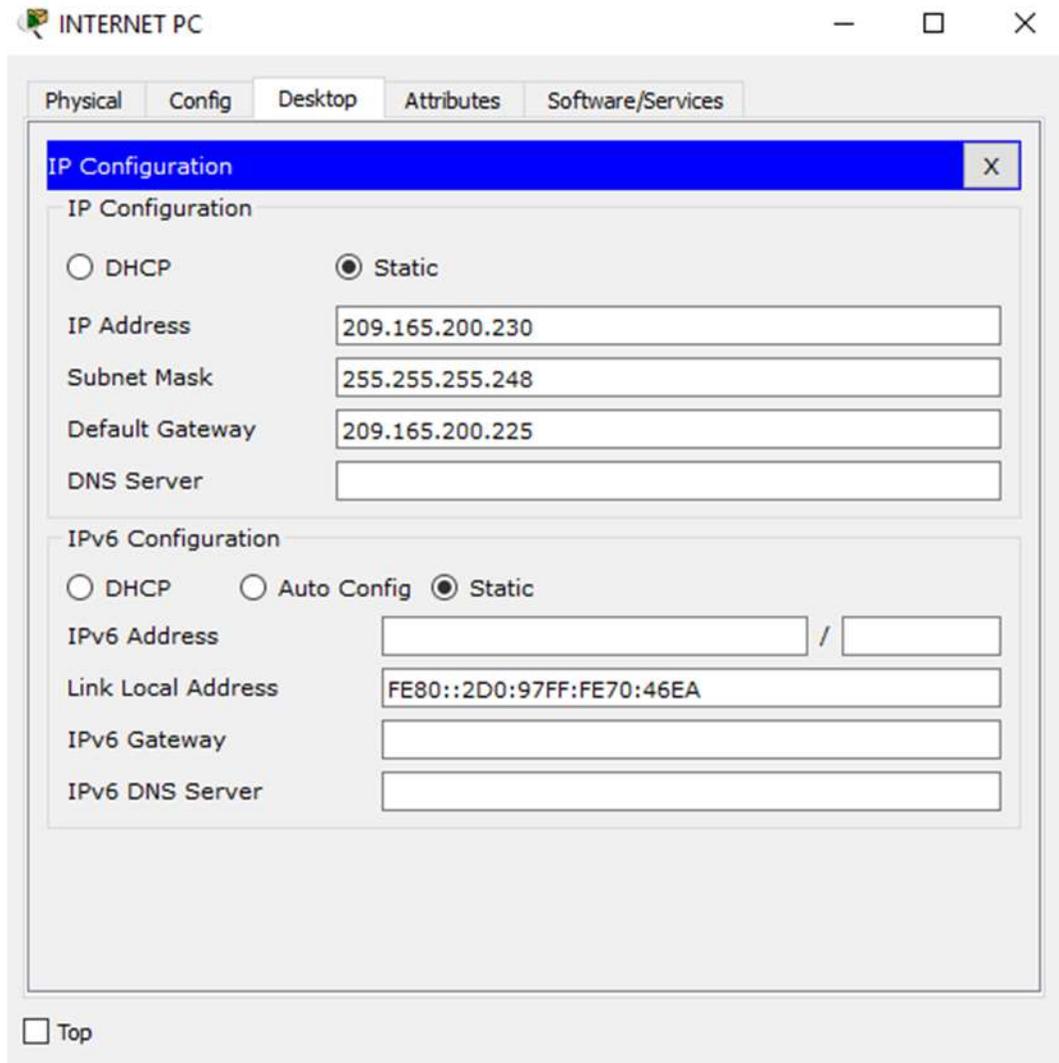
Paste

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.



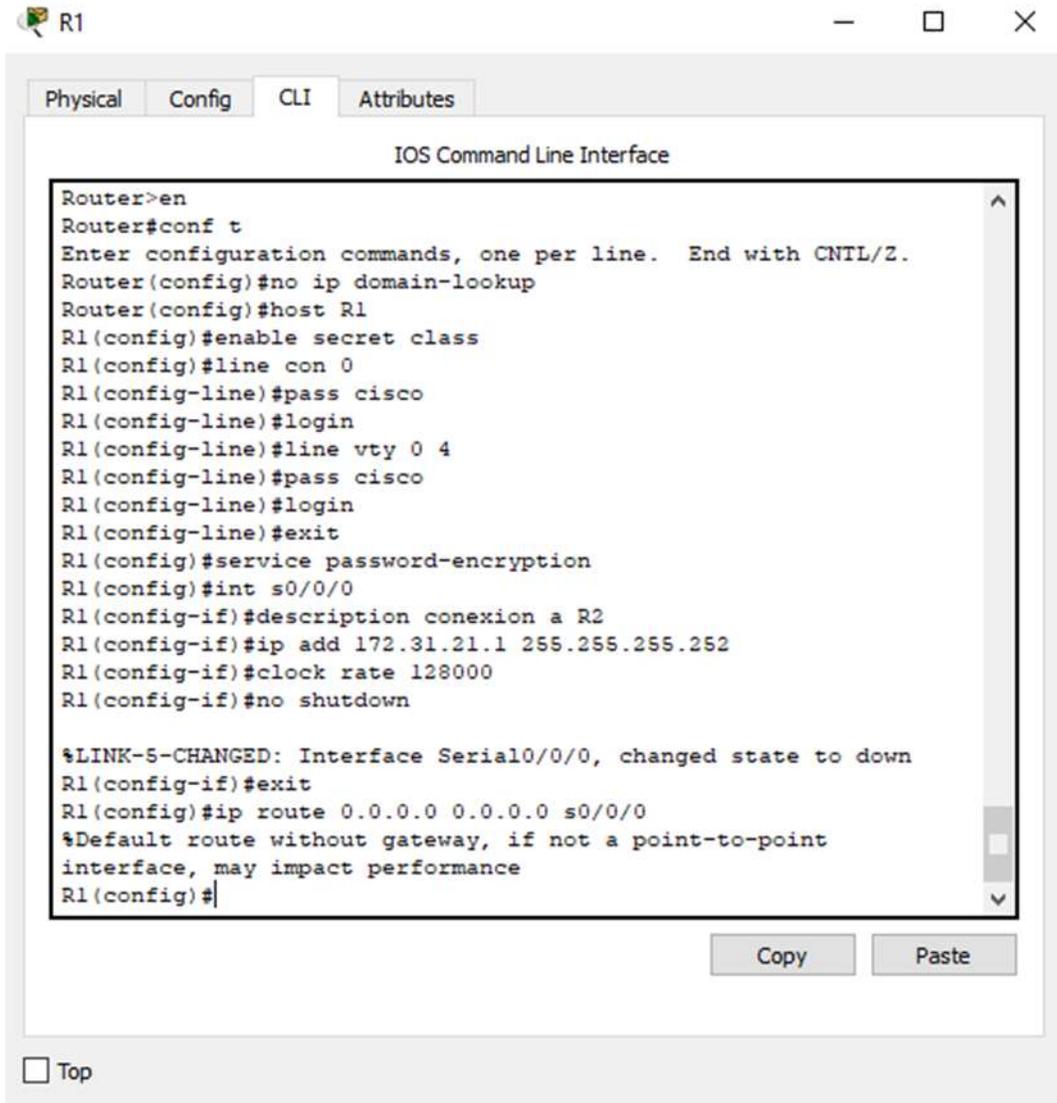
The image shows a screenshot of a virtual machine window titled "INTERNET PC". The window has standard Windows-style window controls (minimize, maximize, close) in the top right corner. Below the title bar, there are several tabs: "Physical", "Config", "Desktop", "Attributes", and "Software/Services". The "Config" tab is selected, and within it, the "IP Configuration" sub-tab is active. The "IP Configuration" window is open, showing the following settings:

- IP Configuration:**
  - DHCP
  - Static
  - IP Address: 209.165.200.230
  - Subnet Mask: 255.255.255.248
  - Default Gateway: 209.165.200.225
  - DNS Server: (empty field)
- IPv6 Configuration:**
  - DHCP
  - Auto Config
  - Static
  - IPv6 Address: (empty field) / (empty field)
  - Link Local Address: FE80::2D0:97FF:FE70:46EA
  - IPv6 Gateway: (empty field)
  - IPv6 DNS Server: (empty field)

At the bottom left of the window, there is a "Top" button with a small square icon next to it.

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 tabbed interface. The "CLI" tab is active, displaying the "IOS Command Line Interface". The terminal output shows the following configuration steps:

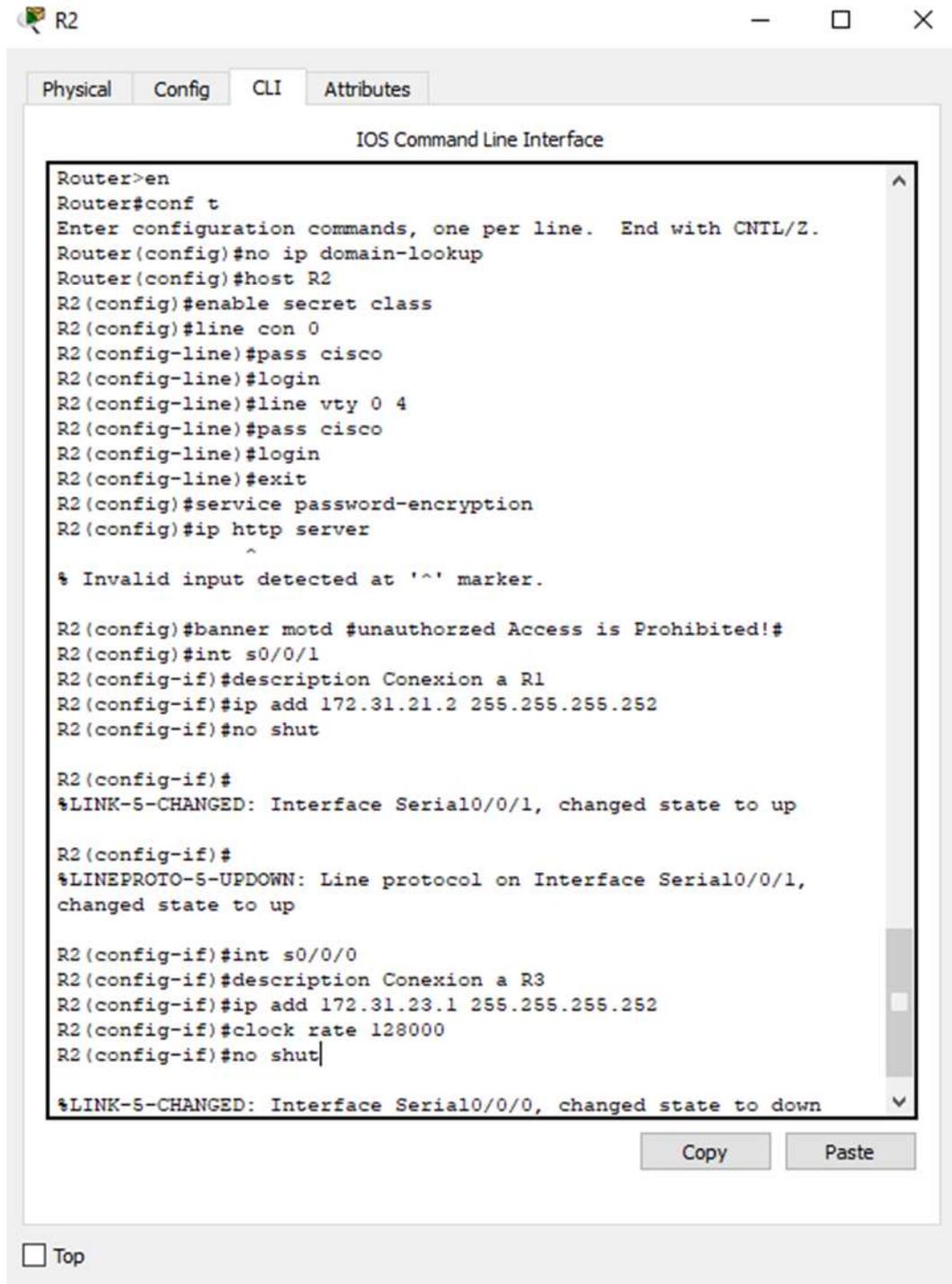
```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#no ip domain-lookup
Router(config)#host R1
R1(config)#enable secret class
R1(config)#line con 0
R1(config-line)#pass cisco
R1(config-line)#login
R1(config-line)#line vty 0 4
R1(config-line)#pass cisco
R1(config-line)#login
R1(config-line)#exit
R1(config)#service password-encryption
R1(config)#int s0/0/0
R1(config-if)#description conexion a R2
R1(config-if)#ip add 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)#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 window, there are "Copy" and "Paste" buttons, and a "Top" button with a checkbox.

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.



The screenshot shows a Cisco IOS Command Line Interface window for router R2. The window has tabs for Physical, Config, CLI, and Attributes, with the CLI tab selected. The terminal output shows the following configuration steps:

```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#no ip domain-lookup
Router(config)#host R2
R2(config)#enable secret class
R2(config)#line con 0
R2(config-line)#pass cisco
R2(config-line)#login
R2(config-line)#line vty 0 4
R2(config-line)#pass cisco
R2(config-line)#login
R2(config-line)#exit
R2(config)#service password-encryption
R2(config)#ip http server
^
% Invalid input detected at '^' marker.

R2(config)#banner motd #unauthorized Access is Prohibited!#
R2(config)#int s0/0/1
R2(config-if)#description Conexion a R1
R2(config-if)#ip add 172.31.21.2 255.255.255.252
R2(config-if)#no shut

R2(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to up

R2(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/1,
changed state to up

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

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

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

R2



Physical

Config

CLI

Attributes

### IOS Command Line Interface

```
% Invalid input detected at '^' marker.

R2(config)#int g0/0
R2(config-if)#description Conexion a ISP
R2(config-if)#ip add 209.165.200.225 255.255.255.248
R2(config-if)#no shut

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 g0/1
R2(config-if)#description Conexion a web server
R2(config-if)#ip add 10.10.10.1 255.255.255.0
R2(config-if)#no shut

R2(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to
up

R2(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface
```

Copy

Paste

Top

Physical Config Services Desktop Attributes Software/Services

**IP Configuration** [X]

Interface: FastEthernet0

IP Configuration

DHCP       Static

IP Address: 10.10.10.10

Subnet Mask: 255.255.255.0

Default Gateway: 10.10.10.1

DNS Server: [ ]

IPv6 Configuration

DHCP     Auto Config     Static

IPv6 Address: [ ] / [ ]

Link Local Address: FE80::230:F2FF:FEDA:6961

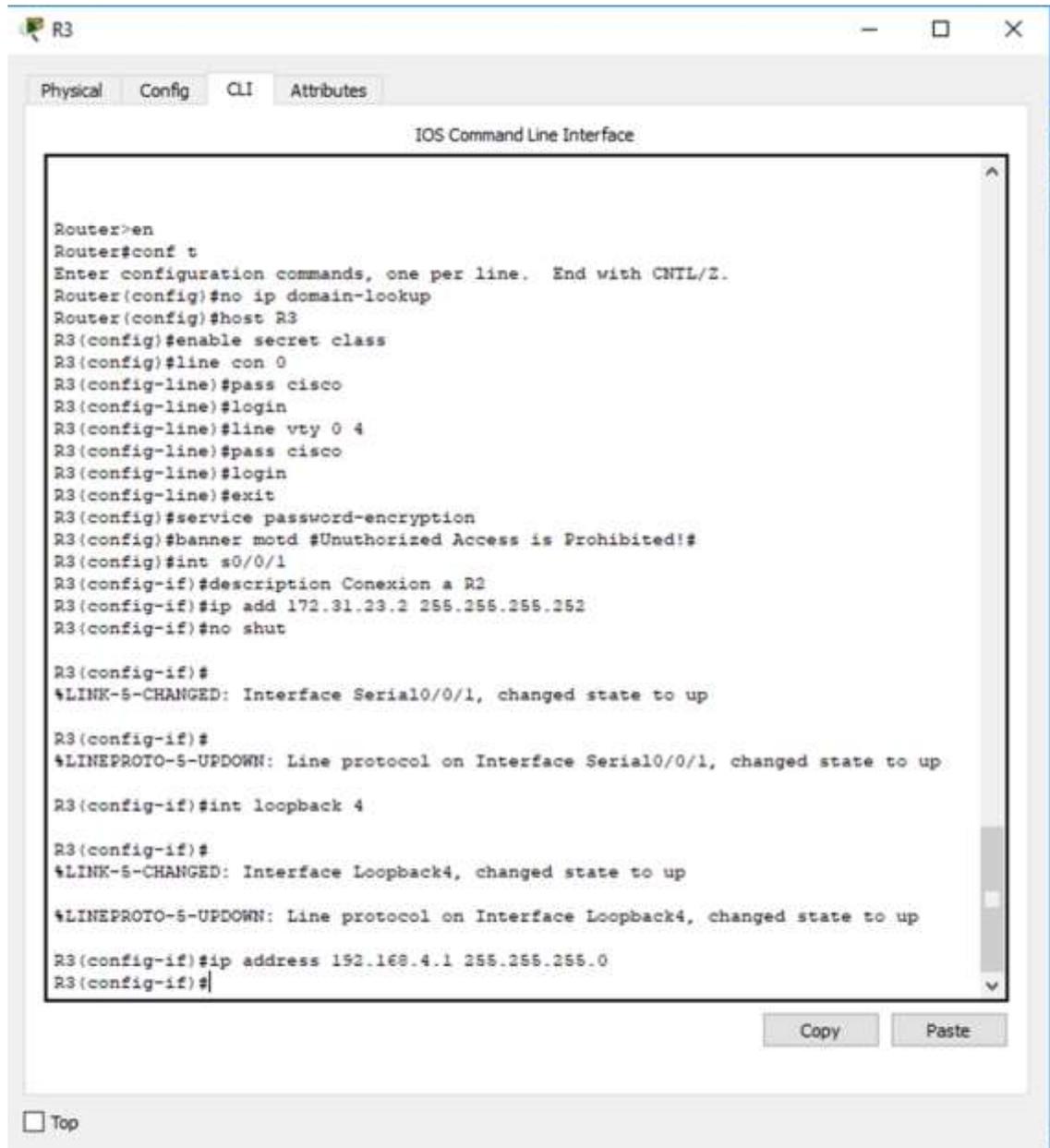
IPv6 Gateway: [ ]

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>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#no ip domain-lookup
Router(config)#host R3
R3(config)#enable secret class
R3(config)#line con 0
R3(config-line)#pass cisco
R3(config-line)#login
R3(config-line)#line vty 0 4
R3(config-line)#pass cisco
R3(config-line)#login
R3(config-line)#exit
R3(config)#service password-encryption
R3(config)#banner motd #Unauthorized Access is Prohibited!#
R3(config)#int s0/0/1
R3(config-if)#description Conexion a R2
R3(config-if)#ip add 172.31.23.2 255.255.255.252
R3(config-if)#no shut

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

R3(config-if)#
%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)#
```

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)#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-6-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)#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)#
```

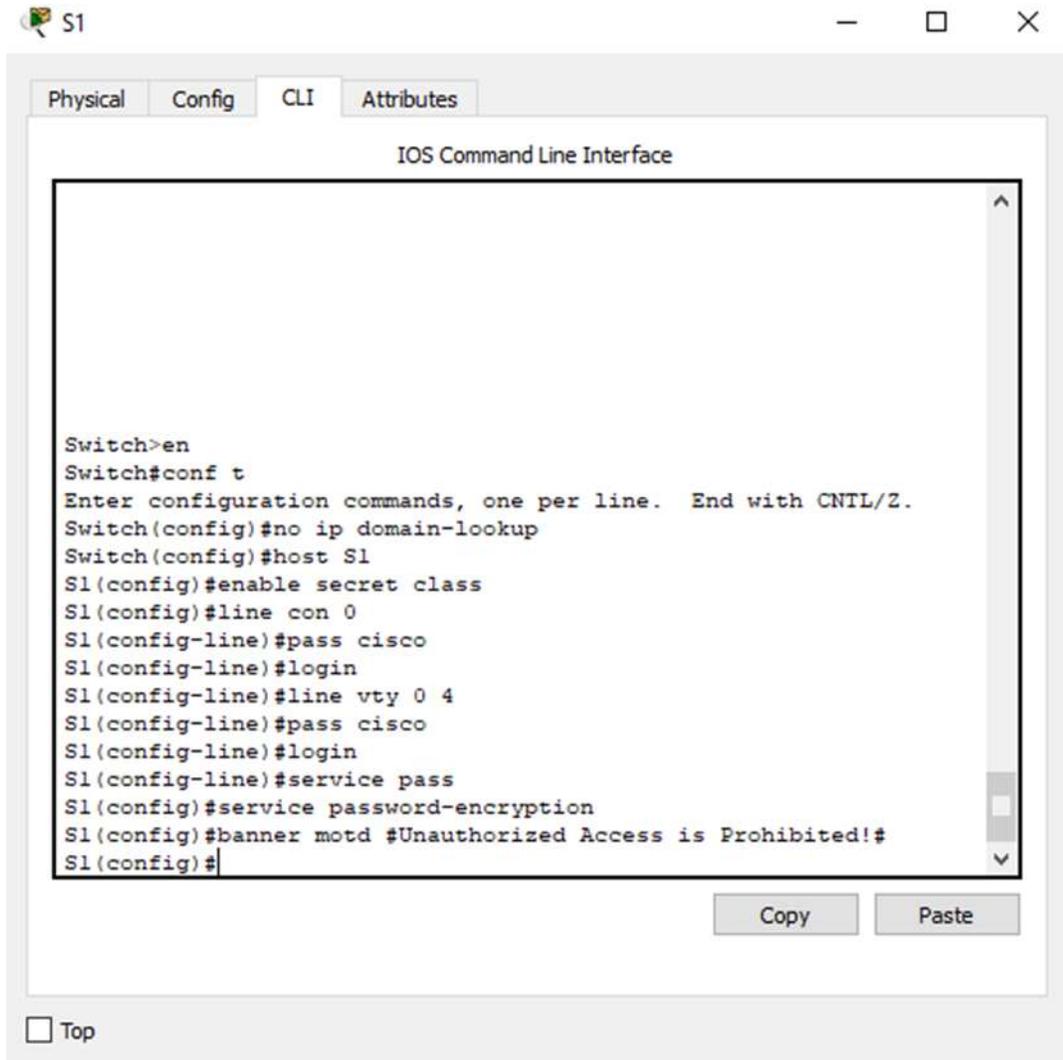
Copy

Paste

Top

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

## Configurando S1.



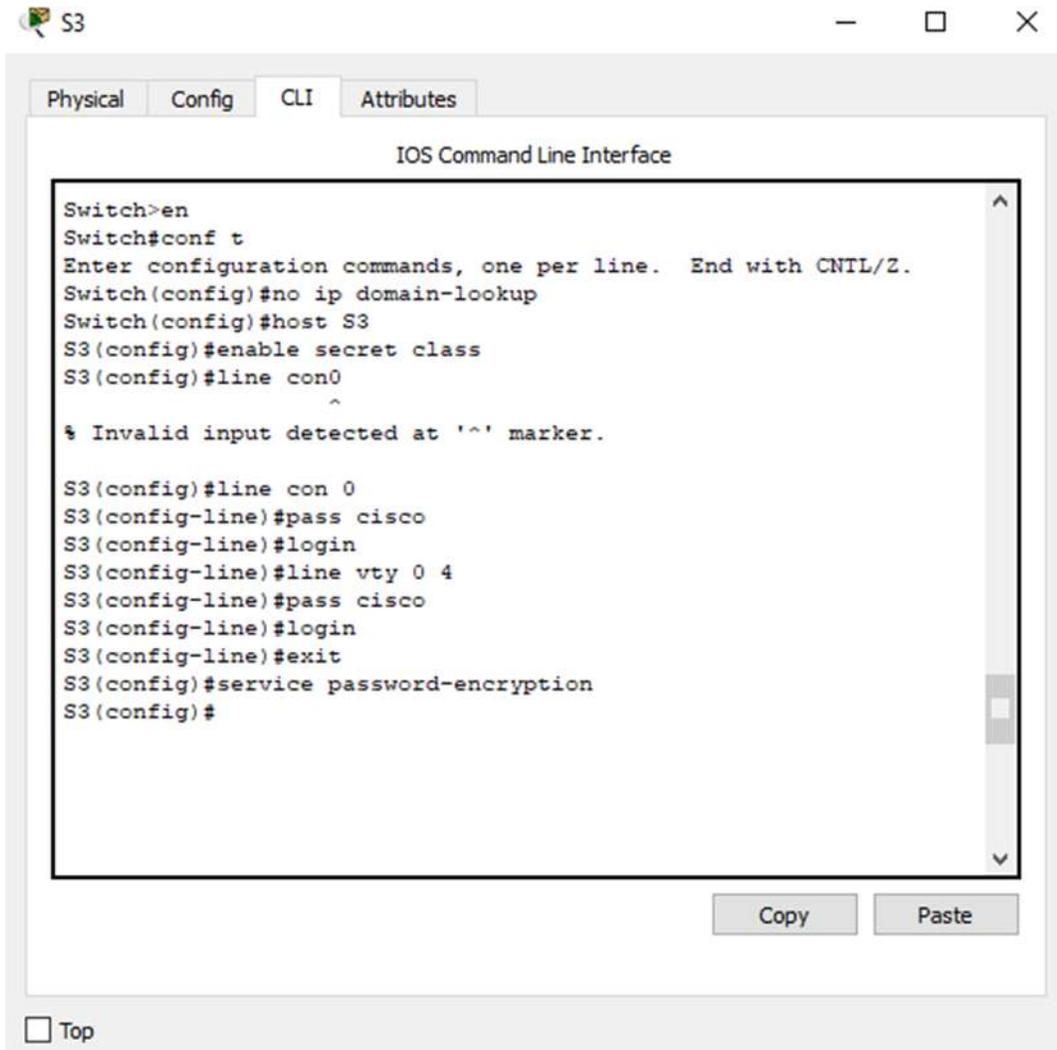
The screenshot shows a window titled "S1" with a tabbed interface. The "CLI" tab is active, displaying the "IOS Command Line Interface". The terminal text shows the following configuration steps:

```
Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#no ip domain-lookup
Switch(config)#host S1
S1(config)#enable secret class
S1(config)#line con 0
S1(config-line)#pass cisco
S1(config-line)#login
S1(config-line)#line vty 0 4
S1(config-line)#pass cisco
S1(config-line)#login
S1(config-line)#service pass
S1(config)#service password-encryption
S1(config)#banner motd #Unauthorized Access is Prohibited!#
S1(config)#
```

At the bottom of the CLI window, there are "Copy" and "Paste" buttons. Below the window, there is a "Top" button with a square icon.

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

## Configurando S3.



The screenshot shows a window titled "S3" with a standard Windows-style title bar (minimize, maximize, close). The window contains a tabbed interface with four tabs: "Physical", "Config", "CLI", and "Attributes". The "CLI" tab is selected, displaying the "IOS Command Line Interface". The interface shows a series of commands entered in a terminal window, with a vertical scrollbar on the right side. The commands are: "Switch>en", "Switch#conf t", "Enter configuration commands, one per line. End with CNTL/Z.", "Switch(config)#no ip domain-lookup", "Switch(config)#host S3", "S3(config)#enable secret class", "S3(config)#line con0", an error message "% Invalid input detected at '^' marker." with a caret under the apostrophe, "S3(config)#line con 0", "S3(config-line)#pass cisco", "S3(config-line)#login", "S3(config-line)#line vty 0 4", "S3(config-line)#pass cisco", "S3(config-line)#login", "S3(config-line)#exit", "S3(config)#service password-encryption", and "S3(config)#". Below the terminal window are "Copy" and "Paste" buttons. At the bottom left of the window is a "Top" button with a square icon.

```
Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#no ip domain-lookup
Switch(config)#host S3
S3(config)#enable secret class
S3(config)#line con0
      ^
% Invalid input detected at '^' marker.

S3(config)#line con 0
S3(config-line)#pass cisco
S3(config-line)#login
S3(config-line)#line vty 0 4
S3(config-line)#pass cisco
S3(config-line)#login
S3(config-line)#exit
S3(config)#service password-encryption
S3(config)#
```

Top

S3



Physical

Config

CLI

Attributes

### IOS Command Line Interface

Press RETURN to get started.

User Access Verification

Password:

S3>en

Password:

S3#conf t

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

S3(config)#banner motd #Unaurhotized Access is Prohibited!#

S3(config)#

Copy

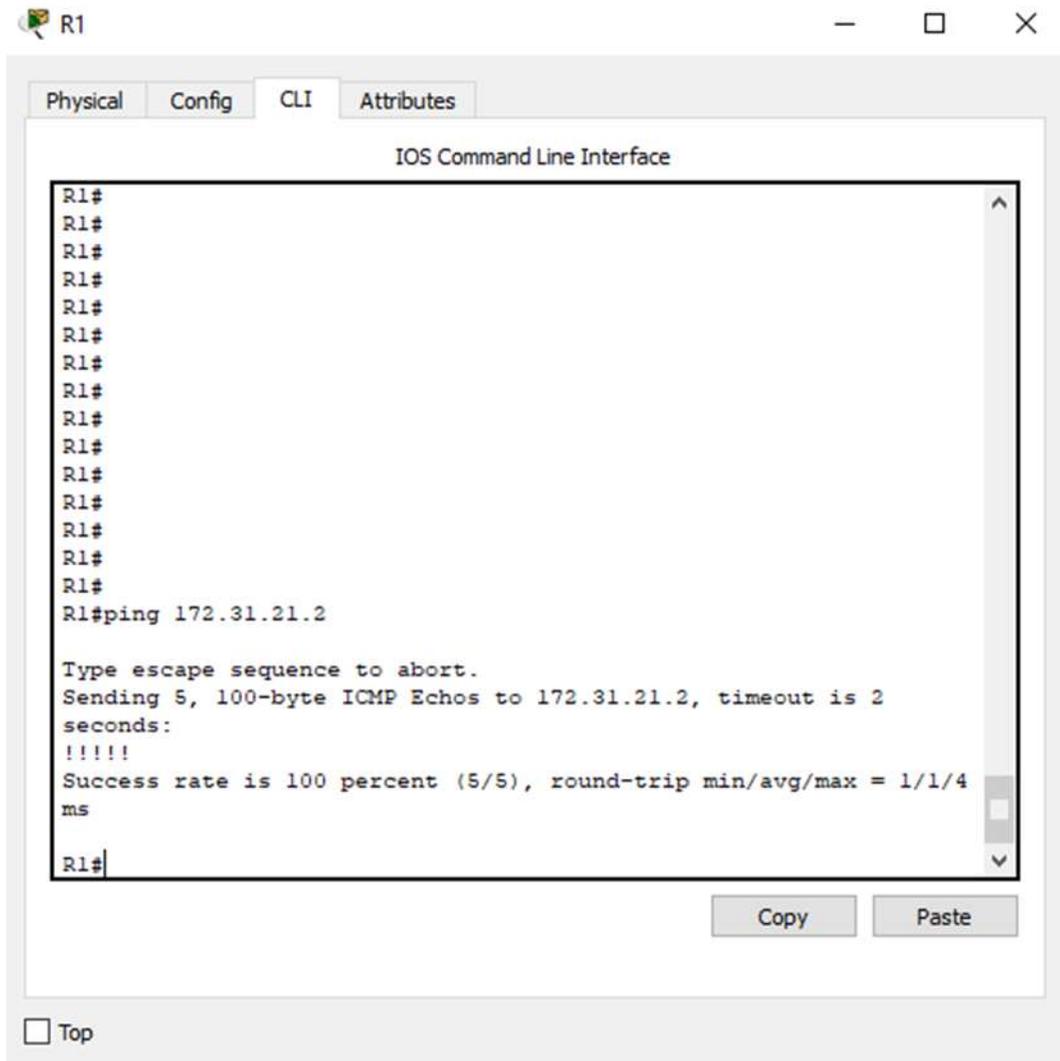
Paste

Top

## 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#
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 = 1/1/4
ms
R1#
```

Copy Paste

Top

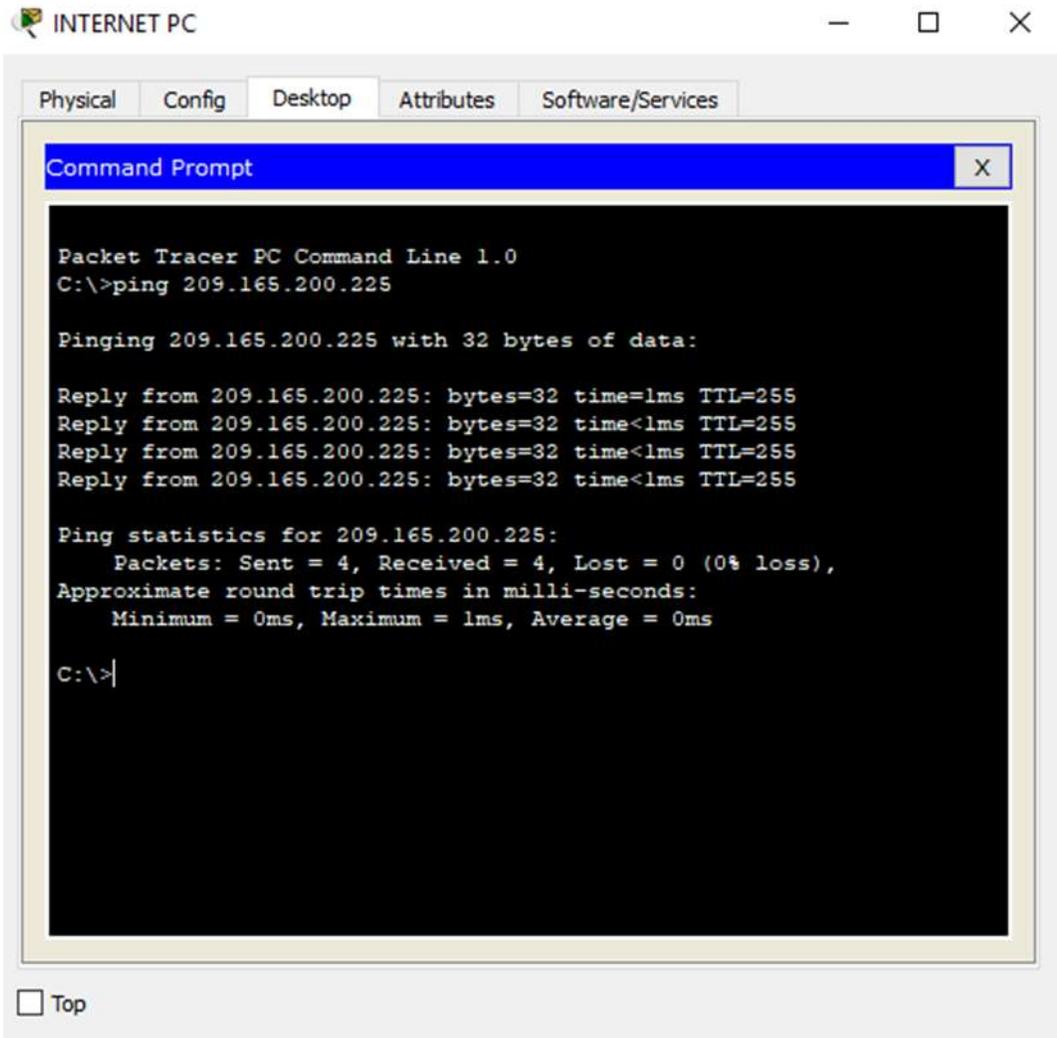
## Ping desde R3 a R2, S0/0/1

The screenshot shows a window titled "R3" with a standard Windows-style title bar (minimize, maximize, close buttons). The window contains a tabbed interface with 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:

```
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 =  
2/6/19 ms  
R3#
```

At the bottom right of the CLI window, there are two buttons: "Copy" and "Paste". Below the CLI window, there is a checkbox labeled "Top" which is currently unchecked.

## Ping desde Internet PC a Puerta de Enlace Predeterminada



The screenshot shows a Packet Tracer PC Command Line window titled "INTERNET PC". The window has tabs for "Physical", "Config", "Desktop", "Attributes", and "Software/Services". The "Desktop" tab is active, displaying a "Command Prompt" window. The command prompt shows the execution of a ping command to the IP address 209.165.200.225. The output indicates that all four packets were received successfully with 0% loss and a round trip time of 1ms.

```
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=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
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 = 1ms, Average = 0ms

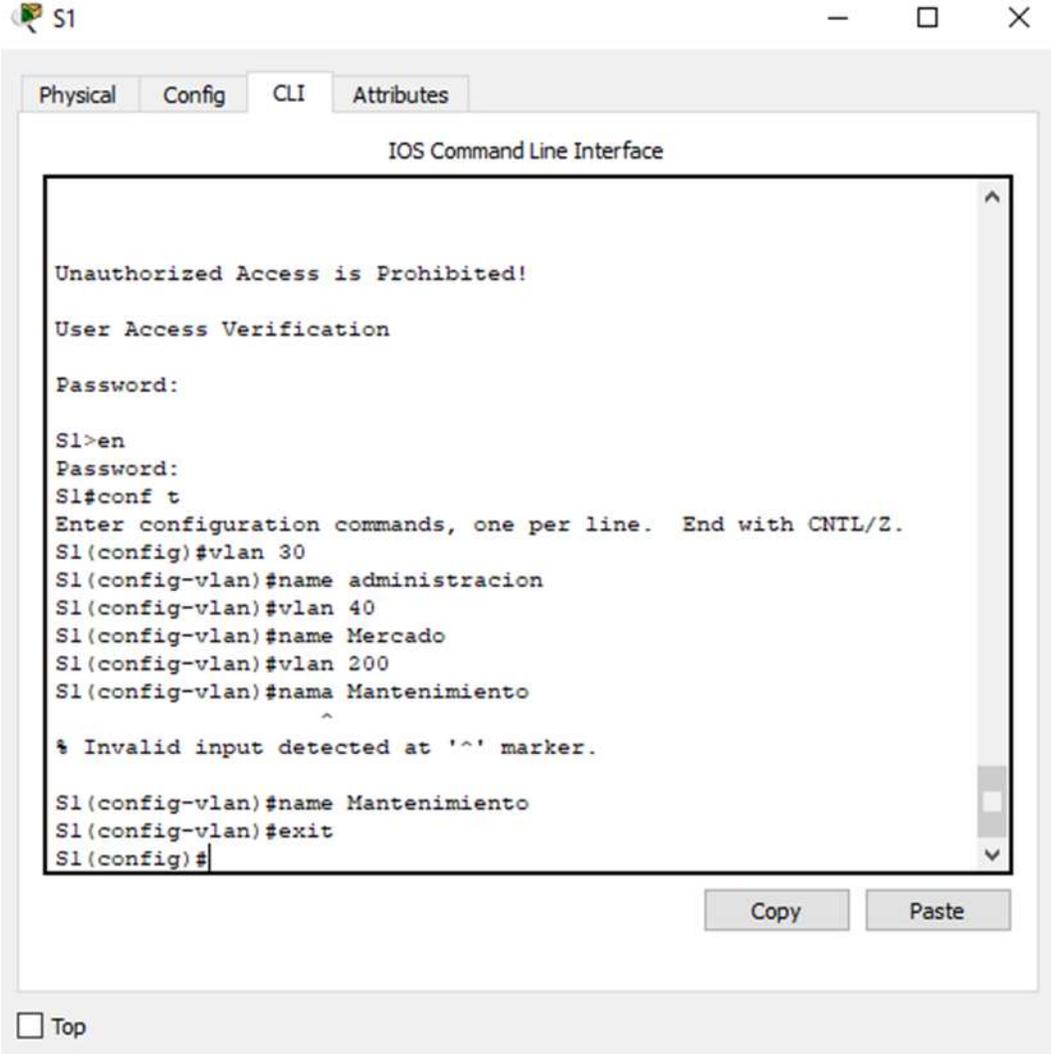
C:\>|
```

Top

## 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.

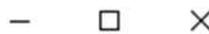


The screenshot shows a terminal window titled "S1" with a window control bar (minimize, maximize, close). The main content area is titled "IOS Command Line Interface" and contains the following text:

```
Unauthorized Access is Prohibited!  
User Access Verification  
Password:  
S1>en  
Password:  
S1#conf t  
Enter configuration commands, one per line. End with CNTL/Z.  
S1(config)#vlan 30  
S1(config-vlan)#name administracion  
S1(config-vlan)#vlan 40  
S1(config-vlan)#name Mercado  
S1(config-vlan)#vlan 200  
S1(config-vlan)#nama Mantenimiento  
^  
% Invalid input detected at '^' marker.  
S1(config-vlan)#name Mantenimiento  
S1(config-vlan)#exit  
S1(config)#
```

At the bottom of the terminal window, there are "Copy" and "Paste" buttons. Below the terminal window, there is a "Top" button with a square icon.

S1



Physical Config CLI Attributes

IOS Command Line Interface

```
S1(config)#int vlan 200
S1(config-if)#
%LINK-5-CHANGED: Interface Vlan200, changed state to up

S1(config-if)#
S1(config-if)#ip add 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)#
```

Copy

Paste

Top

S1



Physical

Config

CLI

Attributes

IOS Command Line Interface

```
S1>en
Password:
S1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
S1(config)#int f0/24
S1(config-if)#switch port mode trunk
      ^
% Invalid input detected at '^' marker.

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)#swichport mode access
      ^
% Invalid input detected at '^' marker.

S1(config-if-range)#switchport mode access
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
```

Copy

Paste

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>en
Password:
S3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
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

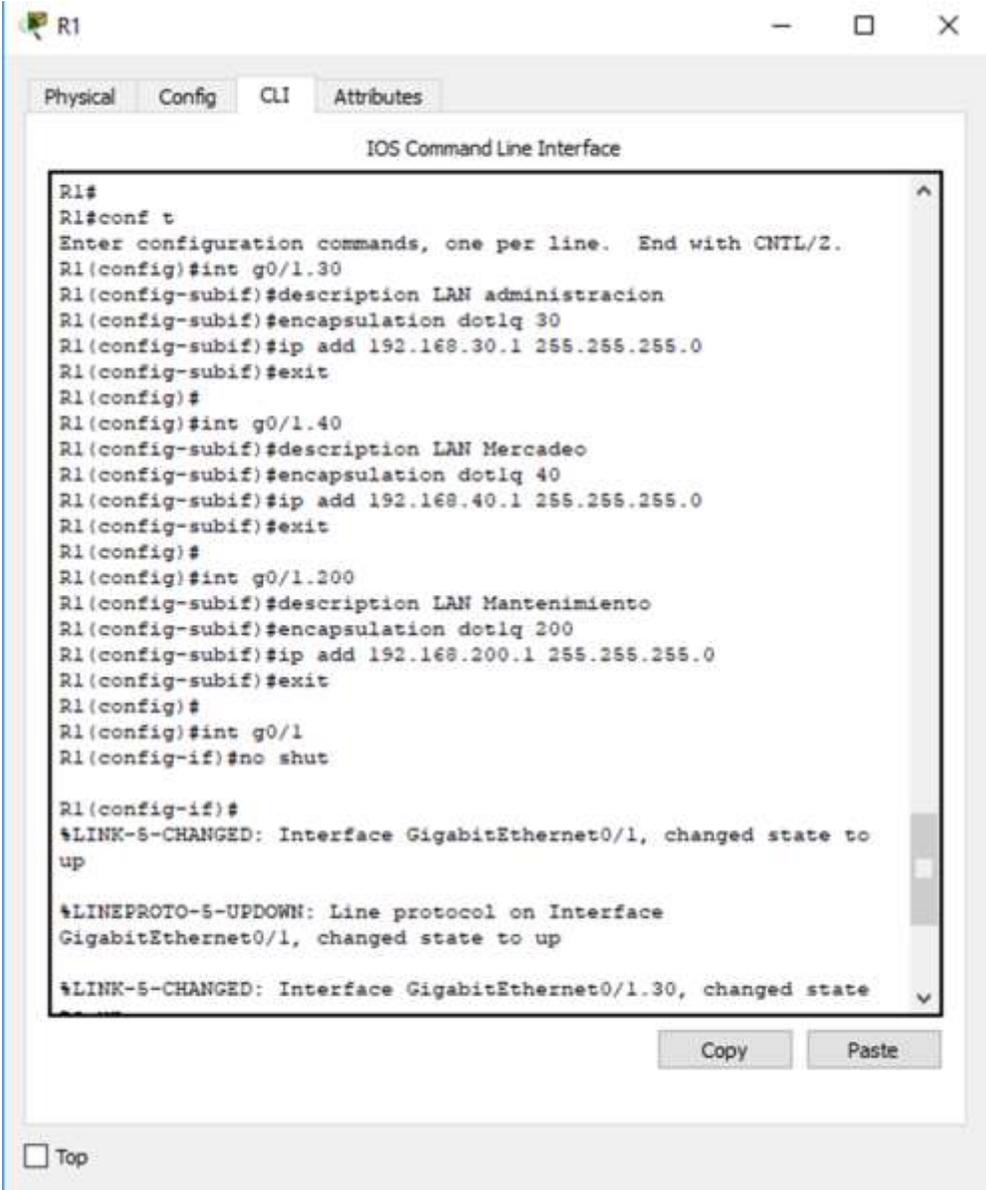
%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan200, changed
state to up

S3(config-if)#ip add 192.168.200.3 255.255.255.0
S3(config-if)#no shut
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)#shut

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

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.



```
R1#
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#int g0/1.30
R1(config-subif)#description LAN administracion
R1(config-subif)#encapsulation dot1q 30
R1(config-subif)#ip add 192.168.30.1 255.255.255.0
R1(config-subif)#exit
R1(config)#
R1(config)#int g0/1.40
R1(config-subif)#description LAN Mercadeo
R1(config-subif)#encapsulation dot1q 40
R1(config-subif)#ip add 192.168.40.1 255.255.255.0
R1(config-subif)#exit
R1(config)#
R1(config)#int g0/1.200
R1(config-subif)#description LAN Mantenimiento
R1(config-subif)#encapsulation dot1q 200
R1(config-subif)#ip add 192.168.200.1 255.255.255.0
R1(config-subif)#exit
R1(config)#
R1(config)#int g0/1
R1(config-if)#no shut

R1(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to
up

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

%LINK-5-CHANGED: Interface GigabitEthernet0/1.30, changed state
```

Copy Paste

Top

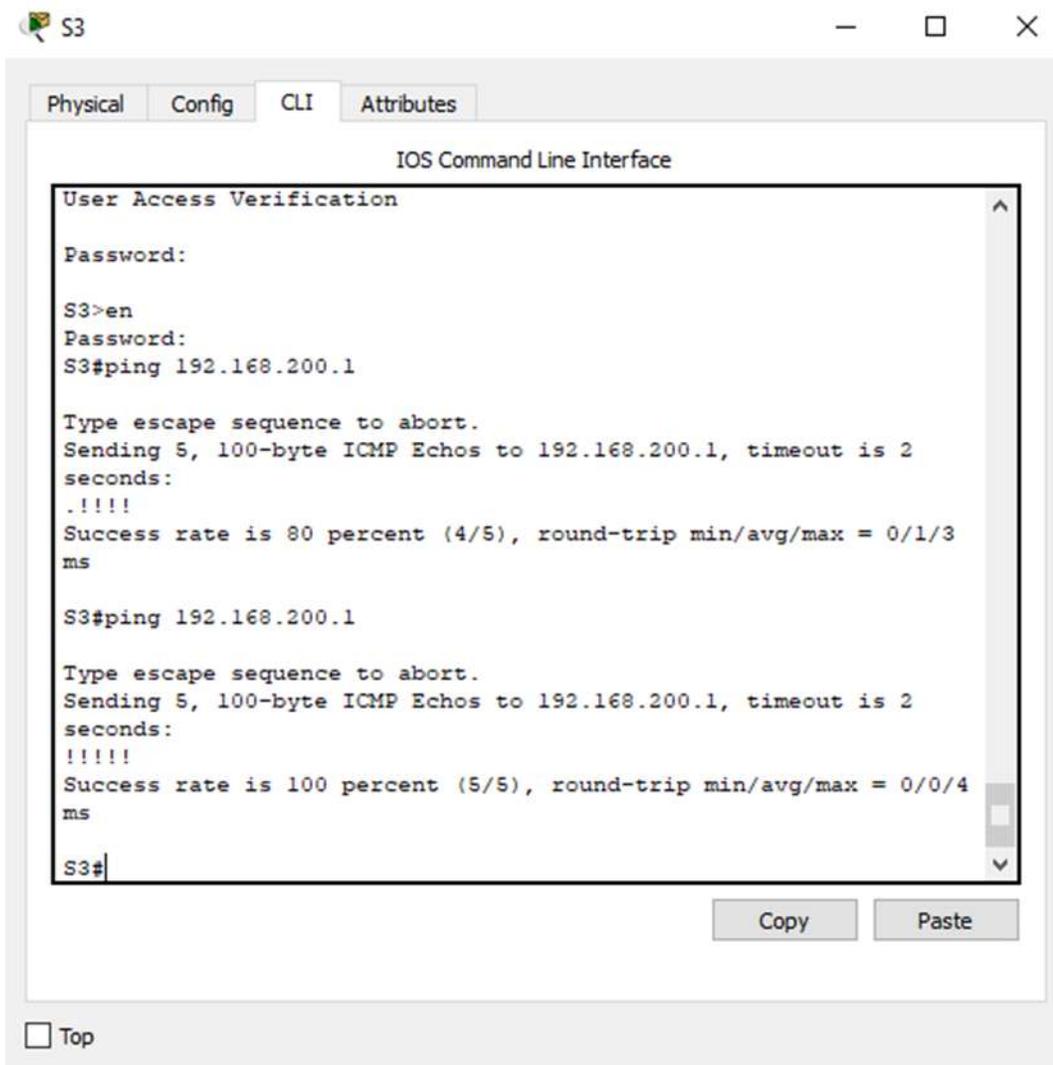
Verificación de la Conectividad de la Red Se usa el comando ping para probar la conectividad entre los Switches y R1. Ping desde S1 a R1, Dirección VLAN 200

```
S1
Physical Config CLI Attributes
IOS Command Line Interface
User Access Verification
Password:
S1>en
Password:
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 = 0/0/0
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 = 0/0/1
ms
S1#
```

Copy Paste

Top

## Ping desde S3 a R1, Dirección VLAN 200



S3

Physical Config CLI Attributes

IOS Command Line Interface

```
User Access Verification

Password:

S3>en
Password:
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 = 0/1/3
ms

S3#ping 192.168.200.1

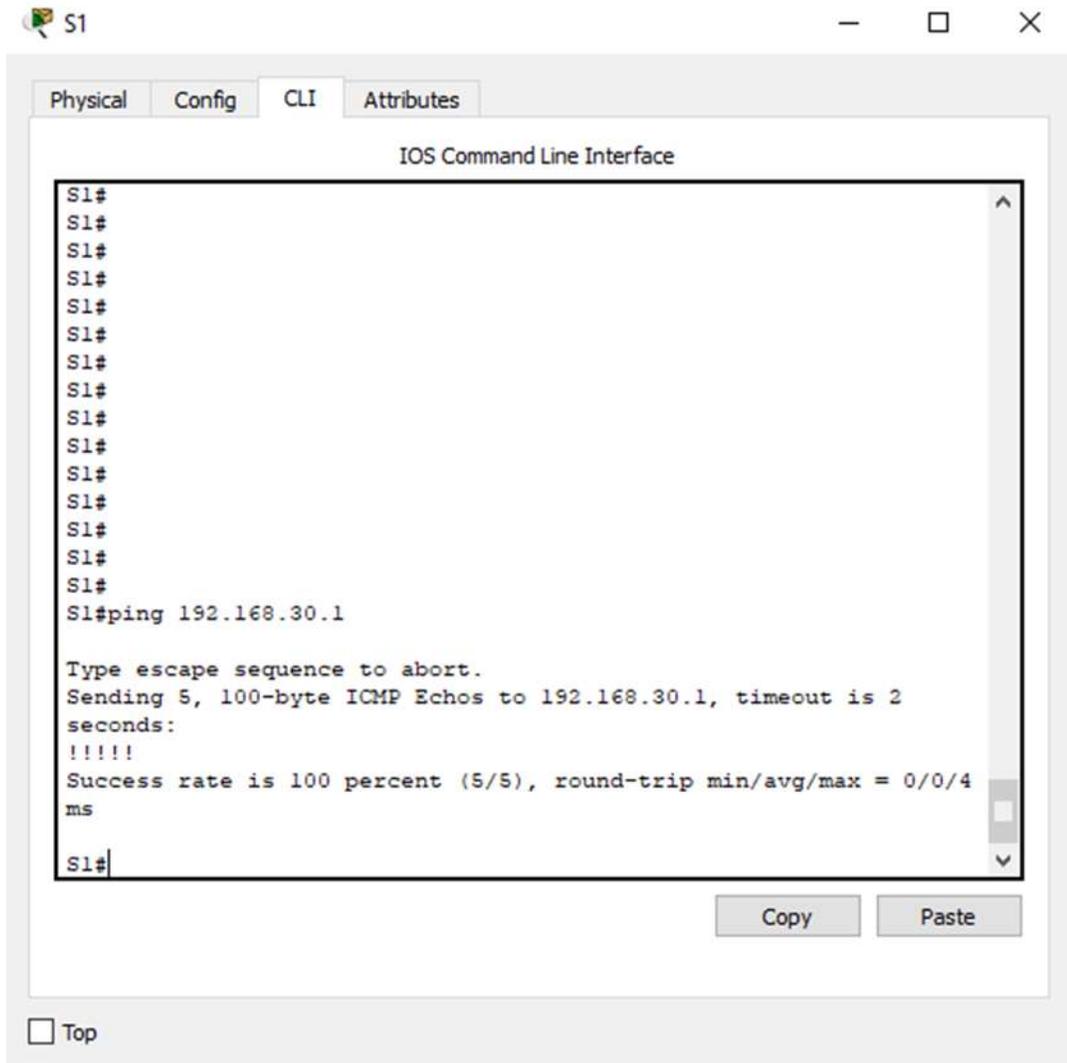
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.200.1, timeout is 2
seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/4
ms

S3#
```

Copy Paste

Top

## Ping desde S1 a R1, Dirección VLAN 30

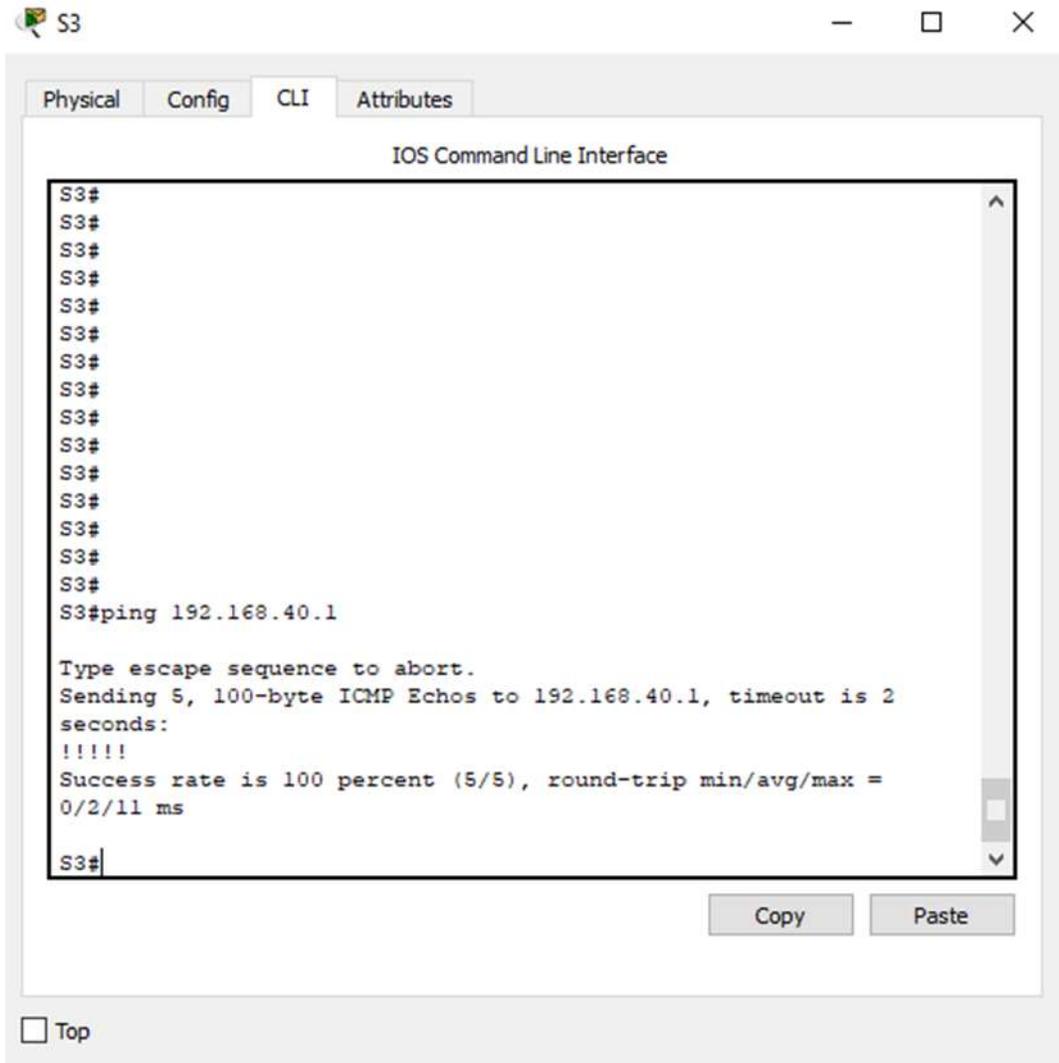


The image shows a window titled "S1" with a standard Windows-style title bar (minimize, maximize, close). Inside the window, there are four tabs: "Physical", "Config", "CLI", and "Attributes". The "CLI" tab is active, displaying the "IOS Command Line Interface". The terminal output shows the following sequence of commands and responses:

```
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 = 0/0/4  
ms  
S1#
```

At the bottom right of the CLI window, there are two buttons: "Copy" and "Paste". At the bottom left of the main window, there is a checkbox labeled "Top".

## Ping desde S3 a R1, Dirección VLAN 40



The image shows a window titled "S3" with a standard Windows-style title bar (minimize, maximize, close). Inside the window, there are four tabs: "Physical", "Config", "CLI", and "Attributes". The "CLI" tab is selected, and the text "IOS Command Line Interface" is centered above the main text area. The text area contains the following output:

```
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 =  
0/2/11 ms  
S3#
```

Below the text area, there are two buttons: "Copy" and "Paste". At the bottom left of the 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
Physical Config CLI Attributes
IOS Command Line Interface
R1(config)#
R1(config)#
R1(config)#
R1(config)#
R1(config)#
R1(config)#
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 g0/1.30
R1(config-router)#passive-interface g0/1.40
R1(config-router)#passive-interface g0/1.200
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)#
R1(config-if)#
R1(config-if)#
```

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.

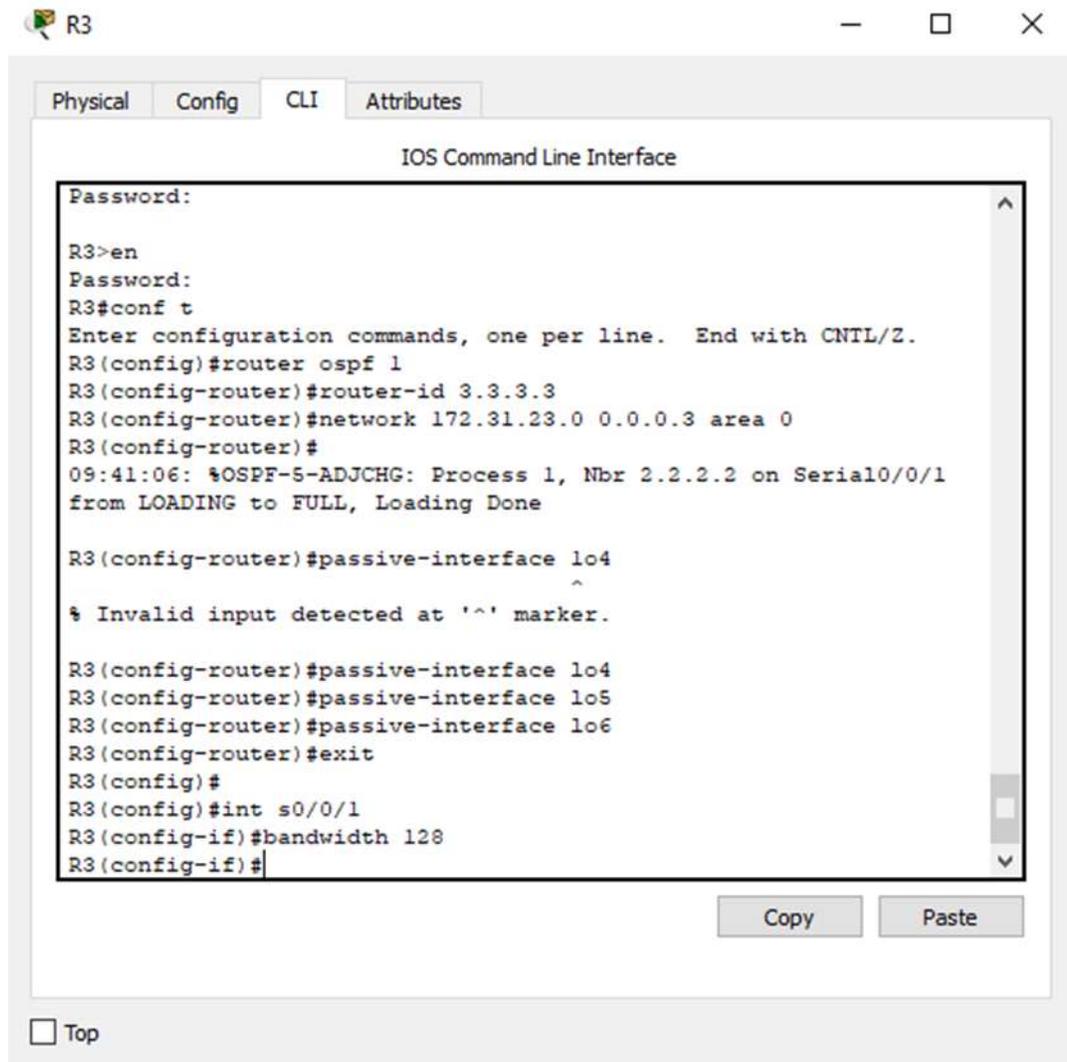
```
IOS Command Line Interface

Password:
R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
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)#
07:20:08: %OSPF-5-ADJCHG: Process 1, Nbr 1.1.1.1 on Serial0/0/1
from LOADING to FULL, Loading Done

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 g0/1
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)#
```

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.



```

R3
Physical Config CLI Attributes
IOS Command Line Interface
Password:
R3>en
Password:
R3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
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)#
09:41:06: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on Serial0/0/1
from LOADING to FULL, Loading Done

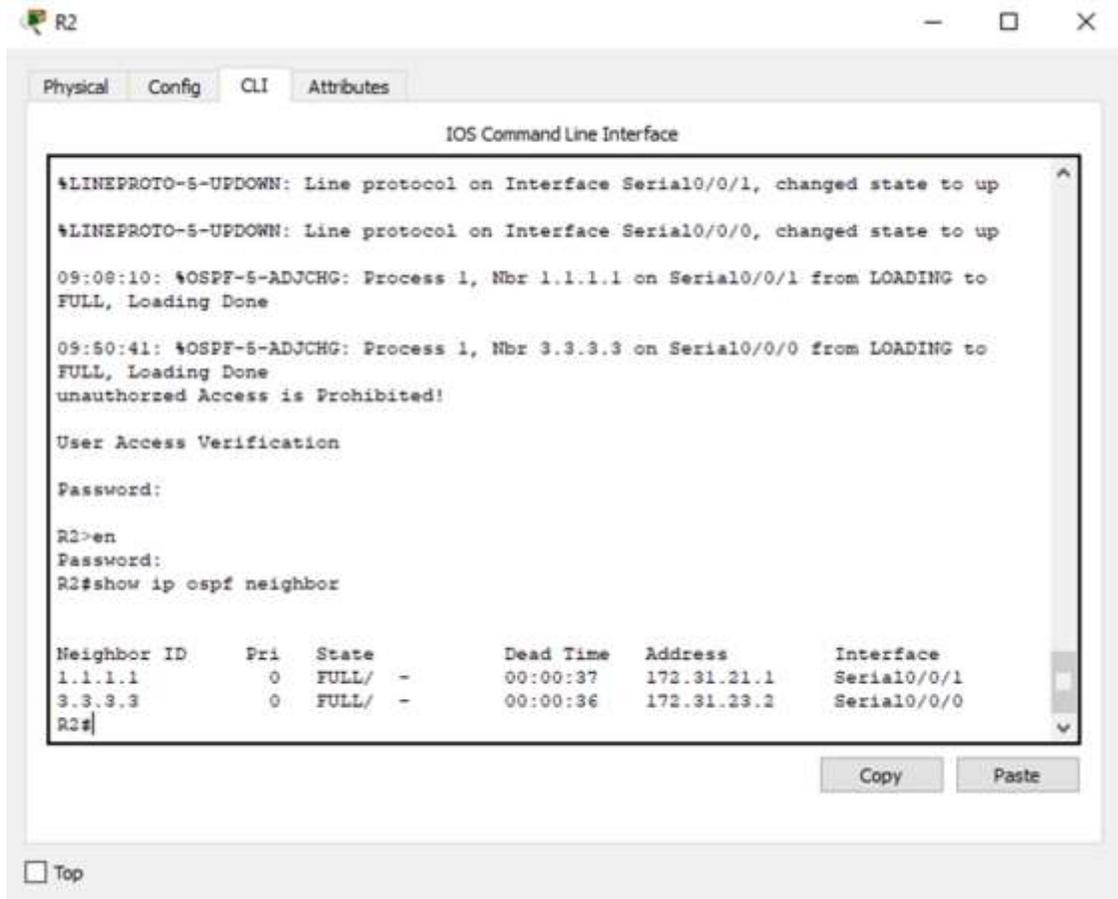
R3(config-router)#passive-interface lo4
^
% Invalid input detected at '^' marker.

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)#
Copy Paste
Top
```

## Verificación de la Información de OSPF

Ejemplificamos realizando la verificación en el Router R2.

### Routers conectados por OSPFv2



The screenshot shows the IOS Command Line Interface (CLI) for Router R2. The interface is titled "IOS Command Line Interface" and has tabs for "Physical", "Config", "CLI", and "Attributes". The CLI output shows the following:

```

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up
09:08:10: %OSPF-5-ADJCHG: Process 1, Nbr 1.1.1.1 on Serial0/0/1 from LOADING to FULL, Loading Done
09:50:41: %OSPF-5-ADJCHG: Process 1, Nbr 3.3.3.3 on Serial0/0/0 from LOADING to FULL, Loading Done
unauthorized Access is Prohibited!

User Access Verification

Password:

R2>en
Password:
R2#show ip ospf neighbor

Neighbor ID    Pri   State           Dead Time   Address        Interface
1.1.1.1        0     FULL/ -         00:00:37   172.31.21.1   Serial0/0/1
3.3.3.3        0     FULL/ -         00:00:36   172.31.23.2   Serial0/0/0
R2#

```

At the bottom of the CLI window, there are "Copy" and "Paste" buttons, and a "Top" button.

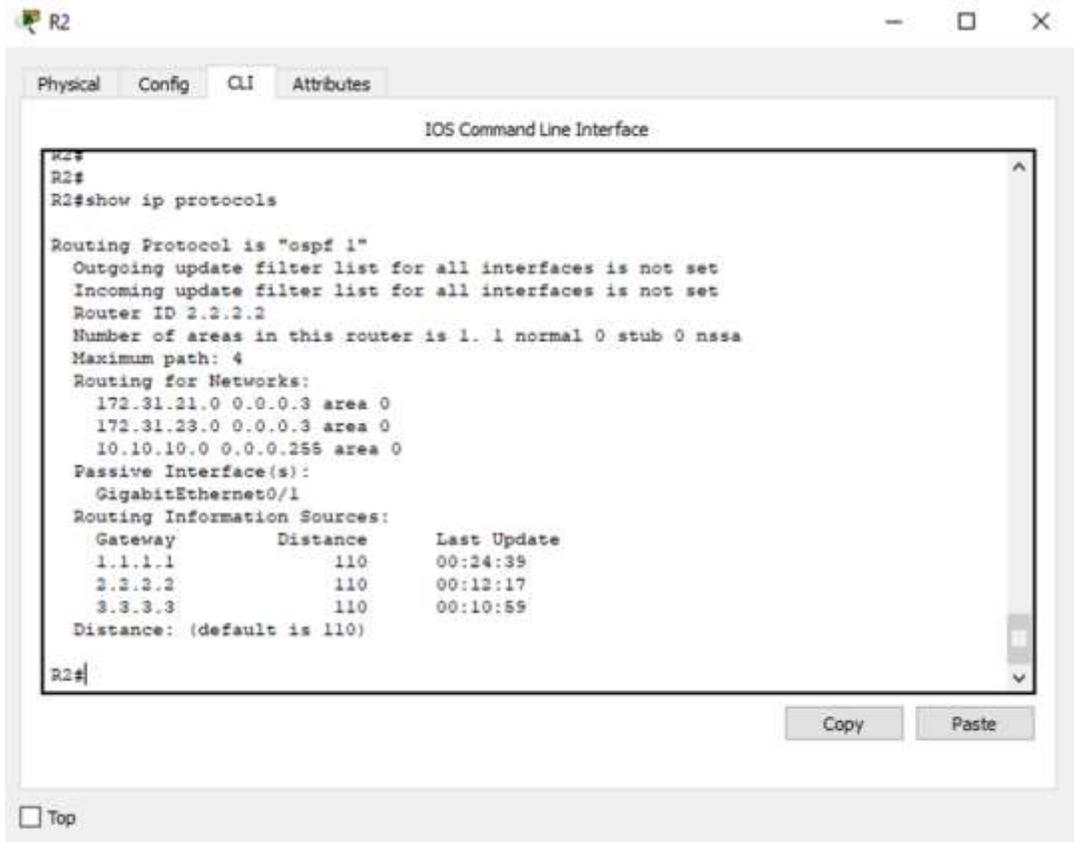
## Resumen de las interfaces OSPF que incluye una columna para el Costo de cada Interfaz

```
R2#show ip ospf interface

GigabitEthernet0/1 is up, line protocol is up
 Internet address is 10.10.10.1/24, Area 0
 Process ID 1, Router ID 2.2.2.2, Network Type BROADCAST, Cost: 1
 Transmit Delay is 1 sec, State WAITING, Priority 1
 No designated router on this network
 No backup designated router on this network
 Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
  No Hellos (Passive interface)
 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 0, Adjacent neighbor count is 0
 Suppress hello for 0 neighbor(s)
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 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)
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
```

Top

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



R2#  
R2#  
R2#show ip protocols

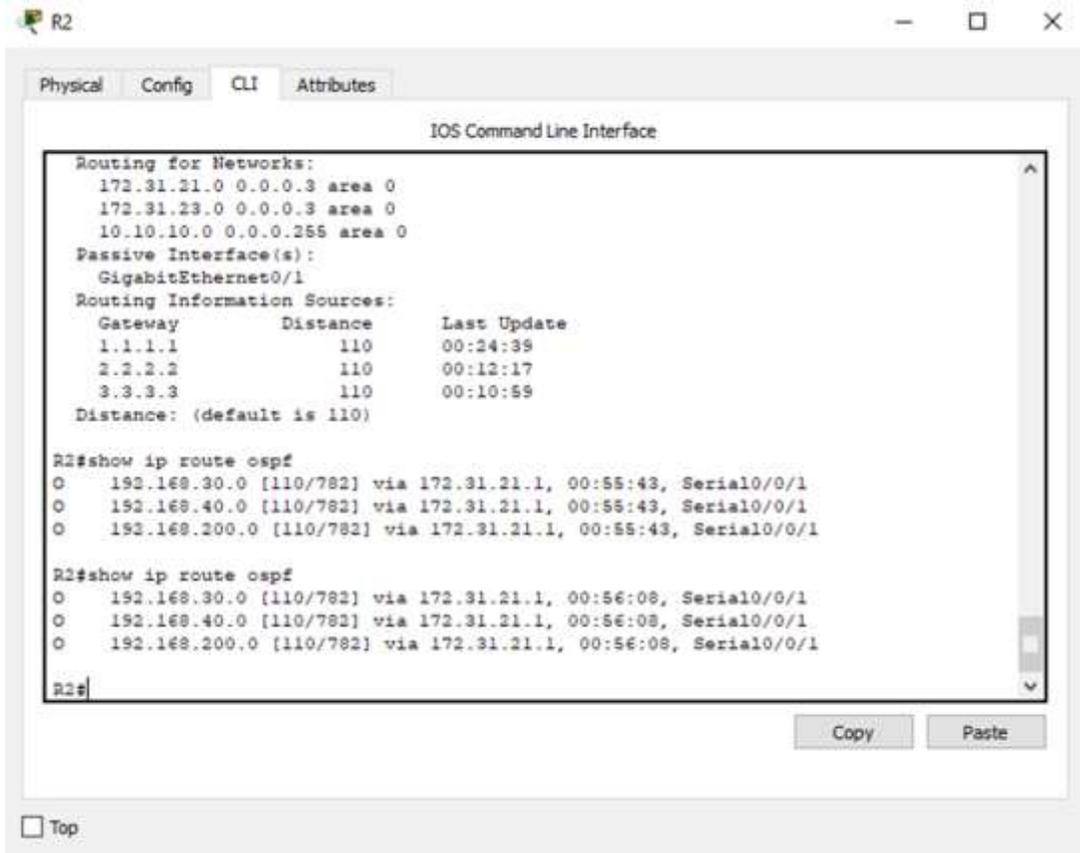
Routing Protocol is "ospf 1"  
Outgoing update filter list for all interfaces is not set  
Incoming update filter list for all interfaces is not set  
Router ID 2.2.2.2  
Number of areas in this router is 1. 1 normal 0 stub 0 nssa  
Maximum path: 4  
Routing for Networks:  
172.31.21.0 0.0.0.3 area 0  
172.31.23.0 0.0.0.3 area 0  
10.10.10.0 0.0.0.255 area 0  
Passive Interface(s):  
GigabitEthernet0/1  
Routing Information Sources:  
Gateway Distance Last Update  
1.1.1.1 110 00:24:39  
2.2.2.2 110 00:12:17  
3.3.3.3 110 00:10:55  
Distance: (default is 110)

R2#

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:

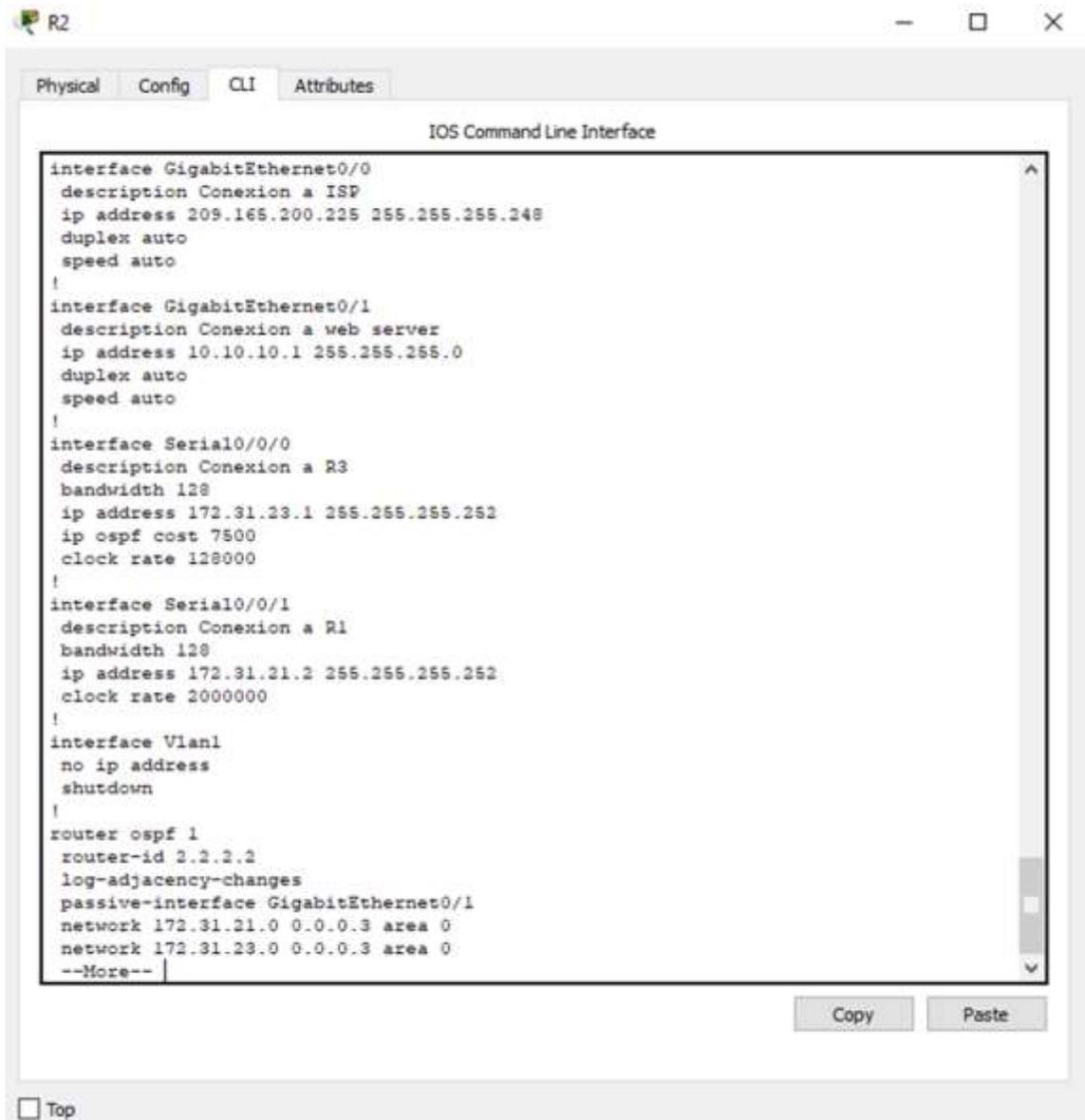
```
Routing for Networks:
 172.31.21.0 0.0.0.3 area 0
 172.31.23.0 0.0.0.3 area 0
 10.10.10.0 0.0.0.255 area 0
Passive Interface(s):
 GigabitEthernet0/1
Routing Information Sources:
 Gateway      Distance    Last Update
 1.1.1.1      110         00:24:39
 2.2.2.2      110         00:12:17
 3.3.3.3      110         00:10:59
Distance: (default is 110)

R2#show ip route ospf
O   192.168.30.0 [110/782] via 172.31.21.1, 00:55:43, Serial0/0/1
O   192.168.40.0 [110/782] via 172.31.21.1, 00:55:43, Serial0/0/1
O   192.168.200.0 [110/782] via 172.31.21.1, 00:55:43, Serial0/0/1

R2#show ip route ospf
O   192.168.30.0 [110/782] via 172.31.21.1, 00:56:08, Serial0/0/1
O   192.168.40.0 [110/782] via 172.31.21.1, 00:56:08, Serial0/0/1
O   192.168.200.0 [110/782] via 172.31.21.1, 00:56:08, Serial0/0/1
R2#
```

At the bottom of the CLI window, there are two buttons: "Copy" and "Paste". Below the window, there is a "Top" button with a square icon to its left.

## Sección OSPF de la configuración en ejecución



The screenshot shows a network configuration window for a device named R2. The window has tabs for Physical, Config, CLI, and Attributes, with the CLI tab selected. The title bar reads "IOS Command Line Interface". The main content area displays the following configuration:

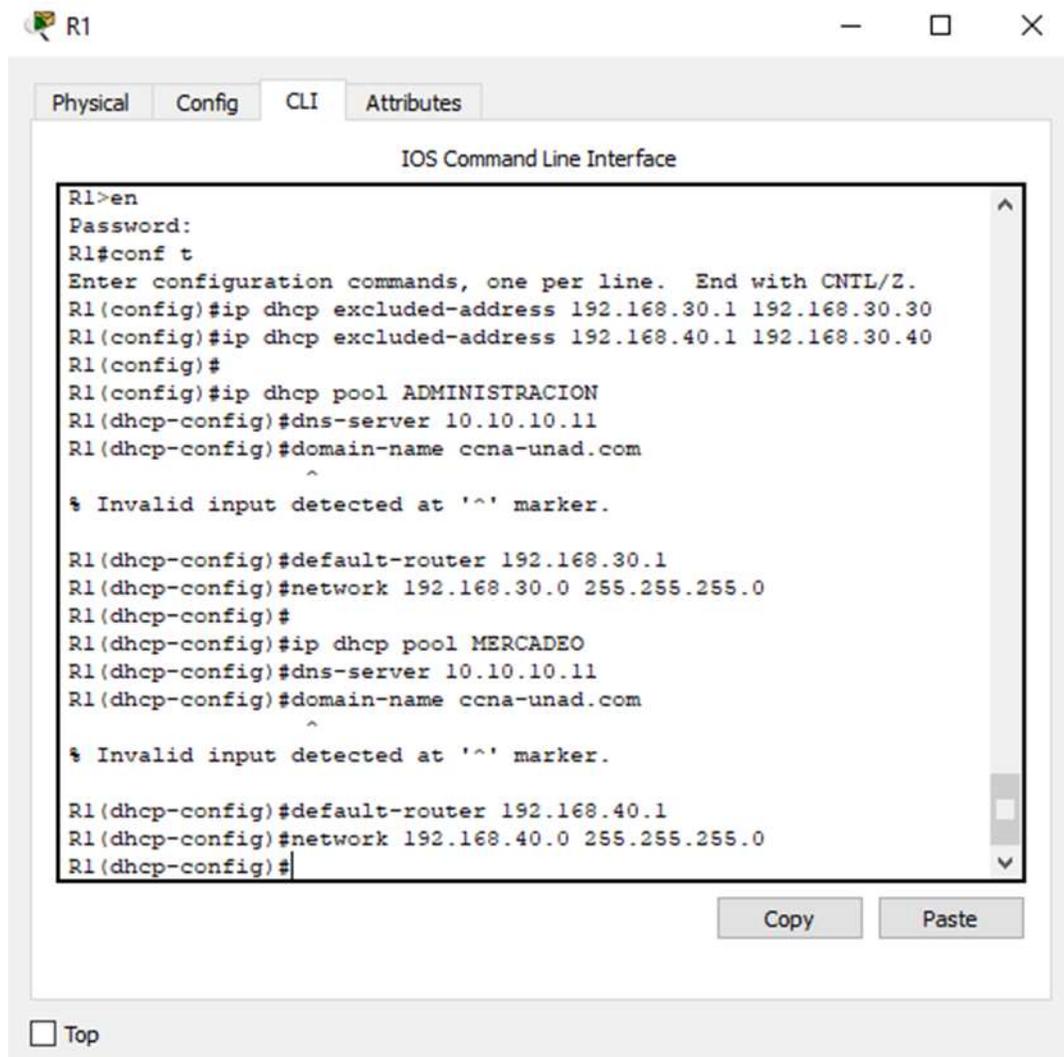
```
interface GigabitEthernet0/0
description Conexion a ISP
ip address 209.165.200.225 255.255.255.248
duplex auto
speed auto
!
interface GigabitEthernet0/1
description Conexion a web server
ip address 10.10.10.1 255.255.255.0
duplex auto
speed auto
!
interface Serial10/0/0
description Conexion a R3
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
clock rate 2000000
!
interface Vlan1
no ip address
shutdown
!
router ospf 1
router-id 2.2.2.2
log-adjacency-changes
passive-interface GigabitEthernet0/1
network 172.31.21.0 0.0.0.3 area 0
network 172.31.23.0 0.0.0.3 area 0
--More--
```

At the bottom of the window, there are "Copy" and "Paste" buttons. A "Top" button is located at the bottom left of the window frame.

## 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>en
Password:
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
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.

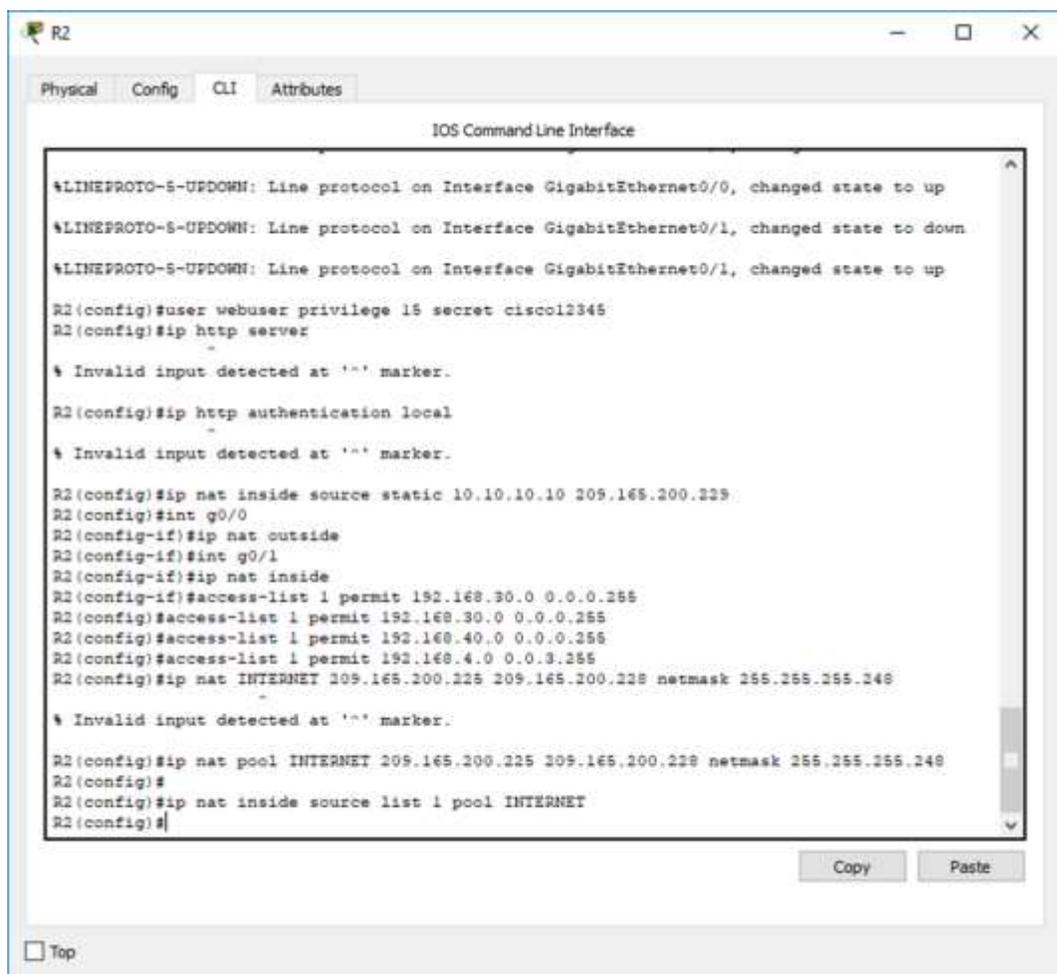
R1(dhcp-config)#default-router 192.168.30.1
R1(dhcp-config)#network 192.168.30.0 255.255.255.0
R1(dhcp-config)#
R1(dhcp-config)#ip dhcp pool MERCADEO
R1(dhcp-config)#dns-server 10.10.10.11
R1(dhcp-config)#domain-name ccna-unad.com
^
% Invalid input detected at '^' marker.

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

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
Physical Config CLI Attributes
IOS Command Line Interface

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

R2(config)#user webuser privilege 15 secret cisco12345
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)#int g0/0
R2(config-if)#ip nat outside
R2(config-if)#int g0/1
R2(config-if)#ip nat inside
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)#access-list 1 permit 192.168.4.0 0.0.3.255
R2(config)#ip nat INTERNET 209.165.200.225 209.165.200.228 netmask 255.255.255.248
-
% Invalid input detected at '^' marker.

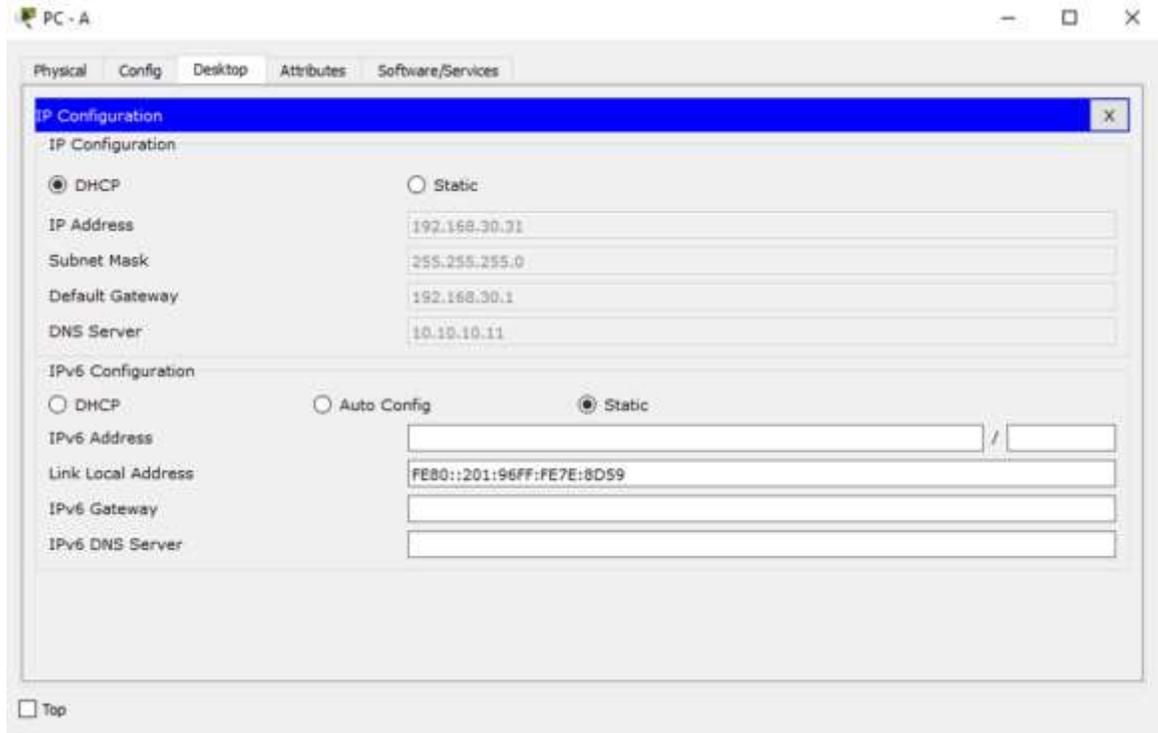
R2(config)#ip nat pool INTERNET 209.165.200.225 209.165.200.228 netmask 255.255.255.248
R2(config)#
R2(config)#ip nat inside source list 1 pool INTERNET
R2(config)#
```

Copy Paste

Top

## Verificando DHCP y NAT estática.

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

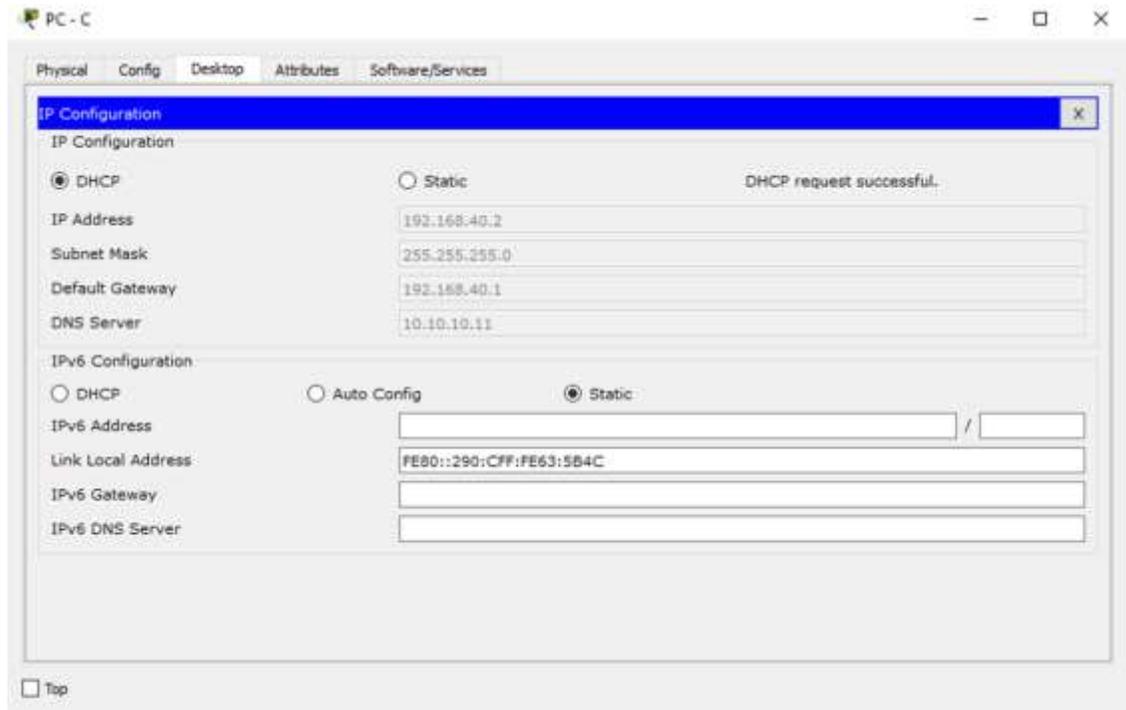


The screenshot shows the 'IP Configuration' window for 'PC-A'. The window has tabs for 'Physical', 'Config', 'Desktop', 'Attributes', and 'Software/Services'. The 'Config' tab is active, and the 'IP Configuration' sub-tab is selected. The 'IP Configuration' section is expanded, showing the following settings:

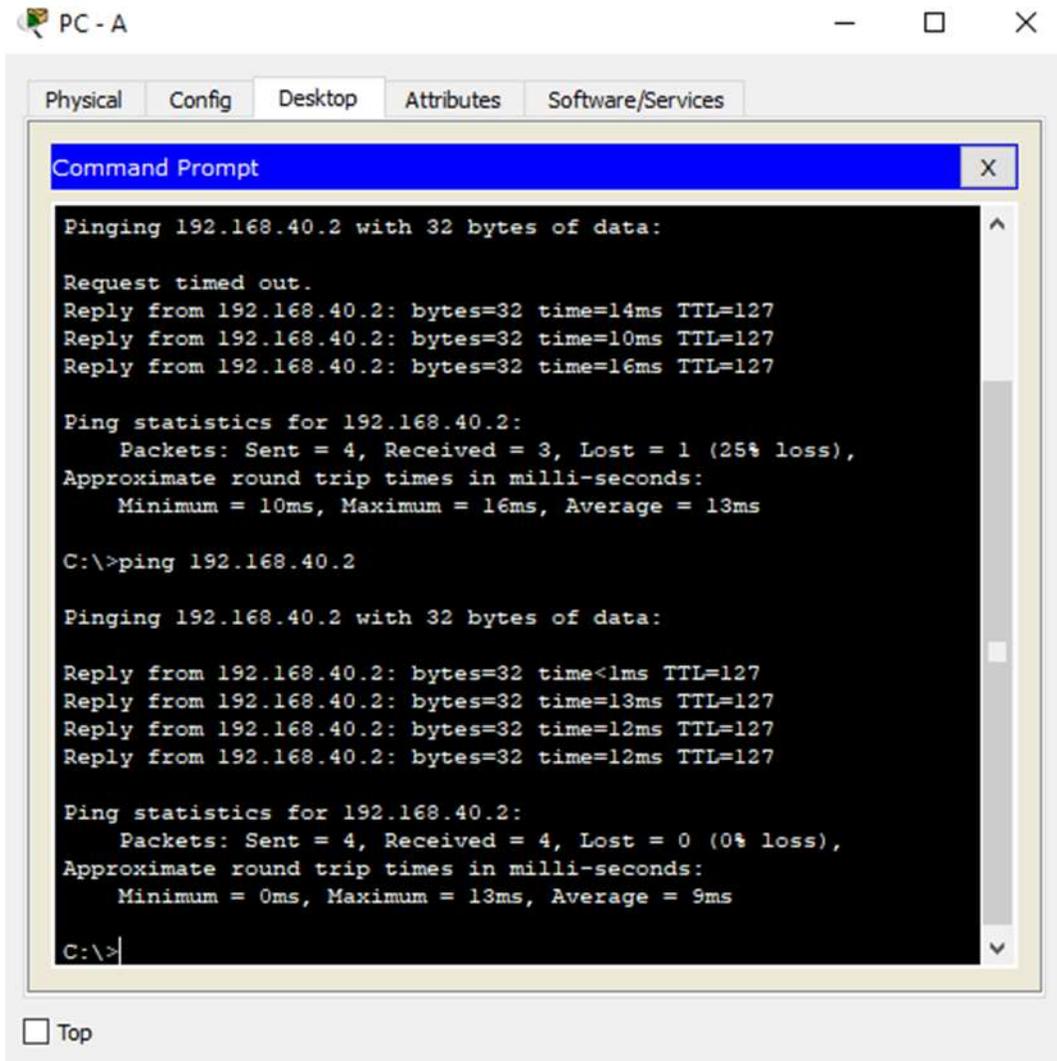
- IP Configuration:**
  - DHCP (selected) and  Static
  - IP Address: 192.168.30.31
  - Subnet Mask: 255.255.255.0
  - Default Gateway: 192.168.30.1
  - DNS Server: 10.10.10.11
- IPv6 Configuration:**
  - DHCP,  Auto Config, and  Static
  - IPv6 Address: [Empty field] / [Empty field]
  - Link Local Address: FE80::201:96FF:FE7E:8D59
  - IPv6 Gateway: [Empty field]
  - IPv6 DNS Server: [Empty field]

At the bottom left of the window, there is a 'Top' button with a small square icon next to it.

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 desktop environment for PC-A. The desktop has tabs for Physical, Config, Desktop, Attributes, and Software/Services. A Command Prompt window is open, displaying the results of a ping command to 192.168.40.2. The first attempt shows a 25% loss of packets, while the second attempt shows 0% loss.

```
PC - A
Physical Config Desktop Attributes Software/Services
Command Prompt
Pinging 192.168.40.2 with 32 bytes of data:

Request timed out.
Reply from 192.168.40.2: bytes=32 time=14ms TTL=127
Reply from 192.168.40.2: bytes=32 time=10ms TTL=127
Reply from 192.168.40.2: bytes=32 time=16ms 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 = 10ms, Maximum = 16ms, Average = 13ms

C:\>ping 192.168.40.2

Pinging 192.168.40.2 with 32 bytes of data:

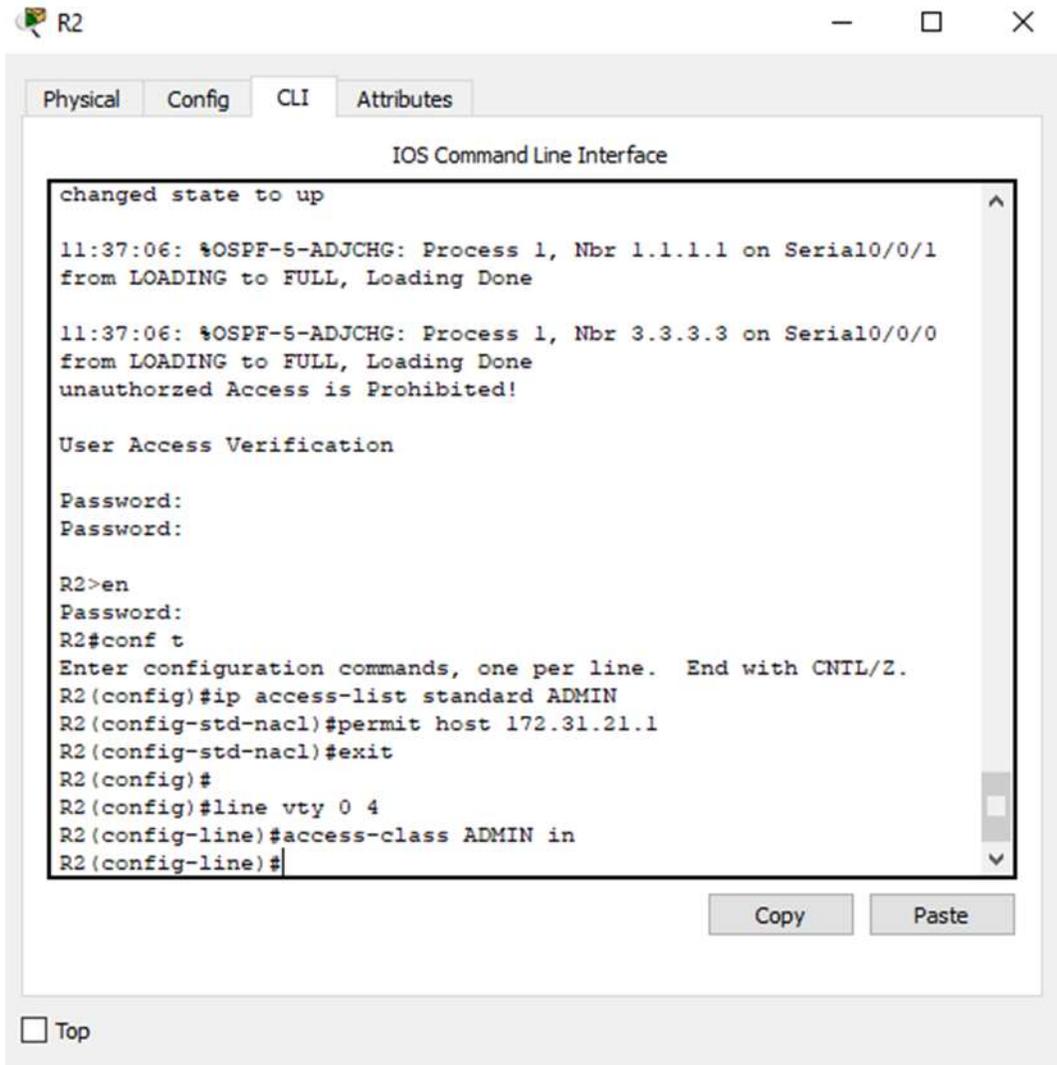
Reply from 192.168.40.2: bytes=32 time<1ms TTL=127
Reply from 192.168.40.2: bytes=32 time=13ms TTL=127
Reply from 192.168.40.2: bytes=32 time=12ms TTL=127
Reply from 192.168.40.2: bytes=32 time=12ms TTL=127

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 = 13ms, Average = 9ms

C:\>
```

Top

## Configurando y verificando listas de control de acceso (ACL) Restringiendo el acceso a las líneas VTY en R2



```
changed state to up

11:37:06: %OSPF-5-ADJCHG: Process 1, Nbr 1.1.1.1 on Serial0/0/1
from LOADING to FULL, Loading Done

11:37:06: %OSPF-5-ADJCHG: Process 1, Nbr 3.3.3.3 on Serial0/0/0
from LOADING to FULL, Loading Done
unauthorized Access is Prohibited!

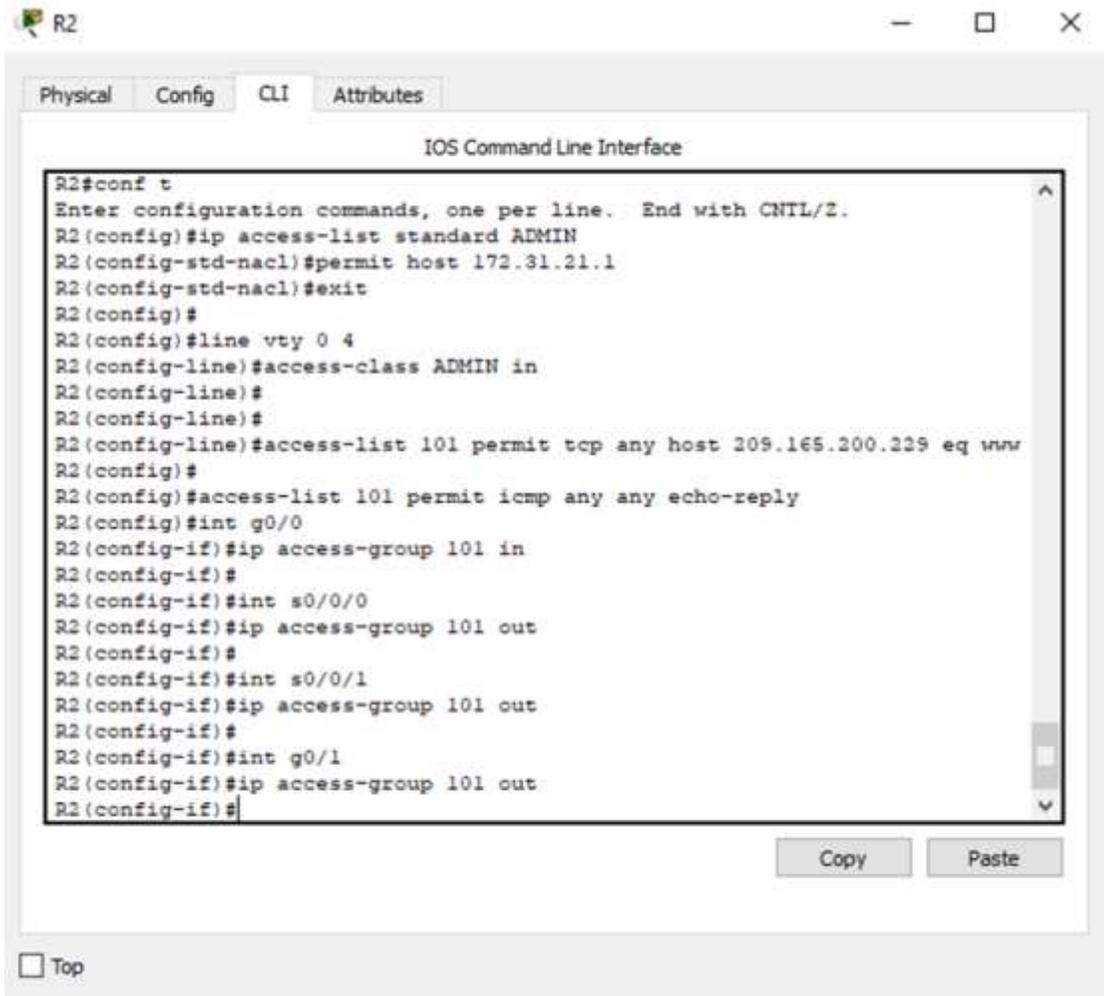
User Access Verification

Password:
Password:

R2>en
Password:
R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
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)#
```

Top

## Asegurando la Red del Tráfico de Internet



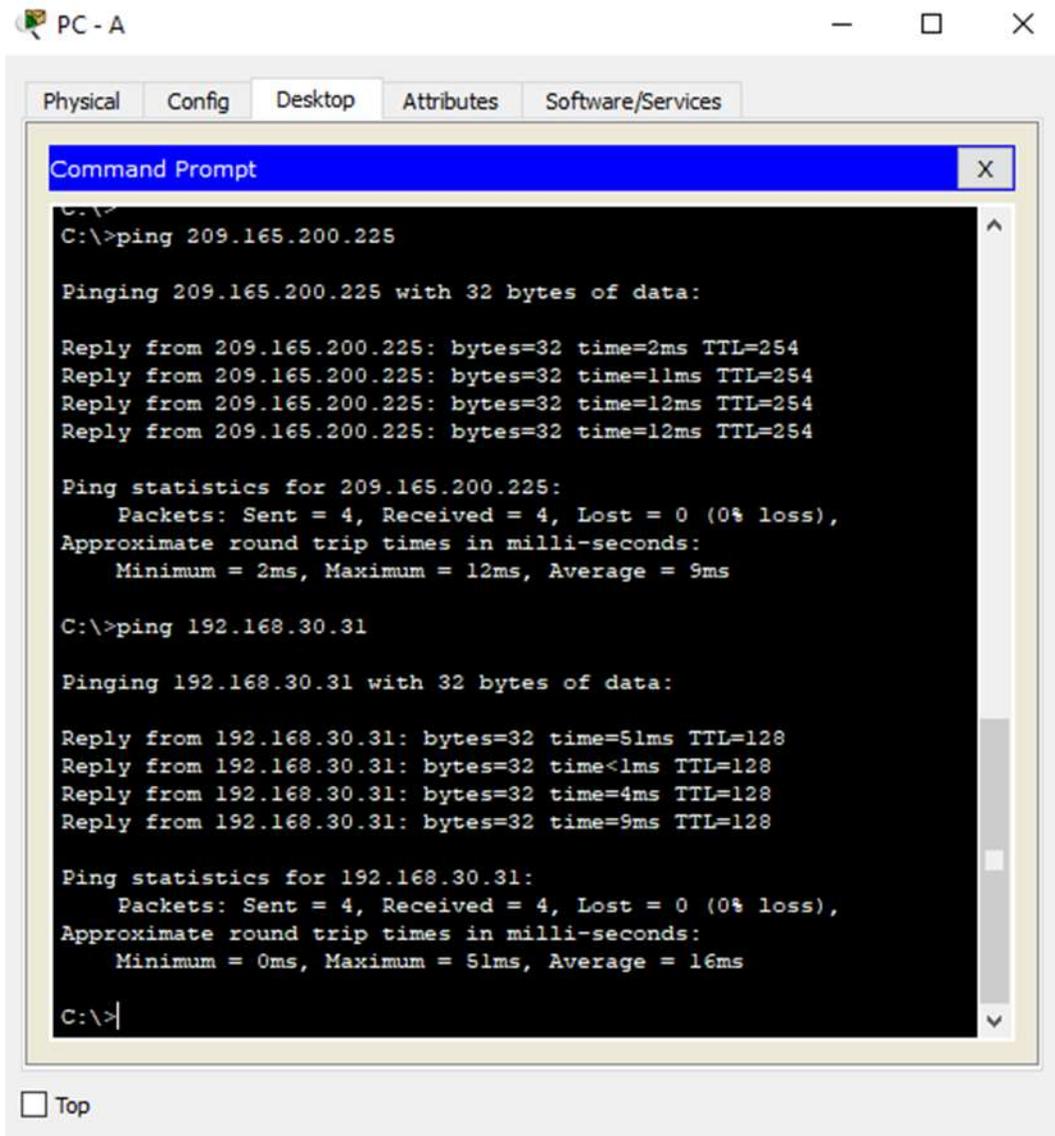
The screenshot shows a network configuration window for a device named R2. The window has tabs for Physical, Config, CLI, and Attributes, with the CLI tab selected. The main area is titled "IOS Command Line Interface" and contains a list of configuration commands. The commands are as follows:

```
R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
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)#
R2(config-line)#
R2(config-line)#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 g0/1
R2(config-if)#ip access-group 101 out
R2(config-if)#
```

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

Verificando que la ACL esté funcionando desde la Internet PC:

### Ping PC-A (Ping debería ser inalcanzable)



The screenshot shows a Windows desktop environment for PC-A. A Command Prompt window is open, displaying the results of two ping commands. The first command is for 209.165.200.225, which shows successful replies with 0% loss. The second command is for 192.168.30.31, which also shows successful replies with 0% loss. The desktop background is a light blue gradient, and the taskbar is visible at the bottom.

```
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=254
Reply from 209.165.200.225: bytes=32 time=11ms TTL=254
Reply from 209.165.200.225: bytes=32 time=12ms TTL=254
Reply from 209.165.200.225: bytes=32 time=12ms TTL=254

Ping statistics for 209.165.200.225:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 12ms, Average = 9ms

C:\>ping 192.168.30.31

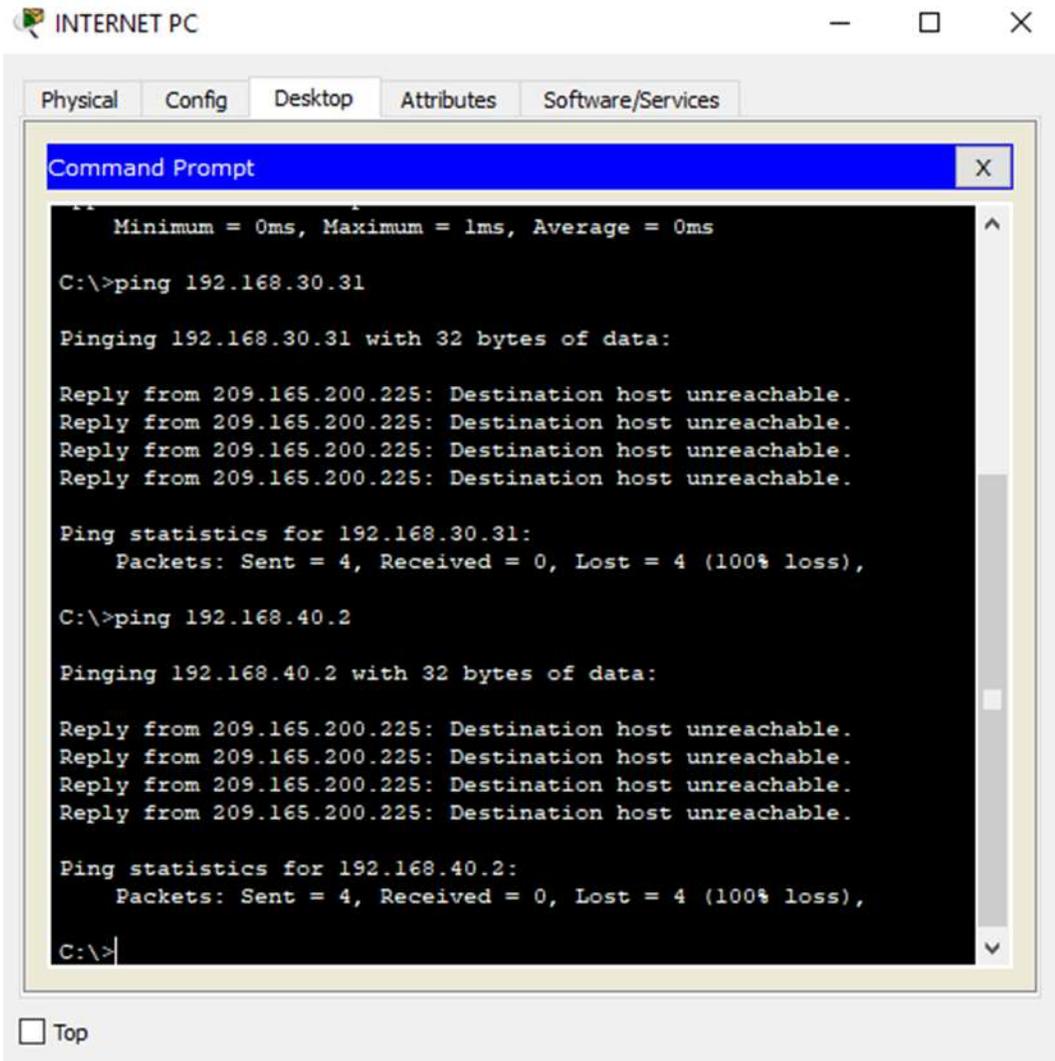
Pinging 192.168.30.31 with 32 bytes of data:

Reply from 192.168.30.31: bytes=32 time=51ms TTL=128
Reply from 192.168.30.31: bytes=32 time<1ms TTL=128
Reply from 192.168.30.31: bytes=32 time=4ms TTL=128
Reply from 192.168.30.31: bytes=32 time=9ms TTL=128

Ping statistics for 192.168.30.31:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 51ms, Average = 16ms

C:\>
```

## Ping PC-C (Ping debería ser inalcanzable)



INTERNET PC

Physical Config Desktop Attributes Software/Services

Command Prompt

```
Minimum = 0ms, Maximum = 1ms, 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:\>
```

Top

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

Physical Config CLI Attributes

IOS Command Line Interface

```
from FULL to DOWN, Neighbor Down: Interface down or detached
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0,
changed state to up
04:56:41: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on Serial0/0/0
from LOADING to FULL, Loading Done

User Access Verification

Password:

R1>enable
Password:
R1#ping 209.165.200.230

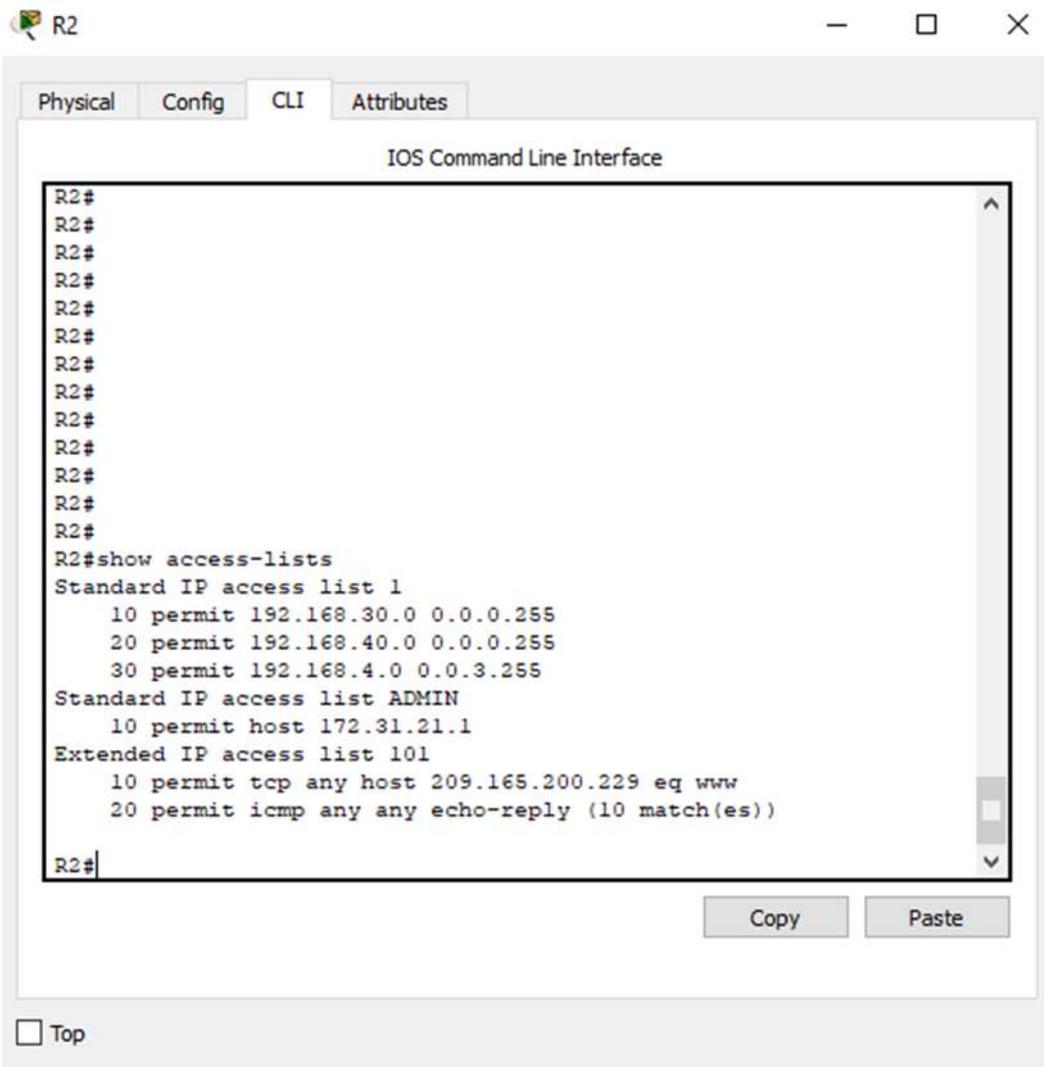
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.165.200.230, timeout is 2
seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max =
1/5/13 ms

R1#
```

Copy Paste

Top

## Verificación de la Información de las ACLs.

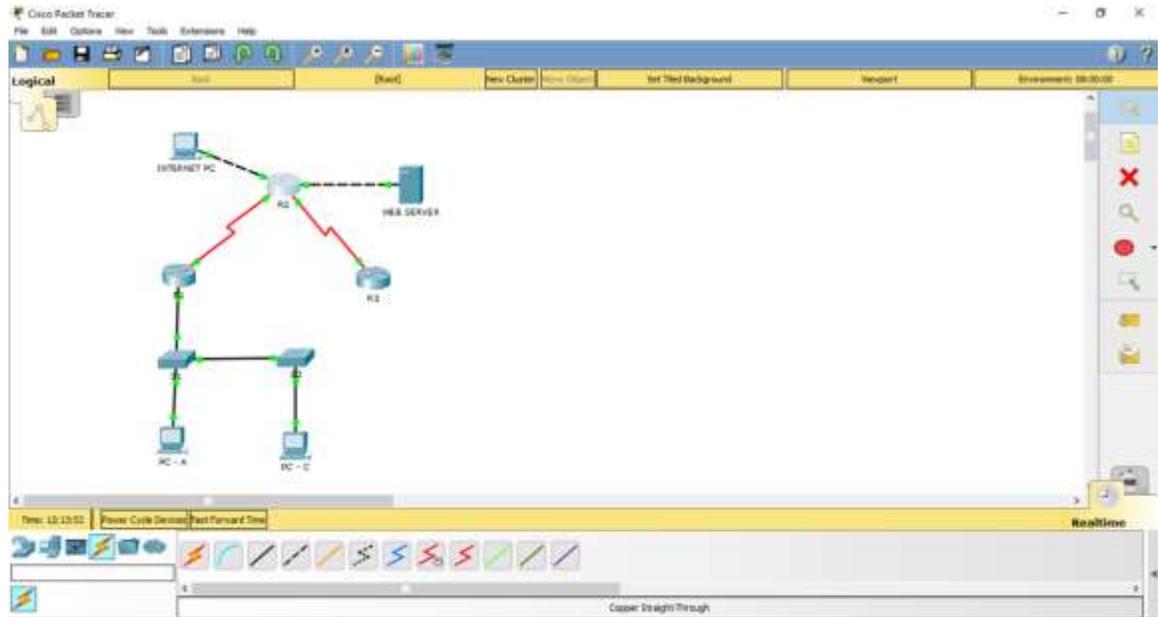


The screenshot shows a network device CLI window titled "R2" with tabs for "Physical", "Config", "CLI", and "Attributes". The "CLI" tab is active, displaying the "IOS Command Line Interface". The terminal output shows the command `R2#show access-lists` and its results:

```
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  
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#
```

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

## Diagrama de la Topología de Red totalmente Funcional



## 4. 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 una 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.

## 5. Bibliografía

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