

DESARROLLO DE HABILIDADES PRÁCTICAS PARA LA COMPRENSIÓN Y  
SOLUCIÓN DE PROBLEMAS RELACIONADOS CON DIVERSOS ASPECTOS  
DE NETWORKING.

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ESCUELA DE CIENCIAS BÁSICAS, TECNOLOGÍA E INGENIERÍA  
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2018

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## **RESUMEN**

El presente documento muestra la forma como se aplican los conocimientos, habilidades y competencias adquiridas a lo largo del desarrollo del diplomado de profundización CCNA, en el cual se busca solucionar un problema planteado mediante la utilización de diversas herramientas y aspectos relacionados con el Networking.

En la práctica se emplea packet tracer como herramienta para la simulación y configuración de las redes y los elementos necesarios para dar solución a la problemática planteada, apoyados en una topología de red predeterminada y mediante la configuración del direccionamiento IP de los diferentes dispositivos, la configuración del protocolo OSPFv2, configuración de VLANs, puertos troncales, puertos de acceso, encapsulamiento, Inter-VLAN Routing, seguridad en los Switches, implementación de DHCP y NAT para IPv4 y listas de acceso.

Lo anterior se aplica y se valida mediante distintas pruebas de conexión entre cada uno de los dispositivos involucrados en las diferentes redes que conforman la topología, para ello se deja evidencia en el presente documento mediante la captura de pantalla de los procesos de validación de conexión, al igual, que de los procesos de configuración de cada uno de los diferentes dispositivos.

## INTRODUCCIÓN

Las redes de comunicaciones han asumido una gran importancia en el mundo moderno, contribuyendo notablemente al desarrollo eficiente de los procesos de las organizaciones, facilitando el manejo e integridad de la información, por ende, en nuestra sociedad que cada vez está más influenciada por las tecnologías es casi que una obligación para las organizaciones contar con sistemas de información y redes que permitan competir en un mercado que evoluciona constantemente.

El presente documento muestra las actividades necesarias para la solución de un problema planteado, que mediante la configuración de una red permite la interconexión de tres sedes de una empresa de tecnología ubicadas en las ciudades de Bogotá, Medellín y Bucaramanga. Para ello se aplican conceptos de direccionamiento IP, protocolos de enrutamiento, configuración de VLANs, puertos troncales, puertos de acceso, encapsulamiento, Inter-VLAN Routing, seguridad en los Switches, DHCP, NAT y listas de acceso.

Para dar solución al problema se desarrolla un modelo de las redes en packet tracer y mediante la aplicación de los conceptos mencionados anteriormente se configuran las distintas redes a fin de permitir la interconexión entre cada una de las sedes de la empresa, se realizan las pruebas de conectividad pertinentes, al igual que algunas restricciones de seguridad, posteriormente se deja evidencia del funcionamiento de la misma mediante capturas de pantalla de las configuraciones y pruebas realizadas.

## OBJETIVOS

### GENERAL

Aplicar los conceptos desarrollados a lo largo del curso mediante la solución de un caso de estudio, implementando la herramienta packet tracer.

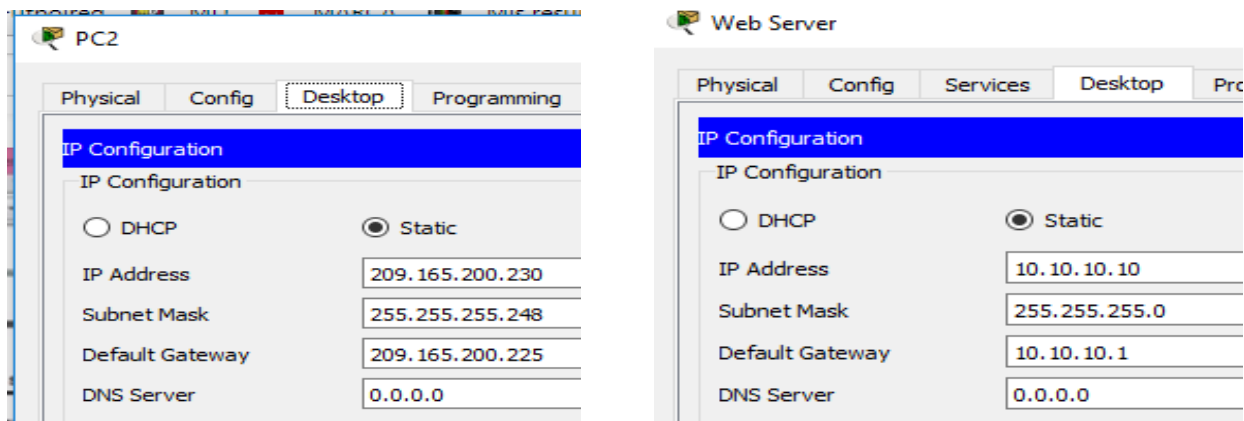
### ESPECÍFICOS

- ✓ Aplicar los conceptos de direccionamiento IP, protocolos de enrutamiento, configuración de VLANs, puertos troncales, puertos de acceso, encapsulamiento, Inter-VLAN Routing, seguridad en los Switches, DHCP, NAT y listas de acceso.
- ✓ Configurar cada uno de los dispositivos que hacen parte del diseño de la red para permitir la comunicación entre cada una de las distintas redes.
- ✓ Realizar pruebas de conectividad entre los dispositivos de las distintas redes.
- ✓ Aplicar protocolos de seguridad en los dispositivos.
- ✓ Documentar la configuración de los distintos dispositivos que hacen parte de la red.

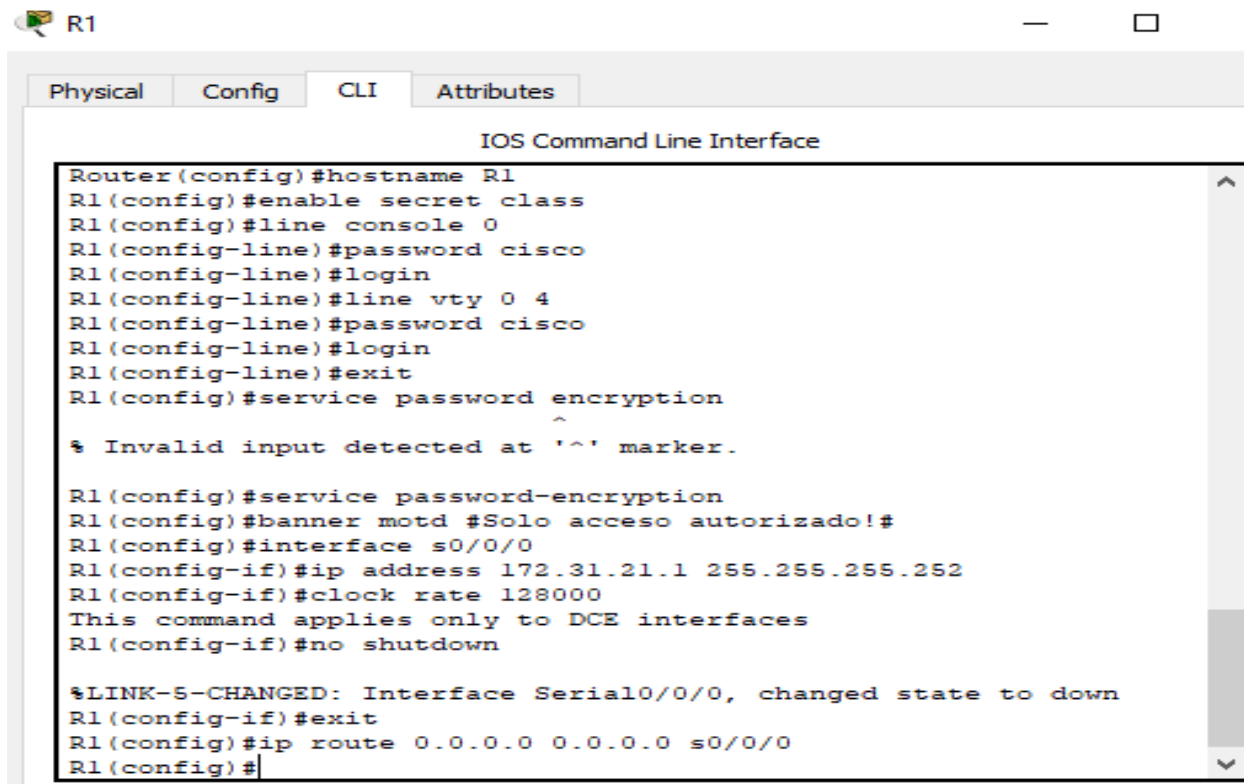
## DESARROLLO DE LA ACTIVIDAD

1. Configurar el direccionamiento IP acorde con la topología de red para cada uno de los dispositivos que forman parte del escenario.

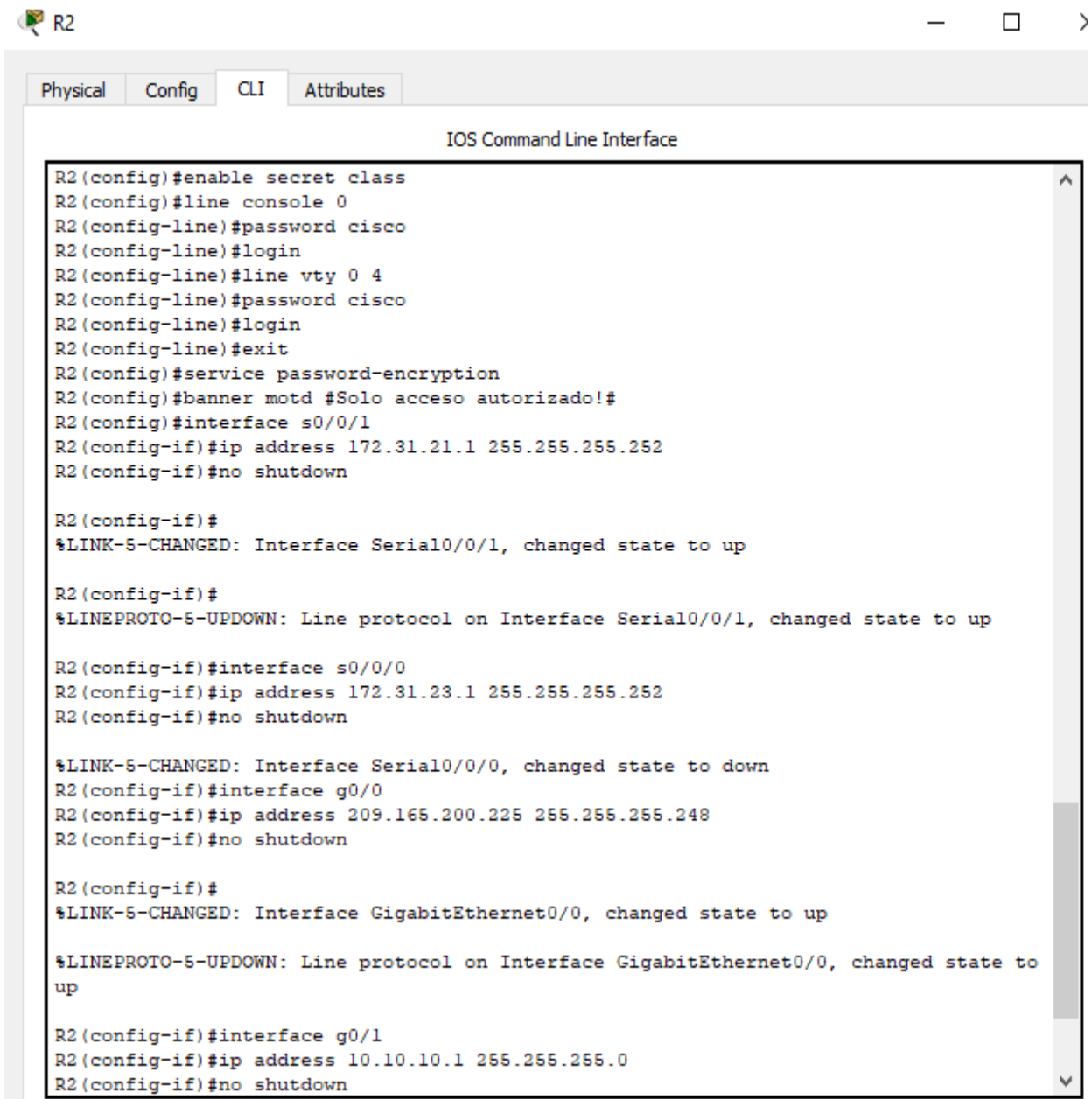
Configuración IP de PC2 y Web Server de acuerdo a la topología de red.



Configuración básica de interfaces de R1.



### Configuración básica de interfaces de R2.



```
R2 (config)#enable secret class
R2 (config)#line console 0
R2 (config-line)#password cisco
R2 (config-line)#login
R2 (config-line)#line vty 0 4
R2 (config-line)#password cisco
R2 (config-line)#login
R2 (config-line)#exit
R2 (config)#service password-encryption
R2 (config)#banner motd #Solo acceso autorizado!#
R2 (config)#interface s0/0/1
R2 (config-if)#ip address 172.31.21.1 255.255.255.252
R2 (config-if)#no shutdown

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)#interface s0/0/0
R2 (config-if)#ip address 172.31.23.1 255.255.255.252
R2 (config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down
R2 (config-if)#interface g0/0
R2 (config-if)#ip address 209.165.200.225 255.255.255.248
R2 (config-if)#no shutdown

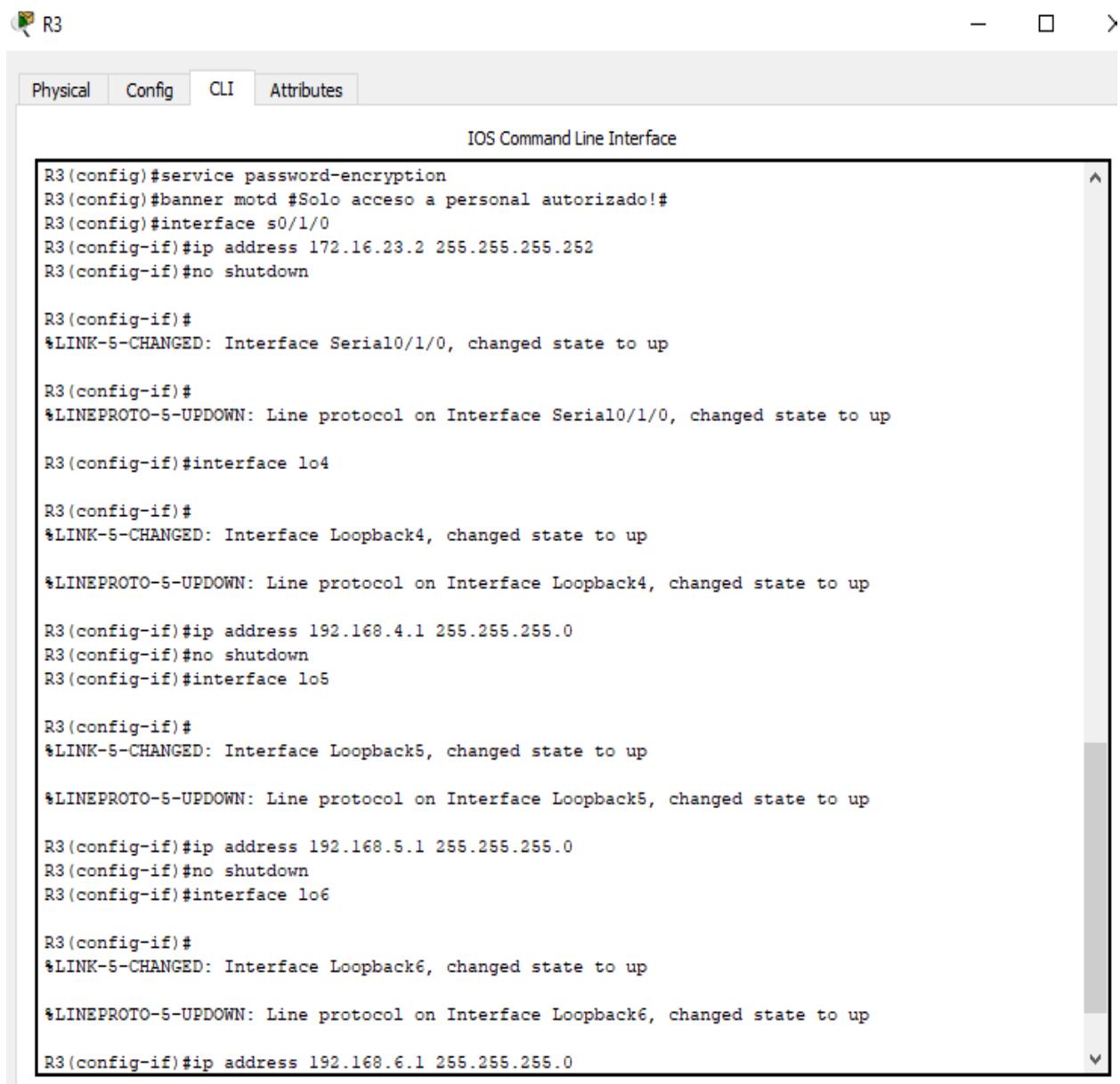
R2 (config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up

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

R2 (config-if)#interface g0/1
R2 (config-if)#ip address 10.10.10.1 255.255.255.0
R2 (config-if)#no shutdown
```



### Configuración básica de interfaces de R3.



The screenshot shows the configuration interface for R3. The 'CLI' tab is active, displaying the following commands and their outputs:

```
R3(config)#service password-encryption
R3(config)#banner motd #Solo acceso a personal autorizado!#
R3(config)#interface s0/1/0
R3(config-if)#ip address 172.16.23.2 255.255.255.252
R3(config-if)#no shutdown

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

R3(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/0, changed state to up

R3(config-if)#interface lo4
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)#no shutdown
R3(config-if)#interface lo5
R3(config-if)#
%LINK-5-CHANGED: Interface Loopback5, changed state to up

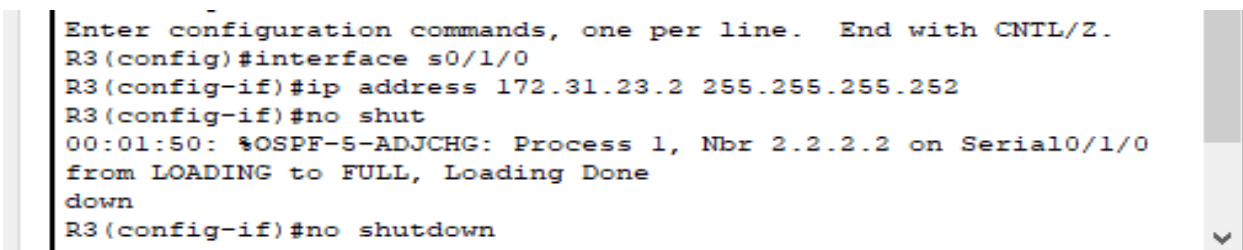
%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback5, changed state to up

R3(config-if)#ip address 192.168.5.1 255.255.255.0
R3(config-if)#no shutdown
R3(config-if)#interface lo6
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
```

### Corrección configuración interfaz S0/1/0 R3



The screenshot shows the configuration interface for R3, focusing on the correction of the S0/1/0 interface configuration. The following commands and their outputs are visible:

```
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#interface s0/1/0
R3(config-if)#ip address 172.31.23.2 255.255.255.252
R3(config-if)#no shut
00:01:50: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on Serial0/1/0
from LOADING to FULL, Loading Done
down
R3(config-if)#no shutdown
```

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

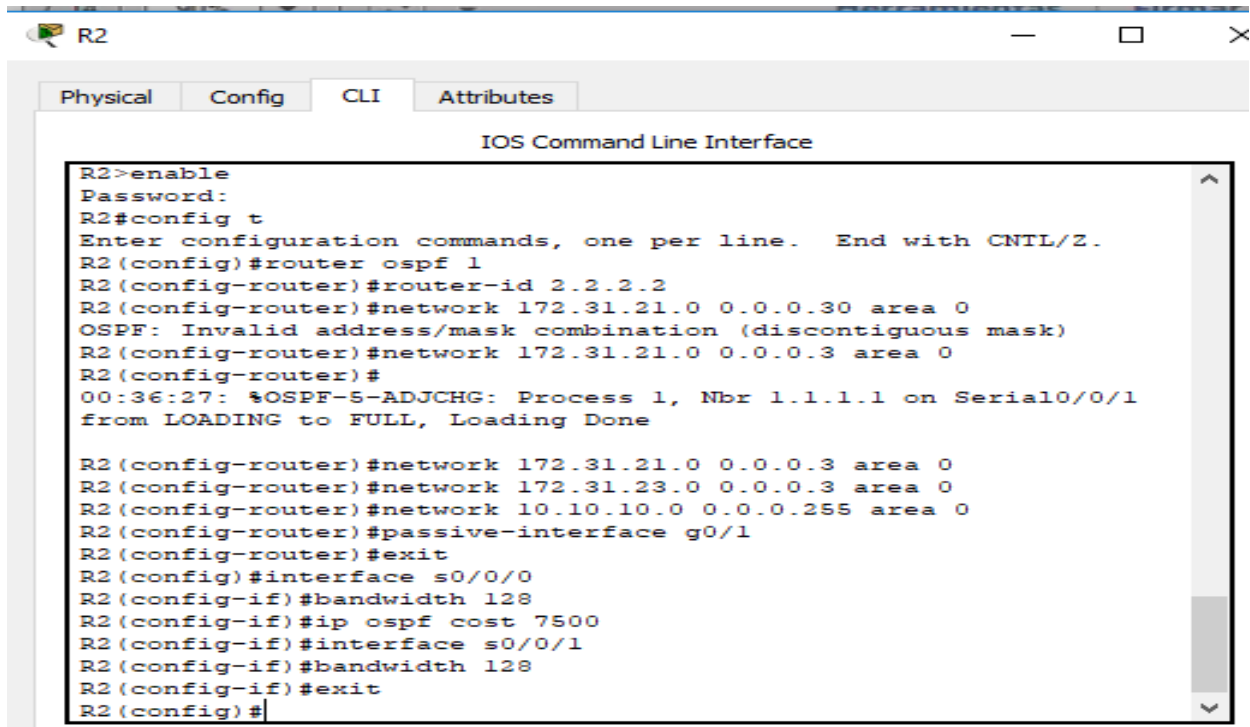
Configuración protocolo OSPFv2 de R1.

```

R1(config-if)#exit
R1(config)#exit
R1#
%SYS-5-CONFIG_I: Configured from console by console

R1#copy run start
Destination filename [startup-config]?
Building configuration...
[OK]
R1#config t
Enter configuration commands, one per line.  End with CNTL/Z.
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 192.168.99.0 0.0.0.255 area 0
R1(config-router)#passive-interface fa0/0.30
R1(config-router)#passive-interface fa0/0.40
R1(config-router)#passive-interface fa0/0.200
R1(config-router)#exit
R1(config)#interface s0/0/0
R1(config-if)#bandwidth 128
R1(config-if)#ip ospf cost 1500
R1(config-if)#|
    
```

Configuración protocolo OSPFv2 de R2.

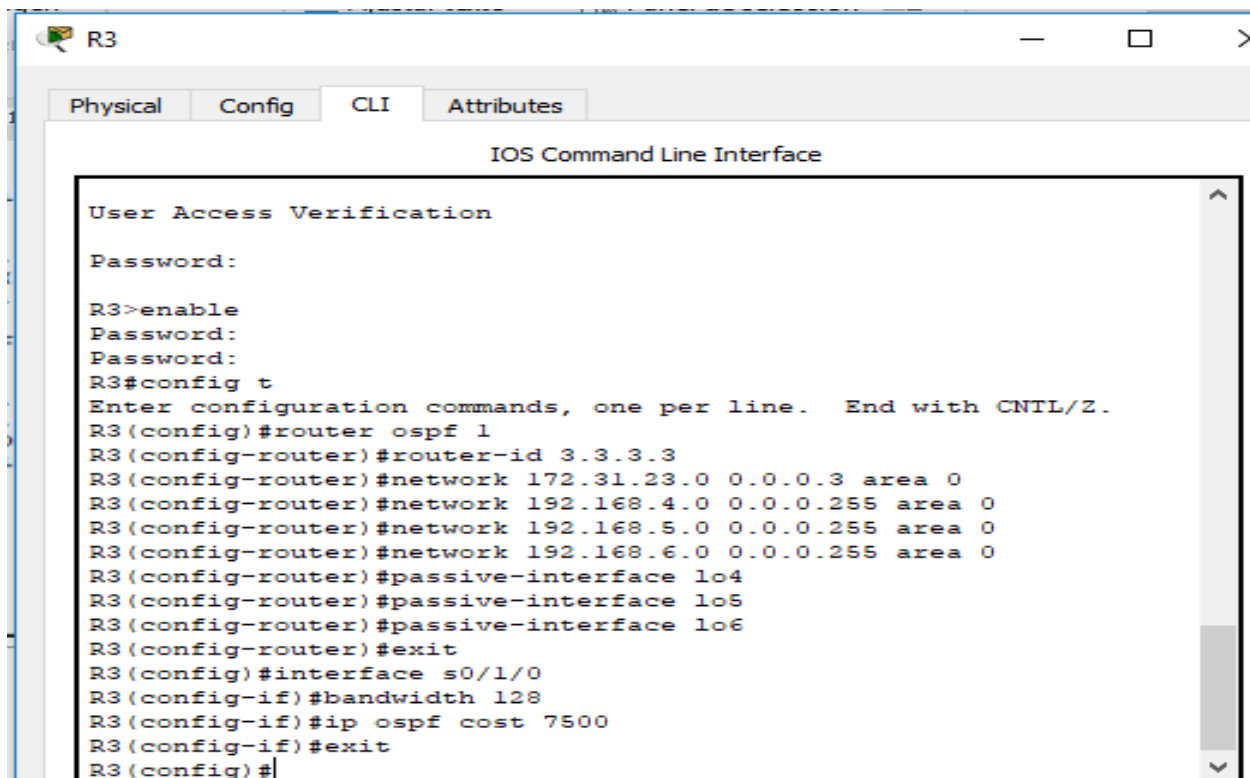


The screenshot shows the CLI of router R2. The user has entered the following commands:

```
R2>enable
Password:
R2#config 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 0.0.0.30 area 0
OSPF: Invalid address/mask combination (discontiguous mask)
R2(config-router)#network 172.31.21.0 0.0.0.3 area 0
R2(config-router)#
00:36:27: %OSPF-5-ADJCHG: Process 1, Nbr 1.1.1.1 on Serial0/0/1
from LOADING to FULL, Loading Done

R2(config-router)#network 172.31.21.0 0.0.0.3 area 0
R2(config-router)#network 172.31.23.0 0.0.0.3 area 0
R2(config-router)#network 10.10.10.0 0.0.0.255 area 0
R2(config-router)#passive-interface g0/1
R2(config-router)#exit
R2(config)#interface s0/0/0
R2(config-if)#bandwidth 128
R2(config-if)#ip ospf cost 7500
R2(config-if)#interface s0/0/1
R2(config-if)#bandwidth 128
R2(config-if)#exit
R2(config)#
```

Configuración protocolo OSPFv2 de R3.



The screenshot shows the CLI of router R3. The user has entered the following commands:

```
User Access Verification

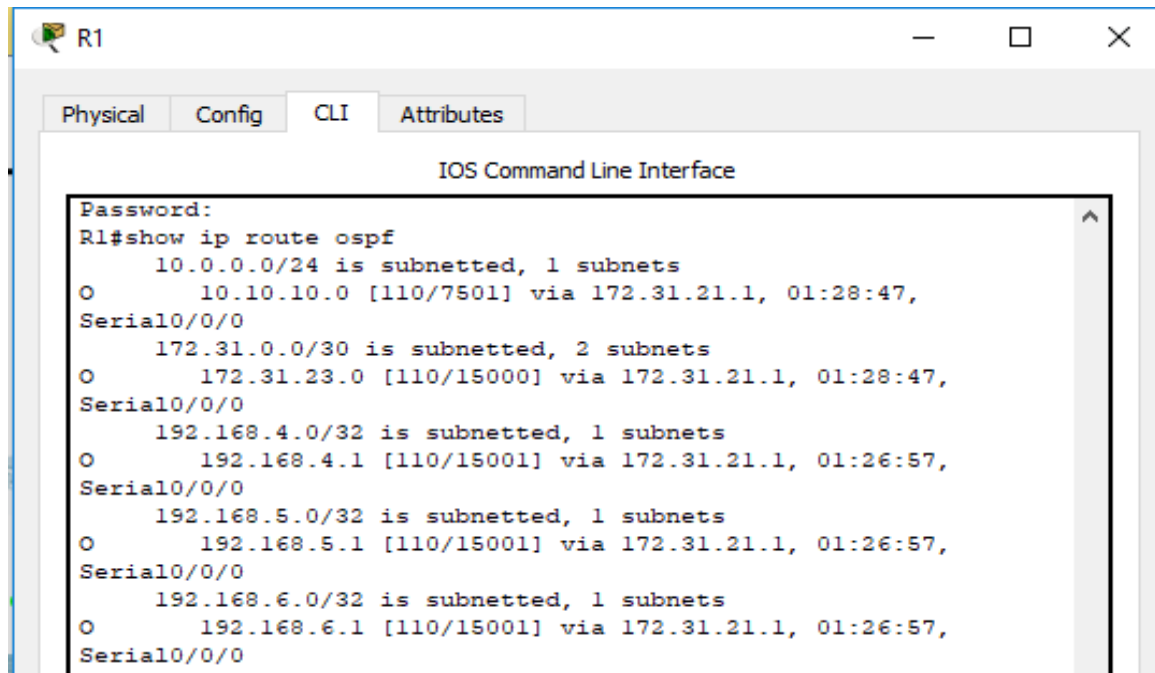
Password:

R3>enable
Password:
Password:
R3#config 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)#network 192.168.4.0 0.0.0.255 area 0
R3(config-router)#network 192.168.5.0 0.0.0.255 area 0
R3(config-router)#network 192.168.6.0 0.0.0.255 area 0
R3(config-router)#passive-interface lo4
R3(config-router)#passive-interface lo5
R3(config-router)#passive-interface lo6
R3(config-router)#exit
R3(config)#interface s0/1/0
R3(config-if)#bandwidth 128
R3(config-if)#ip ospf cost 7500
R3(config-if)#exit
R3(config)#
```

Verificar información de OSPF

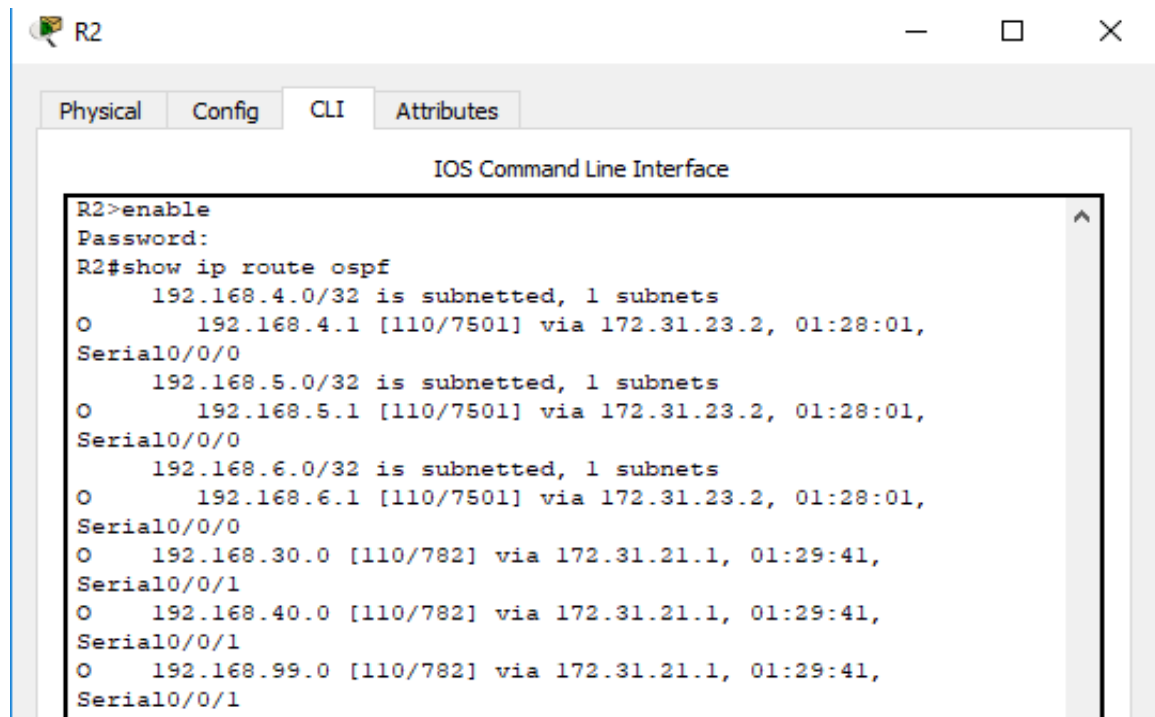
- Visualizar tablas de enrutamiento y routers conectados por OSPFv2

### Tablas de enrutamiento



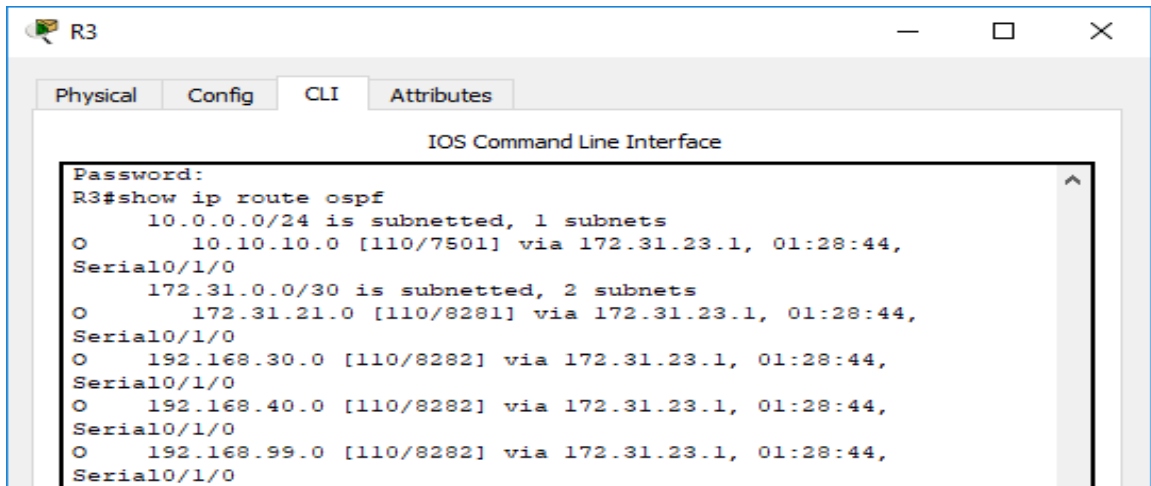
The screenshot shows the CLI of router R1. The user has entered the command 'show ip route ospf'. The output displays OSPF routes for three subnets: 10.0.0.0/24, 172.31.0.0/30, and 192.168.4.0/32. Each route is shown with its next hop IP address and the interface used to reach it.

```
IOS Command Line Interface
Password:
R1#show ip route ospf
 10.0.0.0/24 is subnetted, 1 subnets
O    10.10.10.0 [110/7501] via 172.31.21.1, 01:28:47,
Serial0/0/0
 172.31.0.0/30 is subnetted, 2 subnets
O    172.31.23.0 [110/15000] via 172.31.21.1, 01:28:47,
Serial0/0/0
 192.168.4.0/32 is subnetted, 1 subnets
O    192.168.4.1 [110/15001] via 172.31.21.1, 01:26:57,
Serial0/0/0
 192.168.5.0/32 is subnetted, 1 subnets
O    192.168.5.1 [110/15001] via 172.31.21.1, 01:26:57,
Serial0/0/0
 192.168.6.0/32 is subnetted, 1 subnets
O    192.168.6.1 [110/15001] via 172.31.21.1, 01:26:57,
Serial0/0/0
```

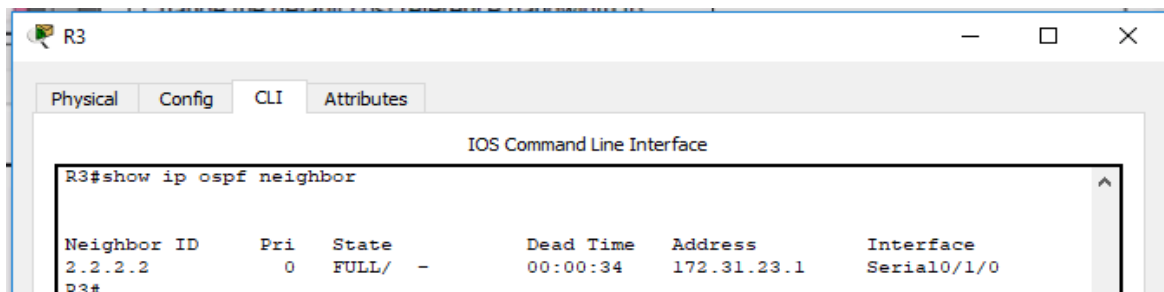
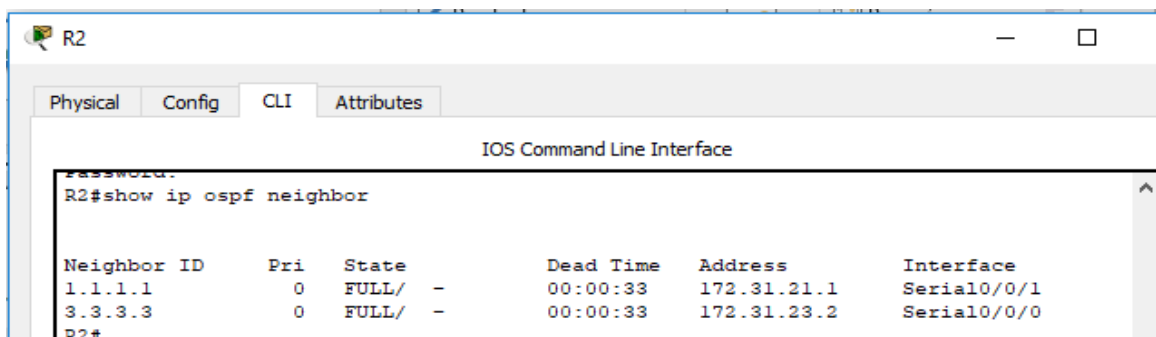
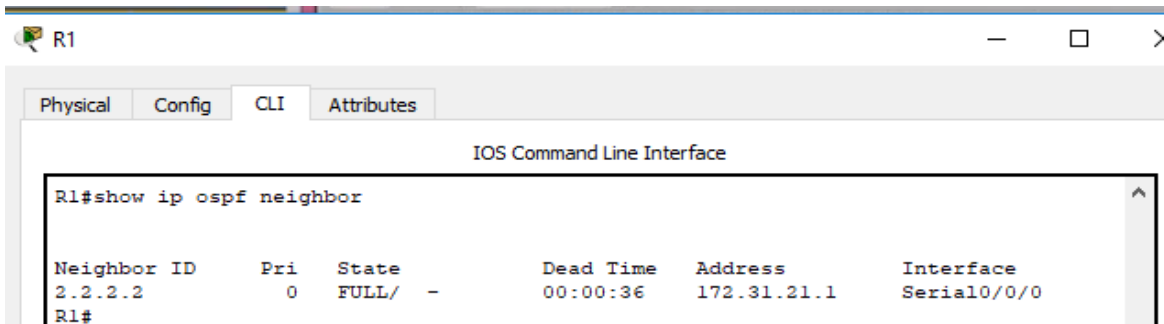


The screenshot shows the CLI of router R2. The user has entered the command 'show ip route ospf'. The output displays OSPF routes for three subnets: 192.168.4.0/32, 192.168.5.0/32, and 192.168.6.0/32. Each route is shown with its next hop IP address and the interface used to reach it.

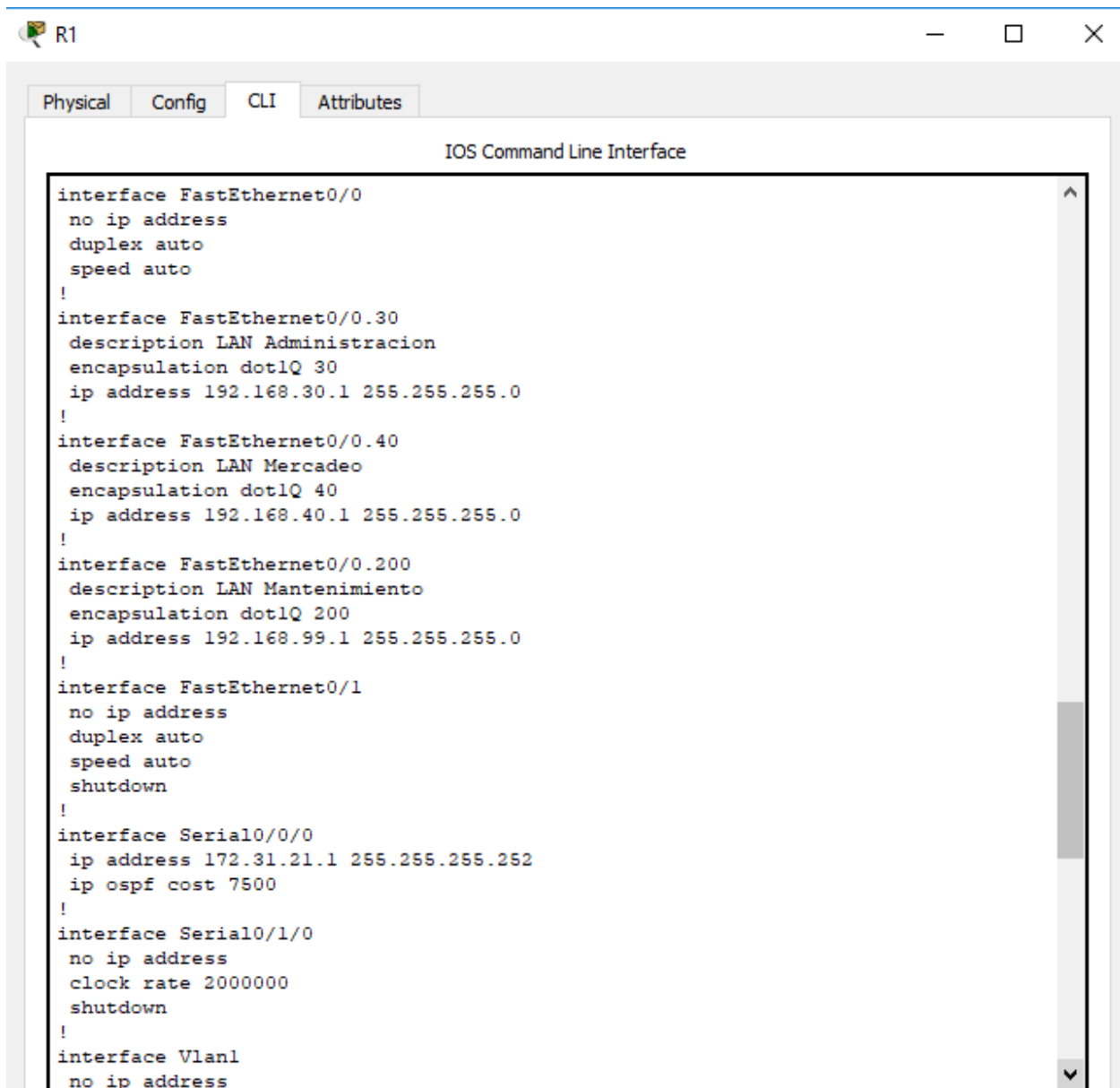
```
IOS Command Line Interface
R2>enable
Password:
R2#show ip route ospf
 192.168.4.0/32 is subnetted, 1 subnets
O    192.168.4.1 [110/7501] via 172.31.23.2, 01:28:01,
Serial0/0/0
 192.168.5.0/32 is subnetted, 1 subnets
O    192.168.5.1 [110/7501] via 172.31.23.2, 01:28:01,
Serial0/0/0
 192.168.6.0/32 is subnetted, 1 subnets
O    192.168.6.1 [110/7501] via 172.31.23.2, 01:28:01,
Serial0/0/0
O    192.168.30.0 [110/782] via 172.31.21.1, 01:29:41,
Serial0/0/1
O    192.168.40.0 [110/782] via 172.31.21.1, 01:29:41,
Serial0/0/1
O    192.168.99.0 [110/782] via 172.31.21.1, 01:29:41,
Serial0/0/1
```



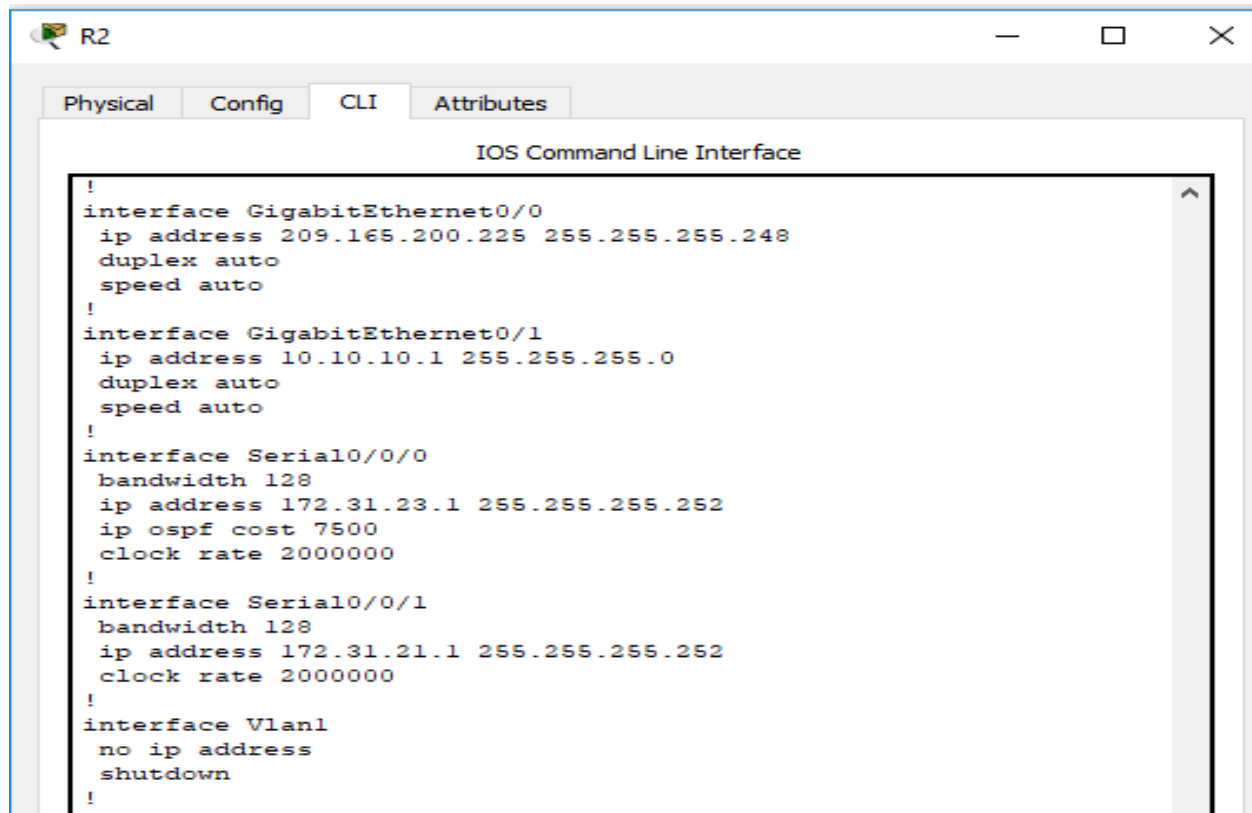
### Conexión por OSPFv2



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

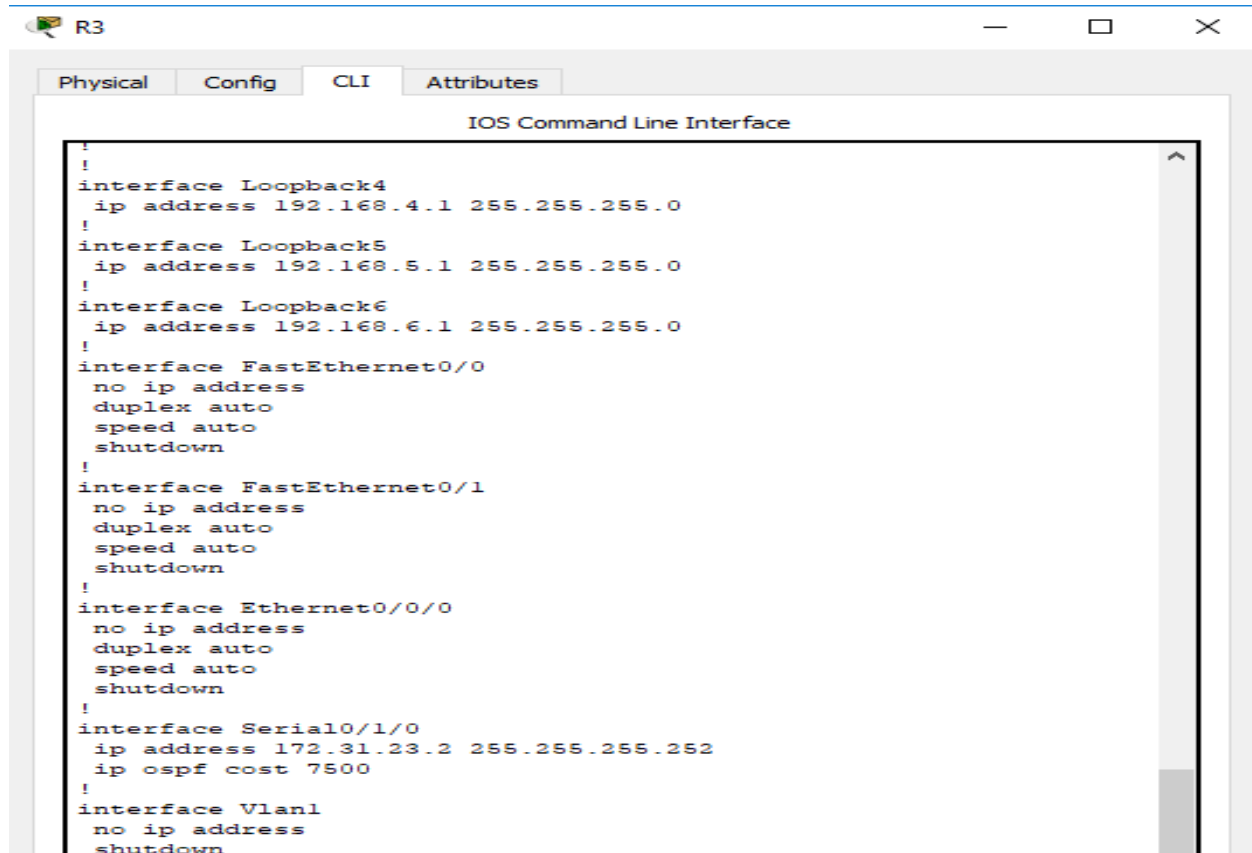


```
interface FastEthernet0/0
no ip address
duplex auto
speed auto
!
interface FastEthernet0/0.30
description LAN Administracion
encapsulation dot1Q 30
ip address 192.168.30.1 255.255.255.0
!
interface FastEthernet0/0.40
description LAN Mercadeo
encapsulation dot1Q 40
ip address 192.168.40.1 255.255.255.0
!
interface FastEthernet0/0.200
description LAN Mantenimiento
encapsulation dot1Q 200
ip address 192.168.99.1 255.255.255.0
!
interface FastEthernet0/1
no ip address
duplex auto
speed auto
shutdown
!
interface Serial10/0/0
ip address 172.31.21.1 255.255.255.252
ip ospf cost 7500
!
interface Serial10/1/0
no ip address
clock rate 2000000
shutdown
!
interface Vlan1
no ip address
```



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' configuration for router R2. The configuration includes settings for GigabitEthernet0/0, GigabitEthernet0/1, Serial10/0/0, Serial10/0/1, and Vlan1.

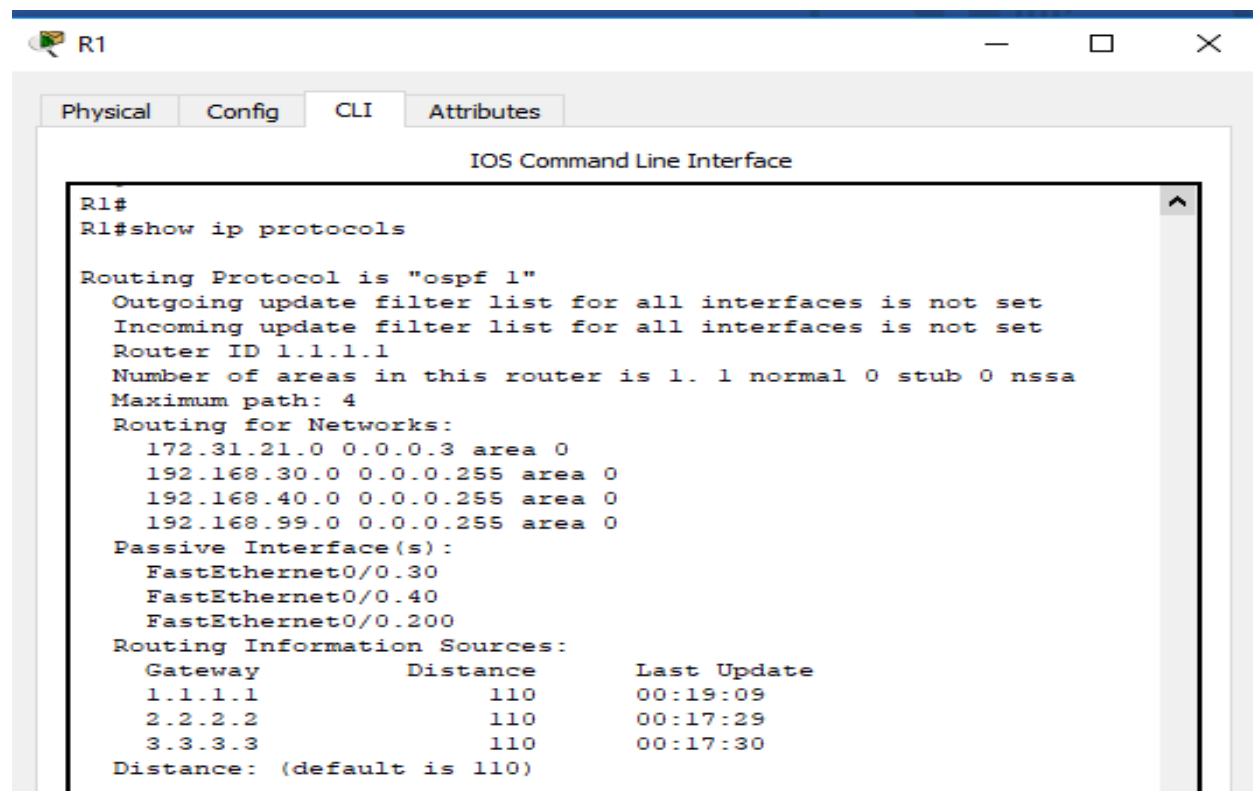
```
!
interface GigabitEthernet0/0
 ip address 209.165.200.225 255.255.255.248
 duplex auto
 speed auto
!
interface GigabitEthernet0/1
 ip address 10.10.10.1 255.255.255.0
 duplex auto
 speed auto
!
interface Serial10/0/0
 bandwidth 128
 ip address 172.31.23.1 255.255.255.252
 ip ospf cost 7500
 clock rate 2000000
!
interface Serial10/0/1
 bandwidth 128
 ip address 172.31.21.1 255.255.255.252
 clock rate 2000000
!
interface Vlan1
 no ip address
 shutdown
!
```



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' configuration for router R3. The configuration includes settings for Loopback4, Loopback5, Loopback6, FastEthernet0/0, FastEthernet0/1, Ethernet0/0/0, Serial10/1/0, and Vlan1.

```
!
!
interface Loopback4
 ip address 192.168.4.1 255.255.255.0
!
interface Loopback5
 ip address 192.168.5.1 255.255.255.0
!
interface Loopback6
 ip address 192.168.6.1 255.255.255.0
!
interface FastEthernet0/0
 no ip address
 duplex auto
 speed auto
 shutdown
!
interface FastEthernet0/1
 no ip address
 duplex auto
 speed auto
 shutdown
!
interface Ethernet0/0/0
 no ip address
 duplex auto
 speed auto
 shutdown
!
interface Serial10/1/0
 ip address 172.31.23.2 255.255.255.252
 ip ospf cost 7500
!
interface Vlan1
 no ip address
 shutdown
!
```

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

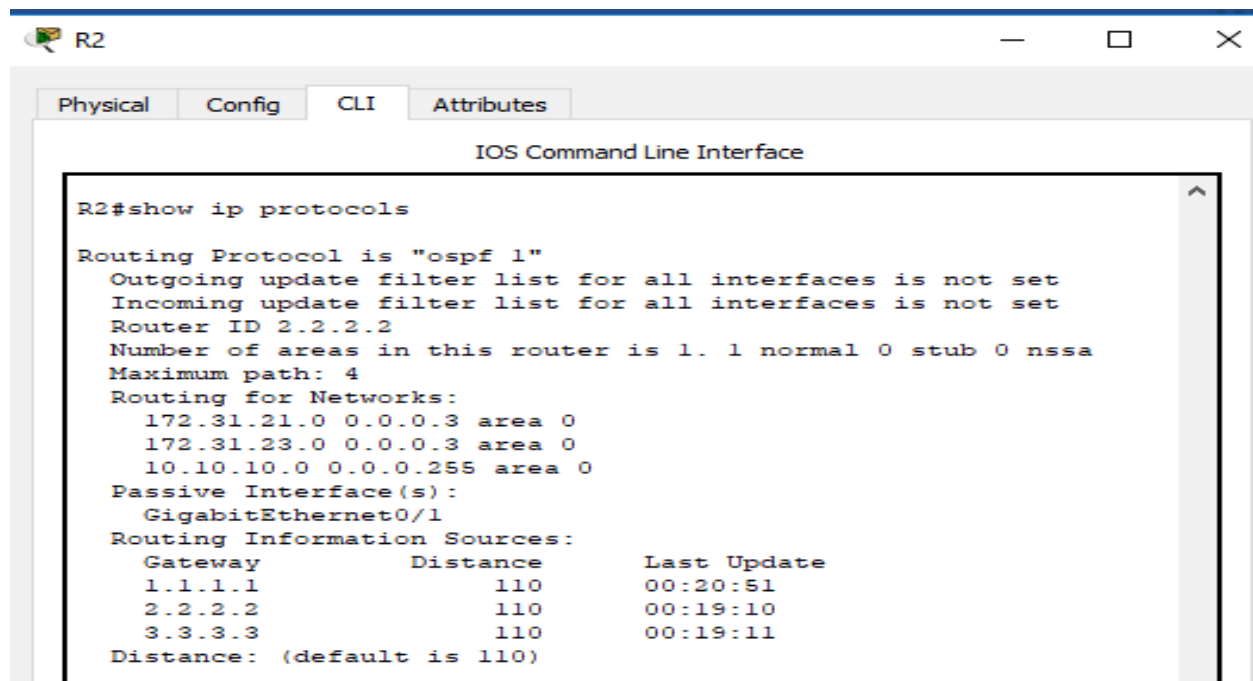


R1

Physical Config CLI Attributes

IOS Command Line Interface

```
R1#  
R1#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 1.1.1.1  
  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  
    192.168.30.0 0.0.0.255 area 0  
    192.168.40.0 0.0.0.255 area 0  
    192.168.99.0 0.0.0.255 area 0  
  Passive Interface(s):  
    FastEthernet0/0.30  
    FastEthernet0/0.40  
    FastEthernet0/0.200  
  Routing Information Sources:  
    Gateway         Distance      Last Update  
    1.1.1.1          110          00:19:09  
    2.2.2.2          110          00:17:29  
    3.3.3.3          110          00:17:30  
  Distance: (default is 110)
```



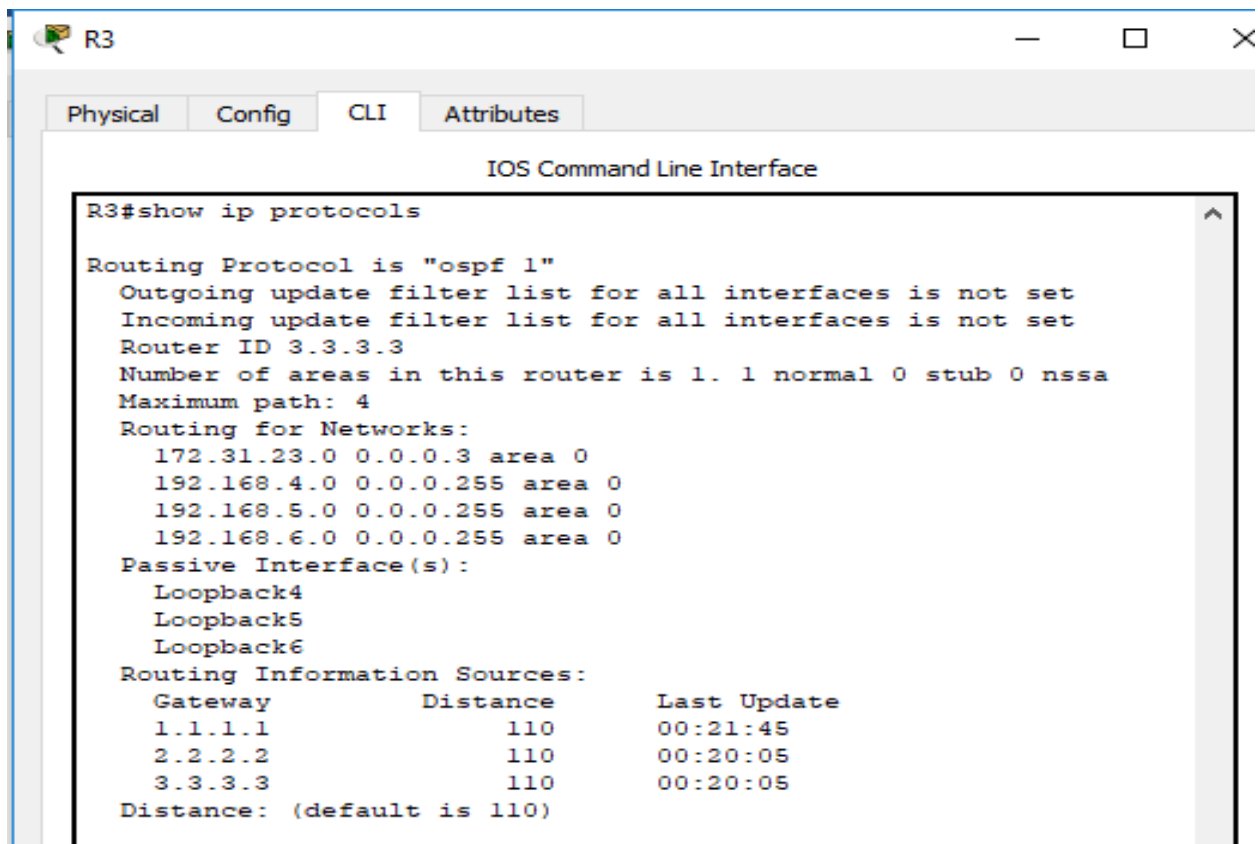
R2

Physical Config CLI Attributes

IOS Command Line Interface

```
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          00:20:51  
    2.2.2.2          110          00:19:10  
    3.3.3.3          110          00:19:11  
  Distance: (default is 110)
```





```
R3#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 3.3.3.3
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    172.31.23.0 0.0.0.3 area 0
    192.168.4.0 0.0.0.255 area 0
    192.168.5.0 0.0.0.255 area 0
    192.168.6.0 0.0.0.255 area 0
  Passive Interface(s):
    Loopback4
    Loopback5
    Loopback6
  Routing Information Sources:
    Gateway         Distance      Last Update
    1.1.1.1          110          00:21:45
    2.2.2.2          110          00:20:05
    3.3.3.3          110          00:20:05
  Distance: (default is 110)
```

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

Configuración de S1.

```
S1
Physical Config CLI Attributes
IOS Command Line Interface
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)#interface vlan 200
S1(config-if)#
%LINK-5-CHANGED: Interface Vlan200, changed state to up

S1(config-if)#ip address 192.168.99.2 255.255.255.0
S1(config-if)#no shutdown
S1(config-if)#exit
S1(config)#ip default-gateway 192.168.99.1
S1(config)#interface f0/3
S1(config-if)#switchport mode trunk

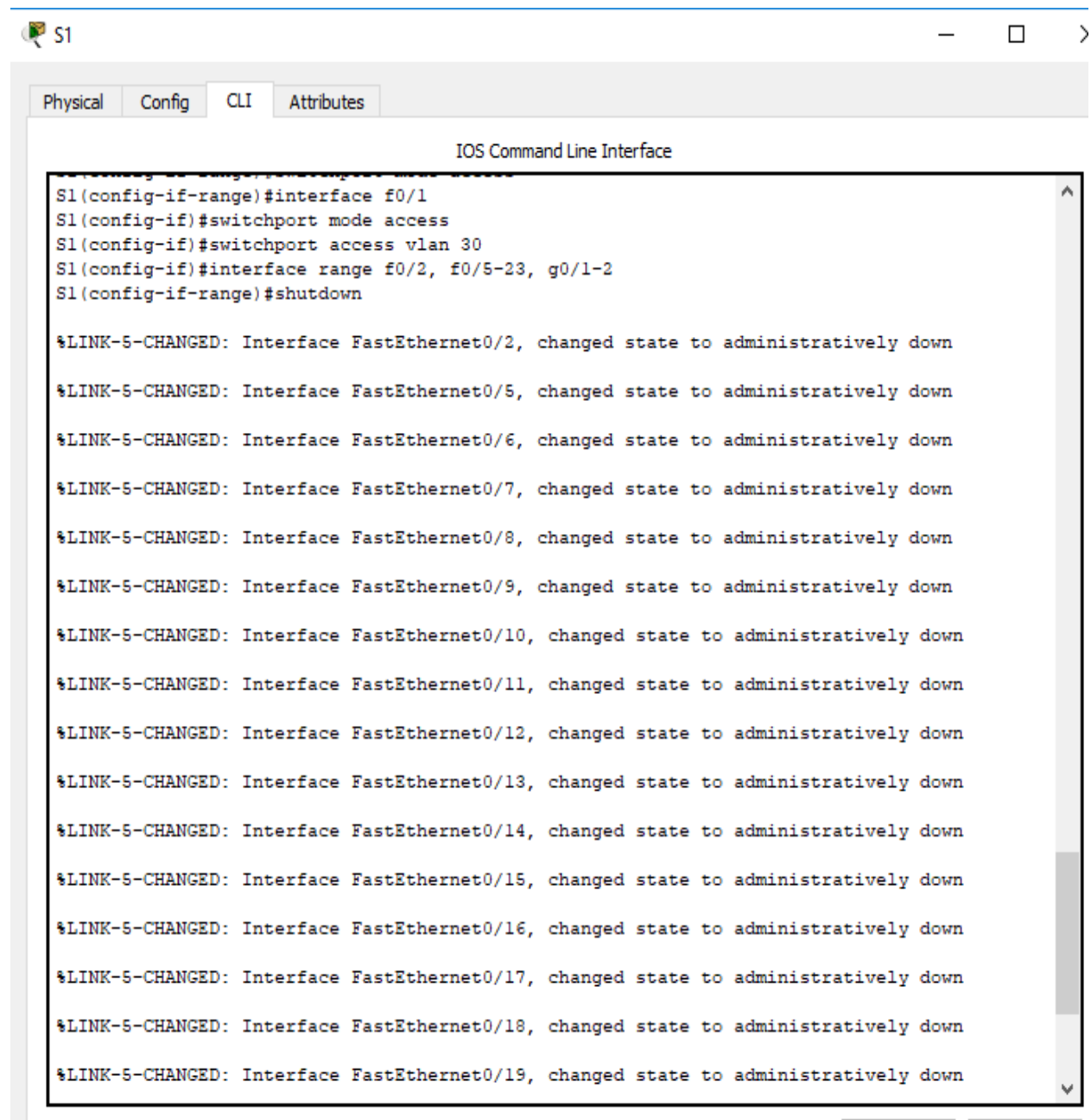
S1(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed state to down

%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)#interface f0/24
S1(config-if)#switchport mode trunk
S1(config-if)#switchport trunk native vlan 1
S1(config-if)#interface range f0/2, f0/5-23, g0/1-2
S1(config-if-range)#switchport mode access
^
% Invalid input detected at '^' marker.

S1(config-if-range)#switchport mode access
S1(config-if-range)#interface f0/1
S1(config-if)#switchport mode access
S1(config-if)#switchport access vlan 30
```

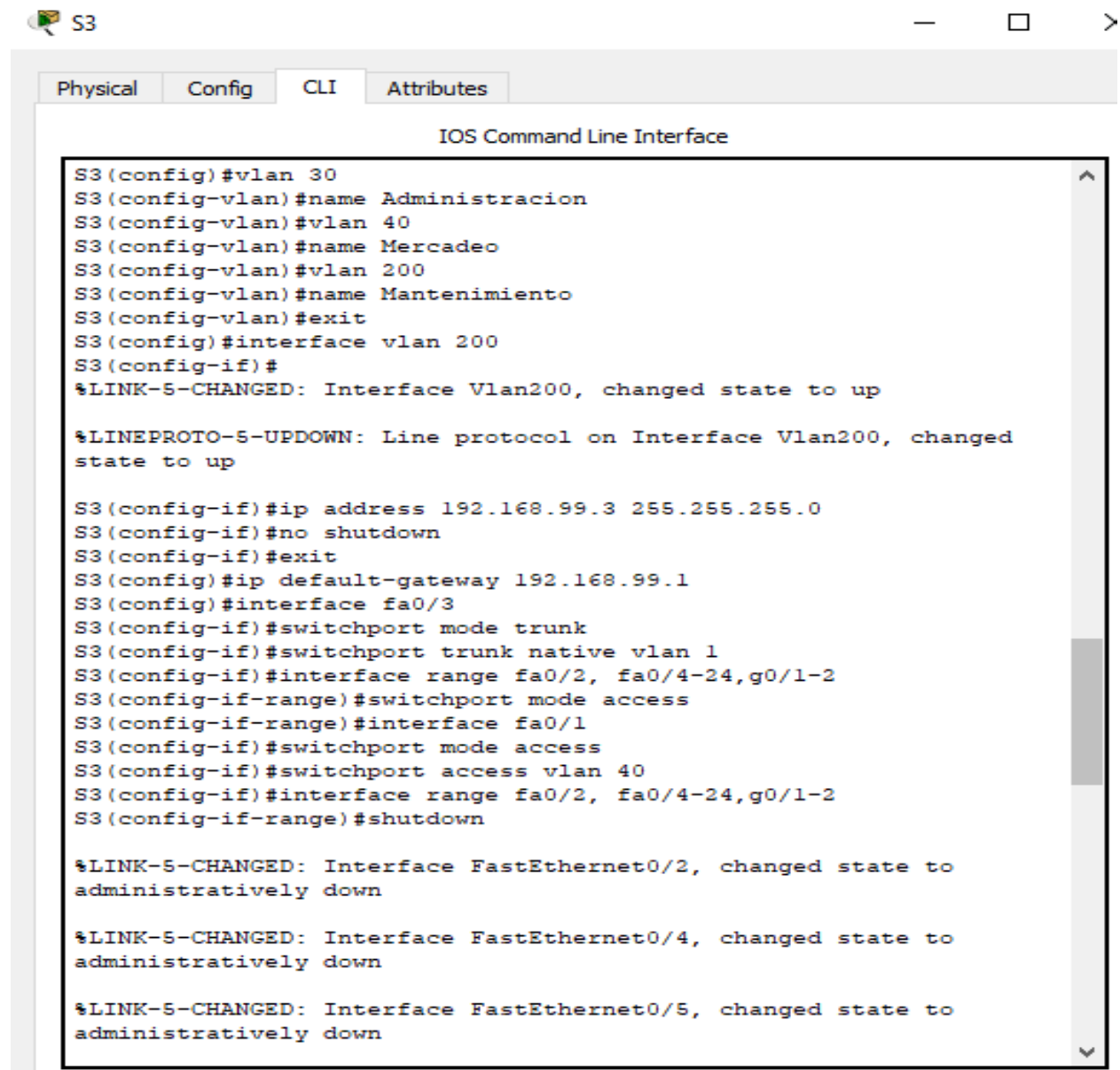


The screenshot shows a network device's CLI interface with the following content:

```
S1
Physical Config CLI Attributes
IOS Command Line Interface
S1(config-if-range)#interface f0/1
S1(config-if)#switchport mode access
S1(config-if)#switchport access vlan 30
S1(config-if)#interface range f0/2, f0/5-23, g0/1-2
S1(config-if-range)#shutdown

%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/5, 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
%LINK-5-CHANGED: Interface FastEthernet0/15, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/16, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/17, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/18, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/19, changed state to administratively down
```

Configuración de S3



```
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)#interface vlan 200
S3 (config-if)#
%LINK-5-CHANGED: Interface Vlan200, changed state to up

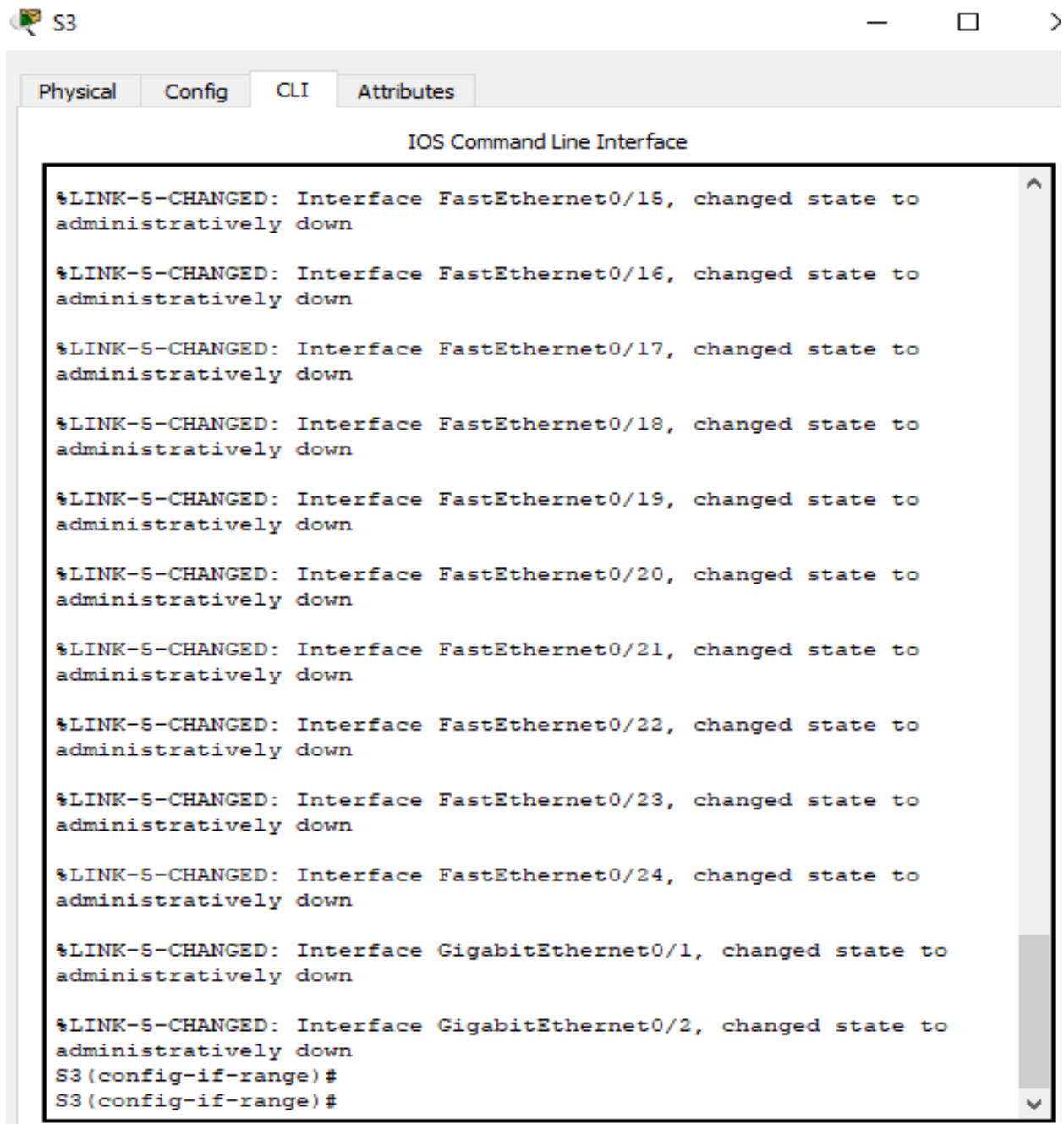
%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan200, changed
state to up

S3 (config-if)#ip address 192.168.99.3 255.255.255.0
S3 (config-if)#no shutdown
S3 (config-if)#exit
S3 (config)#ip default-gateway 192.168.99.1
S3 (config)#interface fa0/3
S3 (config-if)#switchport mode trunk
S3 (config-if)#switchport trunk native vlan 1
S3 (config-if)#interface range fa0/2, fa0/4-24,g0/1-2
S3 (config-if-range)#switchport mode access
S3 (config-if-range)#interface fa0/1
S3 (config-if)#switchport mode access
S3 (config-if)#switchport access vlan 40
S3 (config-if)#interface 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

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



```
IOS Command Line Interface

%LINK-5-CHANGED: Interface FastEthernet0/15, changed state to
administratively down

%LINK-5-CHANGED: Interface FastEthernet0/16, changed state to
administratively down

%LINK-5-CHANGED: Interface FastEthernet0/17, changed state to
administratively down

%LINK-5-CHANGED: Interface FastEthernet0/18, changed state to
administratively down

%LINK-5-CHANGED: Interface FastEthernet0/19, changed state to
administratively down

%LINK-5-CHANGED: Interface FastEthernet0/20, changed state to
administratively down

%LINK-5-CHANGED: Interface FastEthernet0/21, changed state to
administratively down

%LINK-5-CHANGED: Interface FastEthernet0/22, changed state to
administratively down

%LINK-5-CHANGED: Interface FastEthernet0/23, changed state to
administratively down

%LINK-5-CHANGED: Interface FastEthernet0/24, changed state to
administratively down

%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to
administratively down

%LINK-5-CHANGED: Interface GigabitEthernet0/2, changed state to
administratively down
S3(config-if-range)#
S3(config-if-range)#
```

Configuración de R1

```
R1#config t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#interface fa0/0.30
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)#interface fa0/0.40
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)#interface fa0/0.200
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)#interface fa0/0
R1(config-if)#no shutdown

R1(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

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

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

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

%LINK-5-CHANGED: Interface FastEthernet0/0.40, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.40,
changed state to up

%LINK-5-CHANGED: Interface FastEthernet0/0.200, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.200,
changed state to up
```

Corrección configuración vlan 200

```

R1
Physical Config CLI Attributes
IOS Command Line Interface
Password:
R1#config t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#interface fa0/0.200
R1(config-subif)#no description LAN Mantenimiento
R1(config-subif)#no encapsulation dot1q 200
R1(config-subif)#no ip address 192.168.200.1 255.255.255.0
^
% Invalid input detected at '^' marker.

R1(config-subif)#no ip address

% Configuring IP routing on a LAN subinterface is only allowed if
that
subinterface is already configured as part of an IEEE 802.10,
IEEE 802.1Q,
or ISL vLAN.

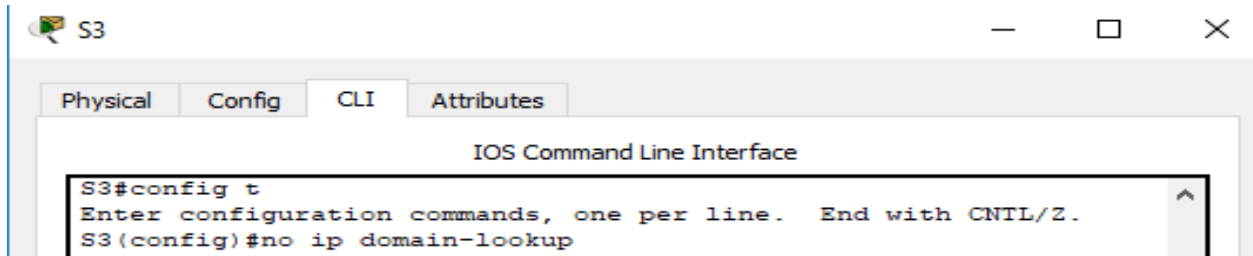
R1(config-subif)#exit
R1(config)#exit
R1#
%SYS-5-CONFIG_I: Configured from console by console

R1#copy run start
Destination filename [startup-config]?
Building configuration...
[OK]
R1#
R1#config t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#interface fa0/0.200
R1(config-subif)#description LAN Mantenimiento
R1(config-subif)#encapsulation dot1q 200
R1(config-subif)#ip address 192.168.99.1 255.255.255.0
R1(config-subif)#interface fa0/0
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#exit

```



#### 4. En el Switch 3 deshabilitar DNS lookup



```
S3
Physical Config CLI Attributes
IOS Command Line Interface
S3#config t
Enter configuration commands, one per line. End with CNTL/Z.
S3(config)#no ip domain-lookup
```

#### 5. Asignar direcciones IP a los Switches acorde a los lineamientos.

##### Configuración IP S1

```
S1(config-if)#ip address 192.168.99.2 255.255.255.0
S1(config-if)#no shutdown
S1(config-if)#exit
S1(config)#ip default-gateway 192.168.99.1
```

##### Configuración IP S3

```
S3(config-if)#ip address 192.168.99.3 255.255.255.0
S3(config-if)#no shutdown
S3(config-if)#exit
S3(config)#ip default-gateway 192.168.99.1
```

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

A continuación, se desactivan las interfaces que no se utilizan en S1 y S3

```
S1(config-if)#interface range f0/2, f0/5-23, g0/1-2
S1(config-if-range)#shutdown
%LINK-S-CHANGED: Interface FastEthernet0/2, changed state to administratively down
%LINK-S-CHANGED: Interface FastEthernet0/5, changed state to administratively down
%LINK-S-CHANGED: Interface FastEthernet0/6, changed state to administratively down
```

```
S3(config-if)#interface range fa0/2, fa0/4-24, g0/1-2
S3(config-if-range)#shutdown
%LINK-S-CHANGED: Interface FastEthernet0/2, changed state to administratively down
%LINK-S-CHANGED: Interface FastEthernet0/4, changed state to administratively down
%LINK-S-CHANGED: Interface FastEthernet0/5, changed state to administratively down
```



## 7. Implement DHCP and NAT for IPv4

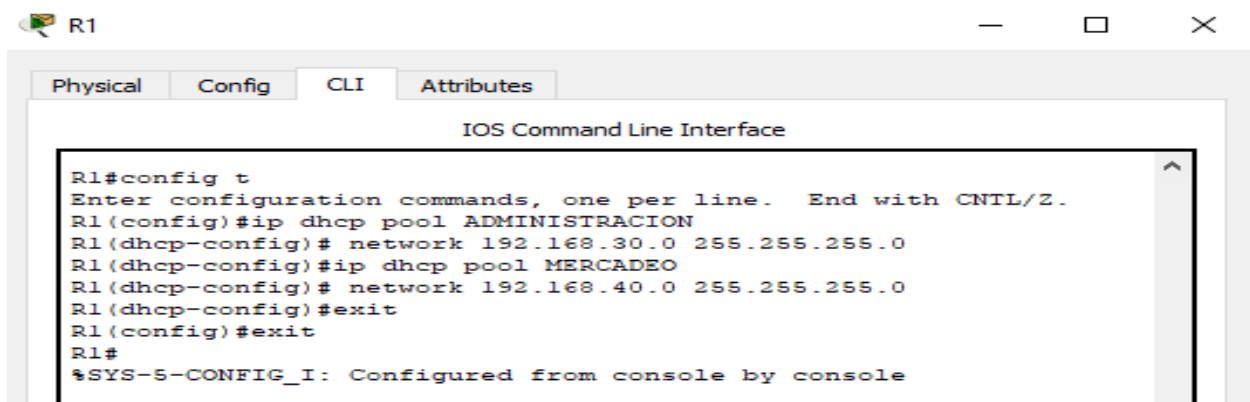
## 8. Configurar R1 como servidor DHCP para las VLANs 30 y 40.

Se configura R1 como servidor DHCP.



A screenshot of the R1 CLI interface showing the configuration of two DHCP pools. The user enters commands to create the 'ADMINISTRACION' pool with a DNS server of 10.10.10.11 and a domain name of ccna-unad.com. They then enter the 'MERCADERO' pool with the same DNS server and domain name. The interface shows help text for the 'default-router' command and the user enters 192.168.30.1 for the first pool and 192.168.40.1 for the second pool. The text is as follows:

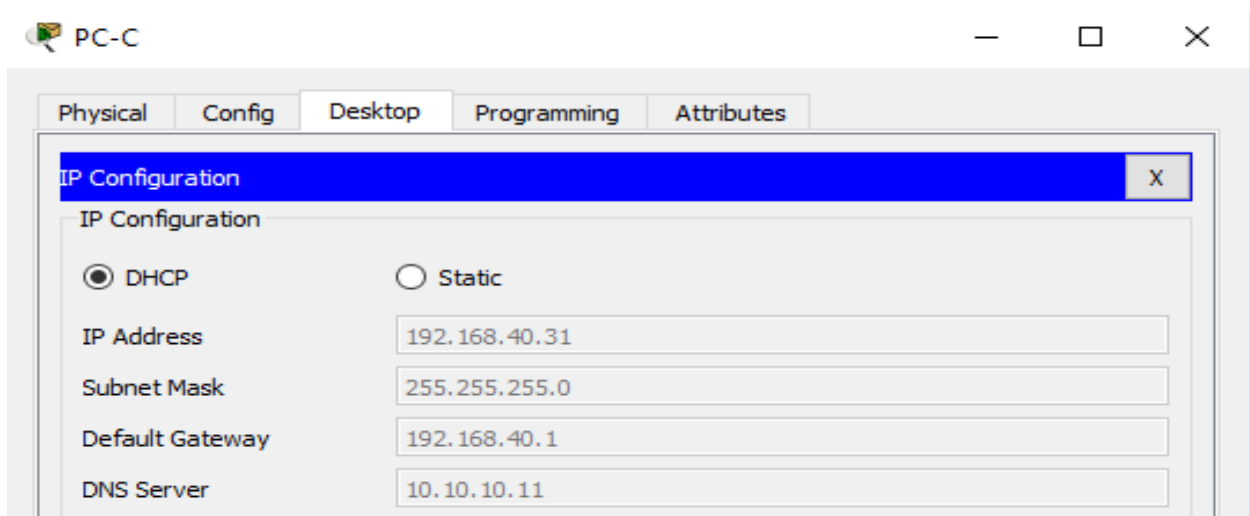
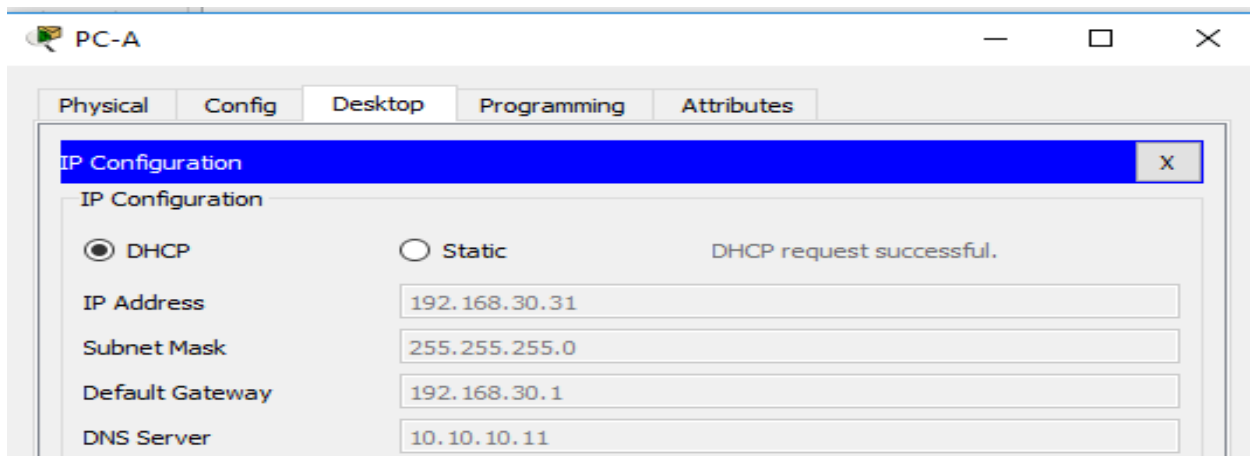
```
R1(config)#ip dhcp pool ADMINISTRACION
R1(dhcp-config)#dns-server 10.10.10.11
R1(dhcp-config)#domain-name: ccna-unad.com
^
% Invalid input detected at '^' marker.
R1(dhcp-config)#domain-name ccna-unad.com
^
% Invalid input detected at '^' marker.
R1(dhcp-config)#?
 default-router  Default routers
 dns-server      Set name server
 exit           Exit from DHCP pool configuration mode
 network        Network number and mask
 no             Negate a command or set its defaults
 option         Raw DHCP options
R1(dhcp-config)#default-router 192.168.30.1
R1(dhcp-config)#ip dhcp pool MERCADERO
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)#
```



A screenshot of the R1 CLI interface showing the configuration summary. The user enters 'config t' and then the commands to create the two DHCP pools. The interface shows the configuration commands and the user exits. The text is as follows:

```
R1#config t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#ip dhcp pool ADMINISTRACION
R1(dhcp-config)# network 192.168.30.0 255.255.255.0
R1(dhcp-config)#ip dhcp pool MERCADERO
R1(dhcp-config)# network 192.168.40.0 255.255.255.0
R1(dhcp-config)#exit
R1(config)#exit
R1#
%SYS-5-CONFIG_I: Configured from console by console
```

Se verifica configuración de DHCP para PC-A y PC-C.

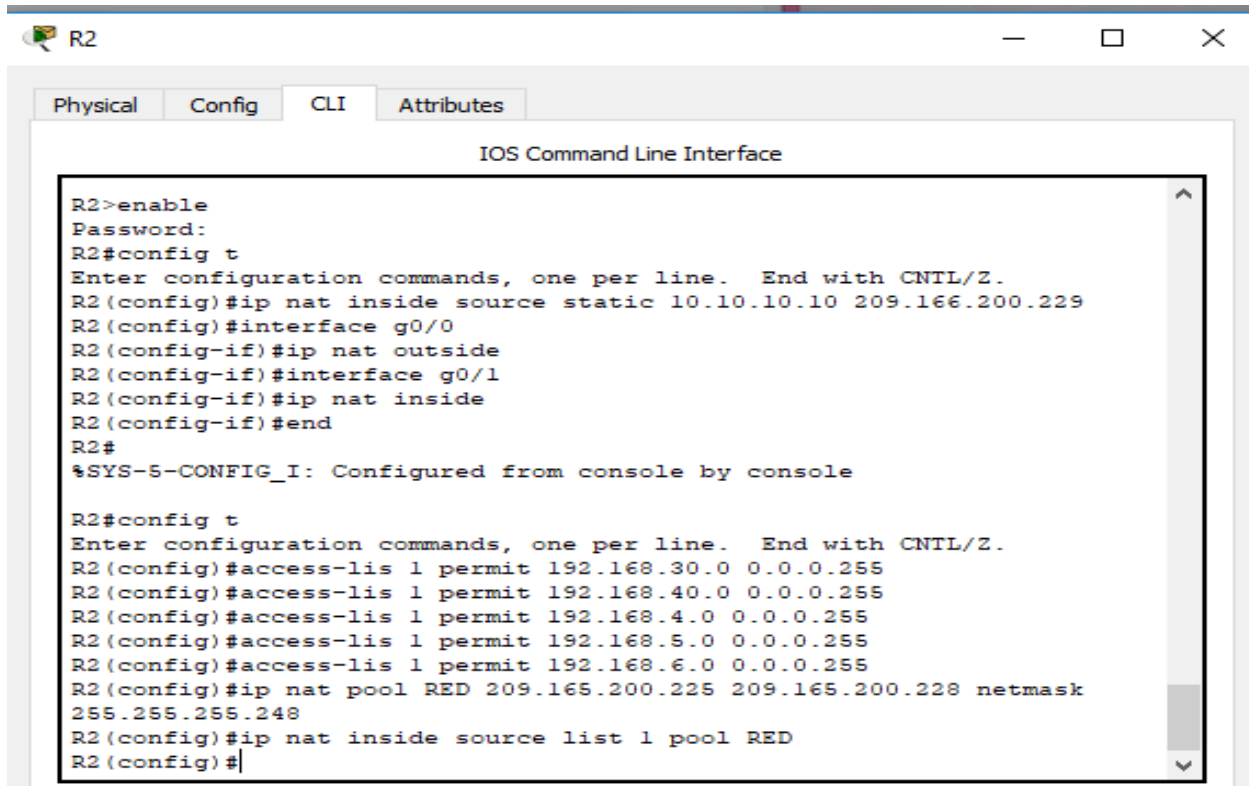


**9. Reservar las primeras 30 direcciones IP de las VLAN 30 y 40 para configuraciones estáticas.**

```
R1#config 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 192.168.40.1 192.168.40.30
R1(config)#
```

## 10. Configurar NAT en R2 para permitir que los hosts puedan salir a internet

Configuración de NAT en R2

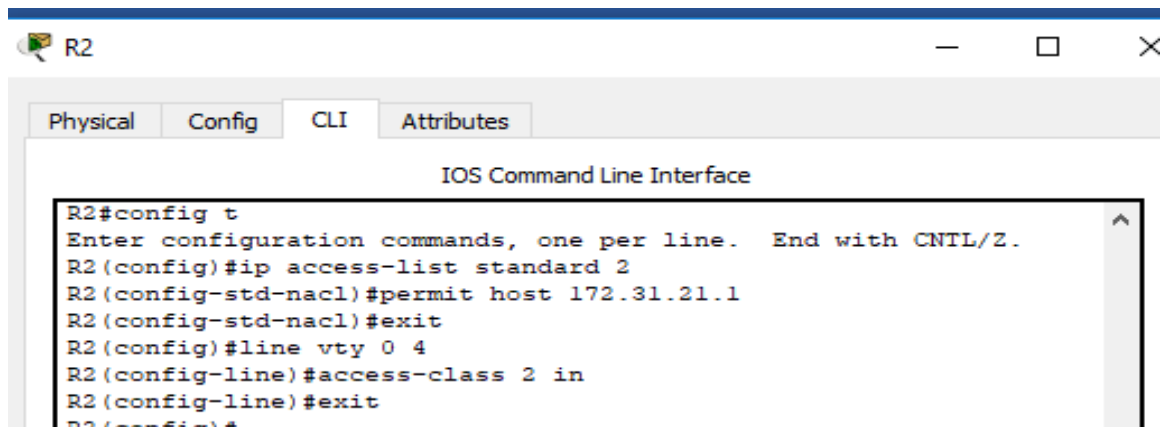


```
R2>enable
Password:
R2#config t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#ip nat inside source static 10.10.10 209.166.200.229
R2(config)#interface g0/0
R2(config-if)#ip nat outside
R2(config-if)#interface g0/1
R2(config-if)#ip nat inside
R2(config-if)#end
R2#
%SYS-5-CONFIG_I: Configured from console by console

R2#config t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#access-lis 1 permit 192.168.30.0 0.0.0.255
R2(config)#access-lis 1 permit 192.168.40.0 0.0.0.255
R2(config)#access-lis 1 permit 192.168.4.0 0.0.0.255
R2(config)#access-lis 1 permit 192.168.5.0 0.0.0.255
R2(config)#access-lis 1 permit 192.168.6.0 0.0.0.255
R2(config)#ip nat pool RED 209.165.200.225 209.165.200.228 netmask
255.255.255.248
R2(config)#ip nat inside source list 1 pool RED
R2(config)#
```

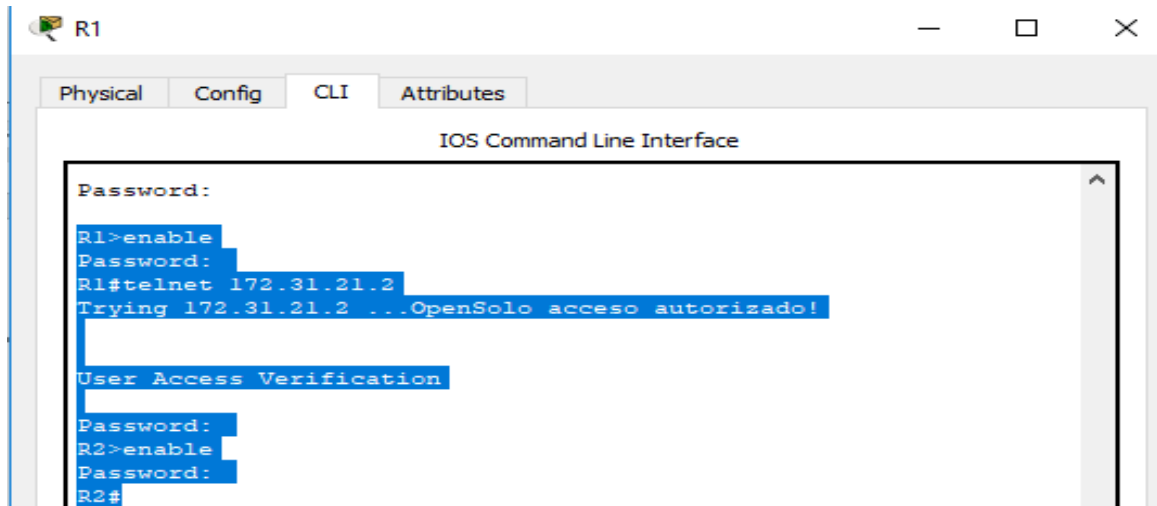
11. Configurar al menos dos listas de acceso de tipo estándar a su criterio en para restringir o permitir tráfico desde R1 o R3 hacia R2.

- Solo acceso Telnet a R2 desde R1.



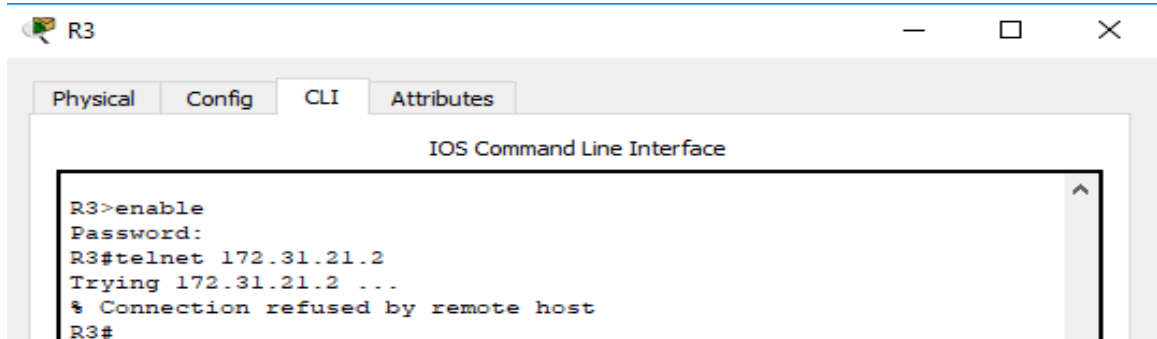
```
R2#config t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#ip access-list standard 2
R2(config-std-nacl)#permit host 172.31.21.1
R2(config-std-nacl)#exit
R2(config)#line vty 0 4
R2(config-line)#access-class 2 in
R2(config-line)#exit
R2(config)#
```

Se realiza Telnet desde R1.



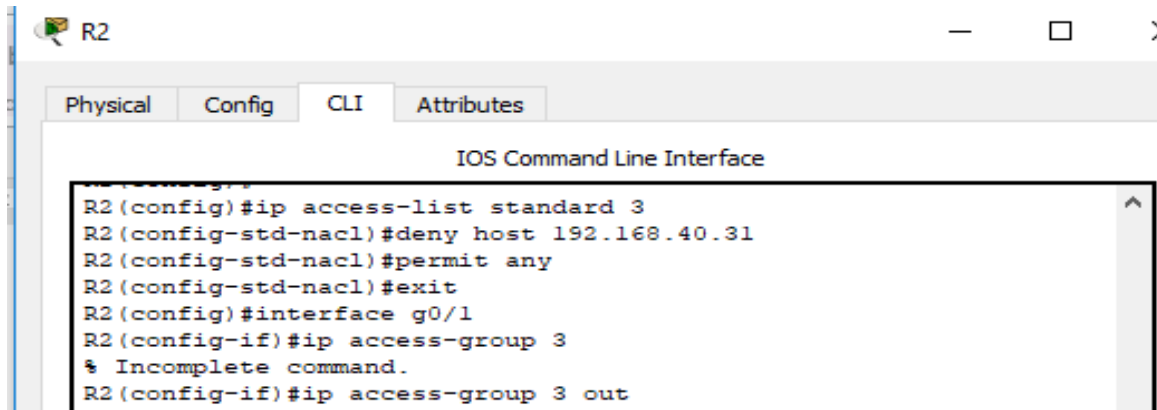
```
R1
Physical Config CLI Attributes
IOS Command Line Interface
Password:
R1>enable
Password:
R1#telnet 172.31.21.2
Trying 172.31.21.2 ...OpenSolo acceso autorizado!
User Access Verification
Password:
R2>enable
Password:
R2#
```

Se realiza Telnet desde R3



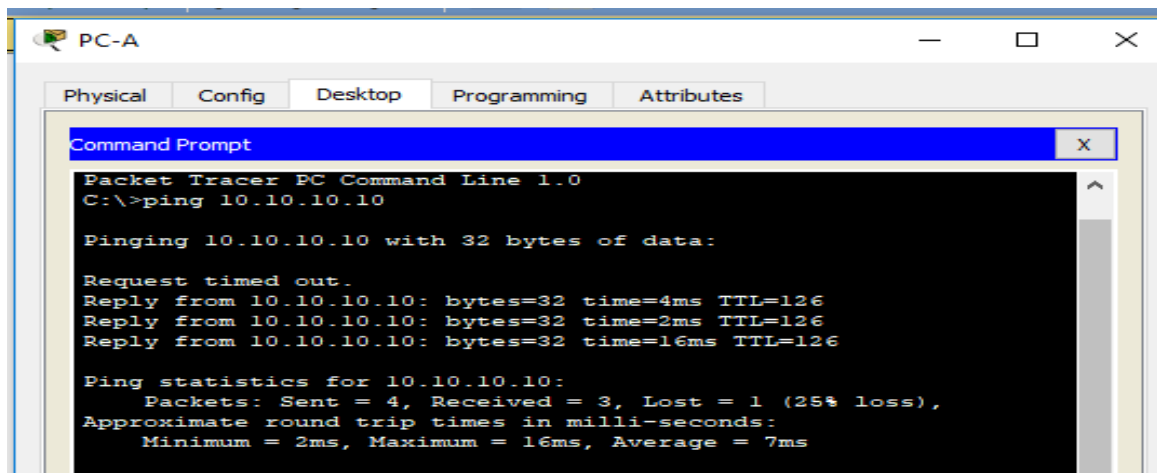
```
R3
Physical Config CLI Attributes
IOS Command Line Interface
R3>enable
Password:
R3#telnet 172.31.21.2
Trying 172.31.21.2 ...
% Connection refused by remote host
R3#
```

- No se permite el acceso del PC-C al Web Server.



```
R2
Physical Config CLI Attributes
IOS Command Line Interface
R2(config)#ip access-list standard 3
R2(config-std-nacl)#deny host 192.168.40.31
R2(config-std-nacl)#permit any
R2(config-std-nacl)#exit
R2(config)#interface g0/1
R2(config-if)#ip access-group 3
% Incomplete command.
R2(config-if)#ip access-group 3 out
```

Se realiza ping desde PC-A



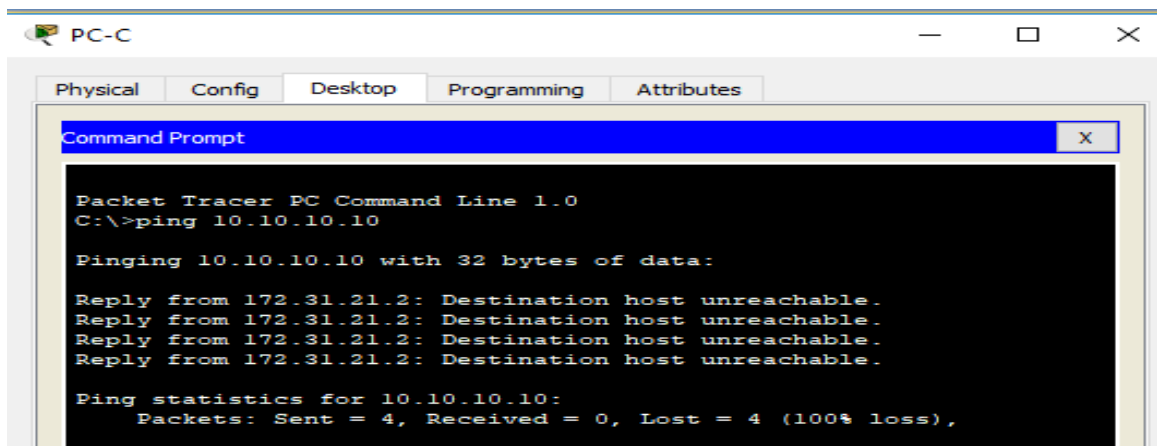
```
PC-A
Physical Config Desktop Programming Attributes
Command Prompt
Packet Tracer PC Command Line 1.0
C:\>ping 10.10.10.10

Pinging 10.10.10.10 with 32 bytes of data:

Request timed out.
Reply from 10.10.10.10: bytes=32 time=4ms TTL=126
Reply from 10.10.10.10: bytes=32 time=2ms TTL=126
Reply from 10.10.10.10: bytes=32 time=16ms TTL=126

Ping statistics for 10.10.10.10:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 16ms, Average = 7ms
```

Se realiza ping desde PC-C



```
PC-C
Physical Config Desktop Programming Attributes
Command Prompt
Packet Tracer PC Command Line 1.0
C:\>ping 10.10.10.10

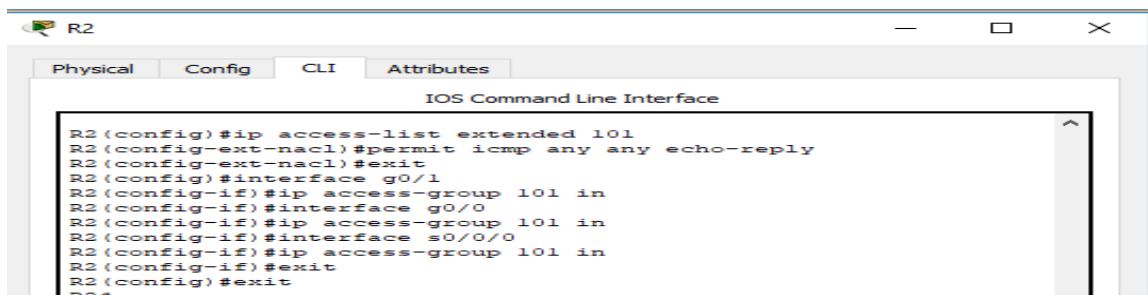
Pinging 10.10.10.10 with 32 bytes of data:

Reply from 172.31.21.2: Destination host unreachable.
Reply from 172.31.21.2: Destination host unreachable.
Reply from 172.31.21.2: Destination host unreachable.
Reply from 172.31.21.2: Destination host unreachable.

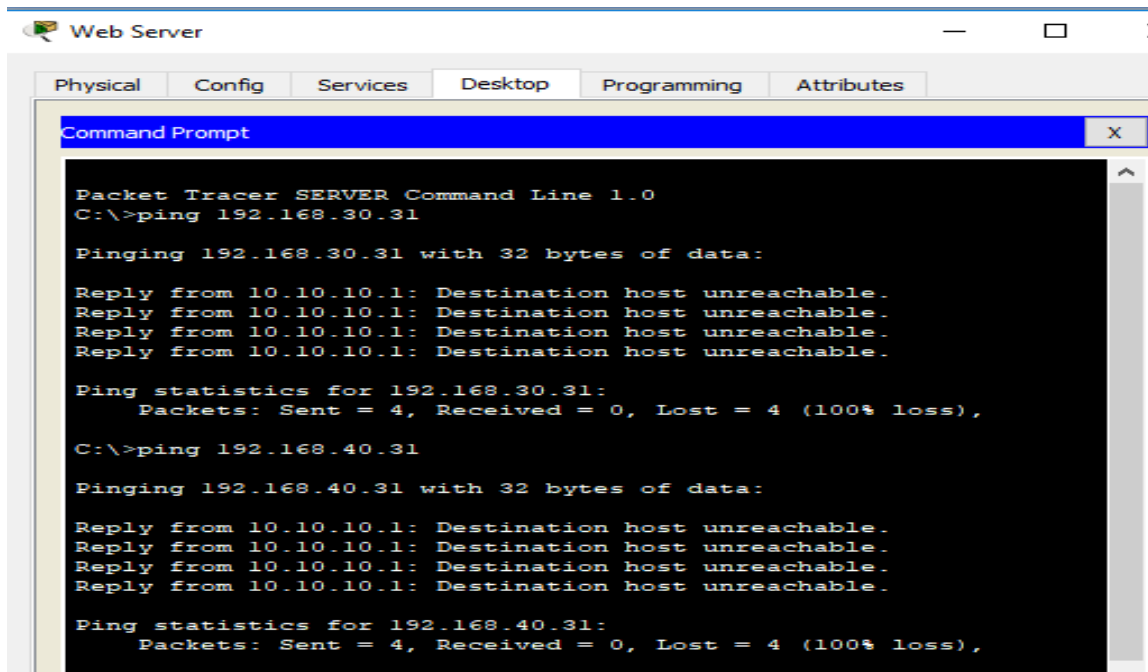
Ping statistics for 10.10.10.10:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

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.

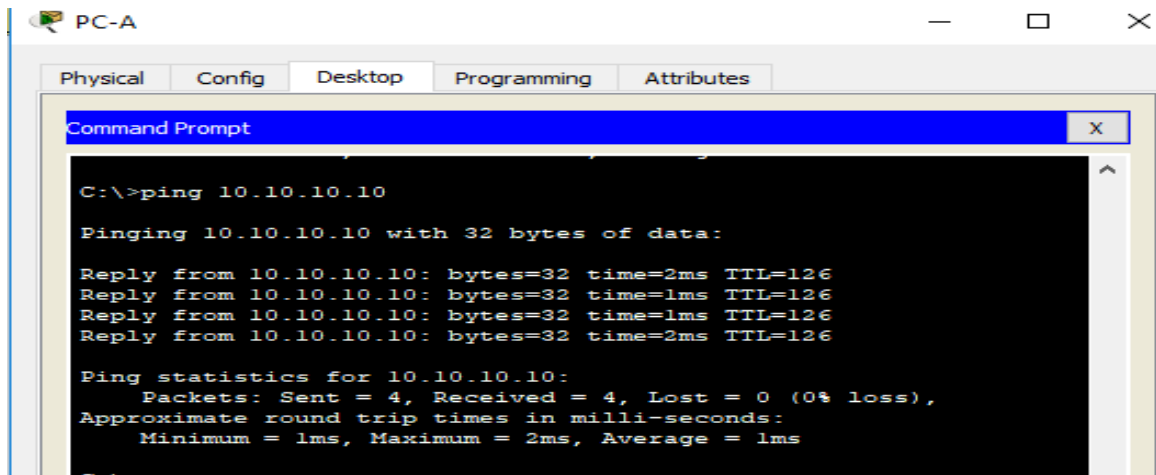
- No se permite el envío de paquetes ICMP desde las redes externas del R2, pero si desde las redes internas del R2 hacia las externas.



Se realiza ping desde Web server a PC-A y PC-C

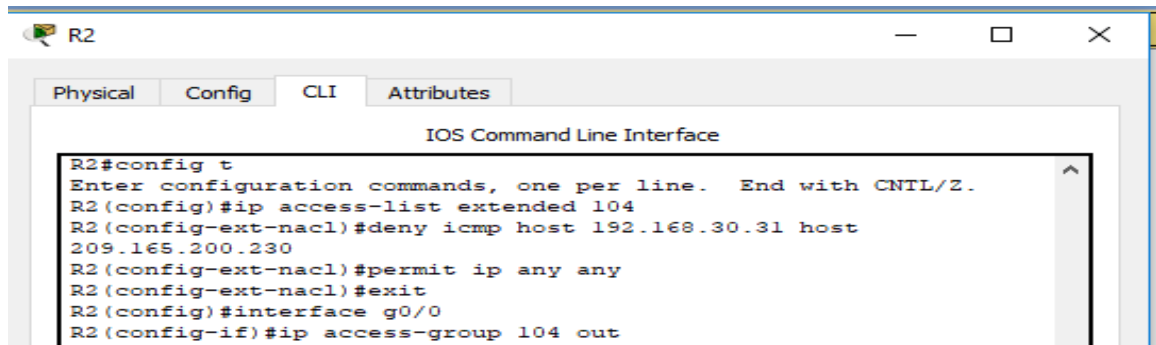


Se realiza ping desde PC-A hacia Web Server.



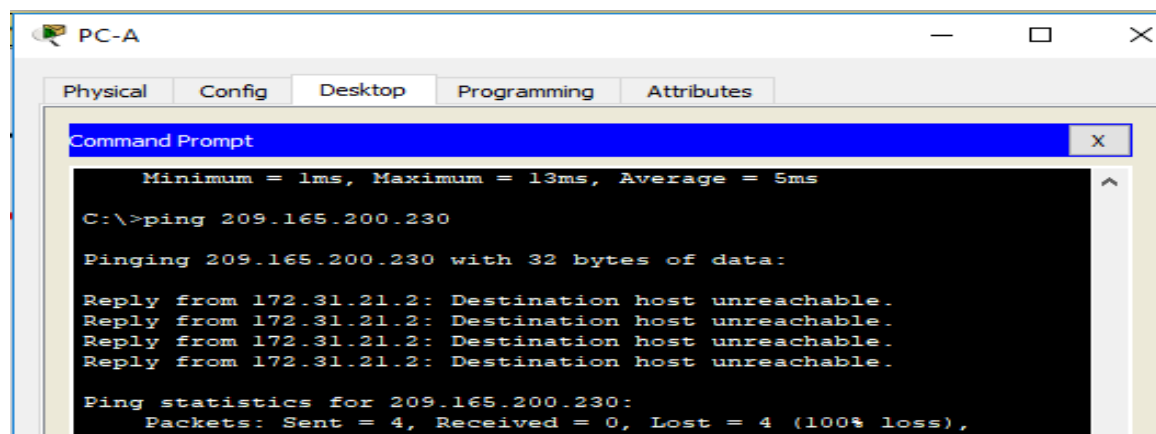
```
PC-A
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 10.10.10.10
Pinging 10.10.10.10 with 32 bytes of data:
Reply from 10.10.10.10: bytes=32 time=2ms TTL=126
Reply from 10.10.10.10: bytes=32 time=1ms TTL=126
Reply from 10.10.10.10: bytes=32 time=1ms TTL=126
Reply from 10.10.10.10: bytes=32 time=2ms TTL=126
Ping statistics for 10.10.10.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 2ms, Average = 1ms
```

- Se restringe el tráfico ICMP desde el PC-A hacia la red del Internet PC.



```
R2
Physical Config CLI Attributes
IOS Command Line Interface
R2#config t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#ip access-list extended 104
R2(config-ext-nacl)#deny icmp host 192.168.30.31 host
209.165.200.230
R2(config-ext-nacl)#permit ip any any
R2(config-ext-nacl)#exit
R2(config)#interface g0/0
R2(config-if)#ip access-group 104 out
```

Se realiza ping de PC-A a Internet pc.

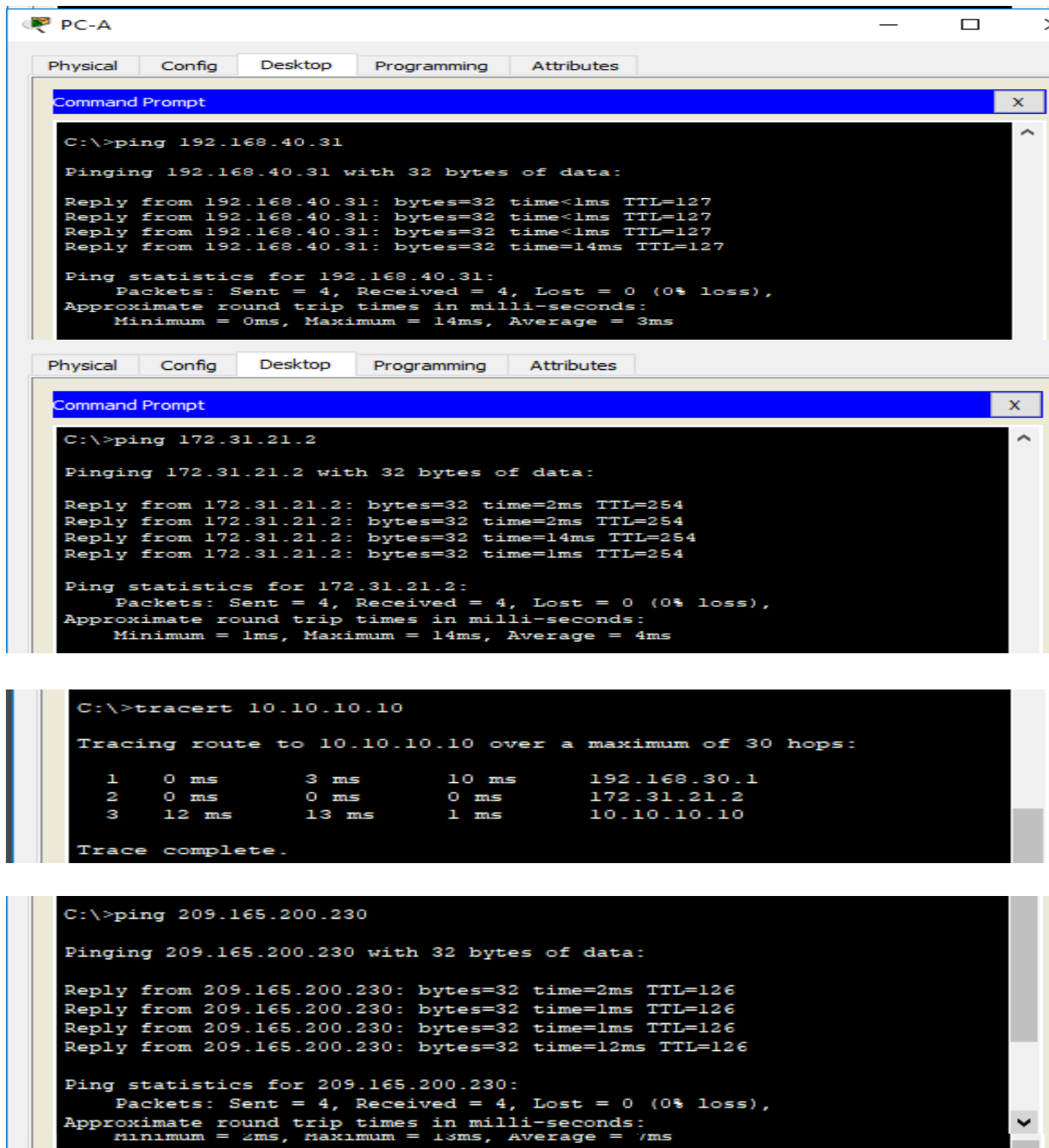


```
PC-A
Physical Config Desktop Programming Attributes
Command Prompt
Minimum = 1ms, Maximum = 13ms, Average = 5ms
C:\>ping 209.165.200.230
Pinging 209.165.200.230 with 32 bytes of data:
Reply from 172.31.21.2: Destination host unreachable.
Reply from 172.31.21.2: Destination host unreachable.
Reply from 172.31.21.2: Destination host unreachable.
Reply from 172.31.21.2: Destination host unreachable.
Ping statistics for 209.165.200.230:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

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

**Nota:** Para realizar las pruebas de conectividad se procede a inhabilitar las listas de acceso ya configuradas en las diferentes interfaces del R2.

A continuación, se realiza prueba de conexión desde el PC-A hacia las demás redes.





Pruebas de conexión desde PC-C.

```
C:\>tracert 209.165.200.230

Tracing route to 209.165.200.230 over a maximum of 30 hops:

  1    1 ms         0 ms         0 ms         192.168.40.1
  2   16 ms         1 ms         1 ms         172.31.21.2
  3    *           35 ms        1 ms         209.165.200.230

Trace complete.
```

```
C:\>tracert 10.10.10.10

Tracing route to 10.10.10.10 over a maximum of 30 hops:

  1    1 ms         0 ms         0 ms         192.168.40.1
  2    1 ms         0 ms         1 ms         172.31.21.2
  3    *           5 ms         11 ms        10.10.10.10

Trace complete.
```

```
C:\>ping 192.168.30.1

Pinging 192.168.30.1 with 32 bytes of data:

Reply from 192.168.30.1: bytes=32 time=1ms TTL=255
Reply from 192.168.30.1: bytes=32 time<1ms TTL=255
Reply from 192.168.30.1: bytes=32 time<1ms TTL=255
Reply from 192.168.30.1: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.30.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

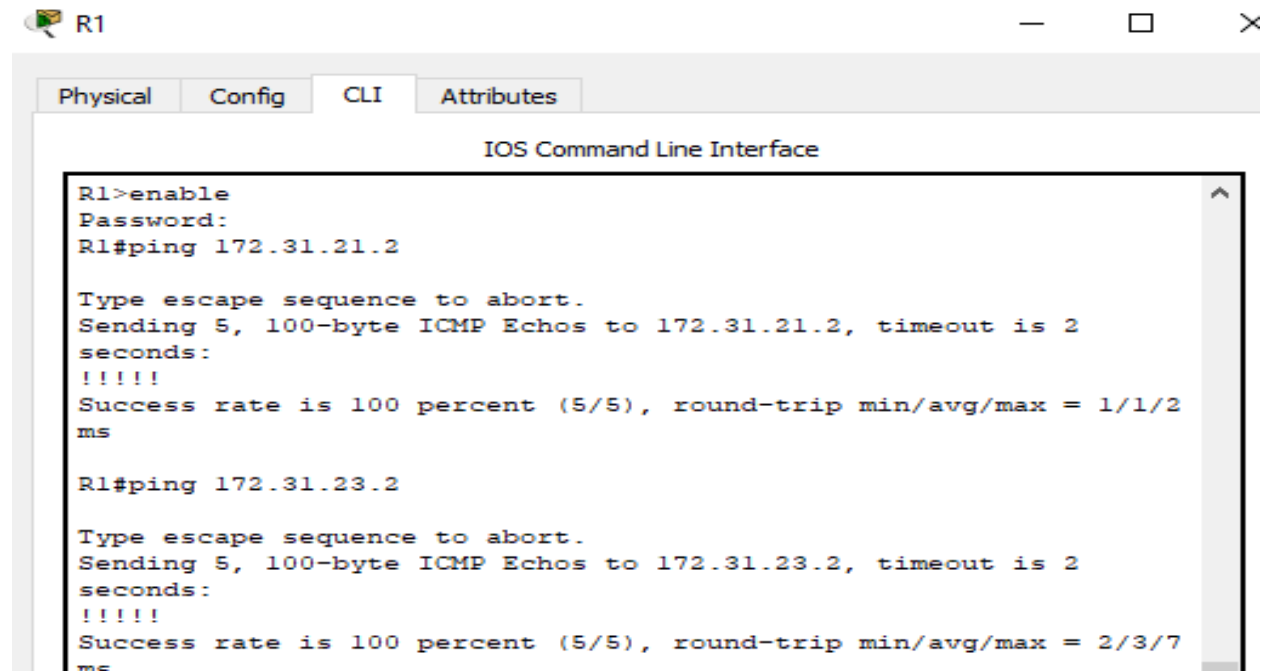
```
C:\>tracert 172.31.23.2

Tracing route to 172.31.23.2 over a maximum of 30 hops:

  1    1 ms         0 ms         0 ms         192.168.40.1
  2    1 ms         1 ms         1 ms         172.31.21.2
  3    1 ms         1 ms         2 ms         172.31.23.2

Trace complete.
```

Prueba de comunicación entre routers.



R1

Physical Config CLI Attributes

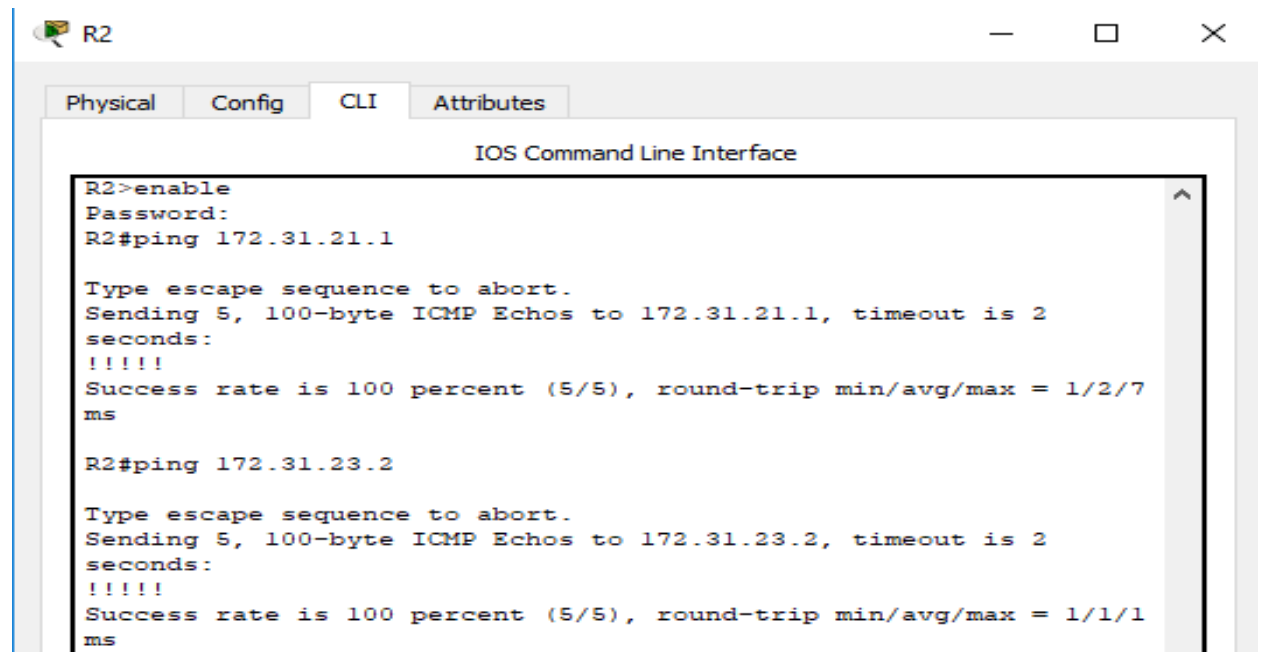
IOS Command Line Interface

```
R1>enable
Password:
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 = 1/1/2
ms

R1#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 = 2/3/7
ms
```



R2

Physical Config CLI Attributes

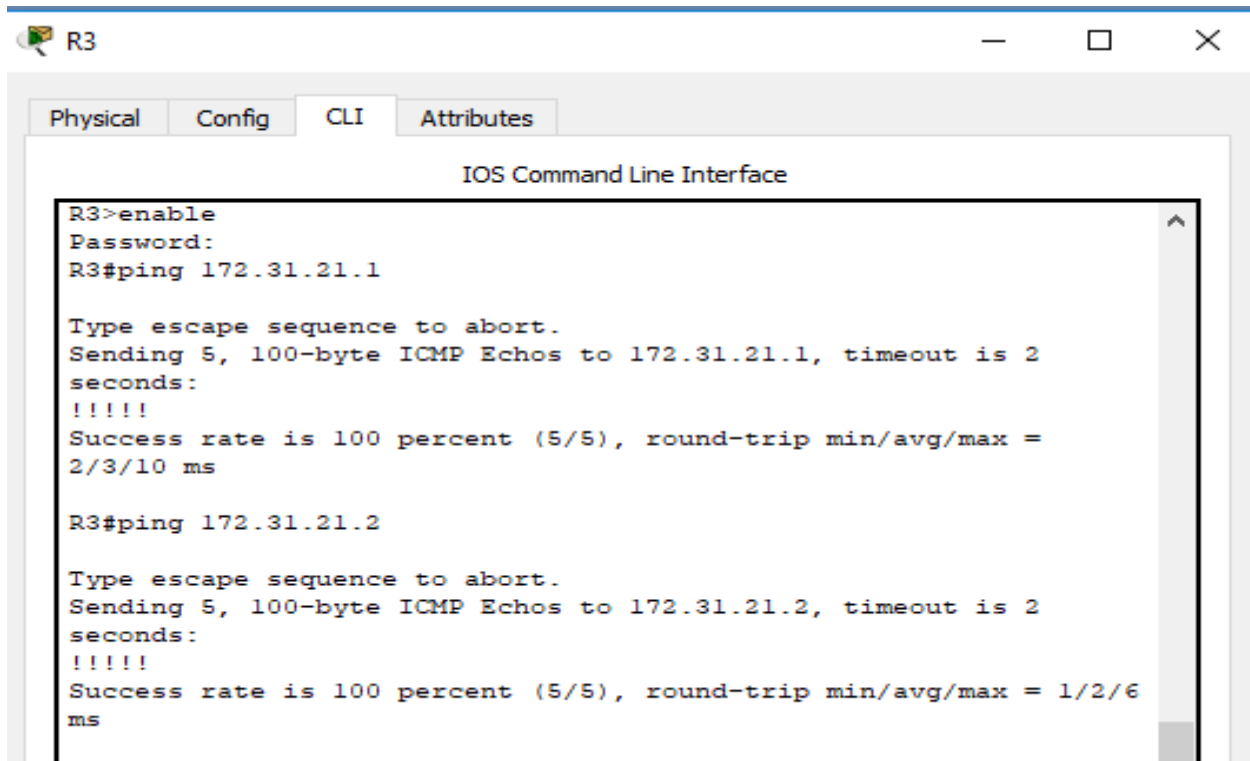
IOS Command Line Interface

```
R2>enable
Password:
R2#ping 172.31.21.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.31.21.1, timeout is 2
seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/7
ms

R2#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 = 1/1/1
ms
```



The screenshot shows a window titled 'R3' with a tabbed interface containing '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>enable
Password:
R3#ping 172.31.21.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.31.21.1, timeout is 2
seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max =
2/3/10 ms

R3#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 = 1/2/6
ms
```

**NOTA:** después de realizar las respectivas pruebas de comunicación se procede a activar las listas de acceso configuradas en los puntos 11 y 12 de la presente actividad en cada una de las interfaces del R2.

## **CONCLUSIONES**

El análisis, desarrollo y administración de redes informáticas es uno de los campos del conocimiento que actualmente tiene mayor desarrollo, el creciente volumen de información y datos, la necesidad de comunicarnos constantemente y la sistematización de nuestras actividades, entre otras razones, han convertido el manejo e implementación de redes informáticas en un área del conocimiento transversal y de carácter obligatorio para quienes se forman como Ingenieros de Sistemas o áreas afines. Por lo anterior, el desarrollo de actividades enfocadas en la promoción de habilidades y conocimientos para el diseño, configuración, implementación y administración de sistemas de redes permitió complementar el proceso de formación académica como Ingeniero de Sistemas, dando las herramientas necesarias para enfrentar los retos que el mercado laboral impone en la actualidad.

El manejo y comprensión de los distintos elementos que pueden conformar una red, al igual que los protocolos, modelos, estandares, servicios, herramientas y otros aspectos desarrollados en el diplomado de Diseño e Implementación de Soluciones Integradas Lan / Wan, han permitido entender el funcionamiento de las redes y todo lo relacionado con las mismas, partiendo de la arquitectura y pasando por aspectos como la seguridad, la conectividad y los recursos, constituyen una herramienta para la solución de problemas y el desarrollo de proyectos que permitan mejorar el desarrollo de los procesos de las organizaciones y por ende la calidad de vida de las personas.

Por último, es importante resaltar la calidad del curso desarrollado, que con sus contenidos proporciona las herramientas necesarias para comprender los temas relacionados con los principios básicos de routing y switching.

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