

# DISEÑO E IMPLEMENTACIÓN DE SOLUCIÓN LAN / WAN USANDO CISCO IOS

VÍCTOR JULIO MARTÍNEZ BARRIOS

UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA  
ESCUELA DE CIENCIAS BÁSICAS, TECNOLOGÍA E INGERIERÍA  
INGENIERÍA DE SISTEMAS  
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# DISEÑO E IMPLEMENTACIÓN DE SOLUCIÓN LAN / WAN USANDO CISCO IOS

VÍCTOR JULIO MARTÍNEZ BARRIOS

Informe para optar al título de ingeniero de sistemas

Profesor

Giovanni Alberto Bracho, tutor del curso

UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA  
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INGENIERÍA DE SISTEMAS

ITAGÜÍ

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NOTA DE ACEPTACION

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Presidente del jurado

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Jurado

## AGRADECIMIENTOS

Antes que nada, a Dios por brindarme el conocimiento y la fortaleza para superar este reto, paso a paso. A mis padres: Nasly Barrios y Gabriel Martínez, por su esfuerzo para llevarme a desarrollar todas mis cualidades. A mi esposa Milena Díaz y su familia por toda la ayuda que me brindaron. A mi empresa Softcaribbean S.A. por el apoyo brindado en cada periodo académico y su preocupación por la superación de sus empleados. A todo el cuerpo docente de la UNAD por su esfuerzo para brindarme conocimiento de calidad y significativo.

## TABLA DE CONTENIDO

INTRODUCCIÓN .....	8
1.1 DESCRIPCIÓN DEL ESCENARIO PROPUESTO .....	9
1.1 ESCENARIO.....	9
1.2 TOPOLOGÍA DE RED .....	9
2. DESARROLLO DE LAS ACTIVIDADES .....	10
2.1 CONFIGURACIÓN DIRECCIONAMIENTO IP .....	10
2.2 CONFIGURACIÓN OSPF .....	16
2.3 CONFIGURACIÓN DE VLAN Y PUERTOS .....	26
2.4 DESHABILITAR DNS LOOKUP EN S3 .....	30
2.5 CONFIGURACIÓN IP DE LOS SWITCHES .....	30
2.6 DESACTIVAR INTERFACES NO USADAS .....	30
2.7 IMPLEMENTAR DHCP Y NAT PARA IPV4.....	33
BIBLIOGRAFIA.....	36

## LISTA DE TABLAS

Tabla 1 Direccionamiento IP .....	12
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## LISTA DE FIGURAS

Ilustración 1 Topología de la red.....	9
Ilustración 2 Topología realizada en Packet Tracer .....	12
Ilustración 3 Configuración OSPF .....	16
Ilustración 4 Evidencia configuración OSPF .....	17
Ilustración 5 Configuración de OSPF R1 .....	18
Ilustración 6 Configuración OSPF R2 .....	18
Ilustración 7 Configuración OSPF R3 .....	19
Ilustración 8 Evidencia interfaces pasivas .....	20
Ilustración 9 Interfaces pasivas y no pasivas .....	21
Ilustración 10 Establecimiento de ancho de banda.....	23
Ilustración 11 Costo de la métrica.....	24
Ilustración 12 Configuración de interfaces .....	25
Ilustración 13 Información del protocolo OSPF .....	25

## RESUMEN

El presente informe contiene el desarrollo de la prueba de habilidades prácticas del diplomado de profundización cisco (diseño e implementación de soluciones integradas LAN / WAN).

El mismo aborda las temáticas revisadas en los módulos CCNA I y CCNA II del curso antes mencionado, entre los que se destacan:

- ✓ Configuraciones básicas de SWITCH y ROUTERS
- ✓ Configuración de direccionamiento IP para los diferentes componentes de una topología de red
- ✓ Configuración del protocolo OSPF
- ✓ Uso de las VLAN y su configuración
- ✓ Implementación de DHCP y NAT
- ✓ Aplicación de listas de control de acceso

El desarrollo de la actividad se realiza bajo el montaje de una topología de red en el simulador Cisco Packet Tracer.

## INTRODUCCIÓN

El presente informe se entrega como evidencia del desarrollo de las actividades concernientes a la evaluación final (prueba de habilidades prácticas) del curso “Diplomado de profundización cisco (diseño e implementación de soluciones integradas LAN / WAN)”.

En el mismo se abordan de manera práctica, a través del uso de la herramienta Cisco Packet Tracer, las temáticas revisadas en los diferentes capítulos del mencionado curso, buscando resolver situaciones de la vida real.



## 1.1 DESCRIPCIÓN DEL ESCENARIO PROPUESTO

### 1.1 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.

### 1.2 TOPOLOGÍA DE RED

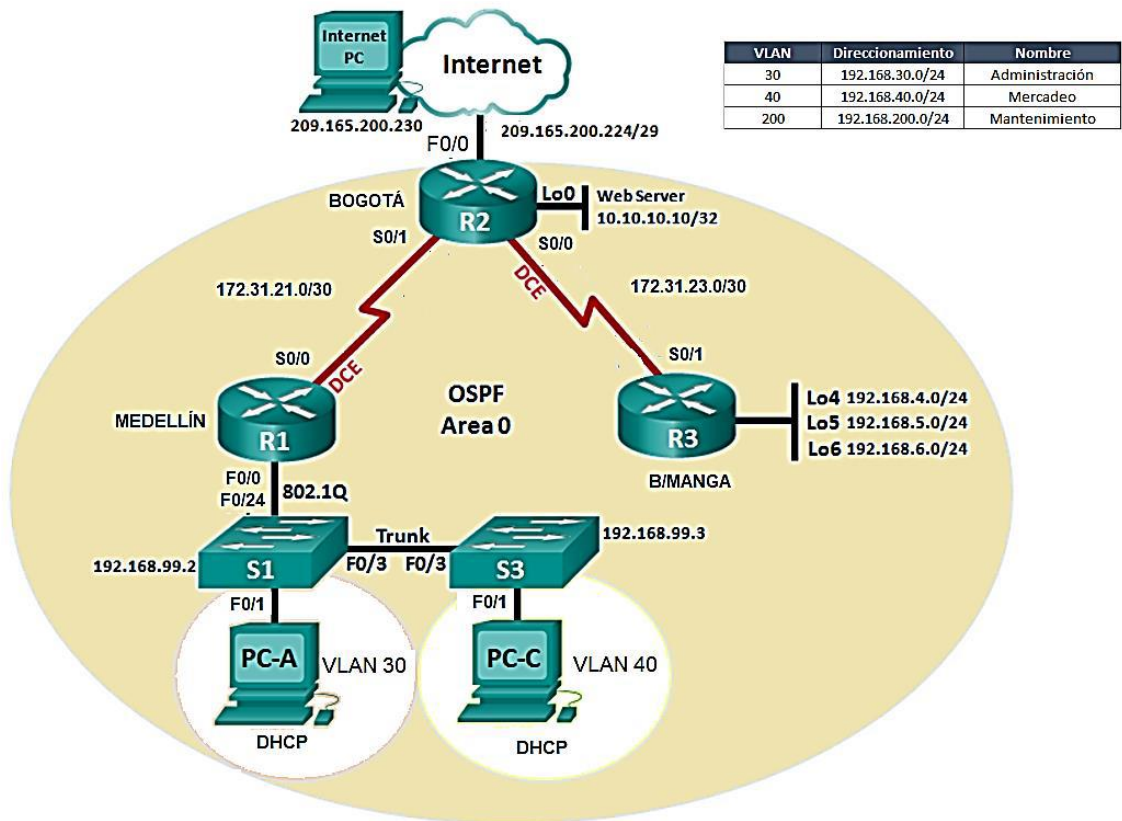


Ilustración 1 Topología de la red

## 2. DESARROLLO DE LAS ACTIVIDADES

### 2.1 CONFIGURACIÓN DIRECCIONAMIENTO IP

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

Configuración básica de los routers:

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname R1
R1(config)#no ip domain-lookup
R1(config)#service password-encryption
R1(config)#enable secret class
R1(config)#line console 0
R1(config-line)#password cisco
R1(config-line)#login
R1(config-line)#line vty 0 15
R1(config-line)#password cisco
R1(config-line)#login
R1(config-line)#exit
R1(config)#banner motd #Prohibido el acceso no autorizado#
R1(config)#line console 0
R1(config-line)#login synchronous
R1(config-line)#end
R1#
%SYS-5-CONFIG_I: Configured from console by console
R1#copy run start
Destination filename [startup-config]?
Building configuration...
```

[OK]

R1#

**El mismo procedimiento fue aplicado a los routers R2 y R3.**

### **Configuración básica de los switches**

```
S1>
S1>enable
S1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
S1(config)#no ip domain-lookup
S1(config)#hostname S1
S1(config)#line console 0
S1(config-line)#password cisco
S1(config-line)#login
S1(config-line)#loggin synchronous
S1(config-line)#line vty 0 15
S1(config-line)#password cisco
S1(config-line)#login
S1(config-line)#exi
S1(config)#enable secret class
S1(config)#service password-encry
S1(config)#banner motd #Prohibido el acceso no autorizado#
```

```
S3>enable
S3#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
S3(config)#hostname S3
S3(config)#no ip domain-lookup
S3(config)#enable secret class
S3(config)#line console 0
S3(config-line)#password cisco
S3(config-line)#login
S3(config-line)#loggin synchrono
S3(config-line)#line vty 0 15
S3(config-line)#password cisco
S3(config-line)#login
S3(config-line)#end
S3#
%SYS-5-CONFIG_I: Configured from console by console
```

```
S3#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
S3(config)#service password-encry
S3(config)#banner motd #Prohibido el acceso no autorizado#
S3(config)#end
S3#
%SYS-5-CONFIG_I: Configured from console by console
```

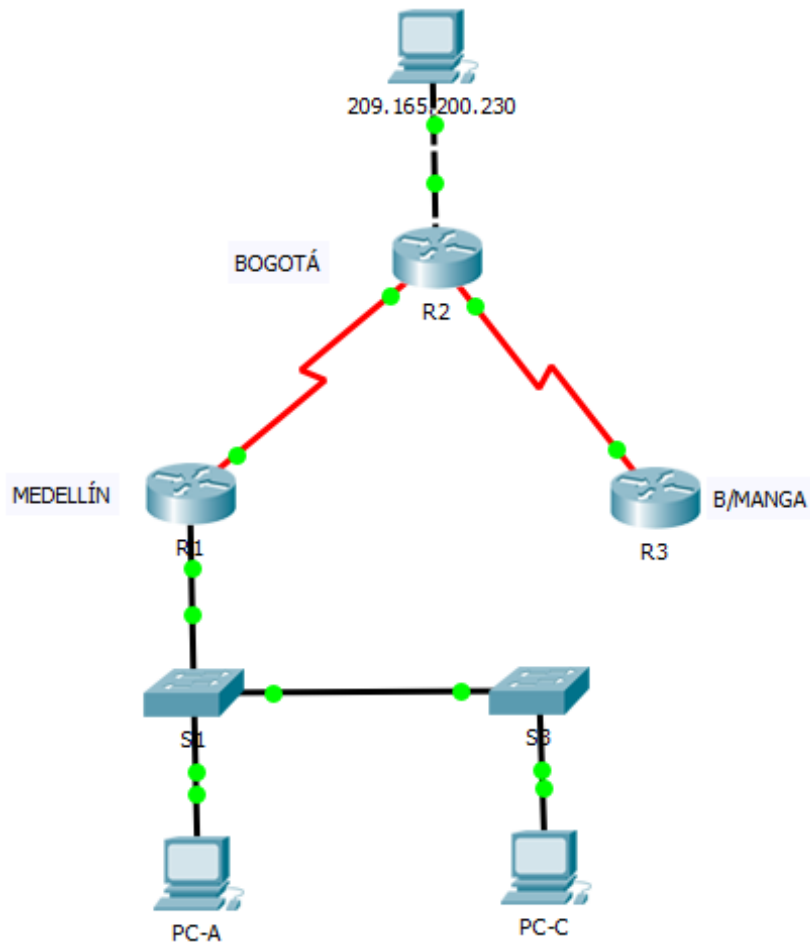


Ilustración 2 Topología realizada en Packet Tracer

### Tabla de direccionamiento:

Tabla 1 Direccionamiento IP

Dispositivo	Interfaz	Dirección IP	Mascara de subred	Gateway predeterminado
R1	F0/0	172.31.1.1	255.255.255.0	N/A
	S0/0/0	172.31.21.1	255.255.255.252	N/A
R2	F0/0 (Simulación internet)	209.165.200.225	255.255.255.248	N/A
	S0/0/0	172.31.23.1	255.255.255.252	N/A

	S0/0/1	172.31.21.2	255.255.255.252	N/A
	Lo4	10.10.10.10	255.255.255.255	
<b>R3</b>	S0/0/1	172.31.23.2	255.255.255.252	N/A
	Lo4	192.168.4.0	255.255.255.255	N/A
	Lo5	192.168.5.0	255.255.255.255	N/A
	Lo6	192.168.6.0	255.255.255.255	N/A
<b>S1</b>		192.168.99.2		
<b>S3</b>		192.168.99.3		
<b>PC-A</b>	NIC	172.31.1.2	255.255.255.0	172.31.1.1
<b>PC-C</b>	C	172.31.1.3	255.255.255.0	172.31.1.1
<b>PC - Internet</b>	NIC	209.165.200.230	255.255.255.248	209.165.200.225

```

R1(config)#interface fastEthernet 0/0
R1(config-if)#description Conecta al R1 (Medellin) a las VLAN 30
(Administracion) y 40 (Mercadeo)
R1(config-if)#ip address 172.31.1.1 255.255.255.0
R1(config-if)#no shutdown
R1(config-if)#interface s0/0/0
R1(config-if)#description Conecta al R1 (Medellin) con R2(Bogota)
R1(config-if)#ip address 172.31.21.1 255.255.255.252
R1(config-if)#clock rate 128000
R1(config-if)#no shutdown
R1(config-if)#

```

```

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

```

```

R1#copy run start
Destination filename [startup-config]?
Building configuration...
[OK]

```

```

R2#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#interface s0/0/0
R2(config-if)#description
% Incomplete command.
R2(config-if)#description Conecta al R2 (Bogota) y el R3 (Bucaramanga)
R2(config-if)#ip address 172.31.23.1 255.255.255.252
R2(config-if)#clock rate 128000
R2(config-if)#no shutdown

```

```

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down
R2(config-if)#interface s0/0/1
R2(config-if)#description Conecta R2(Bogota) con R1(Medellin)
R2(config-if)#ip address 172.31.21.2 255.255.255.252
R2(config-if)#no shutdown

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

R2(config-if)#end
R2#
%SYS-5-CONFIG_I: Configured from console by console

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

R2#copy run start
Destination filename [startup-config]?
Building configuration...
[OK]
R2#

R2(config)#interface fa0/0
R2(config-if)#description Salida a internet
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 FastEthernet0/0, changed state to up

R2(config-if)#

R2(config)#interface lo4

R2(config-if)#
%LINK-5-CHANGED: Interface Loopback4, changed state to up

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

R2(config-if)#ip address 10.10.10.10 255.255.255.255
R2(config-if)#end

R3#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#banner motd #Prohibido el acceso no autorizado#
R3(config)#interface s0/0/1
R3(config-if)#description Conecta R3(Bucaramanga) a R2(Bogota)

```

```
R3(config-if)#ip address 172.31.23.2 255.255.255.252
R3(config-if)#no shutdown

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

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

R3(config-if)#end
R3#
%SYS-5-CONFIG_I: Configured from console by console

R3(config)#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 192.168.4.0 255.255.255.255
R3(config-if)#
R3(config-if)#end
R3#
%SYS-5-CONFIG_I: Configured from console by console

R3#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#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 192.168.5.0 255.255.255.255
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 192.168.6.0 255.255.255.255
R3(config-if)#end
R3#
%SYS-5-CONFIG_I: Configured from console by console
```

```

R3#copy run start
Destination filename [startup-config]?
Building configuration...
[OK]
R3#

```

## 2.2 CONFIGURACIÓN OSPF

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

*Ilustración 3 Configuración OSPF*

### Configuración del protocolo OSPFv2:

```

R1(config)#router ospf 1
R1(config-router)#network 172.31.1.0 0.0.0.255 area 0
R1(config-router)#network 172.31.21.0 0.0.0.3 area 0
R1(config-router)#end

```

```

R2#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#router ospf 1
R2(config-router)#network 172.31.2.0 0.0.0.255 area 0
R2(config-router)#network 172.31.23.0 0.0.0.3 area 0
R2(config-router)#network 172.31.21.0 0.0.0.3 area 0
R2(config-router)#network 209.165.200.224 0.0.0.7 area 0
R2(config-router)#

```

```

R3#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#router ospf 1
R3(config-router)#network 172.31.23.0 0.0.0.3 area 0
R3(config-router)#

```



```

R2#show ip ospf neighbor

Neighbor ID      Pri   State           Dead Time   Address       Interface
172.31.23.2      0     FULL/ -         00:00:35   172.31.23.2   Serial0/0/0
172.31.21.1      0     FULL/ -         00:00:31   172.31.21.1   Serial0/0/1
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 172.31.23.1
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    172.31.2.0 0.0.0.255 area 0
    172.31.23.0 0.0.0.3 area 0
    172.31.21.0 0.0.0.3 area 0
  Routing Information Sources:
    Gateway         Distance      Last Update
    172.31.21.1     110           00:06:16
    172.31.23.1     110           00:03:36
    172.31.23.2     110           00:03:36
  Distance: (default is 110)

R2#

```

*Ilustración 4 Evidencia configuración OSPF*

## **Configuración de ID para los router a través de direcciones loopback:**

```
R1(config)#interface lo0
```

```
R1(config-if)#
```

```
%LINK-5-CHANGED: Interface Loopback0, changed state to up
```

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

```
R1(config-if)#ip address 1.1.1.1 255.255.255.255
```

```
R1(config-if)#
```

```
R2#configure terminal
```

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

```
R2(config)#interface lo0
```

```
R2(config-if)#ip address 2.2.2.2 255.255.255.255
```

```
R2(config-if)#end
```

```
R3#configure terminal
```

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

```
R3(config)#interface lo0
```

```
R3(config-if)#ip address 3.3.3.3 255.255.255.255
```

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

```

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:
    172.31.1.0 0.0.0.255 area 0
    172.31.21.0 0.0.0.3 area 0
  Routing Information Sources:
    Gateway         Distance      Last Update
    1.1.1.1          110           00:02:26
    2.2.2.2          110           00:02:26
    3.3.3.3          110           00:02:32
    172.31.21.1     110           00:23:48
    172.31.23.1     110           00:03:19
    172.31.23.2     110           00:21:08
  Distance: (default is 110)

R1#

```

*Ilustración 5 Configuración de OSPF R1*

```

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:
    172.31.2.0 0.0.0.255 area 0
    172.31.23.0 0.0.0.3 area 0
    172.31.21.0 0.0.0.3 area 0
  Routing Information Sources:
    Gateway         Distance      Last Update
    1.1.1.1          110           00:01:10
    2.2.2.2          110           00:01:10
    3.3.3.3          110           00:01:16
    172.31.21.1     110           00:22:32
    172.31.23.1     110           00:02:03
    172.31.23.2     110           00:19:52
  Distance: (default is 110)

```

*Ilustración 6 Configuración OSPF R2*

```

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
  Routing Information Sources:
    Gateway         Distance      Last Update
    1.1.1.1          110          00:04:01
    2.2.2.2          110          00:04:01
    3.3.3.3          110          00:04:07
    172.31.21.1     110          00:25:23
    172.31.23.1     110          00:04:54
    172.31.23.2     110          00:22:43
  Distance: (default is 110)

```

*Ilustración 7 Configuración OSPF R3*

## Configuración de interfaces LAN como pasivas:

Inicialmente se emite el comando **passive-interface default** en los routers para que todas las interfaces pasen al modo pasivo:

```

R1(config)#router ospf 1
R1(config-router)#passi
R1(config-router)#passive-interface default
R1(config-router)#
00:08:58: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on Serial0/0/0 from FULL to
DOWN, Neighbor Down: Interface down or detached

```

```

R2#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#router ospf 1
R2(config-router)#passive-interface default
R2(config-router)#
00:09:33: %OSPF-5-ADJCHG: Process 1, Nbr 3.3.3.3 on Serial0/0/0 from FULL to
DOWN, Neighbor Down: Interface down or detached
R2(config-router)#

```

```

R3#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#router ospf 1
R3(config-router)#passive-interface default

```

```
R3(config-router)#end
R3#
%SYS-5-CONFIG_I: Configured from console by console

Serial0/0/1 is up, line protocol is up
  Internet address is 172.31.23.2/30, Area 0
  Process ID 1, Router ID 3.3.3.3, Network Type POINT-TO-POINT,
  Cost: 64
  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
  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
  Suppress hello for 0 neighbor(s)
R3#
```

*Ilustración 8 Evidencia interfaces pasivas*

**Posteriormente se activa en cada router las interfaces adecuadas como no pasivas:**

```
R1(config)#router ospf 1
R1(config-router)#no passive-interface s0/0/0
```

```

FastEthernet0/0 is up, line protocol is up
  Internet address is 172.31.1.1/24, Area 0
  Process ID 1, Router ID 1.1.1.1, 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)
Serial10/0/0 is up, line protocol is up
  Internet address is 172.31.21.1/30, Area 0
  Process ID 1, Router ID 1.1.1.1, Network Type POINT-TO-POINT, Cost: 64
  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 00:00:09
  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 2.2.2.2
  Suppress hello for 0 neighbor(s)

```

*Ilustración 9 Interfaces pasivas y no pasivas*

```

R2#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#router ospf 1
R2(config-router)#no passive-interface s0/0/1
R2(config-router)#no passive-interface s0/0/0
R2(config-router)#end
R2#

```

```

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: 64
  Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
  No designated router on this network
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
  Hello due in 00:00:00
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  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: 64
  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 00:00:06
  Index 2/2, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1 , Adjacent neighbor count is 1
    Adjacent with neighbor 3.3.3.3
  Suppress hello for 0 neighbor(s)

```

```

R3(config)#router ospf 1
R3(config-router)#no passive-interface s0/0/1
R3(config-router)#end

```

```

R3#
%SYS-5-CONFIG_I: Configured from console by console

R3#copy run start
Destination filename [startup-config]?
Building configuration...
[OK]
R3#show ip ospf interface s0/0/1

Serial0/0/1 is up, line protocol is up
  Internet address is 172.31.23.2/30, Area 0
  Process ID 1, Router ID 3.3.3.3, Network Type POINT-TO-POINT,
Cost: 64
  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,
Retransmit 5
  Hello due in 00:00:01
  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
  Suppress hello for 0 neighbor(s)
R3#

```

## Establecer el ancho de banda para enlaces seriales:

```
R1(config)#interface s0/0/0
R1(config-if)#bandwidth 128
R1(config-if)#end
```

```
R1#show interface s0/0/0
Serial0/0/0 is up, line protocol is up (connected)
  Hardware is HD64570
  Description: Conecta al R1 (Medellin) con R2(Bogota)
  Internet address is 172.31.21.1/30
  MTU 1500 bytes, BW 128 Kbit, DLY 20000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
```

*Ilustración 10 Establecimiento de ancho de banda*

```
R2(config)#interface s0/0/0
R2(config-if)#bandwidth 128
```

```
R2#show interface s0/0/0
Serial0/0/0 is up, line protocol is up (connected)
  Hardware is HD64570
  Description: Conecta al R2 (Bogota) y el R3 (Bucaramanga)
  Internet address is 172.31.23.1/30
  MTU 1500 bytes, BW 128 Kbit, DLY 20000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
```

```
R2(config-if)#interface s0/0/1
R2(config-if)#bandwidth 128
R2(config-if)#end
```

```
R2#show interface s0/0/1
Serial0/0/1 is up, line protocol is up (connected)
  Hardware is HD64570
  Description: Conecta R2(Bogota) con R1(Medellin)
  Internet address is 172.31.21.2/30
  MTU 1500 bytes, BW 128 Kbit, DLY 20000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
```

```
R3(config)#interface s0/0/1
R3(config-if)#bandwidth 128
R3(config-if)#end
```

```
Serial0/0/1 is up, line protocol is up (connected)
  Hardware is HD64570
  Description: Conecta R3(Bucaramanga) a R2(Bogota)
  Internet address is 172.31.23.2/30
  MTU 1500 bytes, BW 128 Kbit, DLY 20000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
```

## Ajustar el costo en la métrica en S0/0/0 (R1 y R2)

```
R1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#interface s0/0/0
R1(config-if)#ip ospf cost 7500
R1(config-if)#end
```

```
R2#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#interface s0/0/0
R2(config-if)#ip ospf cost 7500
R2(config-if)#end
```

## Verificar información de OSPF

- ✓ Visualizar tablas de enrutamiento y routers conectados por OSPFv2

```
R1#show ip route ospf
      172.31.0.0/16 is variably subnetted, 3 subnets, 2 masks
O       172.31.23.0 [110/15000] via 172.31.21.2, 00:03:16, Serial0/0/0
R1#
```

Ilustración 11 Costo de la métrica

```
R2#show ip route ospf
      172.31.0.0/16 is variably subnetted, 3 subnets, 2 masks
O       172.31.1.0 [110/782] via 172.31.21.1, 00:39:31, Serial0/0/1
```

```
R3#show ip route ospf
      172.31.0.0/16 is variably subnetted, 3 subnets, 2 masks
O       172.31.1.0 [110/1563] via 172.31.23.1, 00:40:35, Serial0/0/1
O       172.31.21.0 [110/1562] via 172.31.23.1, 00:40:35, Serial0/0/1
```

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

Se presenta error en la ejecución del comando *show ip ospf interface brief*

```
R2#show ip ospf interface brief
      ^
% Invalid input detected at '^' marker.
```

- ✓ Visualizar el OSPF Process ID, Router ID, Address summarizations, Routing Networks, and passive



interfaces configuradas en cada router.

```
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:
    172.31.1.0 0.0.0.255 area 0
    172.31.21.0 0.0.0.3 area 0
  Passive Interface(s):
    Vlan1
    FastEthernet0/0
    FastEthernet0/1
    Serial0/0/1
    Loopback0
  Routing Information Sources:
    Gateway         Distance      Last Update
    1.1.1.1          110          00:23:50
    2.2.2.2          110          00:19:30
    3.3.3.3          110          00:24:37
  Distance: (default is 110)
```

*Ilustración 12 Configuración de interfaces*

```
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:
    172.31.2.0 0.0.0.255 area 0
    172.31.23.0 0.0.0.3 area 0
    172.31.21.0 0.0.0.3 area 0
  Passive Interface(s):
    Vlan1
    FastEthernet0/0
    FastEthernet0/1
    Loopback0
  Routing Information Sources:
    Gateway         Distance      Last Update
    1.1.1.1          110          00:19:52
    2.2.2.2          110          00:15:32
    3.3.3.3          110          00:20:39
  Distance: (default is 110)
```

*Ilustración 13 Información del protocolo OSPF*

```

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
  Passive Interface(s):
    Vlan1
    FastEthernet0/0
    FastEthernet0/1
    Serial0/0/0
    Loopback0
  Routing Information Sources:
    Gateway         Distance      Last Update
    1.1.1.1          110           00:24:38
    2.2.2.2          110           00:20:18
    3.3.3.3          110           00:25:25
  Distance: (default is 110)

```

## 2.3 CONFIGURACIÓN DE VLAN Y PUERTOS

### Creación de las VLANs

```

S1#vlan database
% Warning: It is recommended to configure VLAN from config mode,
as VLAN database mode is being deprecated. Please consult user
documentation for configuring VTP/VLAN in config mode.

S1(vlan)#vlan 30
VLAN 30 added:
Name: VLAN0030
S1(vlan)#vlan 40
VLAN 40 added:
Name: VLAN0040
S1(vlan)#vlan 200
VLAN 200 added:
Name: VLAN0200

S1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
S1(config)#interface vlan 30
S1(config-if)#
%LINK-5-CHANGED: Interface Vlan30, changed state to up

S1(config-if)#desc
S1(config-if)#description Administracion
S1(config-if)#end
S1#

```

```
%SYS-5-CONFIG_I: Configured from console by console

S1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
S1(config)#interface vlan 40
S1(config-if)#
%LINK-5-CHANGED: Interface Vlan40, changed state to up

S1(config-if)#descrip
S1(config-if)#description Mercadeo
S1(config-if)#interface vlan 200
S1(config-if)#
%LINK-5-CHANGED: Interface Vlan200, changed state to up

S1(config-if)#desc
S1(config-if)#description Mantenimiento
S1(config-if)#end
S1#
%SYS-5-CONFIG_I: Configured from console by console

S1#copy run start

S3#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
S3(config)#interface vlan 40
S3(config-if)#
%LINK-5-CHANGED: Interface Vlan40, changed state to up

S3(config-if)#description Mercadeo
S3(config-if)#interface vlan 30
S3(config-if)#
%LINK-5-CHANGED: Interface Vlan30, changed state to up

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

S3(config-if)#description Mantenimiento
```

## Configuración puertos troncales y de acceso

```
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 Vlan30, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan40, 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)#

S1(config)#interface f0/24
S1(config-if)#switchport mode trunk

S1(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/24, changed
state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/24, changed
state to up

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

S1(config-if)#interface f0/1
S1(config-if)#switchport mode access

S1(config-if)#switchport access vlan 30
S1(config-if)#exit

S1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
S1(config)#interface f0/2
S1(config-if)#switchport mode access
S1(config-if)#exit
S1(config)#

S1(config)#interface range f0/4 - f0/24
S1(config-if-range)#switchport mode access
S1(config-if-range)#exit
S1(config)#
```

```
S3#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
S3(config)#interface f0/3
S3(config-if)#switchport mode trunk
S3(config-if)#switchport trunk native vlan 1
S3(config-if)#interface f0/2
S3(config-if)#switchport mode access
S3(config-if)#interface range f0/4 - f0/24
S3(config-if-range)#switchport mode access
S3(config-if-range)#exit
S3#
%SYS-5-CONFIG_I: Configured from console by console
```

```
S3#copy run start
Destination filename [startup-config]?
Building configuration...
[OK]
S3#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
S3(config)#interface f0/1
S3(config-if)#switchport mode access
S3(config-if)#switchport access vlan 30
S3(config-if)#exit
S3(config)#
```

## Inter VLAN routing

```
S1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
S1(config)#interface vlan 30
S1(config-if)#ip address 192.168.30.2 255.255.255.0
S1(config-if)#no shutdown
S1(config-if)#exit
S1(config)#ip default-gateway 192.168.30.1
S1(config)#interface f0/3
S1(config-if)#switchport mode trunk

S3(config)#interface vlan 30
S3(config-if)#ip address 192.168.30.3 255.255.255.0
S3(config-if)#no shutdown
S3(config-if)#exit
S3(config)#ip default-gateway 192.168.30.1
S3(config)#interface f0/3
S3(config-if)#switchport mode trunk
S3(config-if)#end

R1(config)#interface f0/0
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#interface f0/0.30
```

```
R1(config-subif)#ip address 192.168.30.1 255.255.255.0
R1(config-subif)#end
```

## 2.4 DESHABILITAR DNS LOOKUP EN S3

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

```
S3#show run | include domain-lookup
no ip domain-lookup
S3#
```

## 2.5 CONFIGURACIÓN IP DE LOS SWITCHES

```
S1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
S1(config)#interface vlan 1
S1(config-if)#ip address 192.168.30.2 255.255.255.0
S1(config-if)#no shutdown
S1(config-if)#exit
```

```
S3(config)#interface vlan 1
S3(config-if)#ip address 192.168.30.3 255.255.255.0
S3(config-if)#no shutdown
S3(config-if)#end
```

## 2.6 DESACTIVAR INTERFACES NO USADAS

```
S1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
S1(config)#interface range f0/4 - f0/23
S1(config-if-range)#shutdown
```

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

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

```
%LINK-5-CHANGED: Interface FastEthernet0/6, changed state to
administratively down
```

%LINK-5-CHANGED: Interface FastEthernet0/7, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/8, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/9, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/10, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/11, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/12, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/13, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/14, changed state to administratively down

%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

S1(config-if-range)#

S3(config)#interface range f0/4 - f0/24

S3(config-if-range)#shutdown

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

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

%LINK-5-CHANGED: Interface FastEthernet0/6, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/7, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/8, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/9, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/10, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/11, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/12, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/13, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/14, changed state to administratively down

%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
S3(config-if-range)#
```

## 2.7 IMPLEMENTAR DHCP Y NAT PARA IPV4

### Configuración DHCP R1

#### VLAN 30

```
R1#configure terminal
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)#dns-server 10.10.10.11
R1(dhcp-config)#default-router 192.168.30.1
R1(dhcp-config)#domain-name ccna-unad.com
^
% Invalid input detected at '^' marker.
R1(dhcp-config)#
```

#### VLAN 40

```
R1(config)#ip dhcp pool MERCADEO
R1(dhcp-config)#netwo
R1(dhcp-config)#network 192.168.40.0 255.255.255.0
R1(dhcp-config)#defaul
R1(dhcp-config)#default-router 192.168.30.1
R1(dhcp-config)#dns
R1(dhcp-config)#dns-server 10.10.10.11
R1(dhcp-config)#
```

### Reserva de IPs para configuración estática

```
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)#
```

## Configuración de NAT en R2

```
R2#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#ip nat pool INTERNET 209.165.200.225 209.165.200.228 netmask
255.255.255.248
R2(config)#access-list 1 permit 192.168.0.0 0.0.0.255
R2(config)#ip nat inside source list 1 pool INTERNET
R2(config)#interface s0/0/0
R2(config-if)#ip nat inside
R2(config-if)#interface s0/0/1
R2(config-if)#ip nat inside
R2(config-if)#interface f0/0
R2(config-if)#ip nat outside
R2(config-if)#
```

## NAT estático al servidor Web

```
R2(config)#ip nat inside source static 10.10.10.10 209.165.200.229
R2(config)#interface s0/0/1
R2(config-if)#ip nat inside
R2(config-if)#interface f0/0
R2(config-if)#ip nat outside
```

## Configuración de listas de acceso

Configurar una lista de acceso para permitir que solamente el R1 acceda al R2 mediante telnet:

```
R2#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#access-list 101 permit tcp host 172.31.23.2 host 172.31.23.1 eq
telnet
R2(config)#exit
R2#
%SYS-5-CONFIG_I: Configured from console by console
R2#
```

```
R2#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#interface s0/0/0
R2(config-if)#ip access
R2(config-if)#ip access-group 101 in
R2(config-if)#line vty 0 15
R2(config-line)#login local
R2(config-line)#
04:52:50: %OSPF-5-ADJCHG: Process 1, Nbr 3.3.3.3 on Serial0/0/0 from FULL to
DOWN, Neighbor Down: Dead timer expired
```

```
04:52:50: %OSPF-5-ADJCHG: Process 1, Nbr 3.3.3.3 on Serial0/0/0 from FULL to  
DOWN, Neighbor Down: Interface down or detached
```

```
R2(config-line)#
```

Permitir que los hosts de Internet tengan acceso WWW al servidor web simulado en el R2 por medio del acceso a la dirección de NAT estática (209.165.200.229).

```
R2(config)#access-list 102 permit tcp any host 209.165.200.229 eq www  
R2(config)#interface f0/0  
R2(config-if)#ip access-group 102 in  
R2(config-if)#
```

```
R2(config-if)#interface s0/0/0  
R2(config-if)#ip access-group 102 in  
R2(config-if)#
```

```
R3#configure terminal  
Enter configuration commands, one per line. End with CNTL/Z.  
R3(config)#interface s0/0/1  
R3(config-if)#ip access-group 102 in  
R3(config-if)#end  
R3#  
%SYS-5-CONFIG_I: Configured from console by console
```

```
R3#copy run start  
Destination filename [startup-config]?  
Building configuration...  
[OK]  
R3#
```

```
R2#show access-lists  
Standard IP access list 1  
 10 permit 192.168.0.0 0.0.0.255  
Extended IP access list 101  
 10 permit tcp host 172.31.23.2 host 172.31.23.1 eq telnet  
Extended IP access list 102  
 10 permit tcp any any eq www  
 20 permit tcp any host 209.165.200.229 eq www
```

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