Cisco Networking Academy® Mind Wide Open™

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

EVALUACIÓN – PRUEBA DE HABILIDADES PRÁCTICAS CCNA

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OBJETIVO GENERAL

- Identificar el grado de desarrollo de competencias y habilidades que fueron adquiridas a lo largo del diplomado y a través de la cual se pondrá a prueba los niveles de comprensión y solución de problemas relacionados con diversos aspectos de Networking

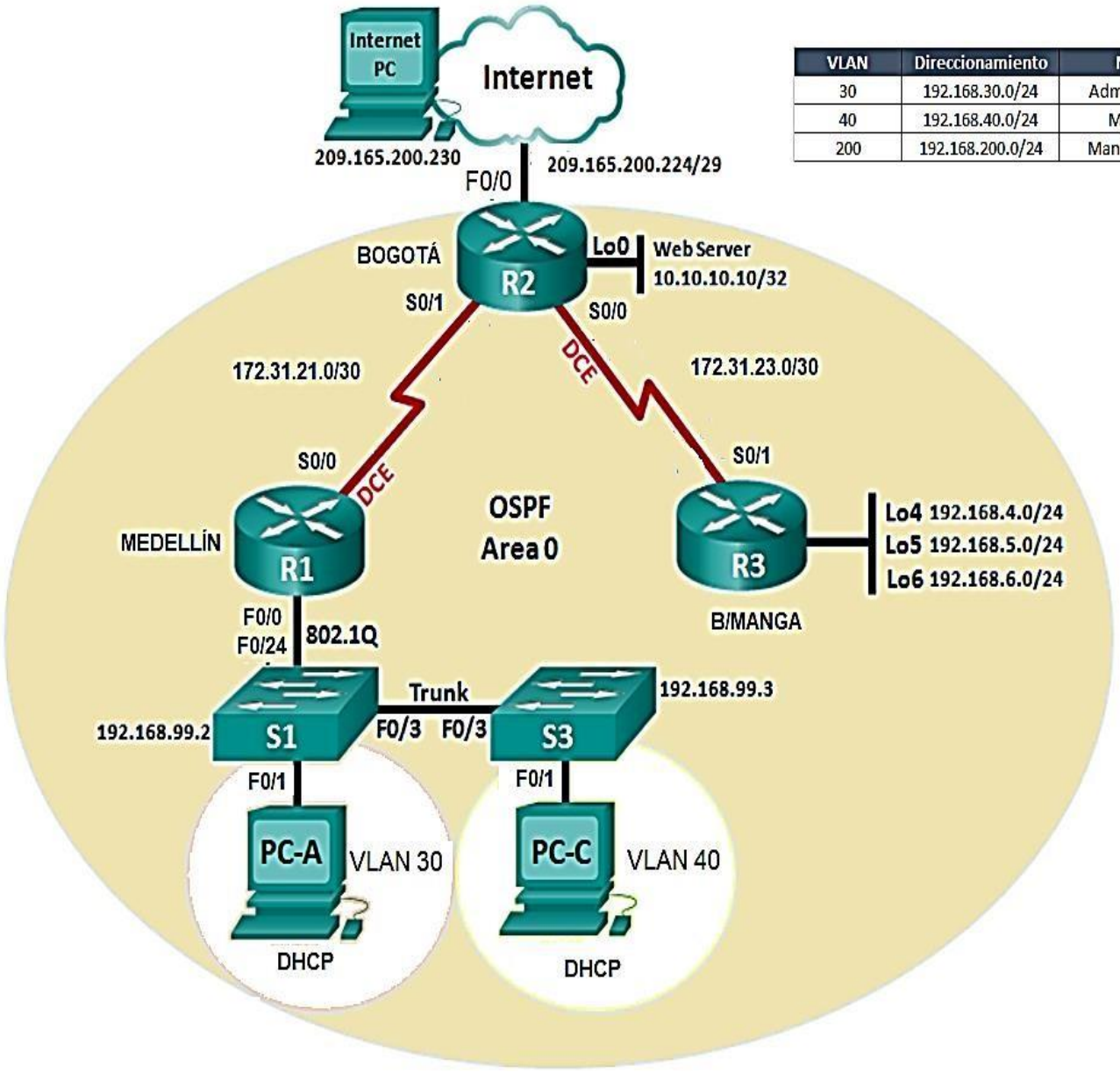
OBJETIVOS ESPECIFICOS

- Identificar y solucionar problemas propios de enrutamiento mediante el uso adecuado de estrategias basadas en comandos del IOS y estadísticas de tráfico en las interfaces.
- Determinar y diseñar Listas de control de acceso
- Diseñar topología OSPF de una sola área
- Realizar Enrutamiento Dinámico

Descripción del escenario propuesto para la prueba de habilidades

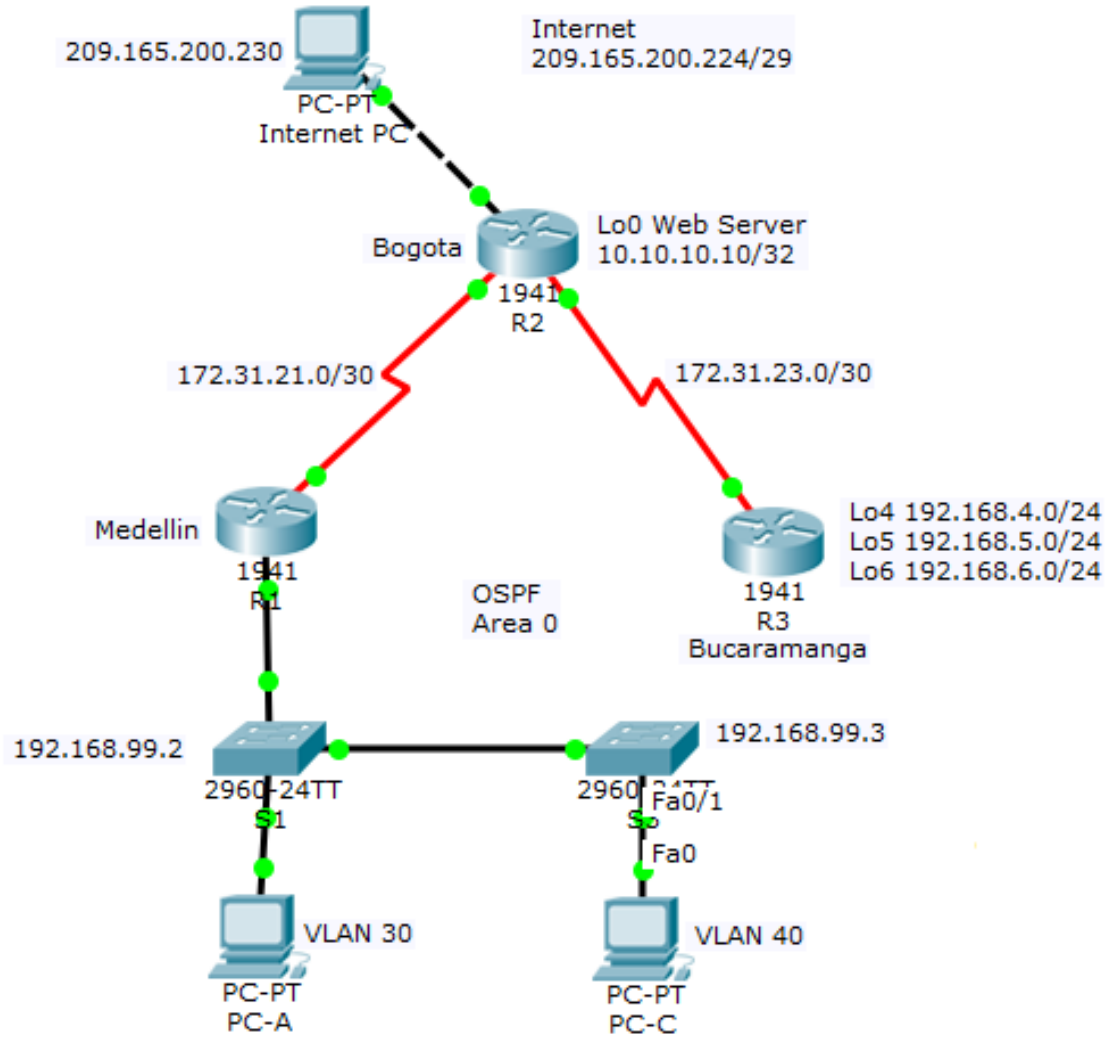
Escenario: Una empresa de Tecnología posee tres sucursales distribuidas en las ciudades de Bogotá, Medellín y Bucaramanga, en donde el estudiante será el administrador de la red, el cual deberá configurar e interconectar entre sí cada uno de los dispositivos que forman parte del escenario, acorde con los lineamientos establecidos para el direccionamiento IP, protocolos de enrutamiento y demás aspectos que forman parte de la topología de red.

Topología de red

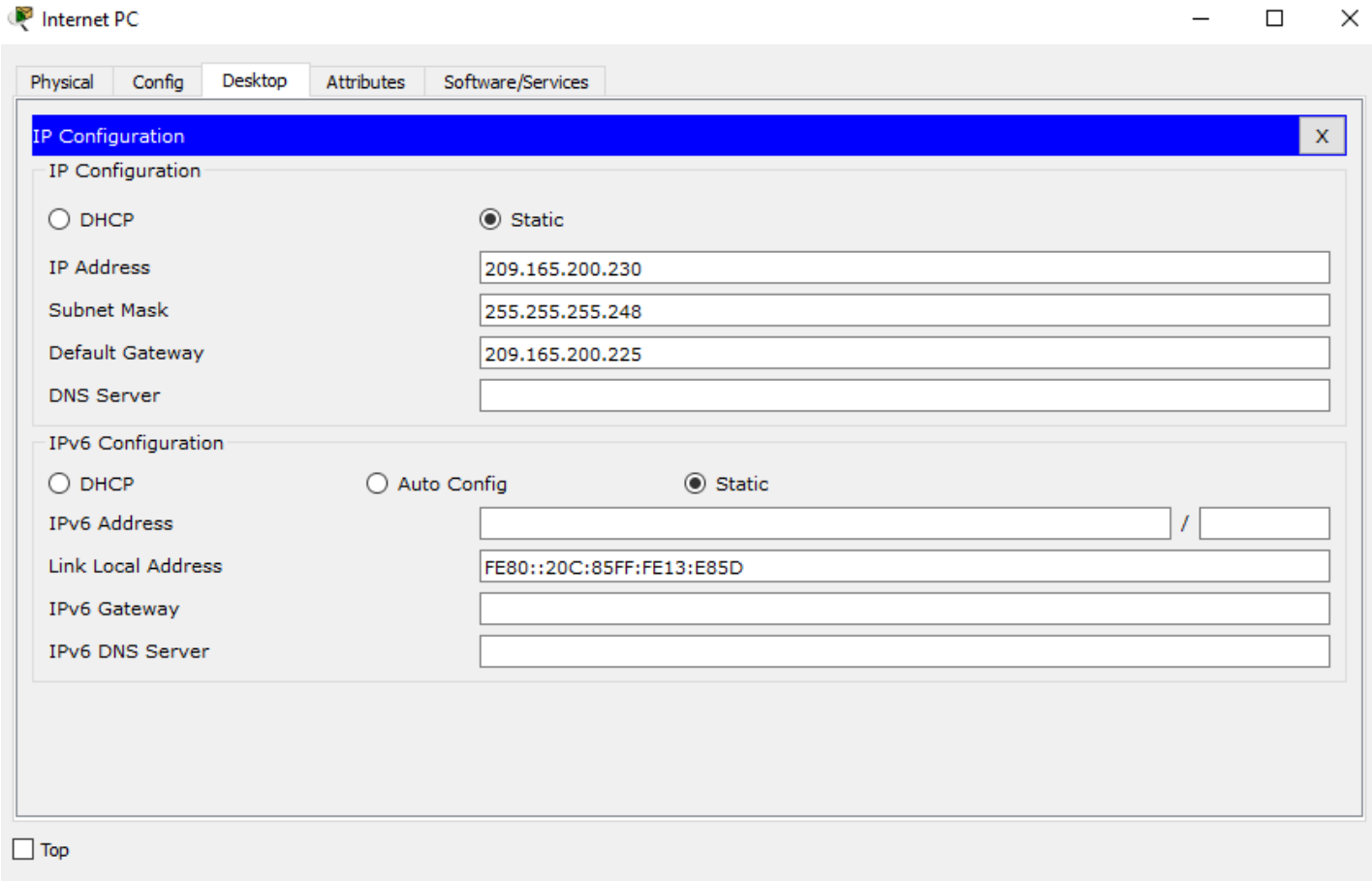


VLAN	Direccionamiento	Nombre
30	192.168.30.0/24	Administración
40	192.168.40.0/24	Mercadeo
200	192.168.200.0/24	Mantenimiento

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



Configuración de direccionamiento de **Internet PC**



Configuración direccionamiento **R1**

```
R1>en
R1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#int s0/0/0
R1(config-if)#description connection to R2
R1(config-if)#ip address 172.31.21.1 255.255.255.252
R1(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down
R1(config-if)#
```

Copy Paste

Configuración direccionamiento **R2**

```
R2>en
R2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#int s0/0/1
R2(config-if)#description connection to R1
R2(config-if)#ip address 172.31.21.2 255.255.255.252
R2(config-if)#int s0/0/0
R2(config-if)#description connection to R3
R2(config-if)#ip address 172.31.23.1 255.255.255.252
R2(config-if)#
```

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Configuración **loopback R2**

```
R2(config-if)#int g0/0
R2(config-if)#description connection to 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 GigabitEthernet0/0, changed state to
up

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

R2(config-if)#int loopback 0

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

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

R2(config-if)#ip address 10.10.10.10 255.255.255.255
R2(config-if)#description connection to simulated web server
R2(config-if)#exit
R2(config)#end
R2#
```

Configuración loopback y direccionamiento **R3**

```
R3>en
R3#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#int s0/0/1
R3(config-if)#description connection to R2
R3(config-if)#ip address 172.31.23.2 255.255.255.252
R3(config-if)#no shutdown

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

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

```
R3(config)#interface 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)#interface 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)#interface loopback 6

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

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

R3(config-if)#ip address 192.168.6.1 255.255.255.0
R3(config-if)#exit
```

Configuración del protocolo de enrutamiento OSPFv2:

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

R1

```
R1>en
R1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#router ospf 2
R1(config-router)#router-id 1.1.1.1
R1(config-router)#passive-interface g0/0
R1(config-router)#passive-interface g0/1
R1(config-router)#network 172.31.21.0 0.0.0.3 area 0
R1(config-router)#
00:16:15: %OSPF-5-ADJCHG: Process 2, Nbr 2.2.2.2 on Serial0/0/0
from LOADING to FULL, Loading Done

R1(config-router)#do show

R1(config)#
R1(config)#interface serial 0/0/0
R1(config-if)#ip ospf cost 7500
R1(config-if)#bandwidth 128
R1(config-if)#exit
R1(config)#
```

R2

```
R2>en
R2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#router ospf 2
R2(config-router)#router-id 2.2.2.2
R2(config-router)#passive-interface
% Incomplete command.
R2(config-router)#passive-interface g0/0
R2(config-router)#passive-interface g0/1
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)#int se0/0/0
R2(config-if)#ip ospf cost 7500
R2(config-if)#bandwidth 128
R2(config-if)#exit
R2(config)#
```

R3

```
R3>en
R3#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#router ospf 2
R3(config-router)#router-id 3.3.3.3
R3(config-router)#passive-interface g0/0
R3(config-router)#passive-interface g0/1
R3(config-router)#network 172.31.23.0 0.0.0.3 area 0
R3(config-router)#
00:22:22: %OSPF-5-ADJCHG: Process 2, Nbr 2.2.2.2 on Serial0/0/1
from LOADING to FULL, Loading Done

R3(config-router)#
```

```
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#interface serial 0/0/0
R3(config-if)#ip ospf cost 7500
R3(config-if)#bandwidth 128
R3(config-if)#exit
R3(config)#
```

Verificación de 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.

```
R1>en
Password:
R1#show ip protocols

Routing Protocol is "ospf 2"
  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
  Passive Interface(s):
    GigabitEthernet0/0
    GigabitEthernet0/1
  Routing Information Sources:
    Gateway         Distance      Last Update
    1.1.1.1              110      00:07:27
    2.2.2.2              110      00:03:32
    3.3.3.3              110      00:03:33
  Distance: (default is 110)
```

```
R1#show ip ospf interface

Serial0/0/0 is up, line protocol is up
  Internet address is 172.31.21.1/30, Area 0
  Process ID 2, Router ID 1.1.1.1, Network Type POINT-TO-POINT,
Cost: 7500
  Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
  No designated router on this network
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40,
Retransmit 5
    Hello due in 00:00:08
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1 , Adjacent neighbor count is 1
    Adjacent with neighbor 2.2.2.2
  Suppress hello for 0 neighbor(s)
R1#
```

```
R2#show ip protocols

Routing Protocol is "ospf 2"
  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
  Passive Interface(s):
    GigabitEthernet0/0
    GigabitEthernet0/1
  Routing Information Sources:
    Gateway         Distance      Last Update
    1.1.1.1              110      00:05:30
    2.2.2.2              110      00:01:35
    3.3.3.3              110      00:01:36
  Distance: (default is 110)
```

```
R2#show ip ospf interface

Serial0/0/1 is up, line protocol is up
  Internet address is 172.31.21.2/30, Area 0
  Process ID 2, Router ID 2.2.2.2, Network Type POINT-TO-POINT,
Cost: 7500
  Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
  No designated router on this network
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40,
Retransmit 5
    Hello due in 00:00:03
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1 , Adjacent neighbor count is 1
    Adjacent with neighbor 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 2, 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
```

```
R3>en
Password:
R3#show ip protocols

Routing Protocol is "ospf 2"
  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):
    GigabitEthernet0/0
    GigabitEthernet0/1
  Routing Information Sources:
    Gateway         Distance      Last Update
    1.1.1.1              110      00:08:53
    2.2.2.2              110      00:04:58
    3.3.3.3              110      00:04:58
  Distance: (default is 110)

R3#
```

```
R3#show ip ospf interface

Serial0/0/1 is up, line protocol is up
  Internet address is 172.31.23.2/30, Area 0
  Process ID 2, Router ID 3.3.3.3, Network Type POINT-TO-POINT,
Cost: 7500
  Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
  No designated router on this network
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40,
Retransmit 5
    Hello due in 00:00:04
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1 , Adjacent neighbor count is 1
    Adjacent with neighbor 2.2.2.2
  Suppress hello for 0 neighbor(s)
R3#
```

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

Configuración **S1**

```
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)#
```

```
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 Vlan30, changed
state to up

S1(config-if)#switchport trunk native vlan1
                                          ^
% Invalid input detected at '^' marker.

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

```
S1(config-if)#int range fa0/1-2, f0/4-24, g0/1-2
S1(config-if-range)#switchport mode access
S1(config-if-range)#
```

```
S1(config-if-range)#switchport access vlan 30
S1(config-if-range)#int range fa0/2, fa0/4-23, g0/1-2
S1(config-if-range)#shutdown

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

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

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

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

Configuración **S3**

```
S3>en
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 Mantenimiento
                 ^
% Invalid input detected at '^' marker.

S3(config-vlan)#vlan 200
S3(config-vlan)#name Mantenimiento
S3(config-vlan)#int vlan 40
S3(config-if)#
%LINK-5-CHANGED: Interface Vlan40, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan40, 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)#int f0/3
S3(config-if)#switchport mode trunk
S3(config-if)#switchport trunk native vlan 1
S3(config-if)#int range fa0/2, fa0/4-24, g0/1-2
S3(config-if-range)#switchport mode access
S3(config-if-range)#int fa0/1
S3(config-if)#switchport access vlan 40
S3(config-if)#int range fa0/2, fa0/4-24, g0/1-2
S3(config-if-range)#shutdown

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

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

En el Switch 3 deshabilitar DNS lookup

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

Asignar direcciones IP a los Switches acorde a los lineamientos.

```
S1(config)#int vlan 30
S1(config-if)#
%LINK-5-CHANGED: Interface Vlan30, 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)#
```

Encapsulamiento, configuración de las 802.1, descripción de LAN

```
R1>en
R1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#int g0/0.30
R1(config-subif)#encapsulation dotlq 30
R1(config-subif)#ip address 192.168.30.1 255.255.255.0
R1(config-subif)#description Administrador LAN
R1(config-subif)#int g0/0.40
R1(config-subif)#encapsulation dotlq 40
R1(config-subif)#ip address 192.168.40.1 255.255.255.0
R1(config-subif)#description Mercadeo LAN
R1(config-subif)#int g0/0.200
R1(config-subif)#encapsulation dotlq 200
R1(config-subif)#ip address 192.168.200.1 255.255.255.0
R1(config-subif)#description Mantenimiento LAN
R1(config-subif)#int g0/0
R1(config-if)#no shutdown
```

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

Desactivación en **S1**

```
S1(config-if-range)#switchport mode access
S1(config-if-range)#int f0/6
S1(config-if)#switchport access vlan 30
S1(config-if)#int range fa0/2, fa0/4-5, fa0/7-23, g0/1-2
S1(config-if-range)#int fa0/1
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
```

Desactivación en **S3**

```
S3(config-if-range)#switchport mode access
S3(config-if-range)#int fa0/1
S3(config-if)#switchport access vlan 40
S3(config-if)#int range fa0/2, fa0/4-24, g0/1-2
S3(config-if-range)#shutdown

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

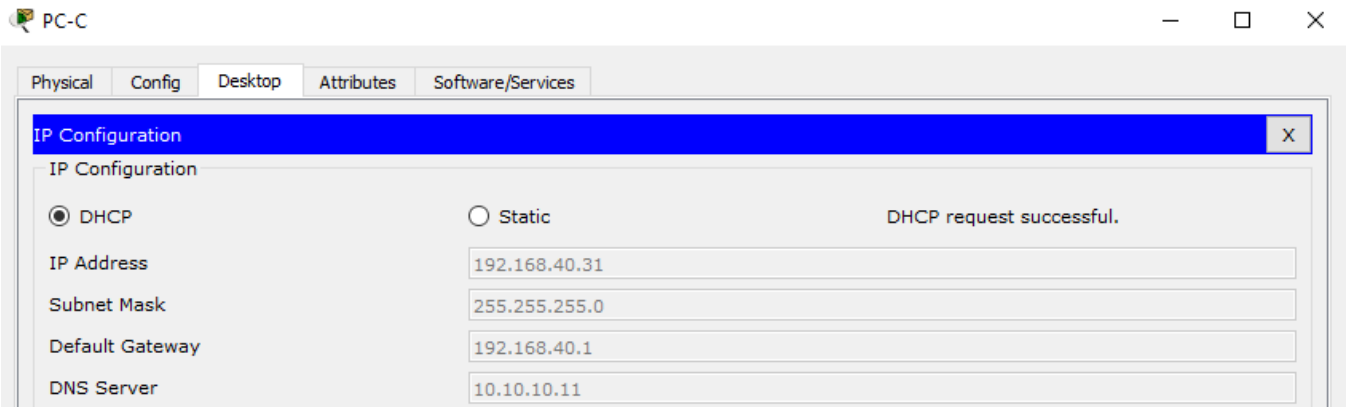
Implementación DHCP and NAT for IPv4

Configuración de R1 como servidor DHCP para las VLANs 30 y 40 y reservar las primeras 30 direcciones IP de las VLAN 30 y 40 para configuraciones estáticas.

```
R1>en
R1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#ip dhcp exluded-address 192.168.30.1 192.168.30.30
                   ^
% Invalid input detected at '^' marker.

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)#
```

La **PC-C** toma mediante DHCP una **ip** a partir de la 31 ya que de la 1 a la 30 están reservadas.



Configurar DHCP pool para VLAN 30:

Name: ADMINISTRACION DNS-Server: 10.10.10.11
Domain-Name: ccna-unad.com
Establecer default gateway.

```
R1(config)#
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)#domain-name ccna-unad.com
                  ^
% Invalid input detected at '^' marker.

R1(dhcp-config)#default-router 192.168.30.1
```

Configurar DHCP pool para VLAN 40:

Name: MERCADEO
DNS-Server: 10.10.10.11
Domain-Name: ccna-unad.com
Establecer default gateway.

```
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)#
R1(dhcp-config)#network 192.168.40.0 255.255.255.0
R1(dhcp-config)#
```

Configuración NAT en R2 para permitir que los hosts puedan salir a internet.

```
R2>en
R2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#
R2(config)#username user privilege 15 secret cisco
R2(config)#ip nat inside source static 10.10.10.10 209.165.200.229
R2(config)#int loopback 0
R2(config-if)#ip nat inside
R2(config-if)#int g0/0
R2(config-if)#ip nat outside
R2(config-if)#
R2(config-if)#
```

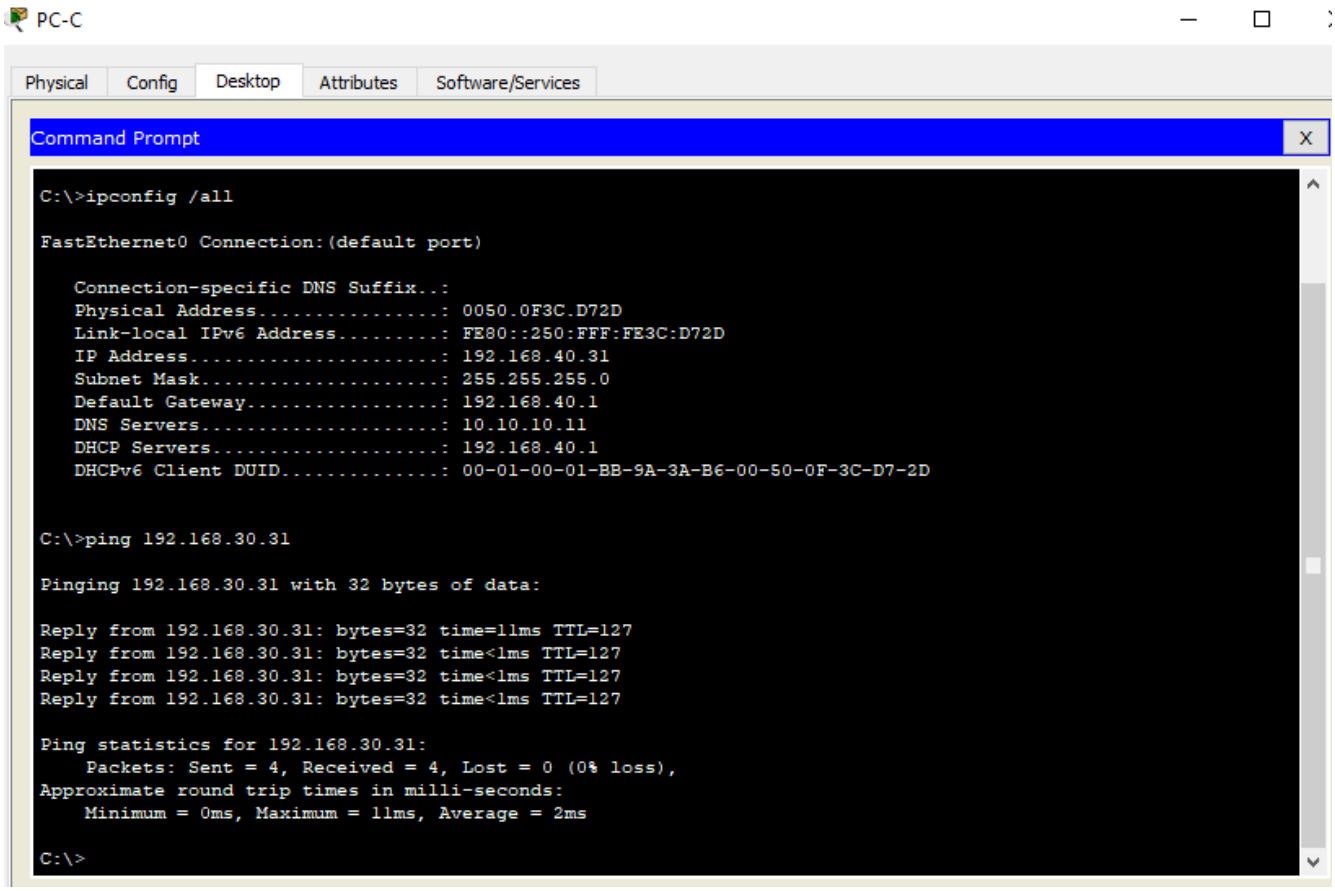
Configurar al menos dos listas de acceso de tipo estándar a su criterio en para restringir o permitir tráfico desde R1 o R3 hacia R2

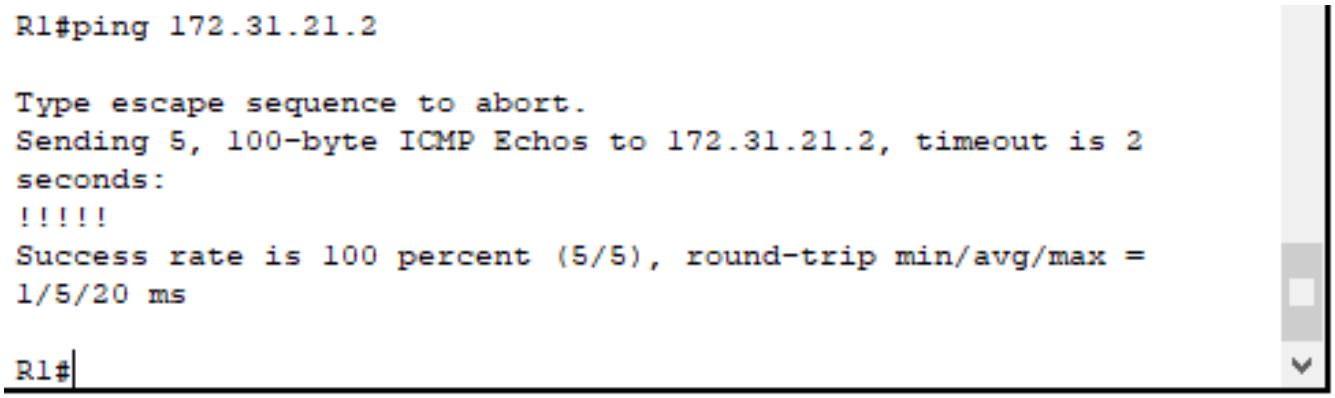
```
R2(config)#ip access-list standard ADMIN-MGT
R2(config-std-nacl)#permit host 172.31.21.1
R2(config-std-nacl)#exit
R2(config)#line vty 0 4
R2(config-line)#access-class ADMIN-MGT in
R2(config-line)#transport input telnet
R2(config-line)#exit
R2(config)#
```

```
R2(config)#ip access-list standard ADMIN-MGT
R2(config-std-nacl)#permit host 172.31.23.2
R2(config-std-nacl)#exit
R2(config)#line vty 0 4
R2(config-line)#access-class ADMIN-MGT in
R2(config-line)#transport input telnet
R2(config-line)#exit
R2(config)#
```

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

Ping de la **PC-C a la PC-A**





```
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 = 1/3/8
ms

R2#
```

```
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 = 2/3/8
ms

R3#
```

CONCLUSIONES

A través del desarrollo de esta práctica final se aprendieron conceptos como el enrutamiento, en una red OSPF, los direccionadores o sistemas de la misma área mantienen una base de datos de enlace-estado idéntica que describe la topología del área. Cada direccionador o sistema del área genera su propia base de datos de enlace-estado a partir de los anuncios de enlace-estado (LSA) que recibe de los demás direccionadores o sistemas de la misma área y de los LSA que él mismo genera. El LSA es un paquete que contiene información sobre los vecinos y los costes de cada vía. Basándose en la base de datos de enlace-estado, cada direccionador o sistema calcula un árbol de extensión de vía más corta, siendo él mismo la raíz, utilizando el algoritmo SPF.

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