PRUEBA DE HABILIDADES PRÁCTICAS CCNA

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UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA UNAD

CIENCIAS BÁSICAS, TECNOLOGÍA E INGENIERÍA

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Diplomado de profundización Cisco (Diseño e implementación de soluciones integradas LAN / WAN) – Grupo 203092_25

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A una persona muy especial, quien me ha apoyado y animado en cada momento, demostrándome lo especial que es... ¡gracias por estar!

Y a la Universidad Nacional Abierta y a Distancia por darme la formación necesaria para ir creciendo personal y profesionalmente.

TABLA DE CONTENIDO

LISTA DE TABLAS

GLOSARIO

CONECTIVIDAD: Capacidad de establecer una conexión: una comunicación, un vínculo. El concepto suele aludir a la disponibilidad que tiene de un dispositivo para ser conectado a otro o a una red.

CONFIGURAR: Grupo de datos e información que caracteriza a diferentes elementos de una computadora, como pueden ser programas, aplicaciones o elementos de hardware / software. La configuración es lo que hace que cada parte de la computadora cumpla una función específica porque es lo que eventualmente la define.

ENCAPSULAMIENTO: Proceso que interviene en el momento en que se envían los datos a través de una determinada Red, de modo que se pueden ordenar, administrar y hasta verificar si han llegado a destino, en qué estado, o si ha sido eficiente la operación, referida comúnmente como Encapsulamiento de Datos.

ESCENARIO: Los escenarios son parte de una serie de comandos a veces denominados herramientas de análisis Y si.

INTERFAZ: La conexión física y funcional que se establece entre dos aparatos, dispositivos o sistemas que funcionan independientemente uno del otro

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

PUERTO: Es una interfaz a través de la cual se pueden enviar y recibir los diferentes tipos de datos.

RED: Es un conjunto de equipos conectados por medio de cables, señales, ondas o cualquier otro método de transporte de datos, que comparten información (archivos), recursos (CD-ROM, impresoras, etc.) y servicios (acceso a internet, e-mail, chat,

ROUTER: Un router es un dispositivo de hardware que permite la interconexión de ordenadores en red. El router o enrutador es un dispositivo que opera en capa tres de nivel de 3. Así, permite que varias redes u ordenadores se conecten entre sí y, por ejemplo, compartan una misma conexión de Internet.

TOPOLOGíA: Cadena de comunicación usada por los nodos que conforman una red para comunicarse.

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

RESUMEN

El objetivo del trabajo es demostrar las habilidades prácticas adquiridas durante el diplomado de profundización CCNA, el escenario propuesto es una empresa de Tecnología que posee tres sucursales distribuidas en las ciudades de Bogotá, Medellín y Bucaramanga, donde se debe configurar e interconectar entre sí cada uno de los dispositivos de red.

Se llevó a cabo la configuración de protocolos de enrutamiento dinámico OSPF V2 para interconectar los routers del escenario propuesto. En el router de Medellín se realizó la configuración o parametrización del router Inter-VLan, DHCP para la VLan de Administración y Mercadeo, listas de acceso para controlar el tráfico desde router1 hacia router2.

En el router2 se llevó a cabo la configuración de NAT para permitir la salida de internet de las VLan definas en R1 y R3. Finalmente se hizo pruebas de conectividad y funcionalidad de las características previamente seleccionas, los resultados de las pruebas fueron satisfactorias. Adicionalmente, a los dispositivos de red, router y switches se les configuró las siguientes funcionalidades:

- Aseguramiento de líneas de consola.
- Aseguramiento de líneas VTY, mediante el protocolo SSH.
- Cifrado de passwords.
- Creación de banners.
- Asignación de nombres descriptivos a los equipos.

INTRODUCCIÓN

Durante el semestre del diplomado de profundización CCNA, se adquirieron conocimientos relacionados con diversos aspectos de Networking, los cuales se colocaron en práctica en el desarrollo de la actividad propuesta, donde se configuro cada uno de los dispositivos de red de una empresa para interconectarlos entre sí, acorde con los lineamientos establecidos para el direccionamiento IP, protocolos de enrutamiento y demás aspectos que forman parte de la topología de red.

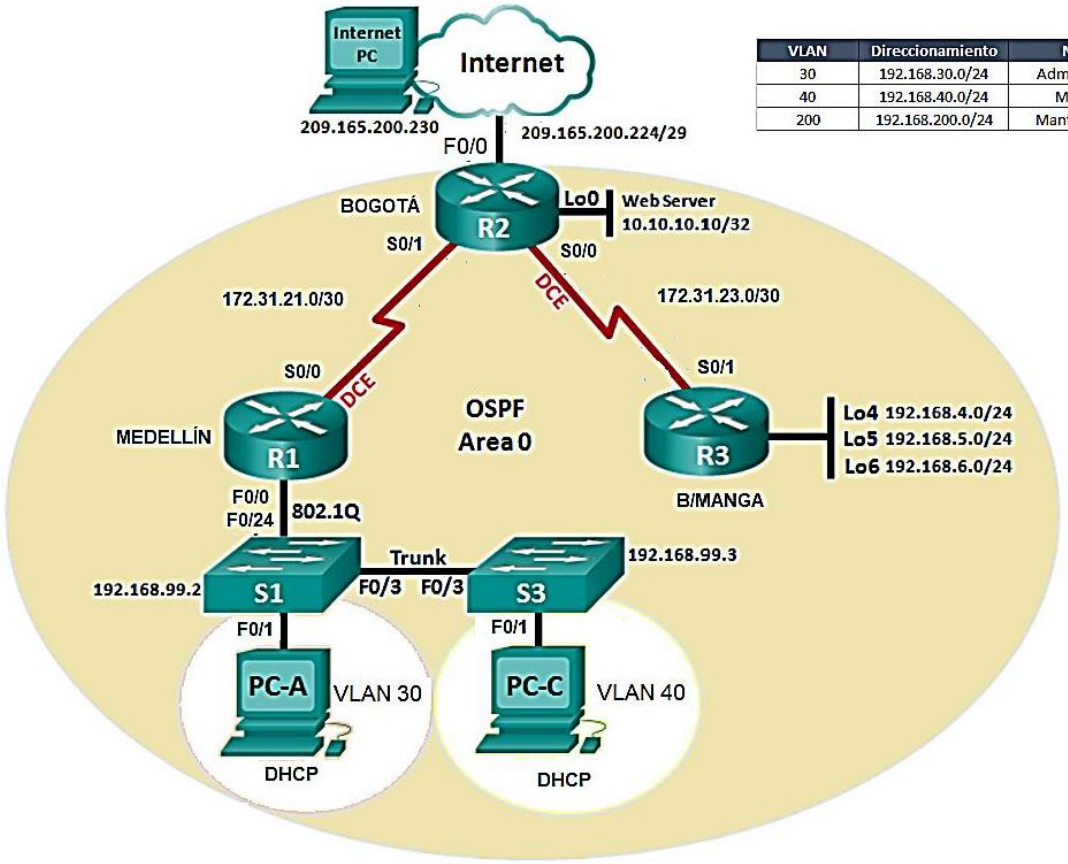
El desarrollo del escenario propuesto se hizo bajo el programa Packet Tracer, en el cual se llevó a cabo cada una de las tareas propuestas, con el objetivo de demostrar las habilidades adquiridas y la aplicabilidad que tiene en el mundo laboral.

1. DESARROLLO DEL ESCENARIO PROPUESTO

1.1 DESCRIPCIÓN DEL ESCENARIO PROPUESTO

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



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

2. DIRECCIONAMIENTO DE RED

2.1 TABLA DE DIRECCIONAMIENTO IP ASIGNADO

El direccionamiento IP asignado a los equipos que conforman el escenario de red propuesto se resumen a continuación:

Tabla 1. Direccionamiento de IP de equipos de red

DISPOSITIVO	INTERFACE	DIRECCION IP	MASCARA DE SUBRED
ROUTER ISP	GI 0/0	209.165.200.230	255.255.255.248
R2	FA 0/0	209.165.200.225	255.255.255.248
R2	S0/0/0	172.31.23.1	255.255.255.252
R2	S0/0/1	172.31.21.2	255.255.255.252
R2	Lo0	10.10.10.10	255.255.255.255
R1	S 0/0/0	172.31.21.1	255.255.255.252
R1	FA 0/0.30	192.168.30.1	255.255.255.0
R1	FA 0/0.40	192.168.40.1	255.255.255.0
R1	FA 0/0.200	192.168.200.1	255.255.255.0
R1	FA 0/0.99	192.168.99.1	255.255.255.0
R3	S0/0/1	172.31.23.2	255.255.255.252
R3	Lo4	192.168.4.1	255.255.255.0
R3	Lo5	192.168.5.1	255.255.255.0
R3	Lo6	192.168.6.1	255.255.255.0
SW1	Vlan 99	192.168.99.2	255.255.255.0
SW3	Vlan 99	192.168.99.3	255.255.255.0
PC-A	Vlan 30	Dinámica	Dinámica
PC-C	Vlan 40	Dinámica	Dinámica

3. CONFIGURACIÓN Y VERIFICACIÓN PROTOCOLO OSPF V2

3.1 TABLA DE ENRUTAMIENTO Y ROUTERS CONECTADOS POR OSPF

3.1.1 Router 1

```
R1#sh ip ro
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     10.0.0.0/32 is subnetted, 1 subnets
O       10.10.10.10 [110/7501] via 172.31.21.2, 00:23:32, Serial0/0/0
     172.31.0.0/30 is subnetted, 2 subnets
C       172.31.21.0 is directly connected, Serial0/0/0
O       172.31.23.0 [110/15000] via 172.31.21.2, 00:23:32, Serial0/0/0
     192.168.4.0/32 is subnetted, 1 subnets
O       192.168.4.1 [110/15001] via 172.31.21.2, 00:23:22, Serial0/0/0
     192.168.5.0/32 is subnetted, 1 subnets
O       192.168.5.1 [110/15001] via 172.31.21.2, 00:23:22, Serial0/0/0
     192.168.6.0/32 is subnetted, 1 subnets
O       192.168.6.1 [110/15001] via 172.31.21.2, 00:23:22, Serial0/0/0
C    192.168.30.0/24 is directly connected, FastEthernet0/0.30
C    192.168.40.0/24 is directly connected, FastEthernet0/0.40
C    192.168.99.0/24 is directly connected, FastEthernet0/0.99
C    192.168.200.0/24 is directly connected, FastEthernet0/0.200
     209.165.200.0/29 is subnetted, 1 subnets
O       209.165.200.224 [110/7501] via 172.31.21.2, 00:23:32, Serial0/0/0
```

3.1.2 Router 2

```
R2#sh ip ro
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is 209.165.200.230 to network 0.0.0.0

     10.0.0.0/32 is subnetted, 1 subnets
C       10.10.10.10 is directly connected, Loopback0
     172.31.0.0/30 is subnetted, 2 subnets
C       172.31.21.0 is directly connected, Serial0/0/1
C       172.31.23.0 is directly connected, Serial0/0/0
     192.168.4.0/32 is subnetted, 1 subnets
O       192.168.4.1 [110/7501] via 172.31.23.2, 00:24:52, Serial0/0/0
     192.168.5.0/32 is subnetted, 1 subnets
O       192.168.5.1 [110/7501] via 172.31.23.2, 00:24:52, Serial0/0/0
     192.168.6.0/32 is subnetted, 1 subnets
O       192.168.6.1 [110/7501] via 172.31.23.2, 00:24:52, Serial0/0/0
O    192.168.30.0/24 [110/782] via 172.31.21.1, 00:24:52, Serial0/0/1
O    192.168.40.0/24 [110/782] via 172.31.21.1, 00:24:52, Serial0/0/1
O    192.168.99.0/24 [110/782] via 172.31.21.1, 00:24:52, Serial0/0/1
O    192.168.200.0/24 [110/782] via 172.31.21.1, 00:24:52, Serial0/0/1
     209.165.200.0/29 is subnetted, 1 subnets
C       209.165.200.224 is directly connected, FastEthernet0/0
S*   0.0.0.0/0 [1/0] via 209.165.200.230

R2#
```

3.1.3 Router 3

```
R3#sh ip ro
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     10.0.0.0/32 is subnetted, 1 subnets
O       10.10.10.10 [110/782] via 172.31.23.1, 00:29:27, Serial0/0/1
     172.31.0.0/30 is subnetted, 2 subnets
O       172.31.21.0 [110/1562] via 172.31.23.1, 00:29:27, Serial0/0/1
C       172.31.23.0 is directly connected, Serial0/0/1
C    192.168.4.0/24 is directly connected, Loopback4
C    192.168.5.0/24 is directly connected, Loopback5
C    192.168.6.0/24 is directly connected, Loopback6
O    192.168.30.0/24 [110/1563] via 172.31.23.1, 00:29:27, Serial0/0/1
O    192.168.40.0/24 [110/1563] via 172.31.23.1, 00:29:27, Serial0/0/1
O    192.168.99.0/24 [110/1563] via 172.31.23.1, 00:29:27, Serial0/0/1
O    192.168.200.0/24 [110/1563] via 172.31.23.1, 00:29:27, Serial0/0/1
     209.165.200.0/29 is subnetted, 1 subnets
O       209.165.200.224 [110/782] via 172.31.23.1, 00:29:27, Serial0/0/1
```

3.2 CONFIGURACIÓN OSPF (PROCESS ID, INTERFACES, ROUTER ID, INTERFACES COSTO)

3.2.1 Router 1

```
FastEthernet0/0.30 is up, line protocol is up
  Internet address is 192.168.30.1/24, Area 0
  Process ID 1, Router ID 1.1.1.1, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 1.1.1.1, Interface address 192.168.30.1
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:07
  Index 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)
FastEthernet0/0.40 is up, line protocol is up
  Internet address is 192.168.40.1/24, Area 0
  Process ID 1, Router ID 1.1.1.1, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 1.1.1.1, Interface address 192.168.40.1
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:07
  Index 2/2, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
FastEthernet0/0.99 is up, line protocol is up
  Internet address is 192.168.99.1/24, Area 0
  Process ID 1, Router ID 1.1.1.1, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 1.1.1.1, Interface address 192.168.99.1
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:07
  Index 3/3, 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)
FastEthernet0/0.200 is up, line protocol is up
  Internet address is 192.168.200.1/24, Area 0
  Process ID 1, Router ID 1.1.1.1, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 1.1.1.1, Interface address 192.168.200.1
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:07
  Index 4/4, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
Serial0/0/0 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: 7500
  Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
```

3.2.2 Router 2

```
R2#sh ip ospf interface

Loopback0 is up, line protocol is up
  Internet address is 10.10.10.10/32, Area 0
  Process ID 1, Router ID 2.2.2.2, Network Type LOOPBACK, Cost: 1
  Loopback interface is treated as a stub Host
FastEthernet0/0 is up, line protocol is up
  Internet address is 209.165.200.225/29, Area 0
  Process ID 1, Router ID 2.2.2.2, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 2.2.2.2, Interface address 209.165.200.225
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    No Hellos (Passive interface)
  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 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
Serial0/0/0 is up, line protocol is up
  Internet address is 172.31.23.1/30, Area 0
  Process ID 1, Router ID 2.2.2.2, Network Type POINT-TO-POINT, Cost: 7500
  Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
  No designated router on this network
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:03
  Index 3/3, 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)
Serial0/0/1 is up, line protocol is up
  Internet address is 172.31.21.2/30, Area 0
  Process ID 1, Router ID 2.2.2.2, Network Type POINT-TO-POINT, Cost: 781
  Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
  No designated router on this network
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:09
  Index 4/4, 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)
```

3.2.3 Router 3

```
R3#sh 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: 781
  Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
  No designated router on this network
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:03
  Index 4/4, 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#sh ip ospf ?
  <1-65535>       Process ID number
  border-routers  Border and Boundary Router Information
  database        Database summary
  interface       Interface information
  neighbor        Neighbor list
  virtual-links   Virtual link information
  <cr>
```

4. CONFIGURACIÓN DE VLANS, PUERTOS TRONCALES, PUERTOS DE ACCESO, ENCAPSULAMIENTO, INTER-VLAN ROUTING

4.1 Router 1

En R1 se llevó a cabo la configuración del enrutamiento inter-vlan y la respectiva encapsulación.

```
!
interface FastEthernet0/0
 description LAN
 no ip address
 duplex auto
 speed auto
!
interface FastEthernet0/0.30
 description VLAN Administracion
 encapsulation dot1Q 30
 ip address 192.168.30.1 255.255.255.0
 ip access-group 102 out
!
interface FastEthernet0/0.40
 description VLAN Mercadeo
 encapsulation dot1Q 40
 ip address 192.168.40.1 255.255.255.0
 ip access-group 101 out
!
interface FastEthernet0/0.99
 description VLAN Management
 encapsulation dot1Q 99
 ip address 192.168.99.1 255.255.255.0
!
interface FastEthernet0/0.200
 description VLAN Mantenimiento
 encapsulation dot1Q 200
 ip address 192.168.200.1 255.255.255.0
 ip access-group 21 out
!
interface FastEthernet0/1
 no ip address
 duplex auto
 speed auto
 shutdown
```

4.2 SW1

En el switch 1 se llevó a cabo a configuración de puertos troncales (conexión a router 1 y conexión a SW3), puerto de acceso, conexión a PC-A

Puerto de acceso:

```
!
interface FastEthernet0/1
 description PC VLAN 30
 switchport access vlan 30
 switchport mode access
 spanning-tree portfast
!
```

Puertos troncales:

```
SW1#sh inter trunk
Port        Mode         Encapsulation  Status        Native vlan
Fa0/3       on           802.1q         trunking      1
Fa0/24      on           802.1q         trunking      1

Port        Vlans allowed on trunk
Fa0/3       1-1005
Fa0/24      1-1005

Port        Vlans allowed and active in management domain
Fa0/3       1,30,40,99,200
Fa0/24      1,30,40,99,200

Port        Vlans in spanning tree forwarding state and not pruned
Fa0/3       1,30,40,99,200
Fa0/24      1,30,40,99,200
```

4.3 SW3

En el SW3 de configuró el puerto de acceso para la conexión a PC – C y un puerto troncal que conecta a SW1.

Puerto de acceso:

```
!
interface FastEthernet0/1
 description PC VLAN 40
 switchport access vlan 40
 switchport mode access
 spanning-tree portfast
!
```

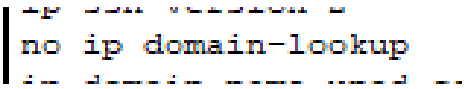
Puertos troncales:

```
SW3#sh int trunk
Port        Mode         Encapsulation  Status        Native vlan
Fa0/3       on           802.1q         trunking      1

Port        Vlans allowed on trunk
Fa0/3       1-1005

Port        Vlans allowed and active in management domain
Fa0/3       1,30,40,99,200

Port        Vlans in spanning tree forwarding state and not pruned
Fa0/3       1,30,40,99,200
```

5. DESHABILITAR DNS LOOKUP EN SW3

5.1 SW3

Se llevó a cabo la configuración requerida mediante el comando que se ilustra en la imagen:



6. ASIGNACIÓN DE DIRECIONES IP A SWITCHES

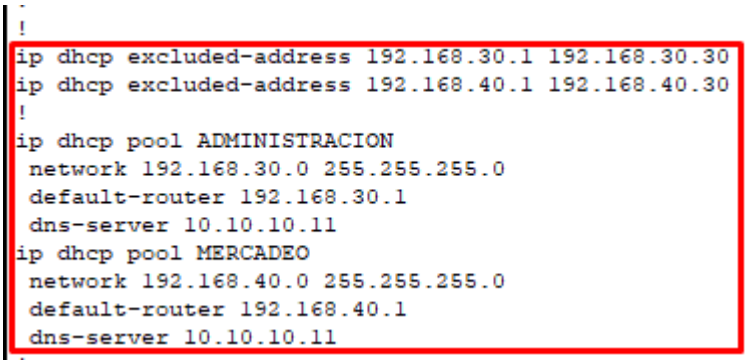
Para la administración de los switches se llevó a cabo la creación de la vlan 99 para gestionar los equipos, como buena práctica se evitó usar la vlan 1 para administrar los equipos, en la tabla se resumen el direccionamiento IP asignado a los dispositivos.

Tabla 2. Direccionamiento de IP asignado switches

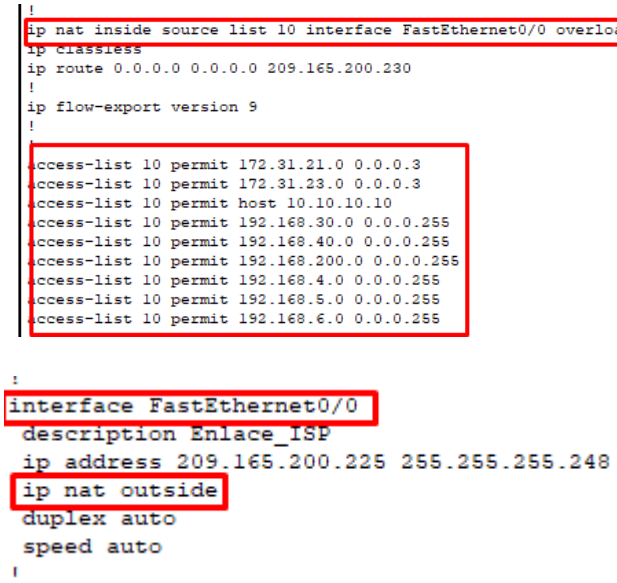
DISPOSITIVO	INTERFACE	DIRECCION IP	MASCARA DE SUBRED
SW1	Vlan 99	192.168.99.2	255.255.255.0
SW3	Vlan 99	192.168.99.3	255.255.255.0

7. CONFIGURACIÓN DE DHCP

La configuración del protocolo DHCP para las vlan 30 y 40 se llevó a cabo en el R1, inicialmente se configuró en el dispositivo los rangos de IP que debían excluirse y posteriormente se asignaron los parámetros propuestos en el escenario.



8. CONFIGURACIÓN DE NAT



```
interface Serial0/0/0
 description Enlace a R3
 bandwidth 128
 ip address 172.31.23.1 255.255.255.252
 ip ospf cost 7500
 ip nat inside
 clock rate 64000
!
interface Serial0/0/1
 description Enlace a R1
 bandwidth 128
 ip address 172.31.21.2 255.255.255.252
 ip nat inside
```

9. CONFIGURACIÓN DE ACL ESTÁNDAR

ACL20: Esta lista de acceso aplicada en R3 deniega el tráfico de la red 192.168.6.0/24 hacia el R2

```
access-list 20 deny 192.168.6.0 0.0.0.255
access-list 20 permit host 0.0.0.0
```

```
interface Serial0/0/1
 description Enlace a R2
 bandwidth 128
 ip address 172.31.23.2 255.255.255.252
 ip access-group 20 out
```

ACL1: Esta lista de acceso aplicada en R1 deniega el tráfico de la red 192.1068.200.0/24 hacia las redes de R2,

```
access-list 21 deny 192.168.200.0 0.0.0.255
access-list 21 permit host 0.0.0.0
```

```
interface FastEthernet0/0.200
 description VLAN Mantenimiento
 encapsulation dot1Q 200
 ip address 192.168.200.1 255.255.255.0
 ip access-group 21 out
```

10. CONFIGURACIÓN DE ACL EXTENDIDA

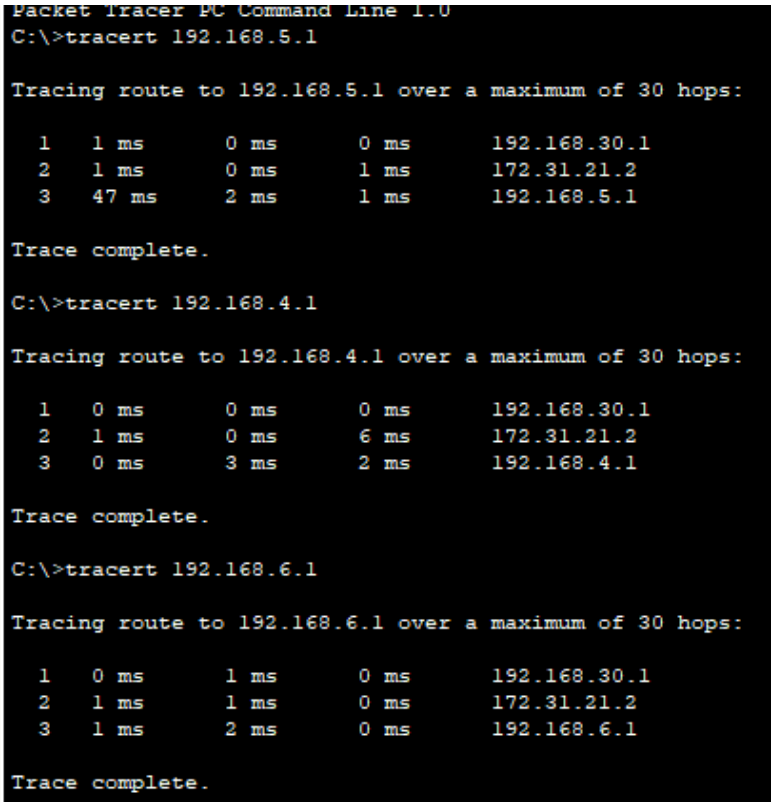
Se crearon dos listas de acceso extendidas en R1: La ACL 101 deniega el tráfico de la red 192.168.40.0/24 hacia la red de internet 209.165.200.224/29 y la ACL 102 deniega el tráfico de la red 192.168.30.0/24 hacia el servidor web con la IP 10.10.10.10. Todo el tráfico restante es permitido.

```
access-list 101 deny ip 192.168.40.0 0.0.0.255 209.165.200.224 0.0.0.7
access-list 101 permit ip any any
access-list 102 deny ip 192.168.30.0 0.0.0.255 host 10.10.10.10
access-list 102 permit ip any any
```

```
interface FastEthernet0/0.30
 description VLAN Administracion
 encapsulation dot1Q 30
 ip address 192.168.30.1 255.255.255.0
 ip access-group 102 out
!
interface FastEthernet0/0.40
 description VLAN Mercadeo
 encapsulation dot1Q 40
 ip address 192.168.40.1 255.255.255.0
 ip access-group 101 out
!
```

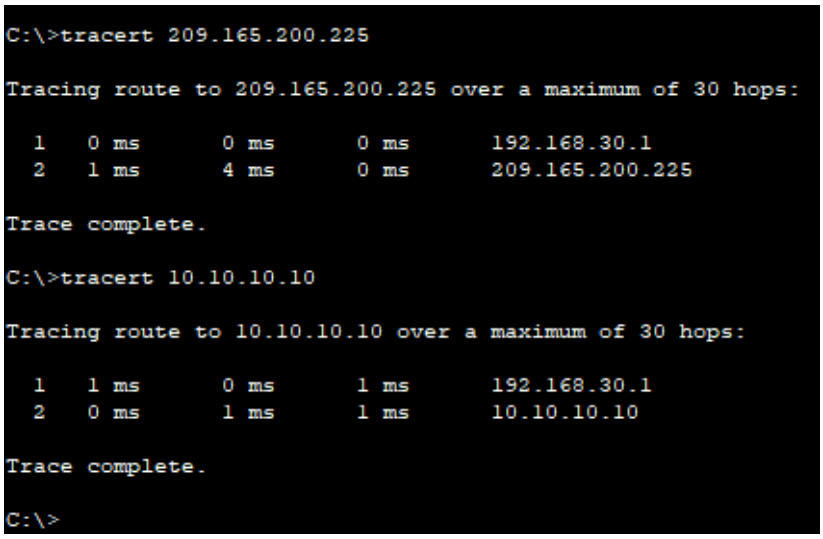
11. PRUEBAS DE CONECTIVIDAD

Trazas desde la PC-A hacia las redes de R3



```
Packet Tracer PC Command Line 1.0
C:\>tracert 192.168.5.1

Tracing route to 192.168.5.1 over a maximum of 30 hops:

  1   1 ms      0 ms      0 ms      192.168.30.1
  2   1 ms      0 ms      1 ms      172.31.21.2
  3   47 ms     2 ms      1 ms      192.168.5.1

Trace complete.

C:\>tracert 192.168.4.1

Tracing route to 192.168.4.1 over a maximum of 30 hops:

  1   0 ms      0 ms      0 ms      192.168.30.1
  2   1 ms      0 ms      6 ms      172.31.21.2
  3   0 ms      3 ms      2 ms      192.168.4.1

Trace complete.

C:\>tracert 192.168.6.1

Tracing route to 192.168.6.1 over a maximum of 30 hops:

  1   0 ms      1 ms      0 ms      192.168.30.1
  2   1 ms      1 ms      0 ms      172.31.21.2
  3   1 ms      2 ms      0 ms      192.168.6.1

Trace complete.
```

Trazas desde PC – A hacia redes de R2



```
C:\>tracert 209.165.200.225

Tracing route to 209.165.200.225 over a maximum of 30 hops:

  1   0 ms      0 ms      0 ms      192.168.30.1
  2   1 ms      4 ms      0 ms      209.165.200.225

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      1 ms      192.168.30.1
  2   0 ms      1 ms      1 ms      10.10.10.10

Trace complete.

C:\>
```

Conectividad desde PC – A hacia redes de R1

```
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 = 0ms, Average = 0ms

C:\>ping 192.168.40.1

Pinging 192.168.40.1 with 32 bytes of data:

Reply from 192.168.40.1: bytes=32 time=1ms TTL=255
Reply from 192.168.40.1: bytes=32 time<1ms TTL=255
Reply from 192.168.40.1: bytes=32 time<1ms TTL=255
Reply from 192.168.40.1: bytes=32 time=1ms TTL=255

Ping statistics for 192.168.40.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 192.168.200.1

Pinging 192.168.200.1 with 32 bytes of data:

Reply from 192.168.200.1: bytes=32 time=1ms TTL=255
Reply from 192.168.200.1: bytes=32 time<1ms TTL=255
Reply from 192.168.200.1: bytes=32 time<1ms TTL=255
Reply from 192.168.200.1: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.200.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

Conectividad desde PC-C hacia R3

```
Packet Tracer PC Command Line 1.0
C:\>ping 192.168.6.1

Pinging 192.168.6.1 with 32 bytes of data:

Reply from 192.168.6.1: bytes=32 time=3ms TTL=253
Reply from 192.168.6.1: bytes=32 time=3ms TTL=253
Reply from 192.168.6.1: bytes=32 time=2ms TTL=253
Reply from 192.168.6.1: bytes=32 time=3ms TTL=253

Ping statistics for 192.168.6.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 3ms, Average = 2ms

C:\>ping 192.168.5.1

Pinging 192.168.5.1 with 32 bytes of data:

Reply from 192.168.5.1: bytes=32 time=2ms TTL=253
Reply from 192.168.5.1: bytes=32 time=2ms TTL=253
Reply from 192.168.5.1: bytes=32 time=2ms TTL=253
Reply from 192.168.5.1: bytes=32 time=5ms TTL=253

Ping statistics for 192.168.5.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 5ms, Average = 2ms

C:\>ping 192.168.4.1

Pinging 192.168.4.1 with 32 bytes of data:

Reply from 192.168.4.1: bytes=32 time=3ms TTL=253
Reply from 192.168.4.1: bytes=32 time=2ms TTL=253
Reply from 192.168.4.1: bytes=32 time=2ms TTL=253
Reply from 192.168.4.1: bytes=32 time=2ms TTL=253

Ping statistics for 192.168.4.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 3ms, Average = 2ms
```

Conectividad desde PC-C hacia R2

```
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=1ms TTL=254
Reply from 10.10.10.10: bytes=32 time=1ms TTL=254
Reply from 10.10.10.10: bytes=32 time=10ms TTL=254
Reply from 10.10.10.10: bytes=32 time=2ms TTL=254

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 = 10ms, Average = 3ms

C:\>ping 209.165.200.224

Pinging 209.165.200.224 with 32 bytes of data:

Reply from 172.31.21.2: bytes=32 time=1ms TTL=254
Reply from 172.31.21.2: bytes=32 time=1ms TTL=254
Reply from 172.31.21.2: bytes=32 time=2ms TTL=254
Reply from 172.31.21.2: bytes=32 time=1ms TTL=254

Ping statistics for 209.165.200.224:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 2ms, Average = 1ms
```

Conectividad desde PC-C hacia R1

```
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 = 0ms, Average = 0ms

C:\>ping 192.168.40.1

Pinging 192.168.40.1 with 32 bytes of data:

Reply from 192.168.40.1: bytes=32 time<1ms TTL=255
Reply from 192.168.40.1: bytes=32 time<1ms TTL=255
Reply from 192.168.40.1: bytes=32 time<1ms TTL=255
Reply from 192.168.40.1: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.40.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.200.1

Pinging 192.168.200.1 with 32 bytes of data:

Reply from 192.168.200.1: bytes=32 time<1ms TTL=255
Reply from 192.168.200.1: bytes=32 time<1ms TTL=255
Reply from 192.168.200.1: bytes=32 time=1ms TTL=255
Reply from 192.168.200.1: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.200.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

12. ARCHIVOS DE CONFIGURACIÓN

Adicional a la configuración requerida en el escenario propuesto, a los equipos de red se les realizó la siguiente configuración: Banners, cifrado de contraseñas, SSH, nombres, direcciones IP de gestión, y accesos para líneas de consola y vty. El siguiente es el archivo de configuración de cada uno de los equipos con componen la red.

ROUTER 1

```
R1#sh run
Building configuration...

Current configuration : 2609 bytes
!
version 12.4
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname R1
!
enable secret 5 $1$mERr$9cTjUIEqNGurQiFU.ZeCi1
enable password 7 0822455D0A16
!
ip dhcp excluded-address 192.168.30.1 192.168.30.30
ip dhcp excluded-address 192.168.40.1 192.168.40.30
!
ip dhcp pool ADMINISTRACION
network 192.168.30.0 255.255.255.0
default-router 192.168.30.1
```

```
dns-server 10.10.10.11
ip dhcp pool MERCADEO
network 192.168.40.0 255.255.255.0
default-router 192.168.40.1
dns-server 10.10.10.11
!
no ip cef
no ipv6 cef
!
username admin secret 5 $1$mERr$9cTjUIEqNGurQiFU.ZeCi1
!
ip ssh version 2
ip domain-name ccna-unad.com
!
spanning-tree mode pvst
!
interface FastEthernet0/0
description LAN
no ip address
duplex auto
speed auto
!
interface FastEthernet0/0.30
description VLAN Administracion
encapsulation dot1Q 30
ip address 192.168.30.1 255.255.255.0
ip access-group 102 out
!
interface FastEthernet0/0.40
description VLAN Mercadeo
```

```
encapsulation dot1Q 40
ip address 192.168.40.1 255.255.255.0
ip access-group 101 out
!
interface FastEthernet0/0.99
description VLAN Management
encapsulation dot1Q 99
ip address 192.168.99.1 255.255.255.0
!
interface FastEthernet0/0.200
description VLAN Mantenimiento
encapsulation dot1Q 200
ip address 192.168.200.1 255.255.255.0
ip access-group 21 out
!
interface FastEthernet0/1
no ip address
duplex auto
speed auto
shutdown
!
interface Serial0/0/0
description Enlace a R2
bandwidth 128
ip address 172.31.21.1 255.255.255.252
ip ospf cost 7500
clock rate 64000
!
interface Serial0/0/1
no ip address
```

```
clock rate 2000000
shutdown
!
interface Vlan1
no ip address
shutdown
!
router ospf 1
router-id 1.1.1.1
log-adjacency-changes
passive-interface FastEthernet0/0
network 172.31.21.0 0.0.0.3 area 0
network 192.168.30.0 0.0.0.255 area 0
network 192.168.40.0 0.0.0.255 area 0
network 192.168.200.0 0.0.0.255 area 0
network 192.168.99.0 0.0.0.255 area 0
!
ip classless
!
ip flow-export version 9
!
access-list 21 deny 192.168.200.0 0.0.0.255
access-list 21 permit host 0.0.0.0
access-list 101 deny ip 192.168.40.0 0.0.0.255 209.165.200.224 0.0.0.7
access-list 101 permit ip any any
access-list 102 deny ip 192.168.30.0 0.0.0.255 host 10.10.10.10
access-list 102 permit ip any any
!
no cdp run
!
```

banner motd ^C Acceso solo a personal autorizado ^C
!
line con 0
exec-timeout 5 0
password 7 0822455D0A16
login
!
line aux 0
!
line vty 0 4
login local
transport input ssh
line vty 5 15
login local
transport input ssh
!
end
R1#

ROUTER 2

R2#sh run
Building configuration...

Current configuration : 2077 bytes
!
version 12.4
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!

```
hostname R2
!
enable secret 5 $1$mERr$9cTjUIEqNGurQiFU.ZeCi1
enable password 7 0822455D0A16
!
no ip cef
no ipv6 cef
!
username admin secret 5 $1$mERr$9cTjUIEqNGurQiFU.ZeCi1
!
ip ssh version 2
ip domain-name unad-ccna.com
!
spanning-tree mode pvst
!
interface Loopback0
description Web Server
ip address 10.10.10.10 255.255.255.255
!
interface FastEthernet0/0
description Enlace_ISP
ip address 209.165.200.225 255.255.255.248
ip nat outside
duplex auto
speed auto
!
interface FastEthernet0/1
no ip address
duplex auto
speed auto
```

```
shutdown
!
interface Serial0/0/0
description Enlace a R3
bandwidth 128
ip address 172.31.23.1 255.255.255.252
ip ospf cost 7500
ip nat inside
clock rate 64000
!
interface Serial0/0/1
description Enlace a R1
bandwidth 128
ip address 172.31.21.2 255.255.255.252
ip nat inside
!
interface Vlan1
no ip address
shutdown
!
router ospf 1
router-id 2.2.2.2
log-adjacency-changes
passive-interface FastEthernet0/0
network 172.31.21.0 0.0.0.3 area 0
network 10.10.10.10 0.0.0.0 area 0
network 172.31.23.0 0.0.0.255 area 0
network 209.165.200.224 0.0.0.7 area 0
!
ip nat inside source list 10 interface FastEthernet0/0 overload
```

```
ip classless
ip route 0.0.0.0 0.0.0.0 209.165.200.230
!
ip flow-export version 9
!
access-list 10 permit 172.31.21.0 0.0.0.3
access-list 10 permit 172.31.23.0 0.0.0.3
access-list 10 permit host 10.10.10.10
access-list 10 permit 192.168.30.0 0.0.0.255
access-list 10 permit 192.168.40.0 0.0.0.255
access-list 10 permit 192.168.200.0 0.0.0.255
access-list 10 permit 192.168.4.0 0.0.0.255
access-list 10 permit 192.168.5.0 0.0.0.255
access-list 10 permit 192.168.6.0 0.0.0.255
!
no cdp run
!
banner motd ^C Acceso solo a peronal aoturizado ^C
!
line con 0
exec-timeout 5 0
password 7 0822455D0A16
login
!
line aux 0
!
line vty 0 4
login local
transport input ssh
line vty 5 15
```

login local
transport input ssh
!
end

ROUTER 3

R3#sh run
Building configuration...

Current configuration : 1615 bytes
!
version 12.4
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname R3
!
enable secret 5 1mERr$9cTjUIEqNGurQiFU.ZeCi1
enable password 7 0822455D0A16
!
no ip cef
no ipv6 cef
!
username admin secret 5 1mERr$9cTjUIEqNGurQiFU.ZeCi1
!
ip ssh version 2
ip domain-name unad-ccna.com
!
spanning-tree mode pvst

```
!
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 Serial0/0/0
no ip address
clock rate 2000000
shutdown
!
interface Serial0/0/1
description Enlace a R2
bandwidth 128
```

```
ip address 172.31.23.2 255.255.255.252
ip access-group 20 out
!
interface Vlan1
no ip address
shutdown
!
router ospf 1
router-id 3.3.3.3
log-adjacency-changes
passive-interface FastEthernet0/0
network 172.31.23.0 0.0.0.3 area 0
network 192.168.4.0 0.0.0.255 area 0
network 192.168.5.0 0.0.0.255 area 0
network 192.168.6.0 0.0.0.255 area 0
!
ip classless
!
ip flow-export version 9
!
access-list 20 deny 192.168.6.0 0.0.0.255
access-list 20 permit host 0.0.0.0
!
no cdp run
!
banner motd ^C Acceso solo a personal autorizado ^C
!
line con 0
exec-timeout 5 0
password 7 0822455D0A16
```

login
!
line aux 0
!
line vty 0 4
login local
transport input ssh
line vty 5 15
login local
transport input ssh
!
end
R3#

SWITCH 1

SW1#sh run
Building configuration...

Current configuration : 2521 bytes
!
version 12.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname SW1
!
enable secret 5 1mERr$9cTjUIEqNGurQiFU.ZeCi1
enable password 7 0822455D0A16
!

```
ip ssh version 2
ip domain-name unad-ccna.com
!
username admin secret 5 $1$mERr$9cTjUIEqNGurQiFU.ZeCi1
!
spanning-tree mode pvst
!
interface FastEthernet0/1
description PC VLAN 30
switchport access vlan 30
switchport mode access
spanning-tree portfast
!
interface FastEthernet0/2
description Sin uso
shutdown
!
interface FastEthernet0/3
description Enlace a SW3
switchport mode trunk
!
interface FastEthernet0/4
description Interfaces sin uso
shutdown
!
interface FastEthernet0/5
description Interfaces sin uso
shutdown
!
interface FastEthernet0/6
```

```
description Interfaces sin uso
shutdown
!
interface FastEthernet0/7
description Interfaces sin uso
shutdown
!
interface FastEthernet0/8
description Interfaces sin uso
shutdown
!
interface FastEthernet0/9
description Interfaces sin uso
shutdown
!
interface FastEthernet0/10
description Interfaces sin uso
shutdown
!
interface FastEthernet0/11
description Interfaces sin uso
shutdown
!
interface FastEthernet0/12
description Interfaces sin uso
shutdown
!
interface FastEthernet0/13
description Interfaces sin uso
shutdown
```

```
!
interface FastEthernet0/14
description Interfaces sin uso
shutdown
!
interface FastEthernet0/15
description Interfaces sin uso
shutdown
!
interface FastEthernet0/16
description Interfaces sin uso
shutdown
!
interface FastEthernet0/17
description Interfaces sin uso
shutdown
!
interface FastEthernet0/18
description Interfaces sin uso
shutdown
!
interface FastEthernet0/19
description Interfaces sin uso
shutdown
!
interface FastEthernet0/20
description Interfaces sin uso
shutdown
!
interface FastEthernet0/21
```

```
description Interfaces sin uso
shutdown
!
interface FastEthernet0/22
description Interfaces sin uso
shutdown
!
interface FastEthernet0/23
description Interfaces sin uso
shutdown
!
interface FastEthernet0/24
description Enlace a R1
switchport mode trunk
!
interface Vlan1
no ip address
shutdown
!
interface Vlan99
description Management
mac-address 00d0.5840.3901
ip address 192.168.99.2 255.255.255.0
!
ip default-gateway 192.168.99.1
!
banner motd ^C Acceso solo a personal autorizado ^C
!
line con 0
password 7 0822455D0A16
```

```
login
exec-timeout 5 0
!
line vty 0 4
login local
transport input ssh
line vty 5 15
login local
transport input ssh
!
end


SW1#
```

SWITCH 3

```
SW3#sh run
Building configuration...

Current configuration : 2458 bytes
!
version 12.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname SW3
!
enable secret 5 $1$mERr$9cTjUIEqNGurQiFU.ZeCi1
enable password 7 0822455D0A16
```

```
!
ip ssh version 2
no ip domain-lookup
ip domain-name unad-ccna.com
!
username admin secret 5 $1$mERr$9cTjUIEqNGurQiFU.ZeCi1
!
spanning-tree mode pvst
!
interface FastEthernet0/1
description PC VLAN 40
switchport access vlan 40
switchport mode access
spanning-tree portfast
!
interface FastEthernet0/2
description Puerto sin uso
shutdown
!
interface FastEthernet0/3
description Enlace a SW1
switchport mode trunk
!
interface FastEthernet0/4
description Puerto Sin uso
shutdown
!
interface FastEthernet0/5
description Puerto Sin uso
shutdown
```

```
!
interface FastEthernet0/6
description Puerto Sin uso
shutdown
!
interface FastEthernet0/7
description Puerto Sin uso
shutdown
!
interface FastEthernet0/8
description Puerto Sin uso
shutdown
!
interface FastEthernet0/9
description Puerto Sin uso
shutdown
!
interface FastEthernet0/10
description Puerto Sin uso
shutdown
!
interface FastEthernet0/11
description Puerto Sin uso
shutdown
!
interface FastEthernet0/12
description Puerto Sin uso
shutdown
!
interface FastEthernet0/13
```

```
description Puerto Sin uso
shutdown
!
interface FastEthernet0/14
description Puerto Sin uso
shutdown
!
interface FastEthernet0/15
description Puerto Sin uso
shutdown
!
interface FastEthernet0/16
description Puerto Sin uso
shutdown
!
interface FastEthernet0/17
description Puerto Sin uso
shutdown
!
interface FastEthernet0/18
description Puerto Sin uso
shutdown
!
interface FastEthernet0/19
description Puerto Sin uso
shutdown
!
interface FastEthernet0/20
description Puerto Sin uso
shutdown
```

```
!
interface FastEthernet0/21
description Puerto Sin uso
shutdown
!
interface FastEthernet0/22
description Puerto Sin uso
shutdown
!
interface FastEthernet0/23
description Puerto Sin uso
shutdown
!
interface FastEthernet0/24
description Puerto Sin uso
shutdown
!
interface Vlan1
no ip address
shutdown
!
interface Vlan99
description Management
mac-address 0090.2b35.9401
ip address 192.168.99.3 255.255.255.0
!
ip default-gateway 192.168.99.1
!
banner motd ^C Acceso solo a personal autorizado ^C
!
```

```
line con 0
password 7 0822455D0A16
login
exec-timeout 5 0
!
line vty 0 4
login local
transport input ssh
line vty 5 15
login local
transport input ssh
!
end

SW3#
```

CONCLUSIONES

Con el desarrollo del presente trabajo fue posible demostrar destrezas en cuanto a la configuración de equipos de red Cisco, como Routers y Switches.

Se logró llevar a cabo de manera exitosa protocolos de enrutamiento dinámico como OSPF y otros servicios como DHCP, listas de acceso, Nat y aseguramiento de dispositivos Cisco

Finamente, aplicar comandos para verificar funcionalidad y resolver problemas presentados con las funcionalidades previamente mencionadas

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