

INSTITUTO TECNOLÓGICO DE SALINA CRUZ

REDES DE COMPUTADORAS

PRACTICA No. 1.

UNIDAD 6.

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LUGAR Y FECHA: SALINA CRUZ OAXACA A JUNIO DE 2015.

SEMESTRE: 6

GRUPO: “E”.

CARRERA:

**INGENIERÍA EN TECNOLOGÍAS DE LA INFORMACIÓN Y LAS
COMUNICACIONES**

OBJETIVO:

Al completar esta práctica de laboratorio podrá:

- Conectar una red de acuerdo con el Diagrama de topología
- Eliminar la configuración de inicio y recargar un router al estado por defecto
- Realizar tareas de configuración básicas en un router
- Configurar y activar interfaces
- Configurar el enrutamiento OSPF en todos los routers
- Configurar las ID del router OSPF
- Verificar el enrutamiento OSPF por medio de los comandos show
- Configurar una ruta estática por defecto
- Propagar la ruta por defecto a vecinos OSPF
- Configurar los temporizadores de Hello y Dead de OSPF
- Configurar OSPF en una red de accesos múltiples
- Configurar la prioridad OSPF
- Comprender el proceso de elección de OSPF
- Documentar la configuración OSPF

INSTRUCCIONES:

Elaborar las prácticas correspondientes ya explicadas en clase en el simulador de Packet Tracer.

MATERIALES:

- Computadora
- Simulador Packet Tracer
- USB
- Office Word

Escenario:

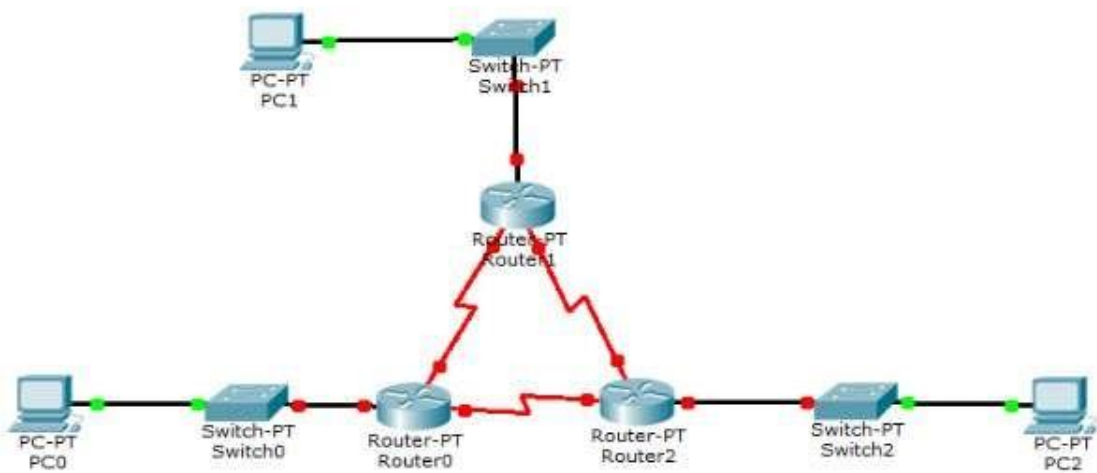
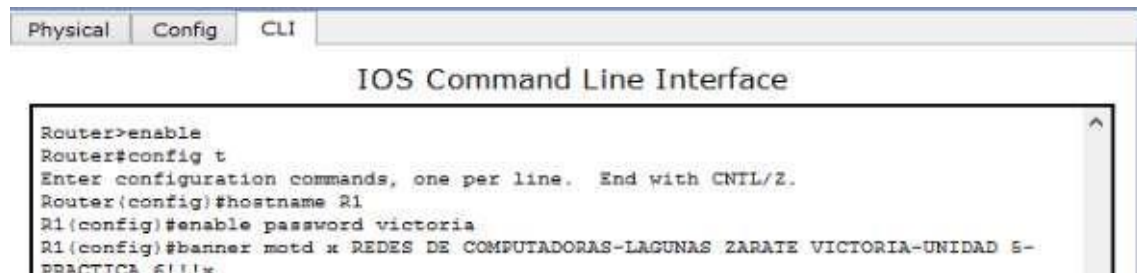


Tabla de enrutamiento:

Dispositivo	Interfaz	Dirección IP	Máscara de subred	Gateway por defecto
R1	Fa0/0	172.16.1.17	255.255.255.240	No aplicable
	S0/0/0	192.168.10.1	255.255.255.252	No aplicable
	S0/0/1	192.168.10.5	255.255.255.252	No aplicable
R2	Fa0/0	10.10.10.1	255.255.255.0	No aplicable
	S0/0/0	192.168.10.2	255.255.255.252	No aplicable
	S0/0/1	192.168.10.9	255.255.255.252	No aplicable
R3	Fa0/0	172.16.1.33	255.255.255.248	No aplicable
	S0/0/0	192.168.10.6	255.255.255.252	No aplicable
	S0/0/1	192.168.10.10	255.255.255.252	No aplicable
PC1	NIC	172.16.1.20	255.255.255.240	172.16.1.17
PC2	NIC	10.10.10.10	255.255.255.0	10.10.10.1
PC3	NIC	172.16.1.35	255.255.255.248	172.16.1.33

Configuración de los routers:

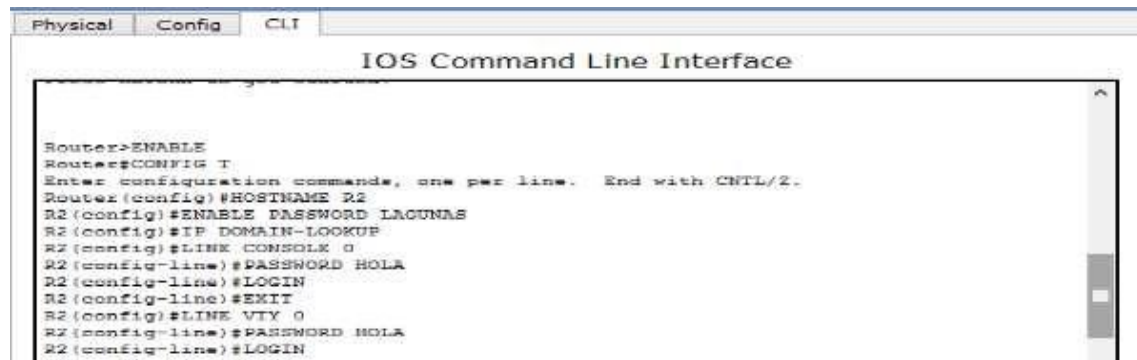
R1



The screenshot shows the IOS Command Line Interface for Router R1. The interface has tabs for Physical, Config, and CLI. The CLI tab is active, and the prompt is Router>. The user enters 'enable' to enter privileged mode, then 'config t' to enter global configuration mode. The prompt changes to Router(config)#. The user enters 'hostname R1' to set the router name. The prompt changes to R1(config)#. The user enters 'enable password victoria' to set the enable password. The prompt changes to R1(config)#. The user enters 'banner motd x REDES DE COMPUTADORAS-LAGUNAS ZARATE VICTORIA-UNIDAD 5-PRACTICA 6!!!x' to set the banner. The prompt changes to R1(config)#.

```
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R1
R1(config)#enable password victoria
R1(config)#banner motd x REDES DE COMPUTADORAS-LAGUNAS ZARATE VICTORIA-UNIDAD 5-
PRACTICA 6!!!x
```

R2



The screenshot shows the IOS Command Line Interface for Router R2. The interface has tabs for Physical, Config, and CLI. The CLI tab is active, and the prompt is Router>. The user enters 'ENABLE' to enter privileged mode, then 'CONFIG T' to enter global configuration mode. The prompt changes to Router(config)#. The user enters 'hostname R2' to set the router name. The prompt changes to R2(config)#. The user enters 'enable password lagunas' to set the enable password. The prompt changes to R2(config)#. The user enters 'ip domain-lookup' to enable domain lookup. The prompt changes to R2(config)#. The user enters 'line console 0' to enter line configuration mode for the console. The prompt changes to R2(config-line)#. The user enters 'password hola' to set the password. The prompt changes to R2(config-line)#. The user enters 'login' to enable login. The prompt changes to R2(config-line)#. The user enters 'exit' to exit line configuration mode. The prompt changes to R2(config)#. The user enters 'line vty 0' to enter line configuration mode for the vty. The prompt changes to R2(config-line)#. The user enters 'password hola' to set the password. The prompt changes to R2(config-line)#. The user enters 'login' to enable login. The prompt changes to R2(config-line)#.

```
Router>ENABLE
Router#CONFIG T
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R2
R2(config)#enable password lagunas
R2(config)#ip domain-lookup
R2(config)#line console 0
R2(config-line)#password hola
R2(config-line)#login
R2(config-line)#exit
R2(config)#line vty 0
R2(config-line)#password hola
R2(config-line)#login
```

R3



The screenshot shows the IOS Command Line Interface for Router R3. The interface has tabs for Physical, Config, and CLI. The CLI tab is active, and the prompt is Router>. The user enters 'enable' to enter privileged mode, then 'config t' to enter global configuration mode. The prompt changes to Router(config)#. The user enters 'hostname R3' to set the router name. The prompt changes to R3(config)#. The user enters 'enable password zarate' to set the enable password. The prompt changes to R3(config)#. The user enters 'no ip domain-lookup' to disable domain lookup. The prompt changes to R3(config)#. The user enters 'line console 0' to enter line configuration mode for the console. The prompt changes to R3(config-line)#. The user enters 'password hola' to set the password. The prompt changes to R3(config-line)#. The user enters 'login exit' to enable login and exit line configuration mode. The prompt changes to R3(config)#.

```
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R3
R3(config)#enable password zarate
R3(config)#no ip domain-lookup
R3(config)#line console 0
R3(config-line)#password hola
R3(config-line)#login exit
```

Ahora el levantamiento Ethernet y seriales de cada uno de los routers:

R1

```
R1>enable
Password:
R1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#interface FastEthernet0/0
R1(config-if)#ip address 172.16.1.17 255.255.255.240
R1(config-if)#no shut

R1(config-if)#
%LINK-3-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

R1(config-if)#interface serial12/0
R1(config-if)#ip address 192.168.10.1 255.255.255.252
R1(config-if)#no shut

R1(config-if)#
%LINK-3-CHANGED: Interface Serial12/0, changed state to down
R1(config-if)#interface serial12/0
R1(config-if)#ip address 192.168.10.8 255.255.255.252
R1(config-if)#no shut

R1(config-if)#
%LINK-3-CHANGED: Interface Serial12/0, changed state to down
R1(config-if)#
```

R2

```
R2>enable
Password:
R2#configure t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#interface FastEthernet0/0
R2(config-if)#ip address 10.10.10.1 255.255.255.0
R2(config-if)#no shut

R2(config-if)#
%LINK-3-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

R2(config-if)#interface serial12/0
R2(config-if)#ip address 101.100.10.2 255.255.255.252
R2(config-if)#no shut

R2(config-if)#
%LINK-3-CHANGED: Interface Serial12/0, changed state to up
R2(config-if)#interface serial13/0
R2(config-if)#ip ad
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial12/0, changed state to up
R2(config-if)#interface serial12/0
R2(config-if)#ip address 192.168.10.9 255.255.255.252
R2(config-if)#no shut

R2(config-if)#
%LINK-3-CHANGED: Interface Serial12/0, changed state to down
```

R3

```

R2>enable
Password:
R2#configure t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#interface Fa0/0
R2(config-if)#ip address 192.168.1.88 255.255.255.255
R2(config-if)#no shut

R2(config-if)#
%LINK-3-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-3-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

R2(config-if)#interface Serial12/0
R2(config-if)#ip address 192.168.10.10 255.255.255.255
R2(config-if)#no shut

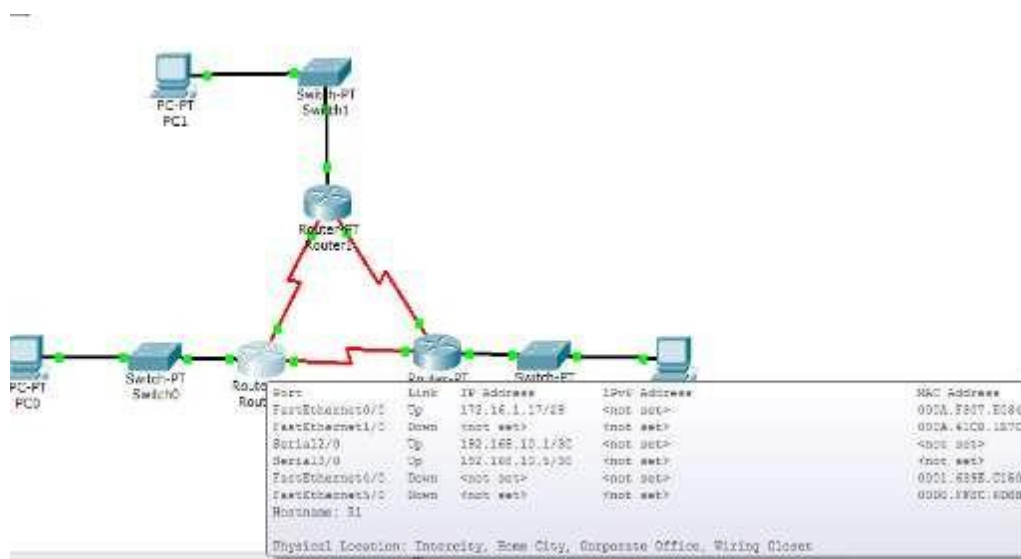
R2(config-if)#
%LINK-3-CHANGED: Interface Serial12/0, changed state to up

R2(config-if)#interface Serial13/0
R2(config-if)#
%LINKSTATUS-6-UPDOWN: Line protocol on Interface Serial12/0, changed state to up
R2(config-if)#interface Serial13/0
R2(config-if)#ip address 192.168.10.10 255.255.255.255
R2(config-if)#shut

R2(config-if)#
%LINK-3-CHANGED: Interface Serial13/0, changed state to up

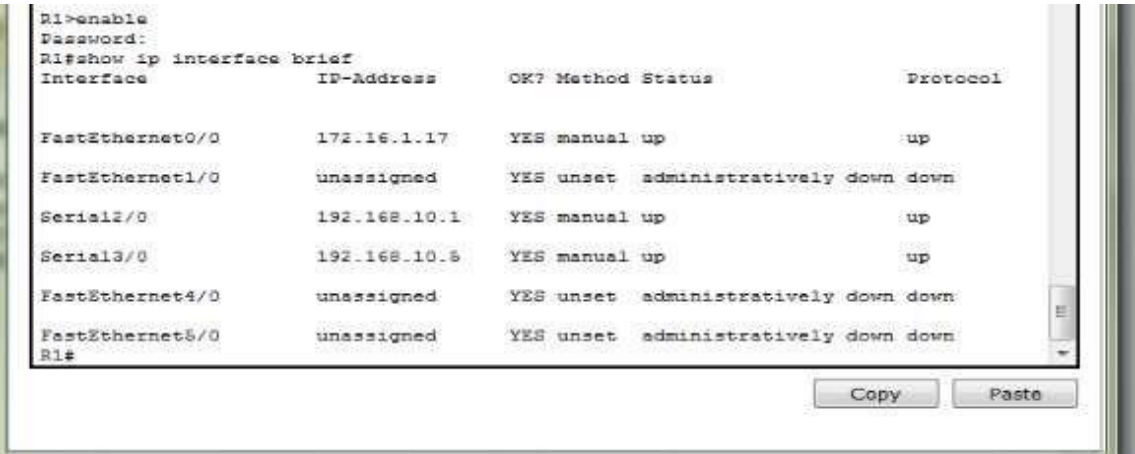
```

Ahora podemos ver cómo fue realizada correctamente el levantamiento de cada uno de los puertos.



Continuamos verificando el direccionamiento IP y las interfaces con el comando SHOW IP INTERFACE BRIEF.

R1



R1>enable
Password:
R1#show ip interface brief

Interface	IP-Address	OK?	Method	Status	Protocol
FastEthernet0/0	172.16.1.17	YES	manual	up	up
FastEthernet1/0	unassigned	YES	unset	administratively down	down
Serial2/0	192.168.10.1	YES	manual	up	up
Serial3/0	192.168.10.6	YES	manual	up	up
FastEthernet4/0	unassigned	YES	unset	administratively down	down
FastEthernet5/0	unassigned	YES	unset	administratively down	down

R1#

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R2



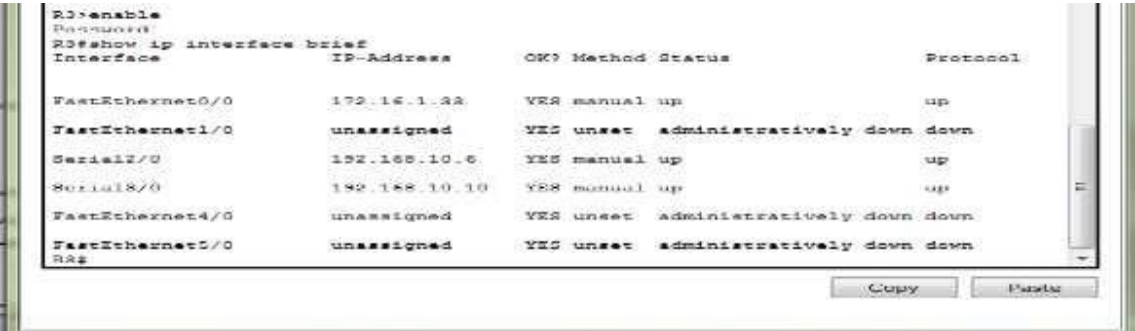
R2>enable
Password:
R2#show ip interface brief

Interface	IP Address	OK?	Method	Status	Protocol
FastEthernet0/0	10.10.10.1	YES	manual	up	up
FastEthernet1/0	unassigned	YES	unset	administratively down	down
Serial2/0	102.100.10.2	YES	manual	up	up
Serial3/0	102.100.10.3	YES	manual	up	up
FastEthernet4/0	unassigned	YES	unset	administratively down	down
FastEthernet5/0	unassigned	YES	unset	administratively down	down

R2#

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R3



R3>enable
Password:
R3#show ip interface brief

Interface	IP-Address	OK?	Method	Status	Protocol
FastEthernet0/0	172.16.1.22	YES	manual	up	up
FastEthernet1/0	unassigned	YES	unset	administratively down	down
Serial2/0	192.168.10.6	YES	manual	up	up
Serial3/0	192.168.10.10	YES	manual	up	up
FastEthernet4/0	unassigned	YES	unset	administratively down	down
FastEthernet5/0	unassigned	YES	unset	administratively down	down

R3#

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Seguimos ahora con la configuración de los interfaces Ethernet de las PC`s:

PC1:



The image shows a Windows-style 'IP Configuration' dialog box. It has a blue title bar with the text 'IP Configuration' and a close button. The dialog is divided into two main sections. The first section, 'IP Configuration', has two radio buttons: 'DHCP' (unselected) and 'Static' (selected). Below these are four text input fields: 'IP Address' with the value '172.16.1.20', 'Subnet Mask' with '255.255.255.240', 'Default Gateway' with '172.16.1.17', and 'DNS Server' which is empty. The second section, 'IPv6 Configuration', has three radio buttons: 'DHCP' (unselected), 'Auto Config' (unselected), and 'Static' (selected). Below these are four text input fields: 'IPv6 Address' which is empty, 'Link Local Address' with the value 'FE80::260:5CFF:FE75:423A', 'IPv6 Gateway' which is empty, and 'IPv6 DNS Server' which is empty.

IP Configuration	
☐ DHCP ☒ Static	
IP Address	172.16.1.20
Subnet Mask	255.255.255.240
Default Gateway	172.16.1.17
DNS Server	

IPv6 Configuration	
☐ DHCP ☐ Auto Config ☒ Static	
IPv6 Address	
Link Local Address	FE80::260:5CFF:FE75:423A
IPv6 Gateway	
IPv6 DNS Server	

PC2:



The image shows a Windows-style 'IP Configuration' dialog box, similar to the one for PC1. It has a blue title bar with the text 'IP Configuration' and a close button. The dialog is divided into two main sections. The first section, 'IP Configuration', has two radio buttons: 'DHCP' (unselected) and 'Static' (selected). Below these are four text input fields: 'IP Address' with the value '10.10.10.10', 'Subnet Mask' with '255.255.255.0', 'Default Gateway' with '10.10.10.1', and 'DNS Server' which is empty. The second section, 'IPv6 Configuration', has three radio buttons: 'DHCP' (unselected), 'Auto Config' (unselected), and 'Static' (selected). Below these are four text input fields: 'IPv6 Address' which is empty, 'Link Local Address' with the value 'FE80::260:70FF:FE03:7511', 'IPv6 Gateway' which is empty, and 'IPv6 DNS Server' which is empty.

IP Configuration	
☐ DHCP ☒ Static	
IP Address	10.10.10.10
Subnet Mask	255.255.255.0
Default Gateway	10.10.10.1
DNS Server	

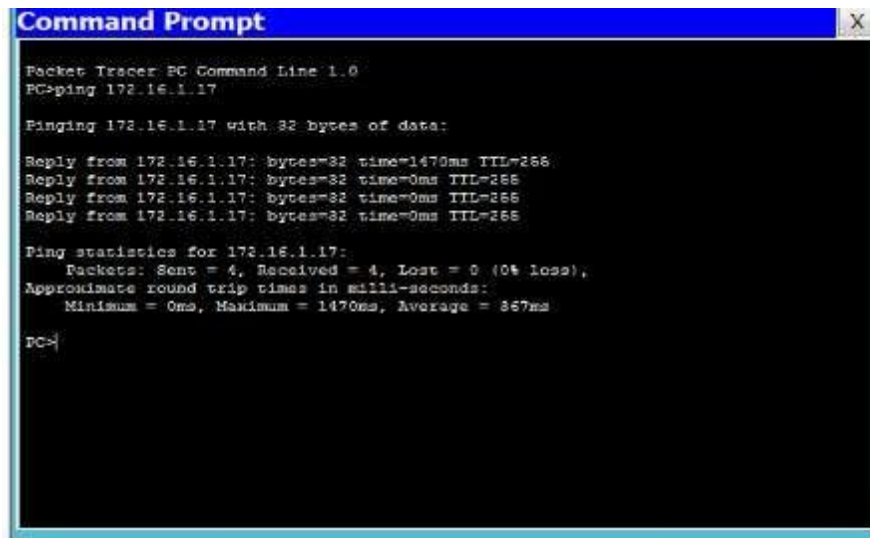
IPv6 Configuration	
☐ DHCP ☐ Auto Config ☒ Static	
IPv6 Address	
Link Local Address	FE80::260:70FF:FE03:7511
IPv6 Gateway	
IPv6 DNS Server	

PC3:



Ahora probamos las conexiones de las PC`s utilizando el comando PING:

PC1:



PC2:



PC3:



```
Command Prompt
Packet Tracer PC Command Line 1.0
DC>PING 172.16.1.88

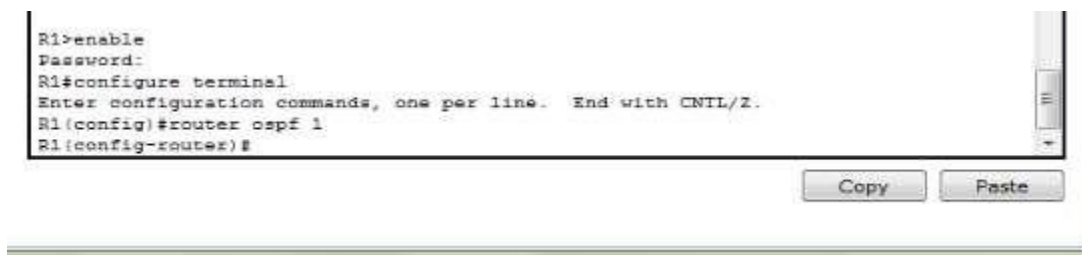
Pinging 172.16.1.88 with 82 bytes of data:

Reply from 172.16.1.88: bytes=82 time=0ms TTL=255
Reply from 172.16.1.88: bytes=82 time=0ms TTL=255
Reply from 172.16.1.88: bytes=82 time=0ms TTL=255
Reply from 172.16.1.88: bytes=82 time=0ms TTL=255

Ping statistics for 172.16.1.88:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

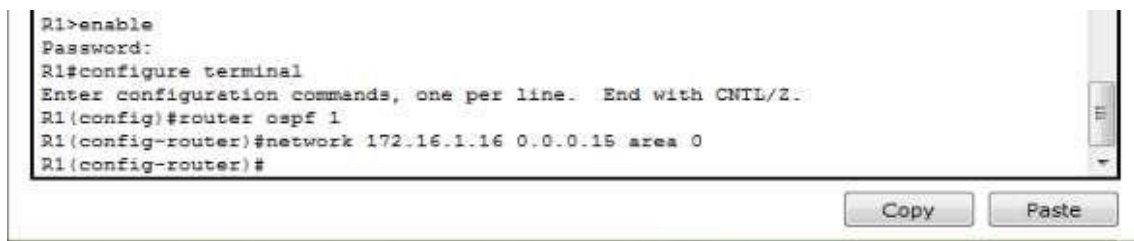
PC>
```

Configuración OSPF en el Router R1:



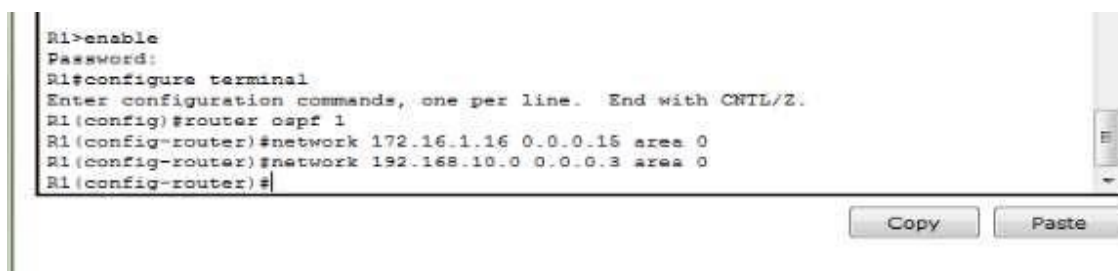
```
R1>enable
Password:
R1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#router ospf 1
R1(config-router)#
```

Configurar la sentencia de la red LAN:



```
R1>enable
Password:
R1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#router ospf 1
R1(config-router)#network 172.16.1.16 0.0.0.15 area 0
R1(config-router)#
```

Configurar el router para notificar la red 192.168.10.0/30 conectada a la interfaz Serial0/0/0.



```
R1>enable
Password:
R1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#router ospf 1
R1(config-router)#network 172.16.1.16 0.0.0.15 area 0
R1(config-router)#network 192.168.10.0 0.0.0.3 area 0
R1(config-router)#
```

Configurar el router para notificar la red 192.168.10.4/30 conectada a la interfaz Serial0/0/1.

```
R1>enable
Password:
R1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#router ospf 1
R1(config-router)#network 172.16.1.16 0.0.0.16 area 0
R1(config-router)#network 192.168.10.0 0.0.0.3 area 0
R1(config-router)#network 192.168.10.4 0.0.0.3 area 0
R1(config-router)#
```

Cuando haya finalizado con la configuración OSPF para R1, regrese al modo EXEC privilegiado

```
R1>enable
Password:
R1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#router ospf 1
R1(config-router)#network 172.16.1.16 0.0.0.16 area 0
R1(config-router)#network 192.168.10.0 0.0.0.3 area 0
R1(config-router)#network 192.168.10.4 0.0.0.3 area 0
R1(config-router)#end
R1#
%SYS-5-CONFIG_I: Configured from console by console
R1#
```

Eliminar la ID del router configurado con la forma no del comando router-id.

```
R1>enable
Password:
R1#config t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#router ospf 1
R1(config-router)#router-id 10.4.4.4
R1(config-router)#Reload or use "clear ip ospf process" command, for this to take effect
R1#
```

Reiniciar el proceso OSPF por medio del comando clear ip ospf process.

```
R1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#end
R1#
%SYS-5-CONFIG_I: Configured from console by console
R1#clear ip ospf process
Reset ALL OSPF processes? [no]: yes
R1#
```

Configuración del costo de OSPF:



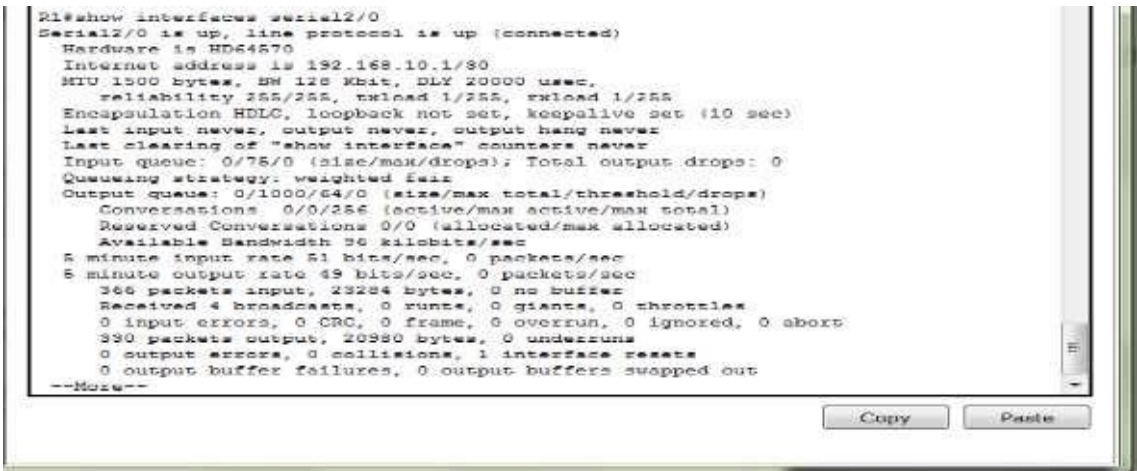
```
IOS Command Line Interface

C 172.16.1.16 is directly connected, FastEthernet0/0
  192.168.10.0/30 is subnetted, 2 subnets
C   192.168.10.0 is directly connected, Serial12/0
C   192.168.10.4 is directly connected, Serial13/0
R1#show ip route
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
C   10.1.1.1 is directly connected, Loopback0
  172.16.0.0/28 is subnetted, 1 subnets
C   172.16.1.16 is directly connected, FastEthernet0/0
  192.168.10.0/30 is subnetted, 2 subnets
C   192.168.10.0 is directly connected, Serial12/0
C   192.168.10.4 is directly connected, Serial13/0
R1#
```

Utilizar el comando show interfaces serial0/0/0 en el router R1 para visualizar el ancho de banda de la interfaz Serial 0/0/0.



```
R1#show interfaces serial12/0
Serial12/0 is up, line protocol is up (connected)
  Hardware is HD64570
  Internet address is 192.168.10.1/30
  MTU 1500 bytes, BW 128 Kbit, DLY 20000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)
  last input never, output never, output hang never
  last clearing of "show interface" counters never
  Input queue: 0/75/0 (size/max/drops); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/1000/64/0 (size/max total/threshold/drops)
    Conversations 0/0/255 (active/max active/max total)
    Reserved Conversations 0/0 (allocated/max allocated)
    Available Bandwidth 96 kilobits/sec
  5 minute input rate 51 bits/sec, 0 packets/sec
  5 minute output rate 49 bits/sec, 0 packets/sec
  366 packets input, 23284 bytes, 0 no buffer
  Received 4 broadcasts, 0 runts, 0 giants, 0 throttles
  0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
  390 packets output, 20980 bytes, 0 underruns
  0 output errors, 0 collisions, 1 interface resets
  0 output buffer failures, 0 output buffers swapped out
--More--
```

Utilizar el comando show ip ospf interface en el router R1 para verificar el costo de los enlaces seriales.

```

R1>enable
Password:
R1#show ip ospf interface
FastEthernet0/0 is up, line protocol is up
  Internet address is 172.16.1.17/28, Area 0
  Process ID 1, Router ID 10.4.4.4, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 10.4.4.4, Interface Address 172.16.1.17
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 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
  Neighbor Count is 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
Serial12/0 is up, line protocol is up
  Internet address is 192.168.10.1/30, Area 0
  Process ID 1, Router ID 10.4.4.4, Network Type POINT-TO-POINT, Cost: 1562
  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
--More--

```

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Examinar la tabla de enrutamiento en el router R1 para verificar el cambio en la métrica del costo de OSPF.

```

R1>enable
Password:
R1#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       E - 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, I - IGP
       * - 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 0.0.0.0 to network 0.0.0.0

10.0.0.0/32 is subnetted, 1 subnets
  10.1.1.1 is directly connected, Loopback0
172.16.0.0/28 is subnetted, 1 subnets
  172.16.1.16 is directly connected, FastEthernet0/0
172.30.0.0/30 is subnetted, 1 subnets
  172.30.1.0 is directly connected, Loopback1
192.168.10.0/30 is subnetted, 2 subnets
  192.168.10.0 is directly connected, Serial12/0
  192.168.10.4 is directly connected, Serial13/0
S*  0.0.0.0/0 is directly connected, Loopback1
R1#

```

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```

R2>enable
Password:
R2#config t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#interface serial12/0
R2(config-if)#ip ospf hello-interval 5
R2(config-if)#ip ospf dead-interval 20
R2(config-if)#
R2(config-if)#

```

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Utilizar el comando `show ip ospf interface serial0/0/0` para verificar que se han cambiado los intervalos del temporizador Hello y del temporizador Dead.

```
RT>enable
RT#configure
RT#show ip ospf interface serial0/0/0
Serial0/0/0 is up, line protocol is up
Internet address is 192.168.10.2/30, Area 0
Process ID 1, Router ID 192.168.10.9, Network Type POINT-TO-POINT, Cost: 100
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 5, Dead 20, Wait 20, Retransmit 5
  Hello due in 00:00:04
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
Suppress hello for 0 neighbor(s)
RT#
```

CONCLUSIÓN

En conclusión la práctica que realizamos de la configuración del protocolo OSPF, como ya anteriormente lo habíamos realizado, indicando el número de proceso de igual forma para los tres routers utilizados en la topología. Con esta práctica terminamos la unidad 6, con lo cual fuimos observando el procedimiento que se realiza para que la topología pueda operar