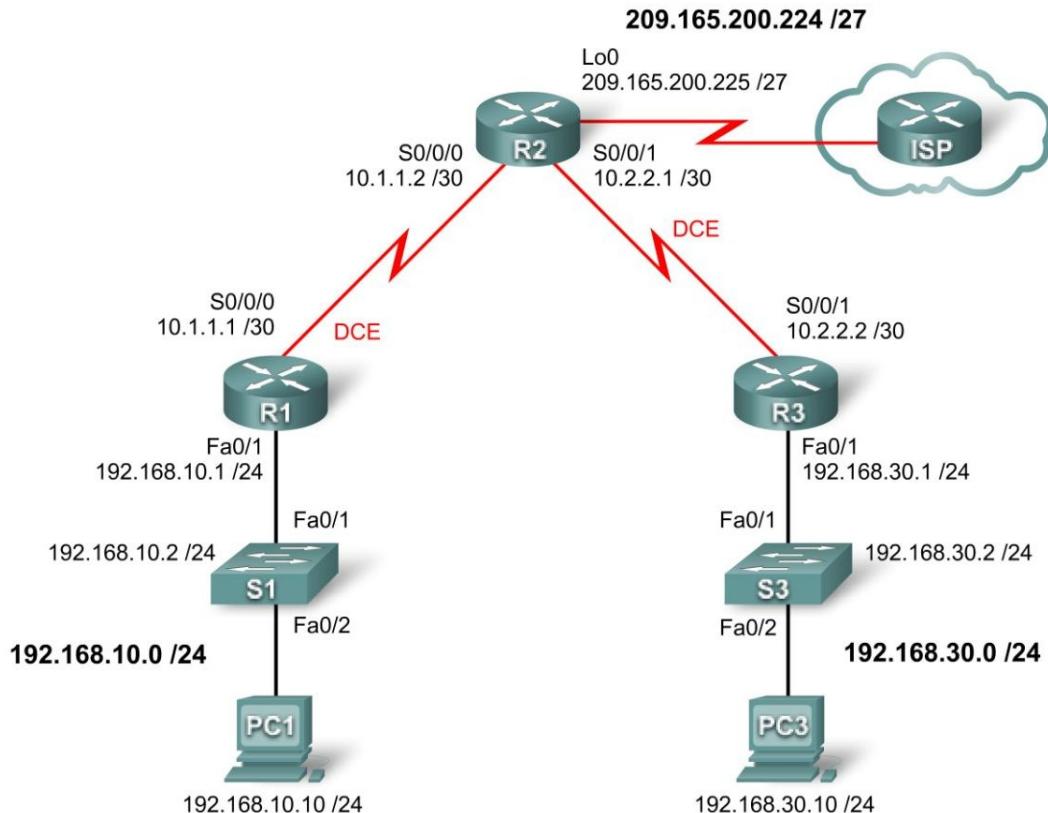


## Práctica de laboratorio 2.5.1: Configuración básica de PPP

### Diagrama de topología



### Tabla de direccionamiento

Dispositivo	Interfaz	Dirección IP	Máscara de subred	Gateway por defecto
R1	<b>Fa0/1</b>	192.168.10.1	255.255.255.0	N/C
	<b>S0/0/0</b>	10.1.1.1	255.255.255.252	N/C
R2	<b>Lo0</b>	209.165.200.225	255.255.255.224	N/C
	<b>S0/0/0</b>	10.1.1.2	255.255.255.252	N/C
	<b>S0/0/1</b>	10.2.2.1	255.255.255.252	N/C
R3	<b>Fa0/1</b>	192.168.30.1	255.255.255.0	N/C
	<b>S0/0/1</b>	10.2.2.2	255.255.255.252	N/C
<b>PC1</b>	<b>NIC</b>	192.168.10.10	255.255.255.0	192.168.10.1
<b>PC3</b>	<b>NIC</b>	192.168.30.10	255.255.255.0	192.168.30.1

## Objetivos de aprendizaje

Al completar esta práctica de laboratorio, el usuario podrá:

- Cablear una red según el diagrama de topología
- Borrar 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 la encapsulación PPP en todas las interfaces seriales
- Aprender acerca de los comandos **debug ppp negotiation** y **debug ppp packet**
- Aprender cómo cambiar la encapsulación en las interfaces seriales de PPP a HDLC
- Interrumpir intencionalmente y restablecer la encapsulación PPP
- Configurar la autenticación CHAP y PAP de PPP
- Interrumpir intencionalmente y restablecer la autenticación PAP y CHAP de PPP

## Escenario

En esta práctica de laboratorio, se aprenderá a configurar la encapsulación PPP en enlaces seriales a través de la red que se muestra en el diagrama de topología. También se aprenderá a restaurar los enlaces seriales a su encapsulación HDLC por defecto. Se debe prestar especial atención al aspecto del resultado del router cuando se interrumpe intencionalmente la encapsulación PPP. Esto ayudará en la práctica de laboratorio de resolución de problemas relacionada con este capítulo. Por último, se configurará la autenticación PPP PAP y la autenticación PPP CHAP.

### Tarea 1: Preparar la red

#### Paso 1: Conectar una red que sea similar a la del diagrama de topología.

Se puede utilizar cualquier router del laboratorio, siempre y cuando éste disponga de las interfaces necesarias que se muestran en el diagrama de topología.

Nota: Si se utilizan los routers 1700, 2500 ó 2600, los resultados del router y las descripciones tienen un aspecto diferente.

#### Paso 2: Borrar todas las configuraciones de los routers.

### Tarea 2: Realizar la configuración básica del router

Configure los routers R1, R2 y R3 de acuerdo con las siguientes instrucciones:

- Configure el nombre de host del router.
- Deshabilite la búsqueda DNS.
- Configure una contraseña de Modo EXEC.
- Configure un mensaje del día.

- Configure una contraseña para las conexiones de la consola.
- Configure el registro de datos sincrónico.
- Configure una contraseña para las conexiones de vty.

```
enable
configure terminal
no ip domain-lookup
enable secret class
banner motd ^CUnauthorized access strictly prohibited and prosecuted
to the full extent of the law^C
!
!
line con 0
  exec-timeout 0 0
  logging synchronous
  password cisco
  login
!
line vty 0 4
  password cisco
  login
end
copy running-config starting-config
```

### Tarea 3: Configurar y activar las direcciones serial y Ethernet

#### Paso 1: Configurar las interfaces de R1, R2 y R3.

Configure las interfaces de los routers R1, R2 y R3 con las direcciones IP de la tabla de direccionamiento que se encuentra al comienzo de esta práctica de laboratorio. Asegúrese de incluir la frecuencia de reloj en las interfaces DCE seriales.

```
R1
!
interface FastEthernet0/1
  ip address 192.168.10.1 255.255.255.0
  no shutdown
!

interface Serial0/0/0
  ip address 10.1.1.1 255.255.255.252
  no shutdown
  clock rate 64000
```

```
R2
!
interface Loopback0
  ip address 209.165.200.225 255.255.255.224
!
!
interface Serial0/0/0
  ip address 10.1.1.2 255.255.255.252
  no shutdown
!
interface Serial0/0/1
```

```
ip address 10.2.2.1 255.255.255.252
clock rate 64000
no shutdown
```

R3

```
!
interface FastEthernet0/1
 ip address 192.168.30.1 255.255.255.0
 no shutdown
!
interface Serial0/0/1
 ip address 10.2.2.2 255.255.255.252
 no shutdown
```

### Paso 2: Verificar el direccionamiento IP y las interfaces.

Utilice el comando **show ip interface brief** para verificar que el direccionamiento IP es correcto y que las interfaces están activas.

R1#**show ip interface brief**

Interface Protocol	IP-Address	OK?	Method	Status	Protocol
FastEthernet0/0	unassigned	YES	NVRAM	administratively down	down
FastEthernet0/1	192.168.10.1	YES	manual	up	up
Serial0/0/0	10.1.1.1	YES	manual	up	up
Serial0/0/1	unassigned	YES	NVRAM	administratively down	down

R2#**show ip interface brief**

Interface	IP-Address	OK?	Method	Status	Protocol
FastEthernet0/0	unassigned	YES	NVRAM	administratively down	down
FastEthernet0/1	unassigned	YES	NVRAM	administratively down	down
Serial0/0/0	10.1.1.2	YES	manual	up	up
Serial0/0/1	10.2.2.1	YES	manual	up	up
Loopback0	209.165.200.225	YES	manual	up	up

R3#**show ip interface brief**

Interface	IP-Address	OK?	Method	Status	Protocol
FastEthernet0/0	unassigned	YES	NVRAM	administratively down	down
FastEthernet0/1	192.168.30.1	YES	manual	up	up
Serial0/0/0	unassigned	YES	NVRAM	administratively down	down
Serial0/0/1	10.2.2.2	YES	manual	up	up

Cuando haya finalizado, asegúrese de guardar la configuración en ejecución para la NVRAM del router.

### Paso 3: Configurar las interfaces Ethernet de PC1 y PC3.

Configure las interfaces Ethernet de IPC1 y PC3 con las direcciones IP y gateways por defecto que se indican en la tabla de direccionamiento.

### Paso 4: Probar la configuración al hacer ping desde el equipo PC a la gateway por defecto.

#### Tarea 4: Configurar OSPF en los routers

Si se necesita repasar los comandos de OSPF, consulte el módulo 11 de Exploration 2.

##### Paso 1: Activar el enrutamiento OSPF en R1, R2 y R3.

Use el comando **router ospf** con un ID de proceso de 1. Asegúrese de publicar las redes.

```
R1(config)#router ospf 1
R1(config-router)#network 192.168.10.0 0.0.0.255 area 0
R1(config-router)#network 10.1.1.0 0.0.0.3 area 0
*Aug 17 17:49:14.689: %OSPF-5-ADJCHG: Process 1, Nbr 209.165.200.225 on
Serial0/0/0 from LOADING to FULL, Loading Done
R1(config-router)#
R2(config)#router ospf 1
R2(config-router)#network 10.1.1.0 0.0.0.3 area 0
*Aug 17 17:48:40.645: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.10.1 on
Serial0/0/0 from LOADING to FULL, Loading Done
R2(config-router)#network 10.2.2.0 0.0.0.3 area 0
R2(config-router)#network 209.165.200.224 0.0.0.31 area 0
R2(config-router)#
*Aug 17 17:57:44.729: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.30.1 on
Serial0/0/1 from LOADING to FULL, Loading Done
R2(config-router)#
R3(config)#router ospf 1
R3(config-router)#network 10.2.2.0 0.0.0.3 area 0
*Aug 17 17:58:02.017: %OSPF-5-ADJCHG: Process 1, Nbr 209.165.200.225 on
Serial0/0/1 from LOADING to FULL, Loading Done
R3(config-router)#network 192.168.30.0 0.0.0.255 area 0
R3(config-router)#

```

##### Paso 2: Verificar que hay conectividad completa en la red.

Use los comandos **show ip route** y **ping** para verificar la conectividad.

```
R1#show ip route
<output omitted>
O    192.168.30.0/24 [110/1563] via 10.1.1.2, 00:33:56, Serial0/0/0
C    192.168.10.0/24 is directly connected, FastEthernet0/1
      209.165.200.0/32 is subnetted, 1 subnets
O      209.165.200.225 [110/782] via 10.1.1.2, 00:33:56, Serial0/0/0
          10.0.0.0/8 is variably subnetted, 3 subnets, 2 masks
C          10.1.1.2/32 is directly connected, Serial0/0/0
O          10.2.2.0/30 [110/1562] via 10.1.1.2, 00:33:56, Serial0/0/0
C          10.1.1.0/30 is directly connected, Serial0/0/0
R1#ping 192.168.30.1
```

```
Type escape sequence to abort.  
Sending 5, 100-byte ICMP Echos to 192.168.30.1, timeout is 2 seconds:  
!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 32/32/32 ms  
R1#
```

```
R2#show ip route
```

```
<output omitted>  
O 192.168.30.0/24 [110/782] via 10.2.2.2, 00:33:04, Serial0/0/1  
O 192.168.10.0/24 [110/782] via 10.1.1.1, 00:33:04, Serial0/0/0  
209.165.200.0/27 is subnetted, 1 subnets  
C 209.165.200.224 is directly connected, Loopback0  
10.0.0.0/8 is variably subnetted, 4 subnets, 2 masks  
C 10.2.2.2/32 is directly connected, Serial0/0/1  
C 10.2.2.0/30 is directly connected, Serial0/0/1  
C 10.1.1.0/30 is directly connected, Serial0/0/0  
C 10.1.1.1/32 is directly connected, Serial0/0/0
```

```
R2#ping 192.168.30.1
```

```
Type escape sequence to abort.  
Sending 5, 100-byte ICMP Echos to 192.168.30.1, timeout is 2 seconds:  
!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 16/16/16 ms  
R2#ping 192.168.10.1
```

```
Type escape sequence to abort.  
Sending 5, 100-byte ICMP Echos to 192.168.10.1, timeout is 2 seconds:  
!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 16/16/16 ms  
R2#
```

```
R3#show ip route
```

```
<output omitted>  
C 192.168.30.0/24 is directly connected, FastEthernet0/1  
O 192.168.10.0/24 [110/1563] via 10.2.2.1, 00:32:01, Serial0/0/1  
209.165.200.0/32 is subnetted, 1 subnets  
O 209.165.200.225 [110/782] via 10.2.2.1, 00:32:01, Serial0/0/1  
10.0.0.0/8 is variably subnetted, 3 subnets, 2 masks  
C 10.2.2.0/30 is directly connected, Serial0/0/1  
O 10.1.1.0/30 [110/1562] via 10.2.2.1, 00:32:01, Serial0/0/1  
C 10.2.2.1/32 is directly connected, Serial0/0/1
```

```
R3#ping 209.165.200.225
```

```
Type escape sequence to abort.  
Sending 5, 100-byte ICMP Echos to 209.165.200.225, timeout is 2  
seconds:  
!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 16/16/16 ms  
R3#ping 192.168.10.1
```

```
Type escape sequence to abort.  
Sending 5, 100-byte ICMP Echos to 192.168.10.1, timeout is 2 seconds:  
!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 32/32/32 ms  
R3#
```

## Tarea 5: Configurar la encapsulación PPP en interfaces seriales

### Paso 1: Utilizar el comando show interface para verificar si HDLC es la encapsulación serial por defecto.

```
R1#show interface serial0/0/0  
Serial0/0/0 is up, line protocol is up  
  Hardware is GT96K Serial  
  Internet address is 10.1.1.1/30  
  MTU 1500 bytes, BW 128 Kbit, DLY 20000 usec,  
    reliability 255/255, txload 1/255, rxload 1/255  
  Encapsulation HDLC, loopback not set  
  
<output omitted>  
  
R2#show interface serial 0/0/0  
Serial0/0/0 is up, line protocol is up  
  Hardware is GT96K Serial  
  Internet address is 10.1.1.2/30  
  MTU 1500 bytes, BW 128 Kbit, DLY 20000 usec,  
    reliability 255/255, txload 1/255, rxload 1/255  
  Encapsulation HDLC, loopback not set  
  
<output omitted>  
  
R2#show interface serial 0/0/1  
Serial0/0/1 is up, line protocol is up  
  Hardware is GT96K Serial  
  Internet address is 10.2.2.1/30  
  MTU 1500 bytes, BW 128 Kbit, DLY 20000 usec,  
    reliability 255/255, txload 1/255, rxload 1/255  
  Encapsulation HDLC, loopback not set  
  
<output omitted>  
  
R3#show interface serial 0/0/1  
Serial0/0/1 is up, line protocol is up  
  Hardware is GT96K Serial  
  Internet address is 10.2.2.2/30  
  MTU 1500 bytes, BW 128 Kbit, DLY 20000 usec,  
    reliability 255/255, txload 1/255, rxload 1/255  
  Encapsulation HDLC, loopback not set  
  
<output omitted>
```

**Paso 2: Utilice los comandos debug en R1 y R2 para ver los efectos que produce la configuración PPP.**

```
R1#debug ppp negotiation
PPP protocol negotiation debugging is on
R1#debug ppp packet
PPP packet display debugging is on
R1#
R2#debug ppp negotiation
PPP protocol negotiation debugging is on
R2#debug ppp packet
PPP packet display debugging is on
R2#
```

**Paso 3: Cambiar la encapsulación de las interfaces seriales de HDLC a PPP.**

Cambie el tipo de encapsulación en el enlace entre R1 y R2, y observe los efectos. Si se comienza a recibir demasiados datos de depuración, use el comando **undebbug all** para desactivar la depuración.

```
R1(config)#interface serial 0/0/0
R1(config-if)#encapsulation ppp
R1(config-if)#
*Aug 17 19:02:53.412: %OSPF-5-ADJCHG: Process 1, Nbr 209.165.200.225 on
Serial0/0/0 from FULL to DOWN, Neighbor Down: Interface down or
detached
R1(config-if)#
*Aug 17 19:02:53.416: Se0/0/0 PPP: Phase is DOWN, Setup
*Aug 17 19:02:53.416: Se0/0/0 PPP: Using default call direction
*Aug 17 19:02:53.416: Se0/0/0 PPP: Treating connection as a dedicated
line
*Aug 17 19:02:53.416: Se0/0/0 PPP: Session handle[E4000001] Session
id[0]
*Aug 17 19:02:53.416: Se0/0/0 PPP: Phase is ESTABLISHING, Active Open
*Aug 17 19:02:53.424: Se0/0/0 LCP: O CONFREQ [Closed] id 1 len 10
*Aug 17 19:02:53.424: Se0/0/0 LCP: MagicNumber 0x63B994DE
(0x050663B994DE)
R1(config-if)#
*Aug 17 19:02:55.412: Se0/0/0 PPP: Outbound cdp packet dropped
*Aug 17 19:02:55.432: Se0/0/0 LCP: TIMEOUT: State REQsent
*Aug 17 19:02:55.432: Se0/0/0 LCP: O CONFREQ [REQsent] id 2 len 10
*Aug 17 19:02:55.432: Se0/0/0 LCP: MagicNumber 0x63B994DE
(0x050663B994DE)
*Aug 17 19:02:56.024: Se0/0/0 PPP: I pkt type 0x008F, datagramsize 24
link[illegal]
*Aug 17 19:02:56.024: Se0/0/0 UNKNOWN(0x008F): Non-NCP packet,
discarding
R1(config-if)#
*Aug 17 19:02:57.252: Se0/0/0 PPP: I pkt type 0x000F, datagramsize 84
link[illegal]
*Aug 17 19:02:57.252: Se0/0/0 UNKNOWN(0x000F): Non-NCP packet,
discarding
*Aug 17 19:02:57.448: Se0/0/0 LCP: TIMEOUT: State REQsent
*Aug 17 19:02:57.448: Se0/0/0 LCP: O CONFREQ [REQsent] id 3 len 10
*Aug 17 19:02:57.448: Se0/0/0 LCP: MagicNumber 0x63B994DE
```

```
(0x050663B994DE)
R1(config-if)#
*Aug 17 19:02:58.412: %LINEPROTO-5-UPDOWN: Line protocol on Interface
Serial0/0/0, changed state to down

R2(config)#interface serial 0/0/0
R2(config-if)#encapsulation ppp
R2(config-if)#
*Aug 17 19:06:48.848: Se0/0/0 PPP: Phase is DOWN, Setup
*Aug 17 19:06:48.848: Se0/0/0 PPP: Using default call direction
*Aug 17 19:06:48.848: Se0/0/0 PPP: Treating connection as a dedicated
line
*Aug 17 19:06:48.848: Se0/0/0 PPP: Session handle[C6000001] Session
id[0]
*Aug 17 19:06:48.848: Se0/0/0 PPP: Phase is ESTABLISHING, Active Open
*Aug 17 19:06:48.856: Se0/0/0 LCP: O CONFREQ [Closed] id 1 len 10
*Aug 17 19:06:48.856: Se0/0/0 LCP: MagicNumber 0x63BD388C
(0x050663BD388C)
*Aug 17 19:06:48.860: Se0/0/0 PPP: I pkt type 0xC021, datagramsize 14
link[ppp]
*Aug 17 19:06:48.860: Se0/0/0 LCP: I CONFACK [REQsent] id 1 len 10
R2(config-if)#
*Aug 17 19:06:48.860: Se0/0/0 LCP: MagicNumber 0x63BD388C
(0x050663BD388C)
R2(config-if)#
*Aug 17 19:06:50.864: Se0/0/0 LCP: TIMEout: State ACKrcvd
*Aug 17 19:06:50.864: Se0/0/0 LCP: O CONFREQ [ACKrcvd] id 2 len 10
*Aug 17 19:06:50.864: Se0/0/0 LCP: MagicNumber 0x63BD388C
(0x050663BD388C)
*Aug 17 19:06:50.868: Se0/0/0 PPP: I pkt type 0xC021, datagramsize 14
link[ppp]
*Aug 17 19:06:50.868: Se0/0/0 LCP: I CONFREQ [REQsent] id 61 len 10
*Aug 17 19:06:50.868: Se0/0/0 LCP: MagicNumber 0x63BDB9A8
(0x050663BDB9A8)
*Aug 17 19:06:50.868: Se0/0/0 LCP: O CONFACK [REQsent] id 61 len 10
*Aug 17 19:06:50.868: Se0/0/0 LCP: MagicNumber 0x63BDB9A8
(0x050663BDB9A8)
*Aug 17 19:06:50.868: Se0/0/0 PPP: I pkt type 0xC021, datagramsize 14
link[ppp]
*Aug 17 19:06:50.868: Se0/0/0 LCP: I CONFACK [ACKsent] id 2 len 10
*Aug 17 19:06:50.868: Se0/0/0 LCP: MagicNumber 0x63BD388C
(0x050663BD388C)
*Aug 17 19:06:50.868: Se0/0/0 LCP: State is Open
*Aug 17 19:06:50.872: Se0/0/0 PPP: Phase is FORWARDING, Attempting
Forward
*Aug 17 19:06:50.872: Se0/0/0 PPP: Phase is ESTABLISHING, Finish LCP
*Aug 17 19:06:50.872: Se0/0/0 PPP: Phase is UP
*Aug 17 19:06:50.872: Se0/0/0 IPCP: O CONFREQ [Closed] id 1 len 10
*Aug 17 19:06:50.872: Se0/0/0 IPCP: Address 10.1.1.2
(0x03060A010102)
*Aug 17 19:06:50.872: Se0/0/0 CDPCP: O CONFREQ [Closed] id 1 len 4
*Aug 17 19:06:50.872: Se0/0/0 PPP: Process pending ncp packets
*Aug 17 19:06:50.876: Se0/0/0 PPP: I pkt type 0x8021, datagramsize 14
link[ip]
*Aug 17 19:06:50.876: Se0/0/0 IPCP: I CONFREQ [REQsent] id 1 len 10
*Aug 17 19:06:50.876: Se0/0/0 IPCP: Address 10.1.1.1
```

```
(0x03060A010101)
*Aug 17 19:06:50.876: Se0/0/0 PPP: I pkt type 0x8207, datagramsize 8
link[cdp]
*Aug 17 19:06:50.876: Se0/0/0 IPCP: O CONFACK [REQsent] id 1 len 10
*Aug 17 19:06:50.876: Se0/0/0 IPCP:      Address 10.1.1.1
(0x03060A010101)
*Aug 17 19:06:50.876: Se0/0/0 CDPCP: I CONFREQ [REQsent] id 1 len 4
*Aug 17 19:06:50.876: Se0/0/0 CDPCP: O CONFACK [REQsent] id 1 len 4
*Aug 17 19:06:50.876: Se0/0/0 PPP: I pkt type 0x8021, datagramsize 14
link[ip]
*Aug 17 19:06:50.876: Se0/0/0 IPCP: I CONFACK [ACKse
R2(config-if)#nt] id 1 len 10
*Aug 17 19:06:50.876: Se0/0/0 IPCP:      Address 10.1.1.2
(0x03060A010102)
*Aug 17 19:06:50.876: Se0/0/0 IPCP: State is Open
*Aug 17 19:06:50.876: Se0/0/0 PPP: I pkt type 0x8207, datagramsize 8
link[cdp]
*Aug 17 19:06:50.876: Se0/0/0 IPCP: Install route to 10.1.1.1
*Aug 17 19:06:50.880: Se0/0/0 CDPCP: I CONFACK [ACKsent] id 1 len 4
*Aug 17 19:06:50.880: Se0/0/0 CDPCP: State is Open
*Aug 17 19:06:50.880: Se0/0/0 PPP: O pkt type 0x0021, datagramsize 80
*Aug 17 19:06:50.880: Se0/0/0 IPCP: Add link info for cef entry
10.1.1.1
*Aug 17 19:06:50.884: Se0/0/0 PPP: I pkt type 0x0021, datagramsize 80
link[ip]
*Aug 17 19:06:51.848: %LINEPROTO-5-UPDOWN: Line protocol on Interface
Serial0/0/0, changed state to up
R2(config-if)#
*Aug 17 19:06:51.888: Se0/0/0 LCP-FS: I ECHOREQ [Open] id 1 len 12
magic 0x63BDB9A8
*Aug 17 19:06:51.888: Se0/0/0 LCP-FS: O ECHOREP [Open] id 1 len 12
magic 0x63BD388C

<output omitted>

*Aug 17 19:07:00.936: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.10.1 on
Serial0/0/0 from LOADING to FULL, Loading Done
```

¿Qué sucede cuando un extremo del enlace serial se encapsula con PPP y el otro extremo del enlace se encapsula con HDLC?

---

---

---

¿Cuáles son los pasos que atraviesa PPP cuando el otro extremo del enlace serial en R2 se configura con la encapsulación PPP?

---

---

---

---

---

¿Qué sucede cuando la encapsulación PPP se configura en cada extremo del enlace serial?

---

---

#### Paso 4: Desactivar la depuración.

Desactive la depuración si aún no utilizó el comando **undebbug all**.

```
R1#undebbug all
Port Statistics for unclassified packets is not turned on.
```

```
All possible debugging has been turned off
R1#
```

```
R2#undebbug all
Port Statistics for unclassified packets is not turned on.
```

```
All possible debugging has been turned off
R2#
```

**Paso 5: Cambiar la encapsulación de HDLC a PPP en ambos extremos del enlace serial entre R2 y R3.**

```
R2(config)#interface serial0/0/1
R2(config-if)#encapsulation ppp
R2(config-if)#
*Aug 17 20:02:08.080: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.30.1 on
Serial0/0/1 from FULL to DOWN, Neighbor Down: Interface down or
detached
R2(config-if)#
*Aug 17 20:02:13.080: %LINEPROTO-5-UPDOWN: Line protocol on Interface
Serial0/0/1, changed state to down
R2(config-if)#
*Aug 17 20:02:58.564: %LINEPROTO-5-UPDOWN: Line protocol on Interface
Serial0/0/1, changed state to up
R2(config-if)#
*Aug 17 20:03:03.644: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.30.1 on
Serial0/0/1 from LOADING to FULL, Loading Done
R2(config-if)#

*Aug 17 20:03:46.988: %LINEPROTO-5-UPDOWN: Line protocol on Interface
Serial0/0/1, changed state to down
R3(config)#interface serial 0/0/1
R3(config-if)#encapsulation ppp
R3(config-if)#
*Aug 17 20:04:27.152: %LINEPROTO-5-UPDOWN: Line protocol on Interface
Serial0/0/1, changed state to up
*Aug 17 20:04:30.952: %OSPF-5-ADJCHG: Process 1, Nbr 209.165.200.225 on
Serial0/0/1 from LOADING to FULL, Loading Done
```

¿Cuándo se activa el protocolo de línea en el enlace serial y se restablece la adyacencia OSPF?

---

---

**Paso 7: Verificar que PPP sea ahora la encapsulación en las interfaces seriales.**

```
R1#show interface serial0/0/0
Serial0/0/0 is up, line protocol is up
  Hardware is GT96K Serial
  Internet address is 10.1.1.1/30
  MTU 1500 bytes, BW 128 Kbit, DLY 20000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation PPP, LCP Open
  Open: CDPCP, IPCP, loopback not set

<output omitted>
```

```
R2#show interface serial 0/0/0
Serial0/0/0 is up, line protocol is up
  Hardware is GT96K Serial
  Internet address is 10.1.1.2/30
  MTU 1500 bytes, BW 128 Kbit, DLY 20000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation PPP, LCP Open
  Open: CDPCP, IPCP, loopback not set

<output omitted>

R2#show interface serial 0/0/1
Serial0/0/1 is up, line protocol is up
  Hardware is GT96K Serial
  Internet address is 10.2.2.1/30
  MTU 1500 bytes, BW 128 Kbit, DLY 20000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation PPP, LCP Open
  Open: CDPCP, IPCP, loopback not set

<output omitted>
R3#show interface serial 0/0/1
Serial0/0/1 is up, line protocol is up
  Hardware is GT96K Serial
  Internet address is 10.2.2.2/30
  MTU 1500 bytes, BW 128 Kbit, DLY 20000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation PPP, LCP Open
  Open: CDPCP, IPCP, loopback not set

<output omitted>
```

### Tarea 7: Interrumpir y restablecer la encapsulación PPP

Al interrumpir intencionalmente la encapsulación PPP, se aprenderá acerca de los mensajes de error que se generan. Esto ayudará más adelante en la práctica de laboratorio de resolución de problemas.

#### Paso 1: Restablecer ambas interfaces seriales en R2 a su encapsulación HDLC por defecto.

```
R2(config)#interface serial 0/0/0
R2(config-if)#encapsulation hdlc
R2(config-if)#
*Aug 17 20:36:48.432: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.10.1 on
Serial0/0/0 from FULL to DOWN, Neighbor Down: Interface down or
detached
*Aug 17 20:36:49.432: %LINEPROTO-5-UPDOWN: Line protocol on Interface
Serial0/0/0, changed state to down
R2(config-if)#
*Aug 17 20:36:51.432: %LINEPROTO-5-UPDOWN: Line protocol on Interface
Serial0/0/0, changed state to up
R2(config-if)#interface serial 0/0/1
*Aug 17 20:37:14.080: %LINEPROTO-5-UPDOWN: Line protocol on Interface
Serial0/0/0, changed state to down
R2(config-if)#encapsulation hdlc
```

```
R2(config-if)#  
*Aug 17 20:37:17.368: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.30.1 on  
Serial0/0/1 from FULL to DOWN, Neighbor Down: Interface down or  
detached  
*Aug 17 20:37:18.368: %LINEPROTO-5-UPDOWN: Line protocol on Interface  
Serial0/0/1, changed state to down  
R2(config-if)#  
*Aug 17 20:37:20.368: %LINEPROTO-5-UPDOWN: Line protocol on Interface  
Serial0/0/1, changed state to up  
R2(config-if)#  
*Aug 17 20:37:44.080: %LINEPROTO-5-UPDOWN: Line protocol on Interface  
Serial0/0/1, changed state to down  
R2(config-if) #
```

¿Por qué resulta útil interrumpir intencionalmente una configuración?

---

---

---

¿Por qué ambas interfaces se desactivan, luego se activan y finalmente vuelven a  
desactivarse?

---

---

---

¿Hay otra forma de cambiar la encapsulación de una interfaz serial de PPP a la  
encapsulación HDLC por defecto que no sea mediante el comando **encapsulation  
hdlc**? (Ayuda: está relacionada con el comando **no**).

---

---

---

**Paso 2: Restablecer ambas interfaces seriales en R2 a la encapsulación PPP.**

```
R2(config)#interface s0/0/0
R2(config-if)#encapsulation ppp
*Aug 17 20:53:06.612: %LINEPROTO-5-UPDOWN: Line protocol on Interface
Serial0/0/0, changed state to up
R2(config-if)#interface s0/0/1
*Aug 17 20:53:10.856: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.10.1 on
Serial0/0/0 from LOADING to FULL, Loading Done
R2(config-if)#encapsulation ppp
*Aug 17 20:53:23.332: %LINEPROTO-5-UPDOWN: Line protocol on Interface
Serial0/0/1, changed state to up
R2(config-if)#
*Aug 17 20:53:24.916: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.30.1 on
Serial0/0/1 from LOADING to FULL, Loading Done
R2(config-if)#

```

**Tarea 8: Configurar la autenticación PPP**

**Paso 1: Configurar la autenticación PPP PAP en el enlace serial entre R1 y R2.**

```
R1(config)#username R1 password cisco
R1(config)#int s0/0/0
R1(config-if)#ppp authentication pap
R1(config-if)#
*Aug 22 18:58:57.367: %LINEPROTO-5-UPDOWN: Line protocol on Interface
Serial0/0/0, changed state to down
R1(config-if)#
*Aug 22 18:58:58.423: %OSPF-5-ADJCHG: Process 1, Nbr 209.165.200.225 on
Serial0/0/0 from FULL to DOWN, Neighbor Down: Interface down or
detached
R1(config-if)#ppp pap sent-username R2 password cisco

```

¿Qué sucede cuando la autenticación PPP PAP sólo se configura en un extremo del enlace serial?

---

---

```
R2(config)#username R2 password cisco
R2(config)#interface Serial0/0/0
R2(config-if)#ppp authentication pap
R2(config-if)#ppp pap sent-username R1 password cisco
R2(config-if)#
*Aug 23 16:30:33.771: %LINEPROTO-5-UPDOWN: Line protocol on Interface
Serial0/0/0, changed state to up
R2(config-if)#
*Aug 23 16:30:40.815: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.10.1 on
Serial0/0/0 from LOADING to FULL, Loading Done
R2(config-if)#

```

¿Qué sucede cuando la autenticación PPP PAP se configura en ambos extremos del enlace serial?

---

---

## Paso 2: Configurar la autenticación PPP CHAP en el enlace serial entre R2 y R3.

En la autenticación PAP, la contraseña no está encriptada. Aunque sin dudas esto es mejor que la falta total de autenticación, es aún mucho mejor encriptar la contraseña que se envía a través del enlace. CHAP encripta la contraseña.

```
R2(config)#username R3 password cisco
R2(config)#int s0/0/1
R2(config-if)#ppp authentication chap
R2(config-if)#
*Aug 23 18:06:00.935: %LINEPROTO-5-UPDOWN: Line protocol on Interface
Serial0/0/1, changed state to down
R2(config-if)#
*Aug 23 18:06:01.947: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.30.1 on
Serial0/0/1 from FULL to DOWN, Neighbor Down: Interface down or
detached
R2(config-if)#
R3(config)#username R2 password cisco
*Aug 23 18:07:13.074: %LINEPROTO-5-UPDOWN: Line protocol on Interface
Serial0/0/1, changed state to up
R3(config)#int s0/0/1
R3(config-if)#
*Aug 23 18:07:22.174: %OSPF-5-ADJCHG: Process 1, Nbr 209.165.200.225 on
Serial0/0/1 from LOADING to FULL, Loading Done
R3(config-if)#ppp authentication chap
R3(config-if)#

```

Observe que el protocolo de línea en la interfaz serial 0/0/1 cambia su estado a UP incluso antes de que se configure la interfaz para la autenticación CHAP. ¿Puede adivinar por qué sucede esto?

---

---

---

### Paso 3: Revisar el resultado de la depuración.

Para comprender mejor el proceso CHAP, observe el resultado del comando **debug ppp authentication** en R2 y R3. Luego desactive la interfaz serial 0/0/1 en R2 y ejecute el comando **no shutdown** en la interfaz serial 0/0/1 en R2.

```
R2#debug ppp authentication
PPP authentication debugging is on
R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#int s0/0/1
R2(config-if)#shutdown
R2(config-if)#
*Aug 23 18:19:21.059: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.30.1 on
Serial0/0/1 from FULL to DOWN, Neighbor Down: Interface down or
detached
R2(config-if)#
*Aug 23 18:19:23.059: %LINK-5-CHANGED: Interface Serial0/0/1, changed
state to administratively down
*Aug 23 18:19:24.059: %LINEPROTO-5-UPDOWN: Line protocol on Interface
Serial0/0/1, changed state to down
R2(config-if)#no shutdown

*Aug 23 18:19:55.059: Se0/0/1 PPP: Using default call direction
*Aug 23 18:19:55.059: Se0/0/1 PPP: Treating connection as a dedicated
line
*Aug 23 18:19:55.059: Se0/0/1 PPP: Session handle[5B000005] Session
id[49]
*Aug 23 18:19:55.059: Se0/0/1 PPP: Authorization required
*Aug 23 18:19:55.063: %LINK-3-UPDOWN: Interface Serial0/0/1, changed
state to up
*Aug 23 18:19:55.063: Se0/0/1 CHAP: O CHALLENGE id 48 len 23 from "R2"
*Aug 23 18:19:55.067: Se0/0/1 CHAP: I CHALLENGE id 2 len 23 from "R3"
*Aug 23 18:19:55.067: Se0/0/1 CHAP: Using hostname from unknown source
*Aug 23 18:19:55.067: Se0/0/1 CHAP: Using password from AAA
*Aug 23 18:19:55.067: Se0/0/1 CHAP: O RESPONSE id 2 len 23 from "R2"
*Aug 23 18:19:55.071: Se0/0/1 CHAP: I RESPONSE id 48 len 23 from "R3"
*Aug 23 18:19:55.071: Se0/0/1 PPP: Sent CHAP LOGIN Request
*Aug 23 18:19:55.071: Se0/0/1 PPP: Received LOGIN Response PASS
*Aug 23 18:19:55.071: Se0/0/1 PPP: Sent LCP AUTHOR Request
*Aug 23 18:19:55.075: Se0/0/1 PPP: Sent IPCP AUTHOR Request
*Aug 23 18:19:55.075: Se0/0/1 LCP: Received AAA AUTHOR Response PASS
*Aug 23 18:19:55.075: Se0/0/1 IPCP: Received AAA AUTHOR Response PASS
```

```
*Aug 23 18:19:55.075: Se0/0/1 CHAP: O SUCCESS id 48 len 4
*Aug 23 18:19:55.075: Se0/0/1 CHAP: I SUCCESS id 2 len 4
*Aug 23 18:19:55.075: Se0/0/1 PPP: Sent CDPCP AUTHOR Request
*Aug 23 18:19:55.075: Se0/0/1 CDPCP: Received AAA AUTHOR Response PASS
*Aug 23 18:19:55.079: Se0/0/1 PPP: Sent IPCP AUTHOR Request
*Aug 23 18:19:56.075: %LINEPROTO-5-UPDOWN: Line protocol on Interface
Serial0/0/1, changed state to up
R2(config-if)#
*Aug 23 18:20:05.135: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.30.1 on
Serial0/0/1 from LOADING to FULL, Loading Done

R3#debug ppp authentication
PPP authentication debugging is on
R3#
*Aug 23 18:19:04.494: %LINK-3-UPDOWN: Interface Serial0/0/1, changed
state to down
R3#
*Aug 23 18:19:04.494: %OSPF-5-ADJCHG: Process 1, Nbr 209.165.200.225 on
Serial0/0/1 from FULL to DOWN, Neighbor Down: Interface down or
detached
*Aug 23 18:19:05.494: %LINEPROTO-5-UPDOWN: Line protocol on Interface
Serial0/0/1, changed state to down
R3#
*Aug 23 18:19:36.494: %LINK-3-UPDOWN: Interface Serial0/0/1, changed
state to up
*Aug 23 18:19:36.494: Se0/0/1 PPP: Using default call direction
*Aug 23 18:19:36.494: Se0/0/1 PPP: Treating connection as a dedicated
line
*Aug 23 18:19:36.494: Se0/0/1 PPP: Session handle[3C000034] Session
id[52]
*Aug 23 18:19:36.494: Se0/0/1 PPP: Authorization required
*Aug 23 18:19:36.498: Se0/0/1 CHAP: O CHALLENGE id 2 len 23 from "R3"
*Aug 23 18:19:36.502: Se0/0/1 CHAP: I CHALLENGE id 48 len 23 from "R2"
*Aug 23 18:19:36.502: Se0/0/1 CHAP: Using hostname from unknown source
*Aug 23 18:19:36.506: Se0/0/1 CHAP: Using password from AAA
*Aug 23 18:19:36.506: Se0/0/1 CHAP: O RESPONSE id 48 len 23 from "R3"
*Aug 23 18:19:36.506: Se0/0/1 CHAP: I RESPONSE id 2 len 23 from "R2"
R3#
*Aug 23 18:19:36.506: Se0/0/1 PPP: Sent CHAP LOGIN Request
*Aug 23 18:19:36.506: Se0/0/1 PPP: Received LOGIN Response PASS
*Aug 23 18:19:36.510: Se0/0/1 PPP: Sent LCP AUTHOR Request
*Aug 23 18:19:36.510: Se0/0/1 PPP: Sent IPCP AUTHOR Request
*Aug 23 18:19:36.510: Se0/0/1 LCP: Received AAA AUTHOR Response PASS
*Aug 23 18:19:36.510: Se0/0/1 IPCP: Received AAA AUTHOR Response PASS
*Aug 23 18:19:36.510: Se0/0/1 CHAP: O SUCCESS id 2 len 4
*Aug 23 18:19:36.510: Se0/0/1 CHAP: I SUCCESS id 48 len 4
*Aug 23 18:19:36.514: Se0/0/1 PPP: Sent CDPCP AUTHOR Request
*Aug 23 18:19:36.514: Se0/0/1 PPP: Sent IPCP AUTHOR Request
*Aug 23 18:19:36.514: Se0/0/1 CDPCP: Received AAA AUTHOR Response PASS
R3#
*Aug 23 18:19:37.510: %LINEPROTO-5-UPDOWN: Line protocol on Interface
Serial0/0/1, changed state to up
R3#
*Aug 23 18:19:46.570: %OSPF-5-ADJCHG: Process 1, Nbr 209.165.200.225 on
Serial0/0/1 from LOADING to FULL, Loading Done
R3#
```

## Tarea 9: Interrumpir intencionalmente y restablecer la autenticación PPP CHAP

### Paso 1: Interrumpir la autenticación PPP CHAP.

En el enlace serial entre R2 y R3, cambie el protocolo de autenticación de la interfaz serial 0/0/1 a PAP.

```
R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#int s0/0/1
R2(config-if)#ppp authentication pap
R2(config-if)#{^Z
R2#
*Aug 24 15:45:47.039: %SYS-5-CONFIG_I: Configured from console by
console
R2#copy run start
Destination filename [startup-config]?
Building configuration...
[OK]
R2#reload
```

¿El cambio de protocolo de autenticación a PAP en la interfaz serial 0/0/1 produce la interrupción de la autenticación entre R2 y R3?

---

---

---

```
R2#show ip int brief
Interface      IP-Address  OK? Method Status          Protocol
FastEthernet0/0 unassigned   YES NVRAM administratively down down
FastEthernet0/1 unassigned   YES NVRAM administratively down down
Serial0/0/0    10.1.1.2    YES NVRAM up            up
Serial0/0/1    10.2.2.1    YES NVRAM up            down
Serial0/1/0    unassigned   YES NVRAM administratively down down
Serial0/1/1    unassigned   YES NVRAM administratively down down
Loopback0     209.165.200.225 YES NVRAM up            up
```

### Paso 2: Restablecer la autenticación PPP CHAP en el enlace serial.

Tenga en cuenta que no es necesario recargar el router para que este cambio surta efecto.

```
R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#int s0/0/1
R2(config-if)#ppp authentication chap
R2(config-if)#
*Aug 24 15:50:00.419: %LINEPROTO-5-UPDOWN: Line protocol on Interface
Serial0/0/1, changed state to up
R2(config-if)#
*Aug 24 15:50:07.467: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.30.1 on
Serial0/0/1 from LOADING to FULL, Loading Done
R2(config-if)#

```

**Paso 3: Interrumpir intencionalmente la autenticación PPP CHAP al cambiar la contraseña en R3.**

```
R3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#username R2 password cisco
R3(config)#^Z
R3#
*Aug 24 15:54:17.215: %SYS-5-CONFIG_I: Configured from console by
console
R3#copy run start
Destination filename [startup-config]?
Building configuration...
[OK]
R3#reload
```

Después de la recarga, ¿cuál es el estado del protocolo de línea en serial 0/0/1?

---

---

```
R3#show ip int brief
Interface      IP-Address  OK? Method Status          Protocol
FastEthernet0/0 unassigned   YES NVRAM administratively down down
FastEthernet0/1 192.168.30.1 YES NVRAM up           up
Serial0/0/0     unassigned   YES NVRAM administratively down down
Serial0/0/1    10.2.2.2    YES NVRAM up           down
```

**Paso 4: Restablecer la autenticación PPP CHAP al cambiar la contraseña en R3.**

```
R3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#username R2 password cisco
R3(config)#
*Aug 24 16:11:10.679: %LINEPROTO-5-UPDOWN: Line protocol on Interface
Serial0/0/1, changed state to up
R3(config)#
*Aug 24 16:11:19.739: %OSPF-5-ADJCHG: Process 1, Nbr 209.165.200.225 on
Serial0/0/1 from LOADING to FULL, Loading Done
R3(config)#

```

## Tarea 10: Documentar las configuraciones del router

En cada router, ejecute el comando **show run** y capture las configuraciones.

```
R1#show run
!<resultado omitido>
!
hostname R1
!
!
enable secret class
!
!
!
no ip domain lookup
!
username R1 password 0 cisco
!
!
!
interface FastEthernet0/1
    ip address 192.168.10.1 255.255.255.0
    no shutdown
!
!
interface Serial0/0/0
    ip address 10.1.1.1 255.255.255.252
    encapsulation ppp
    clockrate 64000
    ppp authentication pap
    ppp pap sent-username R2 password 0 cisco
    no shutdown
!
!
!
router ospf 1
    network 10.1.1.0 0.0.0.3 area 0
    network 192.168.10.0 0.0.0.255 area 0
!
!
banner motd ^CCUnauthorized access strictly prohibited and prosecuted
to the full extent of the law^C
!
line con 0
    exec-timeout 0 0
    password cisco
    logging synchronous
    login
line aux 0
line vty 0 4
    password cisco
    login
!
end
```

```
R2#show run
!<resultado omitido>

!
hostname R2
!
!
enable secret class
!
!
no ip domain lookup
!
username R3 password 0 cisco
username R2 password 0 cisco
!
!
!
interface Loopback0
  ip address 209.165.200.225 255.255.255.224
!
!
!
interface Serial0/0/0
  ip address 10.1.1.2 255.255.255.252
  encapsulation ppp
  ppp authentication pap
  ppp pap sent-username R1 password 0 cisco
  no shutdown
!
interface Serial0/0/1
  ip address 10.2.2.1 255.255.255.252
  encapsulation ppp
  clockrate 64000
  ppp authentication chap
  no shutdown
!
!
router ospf 1
  network 10.1.1.0 0.0.0.3 area 0
  network 10.2.2.0 0.0.0.3 area 0
  network 209.165.200.224 0.0.0.31 area 0
!
!
banner motd ^CUnauthorized access strictly prohibited and prosecuted to
the full extent of the law^C
!
line con 0
  exec-timeout 0 0
  password cisco
  logging synchronous
  login
line aux 0
line vty 0 4
  password cisco
  login
!
```

```
end

R3#show run
!<resultado omitido>

!
hostname R3
!
!
enable secret class
!
!
!
no ip domain lookup
!
username R2 password 0 cisco
!
!
!
interface FastEthernet0/1
    ip address 192.168.30.1 255.255.255.0
    no shutdown
!
!
interface Serial0/0/1
    ip address 10.2.2.2 255.255.255.252
    encapsulation ppp
    ppp authentication chap
    no shutdown
!
!
router ospf 1
    network 10.2.2.0 0.0.0.3 area 0
    network 192.168.30.0 0.0.0.255 area 0
!
!
banner motd ^CUnauthorized access strictly prohibited and prosecuted to
the full extent of the law^C
!
line con 0
exec-timeout 0 0
password cisco
logging synchronous
login
line aux 0
line vty 0 4
password cisco
login
!
end
```

### Tarea 11: Limpiar

Borre las configuraciones y recargue los routers. Desconecte y guarde los cables. Para los equipos PC host que normalmente se conectan a otras redes (tal como la LAN de la escuela o Internet), reconecte los cables correspondientes y restablezca las configuraciones TCP/IP.