Module 2 Enterprise WAN Configuration

Lab 2-1 HDLC and PPP Configuration

Learning Objectives

As a result of this lab section, you should achieve the following tasks:

- Establish HDLC encapsulation as the serial link layer protocol.
- Change the DCE clock baud rate on a serial link.
- Establish PPP encapsulation as the serial link layer protocol.
- Implementation of PAP authentication on the PPP link.
- Implementation of CHAP authentication on the PPP link.

Topology

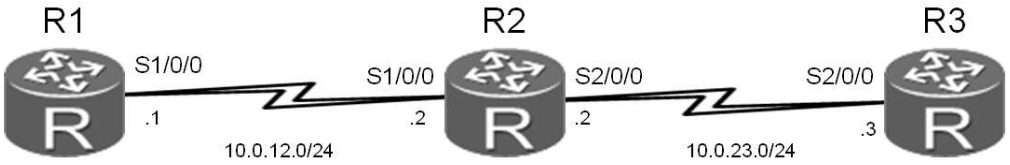

Figure 2.1 HDLC and PPP configuration topology

Scenario

As an expanding enterprise business, multiple branch offices have been established and are to be part of the company' s administrative domain. WAN solutions are required and as the network administrator the company you have been tasked with establishing HDLC and PPP solutions at the edge router to be carried over some service provider network, possibly MPLS, however the details of this have not been revealed to you since the service provider network remains outside of the scope of your task. R2 is an edge router located in the HQ, and R1

and R3 are located in branch offices. The HQ and branches need to be established as a single administrative domain. Use HDLC and PPP on the WAN links, and establish authentication as a simple security measure.

Tasks

Step 1 Preparing the environment.

If you are starting this section with a non-configured device, begin here and then move to step 3. For those continuing from previous labs, begin at step 2.

```
<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]sysname R1

<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]sysname R2

<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]sysname R3
```

Step 2 Clean up the previous configuration.

Remove the static routes to R2 and disable the Ethernet interfaces to avoid creating alternative routes. Remove any unnecessary VLAN configuration.

```
[R1]undo ip route-static 0.0.0.0 0
[R1]interface GigabitEthernet 0/0/1
[R1-GigabitEthernet0/0/1]shutdown

[R3]undo ip route-static 0.0.0.0 0
[R3]interface GigabitEthernet 0/0/2
[R3-GigabitEthernet0/0/2]shutdown

[S1]undo interface Vlanif 3
[S1]undo interface Vlanif 5
[S1]undo vlan batch 3 5 to 7
Warning: The configurations of the VLAN will be deleted. Continue?[Y/N]:y
```

```
Info: This operation may take a few seconds. Please wait for a moment...done.
[S1]interface GigabitEthernet 0/0/1
[S1-GigabitEthernet0/0/1]undo port default vlan
[S1-GigabitEthernet0/0/1]quit
[S1]undo ospf 1
[S2]undo interface Vlanif 5
[S2]undo interface Vlanif 7
[S2]undo vlan batch 3 to 5 7
Warning: The configurations of the VLAN will be deleted. Continue?[Y/N]:y
Info: This operation may take a few seconds. Please wait for a moment...done.
[S2]interface GigabitEthernet 0/0/3
[S2-GigabitEthernet0/0/3]undo port default vlan
[S2-GigabitEthernet0/0/3]quit
[S2]undo ospf 1

[S3]undo interface Vlanif 1

[S4]undo interface Vlanif 1
```

Step 3 Configure serial interface IP addressing for R1, R2 & R3.

```
[R1]interface Serial 1/0/0
[R1-Serial1/0/0]ip address 10.0.12.1 24

[R2]interface Serial 1/0/0
[R2-Serial1/0/0]ip address 10.0.12.2 24
[R2-Serial1/0/0]quit
[R2]interface Serial 2/0/0
[R2-Serial2/0/0]ip address 10.0.23.2 24

[R3]interface Serial 2/0/0
[R3-Serial2/0/0]ip address 10.0.23.3 24
```

Step 4 Enable the HDLC protocol on the serial interfaces.

```
[R1]interface Serial 1/0/0
[R1-Serial1/0/0]link-protocol hdlc
Warning: The encapsulation protocol of the link will be changed. Continue? [Y/N]:y

[R2]interface Serial 1/0/0
[R2-Serial1/0/0]link-protocol hdlc
```

```
Warning: The encapsulation protocol of the link will be changed. Continue? [Y/N]:y
[R2-Serial1/0/0]quit
[R2]interface Serial 2/0/0
[R2-Serial2/0/0]link-protocol hdlc
Warning: The encapsulation protocol of the link will be changed. Continue? [Y/N]:y
[R3]interface Serial 2/0/0
[R3-Serial2/0/0]link-protocol hdlc
Warning: The encapsulation protocol of the link will be changed. Continue? [Y/N]:y
```

After HDLC is enabled on the serial interfaces, view the serial interface status. The displayed information for R1 should be used as an example.

```
[R1]display interface Serial1/0/0
Serial1/0/0 current state : UP
Line protocol current state : UP
Last line protocol up time : 2013-12-10 11:25:08
Description:HUAWEI, AR Series, Serial1/0/0 Interface
Route Port,The Maximum Transmit Unit is 1500, Hold timer is 10(sec)
Internet Address is 10.0.12.1/24
Link layer protocol is nonstandard HDLC
Last physical up time   : 2013-12-10 11:23:55
Last physical down time : 2013-12-10 11:23:55
Current system time: 2013-12-10 11:25:46
Physical layer is synchronous, Baudrate is 64000 bps
Interface is DCE, Cable type is V24, Clock mode is DCECLK
Last 300 seconds input rate 3 bytes/sec 24 bits/sec 0 packets/sec
Last 300 seconds output rate 3 bytes/sec 24 bits/sec 0 packets/sec

Input: 100418 packets, 1606804 bytes
  Broadcast:            0,  Multicast:              0
  Errors:               0,  Runts:                  0
  Giants:               0,  CRC:                    0

  Alignments:           0,  Overruns:               0
  Dribbles:             0,  Aborts:                 0
  No Buffers:           0,  Frame Error:            0

Output: 100418 packets, 1606830 bytes
  Total Error:          0,  Overruns:               0
  Collisions:           0,  Deferred:               0
  No Buffers:           0
DCD=UP DTR=UP DSR=UP RTS=UP CTS=UP
    Input bandwidth utilization  : 0.06%
```

```
   Output bandwidth utilization : 0.06%
```

Test connectivity of the directly connected link after verifying that the physical status and protocol status of the interface are Up.

```
<R2>ping 10.0.12.1
 PING 10.0.12.1: 56  data bytes, press CTRL_C to break
   Reply from 10.0.12.1: bytes=56 Sequence=1 ttl=255 time=44 ms
   Reply from 10.0.12.1: bytes=56 Sequence=2 ttl=255 time=39 ms
   Reply from 10.0.12.1: bytes=56 Sequence=3 ttl=255 time=39 ms
   Reply from 10.0.12.1: bytes=56 Sequence=4 ttl=255 time=40 ms
   Reply from 10.0.12.1: bytes=56 Sequence=5 ttl=255 time=39 ms

 --- 10.0.12.1 ping statistics ---
   5 packet(s) transmitted
   5 packet(s) received
   0.00% packet loss
   round-trip min/avg/max = 39/40/44 ms

[R2]ping 10.0.23.3
 PING 10.0.23.3: 56  data bytes, press CTRL_C to break
   Reply from 10.0.23.3: bytes=56 Sequence=1 ttl=255 time=44 ms
   Reply from 10.0.23.3: bytes=56 Sequence=2 ttl=255 time=39 ms
   Reply from 10.0.23.3: bytes=56 Sequence=3 ttl=255 time=39 ms
   Reply from 10.0.23.3: bytes=56 Sequence=4 ttl=255 time=40 ms
   Reply from 10.0.23.3: bytes=56 Sequence=5 ttl=255 time=39 ms

 --- 10.0.23.3 ping statistics ---
   5 packet(s) transmitted
   5 packet(s) received
   0.00% packet loss
   round-trip min/avg/max = 39/40/44 ms
```

Step 5 **Configure RIPv2.**

Enable the RIP routing protocol to advertise the remote networks of R1 & R3

```
[R1]rip
[R1-rip-1]version 2
[R1-rip-1]network 10.0.0.0

[R2]rip
[R2-rip-1]version 2
[R2-rip-1]network 10.0.0.0
```

```
[R3]rip
[R3-rip-1]version 2
[R3-rip-1]network 10.0.0.0
```

After the configuration is complete, check that all the routes have been learned. Verify that corresponding routes are learned by RIP.

```
<R1>display ip routing-table
Route Flags: R - relay, D - download to fib
------------------------------------------------------------------------------
Routing Tables: Public
        Destinations : 8        Routes : 8

Destination/Mask    Proto   Pre  Cost      Flags NextHop         Interface

    10.0.12.0/24    Direct  0    0           D   10.0.12.1       Serial1/0/0
    10.0.12.1/32    Direct  0    0           D   127.0.0.1       Serial1/0/0
    10.0.12.255/32  Direct  0    0           D   127.0.0.1       Serial1/0/0
    10.0.23.0/24    RIP     100  1           D   10.0.12.2       Serial1/0/0
    127.0.0.0/8     Direct  0    0           D   127.0.0.1       InLoopBack0
    127.0.0.1/32    Direct  0    0           D   127.0.0.1       InLoopBack0
127.255.255.255/32  Direct  0    0           D   127.0.0.1       InLoopBack0
255.255.255.255/32  Direct  0    0           D   127.0.0.1       InLoopBack0
```

On R1, run the **ping** command to test connectivity between R1 and R3.

```
<R1>ping 10.0.23.3
  PING 10.0.23.3: 56  data bytes, press CTRL_C to break
    Reply from 10.0.23.3: bytes=56 Sequence=1 ttl=254 time=44 ms
    Reply from 10.0.23.3: bytes=56 Sequence=2 ttl=254 time=39 ms
    Reply from 10.0.23.3: bytes=56 Sequence=3 ttl=254 time=39 ms
    Reply from 10.0.23.3: bytes=56 Sequence=4 ttl=254 time=40 ms
    Reply from 10.0.23.3: bytes=56 Sequence=5 ttl=254 time=39 ms

  --- 10.0.23.3 ping statistics ---
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
    round-trip min/avg/max = 39/40/44 ms
```

Step 6 **Manage the serial connection.**

View the type of the cable connected to the serial interface, interface status, and clock frequency, and change the clock frequency.

```
<R1>display interface Serial1/0/0
```

```
Serial1/0/0 current state : UP
Line protocol current state : UP
Last line protocol up time : 2013-12-10 11:25:08
Description:HUAWEI, AR Series, Serial1/0/0 Interface
Route Port,The Maximum Transmit Unit is 1500, Hold timer is 10(sec)
Internet Address is 10.0.12.1/24
Link layer protocol is nonstandard HDLC
Last physical up time   : 2013-12-10 11:23:55
Last physical down time : 2013-12-10 11:23:55
Current system time: 2013-12-10 11:51:12
Physical layer is synchronous, Baudrate is 64000 bps
Interface is DCE, Cable type is V24, Clock mode is DCECLK
Last 300 seconds input rate 6 bytes/sec 48 bits/sec 0 packets/sec
Last 300 seconds output rate 4 bytes/sec 32 bits/sec 0 packets/sec
…output omitted…
```

The preceding information shows that S1/0/0 on R1 connects to a DCE cable and the clock frequency is 64000 bit/s. The DCE controls the clock frequency and bandwidth.

Change the clock frequency on the link between R1 and R2 to 128000 bit/s. This operation must be performed on the DCE, R1.

```
[R1]interface Serial 1/0/0
[R1-Serial1/0/0]baudrate 128000
```

After the configuration is complete, view the serial interface status.

```
<R1>display interface Serial1/0/0
Serial1/0/0 current state : UP
Line protocol current state : UP
Last line protocol up time : 2013-12-10 11:25:08
Description:HUAWEI, AR Series, Serial1/0/0 Interface
Route Port,The Maximum Transmit Unit is 1500, Hold timer is 10(sec)
Internet Address is 10.0.12.1/24
Link layer protocol is nonstandard HDLC
Last physical up time   : 2013-12-10 11:23:55
Last physical down time : 2013-12-10 11:23:55
Current system time: 2013-12-10 11:54:19
Physical layer is synchronous, Baudrate is 128000 bps
Interface is DCE, Cable type is V24, Clock mode is DCECLK
Last 300 seconds input rate 6 bytes/sec 48 bits/sec 0 packets/sec
Last 300 seconds output rate 4 bytes/sec 32 bits/sec 0 packets/sec
…output omitted…
```

Step 7 Configure PPP on the serial interfaces.

Configure PPP between R1 and R2, as well as R2 and R3. Both ends of the link must use the same encapsulation mode. If different encapsulation modes are used, interfaces may display as 'Down'.

```
[R1]interface Serial 1/0/0
[R1-Serial1/0/0]link-protocol ppp
Warning: The encapsulation protocol of the link will be changed. Continue? [Y/N]:y

[R2]interface Serial 1/0/0
[R2-Serial1/0/0]link-protocol ppp
Warning: The encapsulation protocol of the link will be changed. Continue? [Y/N]:y

[R2-Serial1/0/0]quit
[R2]interface Serial 2/0/0
[R2-Serial2/0/0]link-protocol ppp
Warning: The encapsulation protocol of the link will be changed. Continue? [Y/N]:y

[R3]interface Serial 2/0/0
[R3-Serial2/0/0]link-protocol ppp
Warning: The encapsulation protocol of the link will be changed. Continue? [Y/N]:y
```

After the configuration is complete, test link connectivity.

```
<R2>ping 10.0.12.1
  PING 10.0.12.1: 56  data bytes, press CTRL_C to break
    Reply from 10.0.12.1: bytes=56 Sequence=1 ttl=255 time=22 ms
    Reply from 10.0.12.1: bytes=56 Sequence=2 ttl=255 time=27 ms
    Reply from 10.0.12.1: bytes=56 Sequence=3 ttl=255 time=27 ms
    Reply from 10.0.12.1: bytes=56 Sequence=4 ttl=255 time=27 ms
    Reply from 10.0.12.1: bytes=56 Sequence=5 ttl=255 time=27 ms

  --- 10.0.12.1 ping statistics ---
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
    round-trip min/avg/max = 22/26/27 ms
<R2>ping 10.0.23.3
  PING 10.0.23.3: 56  data bytes, press CTRL_C to break
    Reply from 10.0.23.3: bytes=56 Sequence=1 ttl=255 time=35 ms
    Reply from 10.0.23.3: bytes=56 Sequence=2 ttl=255 time=40 ms
    Reply from 10.0.23.3: bytes=56 Sequence=3 ttl=255 time=40 ms
    Reply from 10.0.23.3: bytes=56 Sequence=4 ttl=255 time=40 ms
    Reply from 10.0.23.3: bytes=56 Sequence=5 ttl=255 time=40 ms
```

```
  --- 10.0.23.3 ping statistics ---
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
round-trip min/avg/max = 35/39/40 ms
```

If the **ping** operation fails, check the interface status and whether the link layer protocol type is correct.

```
<R1>display interface Serial1/0/0
Serial1/0/0 current state : UP
Line protocol current state : UP
Last line protocol up time : 2013-12-10 12:35:41
Description:HUAWEI, AR Series, Serial1/0/0 Interface
Route Port,The Maximum Transmit Unit is 1500, Hold timer is 10(sec)
Internet Address is 10.0.12.1/24
Link layer protocol is PPP
LCP opened, IPCP opened
Last physical up time   : 2013-12-10 11:57:20
Last physical down time : 2013-12-10 11:57:19
Current system time: 2013-12-10 13:38:03
Physical layer is synchronous, Baudrate is 128000 bps
Interface is DCE, Cable type is V24, Clock mode is DCECLK
Last 300 seconds input rate 7 bytes/sec 56 bits/sec 0 packets/sec
Last 300 seconds output rate 4 bytes/sec 32 bits/sec 0 packets/sec
…output omitted…
```

Step 8 **Check routing entry changes.**

After PPP configuration is complete, routers establish connections at the data link layer. The local device sends a route to the peer device. The route contains the interface IP address and a 32-bit mask.

The following information uses R2 as an example, for which the routes to R1 and R3 can be seen.

```
[R2]display ip routing-table
Route Flags: R - relay, D - download to fib
------------------------------------------------------------------------------
Routing Tables: Public
        Destinations : 12      Routes : 12

Destination/Mask    Proto   Pre  Cost   Flags    NextHop         Interface
```

```
    10.0.12.0/24    Direct  0    0        D       10.0.12.2       Serial1/0/0
    10.0.12.1/32    Direct  0    0        D       10.0.12.1       Serial1/0/0
    10.0.12.2/32    Direct  0    0        D       127.0.0.1       Serial1/0/0
    10.0.12.255/32  Direct  0    0        D       127.0.0.1       Serial1/0/0
    10.0.23.0/24    Direct  0    0        D       10.0.23.2       Serial2/0/0
    10.0.23.2/32    Direct  0    0        D       127.0.0.1       Serial2/0/0
    10.0.23.3/32    Direct  0    0        D       10.0.23.3       Serial2/0/0
    10.0.23.255/32  Direct  0    0        D       127.0.0.1       Serial2/0/0
    127.0.0.0/8     Direct  0    0        D       127.0.0.1       InLoopBack0
    127.0.0.1/32    Direct  0    0        D       127.0.0.1       InLoopBack0
127.255.255.255/32  Direct  0    0        D       127.0.0.1       InLoopBack0
255.255.255.255/32  Direct  0    0        D       127.0.0.1       InLoopBack0
```

Think about the origin and functions of the two routes. Check the following items:

If HDLC encapsulation is used, do these two routes exist?

Can R1 and R2 communicate using HDLC or PPP when the IP addresses of S1/0/0 interfaces on R1 and R2 are located on different network segments?

Step 9 Enable PAP authentication between R1 and R2.

Configure PAP authentication with R1 as the PPP PAP authenticator.

```
[R1]interface Serial 1/0/0
[R1-Serial1/0/0]ppp authentication-mode pap
[R1-Serial1/0/0]quit
[R1]aaa
[R1-aaa]local-user huawei password cipher huawei

 info: A new user added
[R1-aaa]local-user huawei service-type ppp
```

Configure PAP authentication with R2 acting as the PAP authenticated device.

```
[R2]interface Serial 1/0/0
[R2-Serial1/0/0]ppp pap local-user huawei password cipher huawei
```

After R2 sends an authentication request to R1, R1 sends a response message to R2, requesting R2 to use PAP authentication following which R2 will send its password to R1.

After the configuration is complete, test connectivity between R1 and R2.

```
<R1>debugging ppp pap packet
```

```
<R1>terminal debugging
<R1>display debugging
PPP PAP packets debugging switch is on
<R1>system-view
[R1]interface Serial 1/0/0
[R1-Serial1/0/0]shutdown
[R1-Serial1/0/0]undo shutdown

Dec 10 2013 14:44:22.440.1+00:00 R1 PPP/7/debug2:
  PPP Packet:
      Serial1/0/0 Input  PAP(c023) Pkt, Len 22
      State ServerListen, code Request(01), id 1, len 18
      Host Len:  6  Name:huawei
[R1-Serial1/0/0]
Dec 10 2013 14:44:22.440.2+00:00 R1 PPP/7/debug2:
  PPP Packet:
      Serial1/0/0 Output PAP(c023) Pkt, Len 52
      State WaitAAA, code Ack(02), id 1, len 48
      Msg Len: 43  Msg:Welcome to use Quidway ROUTER, Huawei Tech.

[R1-Serial1/0/0]return
<R1>undo debugging all
Info: All possible debugging has been turned off
```

Step 10 Enable CHAP authentication between R2 and R3.

Configure R3 as the authenticator. After R2 sends an authentication request to R3, R3 sends a response message to R2, requesting R2 to use CHAP authentication following which a challenge is sent to R3.

```
[R3]interface Serial 2/0/0
[R3-Serial2/0/0]ppp authentication-mode chap
[R3-Serial2/0/0]quit
[R3]aaa
[R3-aaa]local-user huawei password cipher huawei
 info: A new user added
[R3-aaa]local-user huawei service-type ppp
[R3-aaa]quit
[R3]interface Serial 2/0/0
[R3-Serial2/0/0]shutdown
[R3-Serial2/0/0]undo shutdown
```

On R3, the following information is displayed.

```
Dec 10 2013 15:06:00+00:00 R3 %%01PPP/4/PEERNOCHAP(l)[5]:On the interface
```

```
Serial2/0/0, authentication failed and PPP link was closed because CHAP was
disabled on the peer.
[R3-Serial2/0/0]
Dec 10 2013 15:06:00+00:00 R3 %%01PPP/4/RESULTERR(l)[6]:On the interface
Serial2/0/0, LCP negotiation failed because the result cannot be accepted.
```

The highlighted output indicates that authentication is unable to initialize.

Configure R2 as the CHAP client.

```
[R2]interface Serial 2/0/0
[R2-Serial2/0/0]ppp chap user huawei
[R2-Serial2/0/0]ppp chap password cipher huawei
```

After the configuration is complete, the interface changes to an Up state. The ping command output is as follows:

```
<R2>ping 10.0.23.3
  PING 10.0.23.3: 56  data bytes, press CTRL_C to break
    Reply from 10.0.23.3: bytes=56 Sequence=1 ttl=255 time=35 ms
    Reply from 10.0.23.3: bytes=56 Sequence=2 ttl=255 time=41 ms
    Reply from 10.0.23.3: bytes=56 Sequence=3 ttl=255 time=41 ms
    Reply from 10.0.23.3: bytes=56 Sequence=4 ttl=255 time=41 ms
    Reply from 10.0.23.3: bytes=56 Sequence=5 ttl=255 time=41 ms

  --- 10.0.23.3 ping statistics ---
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
    round-trip min/avg/max = 35/39/41 ms
```

Step 11 **PPP CHAP debugging.**

Run the debug command to view negotiation of the PPP connection between R2 and R3. The PPP connection is established using CHAP. Disable interface Serial 2/0/0 on R2, run the debug command, and enable Serial 2/0/0 on R2.

```
[R2]interface Serial 2/0/0
[R2-Serial2/0/0]shutdown
```

Run the **debugging ppp chap all** and the **terminal debugging** commands to display the debugging information.

```
[R2-Serial2/0/0]return
<R2>debugging ppp chap all
<R2>terminal debugging
```

```
Info: Current terminal debugging is on.
<R2>display debugging
PPP CHAP packets debugging switch is on
PPP CHAP events debugging switch is on
PPP CHAP errors debugging switch is on
PPP CHAP state change debugging switch is on
```

Force CHAP authentication to initialize on S2/0/0 of R2.

```
<R2>system-view
Enter system view, return user view with Ctrl+Z.
[R2]interface Serial 2/0/0
[R2-Serial2/0/0]undo shutdown
```

The following debugging information is displayed:

```
Dec 10 2013 09:10:38.700.1+00:00 R2 PPP/7/debug2:
  PPP State Change:
     Serial2/0/0 CHAP : Initial --> ListenChallenge
[R2-Serial2/0/0]
Dec 10 2013 09:10:38.710.1+00:00 R2 PPP/7/debug2:
  PPP Packet:
     Serial2/0/0 Input  CHAP(c223) Pkt, Len 25
     State ListenChallenge, code Challenge(01), id 1, len 21
     Value_Size:  16  Value: fc 9b 56 e1 53 e3 a6 26 1b 54 e5 e2 a1 ed 90 87
     Name:
[R2-Serial2/0/0]
Dec 10 2013 09:10:38.710.2+00:00 R2 PPP/7/debug2:
  PPP Event:
     Serial2/0/0 CHAP Receive Challenge Event
     state ListenChallenge
[R2-Serial2/0/0]
Dec 10 2013 09:10:38.710.3+00:00 R2 PPP/7/debug2:
  PPP Packet:
     Serial2/0/0 Output CHAP(c223) Pkt, Len 31
     State ListenChallenge, code Response(02), id 1, len 27
     Value_Size:  16  Value: f9 54  1 69 30 59 a0 af 52 a1 1d de 85 77 27 6b
     Name: huawei
[R2-Serial2/0/0]
Dec 10 2013 09:10:38.710.4+00:00 R2 PPP/7/debug2:
  PPP State Change:
     Serial2/0/0 CHAP : ListenChallenge --> SendResponse
[R2-Serial2/0/0]
Dec 10 2013 09:10:38.720.1+00:00 R2 PPP/7/debug2:
  PPP Packet:
     Serial2/0/0 Input  CHAP(c223) Pkt, Len 20
```

```
     State SendResponse, code SUCCESS(03), id 1, len 16
     Message: Welcome to .
[R2-Serial2/0/0]
Dec 10 2013 09:10:38.720.2+00:00 R2 PPP/7/debug2:
  PPP Event:
     Serial2/0/0 CHAP Receive Success Event
     state SendResponse
[R2-Serial2/0/0]
Dec 10 2013 09:10:38.720.3+00:00 R2 PPP/7/debug2:
  PPP State Change:
     Serial2/0/0 CHAP : SendResponse --> ClientSuccess
```

The highlighted debugging information shows the key CHAP behavior. Disable the debugging process.

```
[R2-Serial2/0/0]return
<R2>undo debugging all
Info: All possible debugging has been turned off
```

Additional Exercises: Analyzing and Verifying

Why is the PPP Challenge Handshake Authentication Protocol (CHAP) more secure than the PPP Password Authentication Protocol (PAP)?

Final Configuration

```
[R1]display current-configuration
[V200R003C00SPC200]
#
 sysname R1
#
aaa
 authentication-scheme default
 authorization-scheme default
 accounting-scheme default
 domain default
 domain default_admin
 local-user admin password cipher %$%$=i~>Xp&aY+*2cEVcS-A23Uwe%$%$
 local-user admin service-type http
 local-user huawei password cipher %$%$B:%I)Io0H8)[%SB[idM3C/!#%$%$
 local-user huawei service-type ppp
#
interface Serial1/0/0
```

```
 link-protocol ppp
 ppp authentication-mode pap
 ip address 10.0.12.1 255.255.255.0
 baudrate 128000
#
rip 1
 version 2
 network 10.0.0.0
#
user-interface con 0
 authentication-mode password
 set authentication password
cipher %$%$dD#}P<HzJ;Xs%X>hOkm!,.+Iq61QK`K6tI}cc-;k_o`C.+L,%$%$
user-interface vty 0 4
#
return

[R2]display current-configuration
[V200R003C00SPC200]
#
 sysname R2
#
interface Serial1/0/0
 link-protocol ppp
 ppp pap local-user huawei password cipher %$%$u[hr6d<JVHR@->T7xr1<$.iv%$%$
 ip address 10.0.12.2 255.255.255.0
#
interface Serial2/0/0
 link-protocol ppp
 ppp chap user huawei
 ppp chap password cipher %$%$e{5h)gh"/Uz0mUC%vEx3$4<m%$%$
 ip address 10.0.23.2 255.255.255.0
#
rip 1
 version 2
 network 10.0.0.0
#
user-interface con 0
 authentication-mode password
 set authentication password
cipher %$%$|nRPL^hr2IXi7LHDID!/,.*%.8%h;3:,hXO2dk#ikaWI.*(,%$%$
user-interface vty 0 4
#
```

```
return

[R3]display current-configuration
[V200R003C00SPC200]
#
 sysname R3
#
aaa
 authentication-scheme default
 authorization-scheme default
 accounting-scheme default
 domain default
 domain default_admin
 local-user admin password cipher %$%$=i~>Xp&aY+*2cEVcS-A23Uwe%$%$
 local-user admin service-type http
 local-user huawei password cipher %$%$fZsyUk1=O=>:L4'ytgR~D*Im%$%$
 local-user huawei service-type ppp
#
interface Serial2/0/0
 link-protocol ppp
 ppp authentication-mode chap
 ip address 10.0.23.3 255.255.255.0
#
rip 1
 version 2
 network 10.0.0.0
#
user-interface con 0
 authentication-mode password
 set authentication password
cipher %$%$W|$)M5D}v@bY^gK\;>QR,.*d;8Mp>|+EU,:~D~8b59~..*g,%$%$
user-interface vty 0 4
#
return
```