PPP Half-Bridge on the Cisco ASR 1000 Series Routers

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For situations in which routed network needs connectivity to a remote bridged Ethernet network, a serial or ISDN interface can be configured to function as a PPP half-bridge. The line to the remote bridge functions as a virtual Ethernet interface, and the router's serial or ISDN interface functions as a node on the same Ethernet subnetwork as the remote network.

The PPP full-bridge sends PPP packets to the PPP half-bridge, which converts them to routed packets and forwards them to other router processes. Likewise, the PPP half-bridge converts routed packets to Ethernet bridge packets and sends them to the PPP full-bridge on the same Ethernet subnetwork.

Note An interface cannot function as both a half-bridge and a full-bridge.

Prerequisites for PPP Half-Bridge on the Cisco ASR 1000 Series Routers

PPP encapsulation must be enabled under the interface to use PPP half-bridge on ASR 1000 Series Routers.

Information About PPP Half-Bridge on the Cisco ASR 1000 Series Routers

The following figure shows a half-bridge configuration. The router port connecting to the bridge is configured as a serial interface to the PPP half-bridge. The interface functions as a virtual node on the Ethernet subnetwork on the bridge. The serial interface has an IP address associated with the Ethernet subnetwork.

Figure 1: PPP Half-Bridge Configuration
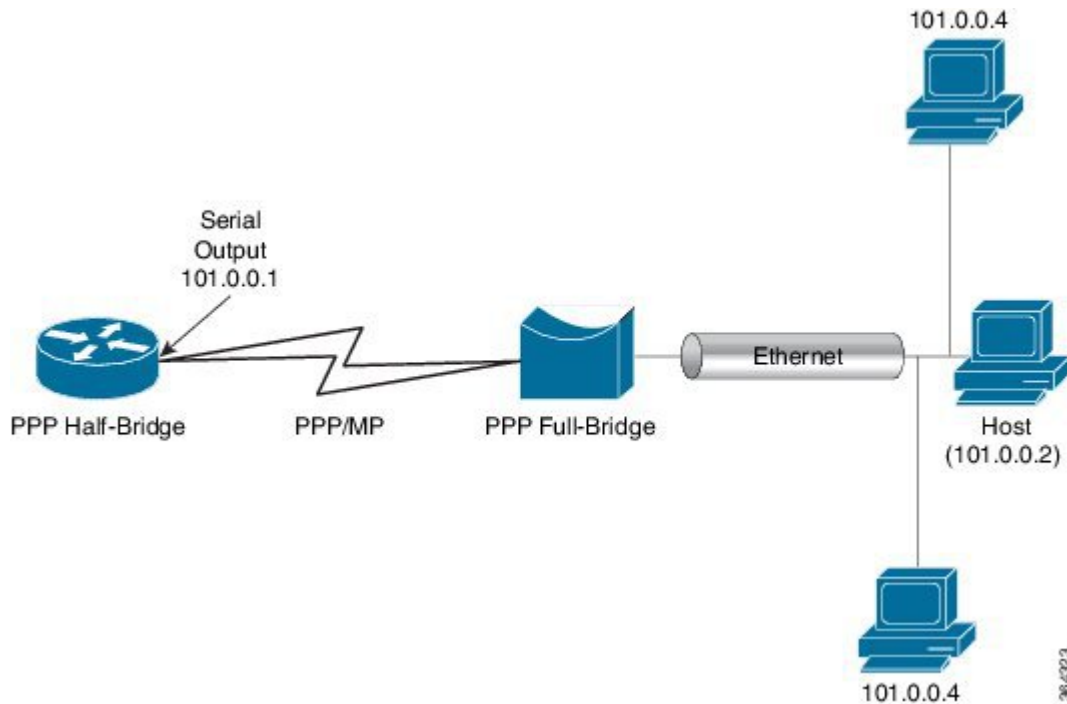
When a packet destined to the Ethernet arrives at the PPP half-bridge, it is converted to Ethernet packets, encapsulated in PPP frames, and sent on the Ethernet bridge link. The PPP full-bridge decapsulates PPP header, and forwards the Ethernet packet with bridge functionality.

In the reverse direction, PPP half-bridge extracts the Ethernet packets encapsulated in PPP frames that are received from PPP full-bridge device. The PPP half-bridge converts them to IP packets, and routes them on the Internet.

PPP Half-Bridge Supported Features

PPP half-bridge supports the following interworking features:

- VRF aware PPP half bridge interface
- Multicast and VPN Multicast (IGMP V2 and V3) on the PPP half bridge interface
- Routing protocol on the PPP half bridge interface
- IPv4 on the PPP half bridge interface
- ACL on the PPP half bridge interface
- QOS on the PPP half bridge interface

• PPP authentication on the half bridge interface

Configuration Examples for PPP Half-Bridge

Example: Configuring PPP Half-Bridge on the Cisco ASR 1000 Series Routers

The following example shows how to configure PPP Half-Bridge on ASR 1000 Series Routers:

```
interface Serial0/1/1:0
 ip address 101.0.0.1 255.255.255.0
 encapsulation ppp
 ppp bridge ip
```

Example: Configuring PPP Full-Bridge on the Cisco 7206 Routers

The following example shows how to emulate the bridge device.

```
no ip routing
interface Serial5/1:0
 no ip address
 encapsulation ppp
 bridge-group 1
interface GigabitEthernet0/2
bridge-group 1
```

Verifying PPP Half-Bridge

The commands outlined in this section can be used to verify the PPP half-bridge.

Command	Purpose
show ppp interfaces	Displays PPP state information for an interface.
show adjacency	Displays information about the Cisco Express Forwarding adjacency table or the hardware Layer 3-switching adjacency table.
show interfaces serial slot/port	Displays information about a serial interface.

The following example displays PPP state information for an interface.

```
Router# show ppp all
Interface/ID OPEN+ Nego* Fail-    Stage    Peer Address    Peer Name
------------ -------------------- -------- -------------- --------------------
Se0/1/1:0    LCP+ BCP+            LocalT   0.0.0.0
```

The following example shows the sample output for **show adjacency** command.

```
Router# show adjacency serial 0/1/1:0 detail
Protocol Interface            Address
IP       Serial0/1/1:0        101.0.0.2(11)
```

```
                                        0 packets, 0 bytes
                                        epoch 0
                                        sourced in sev-epoch 439
                                        Encap length 20
                                        FF0300310001503DE53411110022BDD5
                                        E8000800
                                        ARP
```

The following example displays information about a serial interface.

```
Router# show interfaces serial 0/1/1:0
Serial0/1/1:0 is up, line protocol is up
  Hardware is SPA-8XCHT1/E1
  Internet address is 101.0.0.1/24
  MTU 1500 bytes, BW 1984 Kbit/sec, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation PPP, LCP Open
  Open: BCP, crc 16, loopback not set
  Keepalive set (10 sec)
  ARP type: ARPA, ARP Timeout 04:00:00
```

Debugging PPP Half-Bridge

The following commands are used to debug PPP half-bridge.

Command	Purpose
debug ppp negotiation	Enables debugging of LCP and Network Control Protocol (NCP) session negotiations.
debug ppp error	Displays local errors.
debug ppp events	Displays information about protocol actions and transitions between action states (pending, waiting, idle) on the link.
debug arp	Displays information on Address Resolution Protocol (ARP) transactions.

Sample output for debug ppp command

```
Router# debug ppp
Aug  6 14:36:00.021 CST: ppp827 PPP: Phase is ESTABLISHING
*Aug  6 14:36:00.021 CST: Se0/3/0:0 PPP: Using default call direction
*Aug  6 14:36:00.021 CST: Se0/3/0:0 PPP: Treating connection as a dedicated line*Aug  6
14:36:00.021 CST: Se0/3/0:0 PPP: Session handle[1900033B] Session id[827]
*Aug  6 14:36:00.021 CST: Se0/3/0:0 LCP: Event[OPEN] State[Initial to Starting]
*Aug  6 14:36:00.021 CST: Se0/3/0:0 LCP: O CONFREQ [Starting] id 1 len 10
*Aug  6 14:36:00.021 CST: Se0/3/0:0 LCP:    MagicNumber 0x6B5AC045 (0x05066B5AC045)*Aug  6
 14:36:00.021 CST: Se0/3/0:0 LCP: Event[UP] State[Starting to REQsent]*
```

Sample output for debug arp command

```
Router# debug arp
Aug  6 15:43:22.915 CST: IP ARP: rcvd req src 101.0.0.2 503d.e534.1111, dst 101.0.0.1
Serial0/1/1:0
Aug  6 15:43:22.917 CST: IP ARP: creating entry for IP address: 101.0.0.2, hw: 503d.e534.1111
Aug  6 15:43:22.917 CST: IP ARP: sent rep src 101.0.0.1 0022.bdd5.e800, dst 101.0.0.2
503d.e534.1111 Serial0/1/1:2
```

Additional References

Related Documents

Related Topic	Document Title
Cisco IOS commands	*Cisco IOS Master Commands List, All Releases*

Standards

Standard	Title
None	—

MIBs

MIB	MIBs Link
None	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at this URL: {start hypertext}http://www.cisco.com/go/mibs{end hypertext}

RFCs

RFC	Title
None	—

Technical Assistance

Description	Link
The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	{start hypertext}http://www.cisco.com/cisco/web/support/index.html{end hypertext}

Feature Information for PPP Half-Bridge on the Cisco ASR 1000 Series Routers

{start cross reference}Table 23-1{end cross reference} lists the features in this module and provides links to specific configuration information.

Use Cisco Feature Navigator to find information about platform support and software image support. Cisco Feature Navigator enables you to determine which software images support a specific software release, feature set, or platform. To access Cisco Feature Navigator, go to{start hypertext} http://www.cisco.com/go/cfn{start hypertext}. An account on Cisco.com is not required.

Note {start cross reference}Table 23-1{end cross reference} lists only the software releases that support a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Table 1: Feature Information for PPP Half-Bridge on the Cisco ASR 1000 Series Routers

Feature Name	Releases	Feature Information
PPP Half-Bridge on the Cisco ASR 1000 Series Routers	Cisco IOS XE 3.13.1	In Cisco IOS XE Release 3.13.1, the PPP Half-Bridge feature was introduced on the Cisco ASR 1000 Series Router.