

## Chapter 26

# Configuring Point-to-Point Protocol over Ethernet

The Point-to-Point Protocol over Ethernet (PPPoE) connects multiple hosts on an Ethernet LAN to a remote site through a single customer premises equipment (CPE) device—a J-series Services Router. Hosts share a common digital subscriber line (DSL), a cable modem, or a wireless connection to the Internet. To use PPPoE, you must configure the Services Router as a PPPoE client, encapsulate PPP packets over Ethernet, and initiate a PPPoE session.



**NOTE:** J4300 and J6300 Services Routers with asymmetrical DSL (ADSL) Physical Interface Modules (PIMs) and symmetrical high-speed DSL (SHDSL) PIMs can use PPPoE over Asynchronous Transfer Mode (ATM) to connect through DSL lines only, not for direct ATM connections. For information about configuring ADSL and SHDSL interfaces, see “Configuring ATM-over-ADSL Interfaces” on page 285 and “Configuring ATM-over-SHDSL Interfaces” on page 289.

To configure physical interface properties, include the `encapsulation` statement at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]  
  encapsulation ethernet-over-atm;
```

To configure logical interface encapsulation properties, include the `encapsulation` statement:

```
encapsulation ppp-over-ether;
```

You can include this statement at the following hierarchy levels:

- `[edit interfaces interface-name unit logical-unit-number]`
- `[edit logical-routers logical-router-name interfaces interface-name unit logical-unit-number]`

To configure PPPoE session properties, include the `underlying-interface` statement at the `[edit interfaces interface-name unit logical-unit-number pppoe-options]` hierarchy level:

```
[edit interfaces interface-name]  
  unit logical-unit-number;  
    pppoe-options {
```

```

        underlying-interface interface-name;
        encapsulation ppp-over-ether;
    }
}

```

To configure additional PPPoE session properties, include the `access-concentrator` statement, `auto-reconnect` statement, and `service` statement to specify the access concentrator, type of service provided by the access concentrator, and the reconnection time:

```

    unit logical-unit-number
    {
        pppoe-options {
            access-concentrator name;
            auto-reconnect seconds;
            service-name name;
        }
    }
}

```

To configure the PPPoE interface source and destination address, do one of the following:

- Include the `address` and `destination` statements:

```
address address destination address;
```

- Include the `unnumbered-address` and `destination` statements to derive the source address from a specified interface:

```
unnumbered-address interface-name destination address;
```

- Include the `negotiate-address` statement to obtain an IP address by negotiation with the remote end:

```
negotiate-address;
```

You can include these statements at the following hierarchy levels:

- [edit interfaces pp0.0 family inet]
- [edit logical-routers *logical-router-name* interfaces pp0.0 family inet]

To configure the maximum transmission unit (MTU) of the protocol, include the `mtu` statement at the [edit interfaces pp0] hierarchy level:

```
[edit interfaces pp0]
mtu bytes;
```

To disable the sending of keepalives on a logical interface, include the `no-keepalives` statement:

```
no-keepalives;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces pp0.0 unit *logical-unit-number*]
- [edit logical-routers *logical-router-name* interfaces pp0 unit *logical-unit-number*]

This chapter includes the following topics:

- PPPoE Overview on page 545
- Configuring PPPoE on page 548
- Verifying a PPPoE Configuration on page 553

## PPPoE Overview

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On the Services Router, PPPoE establishes a point-to-point connection between the client (the Services Router) and the server, also called an access concentrator. Multiple hosts can be connected to the Services Router, and their data can be authenticated, encrypted, and compressed before the traffic is sent to the PPPoE session on the Services Router's Fast Ethernet or ATM-over-ADSL interface. PPPoE is easy to configure and allows services to be managed on a per-user basis rather than on a per-site basis.

This overview contains the following topics:

- PPPoE Interfaces on page 545
- PPPoE Stages on page 546
- Optional CHAP Authentication on page 547

## PPPoE Interfaces

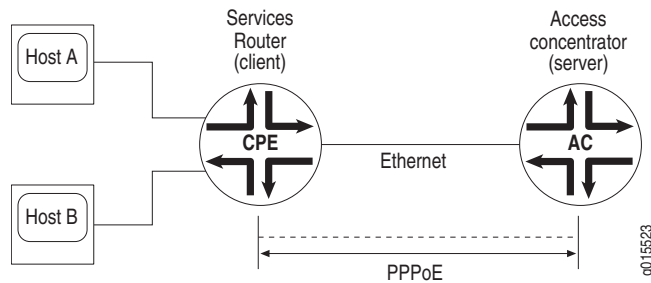
The PPPoE interface to the access concentrator can be either a Fast Ethernet interface on any Services Router or an ATM-over-ADSL interface on a J4300 or J6300 Services Router. The PPPoE configuration is the same for both interfaces. The only difference is the encapsulation for the underlying interface to the access concentrator:

- If the interface is Fast Ethernet, use a PPPoE encapsulation.
- If the interface is ATM over ADSL, use a PPPoE over ATM encapsulation.

## Fast Ethernet Interface

The Services Router encapsulates each PPP frame in an Ethernet frame and transports the frames over an Ethernet loop. Figure 37 shows a typical PPPoE session between a Services Router and an access concentrator on the Ethernet loop.

**Figure 37: PPPoE Session on an Ethernet Loop**



## PPPoE Stages

PPPoE has two stages, the discovery stage and the PPPoE session stage. In the discovery stage, the client discovers the access concentrator by identifying the Ethernet media access control (MAC) address of the access concentrator and establishing a PPPoE session ID. In the PPPoE session stage, the client and the access concentrator build a point-to-point connection over Ethernet, based on the information collected in the discovery stage.

### PPPoE Discovery Stage

A Services Router initiates the PPPoE discovery stage by broadcasting a PPPoE Active Discovery Initiation (PADI) packet. To provide a point-to-point connection over Ethernet, each PPPoE session must learn the Ethernet MAC address of the access concentrator and establish a session with a unique session ID. Because the network might have more than one access concentrator, the discovery stage allows the client to communicate with all of them and select one.



**NOTE:** A Services Router cannot receive PPPoE packets from two different access concentrators on the same physical interface.

The PPPoE discovery stage consists of the following steps:

1. PPPoE Active Discovery Initiation (PADI)—The client initiates a session by broadcasting a PADI packet to the LAN to request a service.
2. PPPoE Active Discovery Offer (PADO)—Any access concentrator that can provide the service requested by the client in the PADI packet replies with a PADO packet that contains its own name, the unicast address of the client, and the service requested. An access concentrator can also use the PADO packet to offer other services to the client.

3. PPPoE Active Discovery Request (PADR)—From the PADOs it receives, the client selects one access concentrator based on its name or the services offered and sends it a PADR packet to indicate the service or services needed.
4. PPPoE Active Discovery Session-Confirmation (PADS)—When the selected access concentrator receives the PADR packet, it accepts or rejects the PPPoE session:
  - To accept the session, the access concentrator sends the client a PADS packet with a unique session ID for a PPPoE session and a service name that identifies the service under which it accepts the session.
  - To reject the session, the access concentrator sends the client a PADS packet with a service name error and resets the session ID to zero.

### PPPoE Session Stage

The PPPoE session stage starts after the PPPoE discovery stage is over. The access concentrator can start the PPPoE session after it sends the PADS packet to the client, or the client can start the PPPoE session after it receives a PADS packet from the access concentrator. A Services Router supports multiple PPPoE sessions on each interface, but no more than 256 PPPoE sessions on all interfaces on the Services Router.

Each PPPoE session is uniquely identified by the Ethernet address of the peer and the session ID. After the PPPoE session is established, data is sent as in any other PPP encapsulation. The PPPoE information is encapsulated within an Ethernet frame and is sent to a unicast address. In this stage, both the client and the server must allocate resources for the PPPoE logical interface.

After a session is established, the client or the access concentrator can send a PPPoE Active Discovery Termination (PADT) packet anytime to terminate the session. The PADT packet contains the destination address of the peer and the session ID of the session to be terminated. After this packet is sent, the session is closed to PPPoE traffic.

### Optional CHAP Authentication

For interfaces with PPPoE encapsulation, you can configure interfaces to support the PPP Challenge Handshake Authentication Protocol (CHAP). When you enable CHAP on an interface, the interface can authenticate its peer and be authenticated by its peer.

If you configure an interface to handle incoming CHAP packets only (by including the `passive` statement at the [edit interfaces *interface-name* ppp-options chap] hierarchy level), the interface does not challenge its peer. However, if the interface is challenged, it responds to the challenge. If you do not include the `passive` statement, the interface always challenges its peer.

For more information about CHAP, see “Configuring the PPP Challenge Handshake Authentication Protocol” on page 90.

## Configuring PPPoE

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To configure PPPoE on a J-series Services Router, you must perform the following tasks:

- Setting the Appropriate Encapsulation on the Interface on page 548
- Configuring a PPPoE Interface on page 549

### Setting the Appropriate Encapsulation on the Interface

For PPPoE on an Ethernet interface, you must configure encapsulation on the logical interface and use PPP over Ethernet encapsulation.

For PPPoE on an ATM-over-ADSL interface, you must configure encapsulation on both the physical and logical interfaces. To configure encapsulation on an ATM-over-ADSL physical interface, use Ethernet over ATM encapsulation. To configure encapsulation on an ATM-over-ADSL logical interface, use PPPoE over AAL5 LLC encapsulation. LLC encapsulation allows a single ATM virtual connection to transport multiple protocols.

When you configure a point-to-point encapsulation such as PPP on a physical interface, the physical interface can have only one logical interface (only one unit statement) associated with it.

Perform the task appropriate for the interface on which you are using PPPoE:

- Configuring PPPoE Encapsulation on an Ethernet Interface on page 548
- Configuring PPPoE Encapsulation on an ATM-over-ADSL Interface on page 549

### Configuring PPPoE Encapsulation on an Ethernet Interface

Both the client and the server must be configured to support PPPoE. To configure PPPoE encapsulation on an Ethernet interface, include the `encapsulation` statement:

```
encapsulation ppp-over-ether;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-routers *logical-router-name* interfaces *interface-name* unit *logical-unit-number*]

### Configuring PPPoE Encapsulation on an ATM-over-ADSL Interface

To configure the PPPoE encapsulation on a ATM-over-ADSL interface, perform the following configuration tasks:

1. Configure Ethernet over ATM encapsulation on the physical ATM-over-ADSL interface by including the `encapsulation` statement at the `[edit interfaces interface-name]` hierarchy level, and specifying `ethernet-over-atm`:

```
[edit interfaces interface-name]  
encapsulation ethernet-over-atm;
```

2. Configure LLC encapsulation on the logical interface by including the `encapsulation` statement and specifying `ppp-over-ether-over-atm-llc`:

```
encapsulation ppp-over-ether-over-atm-llc;
```

You can include this statement at the following hierarchy levels:

- `[edit interfaces interface-name unit logical-unit-number]`
- `[edit logical-routers logical-router-name interfaces interface-name unit logical-unit-number]`

### Configuring a PPPoE Interface

To configure a PPPoE interface over the underlying Fast Ethernet or ATM interface, perform the following tasks:

1. Specify the logical Ethernet interface or the logical ATM interface as the underlying interface for the PPPoE session by including the `underlying-interface` statement:

```
underlying-interface interface-name;
```

You can include this statement at the following hierarchy levels:

- `[edit interfaces interface-name unit logical-unit-number pppoe-options]`
- `[edit logical-routers logical-router-name unit logical-unit-number interfaces interface-name pppoe-options]`

The underlying interface can be an ATM, Fast Ethernet, or Gigabit Ethernet logical interface—for example, `at-0/0/1.0` (ATM VC), `fe-1/0/1.0` (Fast Ethernet interface), or `ge-2/0/0` (Gigabit Ethernet interface).

2. Identify the access concentrator by a unique name by including the `access-concentrator` statement:

```
access-concentrator name;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* pppoe-options]
  - [edit logical-routers *logical-router-name* interfaces *interface-name* unit *logical-unit-number* pppoe-options]
3. By default, after a PPPoE session is terminated, the session attempts to reconnect immediately. To specify how many seconds to wait before attempting to reconnect, include the `auto-reconnect` statement:

```
auto-reconnect seconds;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* pppoe-options]
- [edit logical-routers *logical-router-name* interfaces *interface-name* unit *logical-unit-number* pppoe-options]

You can configure the reconnection attempt to occur in 0 through 4,294,967,295 seconds after the session terminates.

4. Identify the type of service provided by the access concentrator—such as the name of the Internet service provider (ISP), class, or quality of service—by including the `service-name` statement:

```
service-name name;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* pppoe-options]
- [edit logical-routers *logical-router-name* interfaces *interface-name* unit *logical-unit-number* pppoe-options]

5. Configure the maximum transmission unit (MTU) of the protocol by including the `mtu` statement at the [edit interfaces `pp0`] hierarchy level:

```
[edit interfaces pp0]
mtu bytes;
```

6. Configure the PPPoE interface address in one of the following ways:
- Assign source and destination addresses—for example, `192.168.1.1/32` and `192.168.1.2`. To assign the source and destination address, include the `address` and `destination` statements:

```
address address destination address;
```

You can include these statements at the following hierarchy levels:

- [edit interfaces `pp0.0` family inet]
- [edit logical-routers *logical-router-name* interfaces `pp0.0` family inet]

- Derive the source address from a specified interface—for example, the loopback interface, `lo0.0`—and assign a destination address—for example, `192.168.1.2`. The specified interface must include a logical unit number and have a configured IP address. To derive the source address and assign the destination address, include the `unnumbered-address` and `destination` statements:

```
unnumbered-address interface-name destination address;
```

You can include these statements at the following hierarchy levels:

- `[edit interfaces pp0.0 family inet]`
  - `[edit logical-routers logical-router-name interfaces pp0.0 family inet]`
- Obtain an IP address by negotiation with the remote end. This method might require the access concentrator to use a RADIUS authentication server. To obtain an IP address from the remote end, include the `negotiate-address` statement:

```
negotiate-address;
```

You can include this statement at the following hierarchy levels:

- `[edit interfaces pp0.0 family (inet | inet6 | mpls)]`
  - `[edit logical-routers logical-router-name interfaces pp0.0 family (inet | inet6 | mpls)]`
7. Configure the maximum transmission unit (MTU) size for the family. Specify a range from 0 through 5012 bytes. To set the MTU, include the `mtu` statement:

```
mtu bytes;
```

You can include this statement at the following hierarchy levels:

- `[edit interfaces pp0.0 family (inet | inet6 | mpls)]`
  - `[edit logical-routers logical-router-name interfaces pp0.0 family (inet | inet6 | mpls)]`
8. Disable the sending of keepalives on a logical interface by including the `no-keepalives` statement:

```
no-keepalives;
```

You can include this statement at the following hierarchy levels:

- `[edit interfaces pp0.0]`
- `[edit logical-routers logical-router-name interfaces pp0 unit logical-unit-number]`

**Example: Configuring a PPPoE Interface**

Configure a PPPoE over ATM-over-ADSL interface:

```
[edit interfaces]
at-2/0/0 {
  encapsulation ethernet-over-atm;
  atm-options {
    vpi 0;
  }
  dsl-options {
    operating-mode auto;
  }
  unit 0 {
    encapsulation ppp-over-ether-over-atm-llc;
    vci 0.120;
  }
}
pp0 {
  mtu 1492;
  unit 0 {
    ppp-options {
      chap {
        access-profile A-ppp-client;
        local-name A-at-2/0/0.0;
      }
    }
    pppoe-options {
      underlying-interface at-2/0/0;
      access-concentrator ispl.com;
      service-name "video@ispl.com";
      auto-reconnect 100;
    }
    no-keepalives;
    family inet {
      negotiate-address;
      mtu 100;
    }
    family inet6 {
      negotiate-address;
      mtu 200;
    }
    family mpls {
      negotiate-address;
      mtu 300;
    }
  }
}
```

## Verifying a PPPoE Configuration

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To verify a PPPoE configuration, you can issue the following operational mode commands:

- `show interfaces at-fpc/pic/port extensive`
- `show interfaces pp0`
- `show pppoe interfaces`
- `show pppoe version`
- `show pppoe statistics`

For more information about these operational mode commands, see the *J-series Services Router Basic LAN and WAN Access Configuration Guide* and the *JUNOS Interfaces Command Reference*.

