PPP Components

Link Control Protocol (LCP)
Provides for the establishment, configuration, and maintenance of a PPP link. Protocol-independent options are negotiated by LCP.

Network Control Protocol (NCP)
A separate NCP is used to negotiate the configuration of each network layer protocol (such as IP) carried by PPP.

PPP Header

<table>
<thead>
<tr>
<th>Address</th>
<th>Control</th>
<th>Protocol</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>16</td>
<td>24</td>
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LCP Header

<table>
<thead>
<tr>
<th>Code</th>
<th>Identifier</th>
<th>Length</th>
</tr>
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<tbody>
<tr>
<td>8</td>
<td>16</td>
<td>24</td>
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Authentication Protocols

Plaintext Authentication Protocol (PAP)
Original, obsolete authentication protocol which relies on the exchange of a plaintext key to authenticate peers (RFC 1334).

Challenge Handshake Authentication Protocol (CHAP)
Authenticates peers using the MD5 checksum of a pre-shared secret key (RFC 1994).

Extensible Authentication Protocol (EAP)
Provides MD5-based authentication similar to CHAP (RFC 3748). Could be expanded to support other EAP mechanisms as well.

General PPP Configuration

! Configure a peer account if authentication will be used
username peer-hostname password password

! Configure a local IP address pool if needed
ip pool name first-IP last-IP

interface Serial0/0
! Enable PPP encapsulation
encapsulation ppp
! Enable CHAP and/or PAP for authentication
ppp authentication { chap | pap } [ chap | pap ]
! Enable compression
compress { predictor | stac }
! Enable peer IP address assignment (server side)
peer default ip address { pool name | IP-address }
! Enable IP address negotiation (client side)
ip address negotiated

Multilink PPP Configuration

! Create the multilink interface
interface Multilink1
ip address IP-address subnet-mask
ppp multilink group group

! Assign physical interfaces to the multilink group
interface Serial0/0
encapsulation ppp
ppp multilink group group

PPP Summary

Standard
RFC 1661

Interfaces
Asynchronous serial, synchronous serial, ISDN, HSSI

PPP Features

Protocol Multiplexing · Multiple NCPs
Optional Authentication · PAP/CHAP
Optional Compression · Stacker/predictor
Loopback Detection · Provided by LCP
Load Balancing · Multilink PPP

Connection Phase Flowchart

Dead → Establish

Dead → Terminate

Dead → Authenticate

Auth Required

No Auth

Failure

Admin Shutdown

Success

Network

PPP Connection Example

LCP Configuration Request → LCP Configuration Ack

CHAP Challenge → CHAP Response

CHAP Success

IP Control Configuration Request → IP Control Configuration Ack

CDP Control Configuration Request → CDP Control Configuration Ack

PPP Compression Algorithms

Stacker
Replaces repetitive data with symbols from a dynamic dictionary (more processor-intensive)

Predictor
Attempts to predict sequential data (more memory-intensive)

Troubleshooting

show ppp multilink
debuge ppp authentication
debuge ppp { negotiation | packet }