

## 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

8	16	24	32
Address	Control	Protocol	

## LCP Header

8	16	24	32
Code	Identifier	Length	

## 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

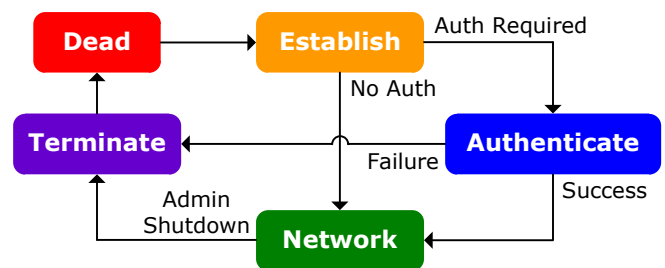
**Optional Authentication** · PAP/CHAP

**Optional Compression** · Stacker/predictor

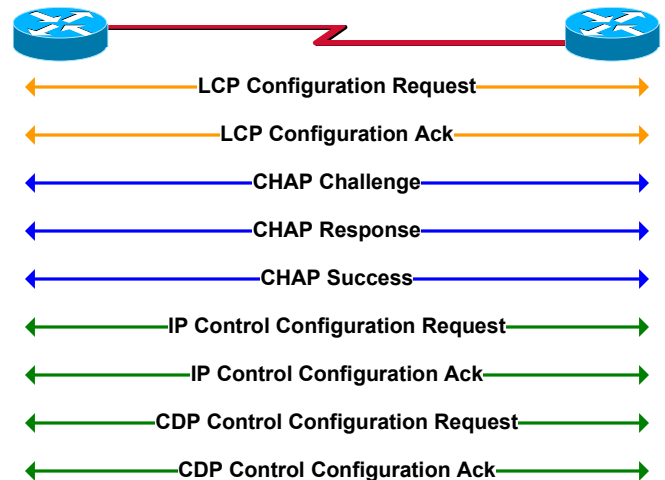
**Loopback Detection** · Provided by LCP

**Load Balancing** · Multilink PPP

## Connection Phase Flowchart



## PPP Connection Example



## 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
```

```
debug ppp authentication
```

```
debug ppp { negotiation | packet }
```