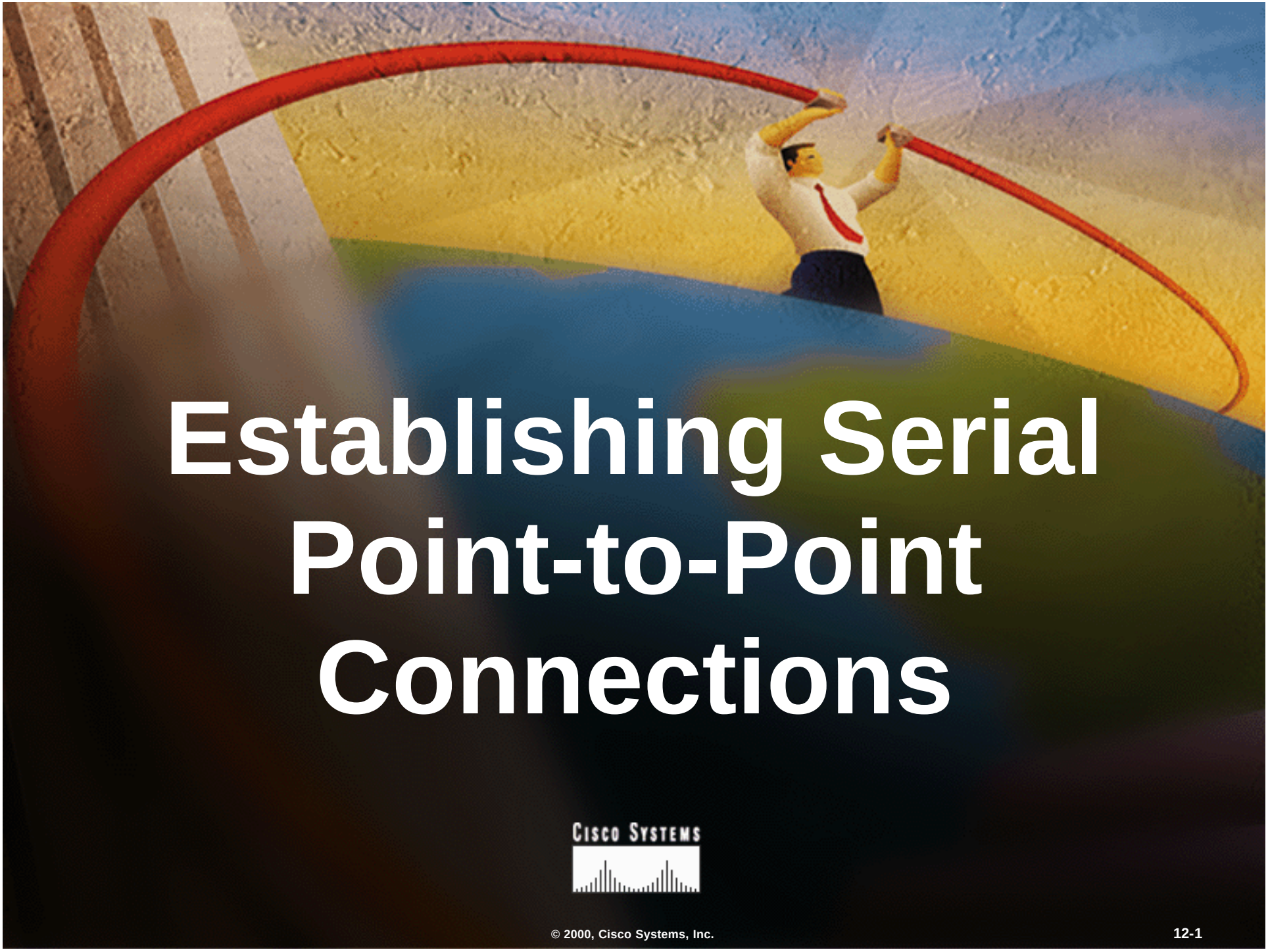


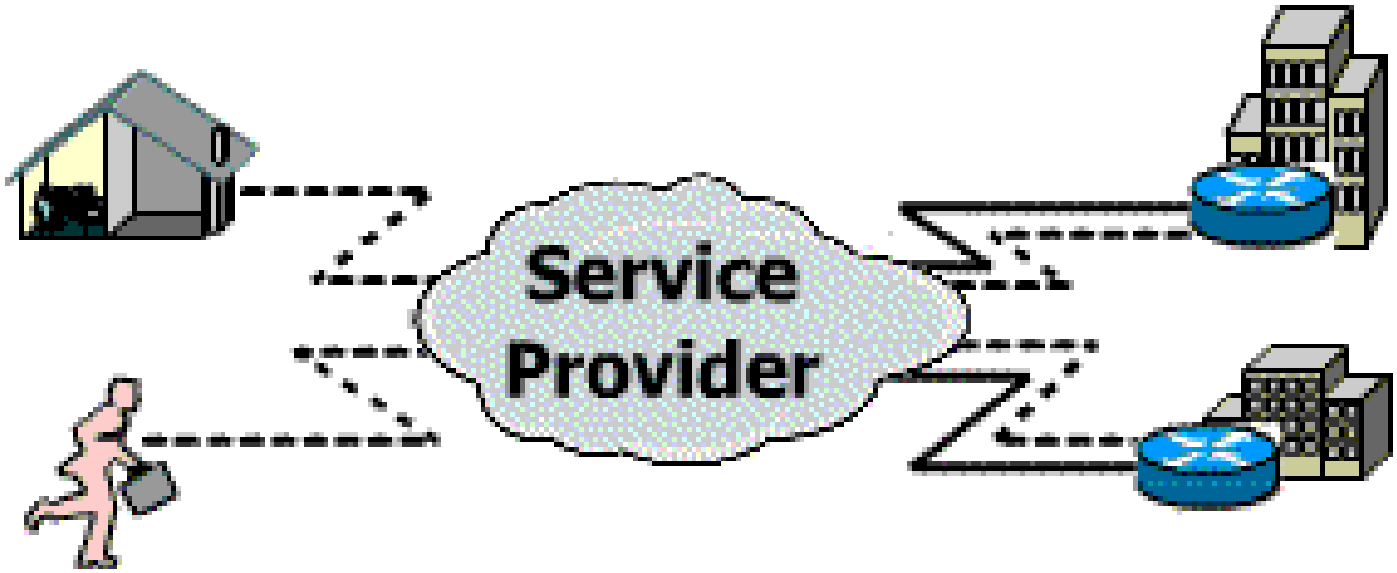
Establishing Serial Point-to-Point Connections

Objectives

Upon completion of this chapter, you will be able to perform the following tasks:

- **Configure HDLC and PPP protocols on a serial WAN connection**
- **Configure PAP and CHAP authentication on a PPP connection**
- **Verify proper point-to-point HDLC and PPP configuration**

WAN Overview

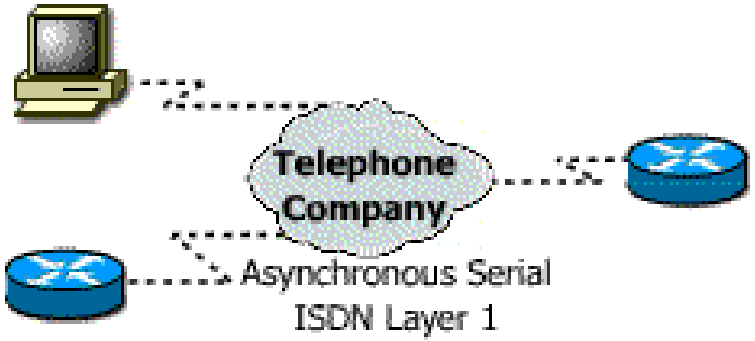


- **WANs connect sites**
- **Connection requirements vary depending on user requirements and cost**

WAN Connection Types: Layer 1

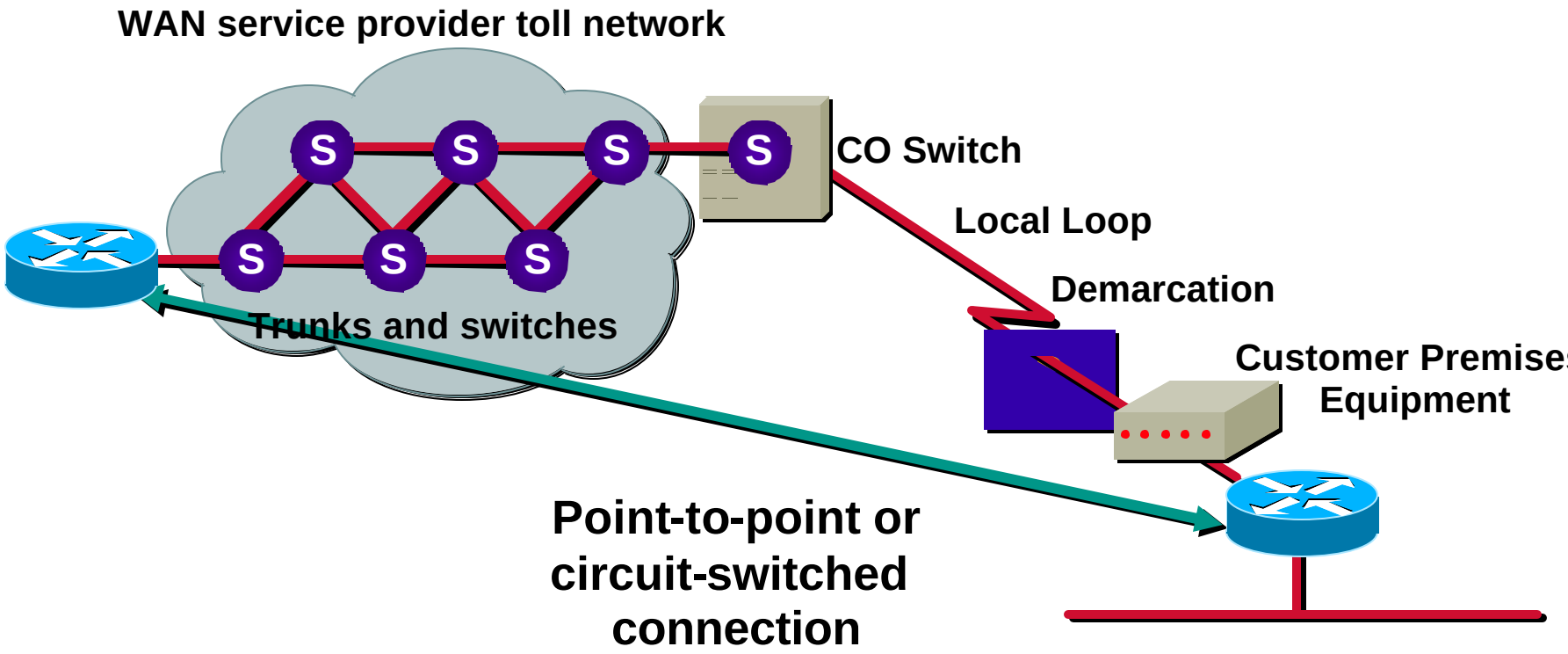
Leased Line

Circuit-switched



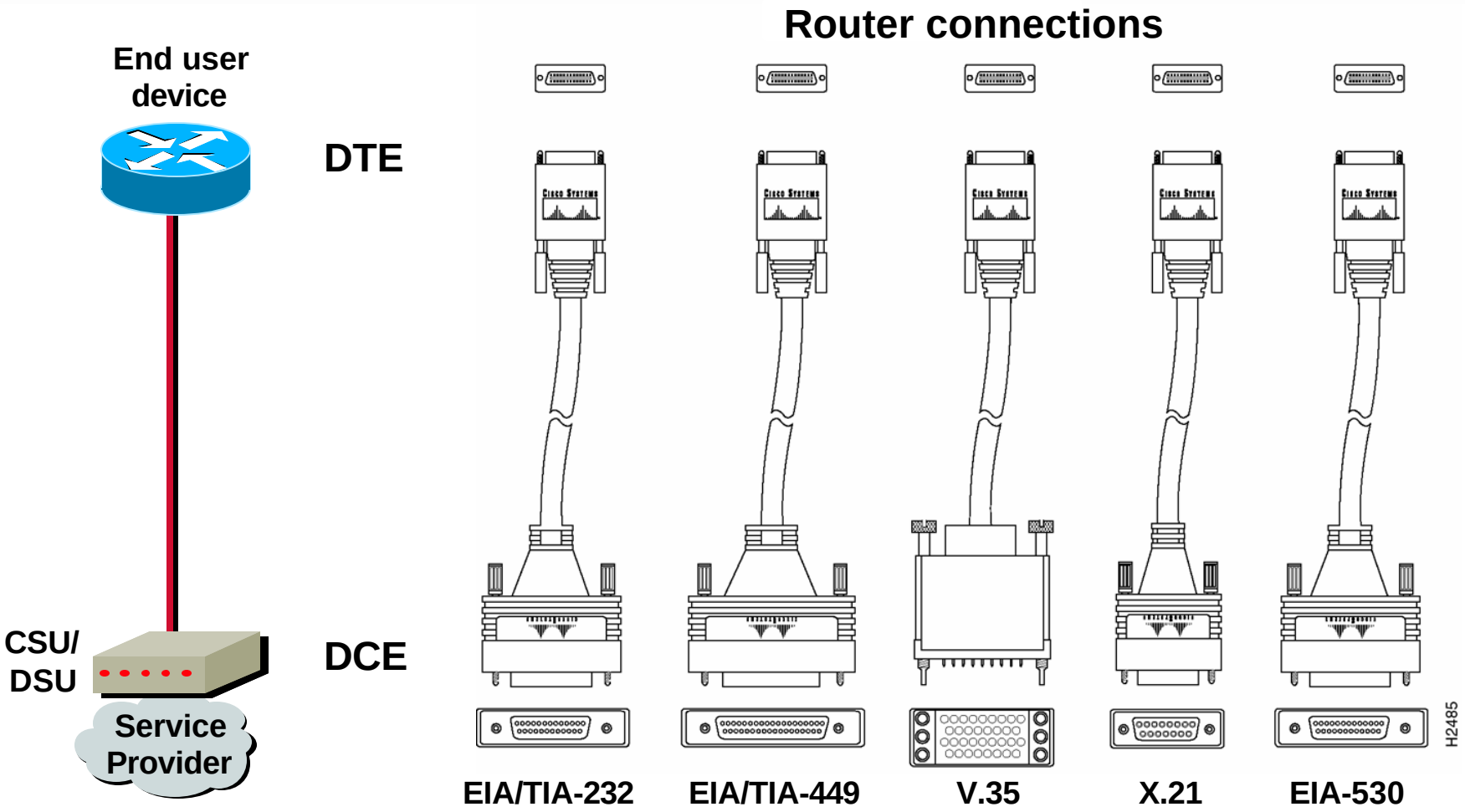
Packet-switched

Interfacing WAN Service Providers



Provider assigns connection parameters to subscriber

Serial Point-to-Point Connections

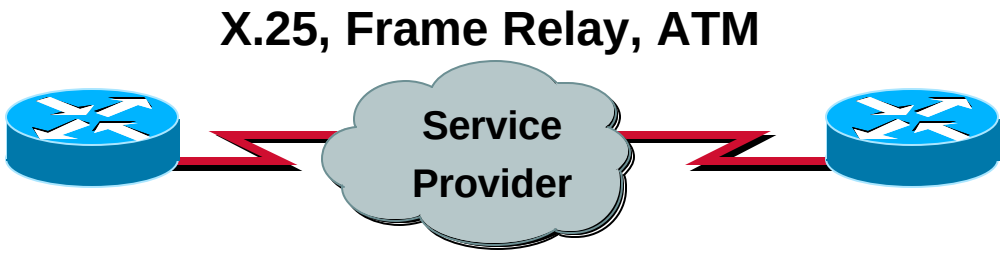


Network connections at the CSU/DSU

Typical WAN Encapsulation Protocols: Layer 2

Leased Line

Packet-switched



Circuit-switched

HDLC Frame Format

Cisco HDLC

- **Cisco's HDLC has a proprietary data field to support multiprotocol environments**

HDLC

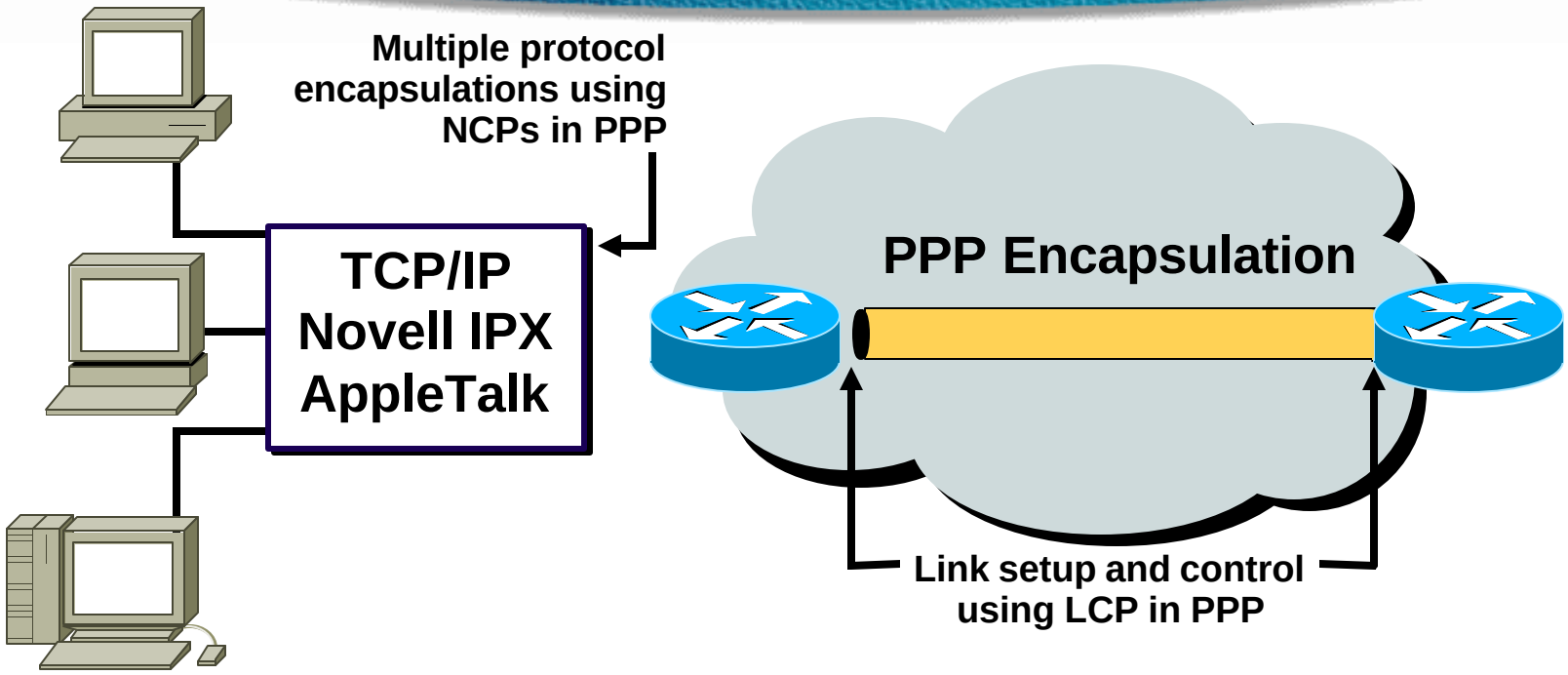
- **Supports only single protocol environments**

HDLC Command

```
Router(config-if)#encapsulation hdlc
```

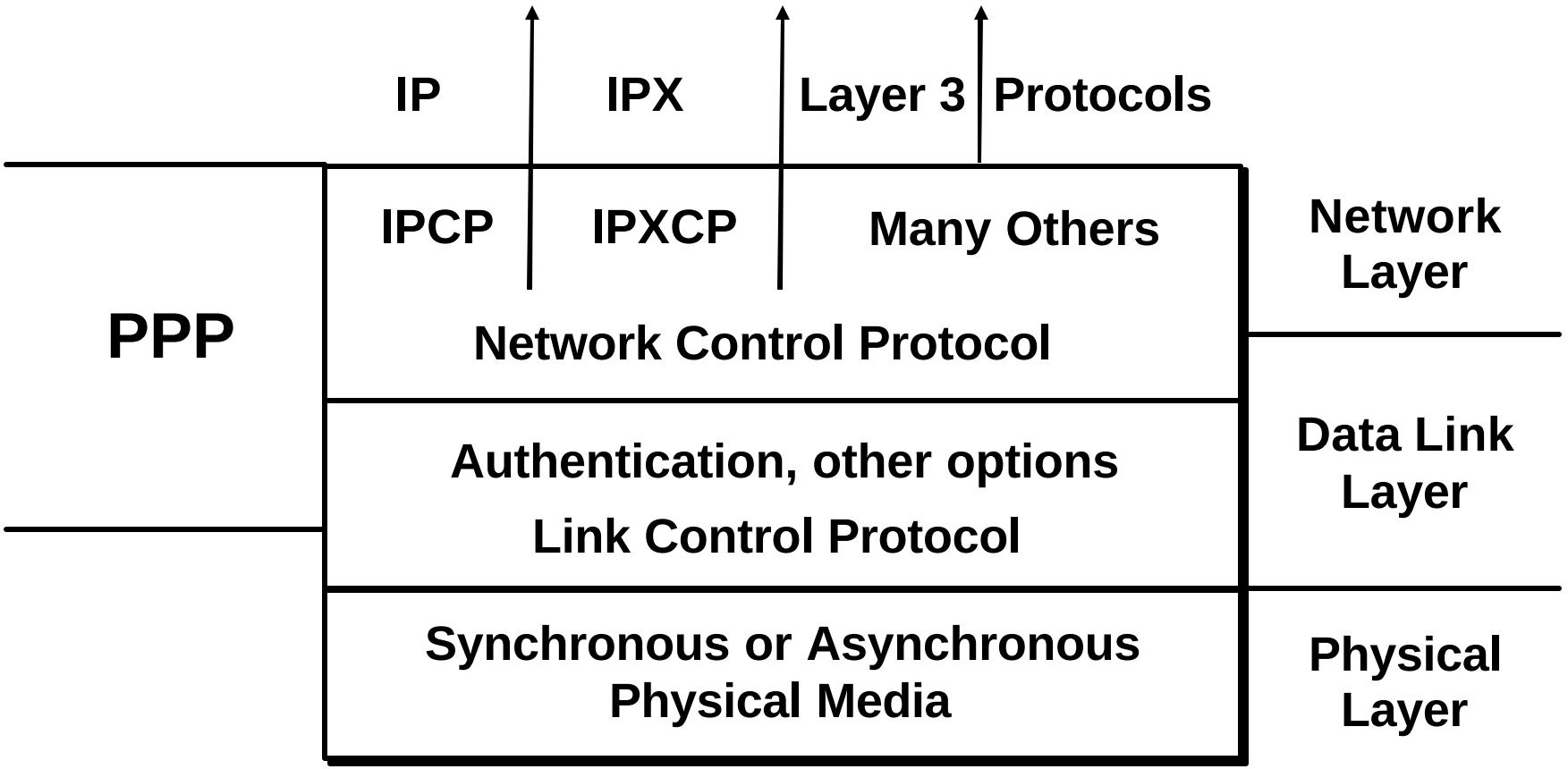
- Enable hdlc encapsulation
- HDLC is the default encapsulation on synchronous serial interfaces

An Overview of PPP



- PPP can carry packets from several protocol suites using Network Control Programs
- PPP controls the setup of several link options using LCP

Layering PPP Elements

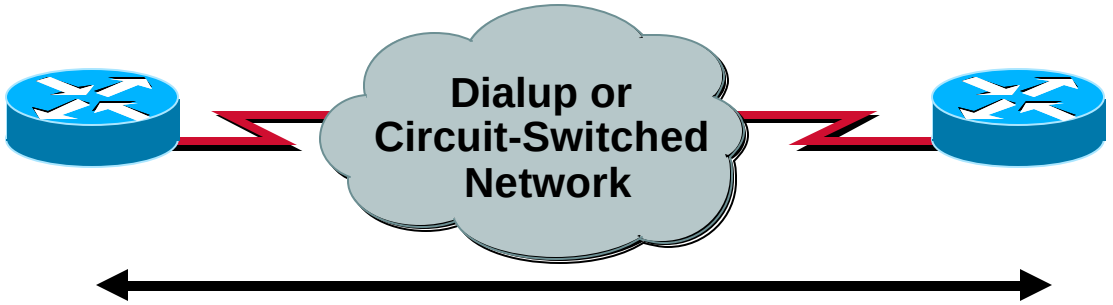


PPP—A data link with network-layer services

PPP LCP Configuration Options

Feature	How It Operates	Protocol
Authentication	Require a password Perform Challenge Handshake	PAP CHAP
Compression	Compress data at source; reproduce data at destination	Stacker or Predictor
Error Detection	Monitor data dropped on link Avoid frame looping	Quality Magic Number
Multilink	Load balancing across multiple links	Multilink Protocol (MP)

PPP Authentication Overview

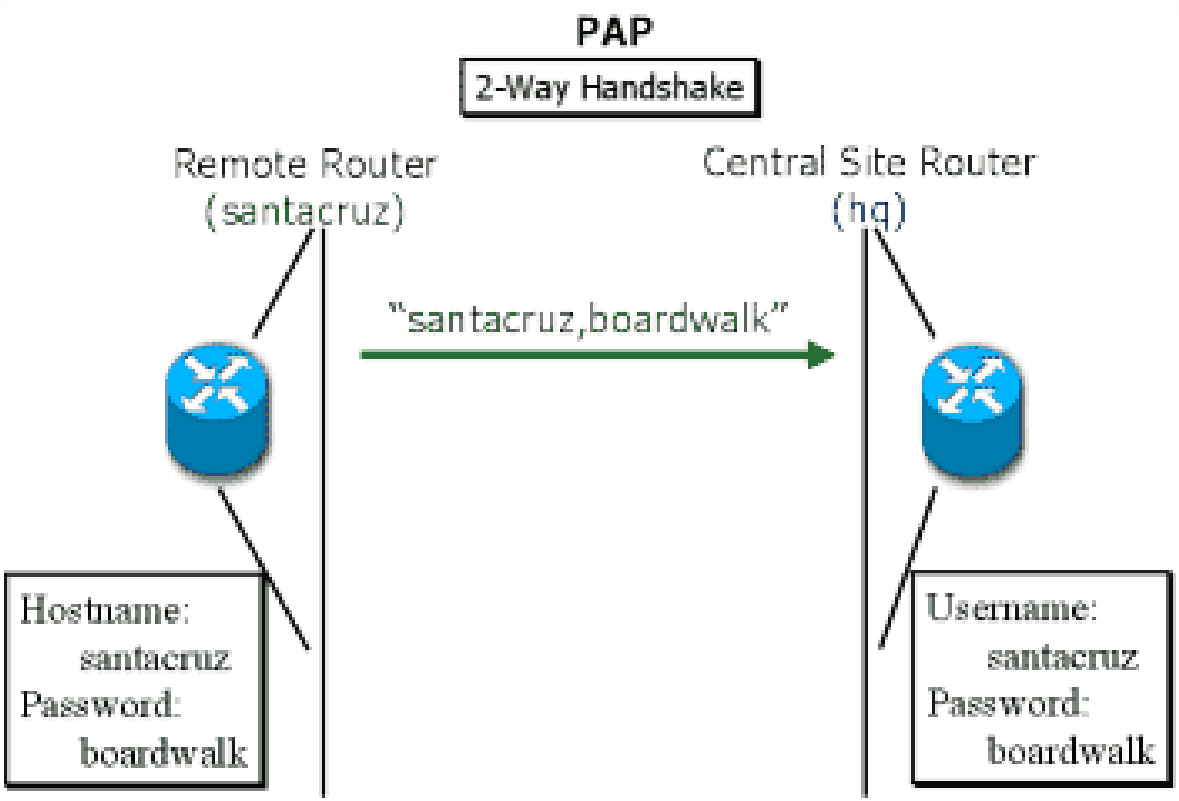


PPP Session Establishment

1. Link Establishment Phase
2. Optional Authentication Phase
3. Network-Layer Protocol Phase

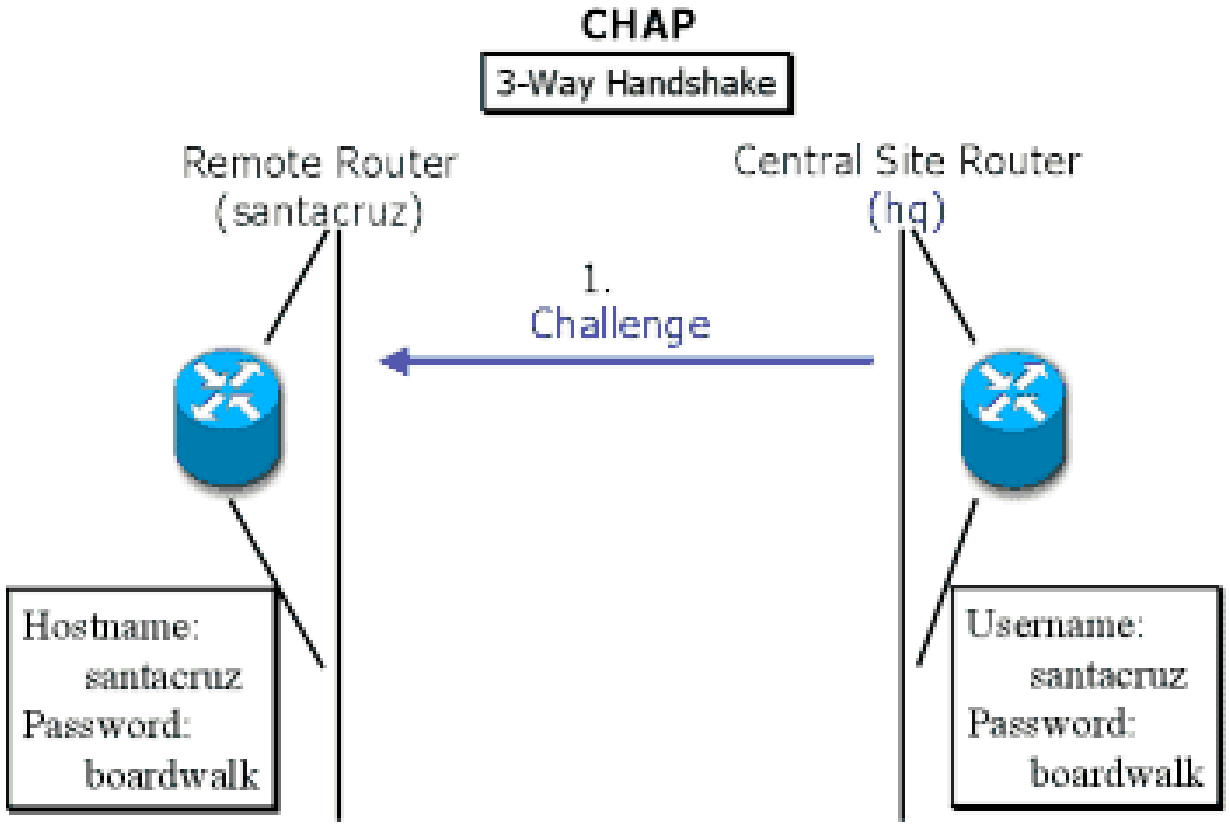
Two PPP authentication protocols: PAP and CHAP

Selecting a PPP Authentication Protocol



- **Passwords sent in clear text**
- **Peer in control of attempts**

Selecting a PPP Authentication Protocol (cont.)



Use “secret” known only to authenticator and peer

Configuring PPP and Authentication Overview

Enabling PPP

- **ppp encapsulation**

Enabling PPP Authentication

- **hostname**
- **username / password**
- **ppp authentication**

Enabling PPP

- **ppp encapsulation**

Enabling PPP Authentication

- **hostname**
- **username / password**
- **ppp authentication**

Configuring PPP

```
Router(config-if)#encapsulation ppp
```

- **Enable PPP encapsulation**

Configuring PPP Authentication

Router(config)#hostname *name*

- **Assigns a host name to your router**

Router(config)#username *name* password *password*

- **Identifies the username and password of authenticating router**

Configuring PPP Authentication (cont.)

```
Router(config-if)#ppp authentication
{chap | chap pap | pap chap | pap}
```

- Enables PAP and/or CHAP authentication

Configuring CHAP Example


```
hostname left
username right password sameone
!
int serial 0
 ip address 10.0.1.1 255.255.255.0
 encapsulation ppp
 ppp authentication CHAP
```

```
hostname right
username left password sameone
!
int serial 0
 ip address 10.0.1.2 255.255.255.0
 encapsulation ppp
 ppp authentication CHAP
```

Verifying HDLC and PPP Encapsulation Configuration

```
Router#show interface s0
Serial0 is up, line protocol is up
  Hardware is HD64570
  Internet address is 10.140.1.2/24
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation PPP, loopback not set, keepalive set (10 sec)
  LCP Open
  Open: IPCP, CDPCP
  Last input 00:00:05, output 00:00:05, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    38021 packets input, 5656110 bytes, 0 no buffer
    Received 23488 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    38097 packets output, 2135697 bytes, 0 underruns
    0 output errors, 0 collisions, 6045 interface resets
    0 output buffer failures, 0 output buffers swapped out
    482 carrier transitions
    DCD=up  DSR=up  DTR=up  RTS=up  CTS=up
```

Verifying PPP Authentication with the *debug ppp authentication* Command


```
4d20h: %LINK-3-UPDOWN: Interface Serial0, changed state to up
4d20h: Se0 PPP: Treating connection as a dedicated line
4d20h: Se0 PPP: Phase is AUTHENTICATING, by both
4d20h: Se0 CHAP: O CHALLENGE id 2 len 28 from ”left"
4d20h: Se0 CHAP: I CHALLENGE id 3 len 28 from ”right"
4d20h: Se0 CHAP: O RESPONSE id 3 len 28 from ”left"
4d20h: Se0 CHAP: I RESPONSE id 2 len 28 from ”right"
4d20h: Se0 CHAP: O SUCCESS id 2 len 4
4d20h: Se0 CHAP: I SUCCESS id 3 len 4
4d20h: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0, changed state to
up
```

***debug ppp authentication* successful CHAP output**