```
RouterA(config-if)#ppp authentication chap
RouterA(config-if)#exit
RouterA(config)#exit
RouterA#show interface s0
```

**password** must be the same for both routers using CHAP.

To encrypt passwords, enter the **service password-encryption** command while in global configuration mode.

## Configuring HDLC and PPP Encapsulation Summary

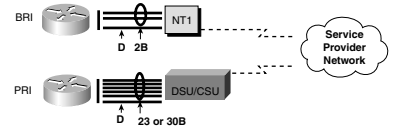
- HDLC is the default protocol on serial data links for Cisco devices. Cisco's proprietary HDLC supports multiprotocol environments.
- PPP encapsulates Layer 3 data over point-to-point links.
- LCP options for PPP define authentication, passwords and challenge handshakes, compression, error detection, and multilink parameters.
- The three PPP session establishment phases are link establishment, authentication, and network layer configuration.
- PPP authentication includes PAP, a simple two-way handshake conducted only upon initial establishment, and CHAP, a three-way password-based handshake done at link establishment and periodically throughout the session.

## ISDN BRI Concepts

*Integrated Services Digital Network* (ISDN) is a collection of standards that define an integrated voice/data architecture over the Public Switched Telephone Network (PSTN). ISDN standards define the hardware and call setup schemes. ISDN provides the following benefits:

- **Multiple traffic feeds**—Voice, video, telex, and packet-switched data are all available over ISDN.
- **Fast call setup**—ISDN uses out-of-band (D, or delta channel) signaling for call setup. ISDN calls can often be set up and completed in less than one second.
- **Fast bearer (B) channel services (64 kbps per channel)**—With multiple B channels (two B channels with BRI), ISDN offers 128 kbps. Leased lines usually provide only 56 kbps in North America.

### ISDN Standard Access Methods




| Channel | Capacity | Mostly Used For |
|---|---|---|
| B | 64 kbps | Circuit-switched data (HDLC, PPP) |
| D | 16/64 kbps | Signaling information (LAPD) |

With BRI, there are two bearer (B) channels (6 kbps each) and one delta (D) channel (16 kbps). (BRI is sometimes written as 2B+D.) The B channels are used for digitized voice and high-speed data transport. The D channel is used for signaling. The D channel can also be used for low-rate packet data (such as alarms). D channel traffic is transported using the LAPD data link layer protocol.

In North America and Japan, Primary Rate Interface (PRI) has 23 B channels and 1 D channel (all channels are 64 kbps). In Europe, PRI has 30 B channels and 1 D channel.

### ISDN Call Setup

The D channel initiates the call by establishing a path between switches and passing the called number. Local switches use the SS7 signaling protocol to complete the path and pass the called number to the terminating ISDN switch. When the destination receives the setup information, it uses the D channel to signal to the ISDN switch that is available. The B channel is now connected end-to-end and can carry conversation or data.

### ISDN Functions

Customer premises equipment (CPE) connects to the ISDN switch. The ISDN standards define functions (devices) that act as transition points between reference-point interfaces. With BRI, you must determine whether you need a transition device (NT1) between the router and the service provider's ISDN switch. Connectors labeled as BRI U have a built-in NT1. Connectors marked BRI S/T require an external NT1.

*Caution*: Insert the cable running from an ISDN BRI port in only an ISDN jack or switch. ISDN BRI uses voltages that can seriously damage non-ISDN devices.