SLIP and PPP

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Data Link Layer in Internet

- We know that Internet consists of individual systems that are connected to each other.
- Basically, it is wide are network that is built up from point-to-point leased lines.
- In these point-to-point lines, two major data link protocols are used:
  - Serial Line Internet Protocol (SLIP)
  - Point-to-Point Protocol (PPP)

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Serial Line Internet Protocol (SLIP)

- It is a means of sending Internet Protocol datagrams over a serial link.
- It can be used by two systems to communicate via a direct cable connection or modem link.
- The initial purpose of this protocol was to connect Sun workstation to the Internet over a dial-up line using modem.

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Problems with SLIP

- It does not perform any error detection and correction.
- It supports only IP (Internet Protocol). So, it cannot be used for other networks that do not use IP (for e.g.: Novell LANs).
- It does not support the allocation of dynamic IP address.
- Both the communicating systems should be assigned a specific IP address before hand.
- It does not provide any authentication.
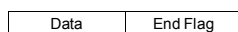- It is not an approved Internet standard.

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Data Format of SLIP

- The data format of SLIP is:

Data	End Flag

- A special END character (equivalent to decimal 192) marks the end of data.

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Point-to-Point Protocol (PPP)

- PPP was devised by IETF (Internet Engineering Task Force) to create a data link protocol for point-to-point lines that can solve all the problems of SLIP.
- It is the most commonly used data link protocol.
- It is used to connect the home PC to the ISP server.

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Benefits of PPP

- PPP defines the format of the frame to be exchanged between the devices.
- It defines Link Control Protocol (LCP) for:
  - Establishing the link between two devices.
  - Maintaining this established link.
  - Configuring this link.
  - Terminating this link after the transfer.

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Benefits of PPP (Contd…)

- It provides error detection.
- Unlike SLIP, that supports only IP, it supports multiple protocols.
- It supports dynamic allocation of IP address.
- It provides authentication.
- It provides NCP (Network Control Protocol), that supports variety of network layer protocol.

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PPP Frame Format

- Frame format of PPP is similar to HDLC frame:

01111110 11111111 00000011   01111110

Flag	Address	Control	Protocol	Information	FCS	Flag
1 Byte	1 Byte	1 Byte	1 or 2 Byte	Variable	2 or 4 Byte	1 Byte

- **Flag Field:** It marks the beginning and end of the PPP frame. Flag byte is 01111110.
- **Address Field:** This field is of 1 byte and is always 11111111. This address is the broadcast address i.e. all stations accept this frame.

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- **Control Field:** It is also of 1 byte. It uses the format of U-Frame in HDLC. The value is always 00000011 to show that the frame does not contain any sequence number and there is no flow control or error control.
- **Protocol Field:** This field specifies the kind of protocol of the data in the information field.

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Flag	Address	Control	Protocol	Information	FCS	Flag
1 Byte	1 Byte	1 Byte	1 or 2 Byte	Variable	2 or 4 Byte	1 Byte

- **Information Field:** Its length is variable. It carries user data or other information.
- **FCS Field:** It stands for Frame Check Sequence. It contains checksum. It is either 2 bytes or 4 bytes.

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Transition Phases in PPP

- The PPP connection goes through different states:

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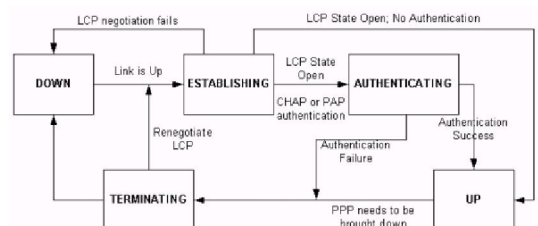
Transition Phases in PPP

- **Down:**
  - In down phase, the link is not used.
- **Establish:**
  - Connection goes into this phase when one of the nodes start communication.
- **Authenticate:**
  - This phase is optional. The two nodes may decide during establishment phase, to use this phase.

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Transition Phases in PPP

- **Up:**
  - In this phase, data transfer takes place. The connection remains in this phase until one of the node wants to end the connection.
- **Terminate:**
  - In this phase, connection is terminated.

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PPP Stack

- PPP uses several other protocols to establish link, authenticate users and to carry the network layer data:
- The various protocols used are:
  - Link Control Protocol
  - Authenticate Protocol
  - Network Control Protocol

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Link Control Protocol

- It is responsible for establishing, maintaining, configuring and terminating the link.
- It provides negotiation mechanism to set options between two nodes.
- All LCP packets are carried in the information field of the PPP frame.

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Authentication Protocol

- Authentication protocol helps to validate the identity of a user who needs to access the resources.
- There are two authentication protocols:
  - Password Authentication Protocols (PAP)
  - Challenge Handshake Authentication Protocol (CHAP)

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Password Authentication Protocol (PAP)

- This protocol provides two step authentication procedure:
  - **Step 1:** Username and password is provided by the user who wants to access the system.
  - **Step 2:** The system checks the validity of username and password, and either accepts or rejects the connection.

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Challenge Handshake Authentication Protocol (CHAP)

- It provides more security than PAP.
- In this method, password is kept secret.
- It is a three way authentication protocol:
  - **Step 1:** System sends a challenge packet to the user. It contains a value, usually a few bytes.
  - **Step 2:** Using a predefined function, a user combines this challenge value with the user password and sends the resultant packet back to the system.
  - **Step 3:** System then applies the same function to the password of the user & challenge value, and creates a result. If the result is same as the result sent in the response packet, access is granted, otherwise, it is denied.

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Network Control Protocol (NCP)

- After establishing the link & authenticating the user, PPP connects to the network layer.
- This connection is established by NCP.
- Therefore, NCP is a set of control protocols that allow the encapsulation of the data coming from the network layer.
- After the network layer configuration is done by one of the NCP, the user can exchange data from the network layer.

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Differences Between SLIP & PPP

S. No.	SLIP	PPP
1.	SLIP stands for Serial Line Internet Protocol.	PPP stands for Point-to-Point Protocol
2.	SLIP does not perform error detection & correction.	PPP performs error detection & correction.
3.	SLIP supports only IP.	PPP supports multiple protocols.
4.	IP address is assigned statically.	IP address is assigned dynamically
5.	SLIP does not provide any authentication.	PPP provides authentication.
6.	SLIP is not approved Internet standard.	PPP is approved Internet standard.

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Thank You

Have a Nice Day

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