SNS College of Engineering Coimbatore - 641107

UNIT 2

LINK LAYER

Services, ARP, DLC Protocols, HDLC, PPP, Media Access Control, Wired LANs: Ethernet, Wireless LANs: IEEE 802.11, Bluetooth, Connecting devices: Hubs, Routers, Switches.

PPP

Point - to - Point Protocol (PPP) is a communication protocol of the data link layer that is used to transmit multiprotocol data between two directly connected (point-to-point) computers.
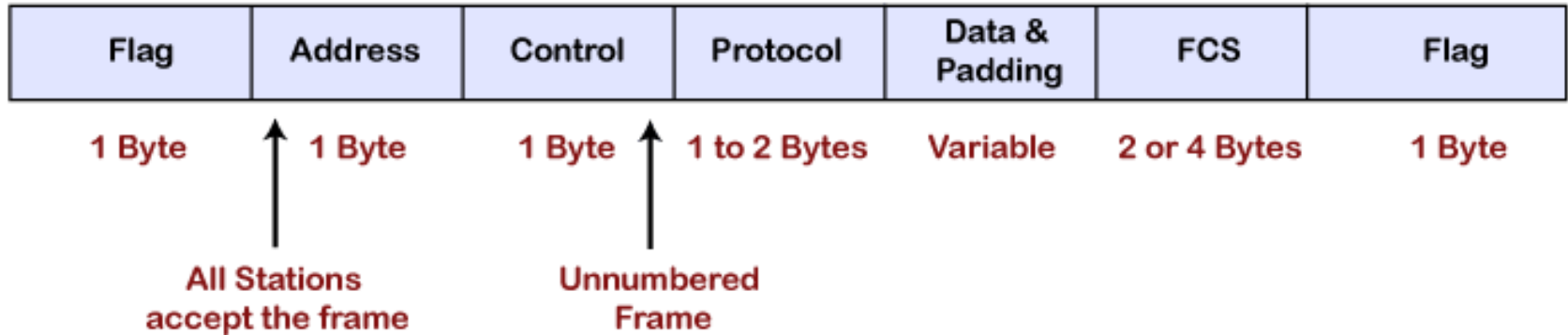
Services provided by PPP

- Defines format for frames

- Provides link establishment process

- Defines data exchange process

- It defines how network layer data and information in the payload are encapsulated in the data link frame.

- It defines the authentication process between the two devices

PPP Encapsulation

- PPP encapsulation defines how network layer packets are encapsulated in the PPP frame.

Flag	Address	Control	Protocol	Data & Padding	FCS	Flag
1 Byte	1 Byte	1 Byte	1 to 2 Bytes	Variable	2 or 4 Bytes	1 Byte

All Stations accept the frame

Unnumbered Frame

K.Revathi,AP/IT

Fields of PPP

- **Flag:** Indicates start and end of the frame. It always has a value of 1 byte i.e., 01111110 binary value

- **Address field:** In this, all 1's simply indicate that all of the stations are ready to accept frame. It has the value of 1 byte i.e., 11111111 binary value.

- K.Revathi,AP/IT

Cont.,

- **Control field:** This field basically uses format of U-frame. This field is set to 1 byte i.e., 00000011 binary value.

- **Protocol:** This field basically identifies network protocol of the datagram. It usually identifies the kind of packet in the data field. 1 or 2 bytes. Identifies the PDU that is encapsulated by PPP frames.

Contd.,

- Data & padding: It usually contains the upper layer datagram. The length of this field is not constant.

- **FCS (frame check sequence):** This field usually contains a checksum simply for the identification of errors. It can be either 16 bits or 32 bits in size.

Protocol Field

- The protocol can be a Link control protocol, Password authentication protocol, Challenge handshake authentication protocol
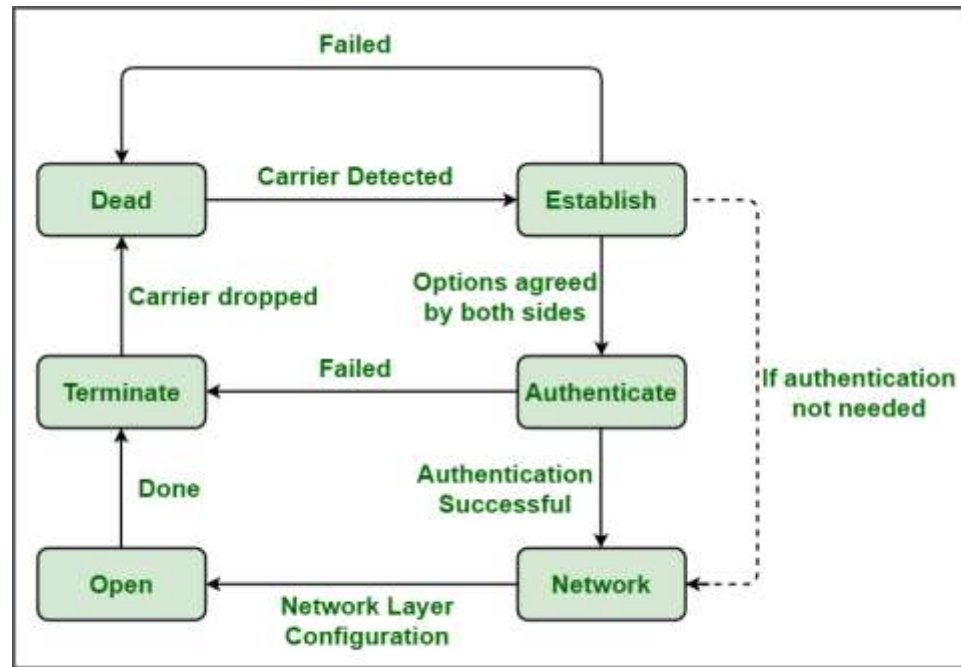
Benefits of PPP frame

- Efficient data transmission

- Enhanced security

- Support for multiple protocols

Working of PPP

- A PPP kink is established for communication in five phases.

Transition Phases

Dead: In this phase, link basically starts and stops.

Establish: In this phase, a connection between two network nodes is established using LCP (Link control protocol) packets. This involves exchanging information about the modem speeds and types, compression techniques, and other configuration options.

Contd.,

- **Authenticate:** It is a critical step in the PPP connection process. During this phase, the two communication endpoints exchange authentication information to ensure that each endpoint is authorized to access the network.

- **Protocols are:** PAP and CHAP

Contd.,

- **Network Phase:** During this phase, the PPP connection transitions from the authentication to the network layer protocol configuration. Network Control Protocol packets are exchanged between two endpoints to configure a network-layer protocol such as IP or IPX

Cont.,

- **Open phase:** The both endpoints have successfully negotiated and established network-layer protocols such as TCP/IP or IPX/SPX.

Contd.,

- **Terminate Phase:** It is the final stage of the PPP protocol, occurring after the Open Phase. During this phase, all communications between two network nodes come to an end.
- The PPP device sends a Terminate-Request packet to request termination of the link and waits for acknowledgment from the other device in response.

PPP Stack

- In PPP, there are three set of protocols:
- Link control protocol(LCP)
- Authentication protocols
  - Password authentication(PAP)
  - Challenged handshake authentication(CHAP)
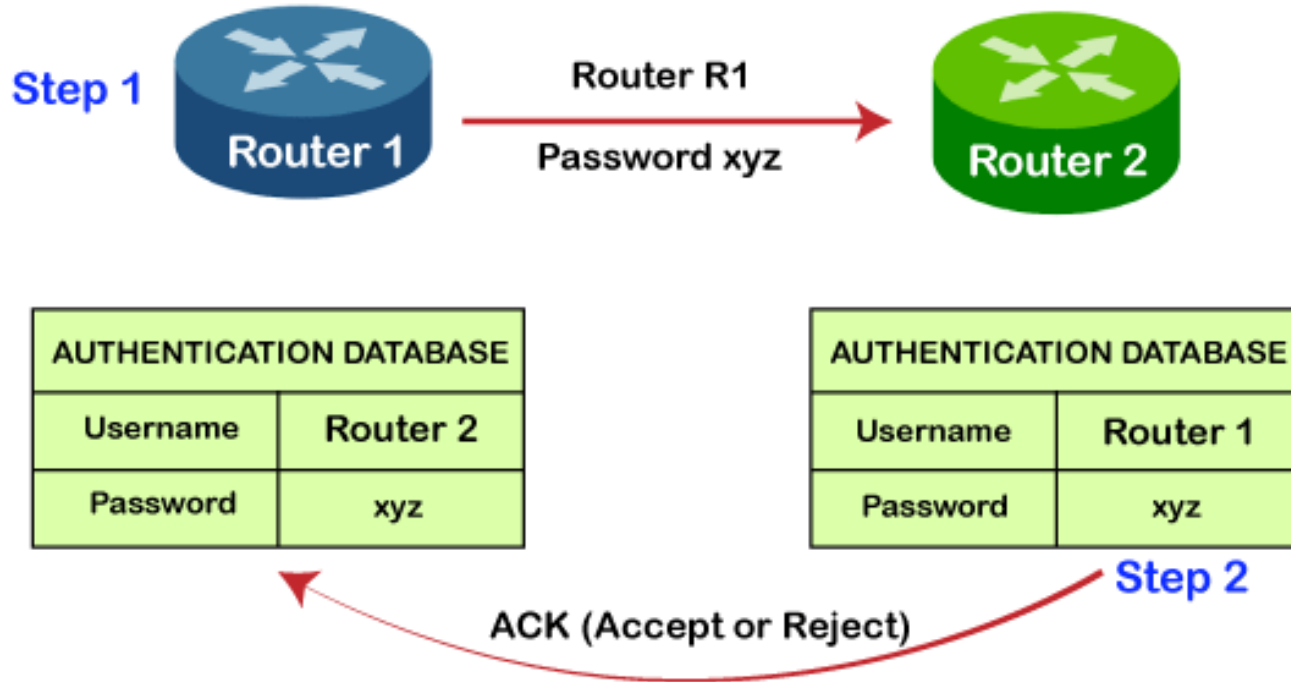- Network control protocols(NCP)

LCP

- The role of LCP is to establish, maintain, configure, and terminate the links. It also provides a negotiation mechanism.
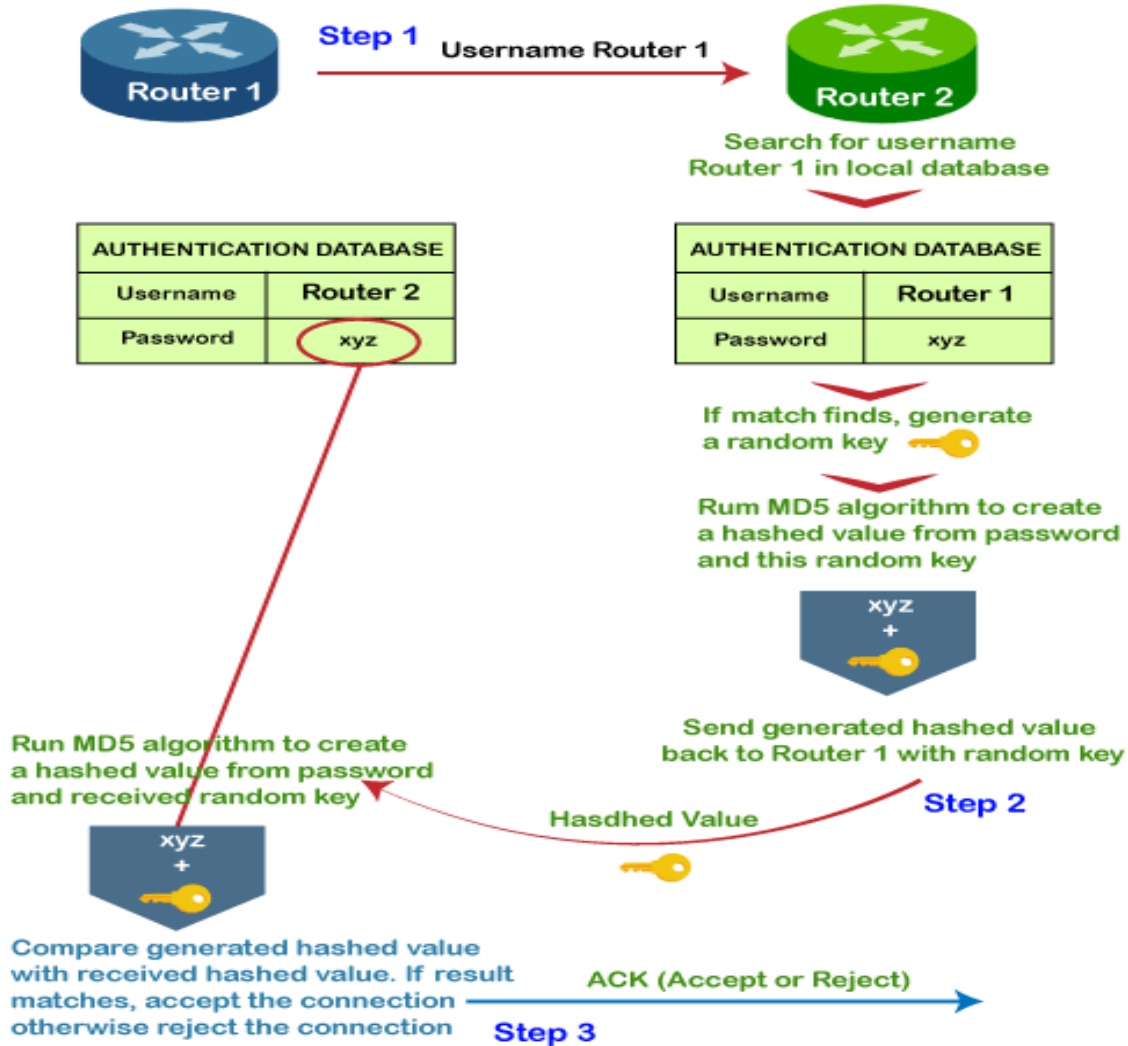
AP-(PAP)

PAP

- In the first step, router 1 wants to authenticate so it sends the username and password for the authentication.

- In the second step, if the username and password are matched then router 2 will authenticate router 1 otherwise the authentication failed.

AP-CHAP

CHAP is a three-step process.

Step 1: Suppose there are two routers, i.e., router 1 and router 2. In this step, router 1 sends the username but not the password to the router 2.

Step 2: The router 2 maintains a database that contains a list of allowed hosts with their login credentials. If the match is found then the random key is passed. The hashed value is also known as Challenge. The challenge along with the random key will be sent to router 1.

Contd.,

Step 3: The router 1 receives the hashed value and a random key from the router 2. If the generated hashed value does not match with the received hashed value then the connection gets terminated. If it is matched, then the connection is granted. Based on the above authentication result, the authentication signal that could be either accepted or rejected is sent to router 2.

NCP

- After the establishment of the link and authentication, the next step is to connect to the network layer. So, PPP uses another protocol known as network control protocol (NCP).

- The NCP is a set of protocols that facilitates the encapsulation of data that is coming from the network layer to the PPP frames.