4 PPP

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THAPAR INSTITUTE
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Course: Computer and Communication Networks

Topic: Point-to-point protocol and PPP stack

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OUTLINE

- Point-to-point protocol (PPP)
- PPP Frame Format
- Transition phases
- Point-to-point protocol Stack

Point-to-point protocol (PPP)

- Point - to - Point Protocol (PPP) is a communication protocol of the data link layer.
- It is used to transmit multiprotocol data between two directly connected (point-to-point) computers.
- It is a byte - oriented protocol that is widely used in broadband communications having heavy loads and high speeds.
- PPP is used over many types of physical networks including serial cable, phone line, trunk line, cellular telephone, specialized radio links, and fiber optic links.
- PPP is also used over Internet access connections

Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication 3. www.tutorialspoint.com

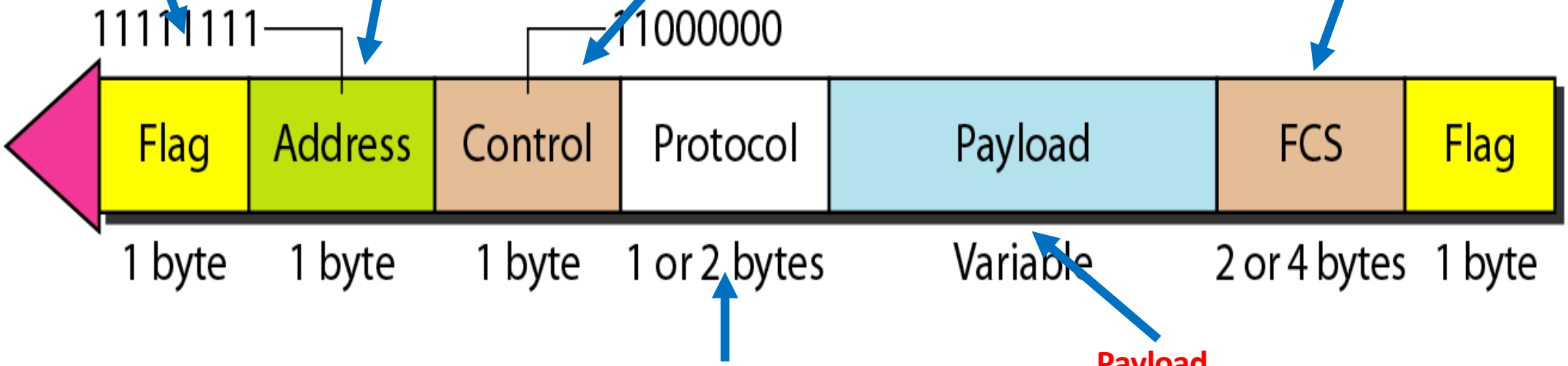
PPP Frame Format

Flag
1-byte with the bit pattern 01111110

Address
Usually set to 11111111 (broadcast address).

Control
Usually set to the constant value 11000000 (imitating unnumbered frames in HDLC)

Frame check sequence
It is a 2 or 4 byte CRC field.



Protocol
Defines what is being carried in the data field: either user data or other information.

Payload
carries user data or other information

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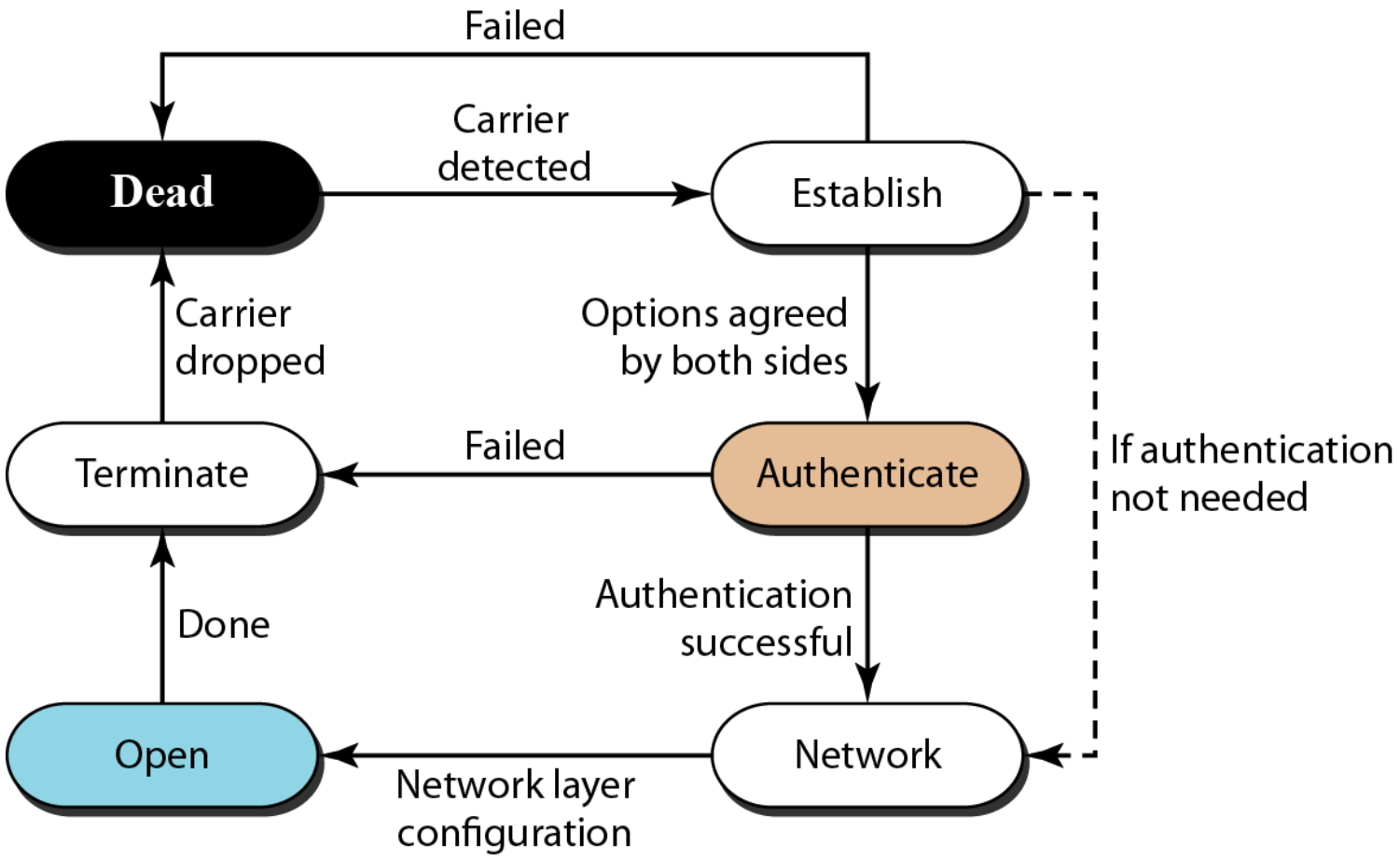
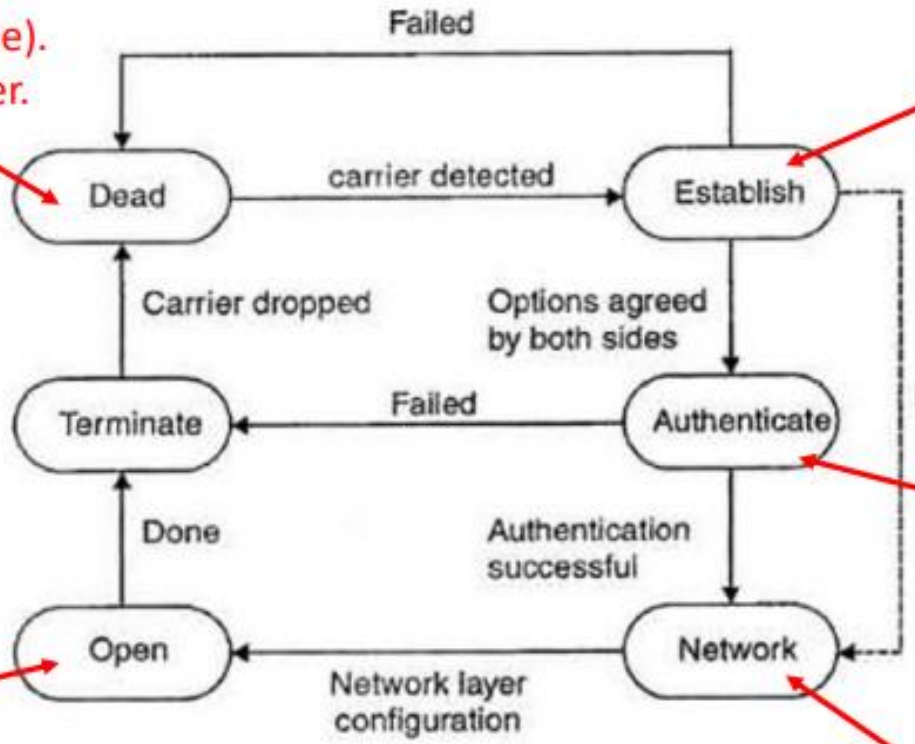
Transition phases



Dead State
Link is not used(or is idle).
There is no active carrier.



Establish Phase
One of the nodes wishes to start communication. The two parties negotiate the communication options

Authentication Phase
The parties send several authentication packets to verify their identities.

Open Phase
Data transfer takes place. The connection remains in this phase until one party requests for termination.

Network Phase
Negotiation for the network layer protocols takes place

Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication 3. ecomputernotes.co.in

Point-to-point protocol Stack

PPP uses a stack of other protocol to establish the link.

Three protocols are defined to make PPP a powerful protocol.

Link Control Protocol

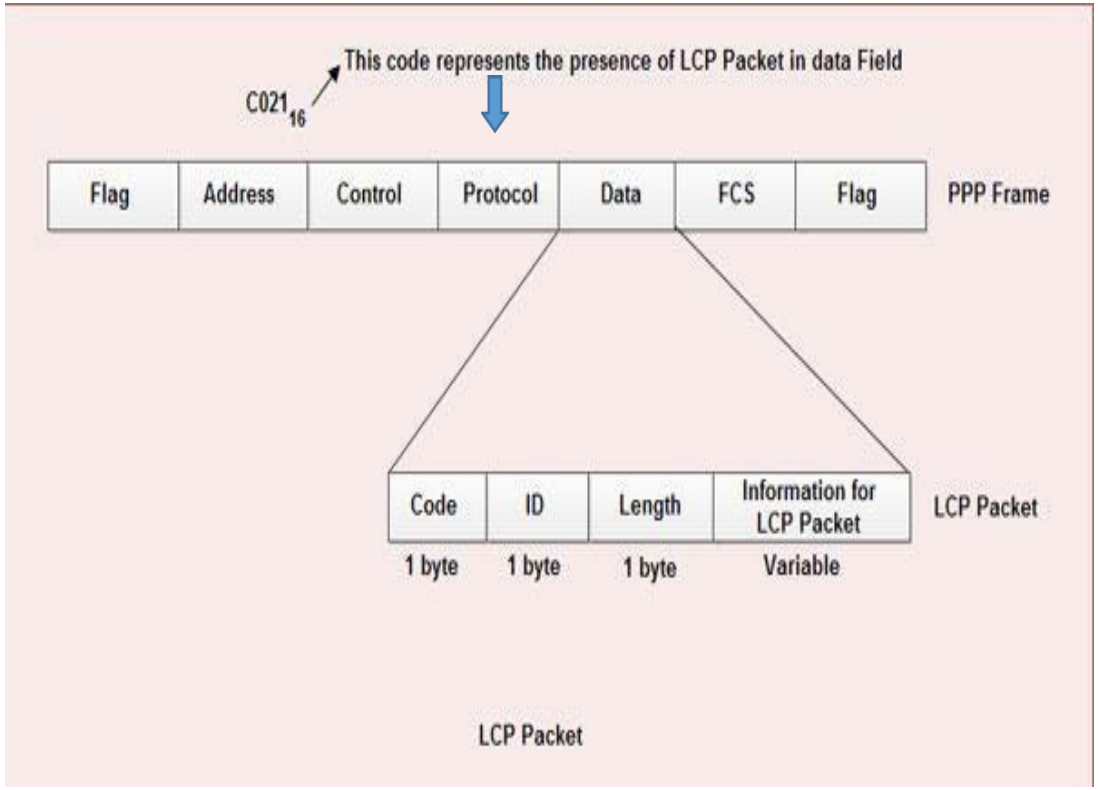
Authentication Protocol

Network Control Protocol

Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication 3. www.tutorialspoint.com

Link Control Protocol

- **Link Control Protocol LCP)** is responsible for establishing, maintaining, configuring and terminating the link.
- LCP provides negotiation mechanism to set options between two endpoints.
- LCP packets are carried in the data field of the PPP frame.
- The presence of a value $C021_{hex}$ in the protocol field of PPP frame indicates that LCP packet is present in the data field.



Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication 3. www.tutorialspoint.com

Authentication Protocol

Authentication protocols help to validate the identity of a user who needs to access the resources.

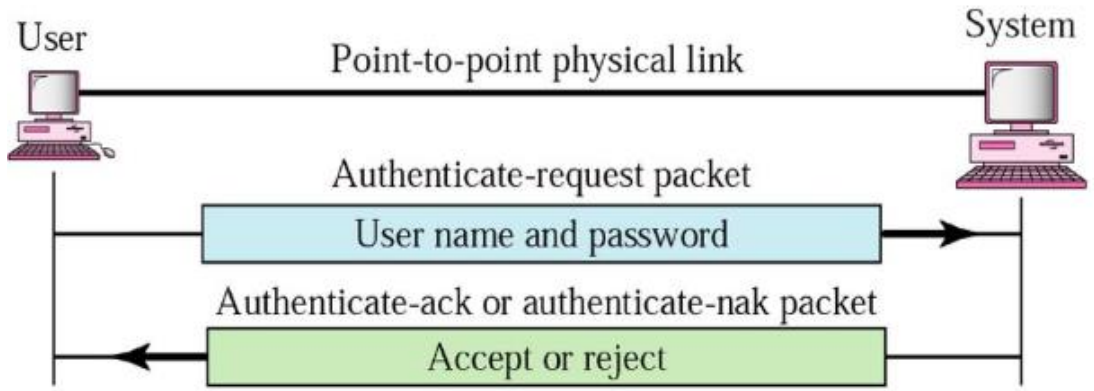
- There are two authentication protocols:

Password Authentication Protocols (PAP)

Challenge Handshake Authentication Protocol (CHAP)

Password Authentication Protocols (PAP)

- PAP sends the user name and password in clear text
- User name and password is provided by the user who wants to access a system.
- The system checks the validity of user name and password and either accepts or denies the connection.
- PAP is not enough for those systems that requires greater security



PAP Packets

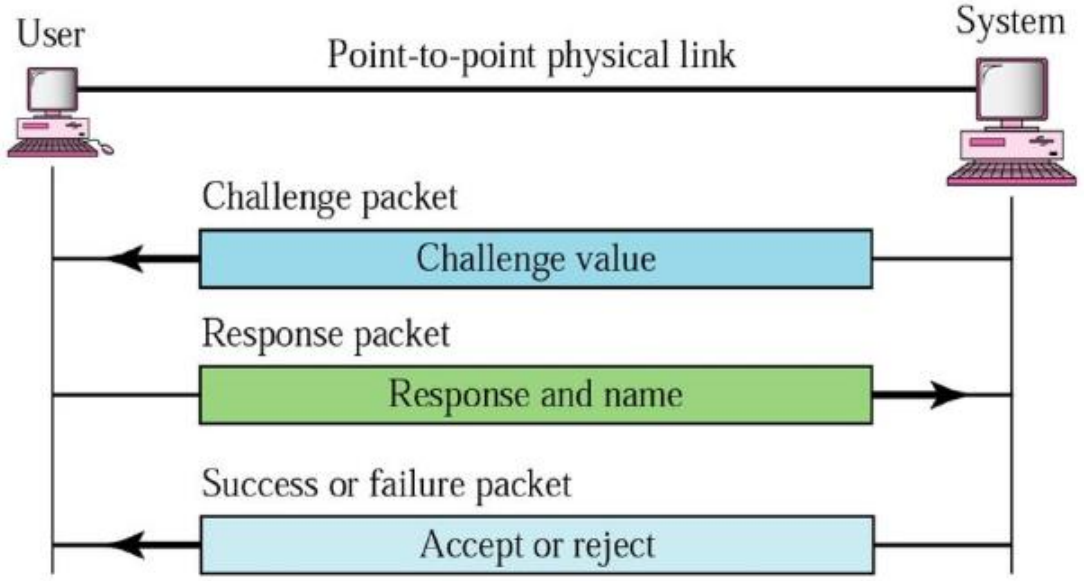
Authenticate-request: used to send user name & password.

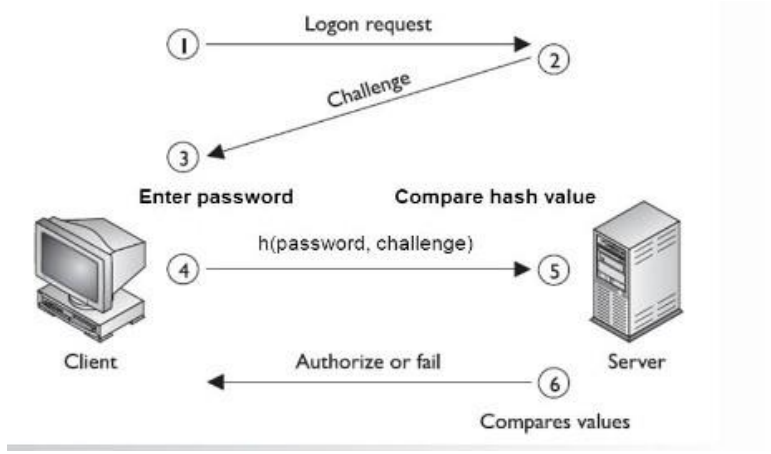
Authenticate-ack: used by system to allow the access.

Authenticate-nak: used by system to deny the access.

Challenge Handshake Authentication Protocol (CHAP)

- It is a three-way handshaking authentication protocol.
- User sends to the system a login request.
- System sends a challenge packet(random) to the user.
- Using a predefined function, a user combines this challenge value with the user password and sends the resultant packet back to the system.
- System applies the same function to the password of the user and challenge value and creates a result.





- **CHAP packets:**

Challenge-used by system to send challenge value.

Response-used by the user to return the result of the calculation.

Success-used by system to allow access to the system.

Failure-used by the system to deny access to the system.

Network Control Protocol

- PPP can carry a network layer data packet from protocols defined by the Internet, DECNET, Apple Talk, Novell, etc.
- **Network Control Protocol (NCP)** is a set of control protocols that allow the encapsulation of the data coming from network layer.
- After the network layer configuration is done by one of the NCP protocols, the users can exchange data from the network layer.

Thank You