



# **SNS COLLEGE OF ENGINEERING**

Kurumbapalayam (Po), Coimbatore – 641 107

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## **DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**COURSE NAME :19IT401 COMPUTER NETWORKS**

**II YEAR /IV SEMESTER**

**Unit 2-LINK LAYER**

**Topic 5 : PPP**



# PPP



- ✓ Today, millions of Internet users who need to connect their home computers to the server of an Internet service provider use PPP.
- ✓ The majority of these users have a traditional modem; they are connected to the Internet through a telephone line, which provides the services of the physical layer.
- ✓ But to control and manage the transfer of data, there is a need for a point-to-point protocol at the data-link layer.



# POINT-TO-POINT PROTOCOL (PPP)



## PPP Defines

Frame format

Negotiate and establish exchange of data

Encapsulation of network layer data

Authentication



# PPP Data Frame



**Flag:** A PPP frame starts and ends with a 1-byte flag with the bit pattern 01111110.

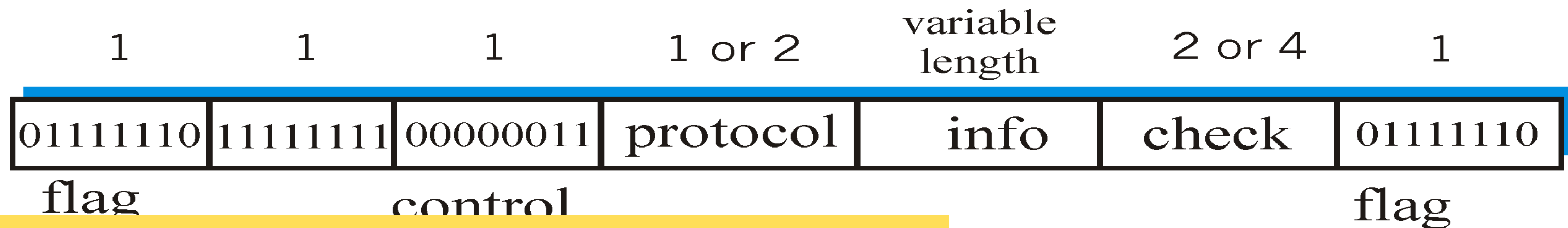
**Address:** The address field in this protocol is a constant value and set to 11111111 (broadcast address)

**Control:** This field is set to the constant value 00000011 (imitating unnumbered frames in HDLC). PPP does not provide any flow control. Error control is also limited to error detection.

**Protocol:** The protocol field defines what is being carried in the data field: either user data or other information

**info:** upper layer data being carried

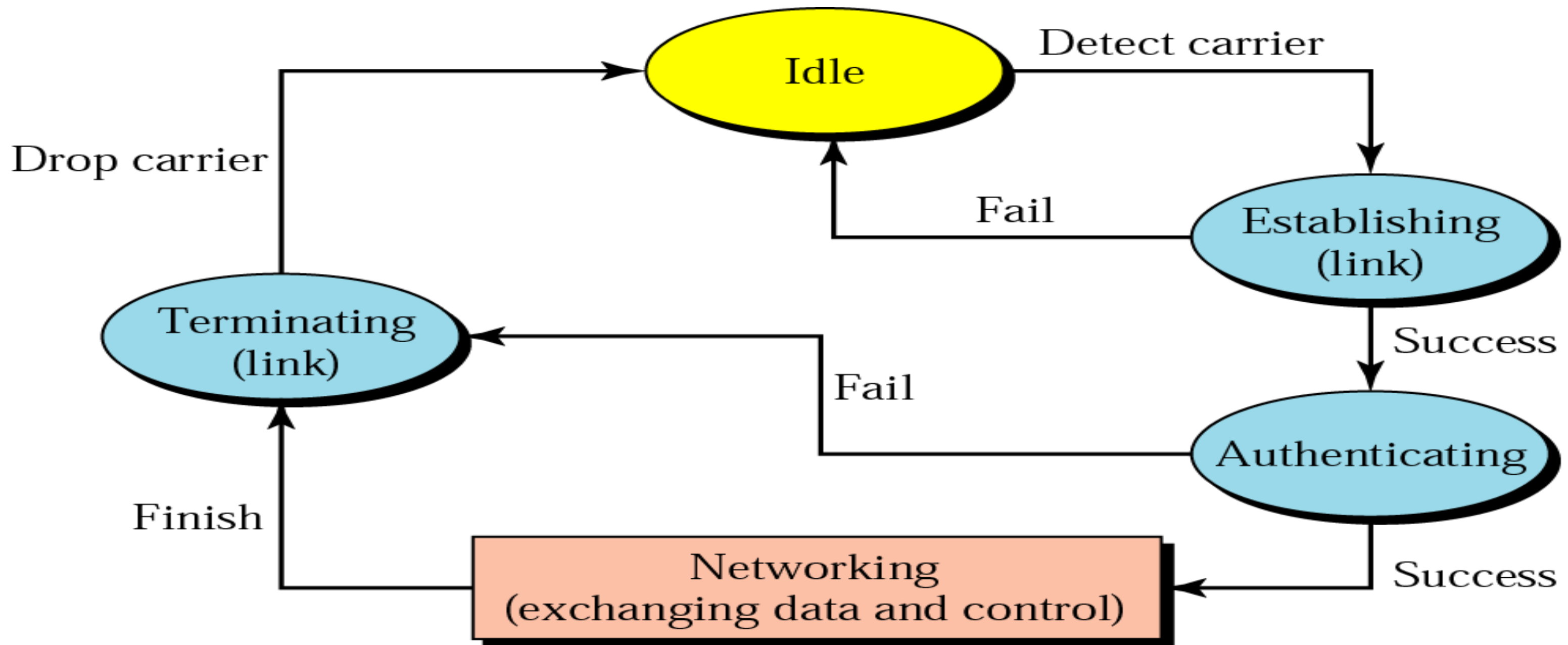
**Check:** The frame check sequence (FCS) is simply a 2-byte or 4-byte standard CRC





# PPP – Transition States

Idle, Establishing, Authenticating, Networking, Terminating





# PPP – Stack

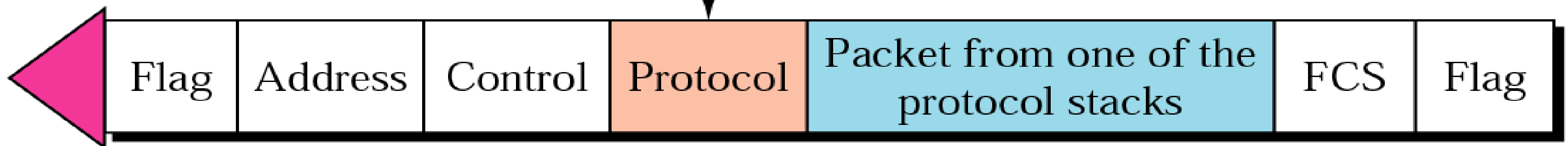


PPP is a link-layer protocol, it uses another set of protocols to establish the link, authenticate the parties involved, and carry the network-layer data

## Three Protocols:

**Link Control protocol**  
**Authentication protocol, and**  
**Network Control protocol**

The value of the protocol field defines the protocol stack.





# PPP – Link Control Protocol



## LCP Responsibilities

Establishing, Maintaining, Configuring, and Terminating Links

Payload: Code, ID, Length, Information Fields

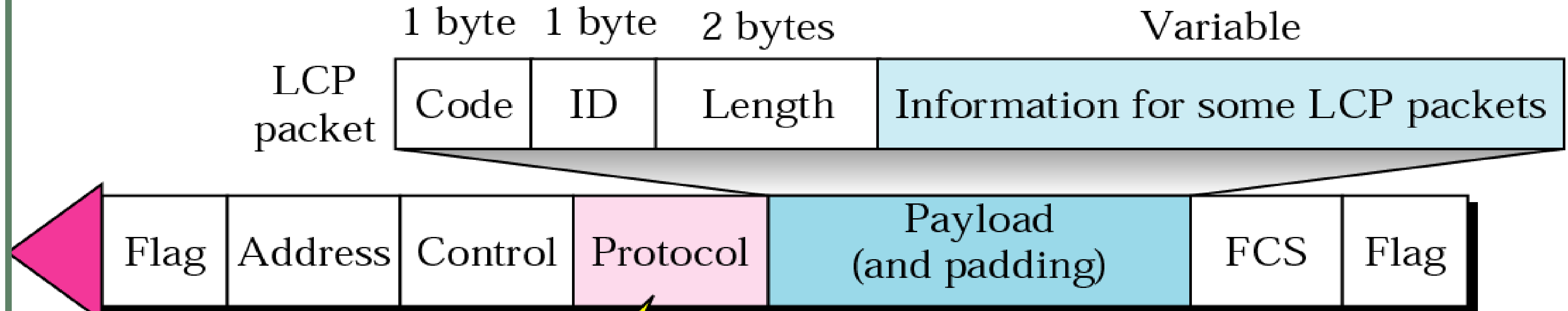




Table 11.2 LCP packets

<i>Code</i>	<i>Packet Type</i>	<i>Description</i>
0x01	Configure-request	Contains the list of proposed options and their values
0x02	Configure-ack	Accepts all options proposed
0x03	Configure-nak	Announces that some options are not acceptable
0x04	Configure-reject	Announces that some options are not recognized
0x05	Terminate-request	Request to shut down the line
0x06	Terminate-ack	Accept the shutdown request
0x07	Code-reject	Announces an unknown code
0x08	Protocol-reject	Announces an unknown protocol
0x09	Echo-request	A type of hello message to check if the other end is alive
0x0A	Echo-reply	The response to the echo-request message
0x0B	Discard-request	A request to discard the packet





# Authentication Protocols



## Password Authentication Protocols (PAP)

User sends ID (user name), and Password

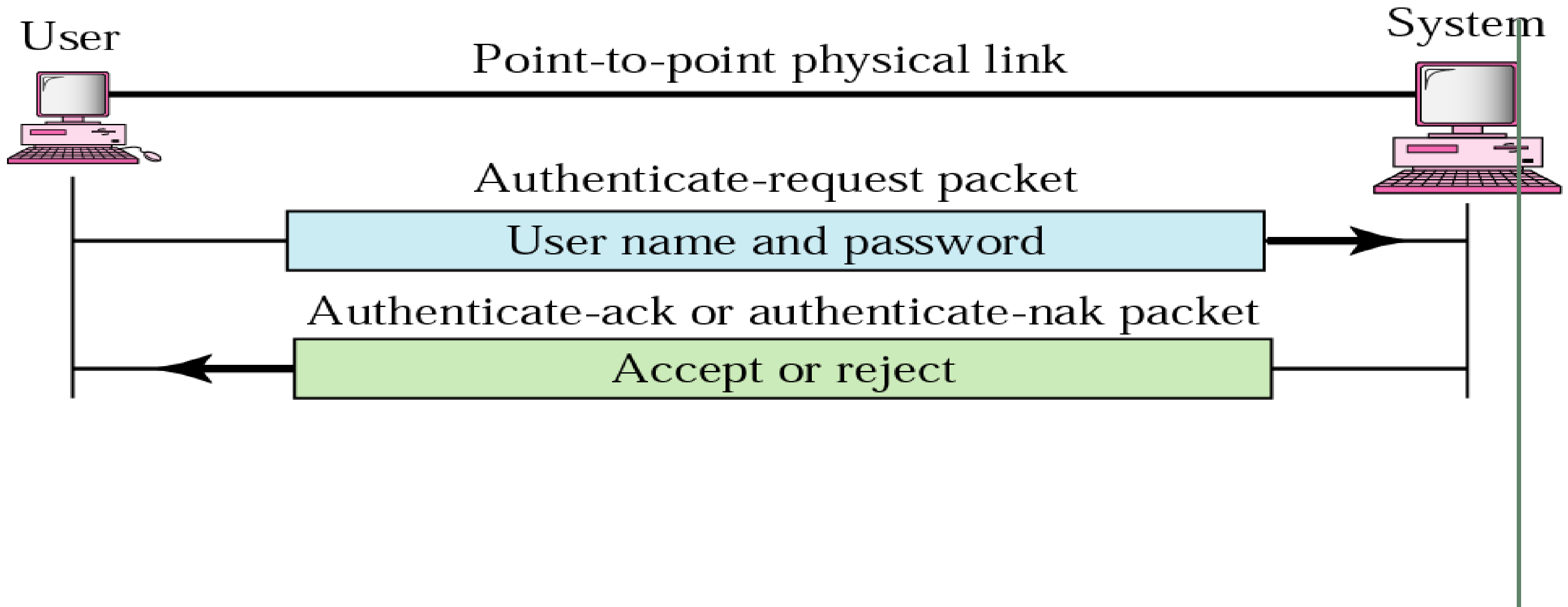
System checks the validity: accept, or reject

## Challenge Handshake Authentication Protocols (CHAP)

1. The system sends the user a challenge packet containing a challenge value.
2. The user applies a predefined function that takes the challenge value and the user's own password and creates a result. The user sends the result in the response packet to the system
3. The system does the same. It applies the same function to the password of the user (known to the system) and the challenge value to create a result. If the result created is the same as the result sent in the response packet, access is granted; otherwise, it is denied

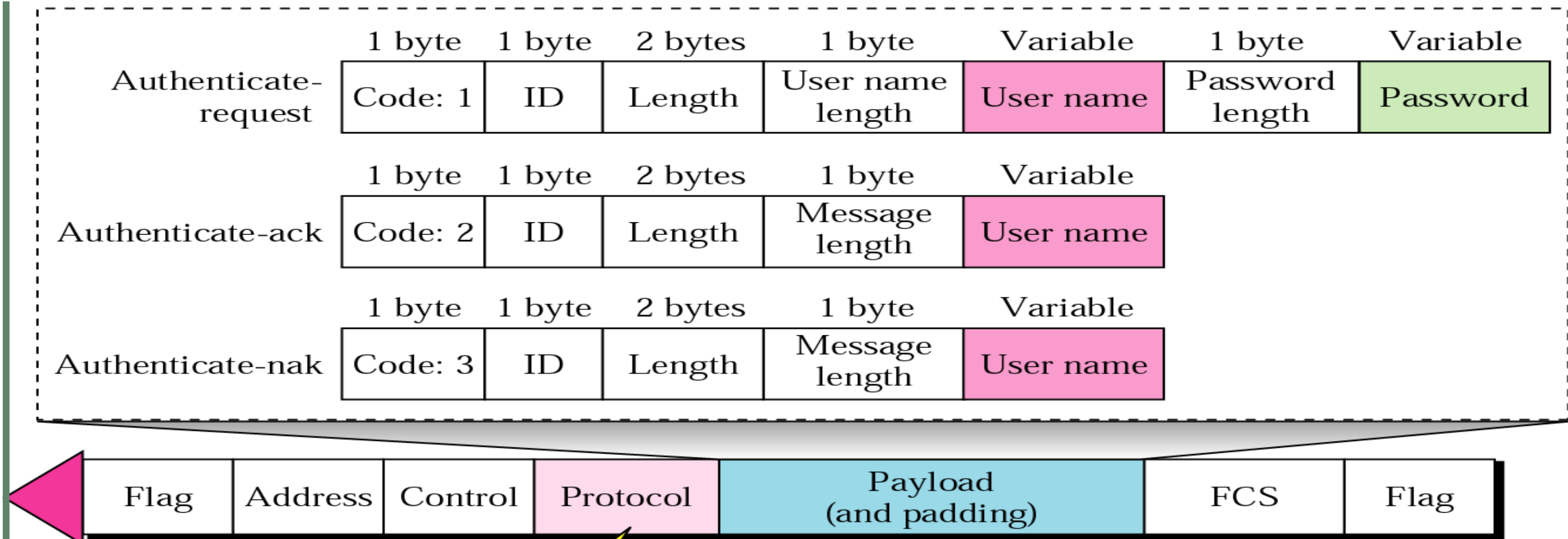


# PAP (Password Authentication)



# PAP Packets

PAP packets





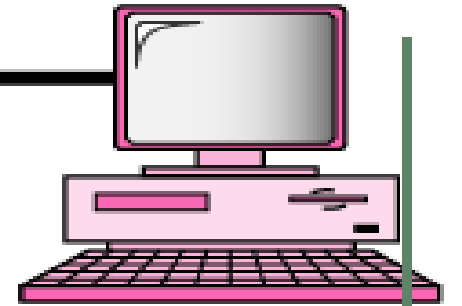
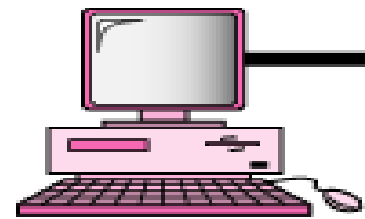
# CHAP



User

System

Point-to-point physical link



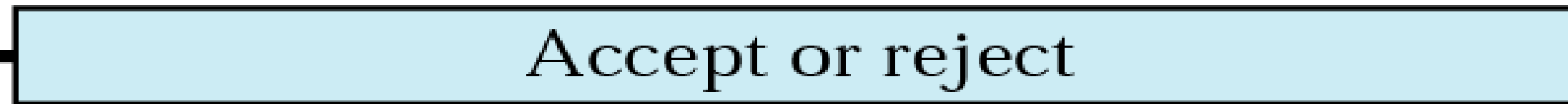
Challenge packet



Response packet

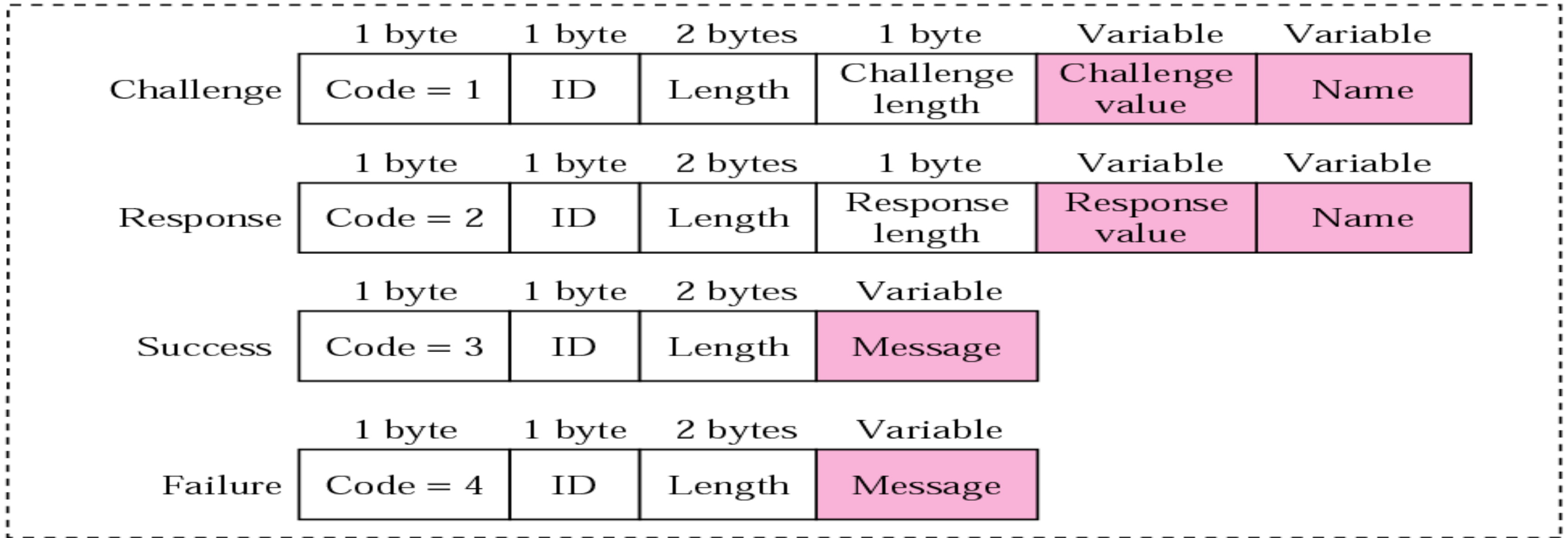


Success or failure packet



# CHAP Packets

CHAP packets

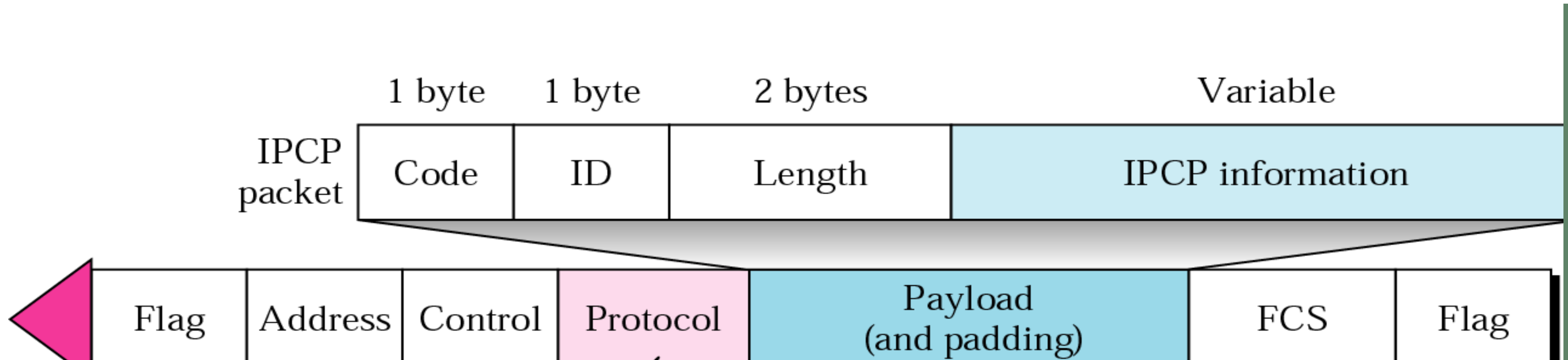




# Network Control Protocol (NCP)



IPCP: Internetwork Protocol Control Protocol



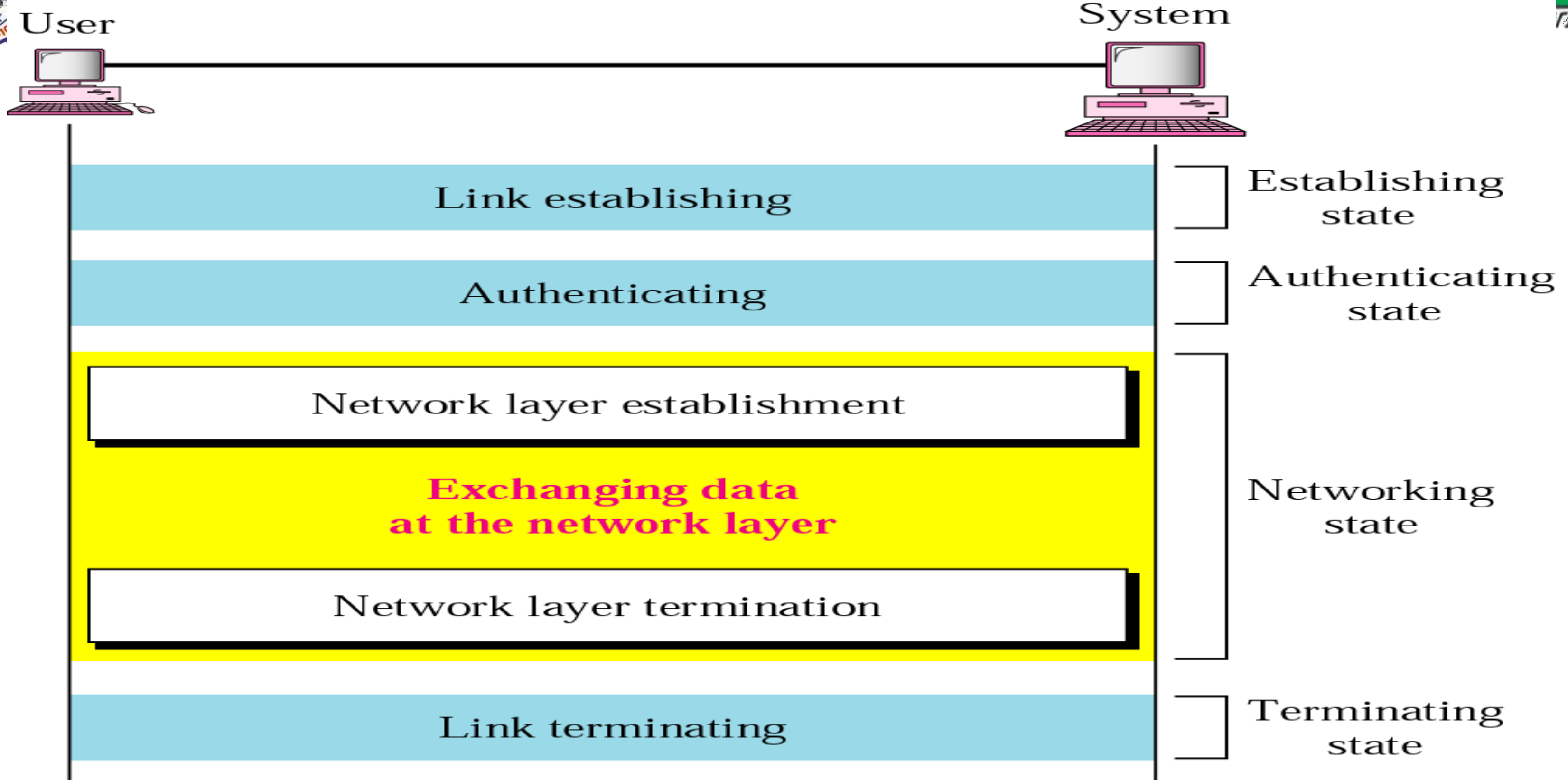


**Table 11.4** *Code value for IPCP packets*

<i>Code</i>	<i>IPCP Packet</i>
0x01	Configure-request
0x02	Configure-ack
0x03	Configure-nak
0x04	Configure-reject
0x05	Terminate-request
0x06	Terminate-ack
0x07	Code-reject



# PPP Connection Example







# Example



Let us go through the phases followed by a network layer packet as it is transmitted through a PPP connection. Figure shows the steps. For simplicity, we assume unidirectional movement of data from the user site to the system site (such as sending an e-mail through an ISP).

The first two frames show link establishment. We have chosen two options (not shown in the figure): using PAP for authentication and suppressing the address control fields. Frames 3 and 4 are for authentication. Frames 5 and 6 establish the network layer connection using IPCP.

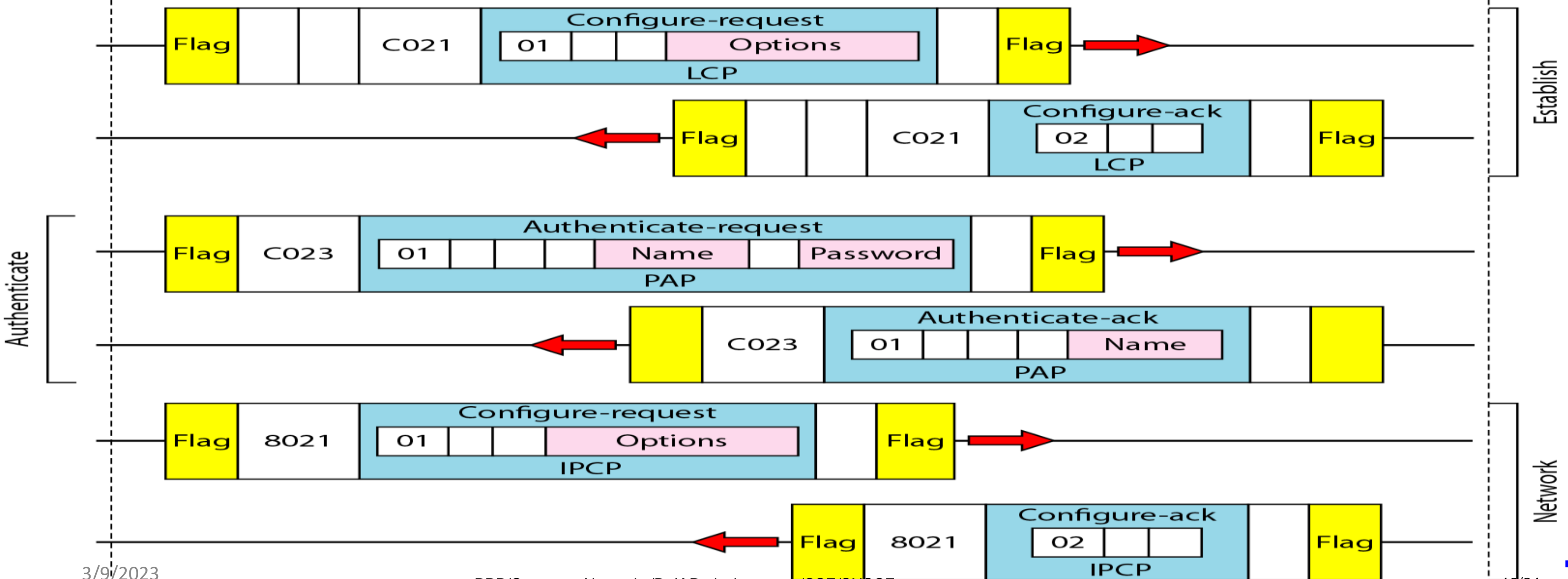


The next several frames show that some IP packets are encapsulated in the PPP frame. The system (receiver) may have been running several network layer protocols, but it knows that the incoming data must be delivered to the IP protocol because the NCP protocol used before the data transfer was IPCP.

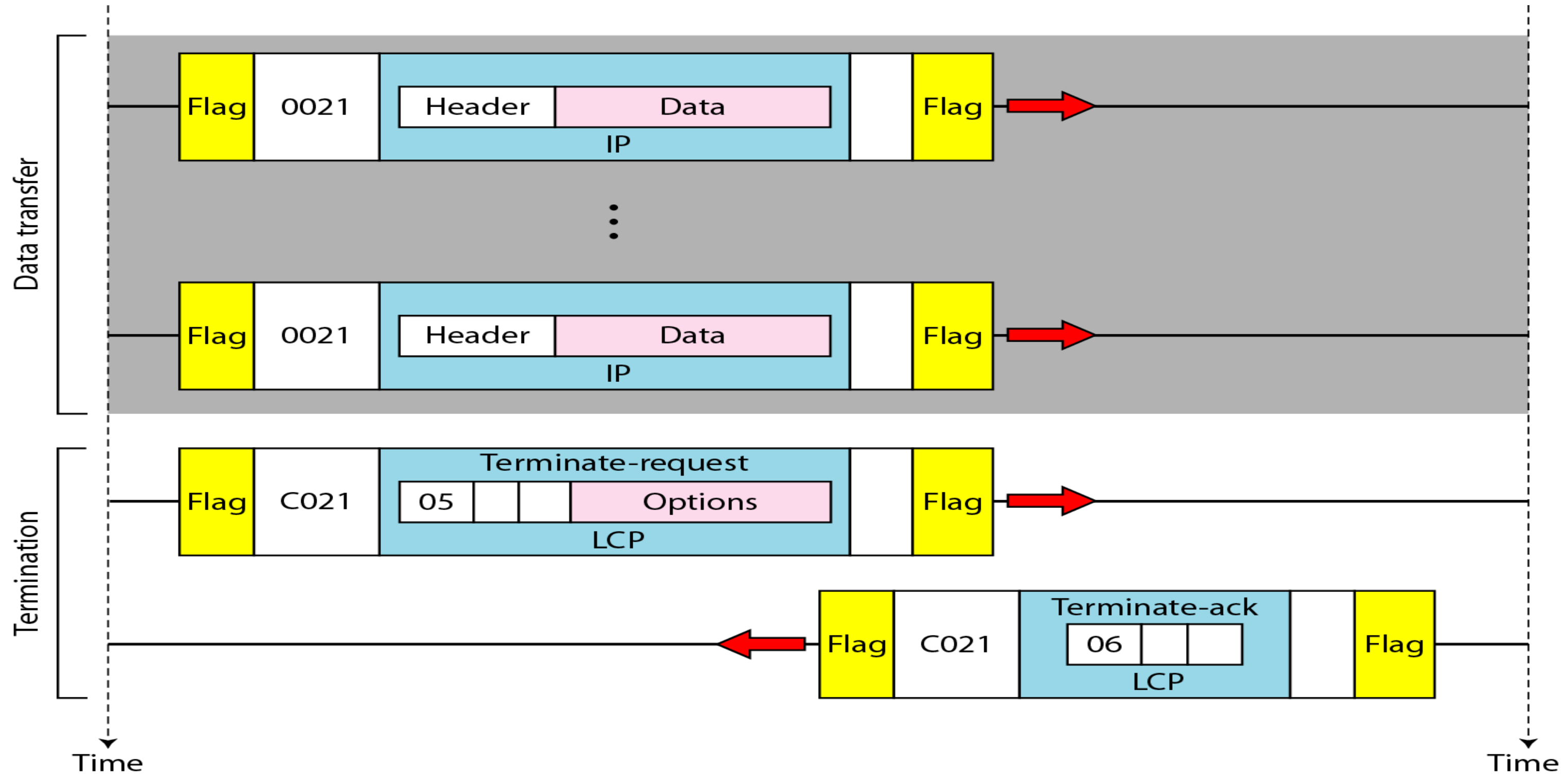
After data transfer, the user then terminates the data link connection, which is acknowledged by the system. Of course the user or the system could have chosen to terminate the network layer IPCP and keep the data link layer running if it wanted to run another NCP protocol.



# An example



# An example (continued)





# Assessment



- a) List PPP protocol stack
- b) What is PPP protocol?
- c) What is the use of PPP?
- d) What is NCP?.





# Reference



## TEXT BOOKS

Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition TMH, 2013.

## REFERENCES

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3. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Sixth Edition, Pearson Education, 2013.
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