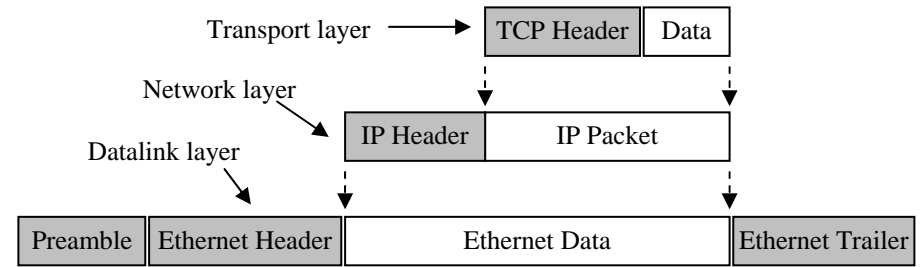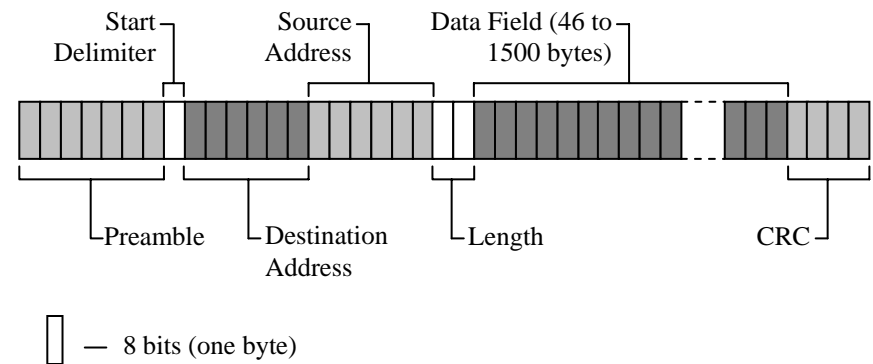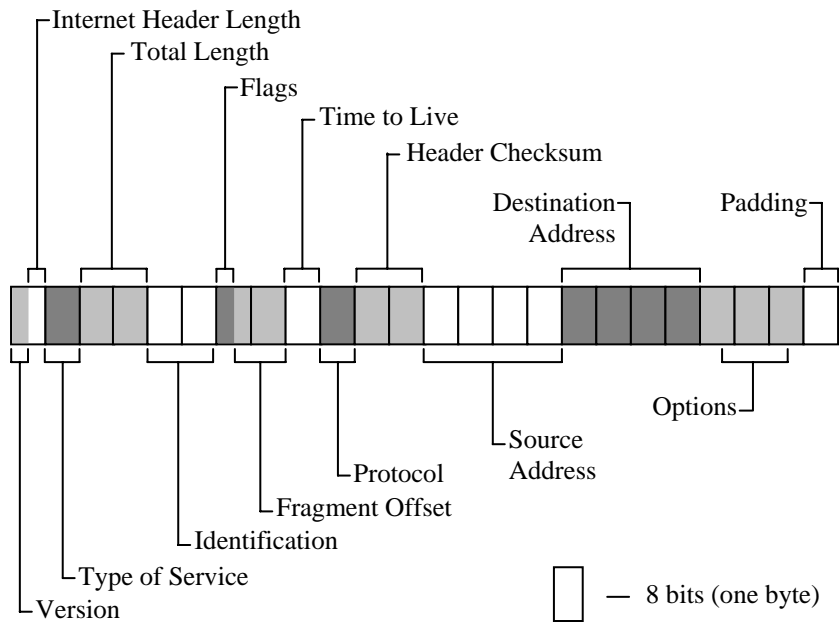- *Application Layer (layer 7)* – At this layer, one application must format the data so that a second application can properly interpret it. Examples include formatting data so that an e-mail agent or a web browser can properly display data to the user.
- *Presentation Layer (layer 6)* – This layer eliminates compatibility problems caused by serving different types of networks. It acts as a generic interface between the application and the details of the network.
- *Session Layer (layer 5)* – This layer starts, maintains, and stops the logical connection between two applications.
- *Transport Layer (layer 4)* – When a block of data is sent from one application to another, mechanisms are needed to provide error checking, the partitioning of large blocks of data into smaller packets, the reassembly of the data packets, and flow control. The transport layer is responsible for these functions.
- *Network Layer (layer 3)* – Once a packet from the transport layer is placed on the network, it needs to find its way from one physical host to another. This is the responsibility of the network layer. It provides routing, forwarding, sequencing, and logical addressing. Since the delivery of a packet may involve several types of networks, this layer must remain independent of the physical implementation of the network.
- *Datalink Layer (layer 2)* – The datalink layer handles the bit-level specifications used to deliver a message within a specific type of network. Examples of datalink protocols include the IEEE 802.3 protocol which defines how the bits are organized in an Ethernet frame and the Serial Line Internet Protocol (SLIP) which may be used on a dial-up network. While the network layer uses logical addresses to identify hosts, the datalink layer uses the physical addresses of the hardware.
- *Physical Layer (layer 1)* – This layer defines how the bits are transmitted. For example, logic ones and zeros may be identified by different voltage levels, the presence or absence of light, or the frequency of a radio signal. This hardware level description of the network is considered the physical layer.
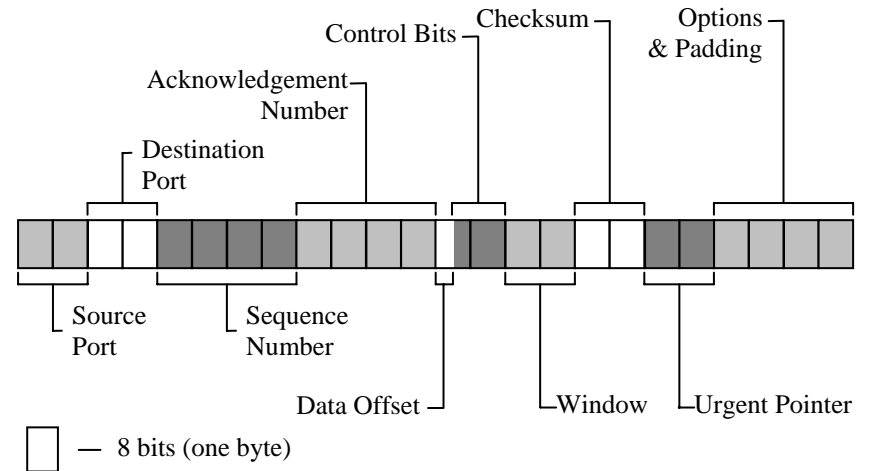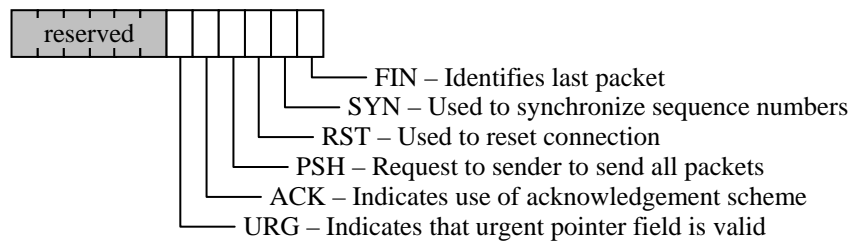

Sample Protocol Stack using TCP, IP, and Ethernet

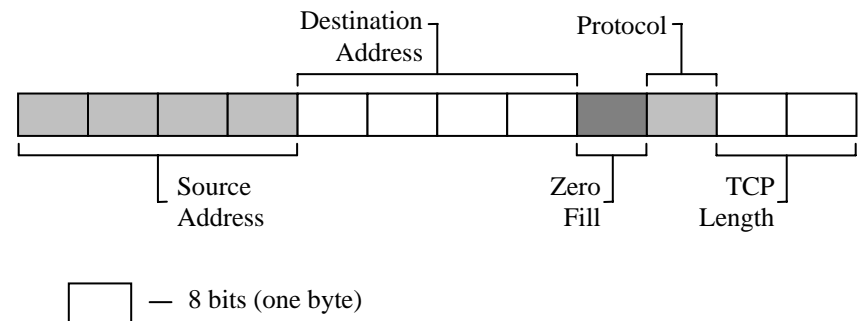Layout of an IEEE 802.3 Ethernet Frame

Internet Header Length
Total Length
Flags
Time to Live
Header Checksum
Destination Address
Padding
Source Address
Options
Protocol
Fragment Offset
Identification
Type of Service
Version

☐ — 8 bits (one byte)

Layout of an IP Packet Header

Control Bits
Checksum
Options & Padding
Acknowledgement Number
Destination Port
Source Port
Sequence Number
Data Offset
Window
Urgent Pointer

☐ — 8 bits (one byte)

Layout of a TCP Packet Header

reserved

FIN – Identifies last packet
SYN – Used to synchronize sequence numbers
RST – Used to reset connection
PSH – Request to sender to send all packets
ACK – Indicates use of acknowledgement scheme
URG – Indicates that urgent pointer field is valid

Position and Purpose of TCP Control Flags

Destination Address
Protocol
Source Address
Zero Fill
TCP Length

☐ — 8 bits (one byte)

Layout of a TCP Pseudo Header