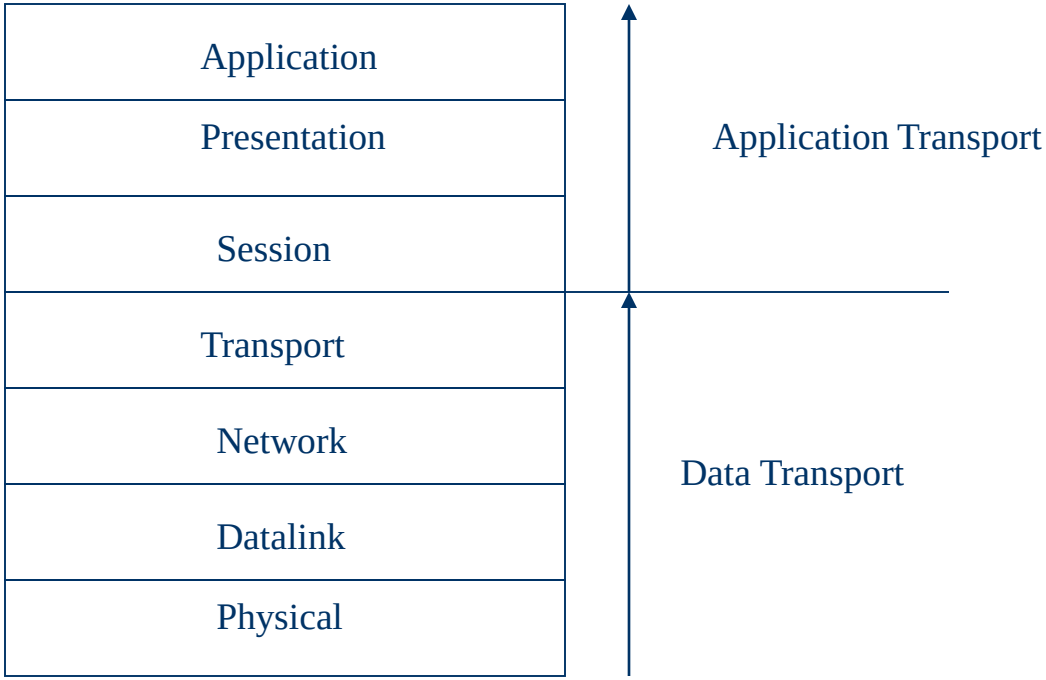
Protocols and Layering

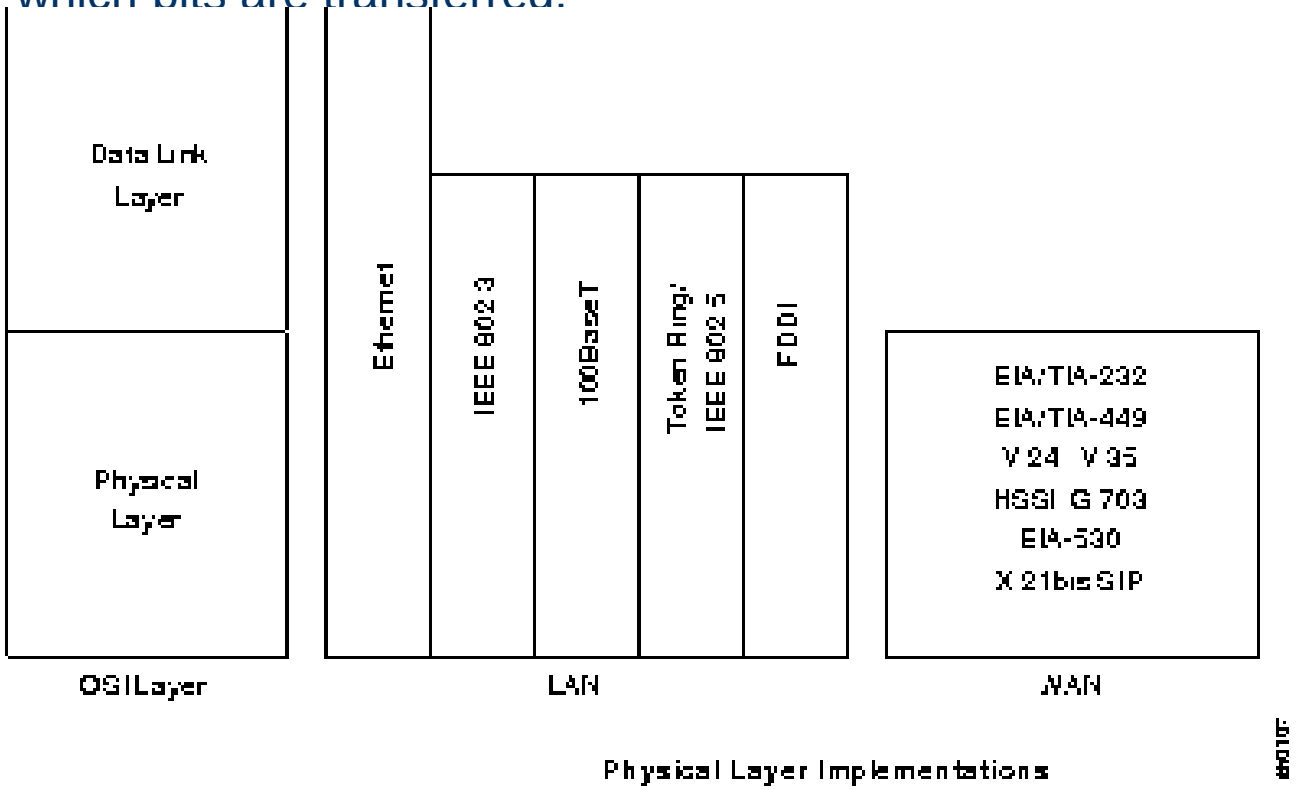
- OSI Network Layer Model
- Define the ‘internet’ and the ‘Internet’

OSI Network Layer Model



Physical Layer

- Physical Layer: covers the physical interface and defines the rules by which bits are transferred.

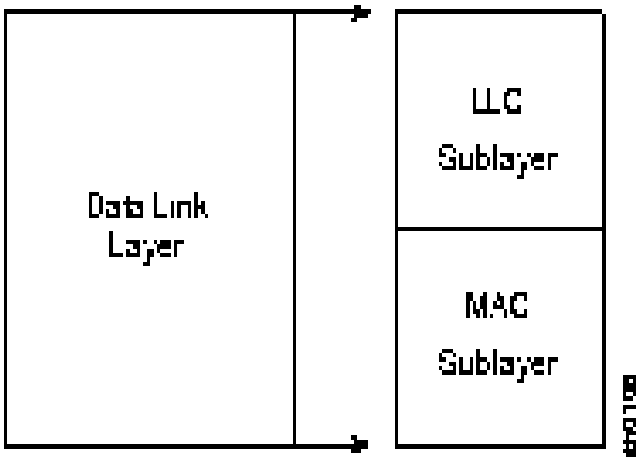


Datalink Layer

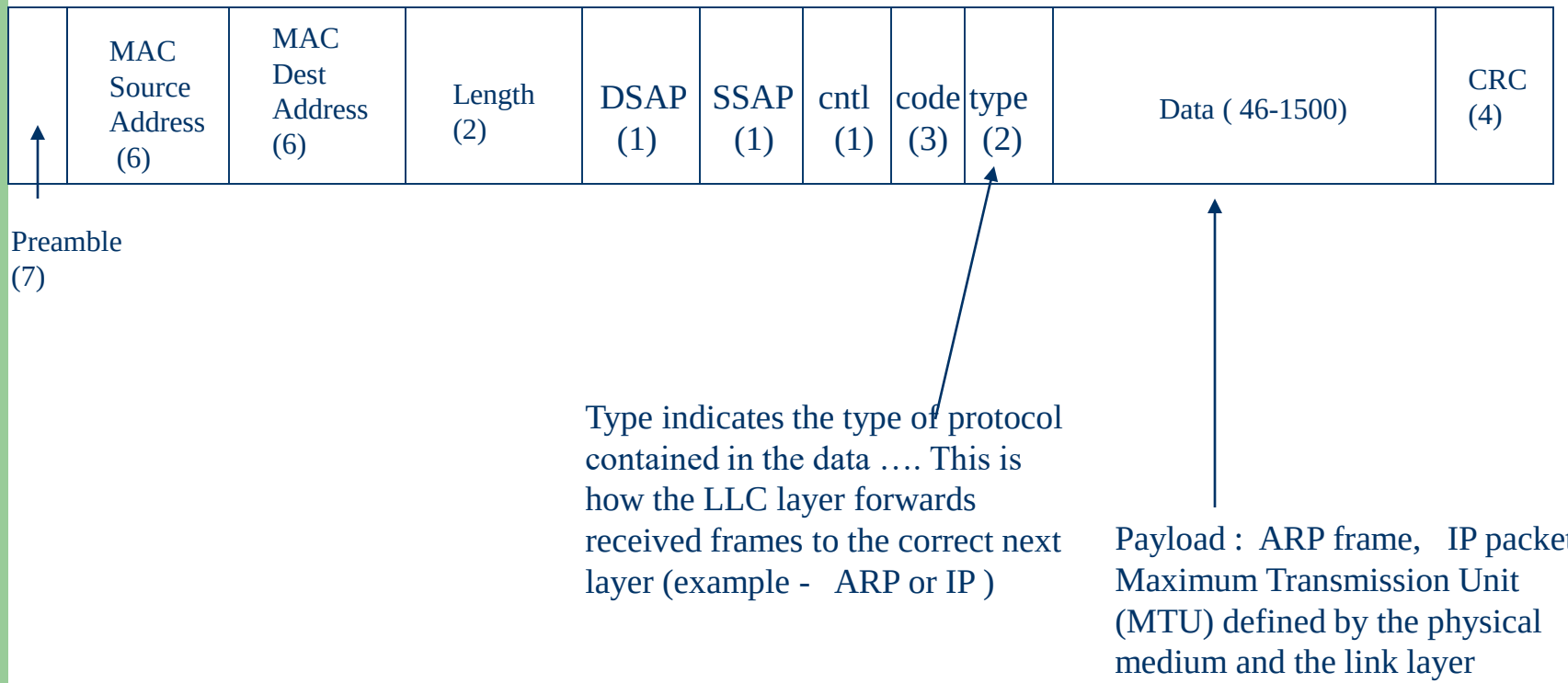
•The data link layer provides reliable (or unreliable) transit of data across a physical network link.
•Different data link layer specifications define different network and protocol characteristics, including ??

•WAN examples ??
- High level Data Link Control HDLC
- The point-to-point protocol PPP

•For a LAN, IEEE has defined layered architecture:
- Logical Link Layer (LLC) : higher level protocol logic- retransmissions, segmentation
- Machine Access Control (MAC): abstracts the PHY layer.



802.2/802.3 Frame Format



Network Layer

•The network layer provides routing and related functions that enable multiple data links to be combined into an **internetwork.**

•This is accomplished by the logical addressing (as opposed to the physical addressing) of devices.

• The network layer supports both connection-oriented and connectionless service from higher-layer protocols.

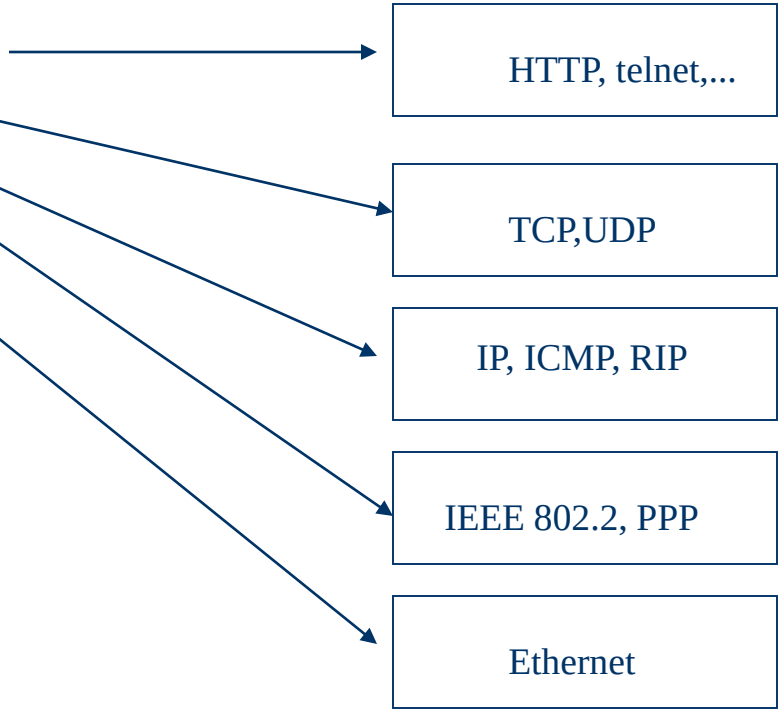
•Network-layer protocols typically are routing protocols

Transport Layer

- The transport layer implements reliable (or unreliable) internetwork data transport services that are transparent to upper layers.
- Transport-layer functions could include
  - Error detection – with checksums or CRCs.
  - Error recovery (reliable transfer) (TCP only)
    - Acknowledgements
    - Timeouts
    - Retransmissions
  - Stream or datagram service – maps to TCP and UDP resp.
  - Oriented towards window+ACK OR rate-based
  - Flow control (TCP only)
    - Window flow control
  - End-to-end network congestion control (TCP only)
    - Reacts to implicit signals of network congestion (packet loss events) or explicit signals of network congestion (Explicit Congestion Notification)

Protocols

- A Protocol defines the rules and conventions that govern how computers exchange information over a network medium.
- Examples:
  - Application protocols
  - Transport protocols
  - Network protocols
  - LAN/WAN protocols
  - Physical protocols



Introduction

- Internetworking: a collection of individual networks connected by intermediate networking devices that function as a single large network.
- An internet approach hides lower layer details from the user via network-level interconnection methods.

The ***Internet*** is an implementation of a network based on the internet approach.

The term TCP/IP refers to the large number of protocols and standards that have been developed by the IETF (the Internet's standards organization) The IETF issues Request For Comments - that represent the protocols and standards that have been reviewed, refined, and agreed upon by the majority in attendance at voting meetings.