Network structure and architecture, OSI reference model

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Concept of Layers

Two Person who communicate through postal mail using services available from the post office.

Sender

Receiver

	Higher layers	
The letter is written, put in an envelope, and dropped in a mailbox.		The letter is picked up, removed from the envelope, and read.
The letter is carried from the mailbox to a post office.	Middle layers	The letter is carried from the post office to the mailbox.
The letter is delivered to a carrier by the post office.	Lower layers	The letter is delivered from the carrier to the post office.

The parcel is carried from the source to the destination.

Why Layering Architectures?

- Layering simplifies design, implementation and testing by partitioning

- Protocols in each layer can be assigned separately from those in other layers

- Protocol makes "call" for services from layer below

- Layering provides flexibility for modifying and evolving protocols and services

- Non-layered architectures are costly, inflexible and obsolete.

Reference Network Models

- OSI
- TCP/IP

- Established in 1947, the International Standards Organization (ISO) is a multinational body dedicated to worldwide agreement on international standards.

- An ISO standard that covers all aspects of network communications is the Open Systems Interconnection (OSI) model which was first introduced in the late 1970s.
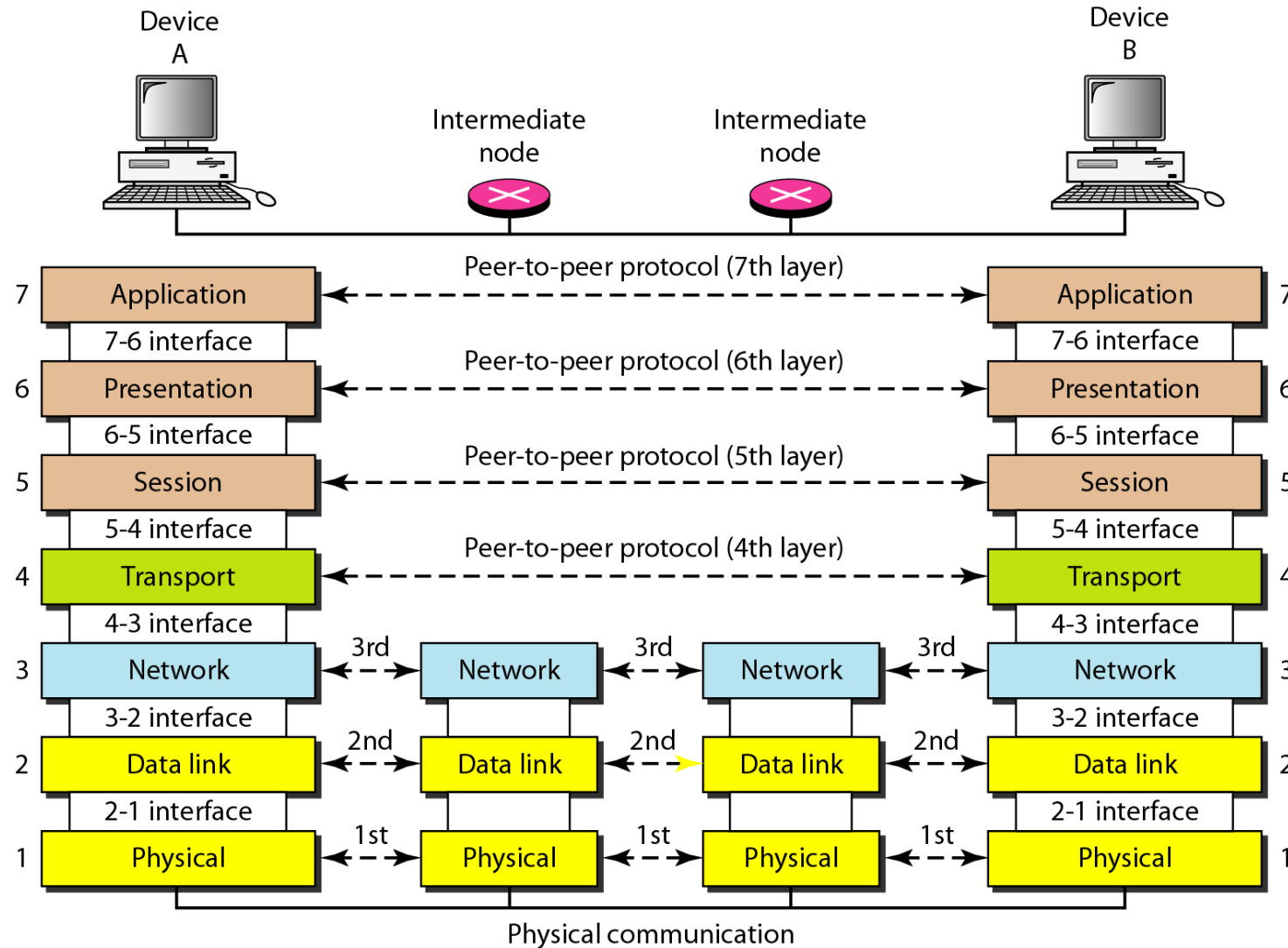
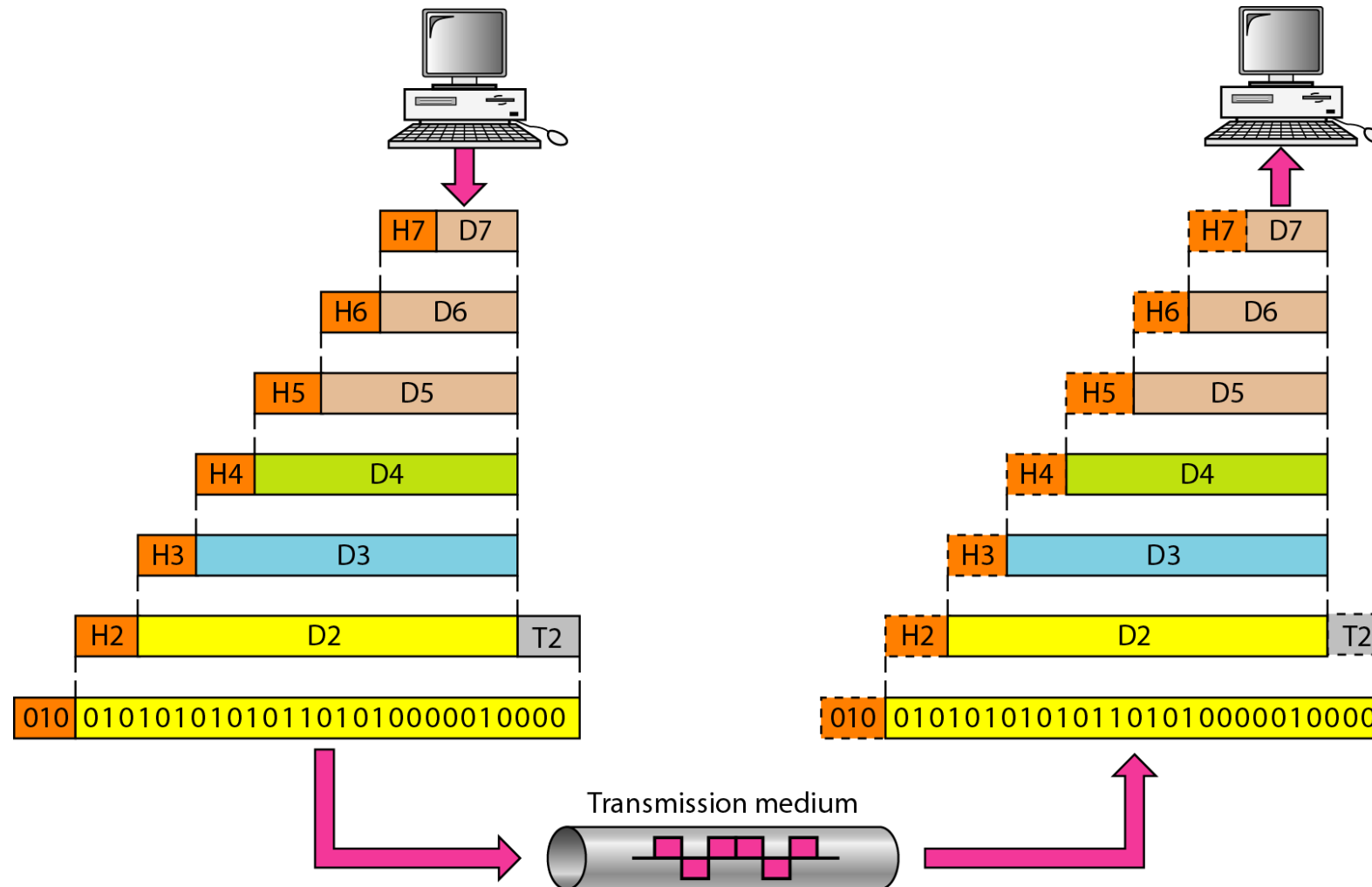- Divides network architecture into seven layers.

Layers of OSI Model

7	Application
6	Presentation
5	Session
4	Transport
3	Network
2	Data link
1	Physical
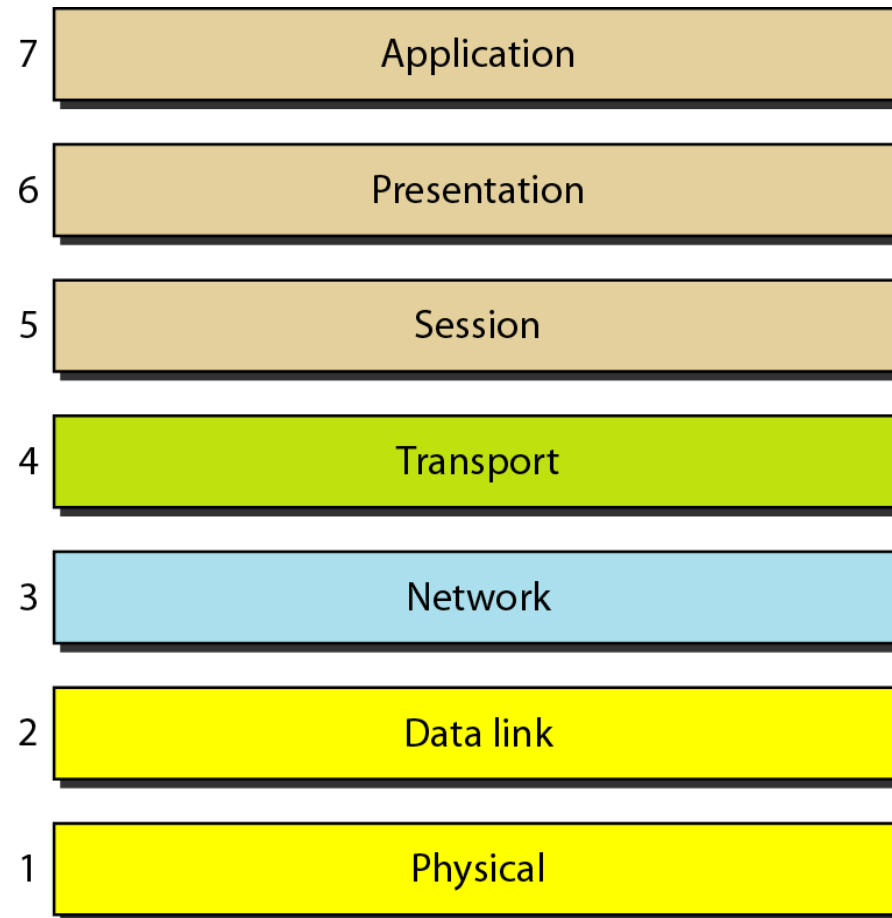
Interaction between Layers

Exchange of Information in OSI Model

Transmission medium

Functionality/Responsibility of Layers in OSI Model

Physical Layer

The physical layer is responsible for

- Movements of individual bits from one hop (node) to the next.
- Interface between communication device and medium
- Conversion of bits to signal and signal to bits

- Data rate of system
- Modulation, Demodulation and multiplexing

UTP Cable

RJ-45

From data link layer

To data link layer

Physical layer

110 | 10101000000010111

110 | 10101000000010111

Physical layer

Transmission medium
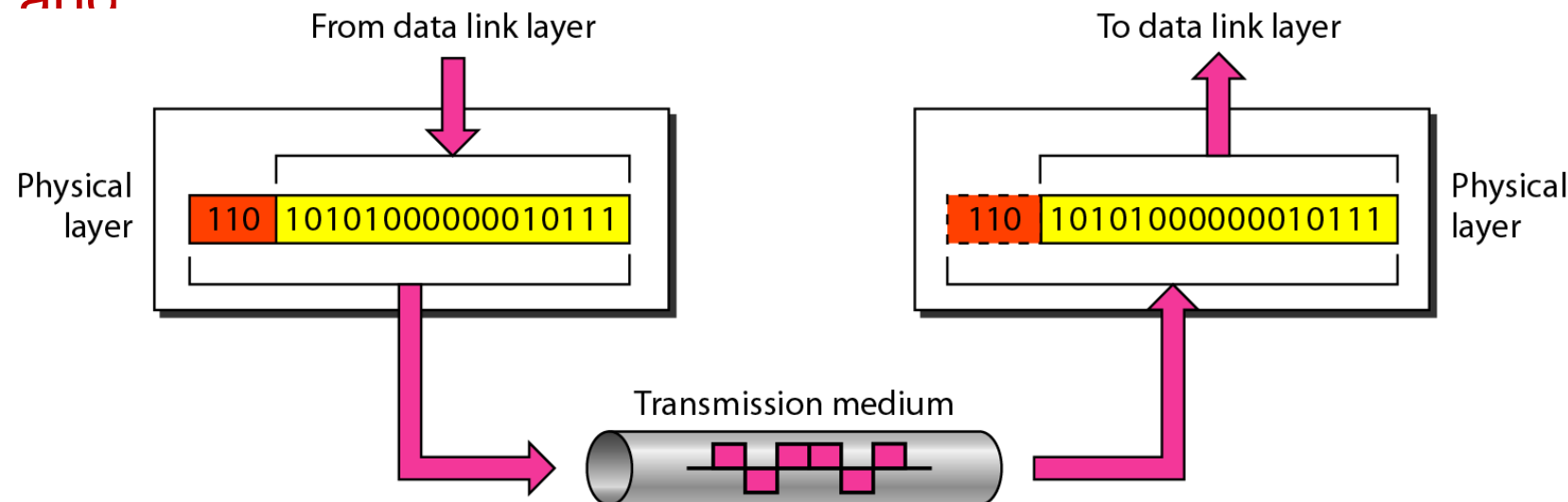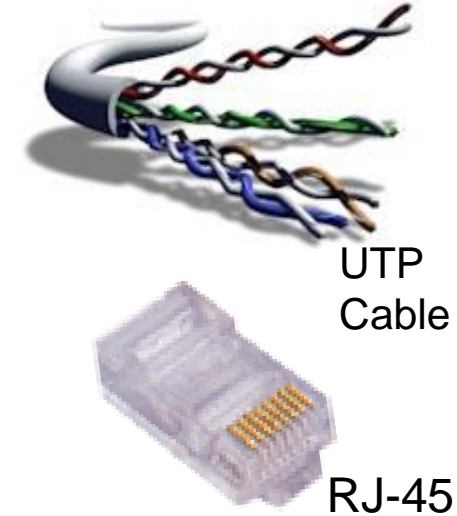
Data link Layer

The data link layer is responsible for

- Moving frames from one hop (node) to the next.

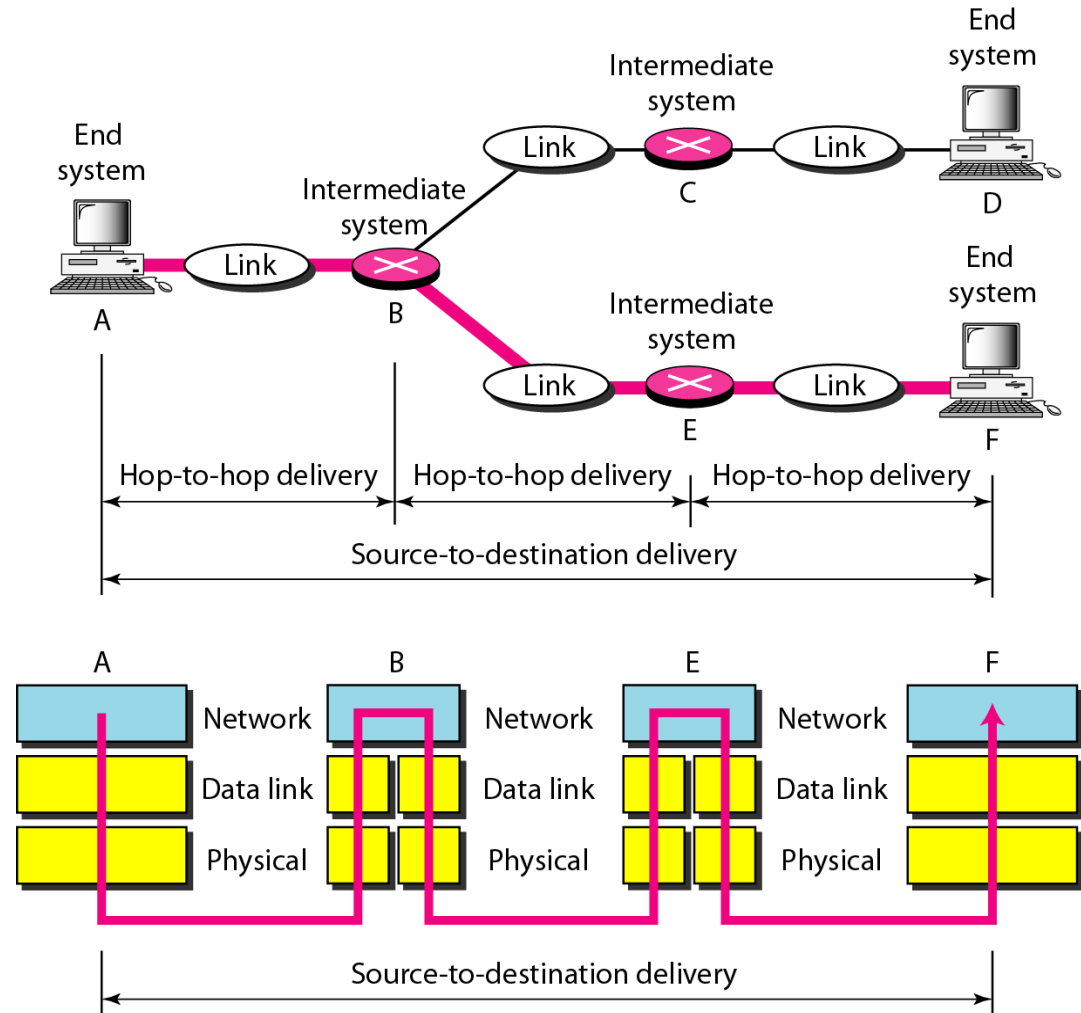- Framing

- Physical Address

- Flow Control

- Error Control
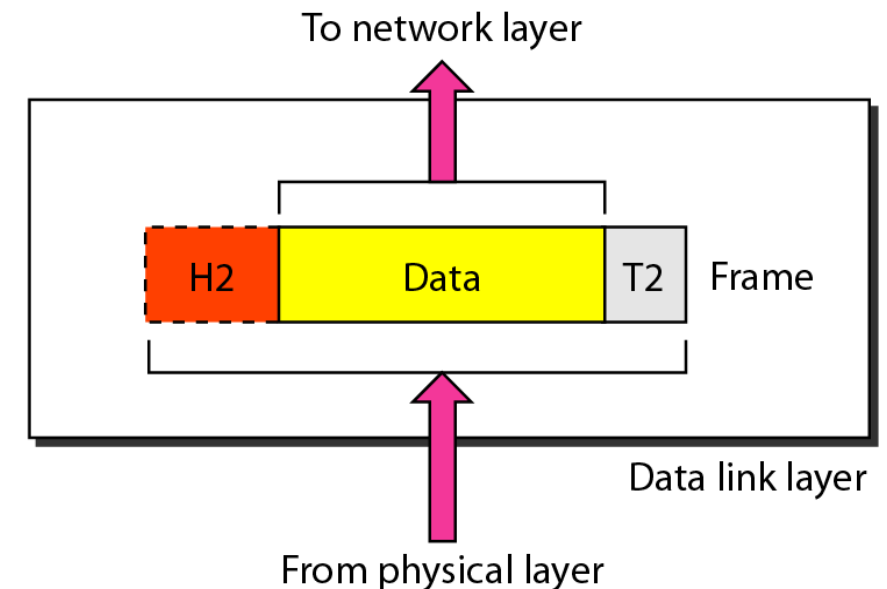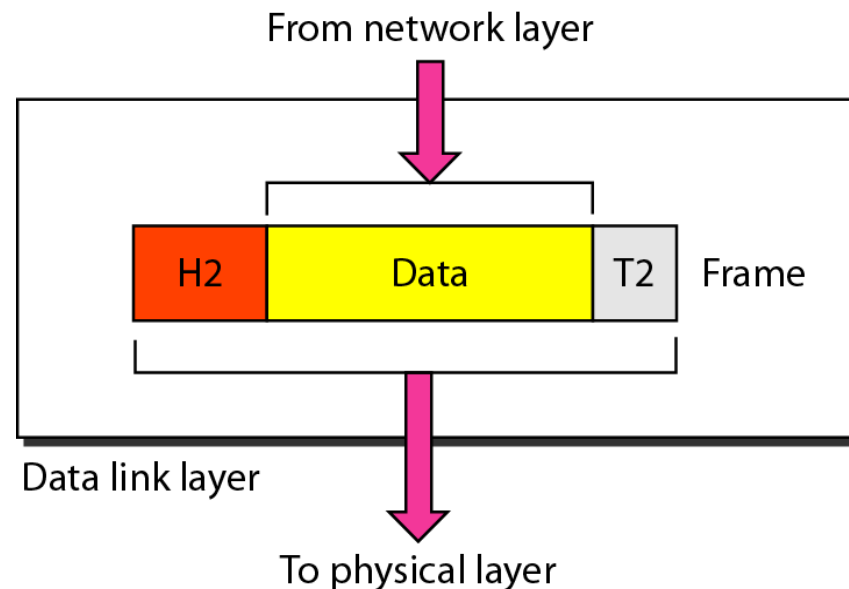
Network Layer

The Network layer is responsible for the

- Delivery of individual packets from the source host to the destination host.

- Logical Address (IP Address)

- Routing

Transport Layer

The transport layer is responsible for the

- Delivery of a message from one process to another.
- Connection Establishment
- Process to process delivery of data
- Segmentation

- Flow Control
- Error Control
- Congestion Control

Reliable process-to-process delivery of a message

Processes

Processes

An internet

Network layer
Host-to-host delivery

Transport layer
Process-to-process delivery