

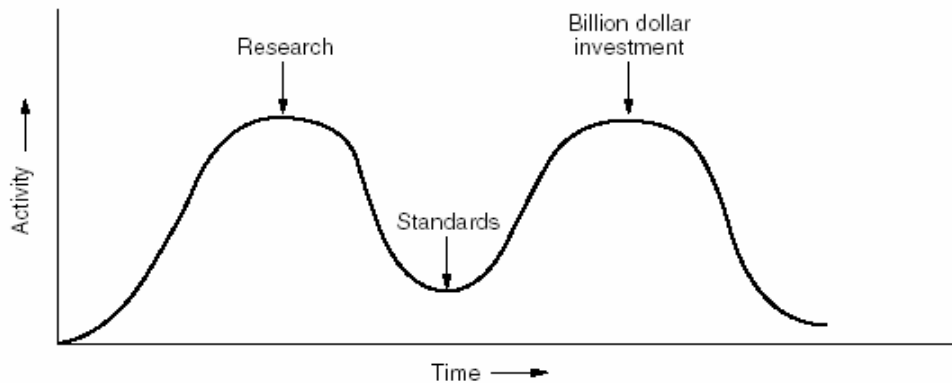
## **LECTURE # 8**

### **Critique of OSI Model**

#### **Reasoning for OSI not getting Widespread**

- Bad Timing(slide) (**Apocalypse of Two Elephants**)
  - David Clarke of MIT
  - If standards are written too early: subject is badly understood and bad standards
  - If standards are written too late so many companies may have already made investments in doing the same thing with different other ways
- Bad Technology
  - Flow control, error control, addressing is multiple
  - Session and Presentation(EMPTY), Network and DL(Full)
- Bad Implementations

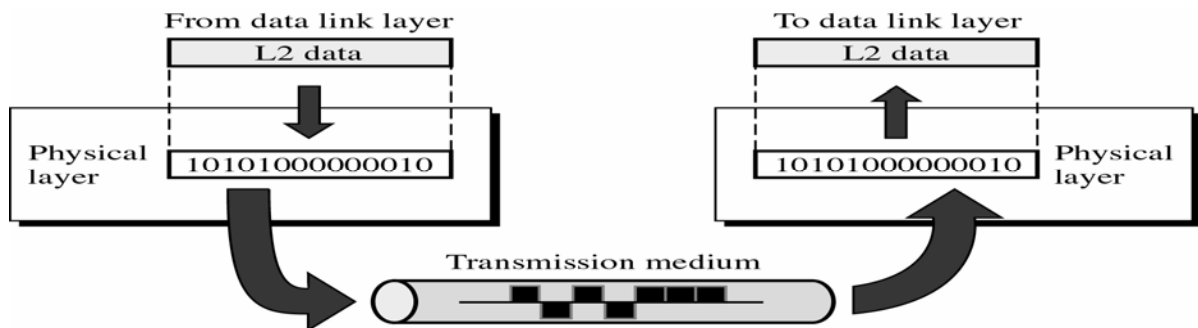
#### **Apocalypse of Two Elephants**



#### ❖ **Physical (Layer 1)**

- Coordinates the functions required to transmit a bit stream over a physical medium
- Deals with mechanical and electrical specifications of Tx. Medium and Interface
- Also defines procedures and functions that physical devices and interfaces need to perform for TX. To occur (Figure)

**Figure**



- **Functions of Physical Layer**

- Physical Characteristics of Interface & Media

- Defines characteristics of Interface b/w device and Tx Medium
- Interface is a plug gable connector that joins one or more signal conductors
- Also defines the type of transmission medium

- Representation of Bits/Encoding

- The physical layer data consists of a stream of bits (sequence of 1's and 0's)
- To be transmitted the bits must be ENCODED into signals: Electrical or Optical
- Physical layer decides the type of **ENCODING**

- Data Rate / Transmission Rate

- Date Rate ( Bits per second) also decided by the Physical Layer
- So , Physical layer defines the Duration of a Bit
- Means how long will a bit last

- Synchronization of Bits

- Sender and Receiver must be synchronized at the bit level
- Sender and Receiver clocks must be synchronized
- It is done by Physical layer

- Line Configuration

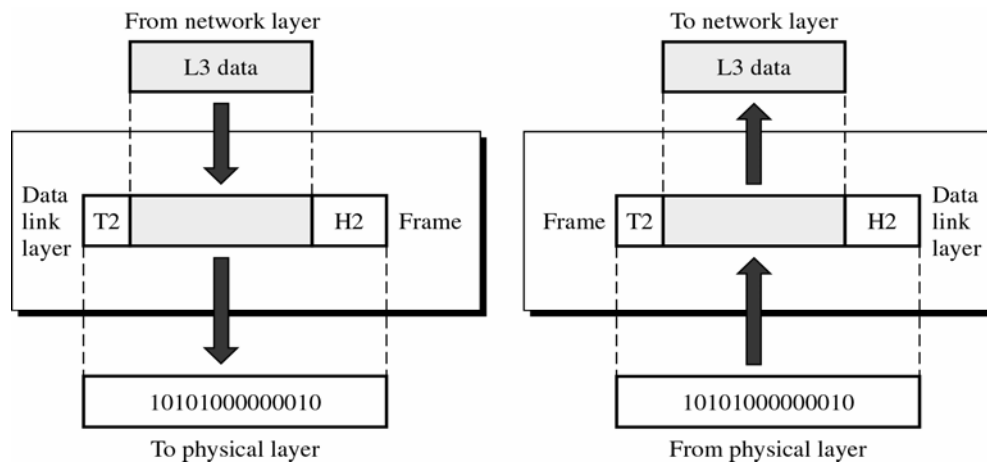
- Physical Layer is also concerned with Line Configuration
- Line Configuration represents the connection of device with the Medium
- Point-To-Point or Multipoint

- Physical Topology
  - Mesh, Star, Ring, Bus etc.
- Transmission Mode
  - Physical Layer also defines the direction of Transmission between the devices
  - Simplex, Half Duplex, Full Duplex

### ❖ Data Link Layer (Layer 2)

- Transforms physical layer which is raw transmission facility to a reliable link
- Responsible for Node to Node Delivery
- Makes physical layer look error free to the upper layer

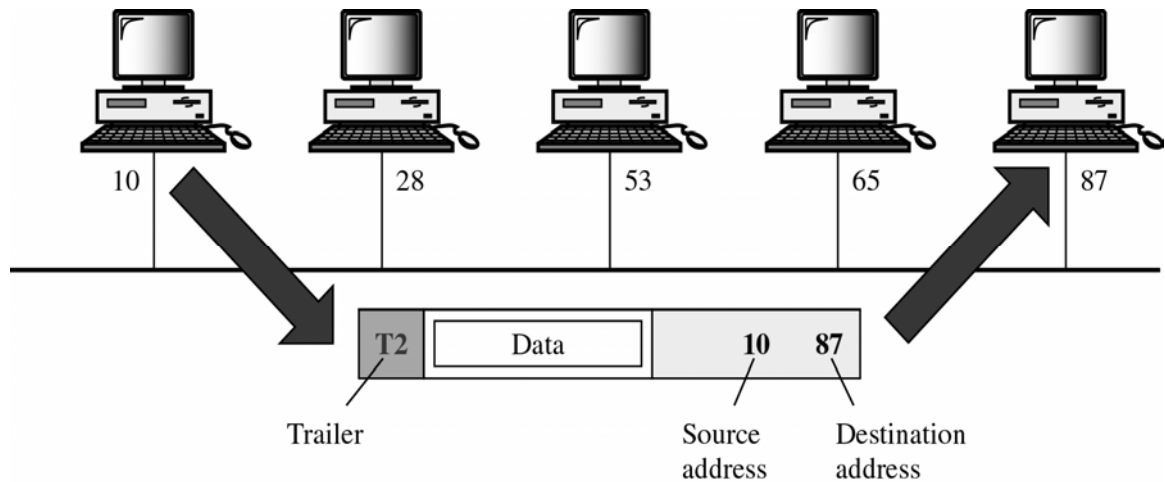
**Figure**



### • Functions of Data Link Layer

- Framing
  - The data link divides the stream of bits from Network layer into manageable data units called “FRAMES”. This process is known as Framing.
- Physical Addressing

- Frames need to be transmitted to different systems on a network
- Data Link layer adds a HEADER to Frame
- Header defines the physical address of sender(Source address) and/or receiver address (Destination address)
- If frame is intended for a device outside the network, the receiver address is the address of the device that connects one network to the other
- **Flow Control**
  - Data Link layer imposes Flow Control mechanisms to prevent overwhelming the receiver
- **Error Control**
  - Data link layer adds reliability to physical layer by adding mechanisms to detect and retransmit lost or damaged frames
  - Also uses a mechanism to prevent duplication of frames
  - Error Control bits are added to the form in the TRAILER
- **Access Control**
  - Two or more devices may be connected to a single link
  - Data link protocols are necessary to determine which device will have the control of the link at a given time
- ✓ **EXAMPLE**
  - Node with physical address 10 sends a frame to a node with physical address 87
  - Two nodes are connected by a link.
  - At the DL level, this frame contains physical address in the Header, This is the only address needed at this level
  - Rest of header contains other info as needed
  - Trailer contains extra bits needed for error detection

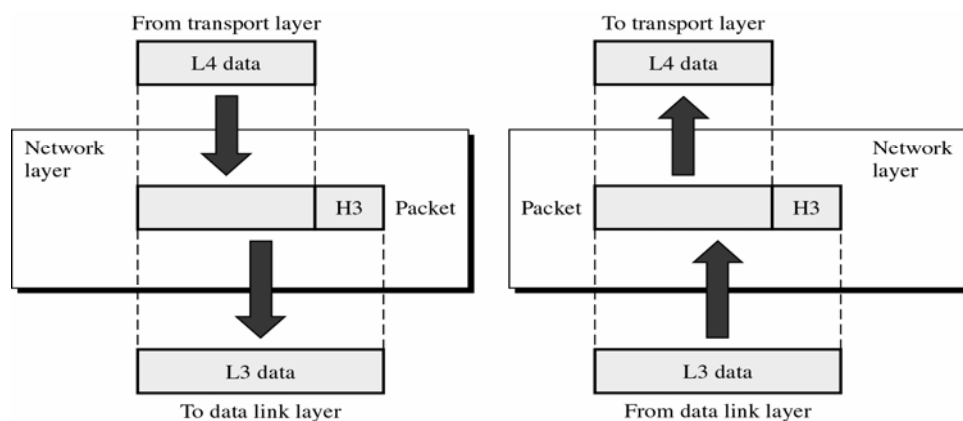


## ❖ NETWORK LAYER

- Responsible for Source-to-Destination delivery
- DL Layer oversees the delivery of data between 2 systems on the same network
- Network Layer ensures that each packet gets from its point of origin to its final destination

### ➤ Node –to Node vs Source to Destination

- ✓ If the two systems are connected to the same network, there is no need for Network layer and node –to node delivery is enough
- ✓ If two systems are connected to two different networks, there is often a need for Source-to destination delivery



## • Function of Network Layer

- **Logical Addressing**

- Physical addressing implemented by Data link layer handles addressing problem locally
- If a packet is going from one network to another, we need another addressing system to help distinguish source & destination systems
- Network layer adds Header to the data coming from upper layers that among other things include LOGICAL ADDRESS of the sender and receiver

- **Routing**

- When independent networks or links are connected together to create an “internetwork”, the internetworking devices route packets to their final destination
- Routers are those internetworking devices
- One of the functions of Network layer is to define this route

- ✓ **Example Network Layer**

- We want to send data from a node with network address ‘A’ and physical address 10, located on one LAN to
- A node with network address P and physical address 95 located on another LAN
- Because the two nodes are present on two different networks, we cannot use physical address only
- We need a Network address that can pass us from the Network boundaries
- The packet therefore contains the logical address which remains the same from source to destination
- The physical address will change when packet moves from one network to the other
- The box with R is a Router

## **Summary**

- ♦ The OSI Model
- ♦ Function of Layers

## **Reading Sections**

- ♦ Section 3.1,3.2, “Data Communications and Networking” 2nd Edition by Behrouz A. Forouzan

