COMPUTER COMMUNICATION NETWORKS

Department of Electronics and Communication Engineering

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UNIT 1: INTERNET ARCHITECTURE AND APPLICATIONS –

Class 11 – Protocol layers & their service models

Department of Electronics and Communication Engineering

Protocol layers and their service

- Data exchange between two hosts over a communication network is a complex task
- The complex task is divided into smaller sub-tasks
  - Maintain simplicity for network devices
  - Put burden on the hosts
- The sub-tasks are completed sequentially
- The entire process can be visualized as layers arranged top to bottom, where
  - Each layer performs its own unique sub-task
  - On the sender side, each layer waits till the above layer finished its sub-task
  - On the receiver side, each layer waits till the below layer finished its sub-task

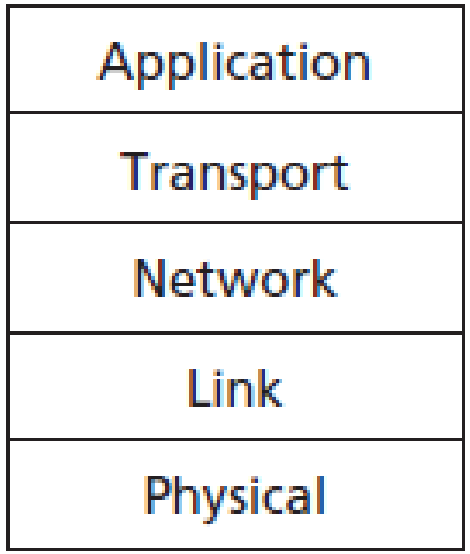
Protocol layers and their service

- Communication between two hosts requires the same layers to be implemented in both hosts
- The peer layers (i.e., sub-task in sender and its counterpart in the receiver) communicate with one other using formatted blocks of data that obey a set of rules or conventions known as a **protocol**
  - Layers implement protocols in hardware or software
- Basics requirements of a Protocol:
  - Syntax: Concerns the format of the data blocks
  - Semantics: Includes control information for coordination and error handling
  - Timing: Includes speed matching and sequencing

Protocol layers and their service

- Arranged vertically, the layers on the systems collectively constitute the **protocol architecture**
- Two types of protocol architecture were proposed
  - TCP/IP model (Transmission Control Protocol/Internet Protocol)
  - OSI model (Open Systems Interconnect)
- TCP/IP model or TCP/IP protocol suite
  - Resulted from protocol research under ARPANET (Advanced Research Projects Agency Network)
  - Consists of large collection of protocols issued as Internet standards issued by IAB (Interactive Advertising Bureau)
  - It consists of 5 layers namely, Application layer, Transport (host-to-host) layer, Network layer (IP layer), Link layer (network access layer), Physical layer

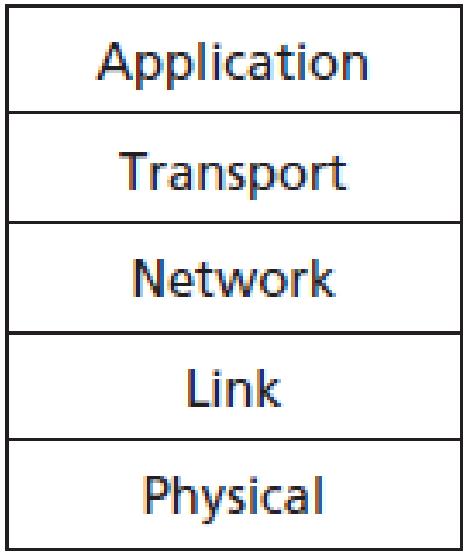
Protocol layers and their service



Five-layer Internet protocol stack

- Application layer :
  - Applications running on hosts generate/receive data
  - Data is referred to as *message*
  - A process initiates communication with another by sending a query/request
  - Message is formatted according to the application layer protocol
  - Messages can be big in size
  - Applications can have QoS(Quality of Service) requirements

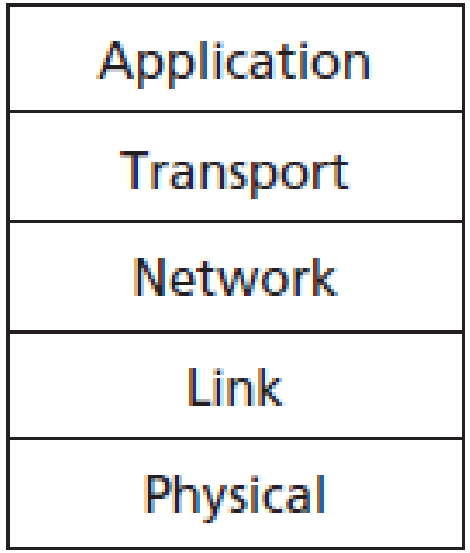
Protocol layers and their service



Five-layer Internet protocol stack

- Transport layer:
  - Responsible for providing QoS for messages
  - Performs *multiplexing* at the sender
  - Performs *demultiplexing* at the receiver
  - Maps each message to a corresponding process
  - Appends a new header to each message
  - Message plus header is called *segment*

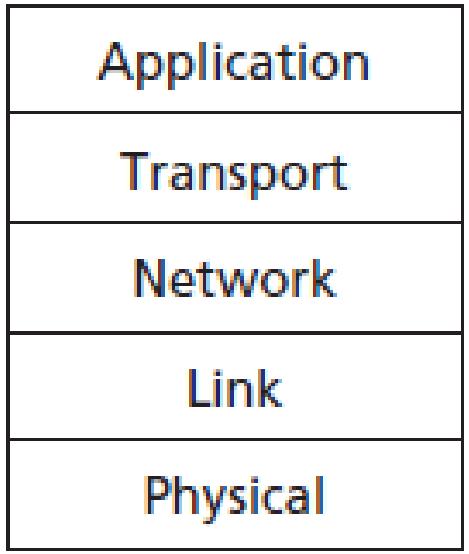
Protocol layers and their service



Five-layer Internet protocol stack

- Network layer:
  - Fragments segments into *packets*
  - Moves packets hop-by-hop
    - E.g., router to router
  - Uses source and destination IP(Internet Protocol) addresses
  - Path between source host and destination host is discovered
  - Appends a new header to each packet
  - Packet plus header is called *datagram*

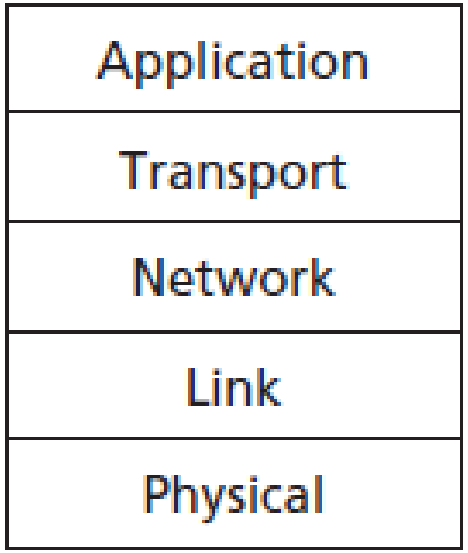
Protocol layers and their service



Five-layer Internet protocol stack

- Link layer:
  - Pushes the packets onto a link
    - Using link layer protocols
  - Can forward frames using MAC(Media Access Control) address
  - Appends a new header to the packet
  - Packet plus header is called *frame*
  - Provides synchronization at receiver
  - Checks for errors in frame

Protocol layers and their service

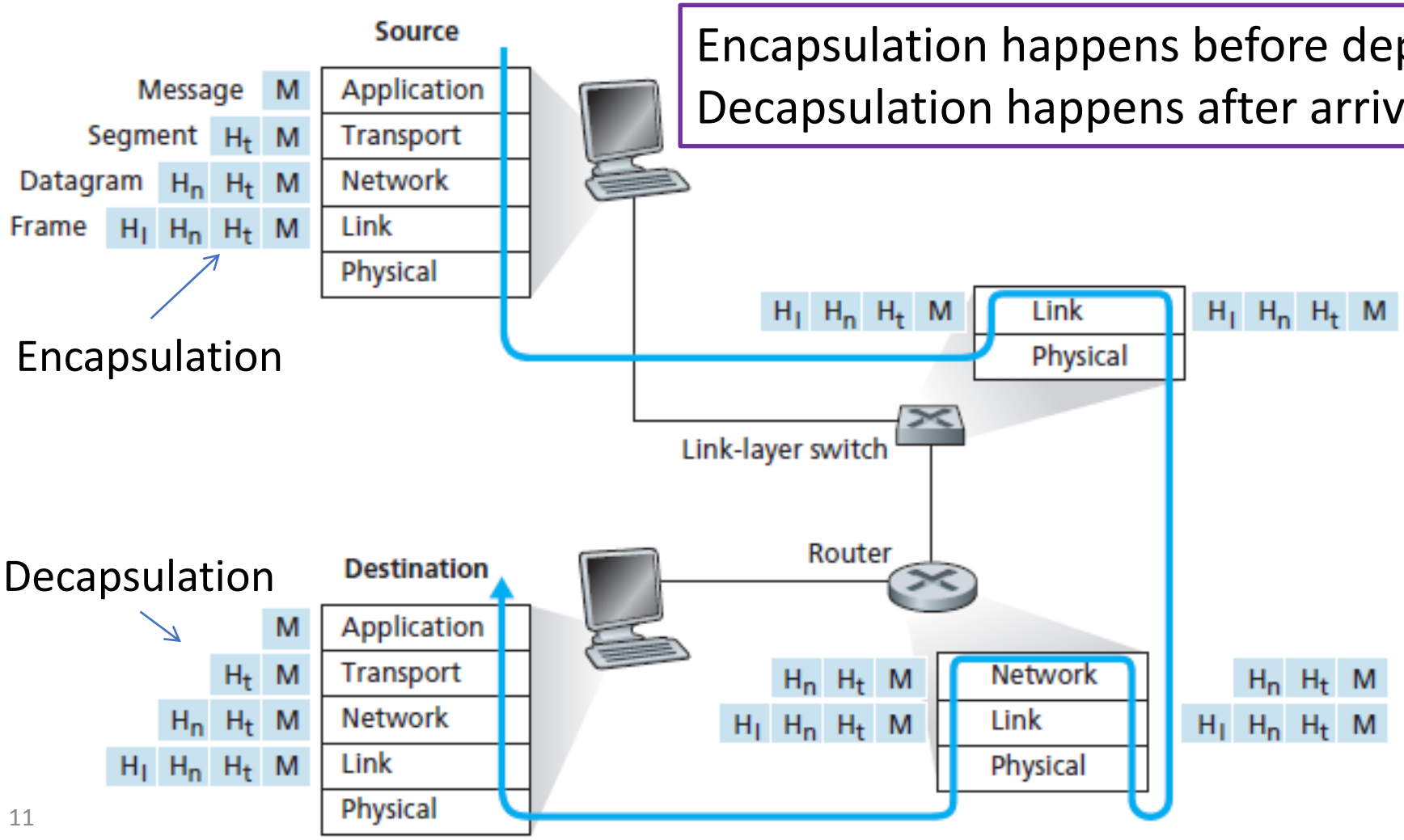


Five-layer Internet protocol stack

- Physical layer:
  - Provides physical interface between the host and the link
    - Example: Modem and Ethernet card, wireless adapter
  - Converts binary data into signals
  - Performs modulation and demodulation
  - Performs transmission, reception and filtering of signals

Protocol layers and their service

Encapsulation happens before departure
Decapsulation happens after arrival



THANK YOU

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