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Wisdom & Virtue

MIRPUR UNIVERSITY OF SCIENCE AND TECHNOLOGY (MUST), MIRPUR

DEPARTMENT OF SOFTWARE ENGINEERING

Computer Networks

Lecture [11]: Multiplexing & Demultiplexing, OSI Model

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(Lecturer)

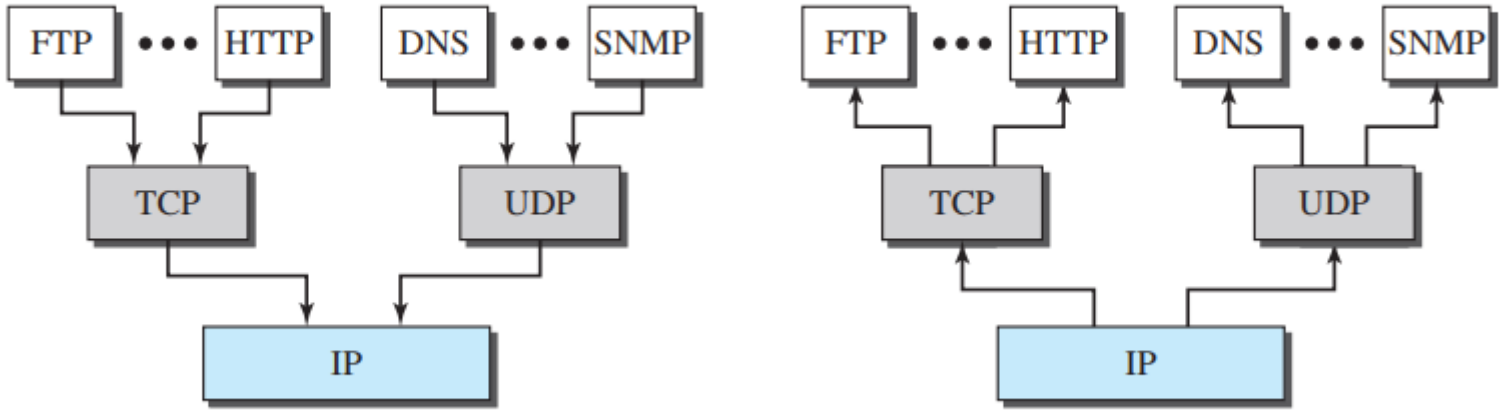
Topics discussed in Today's Lectures

- Multiplexing
- Demultiplexing
- OSI Model

Multiplexing and Demultiplexing

- Multiplexing occur at the source & demultiplexing occur at the destination
- **Multiplexing** means that a protocol at a layer can encapsulate a packet, received from several next-higher layer protocols (one at a time)
- **Demultiplexing** means that a protocol can decapsulate and deliver a packet to several next-higher layer protocols (one at a time)

Figure 2.10 *Multiplexing and demultiplexing*



a. Multiplexing at source

b. Demultiplexing at destination

Multiplexing and Demultiplexing

- For multiplexing & demultiplexing, a protocol needs to have a field in its header, to identify to which protocol the encapsulated packets belong
  - At the **transport layer**, either UDP or TCP can accept a message from several application-layer protocols
  - At the **network layer**, IP can accept a segment from TCP or a user datagram from UDP
    - IP can also accept a packet from other protocols such as ICMP, IGMP, etc
  - At the **data-link layer**, a frame may carry the packet coming from IP or other protocols such as ARP (Address Resolution Protocol)

THE OSI MODEL

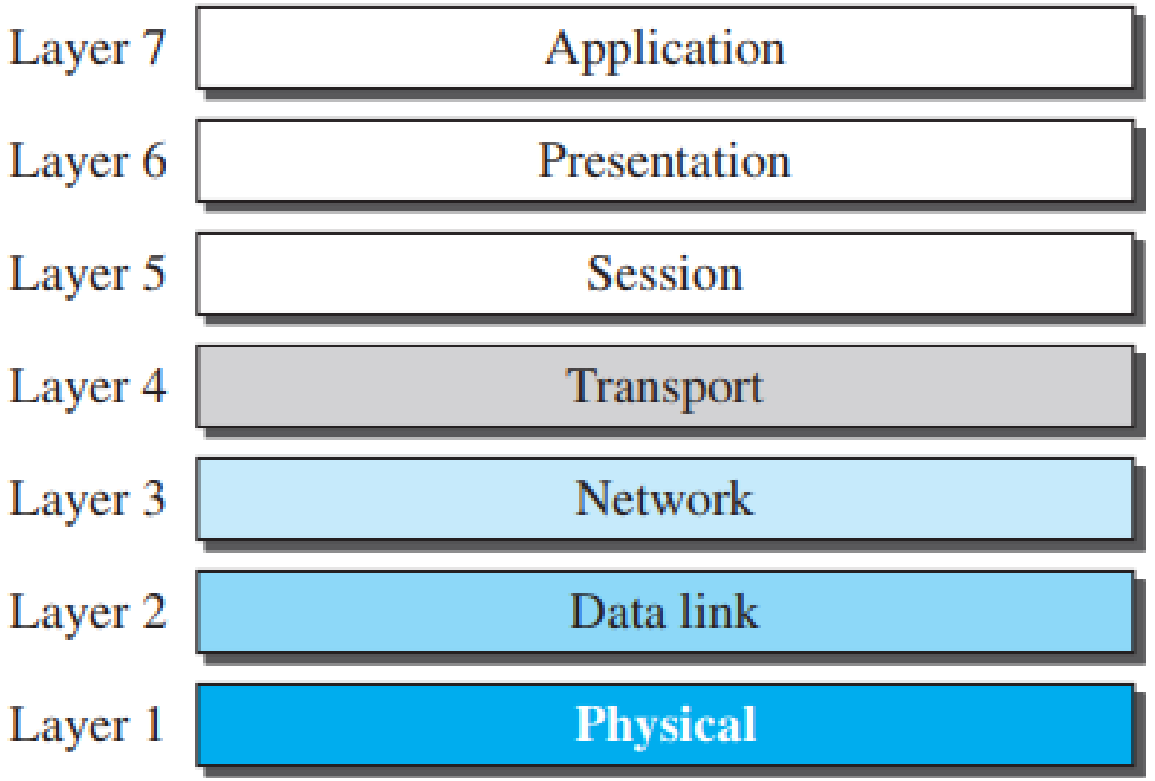
- Open Systems Interconnection (OSI) model
- First introduced in the late 1970s.
- An ISO (International Organization for Standardization (ISO)) standard, that covers all aspects of network communications
- An *open system* is a set of protocols that allows any two different systems to communicate, regardless of their underlying architecture
- The purpose of the OSI model is to show *how to facilitate / enable communication between different systems*

THE OSI MODEL

- The OSI model is not a protocol;
  - It is a model for understanding & designing a network arch. that is flexible, robust, and interoperable
- It is a layered framework for the design of network systems that allows communication between all types of computer systems
- It consists of seven separate but related layers
  - Each of which defines a part of the process of moving info. across a network

THE OSI MODEL

The OSI model



Organization of the Layers

- 7 layers can be thought of as belonging to three subgroups.
- Layers 1, 2, and 3-physical, data link, and network-are the Network support layers;
  - They deal with physical aspects of moving data from one device to another i.e.
    - Electrical specifications
    - Physical connections
    - Physical addressing
    - Transport timing and reliability
- Layers 5, 6, and 7-session, presentation, and application-can be thought of as the

  User support layers
  - They allow interoperability among unrelated software systems

Presentation Layers

- **Presentation Layer**
  - This layer prepares data for the application layer
  - It defines how two devices should encode, encrypt, and compress data so it is received correctly on the other end
  - This layer takes any data transmitted by application layer and prepares it for transmission over the session layer

Session Layers

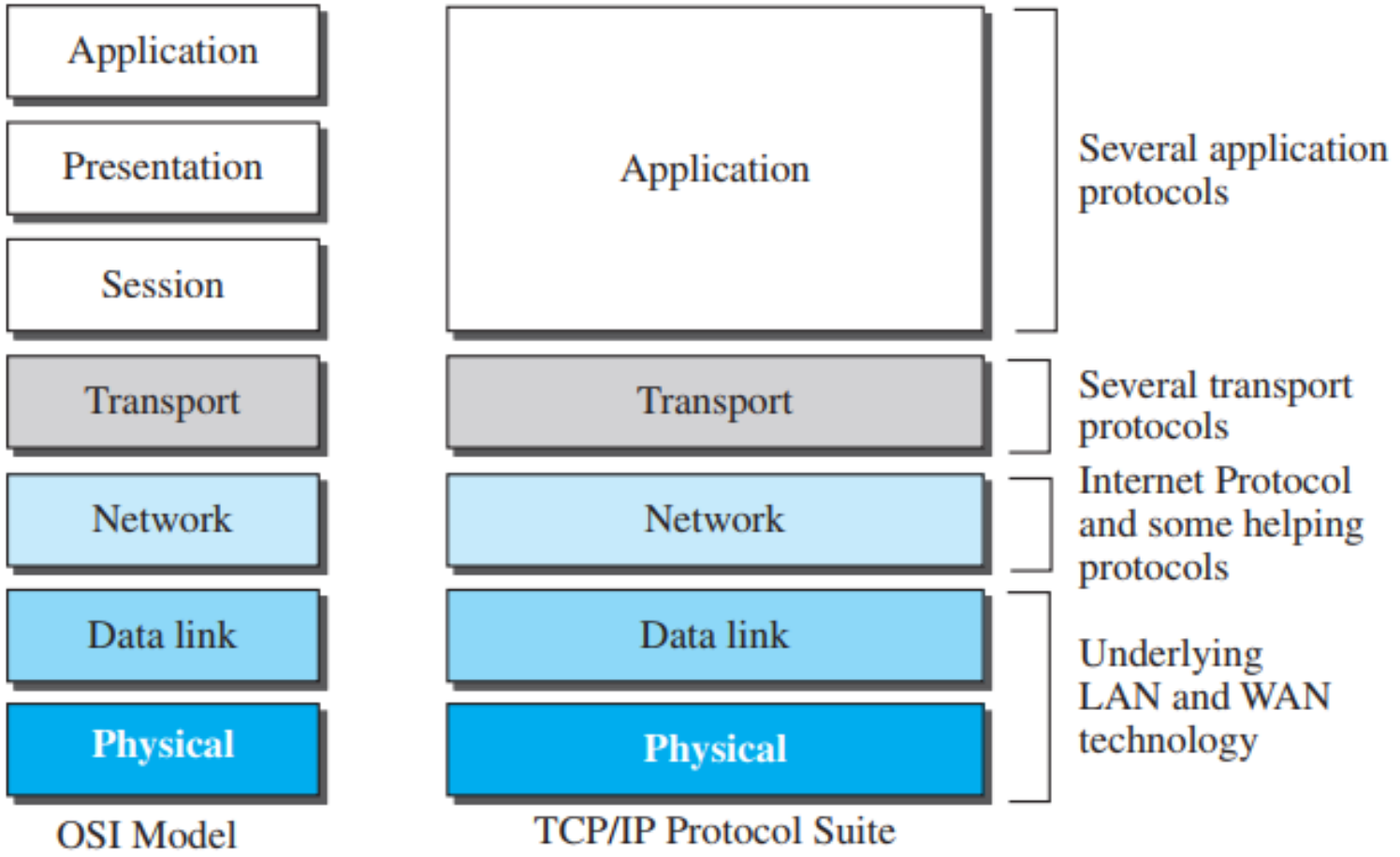
- **Session Layer**
- It creates communication channels, called sessions, between devices
- It is responsible for opening sessions, ensuring they remain open and functional while data is being transferred, and closing them when communication ends
- It can also set checkpoints during a data transfer;
  - If the session is interrupted, devices can resume data transfer from the last checkpoint

OSI versus TCP/IP

- When we compare the two models, 2 layers, session and presentation, are missing from the TCP/IP protocol suite
- These two layers were not added to the TCP/IP protocol suite after the publication of the OSI model
- The application layer in the suite is usually considered to be the combination of three layers in the OSI model, as shown in Figure 2.12

OSI versus TCP/IP

Figure 2.12 *TCP/IP and OSI model*



OSI versus TCP/IP

- OSI was completed when TCP/IP was fully in place
  - Lot of time & money had been spent on the suite; changing it would cost a lot
- Some layers in the OSI model were never fully defined
  - i.e., although services provided by Presentation & Session layers were listed in document, actual protocols for these two layers were not fully defined / described, and corresponding software was not fully developed
- When OSI was implemented by an organization in a different application, it did not show a high enough level of performance to attract the Internet authority to switch from the TCP/IP protocol suite to the OSI model

References

Chapter 2

Data Communication and Networking (5th Edition)
By Behrouz A. Forouzan

THANKS