

# CSC 402 – Internet Technology

# Recap

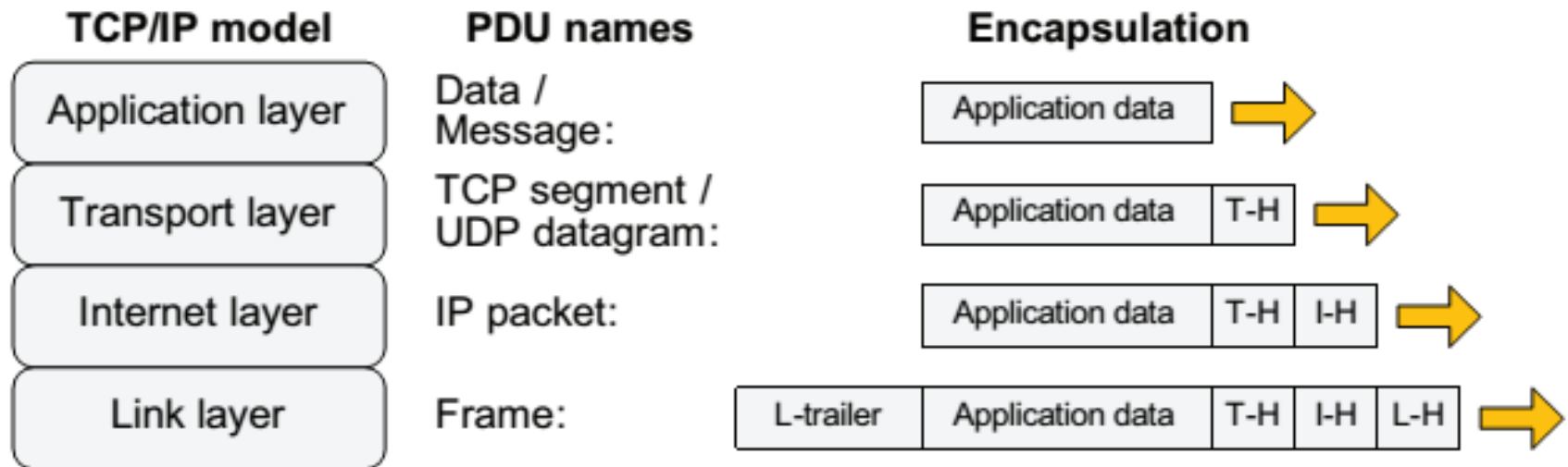
- Protocols
- Protocols vs. Standards
- OSI Reference models
- 7 Layers of OSI reference models

# TCP/IP Model

- **The TCP/IP protocol suite** was initially developed in the 1970s as a part of an effort to define a set of technologies to operate the ARPANET.
- It is so named for two of its most important protocols:
  - **the Transmission Control Protocol (TCP)** and
  - **the Internet Protocol (IP)**
- The first modern versions of these two key protocols were specified in 1981 as TCP version 4 (RFC 793) and IP version 4 (RFC 791).
- In 1983, the TCP/IP protocol suite was deployed as the principal protocol suite of the ARPANET
- **The TCP/IP model** is a layered abstract description for communications and computer network protocol design.
- In contrast to the OSI reference model, the TCP/IP model has never been fully specified.
- The OSI reference model is a conceptual and functional framework for standards development and, therefore, is a **prescriptive model**.
- The TCP/IP model is a **descriptive model** of the existing TCP/IP protocol suite.
- There is no universal agreement regarding how to describe TCP/IP by means of the OSI reference model.

# TCP/IP Model

- The TCP/IP model was developed primary for wired networks hence it has suboptimal or poor performance over wireless networks
- The TCP/IP model consists of **four layers**
- The TCP/IP model does not require strict layering
- Encapsulation and de-capsulation of PDU



# Link Layer

- Sometimes called **the network access layer, the network interface layer, or the data link layer.**
- The link layer of the TCP/IP model corresponds to the data link layer of the OSI reference model.
- The TCP/IP protocol suite defines only 2 protocols to be used at the link layer:
  - Serial Line Internet Protocol (SLIP)
  - Point-to-Point Protocol (PPP)
  - They are commonly used over direct serial line connections (such as dial-up line)
- There is a wide variety of standard protocols corresponding to different types of networks
  - Supported protocols include Ethernet/IEEE 802.3, Token Ring/IEEE802.5, Fiber Distributed Data Interface (FDDI), WiFi/IEEE 802.11, WiMAX/IEEE 802.16, etc.
  - As a rule, the data link layer protocols are closely coupled with the physical layer protocols

# Internet Layer

- Sometimes called **the IP layer**.
- The Internet layer of the TCP/IP model corresponds to the network layer of the OSI reference model
- The TCP/IP protocol suite defines several protocols to be used at the Internet layer:
  - Internet Protocol (IP)
  - Internet Control Message Protocol (ICMP)
  - Address Resolution Protocol (ARP)
  - Reverse Address Resolution Protocol (RARP) etc.

# Transport Layer

- Previously known as **the host-to-host layer**
- The transport layer of the TCP/IP model corresponds to the transport layer of the OSI reference model.
- The TCP/IP protocol suite defines 2 protocols to be used at the transport layer:
  - Transmission Control Protocol (TCP)
  - User Datagram Protocol (UDP)

# Application Layer

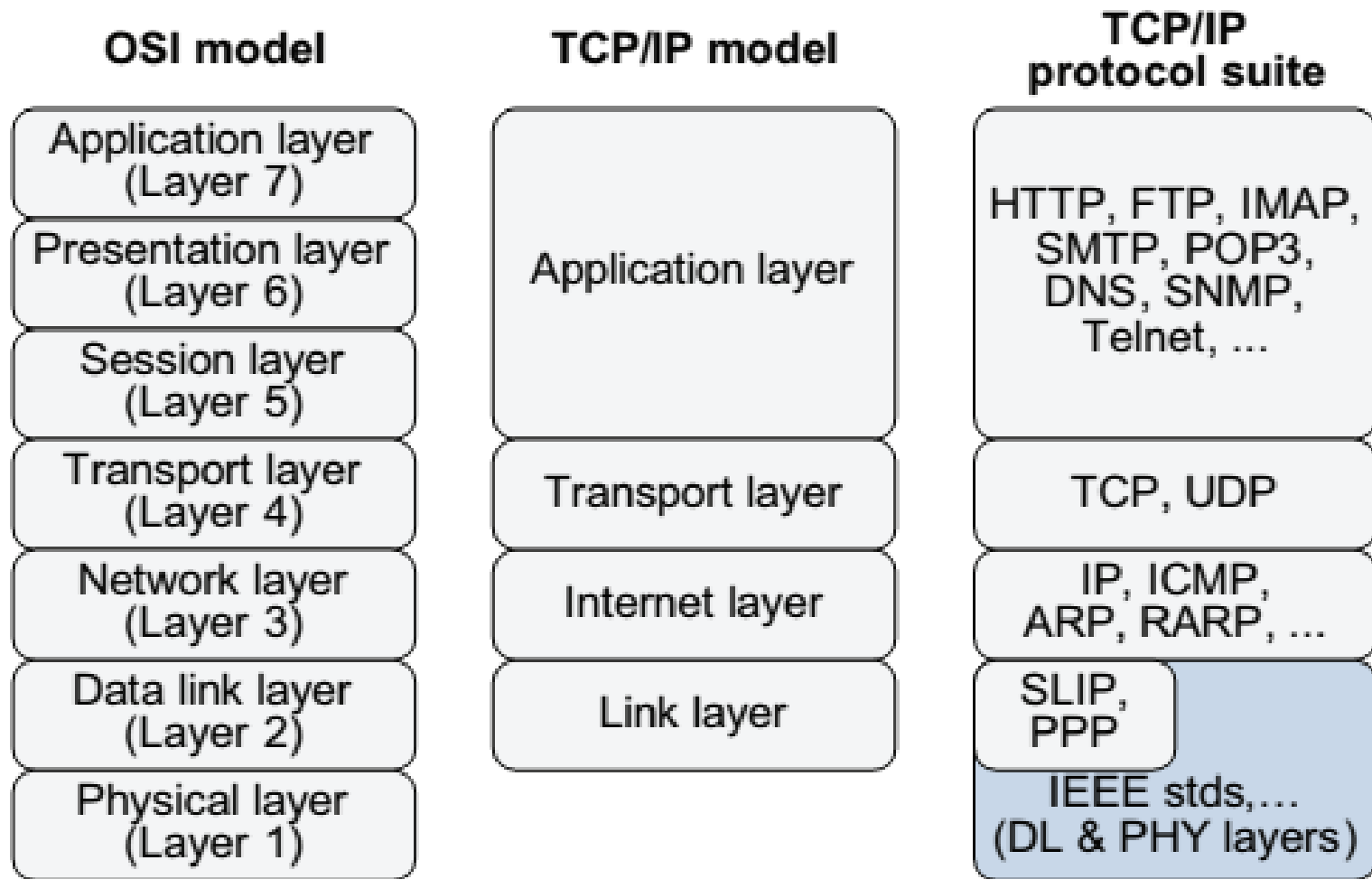
- **The application layer** of the TCP/IP model corresponds to the application layer, the presentation layer, and the session layer of the OSI reference model.
- The TCP/IP protocol suite defines numerous protocols to be used at the application layer (both for end-user applications and network services):
  - HyperText Transfer Protocol (HTTP)
  - File Transfer Protocol (FTP)
  - Internet Message Access Protocol (IMAP)
  - Post Office Protocol Version 3 (POP3)
  - Domain Name Service (DNS)
  - Simple Network Management Protocol (SNMP), etc.



# Application Layer

- Do not confuse what the TCP/IP model calls an "application" with what we (and operating systems) usually call an "application".
- In the TCP/IP model, the application layer provides services for user applications E.g., HyperText Transfer Protocol (HTTP) is an application layer protocol, while a Web browser (e.g., Microsoft Internet Explorer) is a user application.
  - A Web browser does not reside at the application layer.
  - Rather, a Web browser makes use of the services offered by a protocol (HTTP) that operates at the application layer.
- When you run your Web browser, you run an application process (2 running Web browsers will result in 2 application processes and so on)

# OSI & TCP/IP



# OSI vs. TCP/IP

- Why did the TCP/IP protocol suite won out in the competition with the OSI protocol suite?
  - The TCP/IP protocol suite was already deployed, while the OSI reference model was only approved.
  - Early slow and bug-filled, unusable implementations of the OSI protocol suite ruined its public image.
  - The probable market for use of the OSI protocol suite was proprietary, while the TCP/IP protocol suite was bundled as part of Berkeley UNIX operating system and was free.
  - The OSI protocol suite is labyrinthine and full of almost bureaucratic levels of unnecessary complexity, while the IETF's credo "rough consensus and running code" has greatly contributed to the fast success of the TCP/IP protocol suit
  - Paper "Rough Consensus and Running Code and the Internet-OSI Standards War" by Andrew L. Russell