OSI reference model

- OSI stands for *Open Systems Interconnection*
- Has *seven* layers
- Specifies *function* of each layer...
- ...but does not specify exact *services*/*protocols* to use

OSI reference model

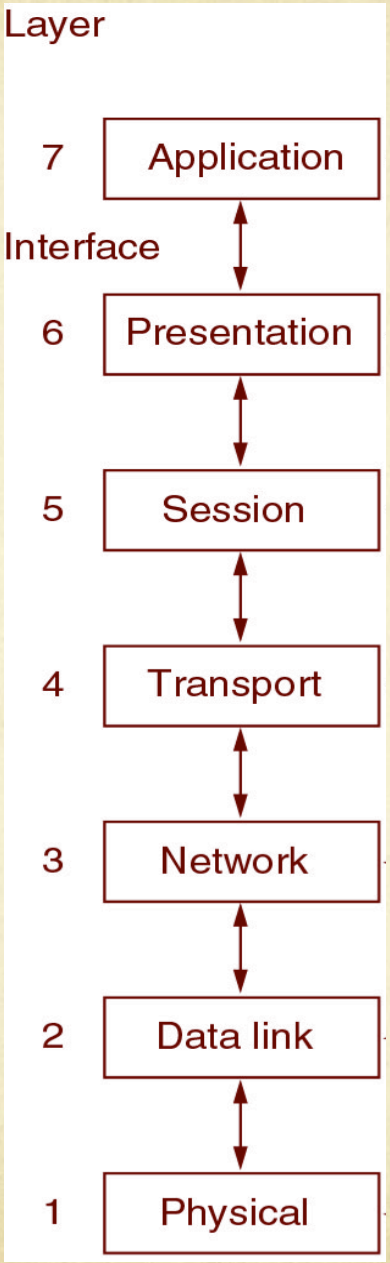
- *Application* layer
  - User interface to networking services
  - Provides variety of commonly used functions
    - E.g., file transfer, e-mail, etc.
- *Presentation* layer
  - Handles formatting details for data
    - E.g., encryption, compression, stream formatting, etc.
- *Session* layer
  - Provides services to initiate, maintain & end connection b/w sender & receiver

OSI reference model

- *Transport* layer
  - Provides *end-to-end* message delivery service
  - Controls rate of transfer & ensures network is not overloaded
    - → *Flow control* & *congestion control*
- *Network* layer
  - Controls actual *transfer* of unit of data through network
  - Determines path to take from source to destination (*routing*)
  - Forwards unit of data to next node/router in path
  - Shares *congestion control* responsibility

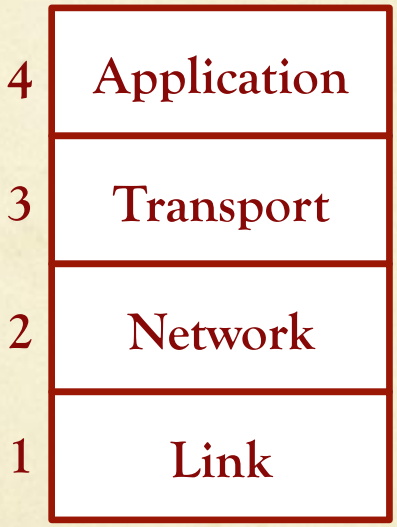
OSI reference model

- *Data link* layer
  - Transmits data over *link* between two nodes
  - Performs *error* and *flow* control over link
  - Determines when computer has the *right* to access medium
    - Medium Access Control (MAC) sub-layer
- *Physical* layer
  - Consists of basic networking *hardware*
  - Transmits/receives *raw bits* over communication channel
  - Determines how connection is established
  - Determines mode of transmission


Layer
7
Application
Interface
6
Presentation
5
Session
4
Transport
3
Network
2
Data link
1
Physical

TCP/IP reference model

- Has *four* layers
  - Was used in *ARPANET* (research n/w sponsored by DoD)



- Named after two of its primary *protocols*
  - *In this model, protocols are more important than strict layering*
  - *So, we will mention specific protocols in this context*

TCP/IP reference model

- *Application* layer
  - Roughly covers functions of *application*, *presentation* & *session* layers in OSI model
  - Widely-used application layer protocols for user services
    - Simple Mail Transfer Protocol (*SMTP*)
    - Hypertext Transfer Protocol (*HTTP*)
    - File Transfer Protocol (*FTP*)

TCP/IP reference model

- *Transport* layer
  - Similar to *transport* layer in OSI model
  - Provides *end-to-end* message delivery service independent of underlying network
    - Can provide *reliability* if needed
  - Provides *error control*, *flow control* & *congestion control*
  - Widely used protocols
    - Transmission Control Protocol (*TCP*)
    - User Datagram Protocol (*UDP*)

TCP/IP reference model

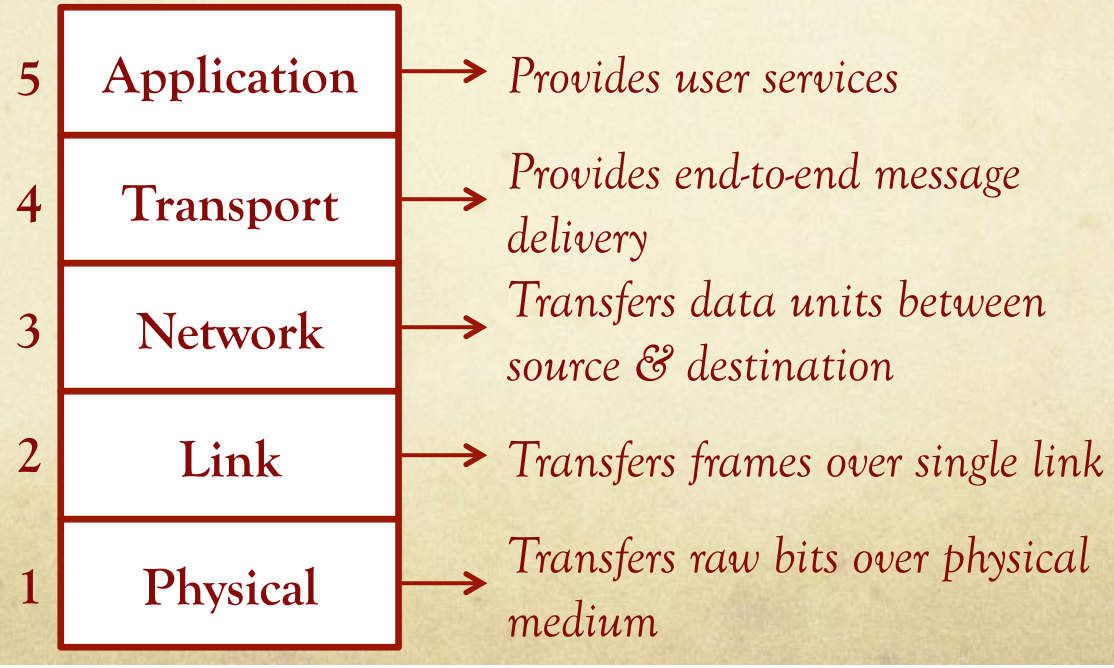
- *Internet* layer
  - Roughly corresponds to *network* layer in OSI model
  - Responsible for sending *units of data* over network
    - Performs *routing* for units of data
  - Provides unreliable (*best-effort*) service
    - Data units could arrive *out of order* at destination
  - Principal, very widely used protocol
    - Internet Protocol (*IP*)

TCP/IP reference model

- *Link* layer
  - Roughly corresponds to *data link* & *physical* layers in OSI model
  - Responsible for moving data units over *link* between two *hosts*
    - Provides *interface* between hosts & transmission links
    - Includes *protocols* to describe local network topology

Discussion

- *OSI* model strength is model or layering itself
  - *Excluding presentation & session layer*
- Strength of *TCP/IP* model is its protocols
- Tanenbaum book considers *hybrid* model



Peer layer communication