

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

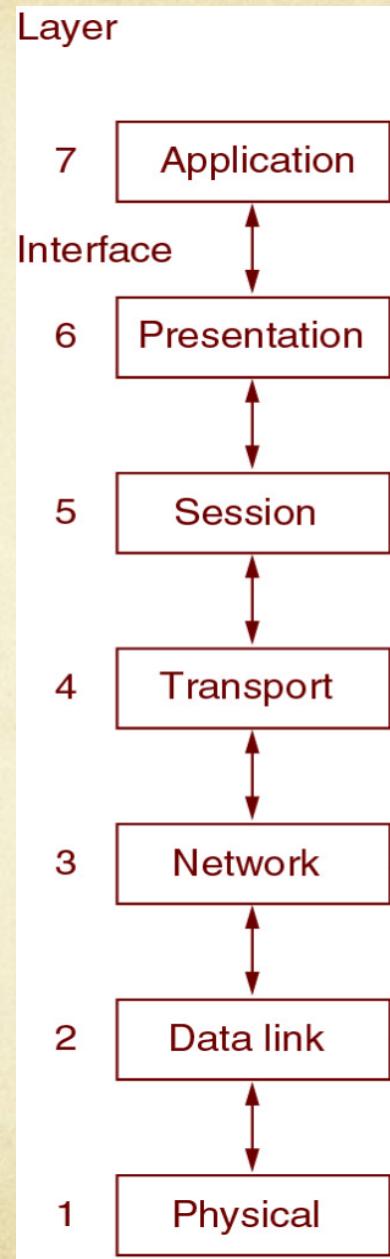
- ◆ *Application* layer
 - ◆ User interface to networking services
 - ◆ Provides variety of commonly used functions
 - ◆ E.g., file transfer, e-mail, etc.
- ◆ *Presentation* layer
 - ◆ Handles formatting details for data
 - ◆ E.g., encryption, compression, stream formatting, etc.
- ◆ *Session* layer
 - ◆ 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

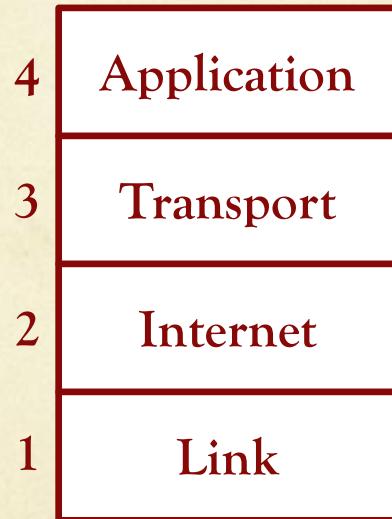
OSI reference model

- ◆ *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



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

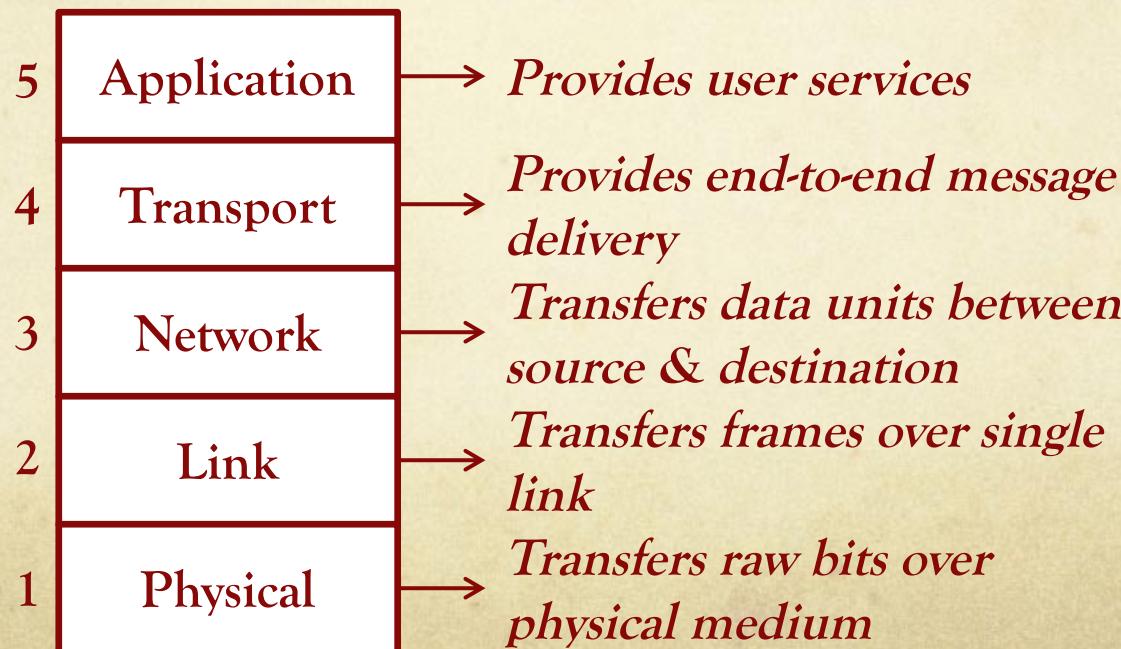
- ◆ *Internet* layer
 - ◆ Roughly corresponds to *network* layer in OSI model
 - ◆ Responsible for sending *units of data* over network
 - ◆ Performs *routing* for units of data
 - ◆ Provides unreliable (*best-effort*) service
 - ◆ Data units could arrive *out of order* at destination
 - ◆ Principal,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

