OSI Model

- OSI model solves a compatibility issue.

Application Layer:
- Interfaces user to network services
- Multiple services supported by protocols
- Browser (HTTP, HTTPS), outlook(SMTP), file transfer(FTP), virtual terminal(telnet)
- Defined in terms of software

Presentation Layer:
- Data is **encapsulated** with a header when sent from application to presentation layer
1. **Data translated into binary**
2. **data compression**
3. **Encryption/decryption**
- Header contains information about translation, compression and encryption
- -concerned with syntax and semantics

Session layer:
- Establish, maintain and terminate the session
- Assume logging into your bank account
1. **Authentication** with username/password
2. Request to download file (check for **authorization**)
- Assume you're logging into your Facebook account: session layer keeps track of packets (content (text, images, videos), destination) - **session management**
- **Synchronization**

Above layers provide services to the user.
Next four layer focus on moving data from one end to the other.

Transport layer:
- Provide reliable mechanism to transmit data (**avoid corruption**)
- **Flow control** (assume receiver processes data 100bits/s. Transmitter transmits 1000bits/s. Channel transmits 1000bits/s. Receiver will lose 900bits/s. To avoid the problem, assume there is a feedback channel from receiver to sender that communicates the speed of the receiver in order to reduce speed of transmission.)
- **Error control**: detect error & identify location (*forward error correction*), *automatic repeat reques*t (uses principle of acknowledgement, transmit again if error detected), *checksum*
- **Segmentation:** your channel is not capable of transmitting a chunk of data, so it divides data into multiple *segments* with port number and sequence number

- <mark>Port addressing done by transport layer</mark> (used to deliver the packet to the right application)
- Sequence number to order segments in the right order (**reassembly)**
- **Connection-oriented(TCP) & connection-less(UDP** faster**)**

Network layer:
- **IP addressing:** ensure the packet is delivered to the right receiver via IP address/logical address
- **Routing**: provide protocol for routing
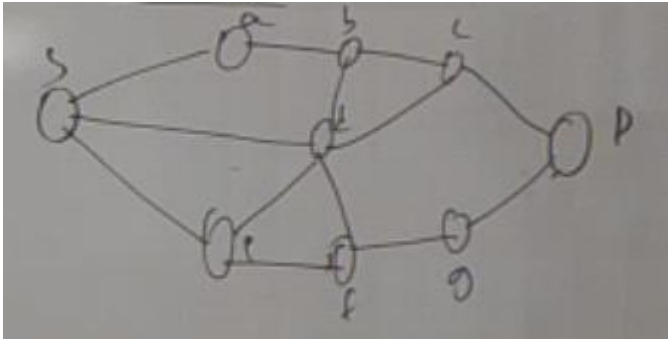
Possible paths:

S-a-b-c-D
S-a-b-d-c-D
S-e-f-g-D

- Routing defines protocol for determining which path a packet takes.
- **Handles congestion:** routing algorithm can identify which paths are congested
- **Fragmentation:** segments divided into smaller packets (depends on bandwidth of the network). If segment is 100o bits, but channel can transfer 100 bits. Packets also contain header with information about IP addressing, routing and fragmentation.
- Maximum transfer unit (MTU)
- Source-to-destination delivery