Module - 1 (NSS) — 6:15 AM

Syllabus:

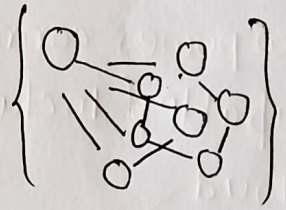
Introduction to Networking Principles
System Security overview
Cryptography basics
Data Privacy
Network Security
Computer Networks

Books:

1. Tanenbaum
2. Kurose and Ross
3. Forouzan
4. Peterson, Davie

Network: Network is a platform to connect with each other and in general provide the service of "connectivity".

O—O
Easy Communication



If not systematic communication then it becoms chaotic

▷ When multiple objects/entities need to do some work together - we need a platform which will allow them to get connected, communicate and collaborate - which is responsibility of a NETWORK.

Computer network is a similar platform for computers for connectivity.

Example:

IoT (Internet of Things)
Internet
IIT Local Area Network

Medical & industrial
More things connected than people

Thing/People Ratio { 0.08 (2003)
1.84 (2010)

Smart Classroom (Example)

The classroom should be able to quickly asses how many students are there

Constraints

- Accurately
- Seamless Installation
- Low cost
- Durable
- Low or negligible maintenance

List of Tech.: involved in IoT

- Sensor Tech. → Pulse sensor, Accelerometer, Force Sensor
- Low cost Embedded system → Ex. Lily Tiny
- Low power connectivity
- Capable of including Mobile devices → Ex. Bluetooth Smart (4.0), Apple watch, Mobile phones
- Cloud → Googlecloud, AWS

Sensors

- Converts physical quantities to electrical signals
- Ex. Pressure sensors, temperature sensors
- Low power consumption
- Small in size
- Low cost

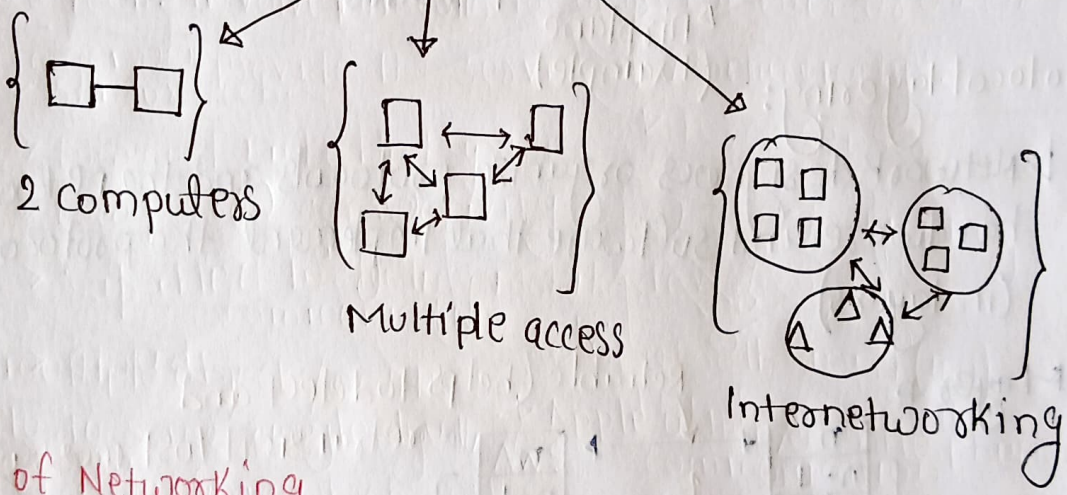
Applications:

- Healthcare
- Transportation
- Food
- Weather
- Disaster prediction
- Smart homes

Difference b/w ~~application~~ and substance information

Cannot be replicable?	Infinitely Replicable
Cannot be represented in bits	Can be represented in bits

Levels of Networking (in computers)



Goals of Networking

- Computers can 'manipulate' information and Networks create 'access' to information
- Move bits everywhere, cheaply and with desired performance characteristics.
- Break the space barrier for information.

Connectivity is the magic needed to communicate if we don't have a direct point to point physical link

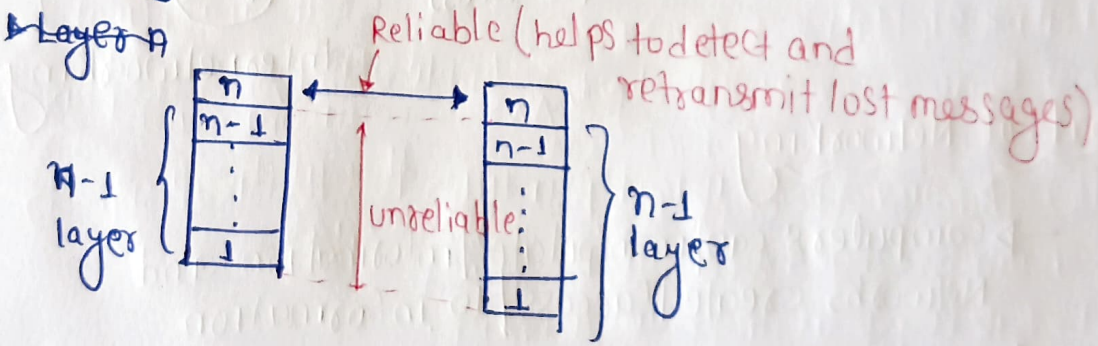
- Lower performance that true physical link
- But provides direct or Indirect access to every other node in the network

Instead of connecting to all ~~others~~ nodes in the other zone we connect to intermediate nodes

Protocols: Some set of rules - when we have two or more systems to talk to each other → Airplane (Example)

Protocol layering:

- Network designers organize protocols and the network hardware and software that implement the protocols (in layers)



- "Every (operational) complex software systems created by humans are designed using a modular (layer) approach" – Software Engineering Principle

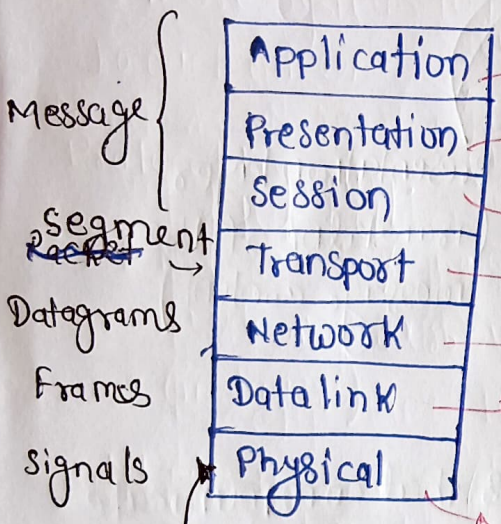
▷ Present day communication systems are layered based upon ISO-OSI Model (Reference model)

International Standard Organization

Open System Interconnection

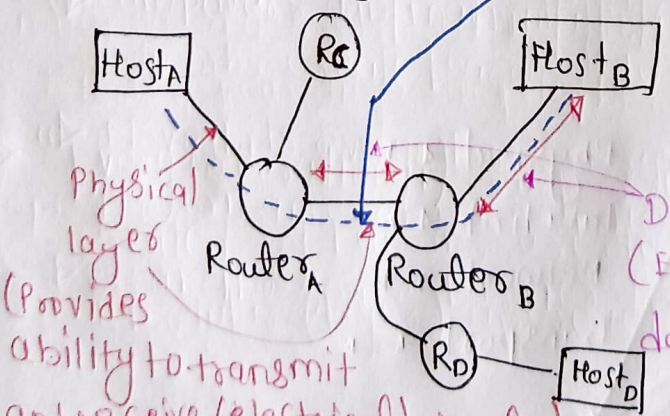
1970s → ISO, CCITT created two similar documents

1983 → Documents Merged together to form a standard called Basic Reference Model for OSI.



- Application → Proper communication procedure
- Presentation → Translation & Encrypt-Decrypt
- Session → Awareness to other users
- Transport → Reliable delivery for start → final
- Network → Determine route
- Data link → make sure node recieve data reliably from neighbour
- Physical → Connect neighbor nodes

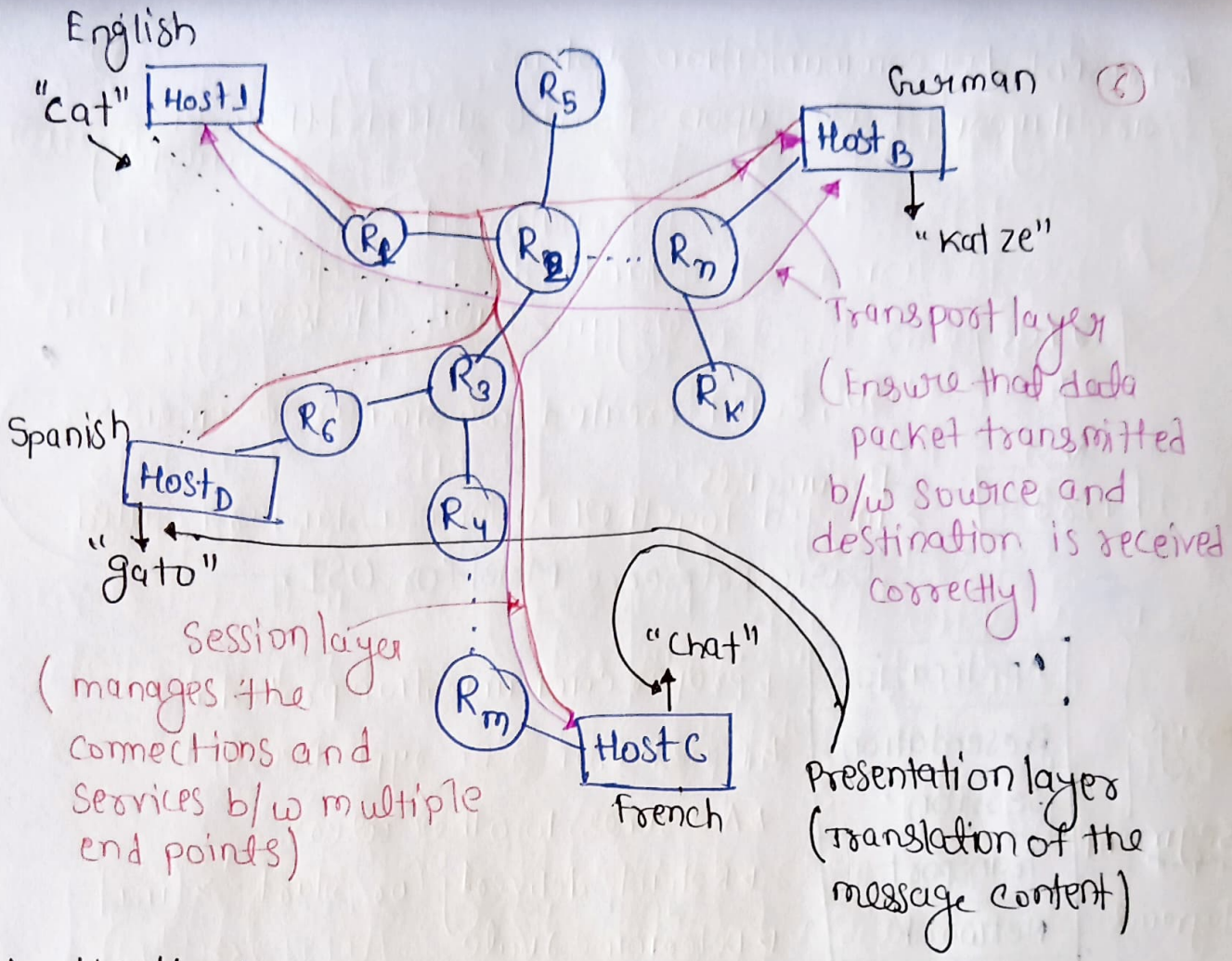
{only hardware layer}



Network layer (Determine the route to reach final destination)

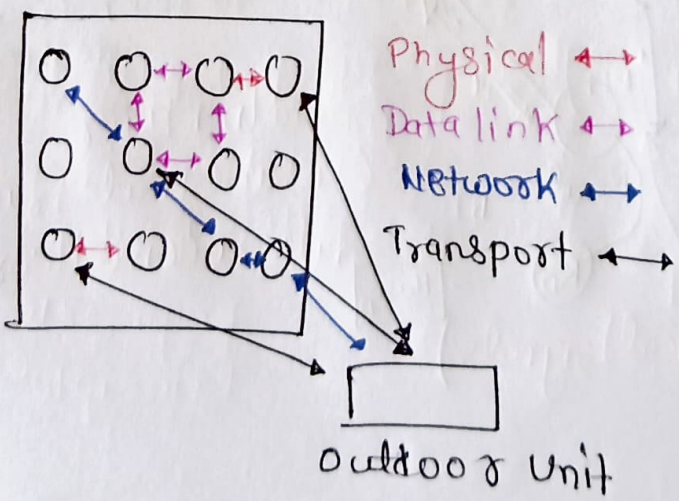
Physical layer (Provides ability to transmit and receive (electrical) signals)

Data link layer (Ensure that transmitted data, received correctly)



Application layer:

- Application layer has user programs that communicate with each other.
- Usually a request/reply exchange protocol
- HTTP, SMTP, FTP, DNS



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