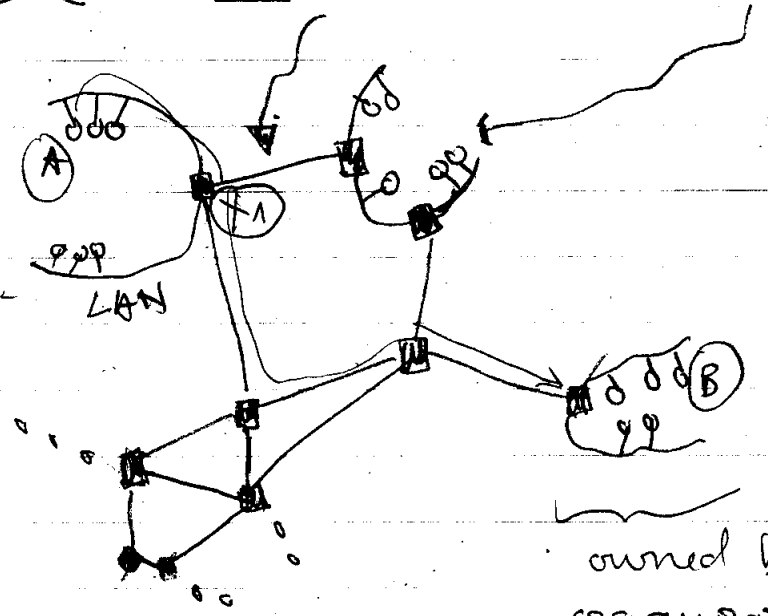
(Week 6, day 2)

Internet (inter networked networks)



owned by different organizations

(*) Computer A wants to communicate with computer B ($A \xrightarrow{data} B$)

(ex) A - laptop

B - stores a webpage

$A \xrightarrow{request} B$ for webpage

How it is done?

(1) Data = split in small chunks (called packets)

(2) Address of B is stored on the packet

- header (contains adress etc...)
- data (what A wants to send)

header = envelope, data = letter } → Internet works similarly to the Post company

(3) Packet → arrives at X_1 (using Ethernet, etc...)

(X_1 - special node, router)

→ X_1 decides where to forward packet based on the destination address

(4) ... eventually, with luck, packet reaches node B.

How was Internet born?

- Donald Davies (1924 – 2000) British Computer Scientist
- Paul Baran (1926 –)

} →

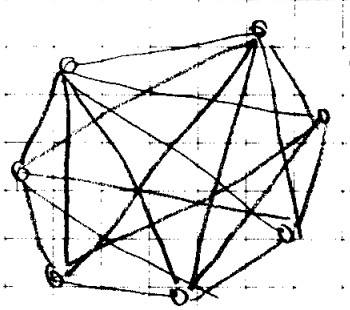
→ inventors of packet-switched networks.

MOTIVATION = communication of data between computers.

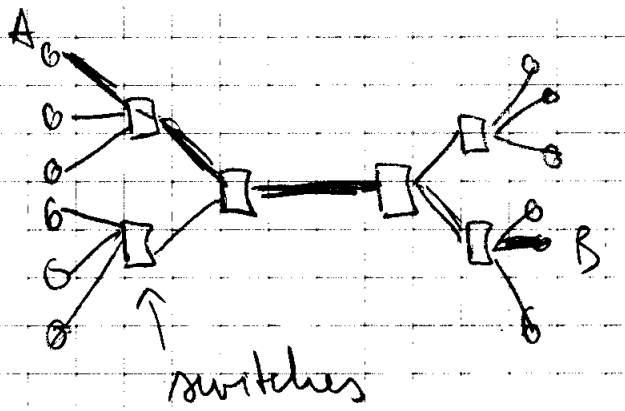
Existing technology for communication

- telephone network. Characteristics:
  a) focus is on creating a path between caller & called; phone # = encoding of the path

1870 → phone system was created, there were no wires connecting people together ← very expensive



The only viable approach :



← hierarchical system

(circuit switched network)

A - initiates a call to B :

① set a path A ↔ B by programming the switches

→ it took time to program switches

→ the telephone # = a "program" to configure the switches

→ once the path was programmed, A & B "owned" it ; they could use it for as long as they wanted.

(ex. of switches) → human operator ('59)
↘ Strowges stepper (pulse dial)

- 1957 : Sputnik was launched in space
- 1958 : ARPA (Advanced Research Projects Agency) was created as response
- '60-ies → ARPA wanted reliable data communication

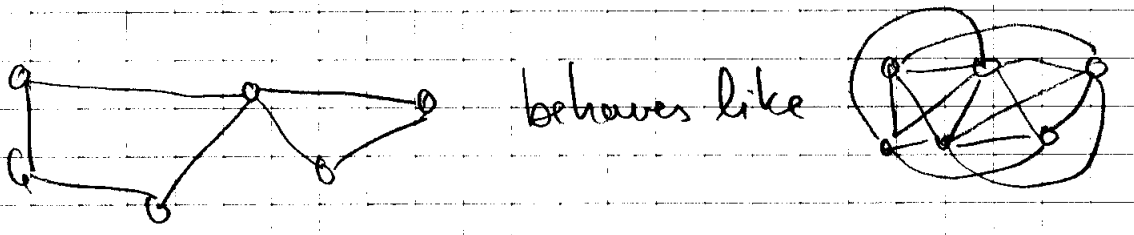
The existing communication network was not suitable!

a) - not reliable (bomb a major switch d whole network is down)

b) - not appropriate for data → short communication because you cannot afford to wait hundreds of mili sec. to set a path & use it only for 10 mili sec.

- *late '60 ~ '70, Donald Davies & Paul Baran
  → used the phone system to get a "fixed" network (no need to setup connections)
  → split data in small packets (they will have to share the network & "you don't want to mix cars & trains on city road, there will be traffic jam".

→ let nodes of networks forward packets for other nodes; then



→ Baran published his idea '64 (considered heresy)

→ ARPA → chipped in & ARPANET was created in 1971.

→ focus now on endpoints & their addresses not on links

- by 1973, a lot of packet-switched networks were built, each different & separate from the other.
- Vint Cerf: idea to connect all these different networks
  - needed → same addressing scheme for nodes
    → same packet header
    } & only at the boundary between 2 networks
  - ↓
    TCP/IP protocol