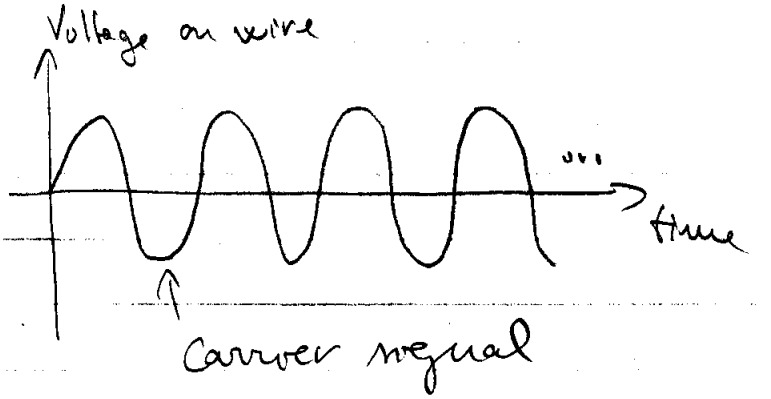
Week 6

Networking (Ch 3)

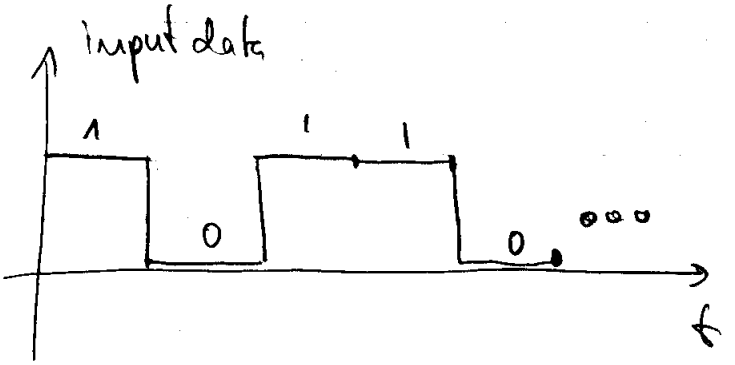
- network = set of independent computers connected via "telecommunication links" to share information.

- encoding of information over the links
  → gives a way to "carry" the information over the link.

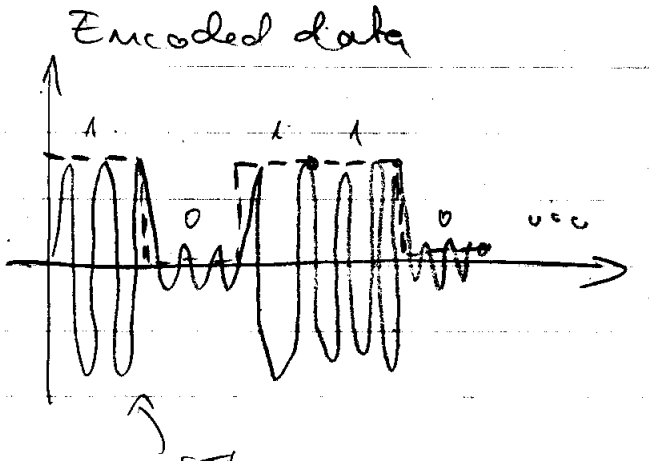
Ex



A signal like this on a wire, is very efficient in transmitting energy (electricity is transported using alternating current (AC) not continuous for ex).



A sequence of bits 10110...



"The carrier signal is "modulated" to encode information (eg bits 10110 ooo)

→ such an encoding is used to transmit info over telephone lines. The modem (MOdulator DEModulator) encodes / decodes the data on / from the carrier.

- How data is encoded over telecommunication lines determines → speed (how many bits/sec or bps)
  ↓ distance between source → destination

Types of network links

a) - dial-up (using telephone line) ≤ 54k bps (kilo bits per second)
   → achieved among the voice line

b) - DSL (digital subscriber line)
   → as telephone systems modernized, they started to use carrier signals to transmit voice + digital info. (digital channel) commands.

→ the "digital channel" allows telephone company to provide → call display
→ call waiting
→ ... etc

→ thus digital line → used to transmit data personal computer ↔ internet

DSL	dial-up
- provided by the telephone company or authorised representative	- not regulated; anyone can connect 2 computers using phone line & modem.
- connection is always on	- need to dial
- speeds ~ 6 Mbps	- speed ≤ 54 kbps (in ideal case!)
- asymmetric (download faster than upload) because "download" more frequent than upload	- symmetric

- both use phone line, but dial-up occupies the voice channel.

c) Cable (TV)
→ uses the network of TV cables (TV signal + + network data)
→ usually faster than DSL.

options b) & c)

broadband

d) • Ethernet → designed specially to connect computers

→ speed 10 Mbps, coaxial cable (designed mid '70)

• Fast Ethernet → 100 Mbps (early 1990) over coaxial cable, fiber optic or twisted copper cable

↳ regular Ethernet cable with Rj-45 connectors (similar to a wider telephone jack)

→ typical wired network connection present in most ~~car~~ P.C.-s today.

• giga bit Ethernet: standard adopted 1998 (1 Gbps = 1000 Mbps)

• ten gigabit Ethernet: -(1- 2003

→ used for the "backbone" of a network, links concentrating the communication from many computers.

Time to transmit 1MB (mega byte) of data or, approx 1 min. mp3 song

Ethernet	10 Mbps	0.8 sec
Fast Ethernet	100 Mbps	0.08 sec
Gigabit Ethernet	1 Gbps	0.008 sec
Ten Gigabit Eth.	10 Gbps	0.0008 sec

Observation

use capital B for byte (8 bits)
lowercase b for bit

e) Wireless communication

- Wi-fi (wireless fidelity)
  - → typical for Internet access in cafe's, airport, on-campus
  - → range 50-100 m.

Details about the encoding process are gathered in standard documents maintained by IEEE (Institute of Electrical & Electronics Engineers)

eg: IEEE 802.11 b ≈ 11 Mbps
802.11 g ≈ 54 Mbps

- Wi-Max
  - → range 45 km
  - → speeds 70 Mbps
  - → details in standard 802.16

  (experimental deployment in Toronto area by Sprint ...)

- Bluetooth
  - → allows only connections peer to peer (between 2 computers)
  - → range 1 – 10 – or 100 m
  - → speed : 723 kbps.

  (used in synchronizing data on PDA & desktop PC or cellphone or digital camera)