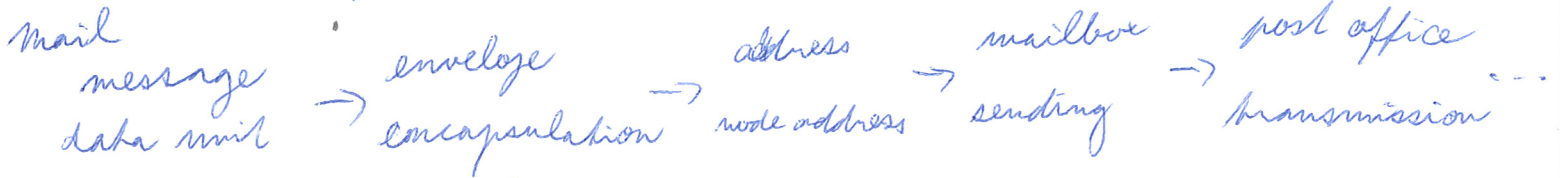


## Communication

- Identification - introduction needed
- Method - you need to use common methods
  - Language
- Speed
- Process
- Types - human
  - telecom - centralised, only interface in telephone
  - computers - embedded logic, network only manages transmission
  - converged network (VoIP, mobile internet)



Same actions in email

- |                          |   |                                 |
|--------------------------|---|---------------------------------|
| circuit switching        | x | packet switching                |
| - if broken data is lost |   | - each packet finds its own way |
| - faster, less reliable  |   | - slower, fault-tolerant        |

## Security

- new requirement - now it's simple to have malicious software
- authentication, antivirus, encryption

## Scalability

- layers - core - ~~backbone~~ connection to ISP
  - router, switches (can be in separate room)

(LAN)

- distribution - cables and switches
- vertical layer
- access layer - terminated as close as possible to users
  - access for end devices

Tier 1 - direct access to Internet backbone

(WAN) Tier 2 - without access to backbone whose customers are ISPs

Tier 3 - ISPs who connect end customers

## Transmission parameters

Latency - delay

Jitter - variance of delay

data loss - needs resending or loss of information (can cause channel congestion)

bandwidth ("speed")

Order - we want to dedicate bandwidth x urgent messages

- QoS key

- best effort strategy

## History

isolated systems  $\rightarrow$  terminal systems  $\rightarrow$  LAN  $\rightarrow$  WAN (consequently client-server)  
 $\uparrow$   
 proprietary lines

## LAN

- geographically limited
- sharing resources (printers, Internet) of nearby computers
- mostly private and centralised

## WAN

- public, managed by multiple organisations
- ~~for~~ data transfer

## VPN

- tunnel that connects to LAN through WAN
- encrypted

## Internet history

60s - packet switching

69 - ARPANET

77 - <sup>another</sup> network connected to ARPANET backbone

83 - TCP/IP dominates

80s TCP/IP into BSD UNIX

## Request for Comments (RFC)

- Internet "standardization", information, best practices
- many rules are too restrictive  $\rightarrow$  users and servers violate
- recommendation receiver: hoboant sender: conservative