McGill

School of Computer Science

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CS 308-435
Basics of Computer Networks

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Practical Questions

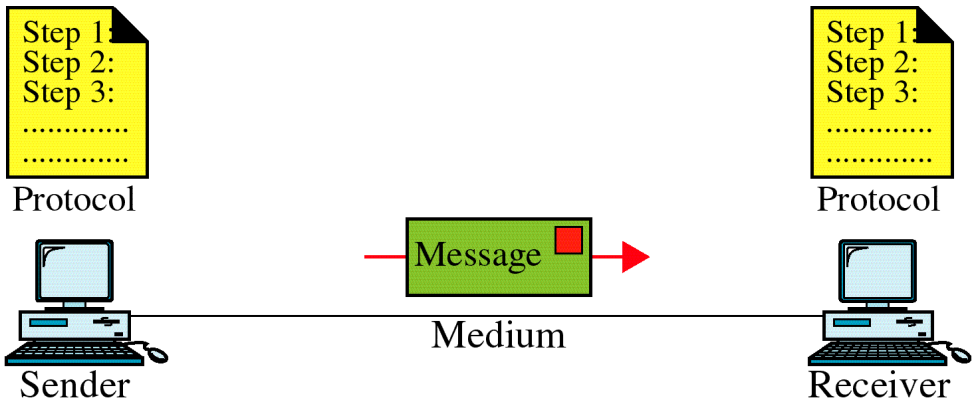
1. Hans Vangheluwe (hv@cs.mcgill.ca)
   Office hours: Thursdays 10:00 – 13:00
2. Course material:
   - *Data Communications and Networking 2nd Edition*, Behrouz A. Forouzan, McGraw-Hill Higher Education. ISBN 0-07-232204-7. Handouts (WWW and copies). Partly from *Computer Networks*, Andrew S. Tanenbaum, Prentice Hall. ISBN 0-13-349945-6.
   - Handouts (WWW and copies). Mostly from *UNIX Network Programming 2nd Edition, Volume 1 Networking APIs: Sockets and XTI*, W. Richard Stevens, Prentice Hall. ISBN 0-13-490012-X.
3. TAs, assignments (protocols, applications), website, newsgroup, . . .

Data Communication

- Exchange of *data* (0 and 1s) between *devices* via a *transmission medium*.
- Network rchitecture: combination of hardware and software.
- Effective communication:
  1. Delivery (to correct destination).
  2. Accuracy (correct data).
  3. On time (order, delay)

  This course: how to achieve the above.

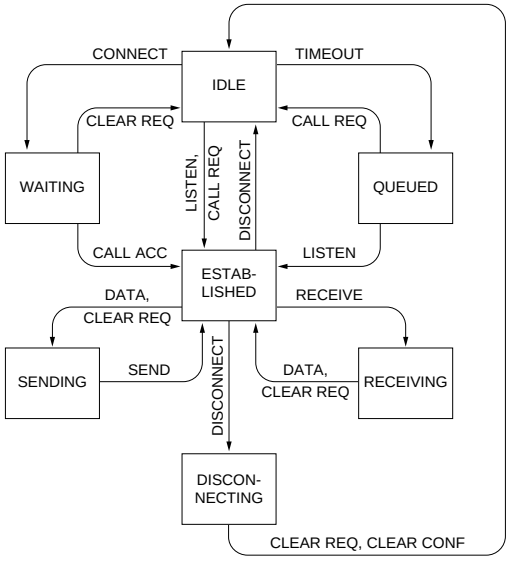
Data Communication Components



Data Communication Components

- Sender
- Receiver
- Medium: physical path
- Protocol: rules governing communication

TCP/IP Protocol (Finite State Machine)



Network

A set of *devices* connected by media *links*.

1. Distributed, *concurrent* processing
   - security (encapsulation)
   - capacity (of distributed databases)
   - parallel processing $\rightarrow$ speedup
   - redundancy
   - collaborative work (space/time)

2. Network criteria
   - performance: number of users, type of transmission medium, hardware of nodes, (protocol) software.
   - reliability: frequency of failure, recovery time, catastrophe protection.
   - security: unauthorized access, viruses.
3. Applications: . . .

Protocols

What is communicated, *how* it is communicated, *when* it is communicated.

- Syntax (structure of message *e.g.,* src/dest)
- Semantics (meaning of message *e.g.,* routing)
- Timing (when and how fast to send)

Standards

- De jure
- De facto
  - proprietary (closed)
  - nonproprietary (open)

Standards Organizations

- International Standards Organization (ISO). (voluntary)
  Open Systems Interconnection (OSI).
- International Telecommunications Union - Telecommunications Standards Sector (ITU-T, formerly CCITT). (United Nations)
  V.32, V.33, . . . (phone lines), X.25, X.400, X.500 (digital transmission over public networks), Integrated Services Digital Networks (ISDN).
- American National Standards Institute (ANSI).
  Represents US in ISO and ITU-T.
- Institute of Electrical and Electronics Engineers (IEEE).
  Local area networks: 802.3, 802.4, 802.5.
- . . .

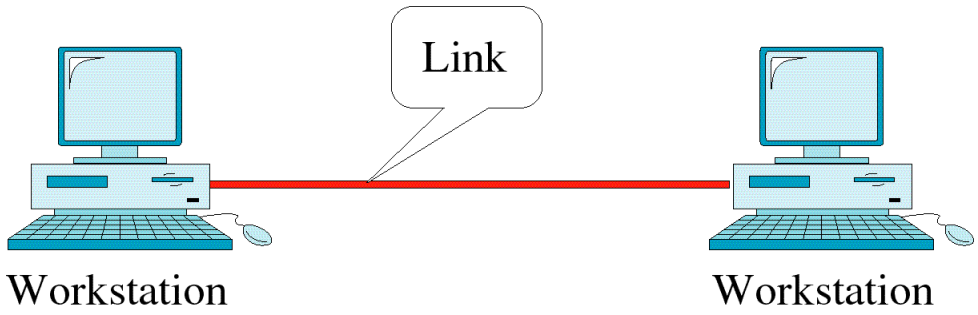
Forums

- Internet Engineering Task Force (IETF): growth of internet.

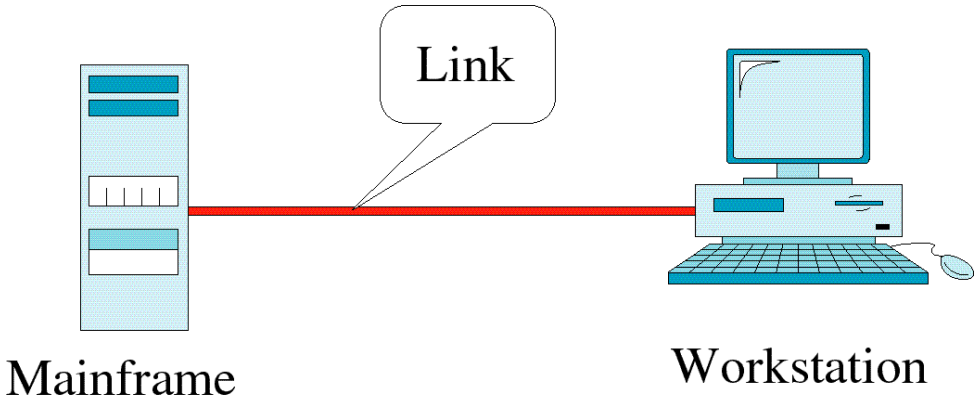
Concepts: line configuration

- point-to-point
- multipoint

Line Configuration: point-to-point

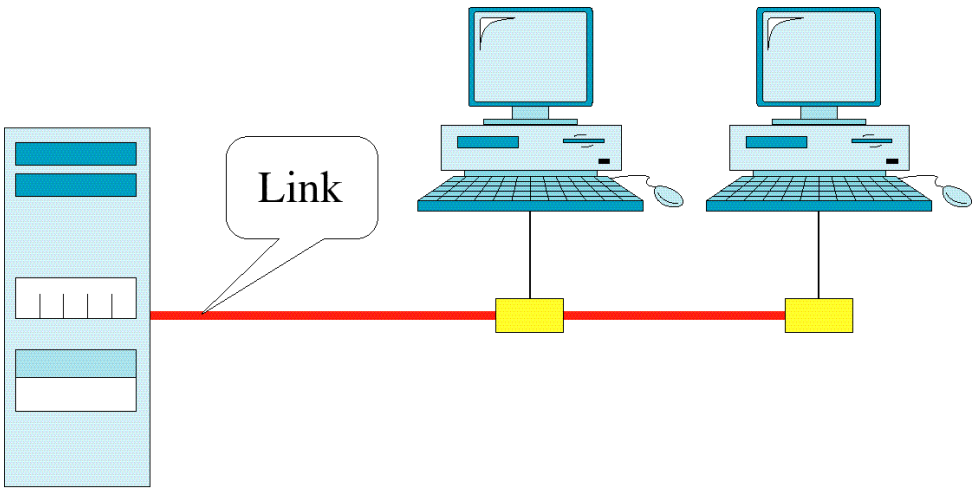


Line Configuration: point-to-point



Line Configuration: point-to-point

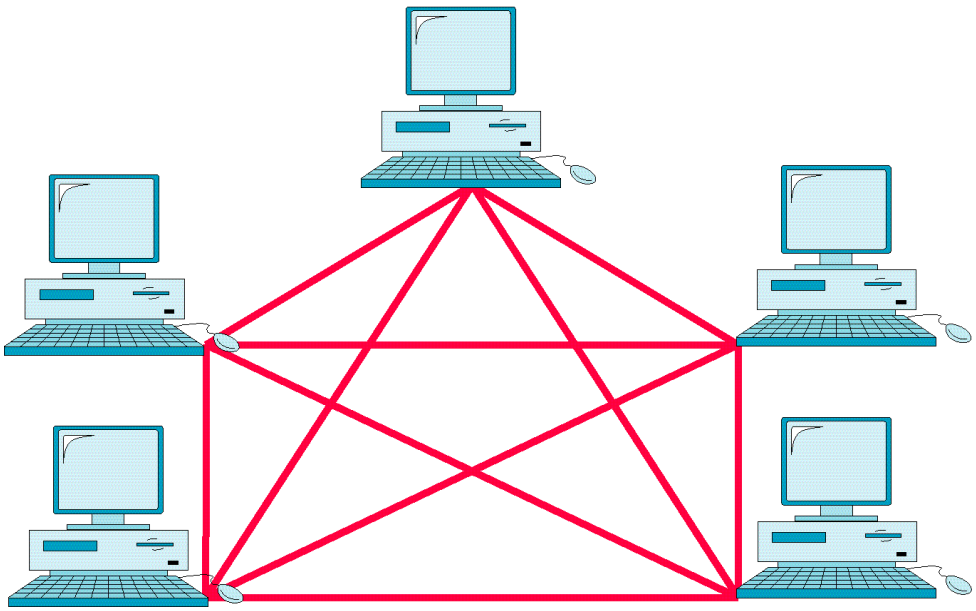
Line Configuration: multipoint



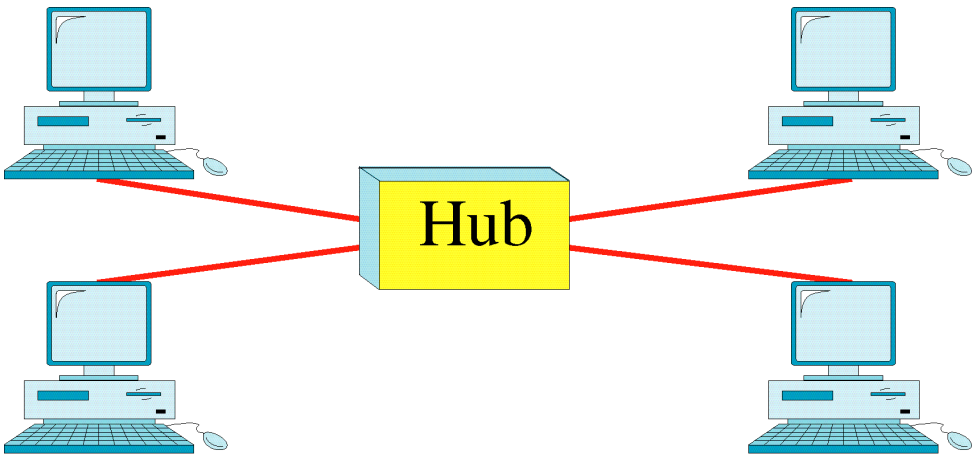
Concepts: Topology

- Mesh
- Star
- Tree
- Bus
- Ring

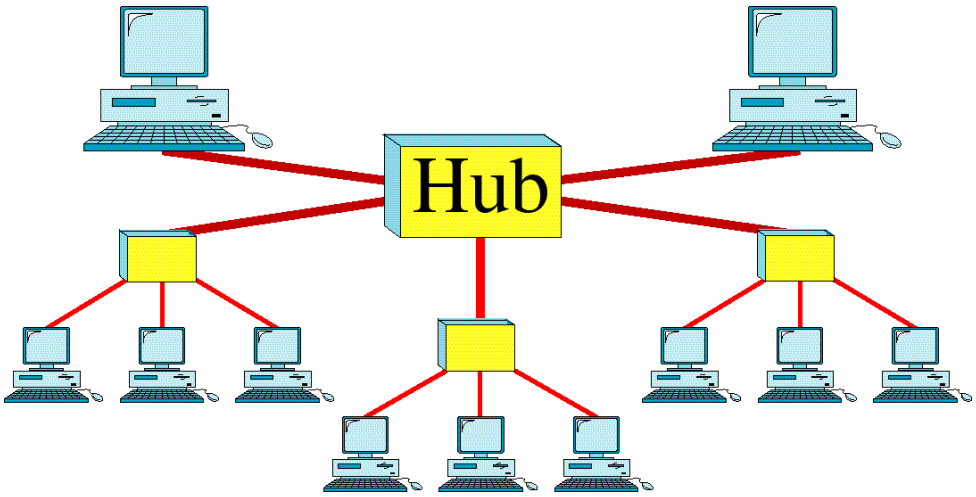
Mesh Topology (fully connected)



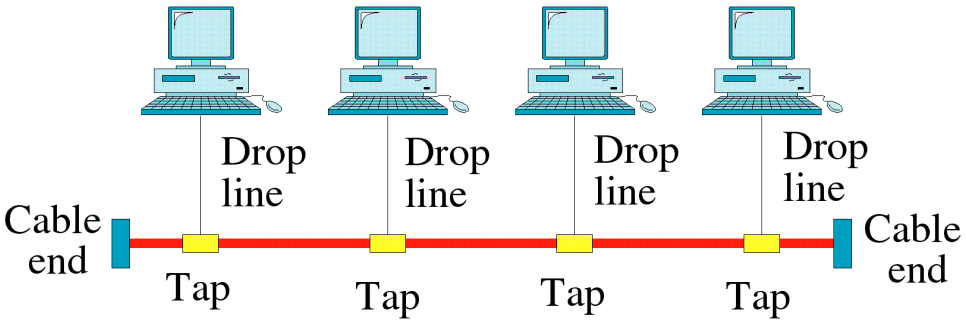
Star Topology



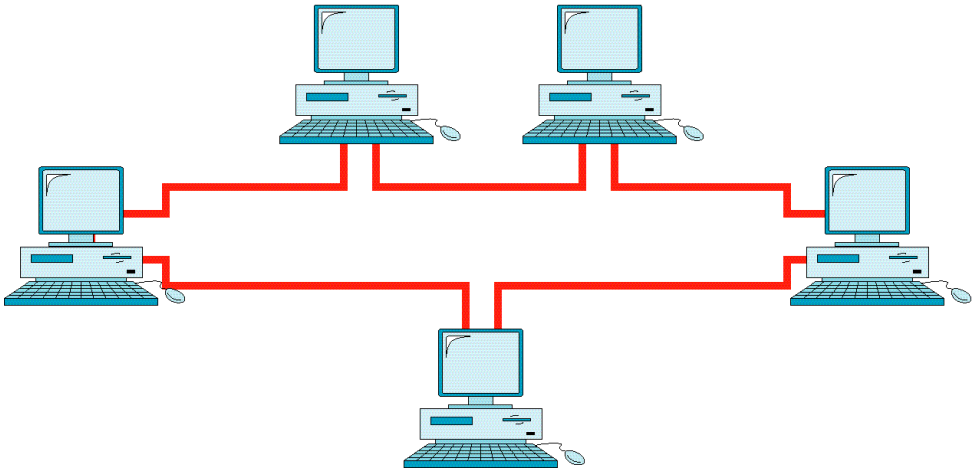
Tree Topology (active/passive)



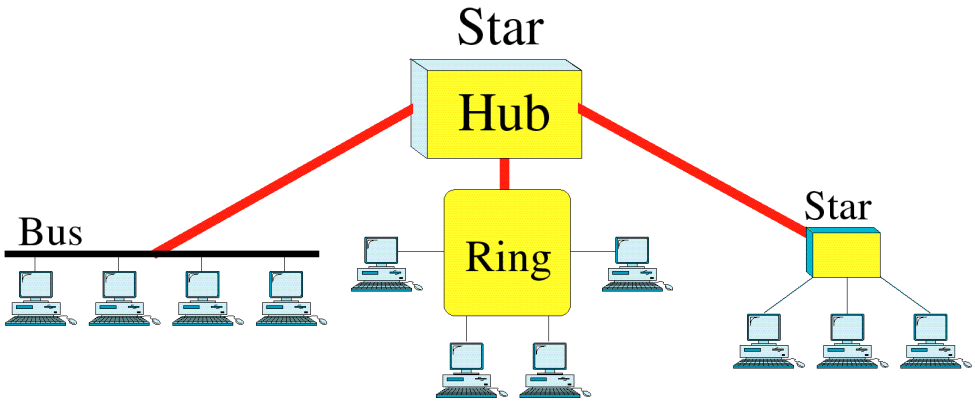
Bus Topology



Ring Topology



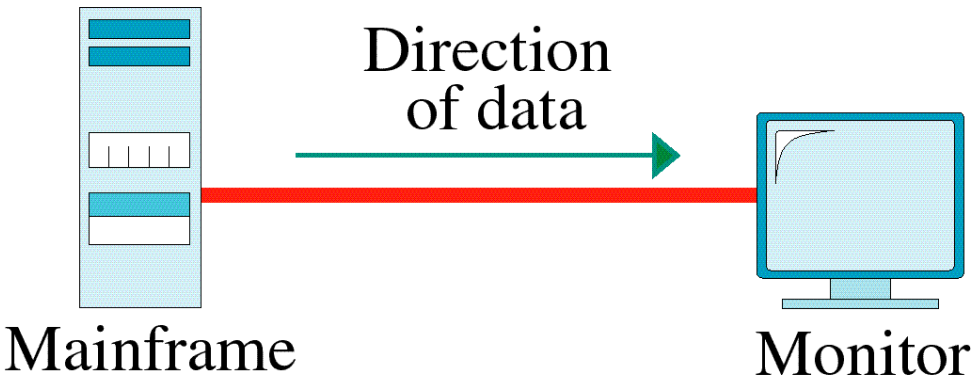
Hybrid Topologies



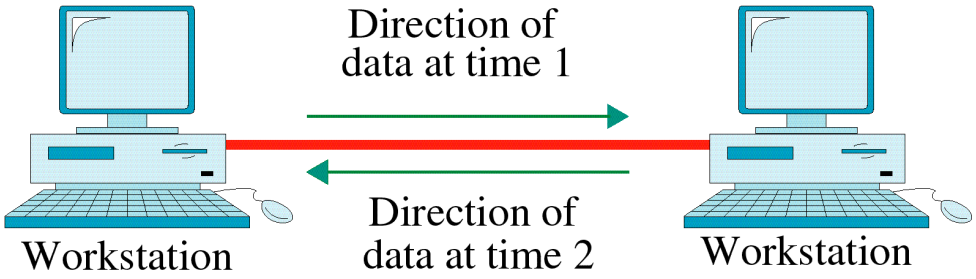
Concepts: Transmission Mode

- Simplex
- Half-duplex
- Full-duplex

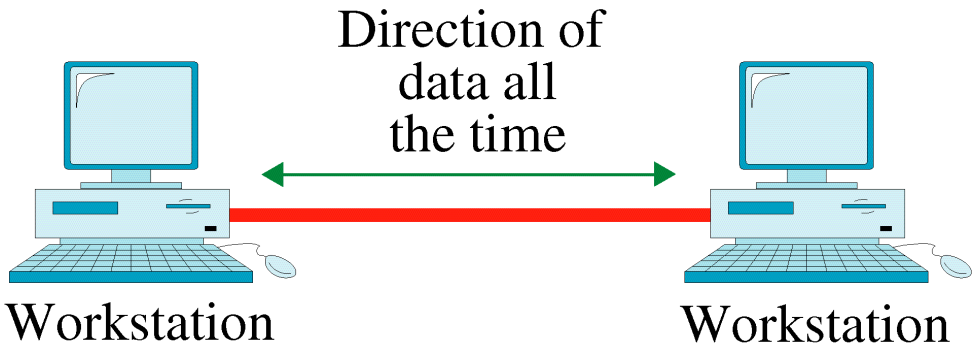
Transmission Mode: Simplex



Transmission Mode: Half-duplex



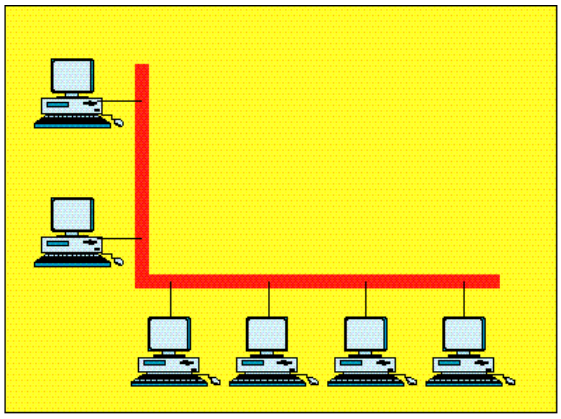
Transmission Mode: Full-duplex



Network Categories

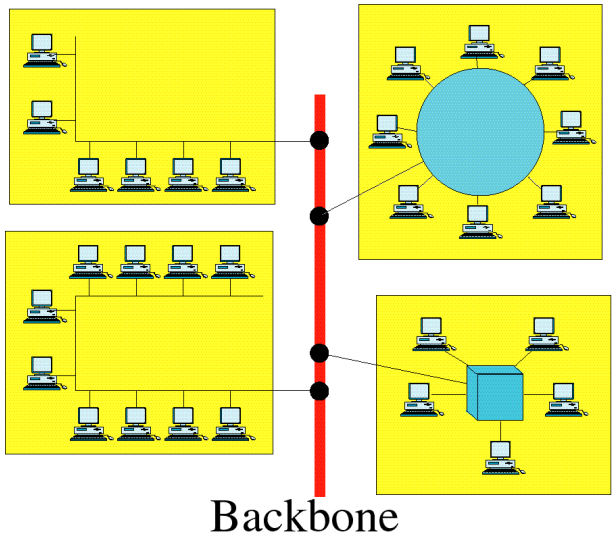
- Local Area Network
- Metropolitan Area Network
- Wide Area Network

LAN



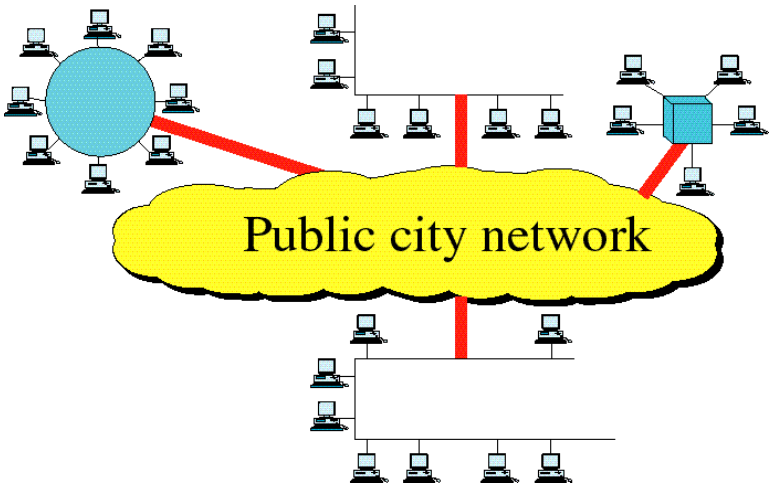
Single building LAN

LAN

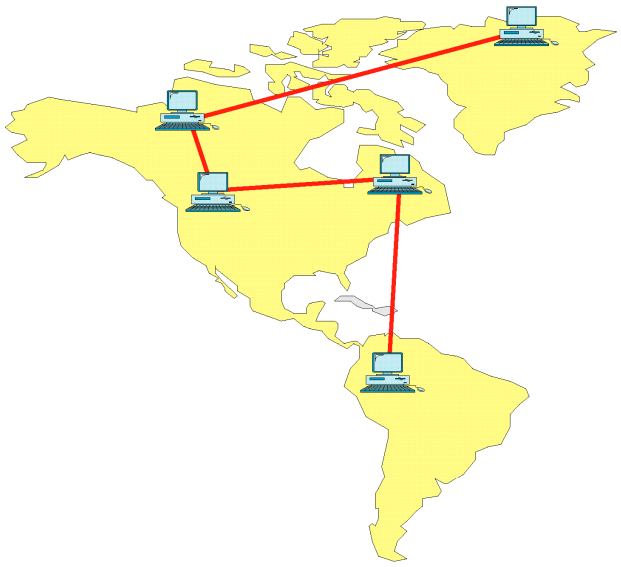


Multiple building LAN

MAN



WAN



Internetworks (internets)