ICT4255-Data Communication and Networks

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William Stallings
Data and Computer Communications
7th Edition

Chapter 1
Data Communications and Networks Overview

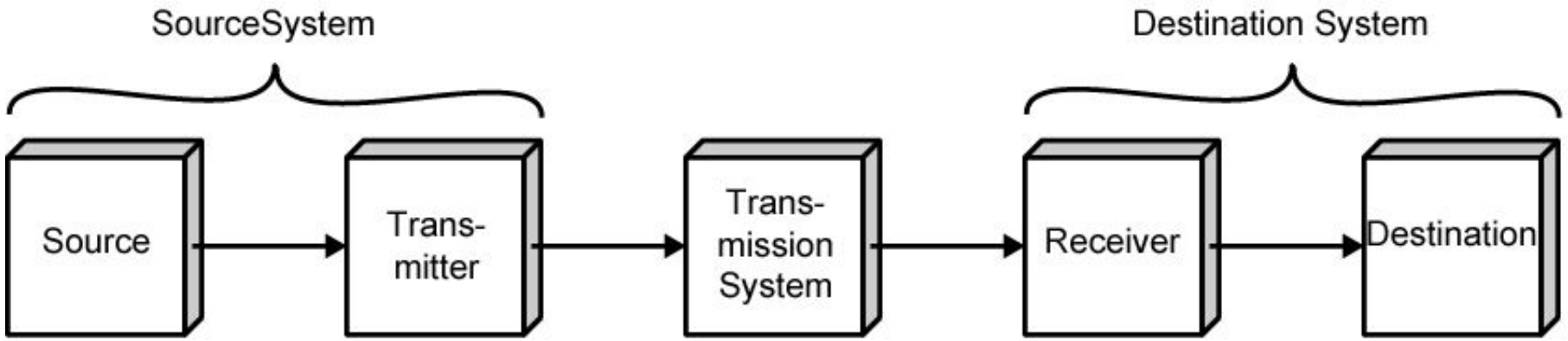
A Communications Model

- Source
  - generates data to be transmitted
- Transmitter
  - Converts data into transmittable signals
- Transmission System
  - Carries data
- Receiver
  - Converts received signal into data
- Destination
  - Takes incoming data

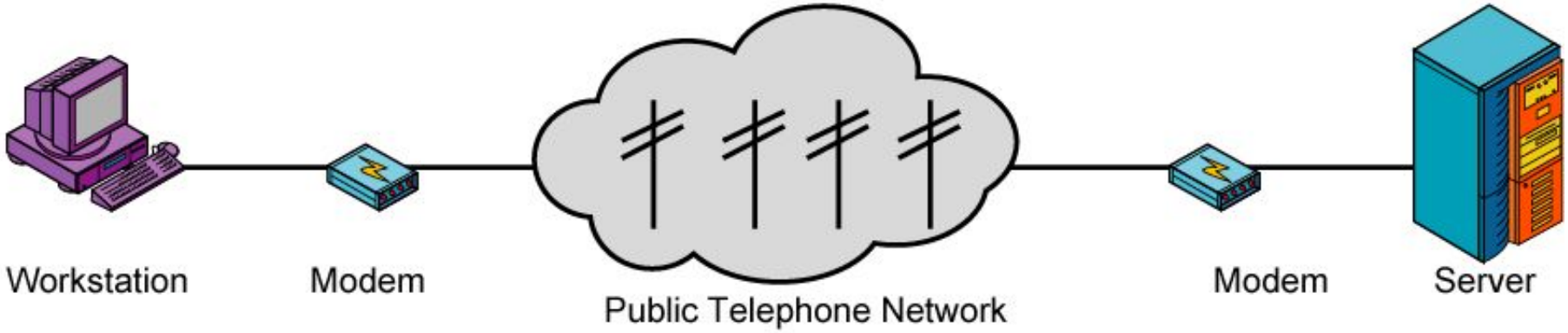
Communications Tasks

Transmission system utilization	Addressing
Interfacing	Routing
Signal generation	Recovery
Synchronization	Message formatting
Exchange management	Security
Error detection and correction	Network management
Flow control	

Simplified Communications Model - Diagram

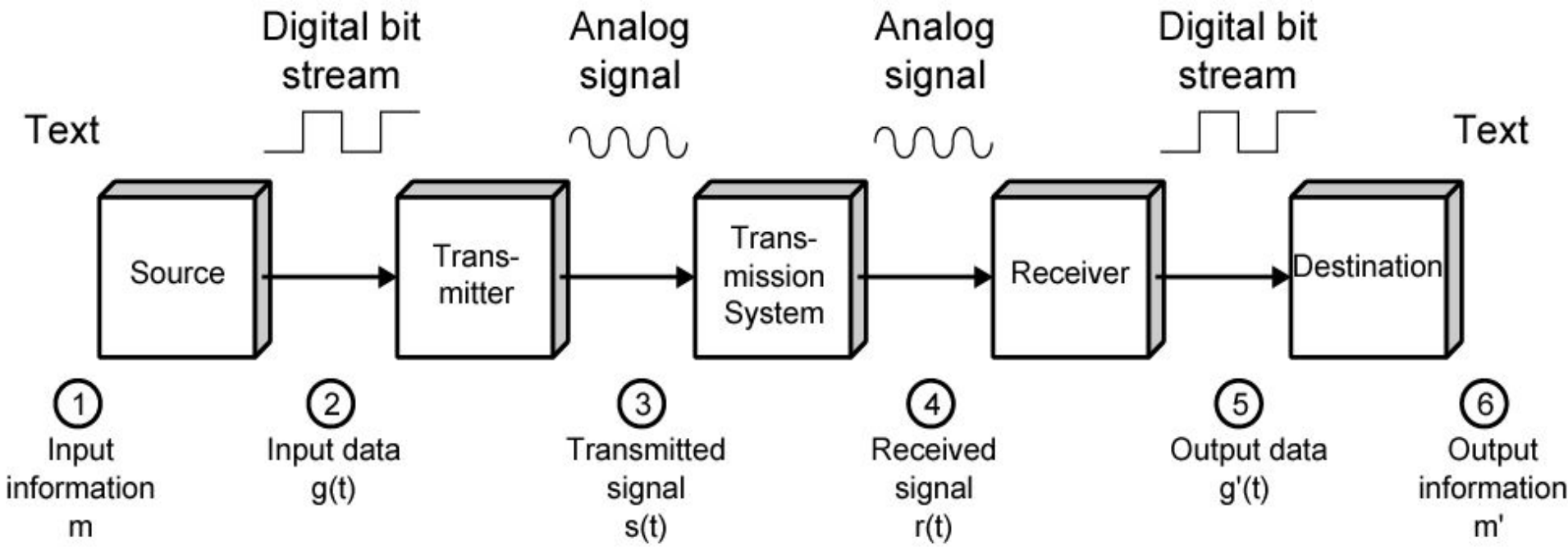


(a) General block diagram



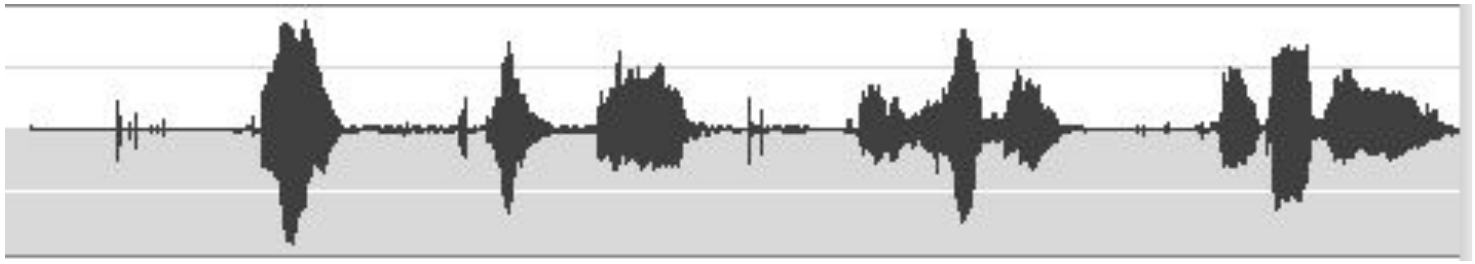
(b) Example

Simplified Data Communications Model

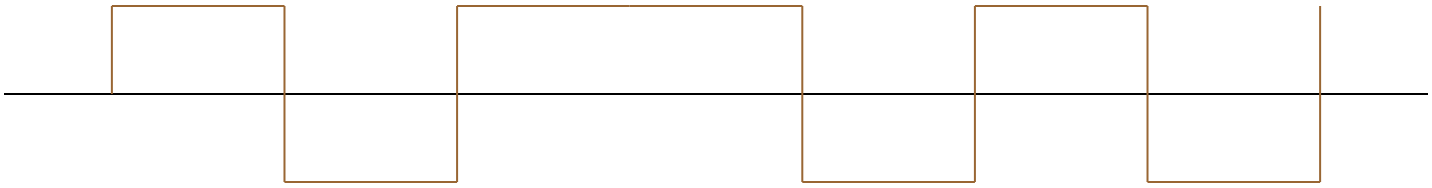


Analog and Digital Signals

- Analog - voice

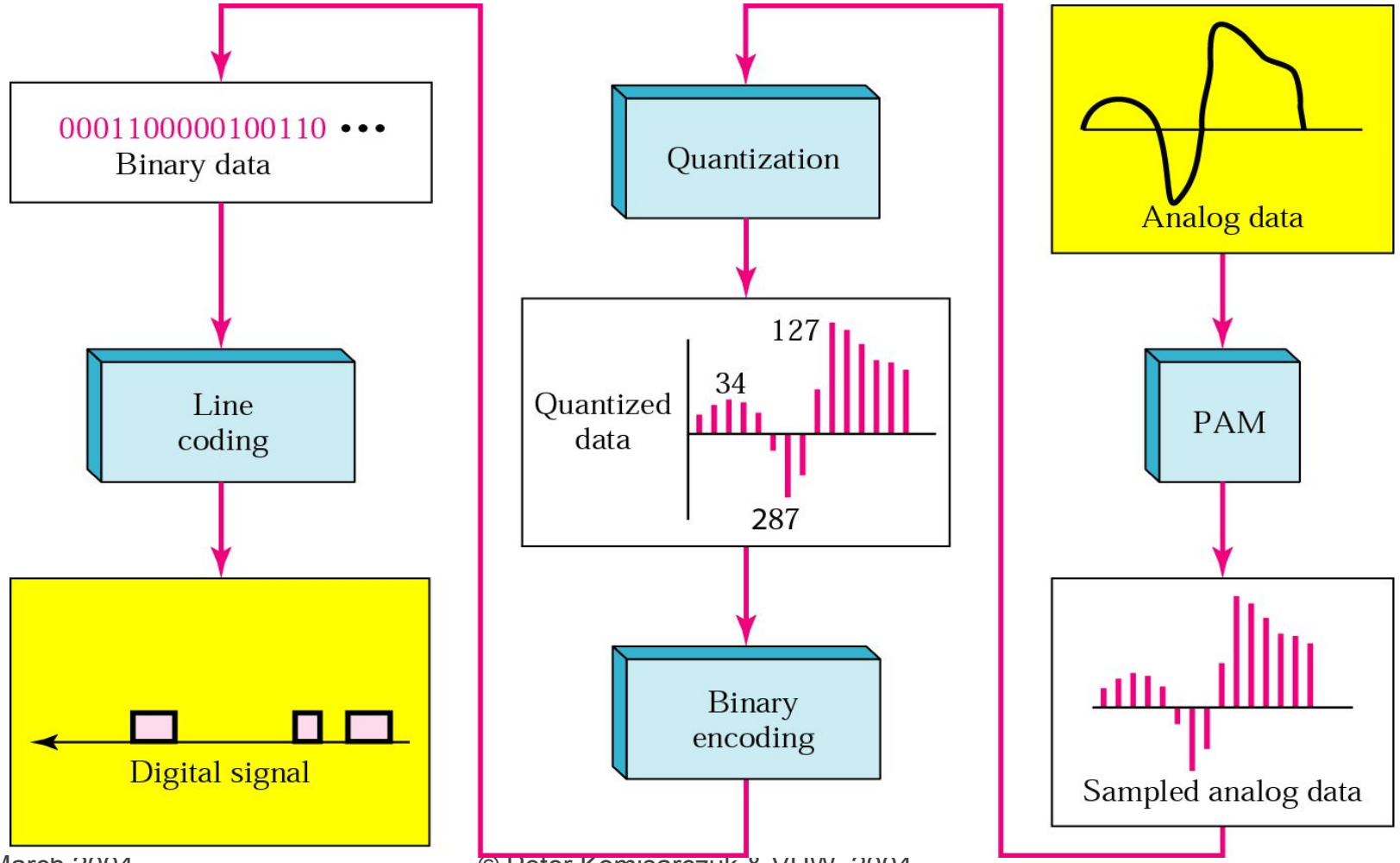


- Digital – computer oriented data

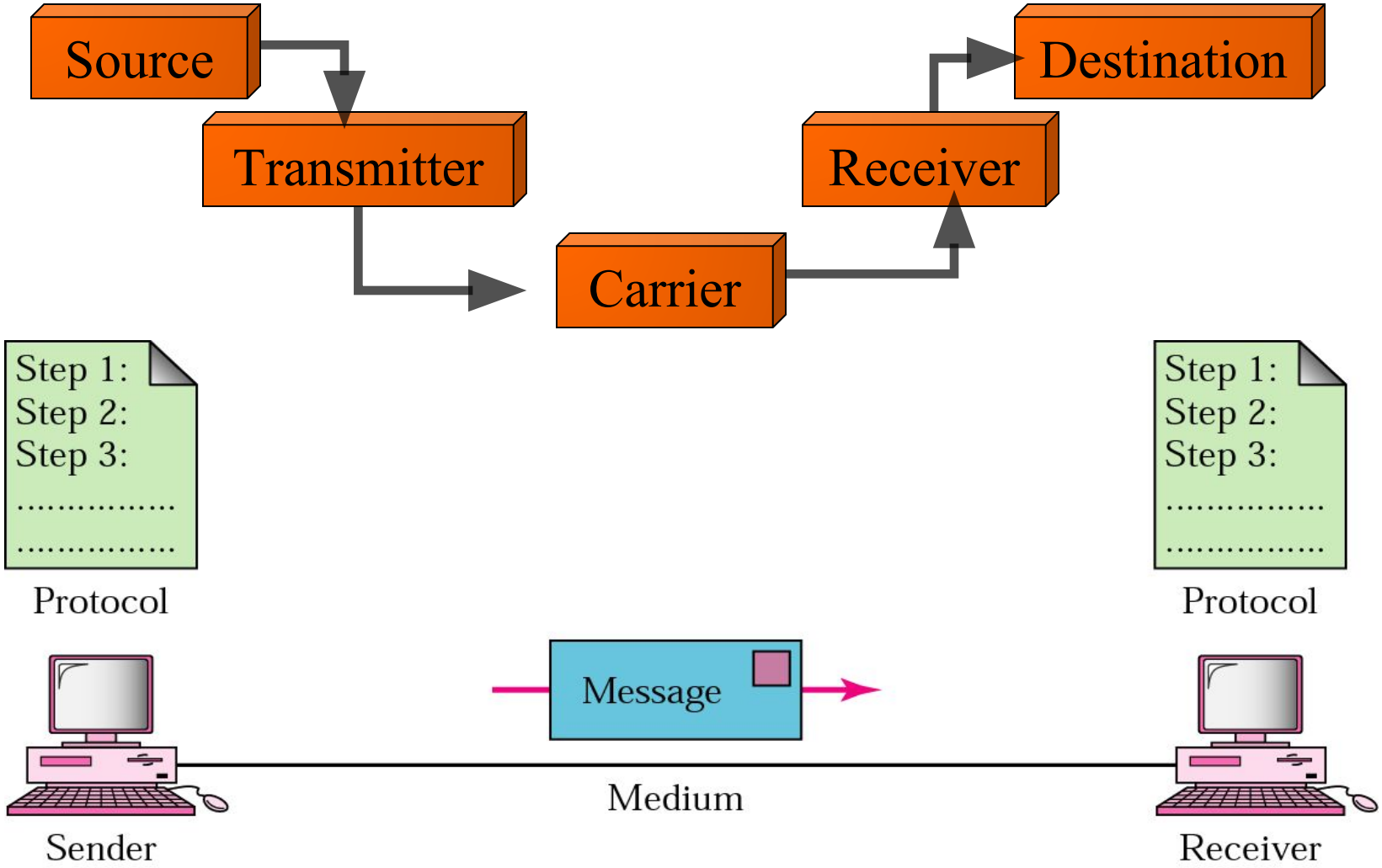


Analog to Digital? How's it done?

- Forouzan –Chapter 4.2

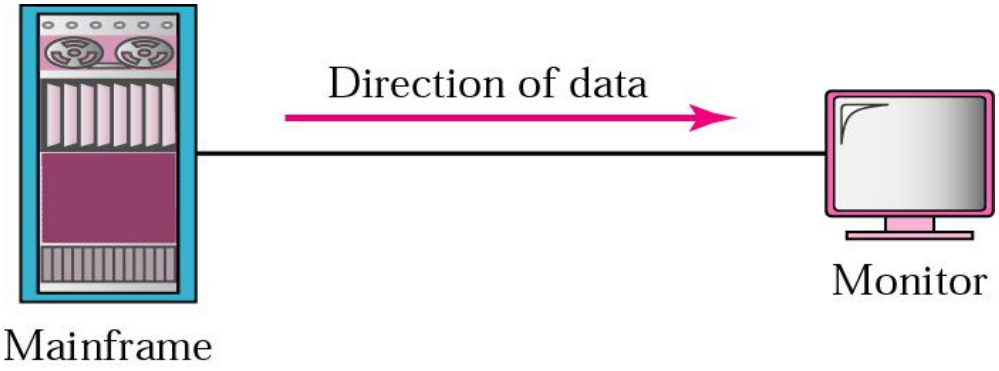


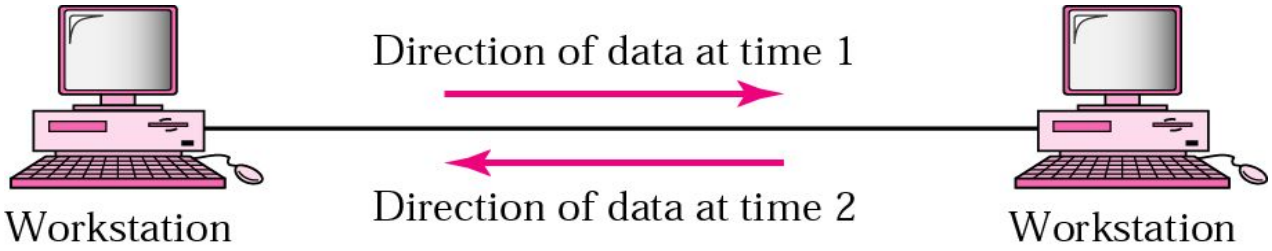
A Network Model



Transmission Modes

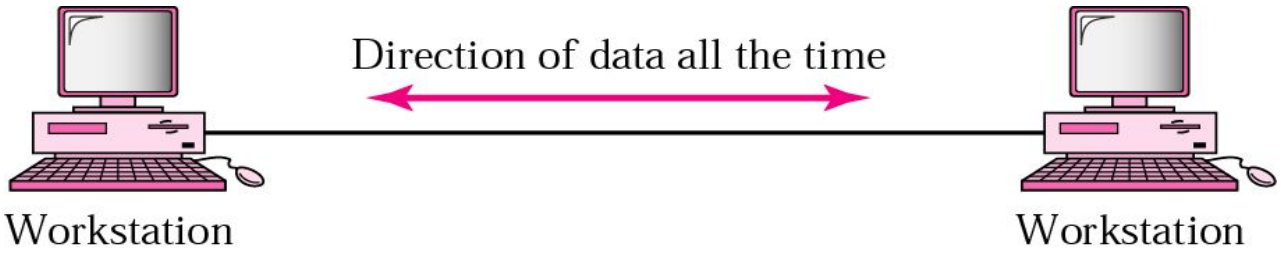
Simplex





Half Duplex

Full Duplex



Encoding Data: The Telegraph Network

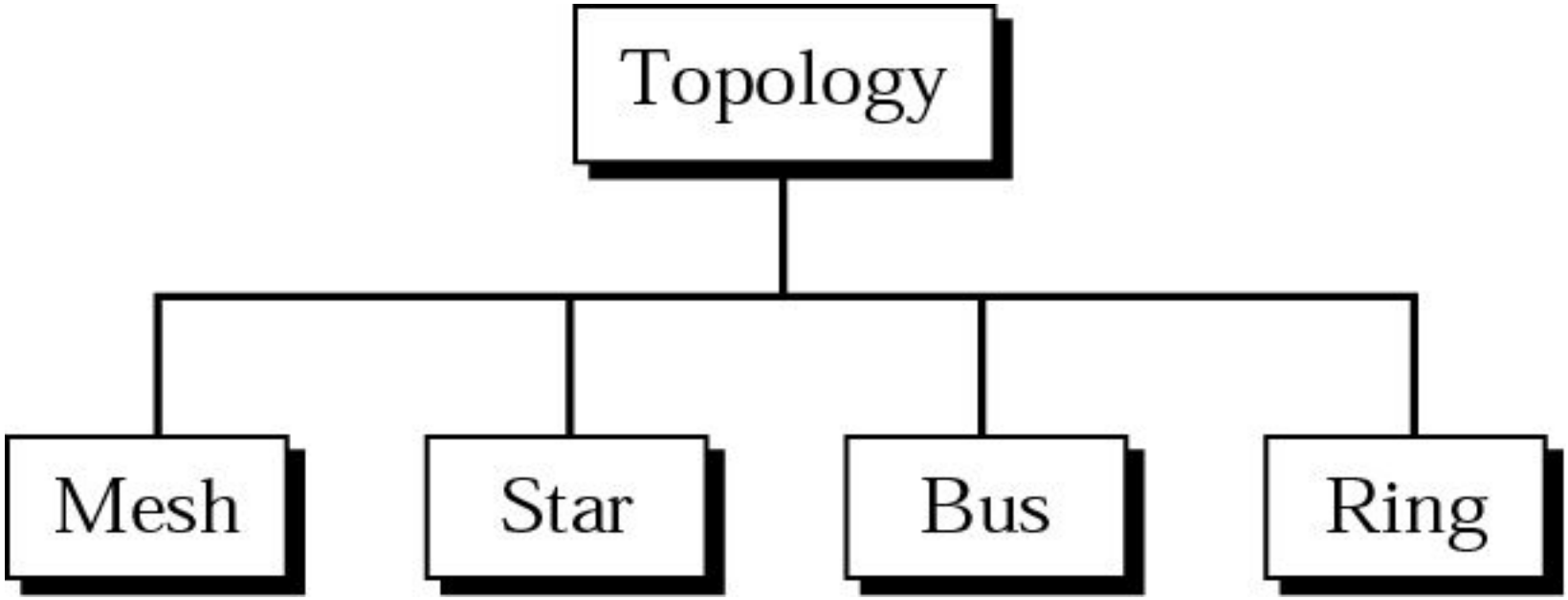
- Point to point
- Relayed (switched) by operator
- Protocol
  - The DOT is the Basic UNIT of Length (sometimes called a DIT).
  - The DASH (DAH) is equal in length to three DOTS.
  - The space between the DOTS and DASHS within a character (letter) is equal to one DOT.
  - The space between characters (letters) in a word is equal to three DOTS.
  - The space between words is equal to seven DOTS.

Networks

- How do we categorise?
  - Topology, geography
  - Technology
- Geographic
  - Wide area networks
  - Metropolitan networks
  - Local area networks
  - Personal networks
- Technologies
  - Circuit switched
  - Packet switched

Consider the physical topology

Topology Types:

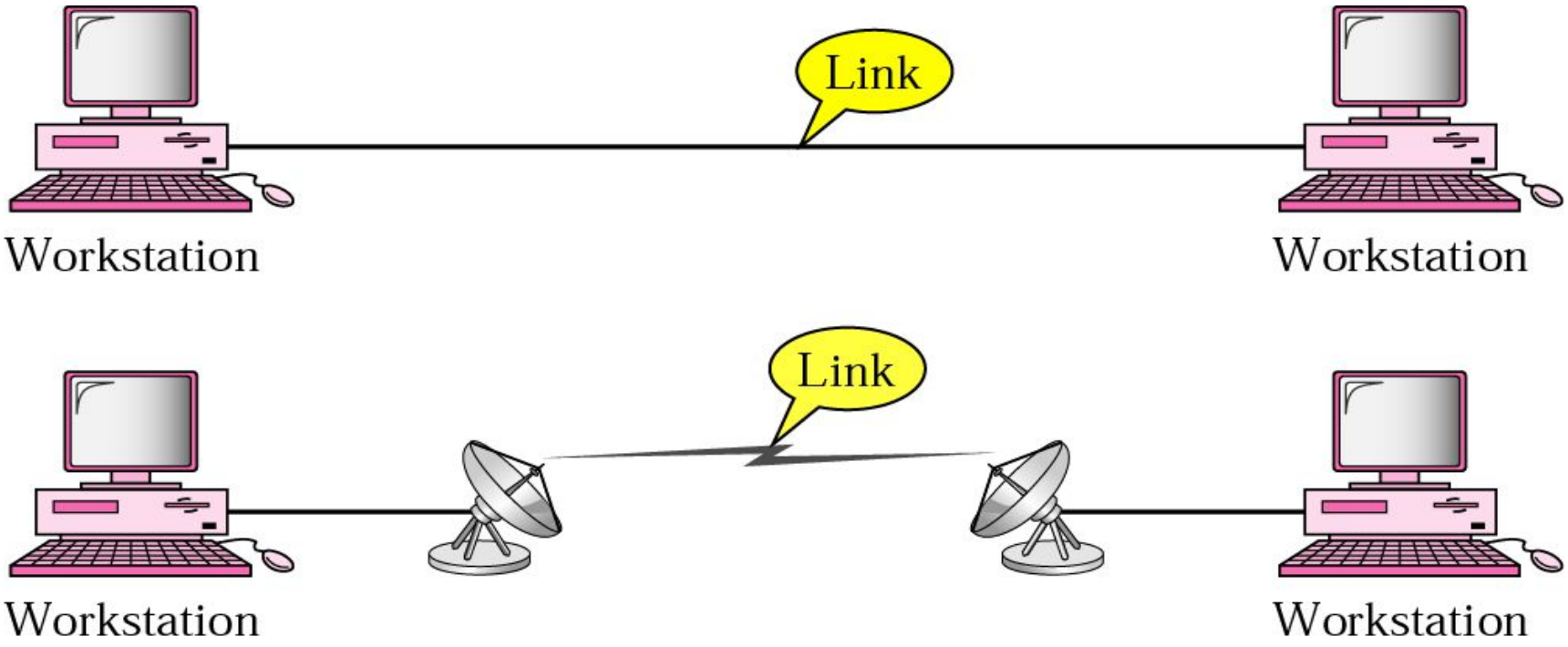


Topology = The map or plan of the network.

The physical topology describes how the wires or cables are laid out, and the logical topology describes how the information flows.

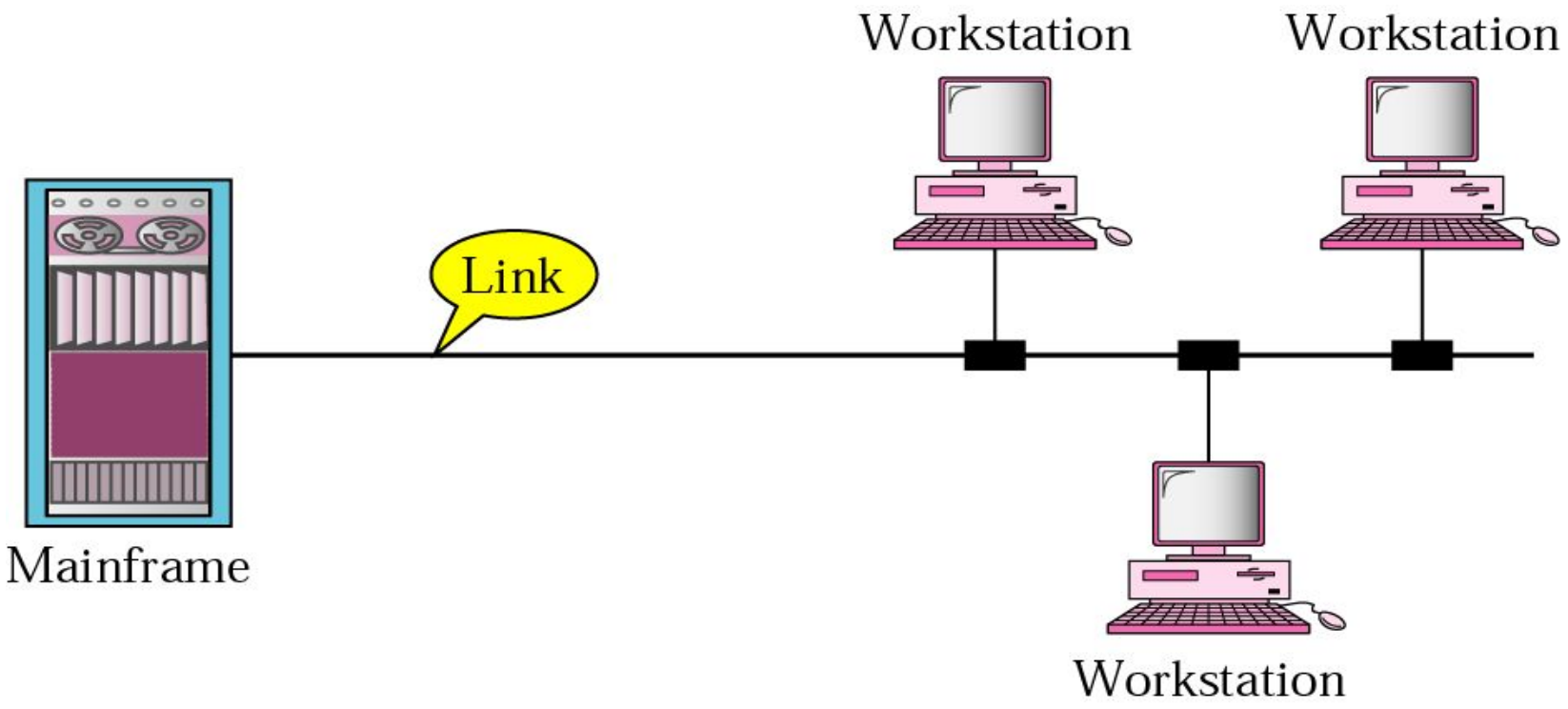
Consider the physical topology

Point-to-Point Connections:

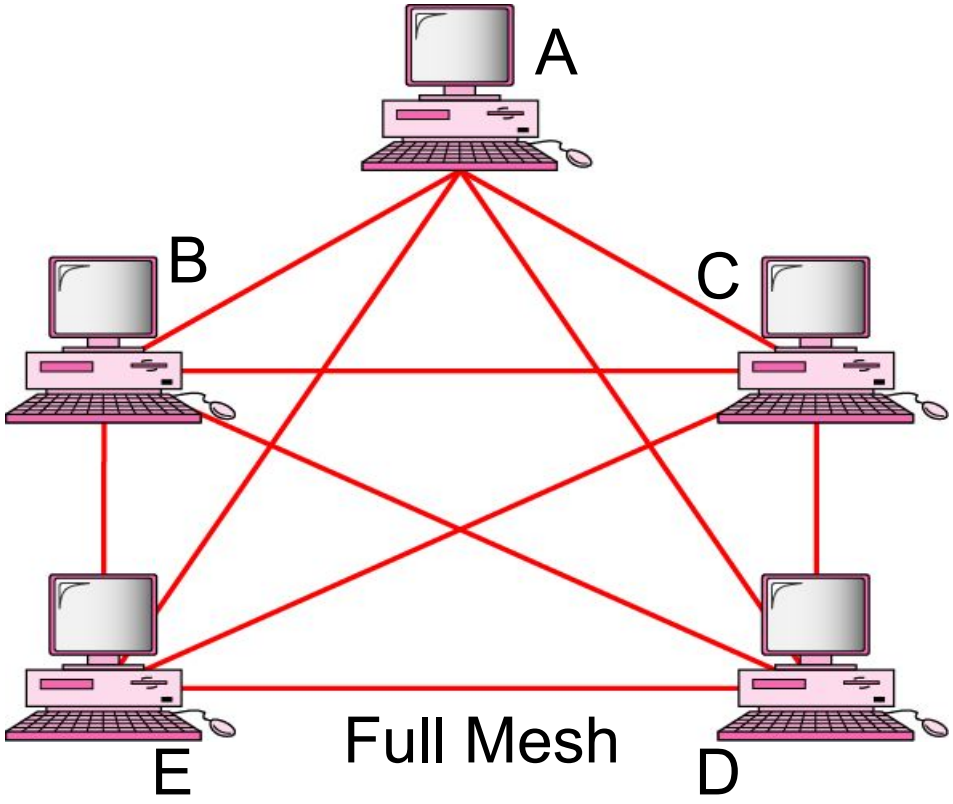


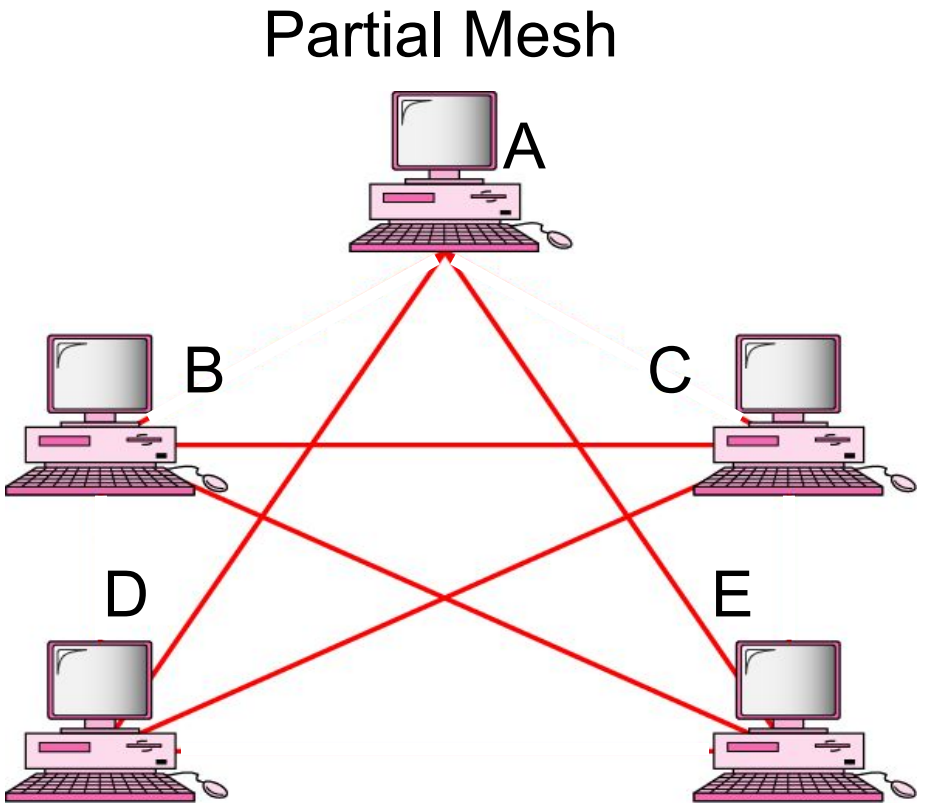
Consider the physical topology

Point-to-Multipoint Connections:

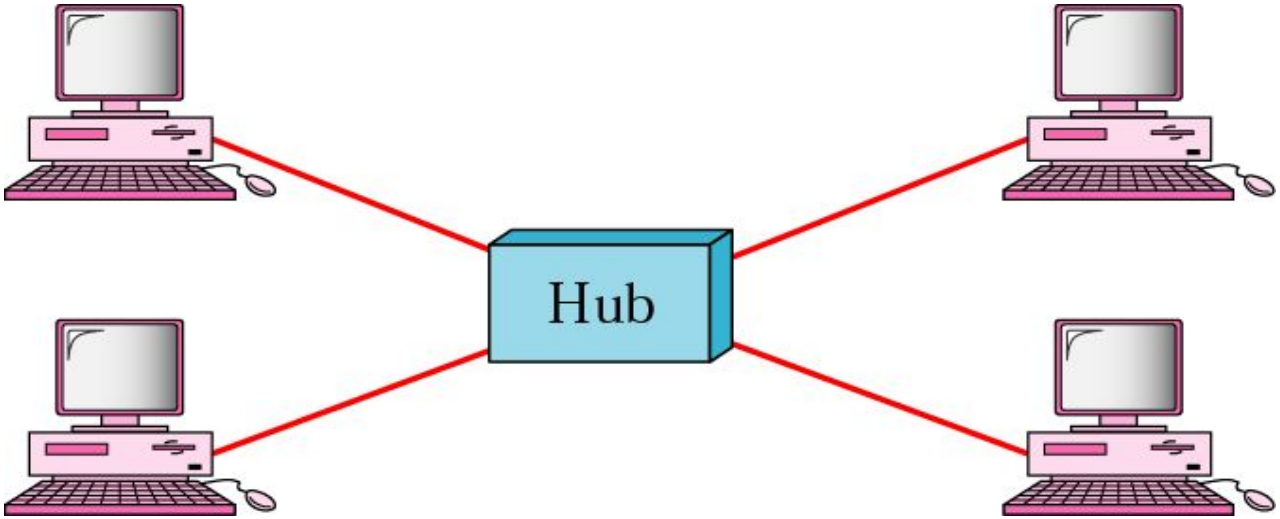


Mesh Networks

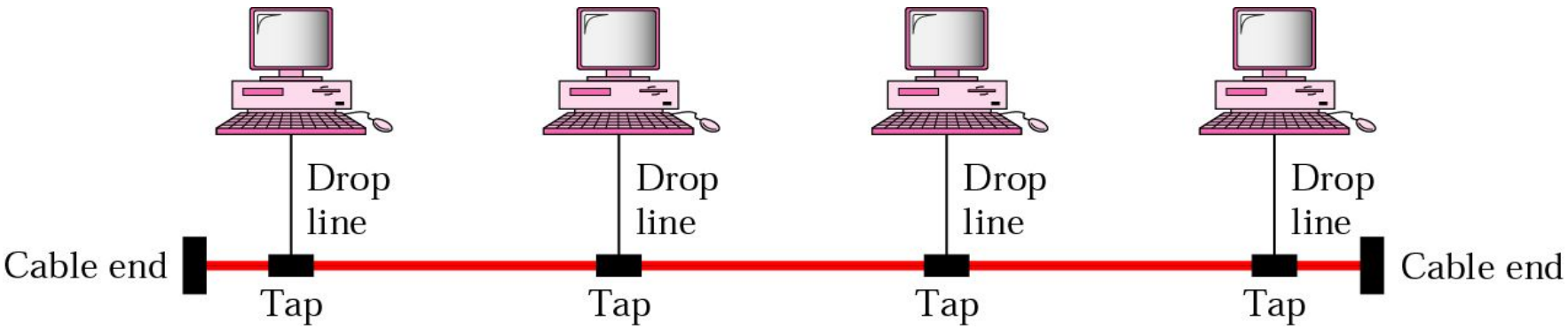




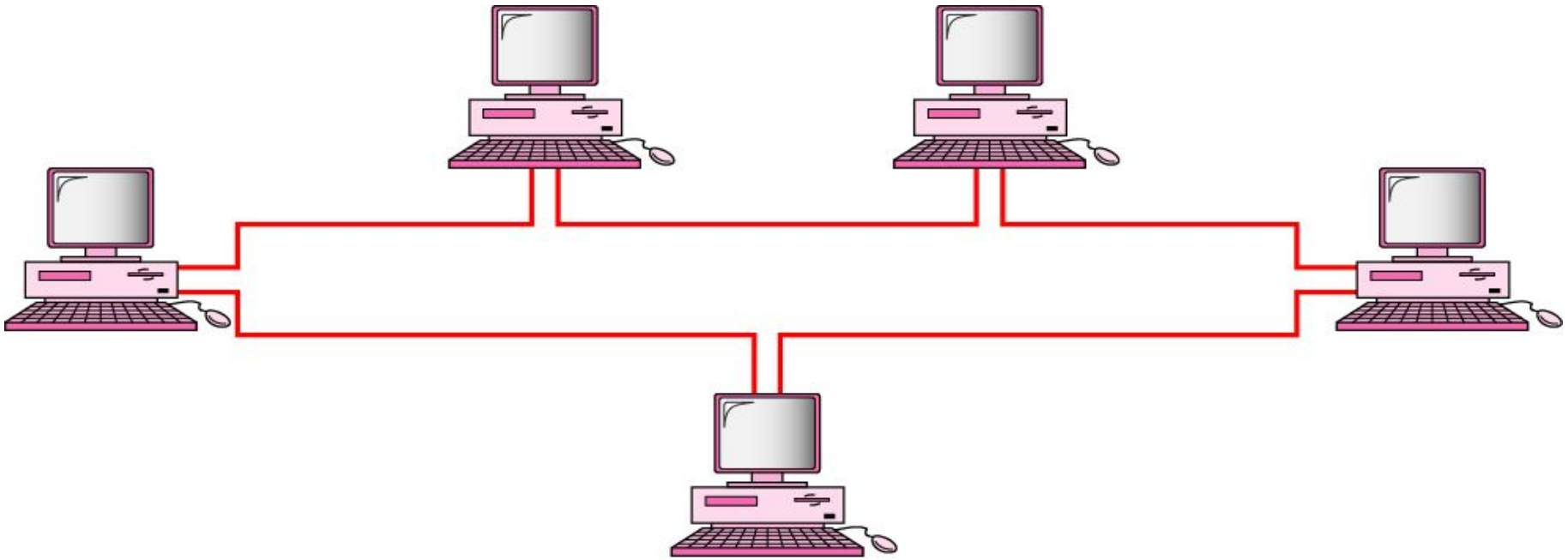
Star Topology



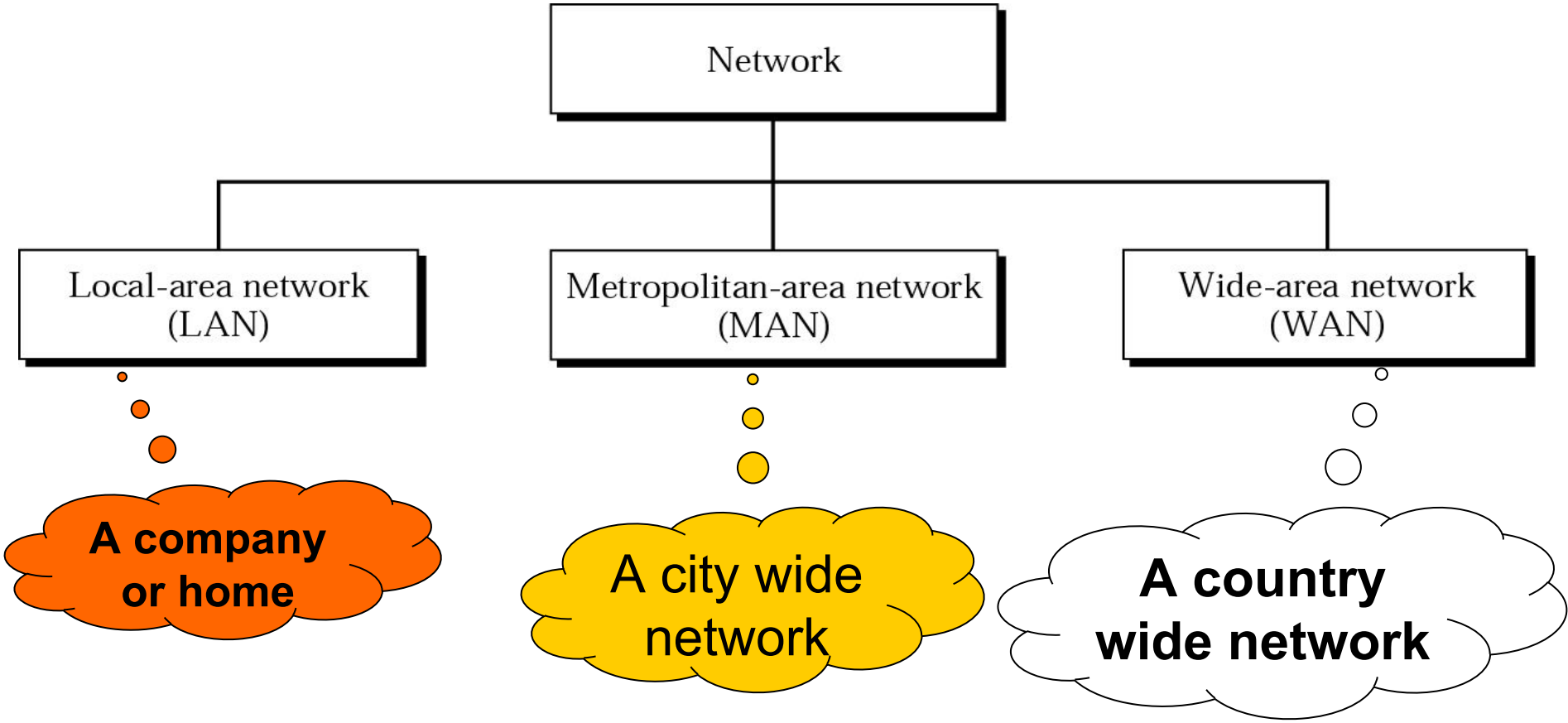
Bus Topology



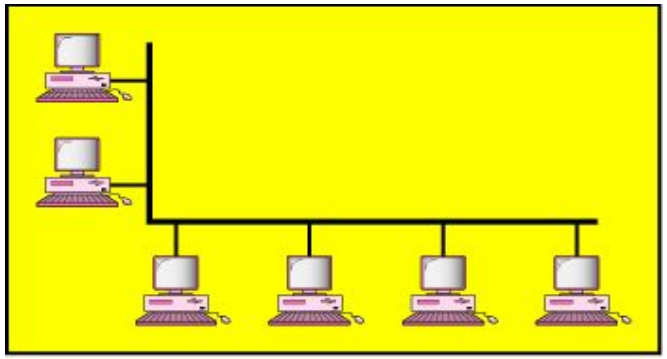
Ring Topology



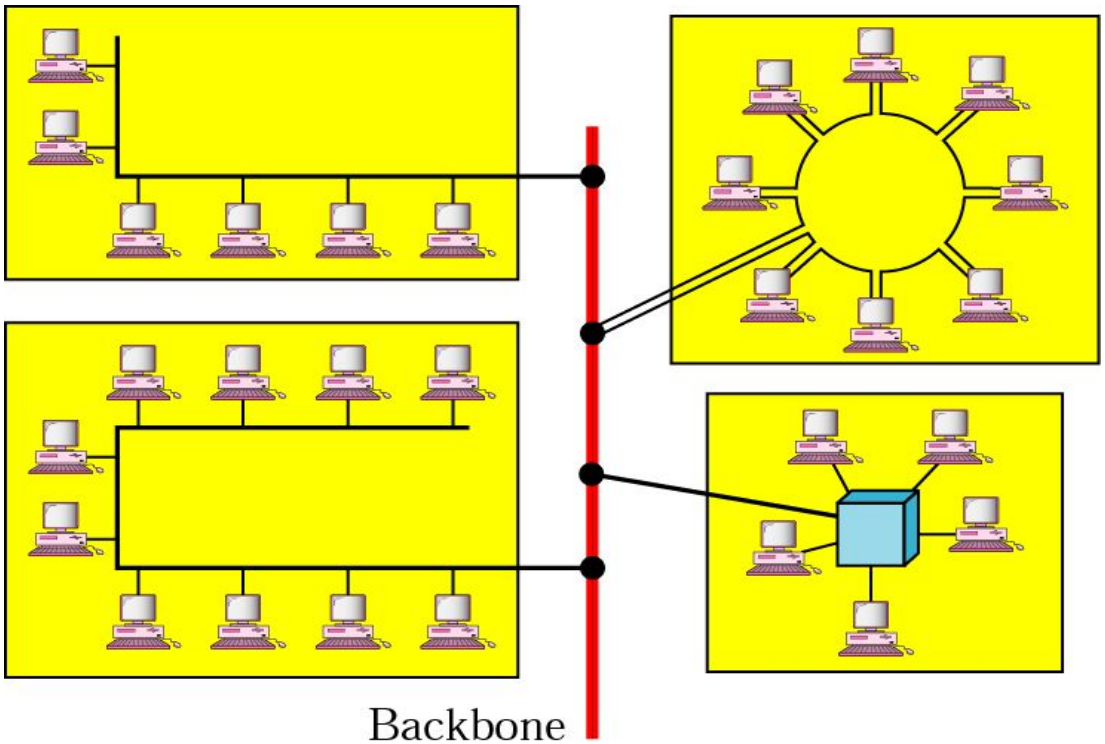
Classification of Networks by Size and Community



Single to Multiple LANs

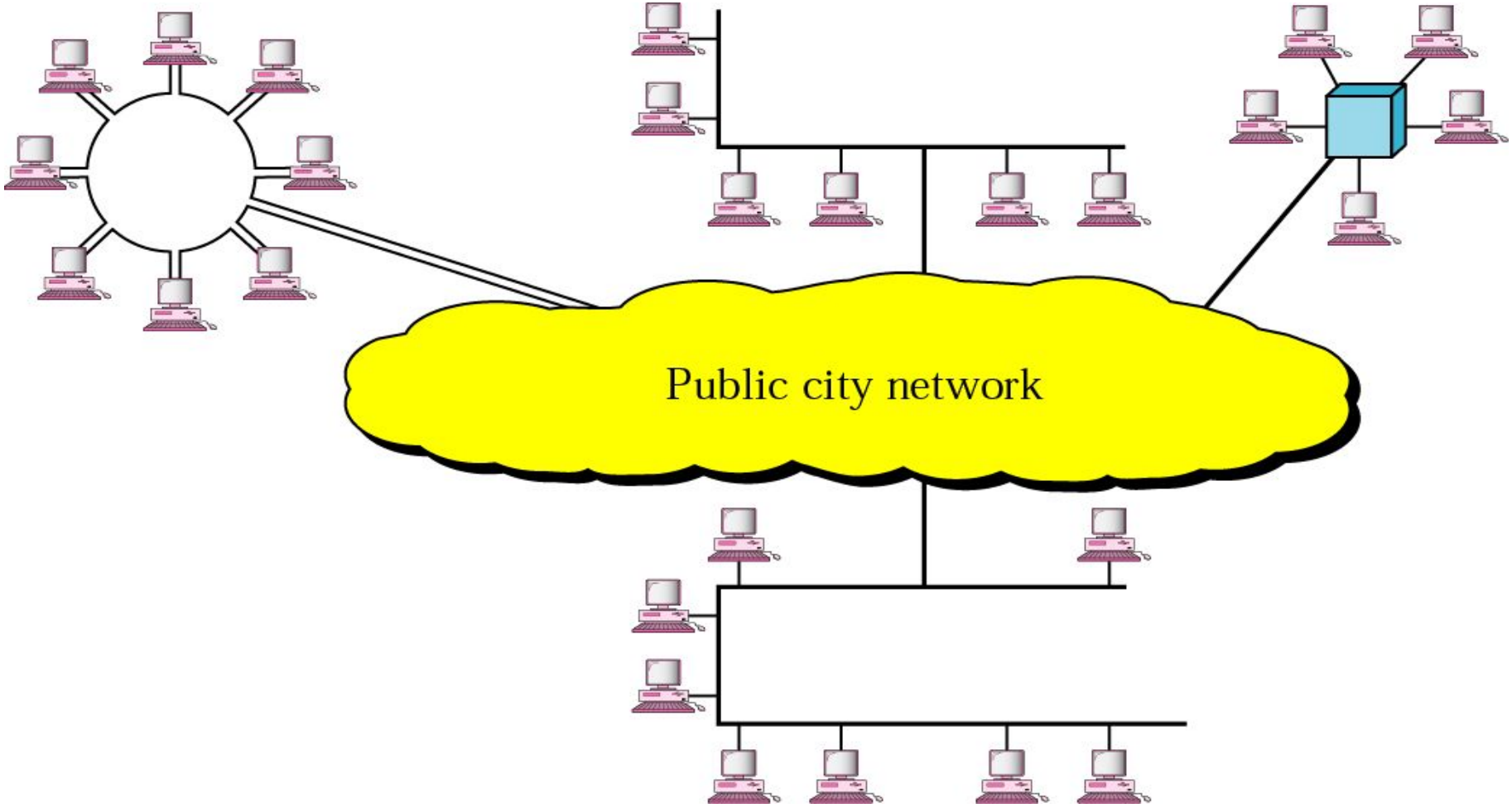


a. Single-building LAN

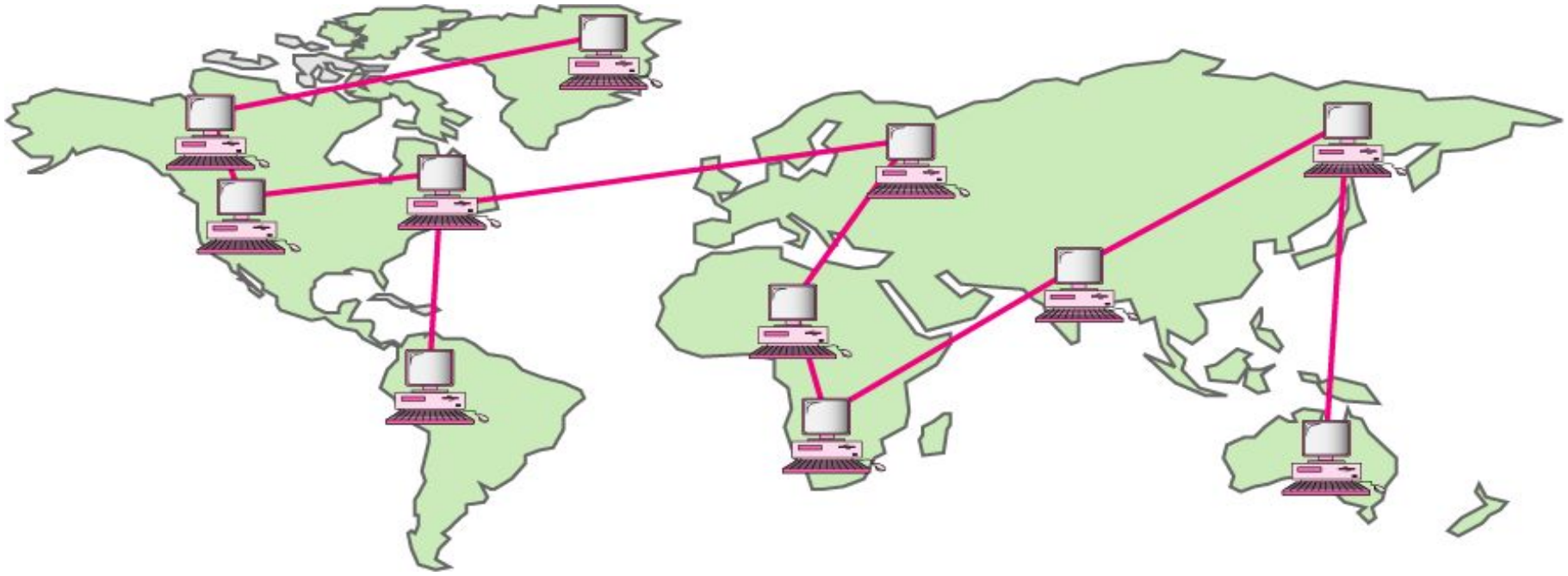


b. Multiple-building LAN

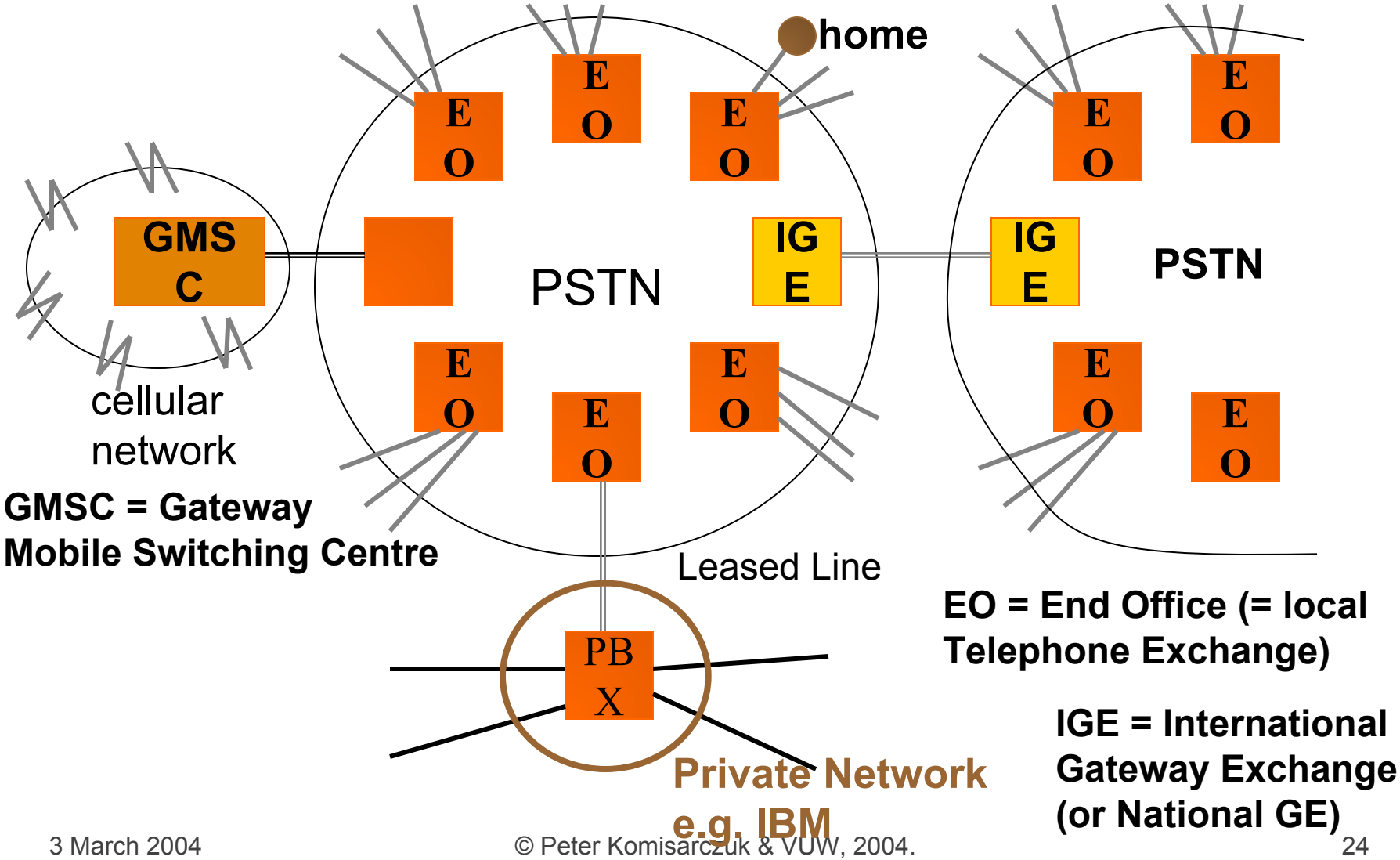
Metropolitan Area Network



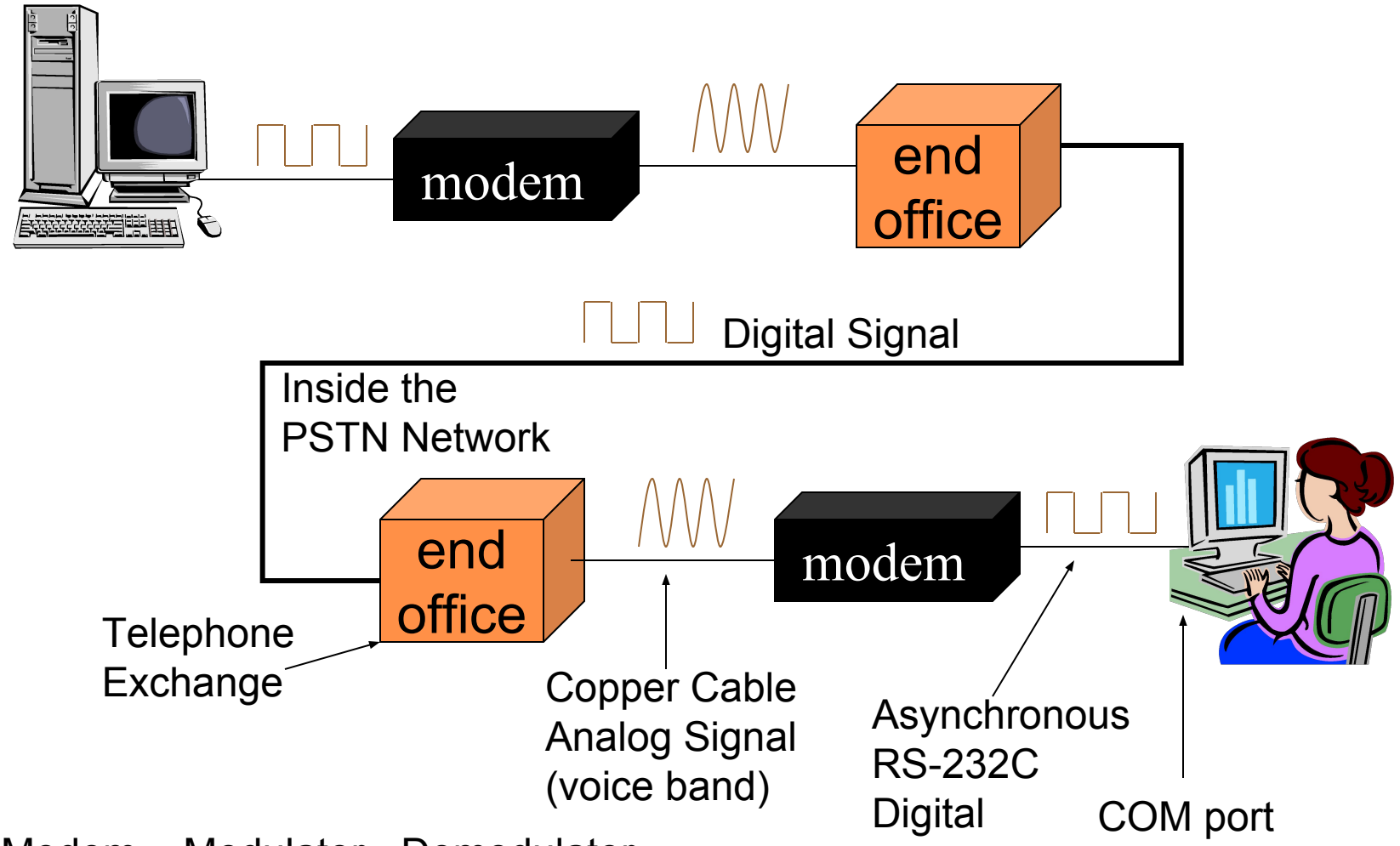
Wide Area Network



The Telephone Network



Example Network



Modem = Modulator - Demodulator

The Internet

Hierarchical Infrastructure

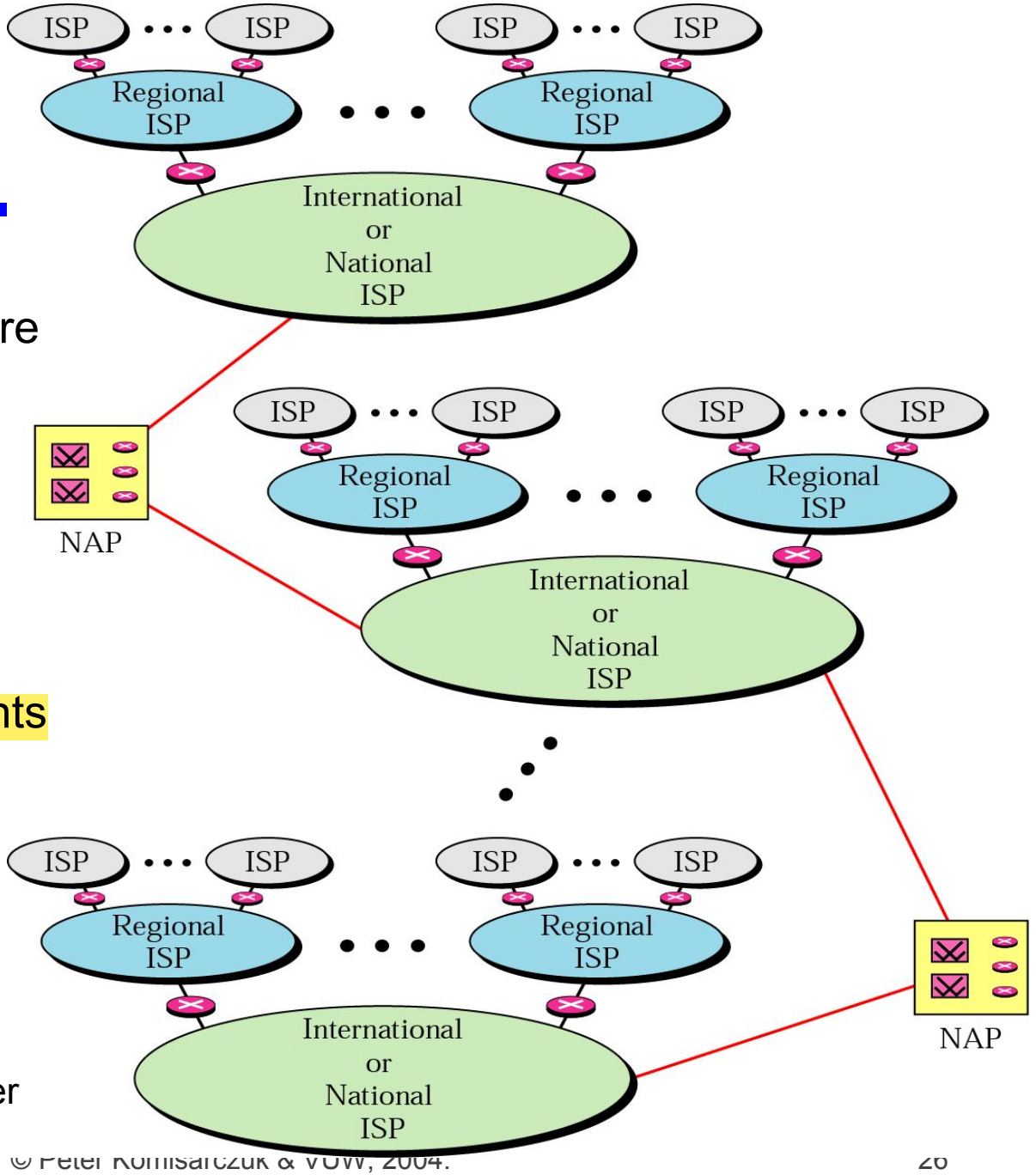
International/National ISPs

Connected by NAP – Network Access Points (also called peering points Or Internet eXchanges)

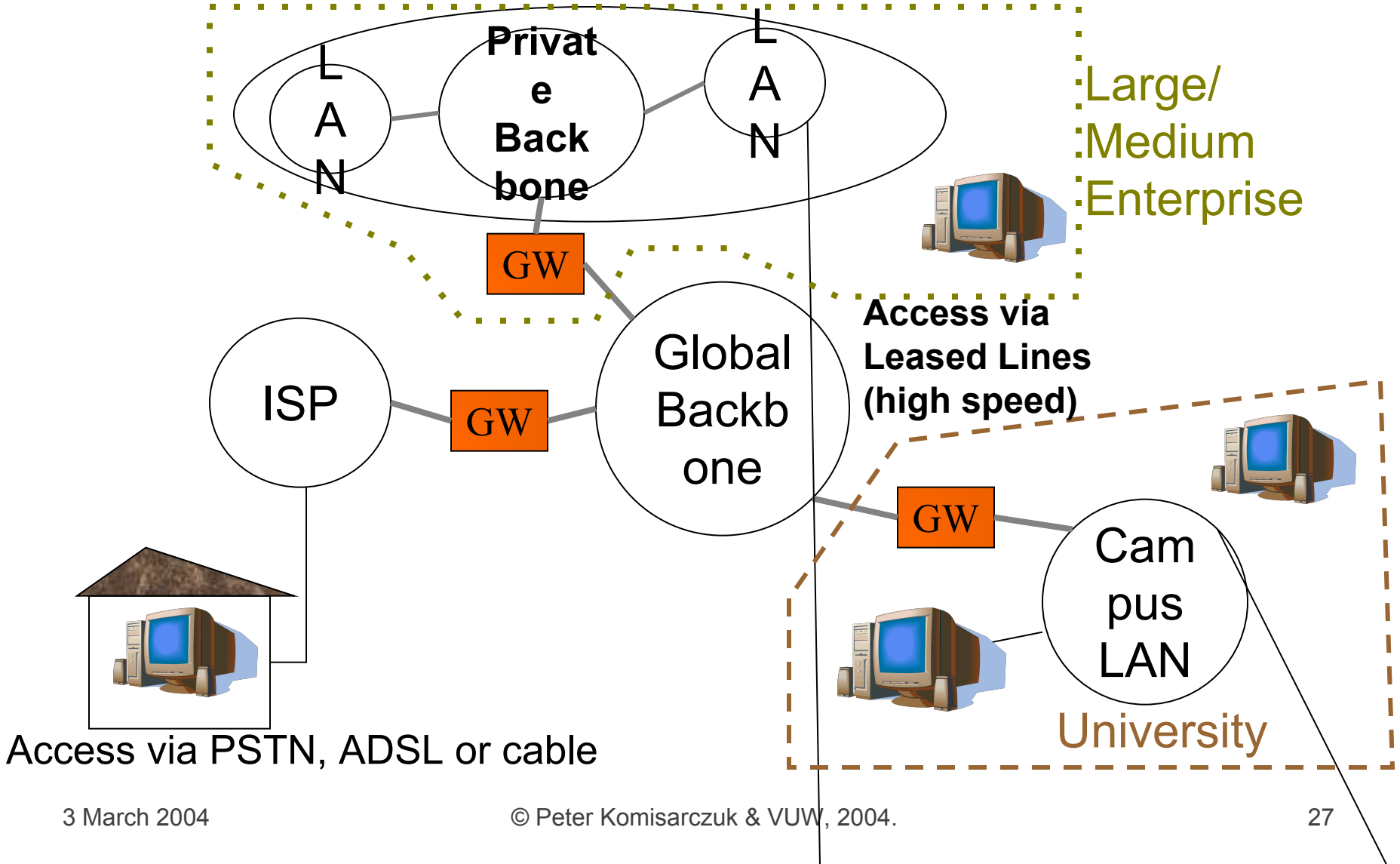
Regional ISP

(Local) ISP

ISP = Internet Service Provider



Internet Connections

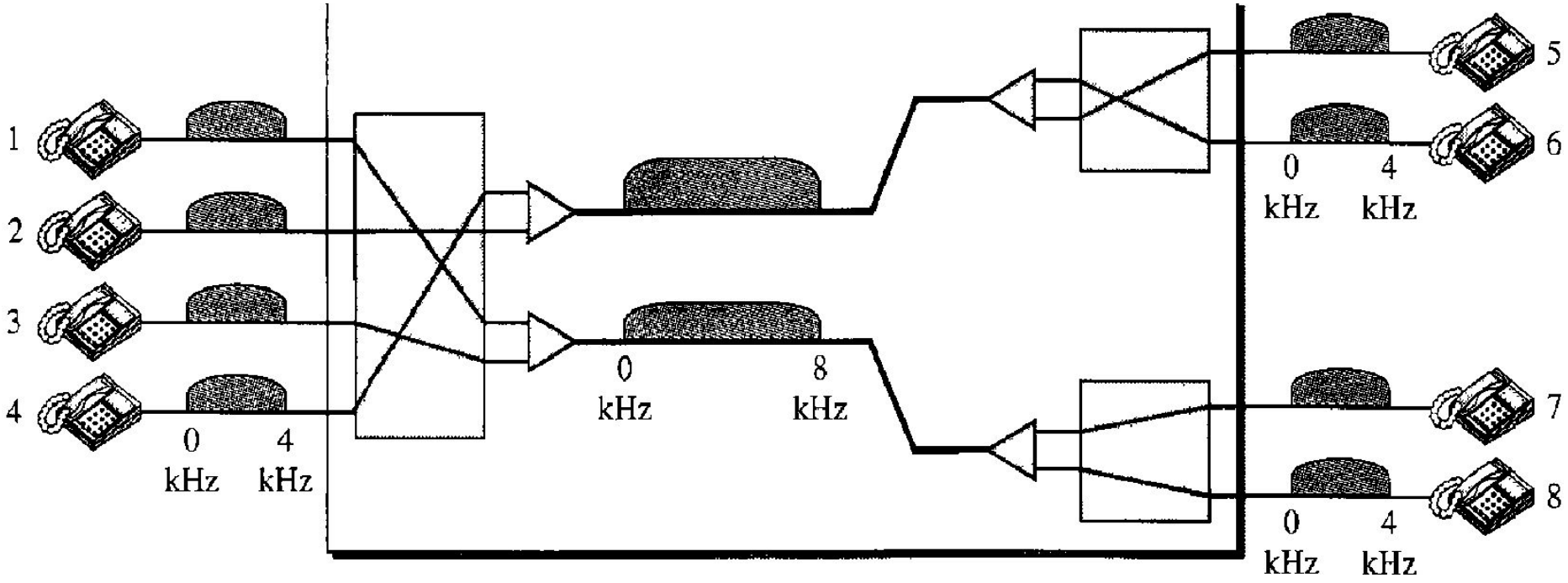


Wide Area Networks

- Large geographical area
- Alternative technologies
  - Circuit switching
  - Packet switching

Circuit Switching

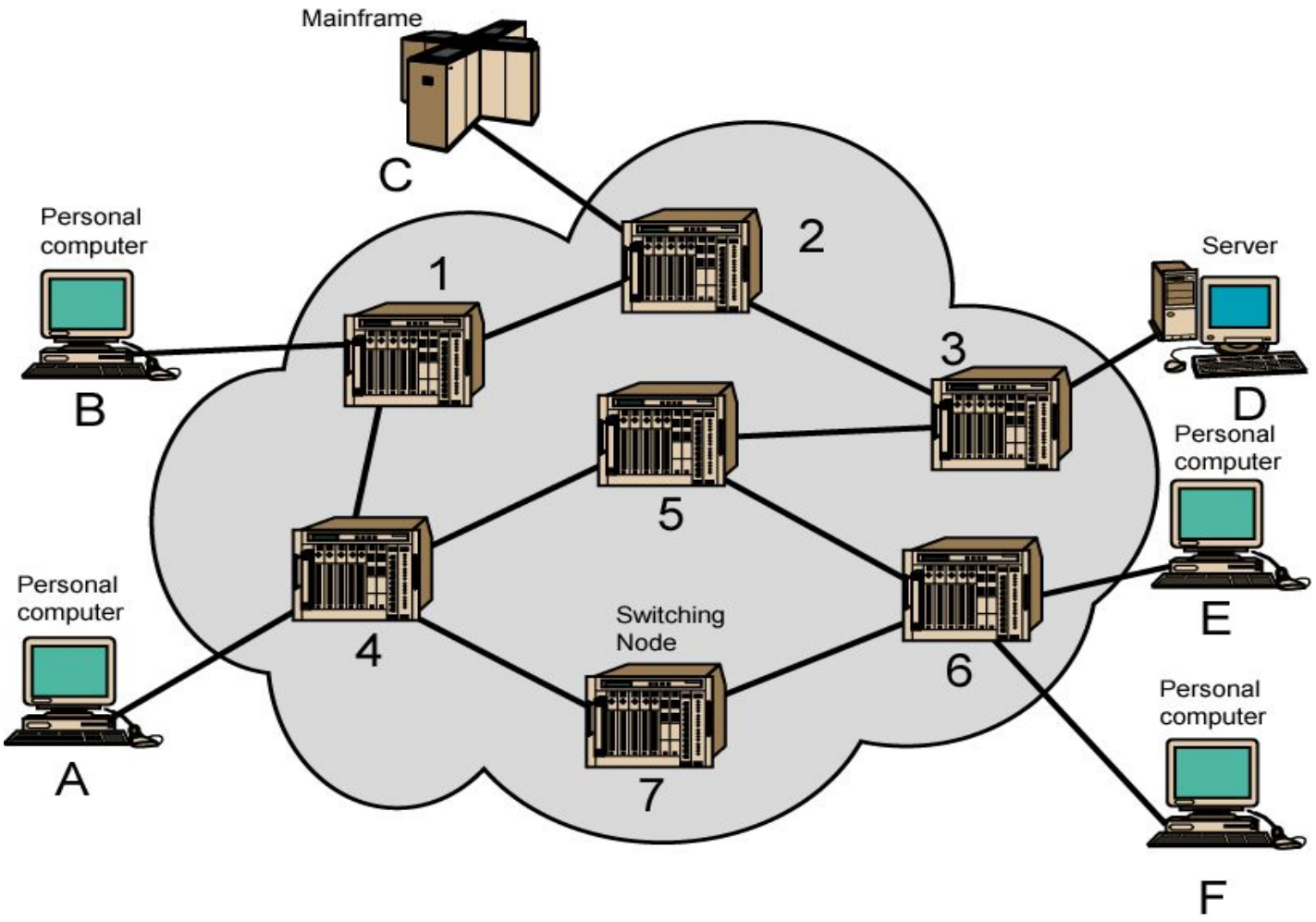
- Dedicated communications path established for the duration of the conversation
- e.g. telephone network



Packet Switching

- Data sent out of sequence
- Small chunks (packets) of data at a time
- Packets passed from node to node between source and destination
- Used for terminal to computer and computer to computer communications

Packet Switching Example




Thank
You