Concepts and fundamental notions

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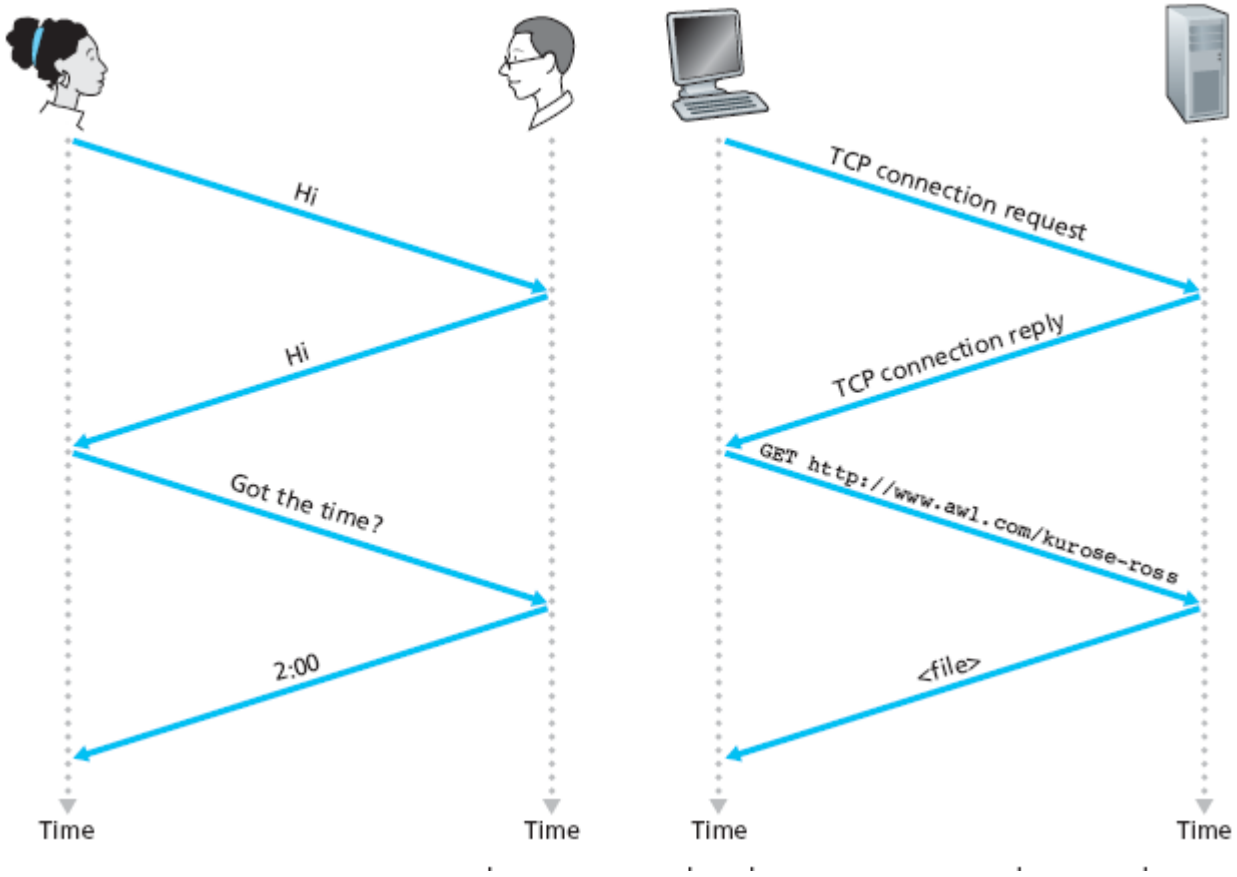
- Concepts
- Definitions
- Computer networks – necessity and use
- Classification
- Topologies
- Components

Concepts

- **Information:** anything that can be represented using bits
- **Resource:** generic term that can signify data, equipment et. al.
- **Package:** a way of storing data
- **Link:** a connection among network members
- **Node:** a computer from the network which has an address
- **Protocol:** rules used to communicate
- **Communication:** information exchanges between network nodes

Concepts

- **Protocol**



*A **protocol** defines the format and the order of messages exchanged between two or more communicating entities, as well as the actions taken on the transmission and/or receipt of a message or other event.*

Figure. Protocol
[Computer networking : a top-down approach James F. Kurose, Keith W. Ross]

Computer Network

- **Definitions:**
  - Interconnected collection of autonomous computers
  - A network may be defined recursively as two or more nodes physically connected, as well as two or several networks connected through one or more nodes.
- **Aspects:**
  - **Hardware:** connect computers from a physical point of view
  - **Software:** Protocols – specify services provided by the network

Computer Network

Necessity:

- Resource sharing (physical, data)
- Reliability
- Reduced costs
- Impact in real life:
  - Remote information access
  - Interactive entertainment
  - E-Commerce
  - …

Networks types- classification

- After the spatial arrangement:
  - PAN (Personal Area Network)
  - LAN (Local Area Network)
  - MAN (Metropolitan Area Network)
  - WAN (Wide Area Network)
  - Internet

Network types- classification

- After the spatial arrangement :

Distanţa Interprocesor	Procesoare localizate în aceeaşi/acelaşi:	Exemple
1 m	Metru pătrat	PAN
10 m	Cameră	LAN
100 m	Clădire	
1 km	Campus	
10 km	Oraş	MAN
100 km	Ţară	WAN
1000 km	Continent	
10.000 km	Planetă	Internet

Figure. Classification after spatial arrangement
[conform Computer Networks, 2010 – Andrew S. Tanenbaum, et. al.]

Network types- classification

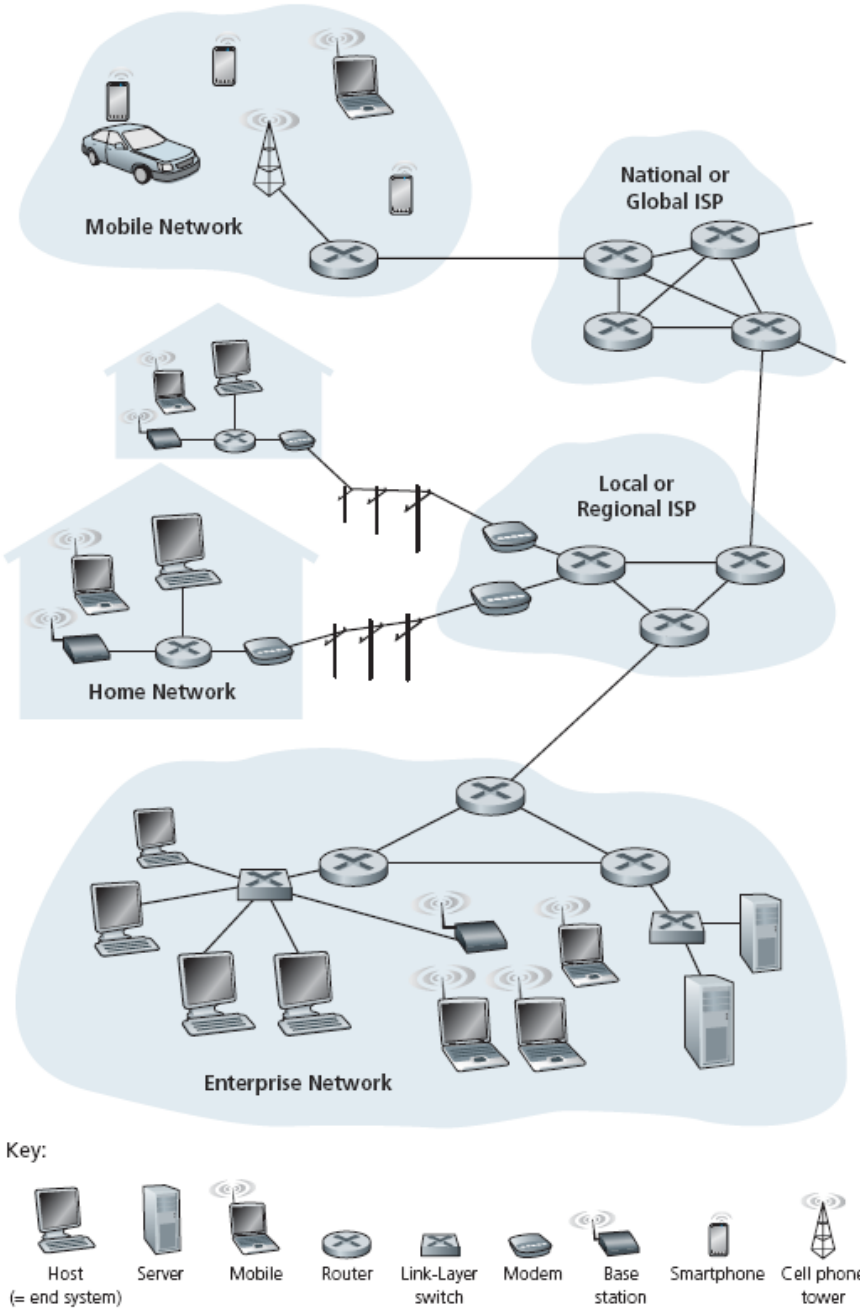


Figure. Some pieces of the Internet
[Computer networking : a top-down approach
James F. Kurose, Keith W. Ross]

Networks types- classification

- Depending on transmission technology:
  - Broadcast networks (one channel to communicate)
    - *broadcast, multicast*
  - *Point-to-point* networks
    - *unicast*

Network topologies

Physical topology: the way computers are connected in the network

Logical topology: the way in which data are transferd from one computer to other

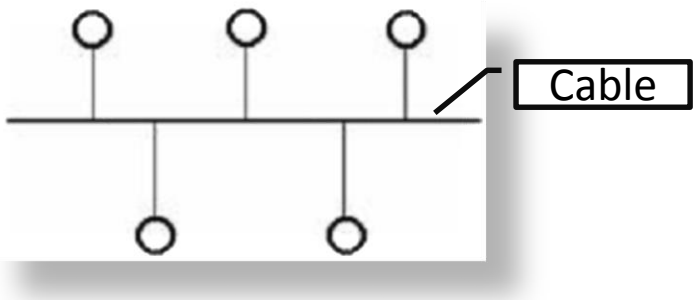
Possible physical topologies for:

- Broadcast networks - LAN
  - *Bus*
  - *Ring*
- *Point-to-point networks*
  - *Star*
  - *Ring*
  - *Tree*
  - Mesh

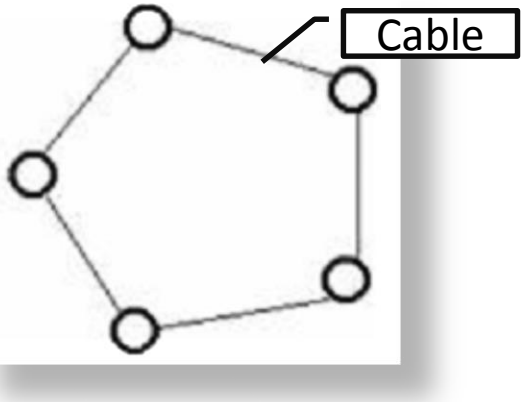
Network topologies

Broadcast networks - LAN

- *Magistrala (bus)*



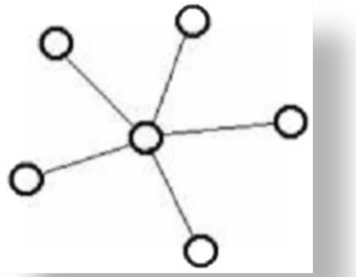
- *Inel (ring)*



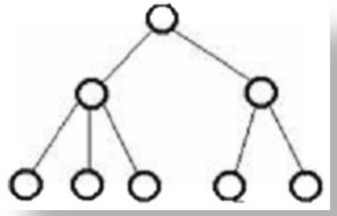
Network topologies

Point-to-point networks

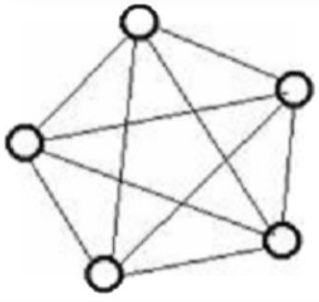
– *Star*



– *Tree*



– *Mesh*



Networks types- classification

- Depending on the hardware technology (and software) used for interconnection:
  - Networks using **wired transmission medium**
  - Networks using **wireless transmission medium** (future course)

Networks types- classification

- Depending on the components:
  - **Homogeneous:** the computer networks use similar configurations and protocols
    - Example: A network using Microsoft Windows via TCP/IP
  - **Heterogeneous:** the network contains different types of computers, operating systems and/or different protocols
    - Example: a LAN that connects a smart phone with an Android and an Apple Machintosh computer

Components

Host – it's a computational system connected to the Internet

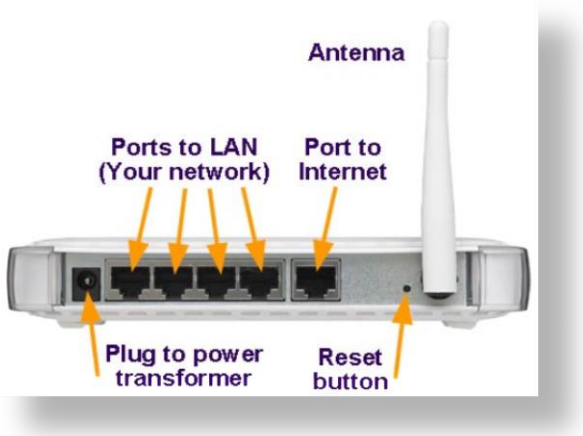
Hub Network – a device (often a signal booster) used to connect multiple devices => *network segment*

Switch - a device which filters network packets and resends them

Leonard-Kleinrock -> IMP (Interface Message Processor) 1969

Components

- *Router* – device providing connectivity between networks, perform routing packets between these networks



- *Bridge* – device that connects two LANs or two segments of the same LAN
- *Gateway* – is a connection point of two networks that that use different base protocols
- *Repeater* **-** device that receives signals that it rebroadcast at a higher level or higher power, so that the signal can cover large areas without degrading its quality

Summary

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- Definitions
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Questions?