

Concepts and fundamental notions

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Content

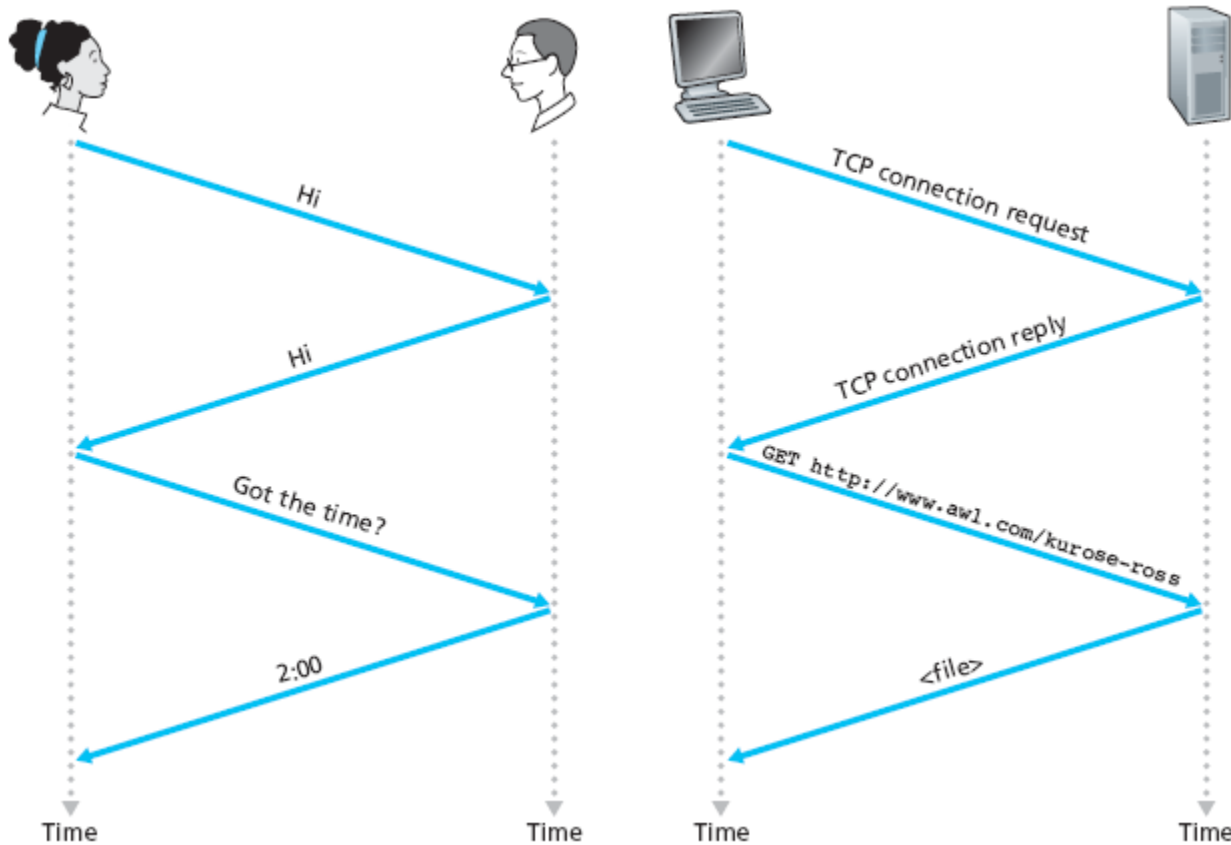
- Concepts
- Definitions
- Computer networks – necessity and use
- Classification
- Topologies
- Components

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 :

Distanța Interprocesor	Procesoare localizate în aceeași/același:	Exemple
1 m	Metru pătrat	PAN
10 m	Cameră	LAN
100 m	Clădire	
1 km	Campus	
10 km	Oraș	MAN
100 km	Țară	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

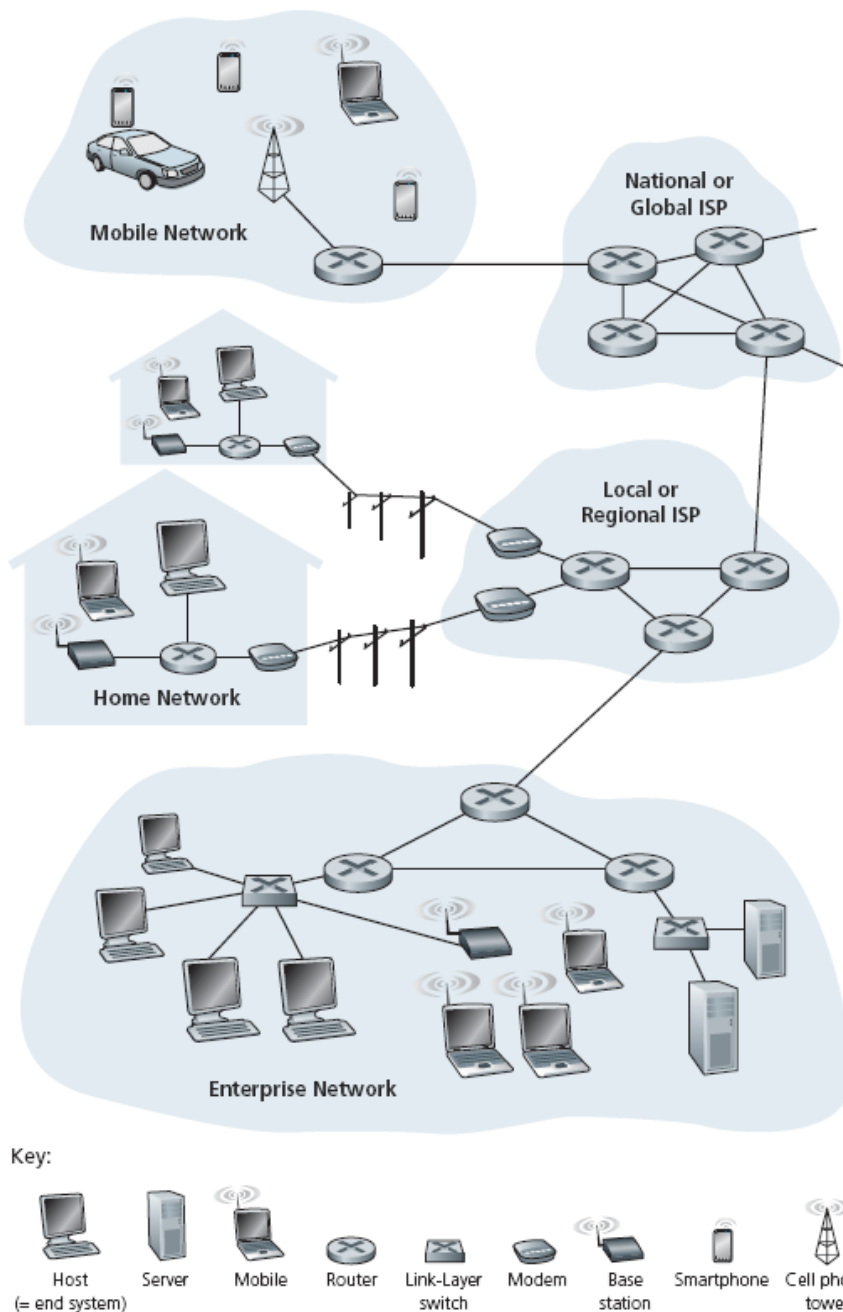


Figure. Some pieces of the Internet
[Computer networking : a top-down approach
James F. Kurose, Keith W. Ross]

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 transferred from one computer to other

Possible physical topologies for:

- Broadcast networks - LAN

- *Bus*
- *Ring*

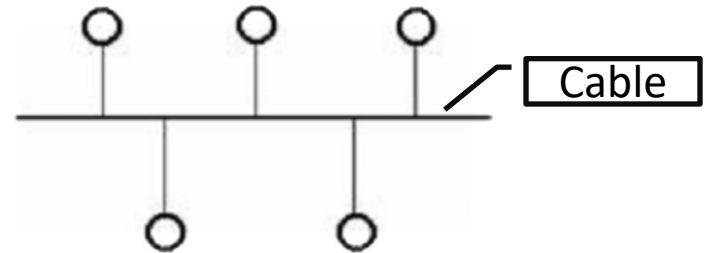
- *Point-to-point networks*

- *Star*
- *Ring*
- *Tree*
- *Mesh*

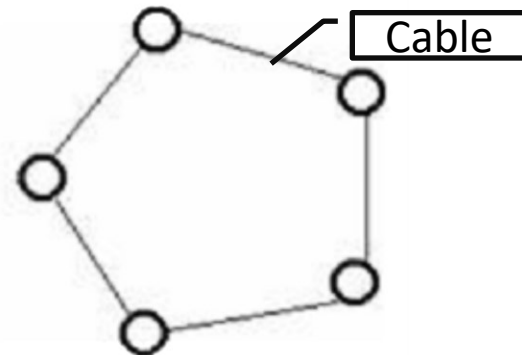
Network topologies

Broadcast networks - LAN

- *Magistrala (bus)*



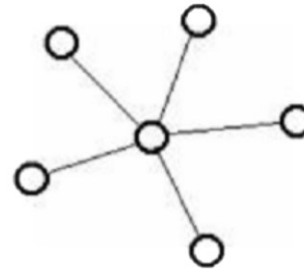
- *Inel (ring)*



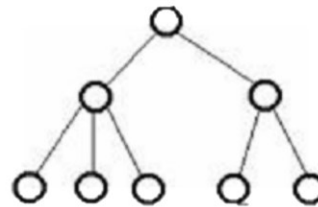
Network topologies

Point-to-point networks

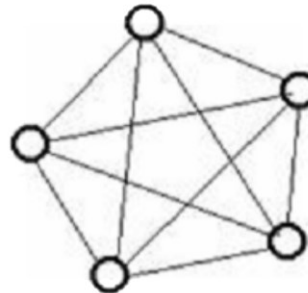
– *Star*



– *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

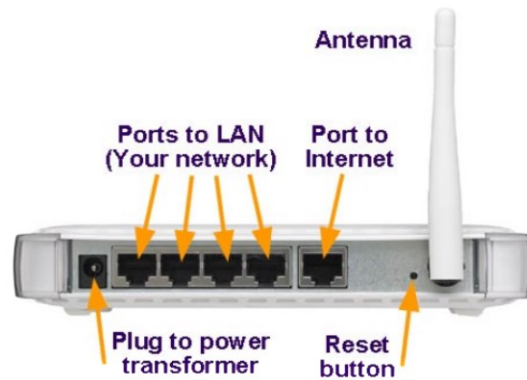
SMC EZ Switch 10/100
SMCGS16-Smart



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 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?