

11 Networks

Topic

Networks, types of networks

Learning objectives

Students will be able:

- To explain what a network is
- To classify network according to different criteria
- To define a LAN, WAN and PAN and discuss their advantages and disadvantages
- To describe the software and devices that make up a network
- Describe and explain network topology

Key words

Wired network, wireless network, network, network architecture, network topology, bus topology, star topology, ring topology, mesh topology, protocol, router, Ethernet, cables, wires, fibre optic cable, wireless access point, Wi-Fi, Bluetooth, PAN, LAN, WAN, MAN, CAN, server, workstation, node, hub, Intranet, bus, network administrator, GSM, WLAN, wireless adapter, hotspot, wireless card

Networks

A **network** is simply two or more computers linked together. It allows users to share not only data files and software applications but also hardware like printers and other hardware.

Networks can be classified according to different criteria:

- Geographical area – **PANs, LANs and WANs.**
- Architecture – a **client-server** network, a **peer-to-peer network**
- Topology – **bus (line), star, ring, mesh, tree**
- Network protocol

PANs, LANs and WANs

PANs – Personal Area Networks - is a computer network used for communication among a computer and different devices like personal computers, printers, fax machines, telephones, PDAs, scanners operated by one person. A PAN may include wired and wireless devices. The reach of a PAN typically extends to 10 meters. A wired PAN is usually constructed with USB and FireWire connections while technologies such as Bluetooth and infrared communication typically form a wireless PAN.

LANs – Local Area Networks – link computers within a limited area – an office or a building. They can be built with two main types of architecture:

- **peer-to-peer** - the computers have the same capabilities
- **client-server** - one computer acts as a **server** containing the main hard disk and controlling the other **workstations** or **nodes** and all the devices linked in the network.

Each node (individual computer) in a LAN has its own CPU which executes programs, but it also is able to access data and devices anywhere within the LAN. This means that many users can share expensive devices, such as laser printers, as well as data. Users can also use the LAN to communicate with each other.

Computers in a LAN need to use the same protocol – the language or a set of rules that computers use to communicate with each other (TCP/IP in case of the Internet). Ethernet is one of most common protocols for LANs.

LANs are capable of transmitting data at very fast rates, much faster than data can be transmitted over a telephone line; but the distances are limited, and there is also a limit on the number of computers that can be attached to a single LAN.

LAN can be connected to other LANs over any distance via telephone lines and radio waves. A system of LANs connected in this way is called a wide-area network (WAN).

A **router** is a device needed to link a LAN to another network (Internet).

Intranet is network based on TCP/IP protocols belonging to an organization, usually a corporation, accessible only by the organization's members, employees, or others with authorization. An intranet's Web sites look and act just like any other Web sites.

Like the Internet itself, intranets are used to share information. Secure intranets are now the fastest-growing segment of the Internet because they are much less expensive to build and manage than private networks based on proprietary protocols.

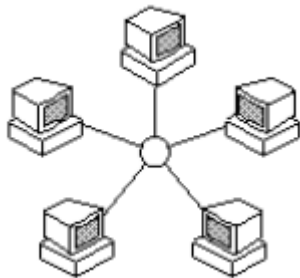
WANs – Wide Area Networks have no geographical limit and may connect computers or LANs on opposite sides of the world. They are usually linked through telephone lines,

fibre-optic cables or satellites. **Wireless WANs** use mobile phone networks. The largest WAN is the **Internet**.

Network topology

Topology is the shape of a network.

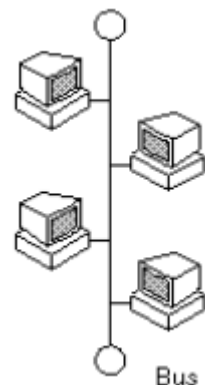
Star topology



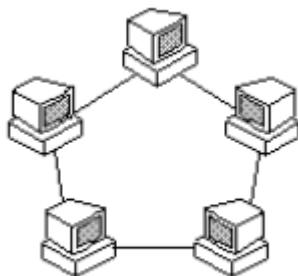
There is a central device to which all the **workstations** or **nodes** are directly connected. The central device is a **server** or a **hub**, nodes communicate across the network by passing data through the hub. The main advantage of a star network is that one faulty node doesn't affect the rest of the network, and it's easy to add and remove nodes. The main disadvantage of star networks is that they require more cabling than other topologies which makes them more expensive. However, communication is fast because there is a direct path from the server to each terminal.

Bus (line) topology

Each workstation is connected to a main cable called a **bus** or **backbone**. Each device has equal status; the advantage is that if one terminal is not working correctly, the others are not affected. This type of network is very cheap and reliable.



Ring topology



All devices are connected to one another in the shape of a closed loop, so that each device is connected directly to two other devices, one on either side of it. All devices are equal, the disadvantage – if there is a fault in any part of the circle, all the nodes are affected.

Mesh topology

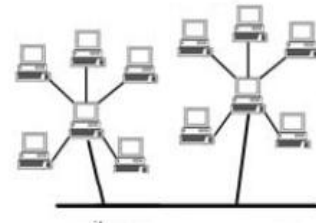
Devices are connected with many redundant interconnections between network nodes. In a true mesh



topology every node has a connection to every other node in the network.

Tree Topology

Is a hybrid topology. Groups of star-configured networks are connected to a linear bus backbone.



Network security

is typically handled by a **network administrator** or **system administrator** who implements the security policy, network software and hardware needed to protect a network and the resources accessed through the network from unauthorized access and also ensure that employees have adequate access to the network and resources to work.

A network security system typically relies on layers of protection and consists of multiple components including networking monitoring and security software in addition to hardware and appliances. All components work together to increase the overall security of the computer network.

Wired and wireless networking

Networks can be linked either with cables and wires or radio waves.

Wired networks are linked by Ethernet cables, phone lines or high-speed optic cables.

Wireless networks use electromagnetic waves, such as radio waves, to transmit data. The main types of wireless networks are:

- **Satellites** – for long distances
- **WiMAX** - for connecting Wi-Fi hotspots
- **Wi-Fi** - for medium-range distances
- **Bluetooth** – for short distances
- **GSM** – for mobile phones

Wi-Fi is a wireless networking technology that uses radio waves to provide high-speed network and Internet connections which allows creation of **WLANs** - wireless local area networks. To build a WLAN you need **access points** - radio-based receiver-transmitters and **wireless adapters** installed in your computer.

Hotspot is a specific geographic location in which an access point provides public wireless broadband network services to mobile visitors through a WLAN. Hotspots are often located in heavily populated places such as airports, train stations, libraries, marinas, conventions centres and hotels.

Wired LANs are more difficult to install, but they are cheaper, faster and more reliable. Wireless networks let you move from one access point to another but they are less secure.

To set up a home wireless LAN you need a computer equipped with a **wireless adapter** or **wireless card**, a **wireless access point** (a **wireless router**) and a **broadband internet connection**.

Vocabulary

Summary

A network is simply two or more computers linked together. It allows users to share not only data files and software applications but also hardware like printers and other hardware.

Networks can be classified according to different criteria:

- Geographical area – PANS, LANs and WANs.
- Architecture – a client-server network, a peer-to-peer network
- Topology – bus (line), star, ring, mesh, tree
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Networks can be linked either with cables and wires or radio waves.

Wired networks are linked by Ethernet cables, phone lines or high-speed optic cables.

Wireless networks use electromagnetic waves, such as radio waves, to transmit data.

Tasks

1. **Which criteria are used to classify the following networks?**

- a) LANs, PANs, MANs, CANs and WANs.
- b) TCP/IP, Ethernet.
- c) A client-server, a peer-to-peer.
- d) bus, star, ring, mesh

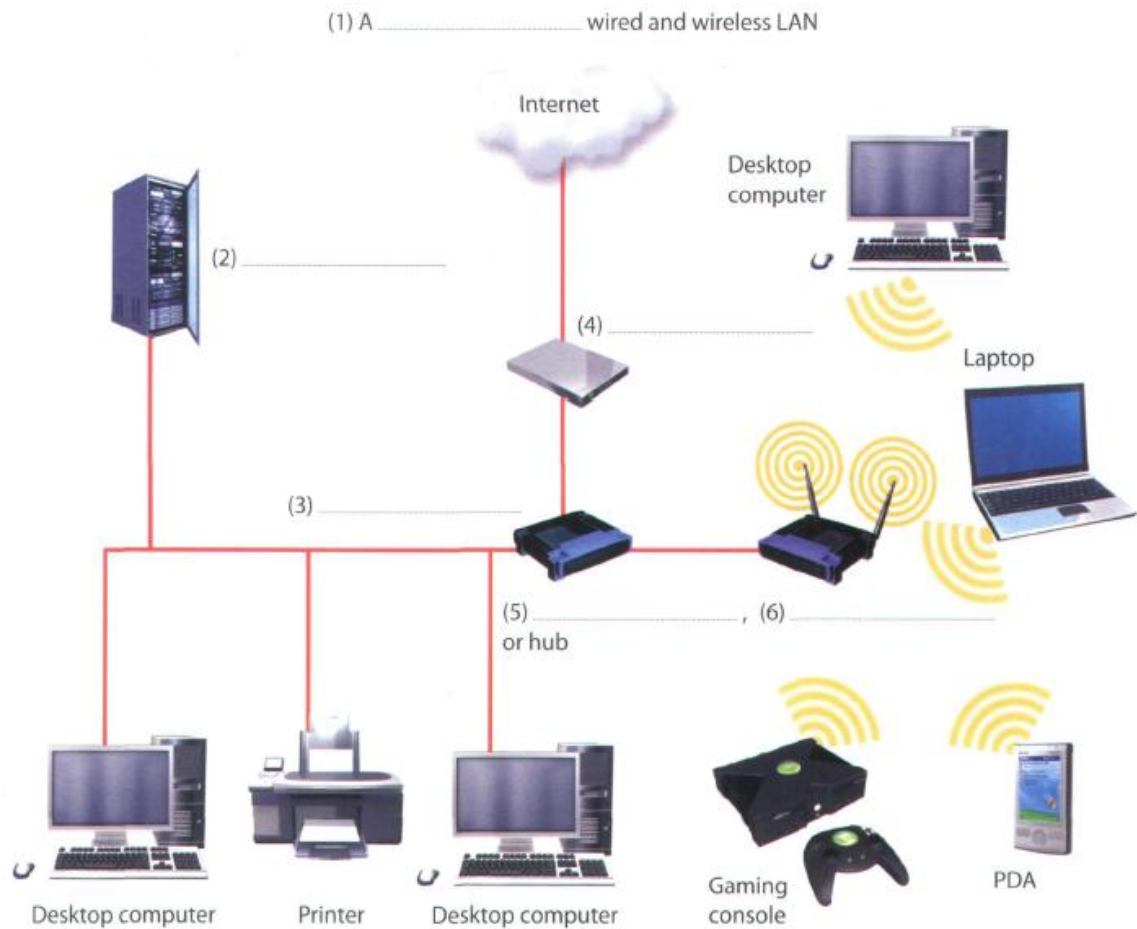
2. Order the following networks in ascending order according to the area which they cover.

WAN PAN CAN MAN LAN

3. Choose the correct option to complete the following sentences.

- a) In a [] topology network if one of the computer fails, the whole network is affected.
ring star bus
- b) If the backbone in a [] topology fails, the whole network fails
ring star bus
- c) If the central server in a [] topology fails, the whole networks fails as well.
ring star bus
- d) If a computer in a [] topology fails it won't affect the whole network
ring star bus
- e) If a cable breaks in a [] topology the whole network is affected
ring star bus
- f) [] is a network covering the area of a large city
PAN MAN LAN
- g) [] network has no dedicated server, all computers are equal.
Client-server Intranet peer-to-peer
- h) The protocol used to communicate on the Internet is [].
Ethernet TCP/IP HTML
- i) [] is a central device in a star topology network.
hub router modem
- j) A [] is a device needed to link a LAN to another network.
hub router modem
- k) In a [] topology network every node has a connection to every other node in the network.
Star mesh tree
- l) [] is a specific geographic location in which an access point provides public wireless broadband network services.
Bluetooth hotspot Wi-Fi

4. Listening Infotech p. 140. Listen and label the elements of the LAN in the picture.



5. Complete the presentation describing the network on page 144 of the Infotech Student's Book by typing in words from the box.

central computer made up consists of log on modem file sharing
 type in satellite wired telephone lines set up look for
 fibre optic cable look at

Clare: If you (1) _____ the diagram, you can see that it represents a wide area network, or WAN, connecting two networks via (2) _____. The two networks are probably two offices of the same company.

Chris: The (3) _____ network on the right – the one in Barcelona – is (4) _____ of a number of PCs connected by (5) _____. You'll be able to see the (6) _____ there, which acts as a file server, allowing (7) _____ between the other PCs on the network. In order to access files on the server, you would probably need to (8) _____ a username and password.

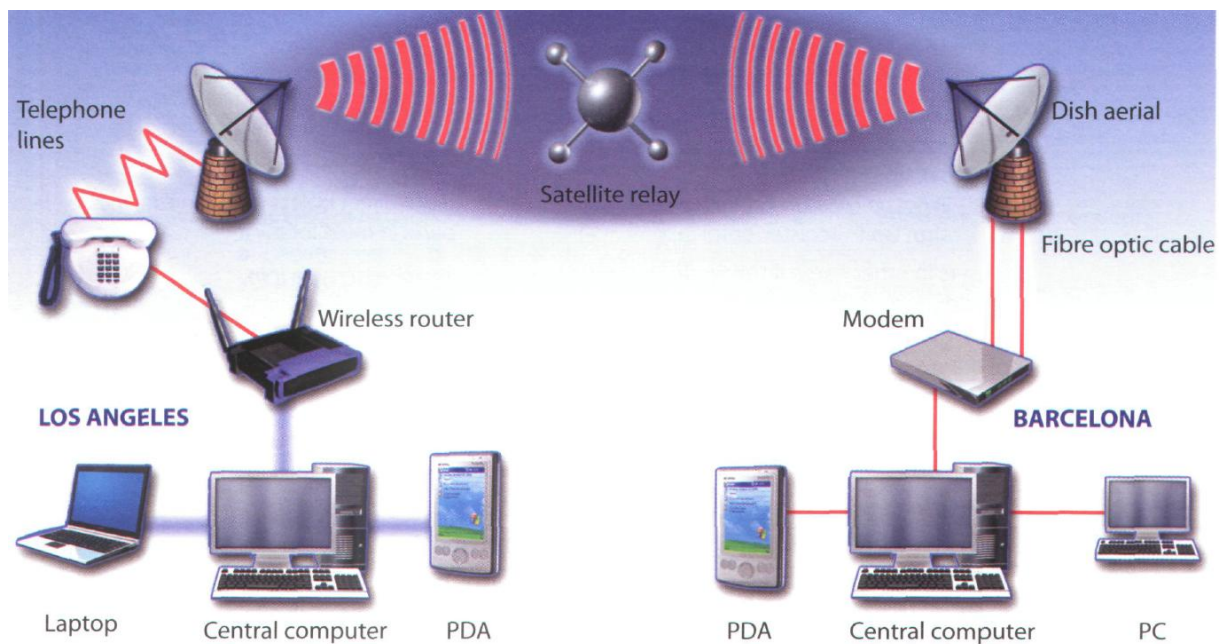
Clare: That's right, Chris. In contrast, the Los Angeles network (9) _____ a wireless router, which links all of the hardware devices without the need for cables. Workers using PDAs or laptops, like those shown in the diagram, would be able to (10) _____ to the network if they had wireless capabilities. Interestingly, while in Barcelona the (11) _____ is linked to the dish aerial with a (12) _____

_____, in Los Angeles they're using regular (13) _____. This may mean slower speeds for the Los Angeles office.

Chris: It looks like this network was (14) _____ to allow the two offices to (15) _____ and share information and resources on each other's systems, and it's a sensible network solution for a company with offices in several different locations.

Now listen and check:

http://www.cambridge.org/servlet/file/store7/item620200/version1/Infotech4ed_WS_U28Networks.pdf



Describe the network in the picture in your own words, the phrases from the box will help you.

Questions

1. What is a network?
2. How are networks classified according to geographical area?
3. How are networks classified according to architecture?
4. How are networks classified according to topology?
5. What is a network protocol?
6. What is a PAN? Say a few words about it.
7. What is a LAN? Say a few words about it.
8. What is a WAN? Say a few words about it.
9. What is a CAN and MAN?
10. What is the difference between a peer-to-peer and client-server architecture?
11. What is a router?
12. What is Intranet?
13. What network topologies do you know?
14. Describe a star topology network.

15. Describe a bus topology network.
16. Describe a ring topology network.
17. Describe a mesh topology network.
18. Describe a tree topology network.
19. What is a hub?
20. What is a backbone?
21. What does a network administrator do?
22. What is the difference between a wired and wireless network?
23. What are the main types of wireless networks?
24. What is a Wi-Fi?
25. What is a wireless access point?
26. What is a hotspot?
27. What do you need to set up a wireless LAN?

Literatura

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