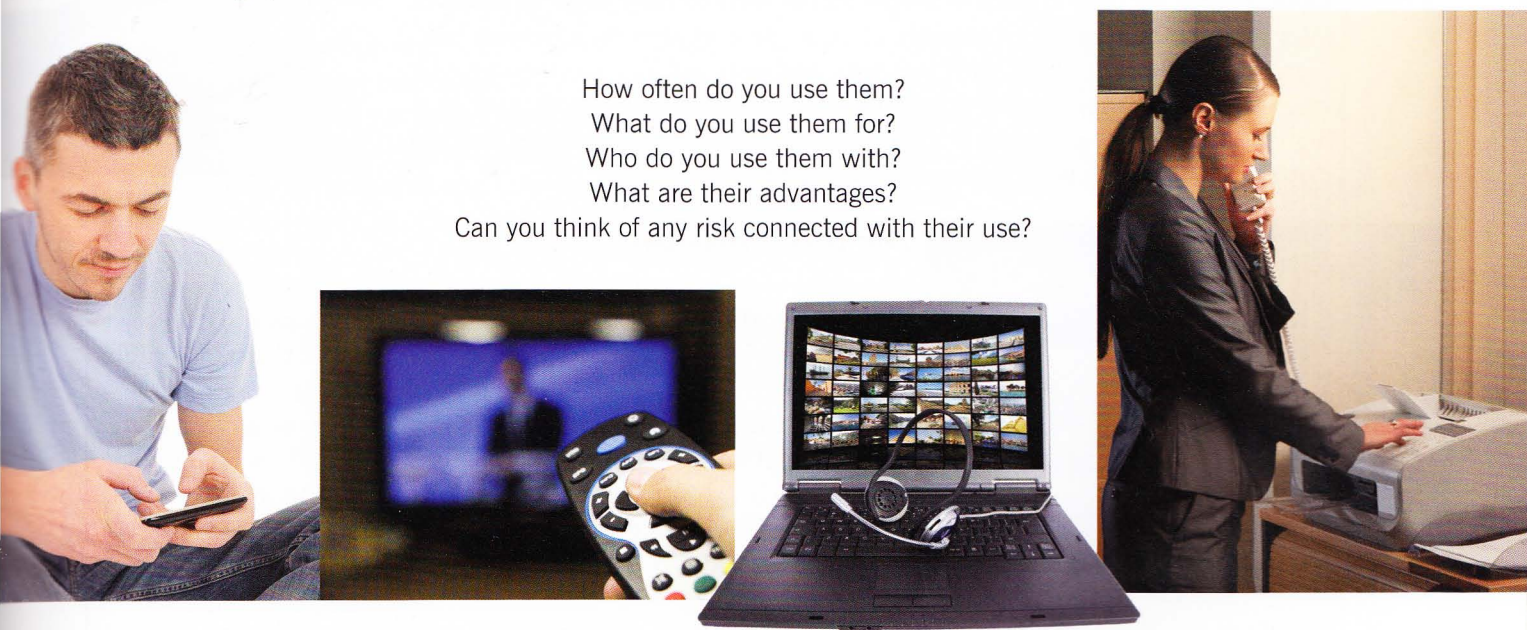


Telecommunications and networks

8

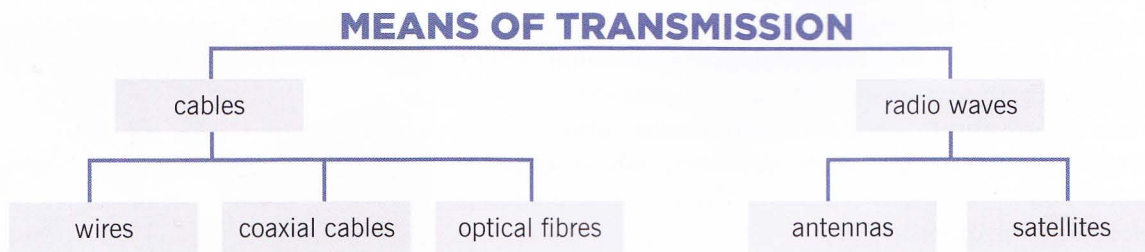
Communication has always played a crucial role in human societies and over time its forms have evolved through the progression of technology, transforming itself into telecommunication. The telegraph, the telephone, the radio, the television, the radar, the fax and, more recently, the computer are all devices which were invented to communicate using electromagnetic waves. Thanks to them, we can transmit texts, pictures, sounds and images and reach everyone in any part of the world.

- 1** Work in pairs. Look at the following means of communication and take turns asking and answering the following questions.



How often do you use them?
 What do you use them for?
 Who do you use them with?
 What are their advantages?
 Can you think of any risk connected with their use?

- 2** Look at the diagram and complete the text about telecommunication systems.



Telecommunication systems need means for the (1) _____ of any information, which is translated into electromagnetic waves that connect the **transmitter** to the **receiver**. These means can be physical media, such as (2) _____, or radio (3) _____, which are transmitted by air. Different kind of cables can be used. The simplest communication cables consist of a single pair of (4) _____ **twisted** together. Other types are (5) _____ cables and optical (6) _____. Radio waves need (7) _____ to be transmitted and sometimes (8) _____ are necessary for long-distance transmission.

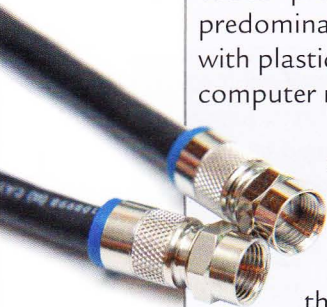
3 Read the text about the different kinds of transmission media and complete the table.

Ground transmission

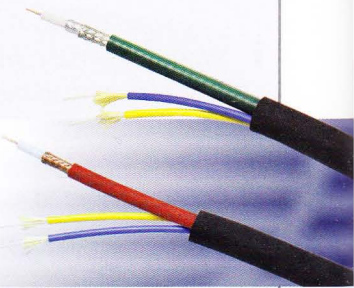
Wires provide a cheap and effective means of communication that was predominant in the past. Wires, which are made out of copper and insulated with plastic, can be single or twisted, and they are used mainly in telephone and computer networks.



Coaxial cables consist of an **inner** conductor insulated with plastic and **surrounded** by a **woven** copper **shield**. They are used in television and radio as these cables can support about 60 channels. The inner copper cable is insulated to protect the wires from **bending** and crushing and to reduce the noises.



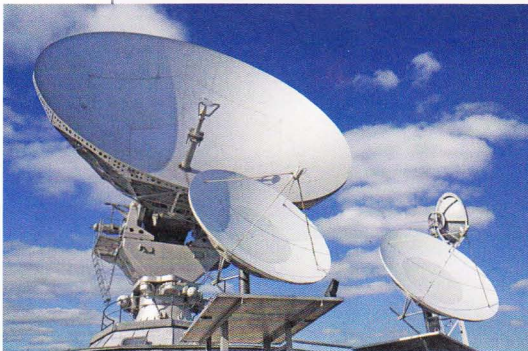
Optical fibres are used in place of simple copper wires to carry larger amounts of information. They consist of **strands** of pure glass as thin as a human hair. Signals travel along fibres with less loss and without any electromagnetic interference. As they permit transmission over longer distances and at a higher speed, they are used in communication systems, in some medical instruments and in a wide variety of **sensing devices**.



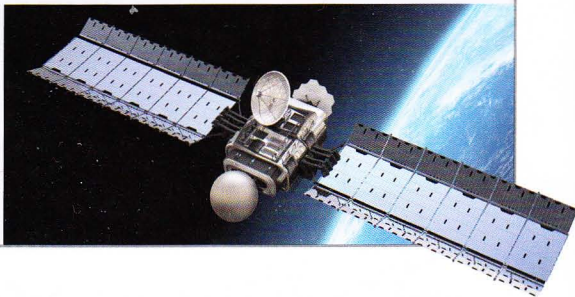
Air transmission

Antennas were invented to capture radio signals and convert them into electrical signals through the receiver. They can also receive electrical signals from the transmitter and convert them into radio signals.

These electric devices, which provide information at a cheap rate, are essential to all equipment that uses radio. They are used in systems such as radio and television broadcasting, radar, mobile phones, and satellite communications, for which they are in form of **dishes**.



Satellites are machines launched into space to move around Earth or another celestial body. A communications satellite is basically a station which receives signals in a given frequency and then retransmits them at a different frequency to avoid interference problems. The first satellite was launched by the Soviet Union in 1957. There are different types of satellites: low-orbit satellites, which travel at about 300 km from the Earth and observe the planet, providing accurate information about agriculture, pollution and weather **forecasting**; medium-altitude satellites, which travel at about 9000-18000 km from the Earth and are used in telecommunications.



Means of transmission	Material	Function	Type of signal (ground or air)	Advantages
wires				
coaxial cables				
optical fibres				
antennas				
satellites				

4 Read the text about networks and answer the questions.



A network is a group of computers **linked** together. It consists of at least two computers joined by cables on the same desk or same office, but it can also mean thousands of computers across the world. The users of a network can **share** hardware (scanner, printer, fax machine, etc.), access data in other people's computers and run other programs stored in the network although not installed on their own computer.

A network consists of:

- nodes, that is to say different computers and devices;
- a connecting medium, such as cables or a wireless connection;
- routers, which are special computers enabled to send messages;
- switches, that is to say devices which help to select a specific path to follow.

Networks can be connected in different ways according to the area they cover.

A LAN (Local Area Network) is generally located in a limited space, such as a building or a campus.

On the contrary, a WAN (Wide Area Network) operates in a larger area and it can reach most of the world, so it could be described as a collection of LANs all over the world.

The exchange of information in a network is controlled by communications protocols, which define the formats and rules that computers must follow when talking to one another.

Well-known communications protocols are Ethernet, which is a family of protocols used in LANs, and the Internet Protocol Suite, which is used in any computer network.

Computer networks offer many advantages. For example, they facilitate communication, allowing people to send emails and texts, make phone/video calls and videoconference. Furthermore, networks allow people to share files, data, and other types of information as users may access data and information stored on other computers in the network.

On the other hand, networks may be difficult to set up and may be insecure as computer **hackers** can send viruses or computer worms to the net computer. They may also interfere with other technologies, as power line communication strongly disturbs certain forms of radio communication and access technology such as ADSL.

1 What does a network consist of?

2 What is a router?

3 What is a LAN?

4 What is a WAN?

5 What is the function of communications protocols?

6 What is Ethernet used for?

7 What are the advantages of using a network?

8 What are the disadvantages of using a network?

5 Refer back to the text and write a summary of the components, pros and cons of networks and describe a situation in which a network can be very useful.

Network topologies

A network topology is the layout of the interconnections of the nodes of a computer network. It depends on the distance involved, the type of hardware used and the stability needed.

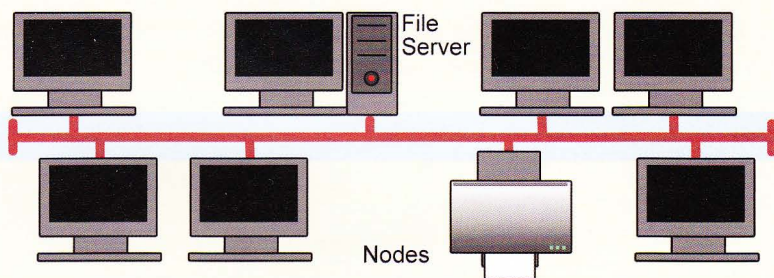
- 6 9 Read the texts about the different network topologies and fill in the gaps with the words in the box. Then listen and check.

~~nodes~~ circle network pathway affect configure
small destination star failure exchanging backbone

Bus network

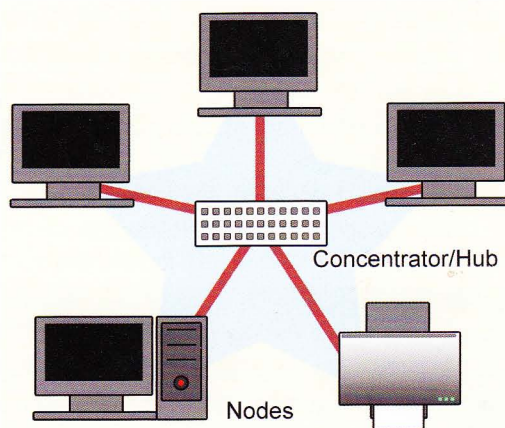
In a bus network all (1) *nodes* are connected to a common medium, called **backbone**, as it happens with Christmas lights. Information sent along the (2) _____ travels until

the destination is reached. This kind of topology is generally used only for (3) _____ networks, as it isn't able to connect a large number of computers. The main advantage offered by this topology is that if a computer or device doesn't work, it doesn't (4) _____ the others.



Star network

In a star network all nodes are connected to a special central node called the **hub**. Once it has received a signal, the hub passes it to all the other nodes until it reaches the (5) _____ computer. This means that all the computers and devices are joined together. This topology is commonly used in businesses because it can **grant** rapidity and safety in (6) _____ data. Thanks to this topology, data is always **up-to-date** and if a computer doesn't work, it doesn't affect the others. The only disadvantage to it is that if the hub goes down, the whole (7) _____ doesn't work.

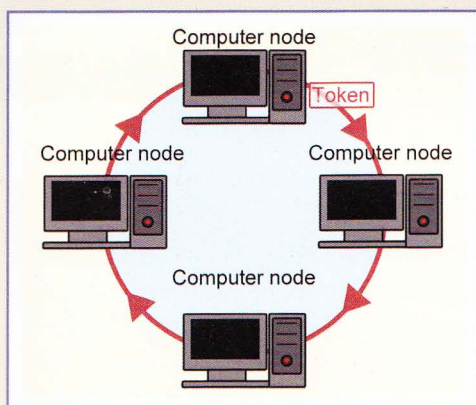


- 7 Read the texts again and decide if the following statements are true (T) or false (F), then correct the false ones.

- 1 The topology chosen depends only on the location of computers. _____
- 2 All topologies use many cables and are very expensive. _____
- 3 In a bus topology all the buses are connected one after the other. _____
- 4 In a bus topology a server controls the flow of data. _____
- 5 In a star network data is always updated. _____
- 6 The hub doesn't connect printers and other devices in a star topology. _____
- 7 In the ring topology each node is connected to the hub. _____
- 8 In the ring topology if the hub doesn't work, the network goes down. _____
- 9 Star bus topology combines elements of bus and ring topologies. _____
- 10 In a star bus topology a backbone line failure affects the whole network. _____

8 Read the texts again and complete the table with the missing information.

Topology	Connection	Use	Advantages	Disadvantages
		<i>small networks</i>		
	<i>Each node is connected to the central hub.</i>			
<i>ring</i>				



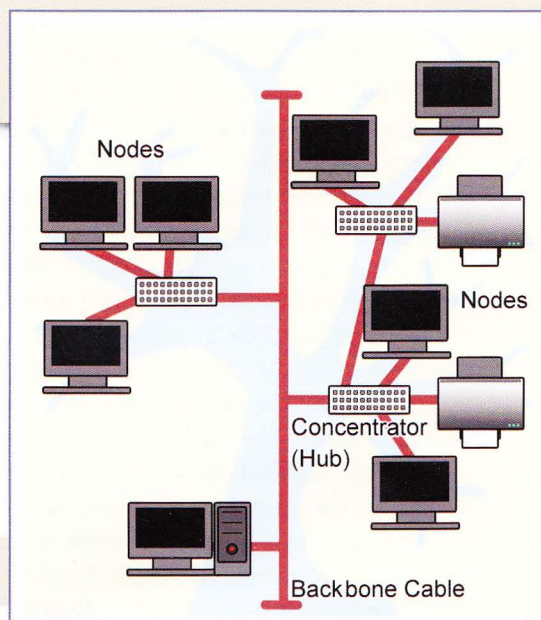
Ring network

In a ring network each node is connected to its left in a (8) _____. There is no central hub that holds all the data, and communication is sent in one direction around the ring through the use of a **token**. As it requires fewer cables, this topology is less expensive. Nonetheless, because it provides only one (9) _____ among the nodes, a single node (10) _____ may isolate all the devices attached to the ring.

Star bus topology

Star bus topology is the most common network topology used today. It combines elements of star and bus topologies to create a more effective network. Computers in a specific area are connected to hubs creating a (11) _____, then each hub is connected together along the network backbone.

The main advantage of this type of topology is that it can be more easily expanded over time than a bus or a star. On the other hand, this topology is more difficult to (12) _____ than the others and if the backbone line breaks, the whole network **goes down**.



MY GLOSSARY

backbone /ˈbækbəʊn/ _____
 bending /ˈbendɪŋ/ _____
 coaxial /kəʊˈæksɪəl/ _____
 dish /dɪʃ/ _____
 forecasting /ˈfɔːkɑːstɪŋ/ _____
 to go down /tə ɡəʊ daʊn/ _____
 to grant /tə ɡrɑːnt/ _____
 hub /hʌb/ _____
 inner /ˈɪnə(r)/ _____
 to link /tə lɪŋk/ _____
 to reach /tə riːtʃ/ _____

receiver /rɪˈsiːvə(r)/ _____
 sensing device /ˈsensɪŋ drɪvaɪs/ _____
 to share /tə ʃeə(r)/ _____
 shield /ʃiːld/ _____
 strand /strænd/ _____
 to surround /tə səˈraʊnd/ _____
 token /ˈtəʊkən/ _____
 transmitter /trænzˈmɪtə(r)/ _____
 to twist /tə twɪst/ _____
 up-to-date /ʌptədeɪt/ _____
 woven /wəʊvən/ _____