VB035 English I

UNIT 1 Computer Users

INTRODUCTION

A computer is a device that processes **data** according to a set of instructions known as a **program**. The equipment is known as the **hardware** and the programs and data are the **software**. A special set of programs, called an **operating system**, provides an interface for the user and allows **applications programs** to communicate with the hardware. Common applications programs include **wordprocessors** for creating and editing texts, **spreadsheets** for calculating **mathematical formulae** and **databases** for storing data in a way that allows the data to be sorted and searched. **Anti-virus programs** are used to detect and remove **viruses** (**harmful** programs that can reproduce themselves and attach themselves to other programs). Some operating systems have **graphical (user) interfaces** that allow the computer user to select items from **menus** (lists of choices) and to start programs using an input device called a **mouse**. This is done by pressing a button on the mouse i.e. **clicking** the mouse. The main device for inputting the data is a **typewriter-style keyboard** and the output is commonly displayed on a **monitor** screen that looks like a small television screen.

There is a range of sizes and types of computer. Those designed for use by one person at a time are known as **personal computers (PCs)** although the term PC is usually only applied to personal computers that are compatible with the standards laid down by the company known as **IBM** (International Business Machines). Personal computers include **desktop** computers (for use on an office desk) and **handheld** computers that can be carried around by the user. Electronics can be added to desktop computers by plugging in **expansion cards** (electronic circuit boards that can be plugged into special sockets called **expansion slots**).

It is also possible to build all the main parts of a computer into one electronic integrated circuit packaged as a single electronic **chip** (the common name for a microchip; an electronic integrated circuit in a small package) i.e. the **'computer on a chip'**. This enables computers to be built into other devices including **household devices** such as washing machines and fridges and to be incorporated into plastic cards i.e. **smart cards**, which are able to store information such as health records, drivers' licences, bank balances, etc. Devices that include a computer circuit are commonly referred to as **smart devices**. A **multimedia computer** can process different forms of data including text, graphics, **audio** (sound), animation and video. This enables computer systems to be used for a combination of **education** and **entertainment**, sometimes referred to as **edutainment**.

Unlike most machines, computers do not have a fixed **purpose**. They are multi-purpose tools. They can be used in a very wide variety of situations and are found in a wide range of systems including security systems, cars and phones. Advanced systems, known as expert systems, enable computers to 'think' like experts. Medical **expert systems**, for example, can help doctors diagnose an illness and decide on the best **treatment**. As computer systems are developed, they are becoming more common and are gradually being used for more and more purposes. How they are developed, and for what purposes they are actually used in the future, can be **influenced** by computer users. A variety of devices known as **peripherals** can be added externally to a computer. One of the most common peripherals is a **printer** used for printing the computer **output** (the processed data or signals that come out of a computer system) on paper. A **digital camera** allows photographs to be input to a computer for editing.

Not all computer systems are **compatible** i.e. they cannot use the same programs and data. Connecting computers together to form a **network** can provide the **'connectivity'** required to enable computers and software to communicate and to **share resources**. Networks connected together form an **internet**. The connection of networks throughout the world is known as **the Internet** (note that a capital I is used) or, more simply, **the Net**. Various communication services are available on the Internet, including **email** (electronic mail) for sending and receiving text messages and **IRC** (Internet Relay Chat) which allows users to communicate using text messages in **real-time** i.e. without any delay, while the users are **logged on** (connected to a network system **account**, normally using a password) to the system. An Internet service called **FTP** (File Transfer Protocol) is used for transferring data or program files between the powerful **server** computers that provide the network services and the **client** computers that use these services e.g. downloading music files. Note that copying data from a larger server system

to a client is referred to as **downloading** and copying from the client to the server is known as **uploading**.

One of the newest and most popular services available on the Internet is **the World Wide Web** (**WWW**) which is often simply referred to as the Web (note the use of the capital W). The Web contains interlinked documents called **webpages**. A set of related webpages stored together on a server computer is called a **website**. Websites, such as Dogpile and Askjeeves, give the user access to special programs called **search engines** that are designed to allow the user to find relevant webpages on the Web. An Internet system designed to provide free, interactive access to vast resources for people all over the world is sometimes referred to as an **information superhighway**.

Services such as these allow people to **telecommute** (use their computers to stay in touch with the office while they are working at home). Computer uses mentioned in this unit include producing greetings cards; learning, using three-dimensional graphics programs called 'Splat the Cat' and 'Pets 3'; using the Microsoft Word wordprocessing program including features such as **clipart** (ready-drawn graphic images that can be inserted into documents); communicating on the Internet using email and chat programs including the use of **email attachments** (other types of files e.g. video files attached to simple email text messages); distance learning and **videoconferencing** (a form of communication over a network that uses video cameras so that the people taking part can see and hear each other); electronic classrooms or boardrooms; **browsing** the Web (moving from webpage to webpage using a Web browser program); selling, using a website; painting; scanning pictures; downloading music and creating **CD-ROM**s (compact disk read only memory, commonly referred to as **CD**s). CD-ROMs are storage devices that use laser light for reading and writing data. The most common storage device is a **hard disk** (a set of aluminium disks coated in a magnetic material and enclosed in a vacuum-sealed case) used for storing the operating system and applications programs as well as the user's data.

SPECIALIZED READING

Computers Make the World Smaller and Smarter

The ability of tiny computing devices to control complex operations has transformed the way many tasks are performed, ranging from scientific research to producing consumer products. Tiny 'computers on a chip' are used in medical equipment, home appliances, cars and toys. Workers use handheld computing devices to collect data at a customer site, to generate forms, to control inventory, and to serve as desktop organisers.

Not only is computing equipment getting smaller, it is getting more **sophisticated**. Computers are part of many machines and devices that once required continual human supervision and control. Today, computers in security systems result in safer environments, computers in cars improve energy efficiency, and computers in phones provide features such as call forwarding, call monitoring, and call answering.

These smart machines are designed to take over some of the basic tasks previously performed by people; by so doing, they make life a little easier and a little more **pleasant**. Smart cards store vital information such as health records, drivers' licenses, bank balances, and so on. Smart phones, cars, and **appliances** with built in computers can be programmed to better meet individual needs. A smart house has a built-in monitoring system that can turn lights on and off, open and close windows, operate the oven, and more.

With small computing devices available for performing smart tasks like cooking dinner, programming the VCR, and controlling the flow of information in an organization, people are able to spend more time doing what they often do best - being creative. Computers can help people work more creatively.

Multimedia systems are known for their educational and entertainment value, which we call '**edutainment**'. **Multimedia** combines text with sound, video, animation, and graphics, which greatly enhances the interaction between user and machine and can make information more interesting and appealing to people. Expert systems software enables computers to 'think' like experts. Medical diagnosis expert systems, for example, can help doctors **pinpoint** a patient's illness, suggest further tests, and prescribe appropriate drugs.

Connectivity enables computers and software that might otherwise be incompatible to communicate and to share resources. Now that computers are **proliferating** in many areas and networks are available for people to access data and communicate with others, personal computers are becoming interpersonal PCs. They have the potential to significantly improve the way we **relate** to each other. Many people today telecommute that is, use their computers to stay in touch with the office while they

are working at home. With the proper tools, hospital staff can get a diagnosis from a medical expert hundreds or thousands, of miles away. Similarly, the disabled can communicate more effectively with others using computers.

Distance learning and videoconferencing are concepts made possible with the use of an electronic classroom or **boardroom** accessible to people in remote locations. **Vast databases** of information are currently available to users of the internet, all of whom can send mail messages to each other. The information superhighway is designed to significantly expand this interactive connectivity so that people all over the world will have free access to all these resources.

People power is critical to ensuring that hardware, software, and connectivity are effectively integrated in a socially responsible way. People - computer users and computer professionals - are the ones who will decide which hardware, software, and networks **endure** and how great an **impact** they will have on our lives. Ultimately people power must be exercised to ensure that computers are used not only efficiently but in a socially responsible way.

UNIT 2 Computer Architecture

INTRODUCTION

There are different types of computer of varying size and power, including the following:

Supercomputer (the most powerful type of mainframe)

Mainframe (large, very powerful, **multi-user** i.e. can be used by many people at the same time, **multi-tasking** i.e. can run many programs and process different sets of data at the same time)

Minicomputer (smaller than a mainframe, powerful, multi-user, multi-tasking)

Personal computer (PC) (single user)

Desktop computer (suitable size for sitting on an office desk)

Workstation (most powerful type of desktop, used for graphic design, etc.)

Portable (can be carried around, can operate with batteries)

Laptop (large portable, can be rested on user's lap)

Notebook (size of a sheet of notebook paper)

Handheld (can be held in one hand)

Pen-based (main input device is an electronic pen)

PDA (personal digital assistant, has functions such as task lists, diary, address book)

Note that the term **PC** usually refers to an IBM compatible personal computer i.e. an Apple Mac personal computer is not referred to as a PC. A computer that provides a **service** on a network e.g. storing files, sharing a printer, is known as a **server** computer. Server computers usually have a **UPS** (uninterruptible power supply) attached to them. This is a battery that automatically provides an electricity supply to allow the server to shut itself down properly if the main supply fails.

The **processor** e.g. Pentium, is the most important part of the computer. It processes the data and controls the computer. **Powerful computers** used as servers often have more than one processor. There are two main types of **memory**:

a **RAM** (random access memory) holds the program instructions and the data that is being used by the processor,

b **ROM** (read only memory) holds the program instructions and settings required to start up the computer.

The combination of the processor and memory is sometimes referred to as the **CPU** (central processing unit), although sometimes the processor itself is referred to as the CPU. The other parts connected to the CPU are known as **peripherals**. These can include input devices, output devices, storage devices and communications devices. **Input devices** include: keyboards, scanners, barcode readers, digital cameras, microphones and video cameras e.g. **webcams** (small digital video cameras used on the Web). **Output devices** include: **monitors** (VDU display screens), printers, plotters, **loudspeakers**, **headphones**. **Storage devices** include: magnetic tape, **floppy disks** (diskettes), hard disks, CD-ROMs, CD-R disks, CD-RW disks, DVDs and MO disks. A common **communications device** is a **modem** (a modulator/demodulator used for converting digital signals to **analogue signals** and vice versa to allow a computer to be connected to the ordinary telephone system).

A set of connectors used for carrying signals between the different parts of a computer is known as a **bus**. Data is transferred constantly between the processor and memory along the **system bus**. Each part of memory has its own **memory address** and the processor determines where processed data is stored by sending an address signal along an **address bus** and data along a **data bus**. This is synchronised by an electronic clock in the CPU that determines the operating speed of the processor. Transferring data between the processor and RAM can slow up the computer; therefore, some very **expensive**, extremely fast memory is usually used as a cache to hold the most frequently used data.

In a desktop computer, the **CPU** (central processing unit) and **storage devices** (pieces of equipment used for reading from and writing to a storage medium) are normal built inside a **system unit** which consists of a **metal chassis enclosed** in a flat desktop or a tower shaped case. Other peripherals are attached to the system unit by cables. Each peripheral uses its own **driver card** or **controller** (an expansion card that is plugged into special **expansion slots** in the system unit). **Expansion cards** contain the electronics required to communicate with and control the device e.g. **video** or **graphics cards** are used for monitors, **soundcards** are used for audio input/output and **NICs** (network interface cards) are used for connecting to other computers in a **network** (computing devices connected together). Extra memory can also be added to the computer using special memory expansion slots inside the computer. A portable computer that does not have enough space inside to fit expansion cards may use an external device called a **port replicator** to provide connections for peripherals.

Storage devices in the form of a **disk** or **tape** are used to store the programs and data that are not being used. Note that the American spelling of *disk* is commonly used, although the British spelling, *disc*, is sometimes used. Before a program or data can be used, it must be transferred from the storage device to the main RAM memory. **Hard disks** consist of a set of magnetic coated metal disks that are **vacuum-sealed** inside a case to keep out the **dust**. The magnetic surfaces of the disks are **formatted** using a **read/write head** to provide magnetic storage areas. These storage areas form concentric circles called **tracks** and each track is subdivided into sections called **sectors**. The disks are rotated at high speed and read from or written to by the read/write head that moves across the surface of the disks, in server computers, hard disks can be connected together and made to operate as one unit using **RAID** (a redundant array of inexpensive disks - see Unit 17). This can speed up the system and provide a way of recovering data if the system **crashes** (fails suddenly and completely, usually referring to the failure of a hard disk). There is a variety of optical storage devices that use laser light to read or write to a disk, including: **CD-ROMs** (compact disk read only memory), **CD-R** (recordable compact disk), **CD-RW** (rewritable compact disk), **DVD** (digital **versatile** disk - previously known as digital video disk).

An **input device** called a **barcode reader** is a special type of **scanner** for reading **barcodes** (a set of printed bars of varying thickness that are used to identify a product e.g. used to price items in supermarkets).

When comparing computers, the **power** of the computer is important. This is mainly determined by the **speed** and **capacity** (size) of each part of the computer.

Speed is measured in **hertz** (Hz) i.e. cycles per second.

Capacity is measured in **bytes** (B) where 1 byte = 8 **bits** (binary digits) = 1 character.

When specifying a computer the following are normally quoted:

a the speed of the processor (MHz - megahertz, GHz - gigahertz)

b the capacity (size) of the memory (MB – megabytes)

c the capacity (size) of the **magnetic storage devices** e.g. hard disk, floppy disk (MB - megabytes, GB – gigabytes)

d the speed of the **optical storage devices** e.g. CD-ROM, DVD (given as a multiple of the speed of the first devices produced e.g. 24x = 24 times, 12x = 12 times)

e the display monitor size (measured in inches diagonally across the screen surface)

f the monitor image quality (**resolution**) given by the number of **pixels** (picture elements) that are used across and down the screen e.g. 800 x 600, or by the graphics standard used e.g., **VGA** (video graphics array), **SVGA** (super video graphics array)

g the graphics card memory size (MB - megabytes)

h the speed of the modern (measured in **kbps** - kilobits per second)

Two different number systems are used in computer specifications:

a The **decimal system**, which consists often digits from 0 to 9, is used for measuring speed.

b The **binary system**, which only has two digits (1 and 0), is used for measuring capacity.

The following prefixes are also used in measurements:

	Decimal system	Binary system
kilo	10^3 = 1 thousand	2^{10} = 1,024
mega	10^6 = 1 million	2^{20} =1,048,576
giga	10^9 = 1 thousand million	2^{30} = 1,073,741,824

e.g. 1.7 GHz = one point seven thousand million cycles per second 256 MB = 256 x 2^{20} bytes = approximately two hundred and fifty six million bytes

Communication is provided between **applications programs** (wordprocessors, drawing programs, etc.) and the computer **hardware** (the physical components of a computer system) by a set of programs collectively known as the **operating system** e.g. Microsoft Windows, MacOS.

READING

How to read a computer ad

1. Intel Pentium IV 1.7 GHz Processor
2. Mini Tower Chassis
3. 256MB Rambus RDRAM
4. 60GB Hard Drive
5. Embedded Intel 3D Direct AGP video with 64MB SDRAM
6. 64-voice wavetable sound
7. 48 X CD-ROM Drive
8. 19" (1 7.9" VIS) Colour SVGA monitor
9. Microsoft Windows XP
10. 1.44MB 3.5" Floppy Drive
11. Microsoft Intellimouse
12. 105-key keyboard

13. The main processing chip that operates at a clock speed of 1.7 thousand million cycles per second.
14. A small size of tall and narrow style of case containing the computer system.
15. 256 megabytes of Rambus dynamic type of main memory chips that constitute the computer RAM.
16. A hard drive internal storage device with a capacity of approx. 60 thousand million bytes.
17. A video controller for controlling the monitor screen that is built on to the computer motherboard. It can process 3D images using the AGP type of video bus interface. It also contains approx. 64 million bytes of synchronous dynamic random access memory that is used as video memory.
18. A sound card that has 64 voices and generates sounds using the wave table system.
19. A CD-ROM storage device that operates at 48 times the speed of the original CD-ROM devices.
20. A colour monitor for displaying output on a screen at resolutions determined by the SVGA standard. The diagonal measurement of the whole screen is 19 inches but the diagonal measurement of the actual viewable area of the screen is only 17.9. inches.
21. The operating system that is used to control the system.

SPECIALIZED READING

Cache memory

Most PCs are held back not by the speed of their main processor, but by the time it takes to move data in and put of memory. One of the most important techniques for getting around this **bottleneck** is the memory cache.

The idea is to use a small number of very fast memory chips as a buffer or cache between main memory and the processor. Whenever the processor needs to read data it looks in this cache area first. If it finds the data in the cache then this counts as a '**cache hit**' and the processor need not go through the more **laborious process** of reading data from the main memory Only if the data is not in the cache does it need to access main memory, but in the process it copies whatever it finds into the cache so that it is there ready for the next time it is needed. The whole process is controlled by a group of logic circuits called the **cache controller**.

One of the cache controller's main jobs is to look after '**cache coherency**' which means ensuring that any changes written to main memory are reflected within the cache and vice versa. There are several techniques for **achieving** this, the most obvious being for the processor to write directly to both the cache and main memory at the same time. This is known as a **'write-through' cache** and is the safest solution, but also the slowest.

The main alternative is the **'write-back' cache** which allows the processor to write changes only to the cache and not to main memory. Cache entries that have changed are flagged as 'dirty', telling the cache controller to write their contents back to main memory before using the space to cache new data. A write-back cache speeds up the write process, but does require a more intelligent cache controller.

Most-cache controllers move a 'line' of data rather than just a single item each time they need to transfer data between man memory and the cache. This **tends** to improve the chance of a cache hit as most programs spend their time stepping through instructions stored sequentially in memory, rather than jumping about from one area to another. The amount of data transferred each time is known as the '**line size**'.

If there is a cache hit then the processor only needs to access the cache. If there is a miss then it needs to both fetch data from main memory and update the cache, which takes longer. With a standard write-through cache, data has to be written both to main memory and to the cache. With a write-back cache the processor needs only write to the cache, leaving the cache controller to write data back to main memory later on.

How a Disk Cache Works

Disk caching works in essentially the same way whether you have a cache on your disk controller or you are using a software-based solution. The CPU requests specific data from the cache. In some cases, the information will already be there and the request can be met without accessing the hard disk.

If the requested information isn't in the cache, the data is read from the disk along with a large chunk of **adjacent information**. The cache then makes room for the new data by replacing old. Depending on the algorithm that is being applied this may be the information that has been in the cache the longest, or the information that is the least recently used. The CPU's request can then be met, and the cache already has the adjacent data: loaded in **anticipation** of that information being requested next.

UNIT 3 Computer Applications

INTRODUCTION

As computer systems become more intelligent, they are used in a wider variety of work situations where previously it was necessary to employ people. Hospitals can increasingly use computers where highly trained people were required to deal with life-threatening situations. Computers can also be used in airports where highly trained experts were previously required to ensure safety and the police can make more use of computers to detect and investigate increasingly sophisticated crimes.

One of the uses considered in this unit is police **speed traps** used to catch drivers that are breaking the official speed limit. In earlier systems, **radar** equipment was used to bounce radio waves off the moving car. A small processor, known as a **microprocessor**, calculated the speed of the car from the changes in the radio waves and triggered an ordinary camera with a flashgun to take a photograph of the car if it was speeding. The details were stored on a **smart card** (a plastic card with a built-in computer system that can store large amounts of data). When the smart card was taken back to the police station, the driver's details were obtained from the **DVLC** (Driver and Vehicle Licensing Centre) **database** i.e. the central computerised records of all licensed drivers and vehicles.

Newer systems prevent '**surfing**' i.e. where the driver only slows down as they pass through the speed trap, by using two computerised units with digital cameras placed at a fixed distance **apart**. Each unit records the time that a vehicle passes it, as well as photographing and identifying the car licence

number using **OCR software** (optical character recognition software that changes picture images of letters and numbers into digital form for use by a computer system). The computer then uses the difference in recorded times to calculate the speed of the vehicle. The registration numbers of vehicles exceeding the speed limit are immediately **downloaded** (copied from the computer to a server computer) to the computer at police headquarters where each vehicle is matched with the DVLC database. Standard letters are then printed off addressed to the vehicle owners using **mailmerge** (a wordprocessing feature that produces a separate standard letter containing details obtained from each record in a database).

There are many ways in which computer systems can be used in large supermarkets, particularly for financial calculations and in stock control using **EPOS tills** (electronic point of sale cash tills). Each item on a supermarket **shelf** has a **barcode label** with a **barcode** (a standard set of vertical bars of **varying thickness** used to identify products) printed on it. The barcode number system giving standard price and item code numbers used throughout Europe is known as **EAN** (European Article Number). The barcodes are read by scanner devices called **barcode readers** that are attached to the EPOS tills. When a checkout operator moves the barcode label across the scanner, the label is scanned and the barcode number for that item is read. The scanner signals are converted to a **digital** form (where the changing signal is either off or on) and sent to the supermarket **branch computer**. The branch computer checks the digital EAN code against a computer **database** (a type of applications program used for storing information so that it can be easily searched and sorted) that holds a record of each type of item. In this way the item and the price of the item can be identified and the sale of the product can be recorded by the computer. The item and the price are shown on the EPOS till display and printed on a paper receipt.

Computers are also used to provide cash to users and to process bank cards such as Visa cards using an **ATM** (automatic teller machine - the type of machine used by banks for enabling customers to **withdraw** money from their bank accounts).

READING

In the last ten years, police have installed speed trap units on many busy roads. These contain a radar set, a microprocessor and a camera equipped with a **flash**. The radar sends out a **beam** of radio waves at a frequency of 24 gigahertz. This is equivalent to a **wavelength** of 1.25 cms. If a car is moving towards the radar, the reflected signal will bounce back with a **slightly** smaller wavelength. If away from the radar, the waves will reflect with a slightly longer wavelength. The microprocessor within the unit measures **tile difference** in wavelength between outgoing and returning signals and calculates the speed of each vehicle. If it is above the speed pre-set by the police, the camera takes a picture of the vehicle. The information is stored on a smart card for transfer to the police computer. The owner of the vehicle can then be traced using the Driver and Vehicle Licensing Centre database.

Some drivers have now got used to these traps. They slow down when they **approach** one to ensure that the camera is not triggered. They speed up again as soon as they have passed. This is known as 'surfing'. One way of **outwitting** such motorists is a new computerised system. This consists of two units equipped with digital cameras positioned at a measured distance apart. The first unit records the time each vehicle passes it and identifies each vehicle by its number plates using optical character recognition software. This information is **relayed** to the second unit which repeats the exercise. The microprocessor within the second unit then calculates the time taken by each vehicle to travel between the units. The registration numbers of those vehicles exceeding the speed limit are relayed to police **headquarters** where a computer matches each vehicle with the DVLC database. Using **mailmerge** a standard letter is then printed off addressed to the vehicle owner.

SPECIALIZED READING

Data Mining

Data mining is simply filtering through large amounts of raw data for useful information that gives businesses a **competitive edge**. This information is made up of meaningful **patterns** and trends that are already in the data but were previously unseen.

The most popular tool used when mining is **artificial intelligence** (**AI**). AI technologies try to work the way the human brain works, by making intelligent **guesses**, learning by example, and using **deductive reasoning**. Some of the more popular AI methods used in data mining include **neural networks**, **clustering**, and **decision trees**.

Neural networks look at the rules of using data, which are based on the connections found on a sample set of data. As a result, the software continually analyzes value and compares it to the other factors, and it compares these factors repeatedly until it finds patterns emerging. These patterns are known as rules. The software then looks for other patterns based on these rules or sends out an alarm when a trigger value is hit.

Clustering divides data into groups based on similar features or limited data ranges. Clusters are used when data, isn't labelled in a way that is favourable to mining. For instance, an **insurance company** that wants to find instances of **fraud** wouldn't have its records labelled as **fraudulent** or not fraudulent. But after analyzing patterns within clusters, the mining software can start to figure out the rules that point to which claims are likely to be false.

Decision trees, like clusters, separate the data into subsets and then analyze the subsets to divide them into further subsets, and so on (for a few more levels). The final subsets, are then small enough that the mining process can find interesting patterns and relationships within data.

Once the data to be mined is identified, it should be cleansed. **Cleansing data** frees it from duplicate information and erroneous data. Next, the data should be stored in a uniform format within relevant categories or fields. Mining tools can work with all types of data storage, from large data warehouses to smaller desktop databases to flat files. **Data warehouses** and **data marts** are storage methods that involve archiving large amounts of data in a way that makes it easy to access when necessary.

When the process is complete, the mining software generates a **report**. An **analyst** goes over the report to see if further work needs to be done, such as refining parameters, using other data **analysis tools** to examine the data, or even **scrapping the data** if it's unusable. If no further work is required, the report proceeds to the decision makers for **appropriate action**.

The power of data mining is being used for many purposes, such as analyzing **Supreme Court decisions**, discovering patterns in health care, pulling stories about competitors from newswires, resolving bottlenecks in production processes, and analyzing sequences in the human genetic makeup. There really is no limit to the type of business or area of study where data mining can be **beneficial**.

Data Stores

You must first have data to mine. Data stores include one or several databases or data warehouses.

Cleanse data

Data must be stored in a consistent format and free from errors and redundancies.

Search data

Actual mining occurs when data is combed for patterns and trends. Rules for patterns are noted.

Analyze reports

Someone must analyze mining results for validity and relevance.

Report findings

The mining results can then be reviewed and interpreted, and a plan of action determined.

UNIT 4 Peripherals

INTRODUCTION

EPOS (electronic point of sale) **tills** used in supermarkets form part of a computer system with various input and output **peripheral devices** attached to the till, including: **electronic scales** for weighing produce, **barcode reader** for looking up prices using barcodes, **swipe card reader** for reading bank cards, **numeric keypad** for inputting prices manually, **LCD** (liquid crystal display) screen for outputting purchase details.

Digital cameras are gradually being developed that are as good as **conventional cameras**. They have various electronic devices inside, including:

a **LCD** (Liquid Crystal Display) screen used as a **view-finder** and for viewing the pictures after they have been taken.

b **CCD** (Charge-Coupled Device) consisting of thousands of **photo-transistors** (light-sensitive transistors - a transistor is an electronic switch). It creates the pictures as a set of dots or **pixels** (picture elements).

c Memory cards e.g. **flash cards - solid state memory** (electronic integrated circuits, i.e. chips, used for storing the pictures).

There is no delay in getting pictures from digital cameras because there is no film requiring chemical processing. They can be attached to a computer to directly transfer pictures for editing using special software and unwanted pictures can be deleted. However, they cost more than conventional cameras and the quality is not quite as good. You also need to buy rechargeable batteries and a photo-quality colour printer with high printing costs for paper, ink, etc. Two important features when buying a digital camera are:

a picture quality or **resolution**. The resolution of a camera is measured in pixels and given as two numbers, indicating how many pixels there are across the image and how many going down the image e.g. 1280 by 960 (or 1280x960).

b the number of pictures the camera can store. The higher the resolution, i.e. the more pixels, the more memory is required to store the pictures. Data can be compressed to allow more pictures to be stored.

Storage devices are used to store data and programs that are not being used by the processor. They usually consist of:

a **storage media** in the form of a circular disk or a tape where the data is stored

b a **disk** or **tape drive** that moves the media past a **read/write head** that reads the data from and writes data to the storage media.

Types of storage devices include:

magnetic devices (that use magnetism)	**floppy disks** (diskettes) and **magnetic tape** made of a magnetic coated flexible plastic; **hard disks** made of magnetic coated aluminium disks.	
optical devices (that use laser light)	**CD-ROM**	– compact disk read only memory
	CD-R	– recordable compact disk
	CD-RW	– re-writable compact disk
	DVD-ROM	– digital versatile disk read only memory
	DVD-RAM	– digital versatile disk random access memory
magneto-optical devices (that use a combination of magnetism and laser light)	**CD-MO**	– magneto optical compact disk

Read and write media enable the user to both read data from and write data to the media. **Read only media** can only be used for reading data i.e. the stored data cannot be changed in any way.

Removable storage enables the user to change the media and transfer it to another computer.

Fixed storage does not allow the media to be changed or transferred to another computer.

Other factors that vary between storage devices include:

a the speed at which the drive moves the media past the read/write head and reads or writes data to the storage media

b the capacity of the media i.e. how much data can be stored on each disk or tape

c the cost of the drive and the media.

There are various types of **printers** for, out-putting text and graphics to paper.

Some types of printers are **mono** (print in black and white only) and others can print in colour. The speed, quality and cost of printing varies between different types of printer. Some are designed for printing text and are not really suited to printing graphics.

Data can take many forms and there is a wide variety of input, output, storage and communication **peripherals**.

Units of measurement used in data storage include:

bit	a binary digit i.e. a 1 or a 0

byte	8 bits = 1 character i.e. a letter, numerical digit or a punctuation mark
megabyte (MB)	1,048,576 bytes (approximately one million bytes)
gigabyte (GB)	1,073,741,824 bytes (approximately one thousand million bytes)
terabit	1,099,511,627,776 bits (approximately one thousand gigabits)
micron	one millionth of a metre
angstrom	the approximate radius of an atom

LISTENING

How a digital camera works

Digital cameras store images on memory cards so pictures can be transferred easily to a computer.

A **lens** focuses the image on to a CCD unit or Charge-Coupled Device where the film would normally be.

So you can aim the camera accurately, there is an optical **viewfinder**.

So you can play back the images and decide which to keep and which to re-shoot, the image is passed to a small LCD screen on the back of the camera.

SPECIALIST READING

Ready for the Bazillion Byte Drive?

Thinking about writing your **memoirs** - putting your life story down on paper for all eternity? Why not skip the repetitive **strain injury** and just capture your whole life on full-motion video, putting it all in a device the size of a sugar cube? It might not be as far of as you think.

Currie Munce, director of IBM's; Advanced HDD Technology Storage Systems Division, has one **avowed** goal: Build bigger storage. Recently Munce and his fellow Ph.Ds restored Big Blue's lead in the disk space race with a new world record for areal (bit) density: 35.3 gigabits per square inch - roughly three times as dense as any drive shipping at press time.

During the 1990s, **areal density** doubled every 13 months, keeping **pace** with the transistor density gains predicted by **Moore's Law**. But increasingly **daunting** technical challenges face those who would push the storage **envelope** further. 'I think magnetic recording technology has another good 5 to 10 years,'says Munce. 'After that, we'll see substantial difficulties with further advances at the pace people are accustomed to.'

From here on, a **phenomenon** called **superpararmagnetism** threatens to make densely-packed bits unstable. Provided that new developments continue to thwart superparamagnetic corruption, scientists speculate that the theoretical limit for discrete bit recording is 10 terabits per square inch (1 terabit =1,000 gigabits).

Approaching this limit will require new technologies. Two possible contenders are **atomic force microscopy** (**AFM**) and **holographic storage**. AFM would use a spinning plastic disk, perhaps inside a wristwatch, and a tiny, 10-micron **cantilever** with a 40-angstrom tip (an angstrom represents the approximate radius of an atom) to write data. In theory, AFM will allow densities of 300 to 400 gigabits per square inch.

While AFM is still in the lab, holographic storage is closer to reality. According to Rusty Rosenberger, optical program manager for Imation, 'We are targeting a $5^{1}/_{4}$ -inch disk with 125GB of storage and a 40MB-per-second transfer rate. Future iterations of holographic systems should improve **substantially**.

The three-dimensional **nature** of holography makes it an appealing storage medium because 'pages' of data can be **superimposed** on a single volume - imagine transferring a whole page of text at once as opposed to reading each letter in sequence. Hans Coufal, manager of IBM's New Directions in Science and Technology, Research division, predicts that the fast access rates and transfer times of holographic storage will lead to improved network searches, video on demand, high-end servers, enterprise computing, and supercomputing.

Meanwhile, also-ran technologies are **thriving**, Tape, first used for data storage in 1951 with the Univac I, has been revitalized by the corporate hunger for affordable archiving solutions. In the consumer arena, says Dataquest analyst Mary Craig, recordable CD-ROMs and DVDs will remain the dominant high-capacity removable storage media for the next decade. **Despite** their failure to match the areal density gains of hard disks, optical disks are cheap to produce, making them ideal for software

distribution (until a **mature** digital rights management system facilitates online delivery). Finally, solidstate options such as flash cards can't yet match the pricing of hard disks at high capacities.

Further out, scientists **salivate** over the prospect of data manipulation and storage on an atomic level. Because consumer demand for capacity is lagging behind what technology can deliver, bringing new storage options to the masses will depend on seeding the need for more space.

UNIT6 Operating Systems

INTRODUCTION

The **OS (operating system)** is the set of computer programs that allow the user to perform basic tasks tike copying, moving, saving and printing files. It also provides an **interface** between (i.e. provides communication between) **applications programs** (e.g. wordprocessors or spreadsheets) and the computer hardware. As a user interacts with an applications program on the screen, the applications program communicates with the operating system and the operating system communicates with the computer hardware. The work of the operating system takes place in the background and is not always obvious to the user.

The most important program in an OS is the **supervisor program**. It remains in memory all the time that the computer is operating, and manages the OS. It loads other parts of the OS into memory when they are needed. Programs that remain in memory while the computer is in use are known as **resident programs**. Programs that only stay in memory while they are being used are known as **non-resident programs**.

Some operating systems are **command driven** (i.e. the user runs a program by typing a command). The screen is usually blank except for a symbol (e.g. $) which acts as a **command prompt**. When the command is typed at the prompt and the Enter key is pressed, the command is processed and the output is displayed on the screen. OS commands are usually short words or **abbreviations** (e.g., date, logout, passwd, ls).

Unix is a command driven operating system used on all sizes of computers, but mostly large multi-user, multi-tasking mainframe computers. It is available in many versions, such as Linux, Minix, HP-UX, Xenix, Venix, Ultrix, A/UX, AIX, Solaris, and PowerOpen. Other command driven operating systems mentioned in this unit include: VAX/VMS, MVS VM OS/390, NetWare, MS-DOS and PC-DOS.

Some operating systems have a **GUI** (pronounced like 'goo-ey' - **graphical user interface**) that allows the user to use a mouse to click on icons on the screen or choose commands from a list of choices known as a **menu**. Operating systems with graphical interfaces mentioned in this unit include: MacOS, OS/2, Penpoint, Windows NT, Windows 3.x, Windows 9X and Windows 2000.

READING

A conceptual diagram of an operating system

Closest to the user are applications programs - software that helps a user compute a payroll or play a game or calculate the trajectory of a rocket.

The operating system is the set of programs between the applications programs and the hardware.

Operating Systems: Hidden Software

When a **brand** new computer comes off the factory assembly line, it can do nothing. The hardware needs software to make it work. Are we talking about applications software such as wordprocessing or spreadsheet software? Partly. But an applications software package does not communicate directly with the hardware. Between the applications software and the hardware is a software interface — an operating system. An operating system is a set of programs that lies between applications software and the computer hardware.

The most important program in the operating system, the program that manages the operating system, is the supervisor program, most of which remains in memory and is thus referred to as resident. The supervisor controls the entire operating system and loads into memory other operating system programs (called nonresident) from disk storage only as needed.

An operating system has three main functions: (1) manage the computer's resources, such as the central processing unit, memory, disk drives, and printers, (2) establish a user Interface, and (3) Execute and provide services for applications software. Keep in mind, however, that much of the work of

an operating system is hidden from the user. In particular, the first listed function, managing the computer's resources, is taken care of without the user being aware of the details. Furthermore, all input and output operations, although invoked by an applications program, are actually carried out by the operating system.

SPECIALIST READING

LINUX

Linux has its roots in a student project. In 1992, an **undergraduate** called Linus Torvalds was studying computer science in Helsinki, Finland. Like most computer science courses, a big component of it was **taught** on (and about) Unix. Unix was the **wonder operating system** of the 1970s and 1980s: both a textbook example of the principles of operating system design, and sufficiently robust to be the standard OS in engineering and scientific computing. But Unix was a commercial product (licensed by AT&T to a number of resellers), and cost more than a student could pay.

Annoyed by the **shortcomings** of Minix (a compact Unix clone written as a teaching aid by Professor Andy Tannenbaum) Linus set out to write his own '**kernel**' — the core of an operating system that handles memory allocation, talks to hardware devices, and makes sure everything keeps running. He used the GNU programming tools developed by Richard Stallman's **Free Software Foundation**, an organization, of **volunteers** dedicated to fulfilling Stallman's ideal of making good software that anyone could use without paying. When he'd written a basic kernel, he released the **source code** to the Linux kernel on the Internet.

Source code is important. It's the original from which compiled programs are generated. If you don't have the source code to a program, you can't modify it to fix bugs or add new features. Most software companies won't sell you their source code, or will only do so for an **eye-watering price**, because they believe that if they make it available it will destroy their **revenue stream**.

What happened next was **astounding**, from the conventional, commercial software industry point of view - and **utterly predictable** to anyone who knew about the Free Software Foundation. Programmers (mostly academics and students) began using Linux. They found that it didn't do things they wanted it to do - so they fixed it. And where they improved it, they sent the improvements to Linus, who rolled them into the kernel. And Linux began to grow.

There's a term for this model of software development; it's called **Open Source** (see www.opensource.org/ for more information). Anyone can have the source code — it's free (in the sense of free speech, not free beer). Anyone can **contribute** to it. If you use it heavily you may want to extend or develop or fix bugs in it — and it is so easy to give your fixes back to the community that most people do so.

An operating system kernel on its own isn't a lot of use; but Linux was **purposefully** designed as a near-clone of Unix, and there is a lot of software out there that is free and was designed to compile on Linux. By about 1992, the first '**distributions**' appeared.

A distribution is the Linux-user term for a complete operating system kit, complete with the utilities and applications you need to make it do useful things - command interpreters, programming tools, text editors, typesetting tools, and graphical user interfaces based on the **X windowing system**. X is a standard in academic and scientific computing, but not **hitherto** common on PCs; it's a complex distributed windowing system on which people implement graphical interfaces like KDE and Gnome.

As more and more people got to know about Linux, some of them began to port the Linux kernel to run on non-standard computers. Because it's free, Linux is now the most widely-ported operating system there is.

UNIT 7 Graphical User Interfaces

INTRODUCTION

A **user interface** allows a user to interact with a computer. In particular, a GUI (graphical user interface) allows the user to use a **mouse** to interact with the computer. **Microsoft Windows** (commonly referred to as Windows) is a common **GUI** used on **PCs** (IBM compatible personal computers). The main Windows background screen is called the **desktop**. Programs, files and folders are represented on the desktop by small images called **icons**. Using a mouse, the user can move a pointer (**cursor**) across the screen. An icon can be **selected** by **clicking** the left mouse button (i.e.

quickly pressing and releasing the button). By holding the pointer over an icon (**hovering**), a text box can be made to appear that explains what the icon represents. This text box is known as a **tooltip**. **Double-clicking** the mouse (pressing and releasing the button twice in quick **succession**) causes the program, file or folder represented by the icon to open in a rectangular box on the screen called a **window**. More than one window can be open at a time but the one with the **focus** is known as the **active window**. Windows can have a vertical **scroll bar** and a horizontal scroll bar to allow the user to move a document up and down or across the screen respectively. A user can **drag** a selected item from one part of the screen to another by holding down the left mouse button while moving the pointer. The user can then **drop** the item at the new location by releasing the mouse button.

Commands are displayed in a **menu bar** along the top of the window. Clicking on a command opens a list of choices known as a **menu**. Clicking on a menu item sometimes opens another related menu called a submenu. Common commands include:

Find	searches for a word, filename, or folder name
Undo	reverses the last action of the user
Cut	deletes the selected text, file or folder and copies it to a special area of memory called the **clipboard**
Paste	inserts the text, file or folder stored in the clipboard, at the location of the cursor

A bar, known as a **taskbar**, is displayed along the bottom of the desktop showing what programs, files and folders are currently open. At the far right of the taskbar is a special area called the **system tray** where icons are displayed showing what resident programs are continuously-running in the background e.g. the system clock or a sound volume control. There is a **Start button** at the far left of the taskbar. When the Start button is clicked, the **Start menu** opens on the screen. The user can close down the operating system by choosing the **Shut Down** option on the Start Menu. A **touchscreen** allows the user to select icons and commands by touching the display screen with their finger instead of using a mouse. Graphical user interfaces were first introduced with the Apple Mac OS. Other GUIs with desktops, icons, pointers, windows, menus and submenus are also available.

Common icons on the Microsoft Windows desktop include:

Microsoft Outlook	a messaging program
My Briefcase	a program that allows the user to exchange files with a portable computer and to synchronise the files on each computer
Network Neighbourhood or **My Network Places**	a feature that displays the names of other computers networked with yours
My Computer	a feature that lets you see the resources on your computer
Internet Explorer	a browser program that allows the user to view webpages on the Internet
Recycle Bin	a feature that stores deleted files and allows the user to restore them to their original location i.e. the equivalent to the **trashcan** on an Apple Mac system.

A + sign used between the names of keyboard keys means that the user should press both keys simultaneously e.g. ALT + TAB. Keyboard keys and combination of keys mentioned in the text include:

Shift key	allows you to type in upper case (capital letters)
MouseKeys feature	enables you to use the numeric keypad to move the mouse pointer
ALT + TAB	allows you to switch between open programs
StickyKeys feature	helps disabled people to operate two keys simultaneously
PRINT SCREEN key	lets you copy an image of the whole screen to the Clipboard
ALT + PRINT SCREEN	lets you copy an image of the active window to the Clipboard

READING

Menu bar

Just about all programs display a menu bar across the top of the screen, including the 'Finder'. The menu bar will change, depending on the program you're running at the time.

Document

This is a text file which tells us something about the contents of this CD-ROM. You can read it by simply double-clicking on it - your iMac will then automatically find the program needed to open it.

Application

This is an application, or program icon. Double-clicking on it will start the program. It's not always obvious whether an icon is for a document or a program, but you soon get to be able to spot these things.

Folder

This is a folder icon, and these all tend to look the same - like a kind of 3D view of a suspension file. Sometimes they're adorned with other graphics, but they're usually pretty easy to spot. Double-clicking on a folder icon displays that folder's contents in another window, which is what we've done here.

Hard Disk icon

Folders; files, documents and other items are displayed as little icons like this. This one, in fact, represents your iMac's internal hard disk.

CD-ROM icon

Your hard disk icon (and Wastebasket icon) may be the only ones you see on your desktop. If you insert a CD-ROM, though, it will appear as an icon on your desktop too. We've double-clicked on it to display its contents. To eject a CD, by the way, you have to drag its icon onto the Wastebasket - you can't just press the CD-ROM drive button. If you do, you'll be waiting an awful long time.

Folder window

When you double-click on a folder or a disk drive, its contents are displayed in a window like this one. These contents can be documents, programs or other folders.

List view

This is another folder window, but this time we're looking at the contents in 'List' view. Otherwise, it's the same as the window next to it - a 'window' on a folder, basically. You can nest folders many layers deep, in case you're wondering, and you're likely to get confused long before your iMac does - try to keep your filing system as simple as possible.

Menu/menu option

To open a menu, click on its name in the menu bar. This displays a drop-down list like the one you see here. To choose one of the menu options, just click on it (the options are highlighted as the mouse pointer moves over them to help you get the right one). Don't forget to always shut down your iMac via this menu, NOT by simply switching the power off.

Control Strip

The Control Strip offers quick access to many of your iMac's settings like the speaker volume, sound input and CD player controls. Until you've found out what these gadgets do, you can 'hide' it by clicking on the small ribbed area to the far right. This reduces it to a little handle in the bottom left-hand corner of the screen. Click this handle if you want to display the Control Strip again.

Scrollbar

You'll see these gadgets whenever the contents of a folder won't fit in the window, You click on either the horizontal or vertical scroll arrows to display more of the contents - either that, or drag on the little blue 'Scrollbox'.

Desktop pattern

This background image can be swapped for many more via the Appearance control panel. You can use a repeating 'pattern' like this, or a single image - a scanned photograph for example.

Wastebasket icon

The Wastebasket is where you throw things you no longer need. It doesn't empty straight away, (though as you can see, ours is so full the lid's fallen off), so you can change your mind if you have to. When you want to eject a disk, be it a CD-ROM or a floppy disk (if you've got a floppy disk drive attached), you drag its icon on to the Wastebasket and the iMac will spit it out automatically.

SPECIALIST READING

User interfaces

Cheaper and more powerful personal computers are making it possible to perform **processor-intensive tasks** on the desktop. **Break-throughts** in technology, such as speech recognition, are enabling new ways of interacting with computers. And the **convergence** of personal computers and consumer electronics devices is **broadening** the base of computer users and placing new emphasis on ease of use. Together, these developments will drive the indrustry in the next few years to build the first completely new interfaces since SRI International and Xerox's Palo Alto Research Center did their pioneering research into graphical user interfaces (GUIs) int the 1970s.

True, it's unlikely that you'll be ready to **toss out** the keyboard and mouse any time soon. **Indeed**, a whole **cottage industry** - inspired by the hyperlinked design of the World Wide Web - has spring up to improve today's graphical user interface. Companies are developing products that organize information graphicaly in more intutive ways. XML based formats enable users to view content, including local and network files, within a single browser interface. But it is the more dramatic innovations such as speech recognition that are **poised** to shake up interface design.

Speech will become a major component of user interfaces, and applications will be completely redesigned to incorporate speech input. Palm size and handheld PCs, with their **cramped** keyboards and basic handwriting recognition, will benefit from speech technology.

Though speech recognition may never be a complete replacement for other input devices, future interfaces will offer a combination of input types a concept known as **multimodal input**. A mouse is a very efficient device for desktop navigation, for example, but not for changing the style of a paragraph. By using both a mouse and speech input, a user can first point to the appropriate paragraph and then say to the computer, 'Make that bold.' Of course, multimodal interfaces will **involve** more than just traditional input devices and speech recognition. Eventually most PCs will alse have handwriting recognition, text to speech (TTS), the ability to recognize faces or gestures, and even the ability to **observe** their surroundings.

At the Intelligent Room, a project of Massechusetts Institute of Technology's Artificial Intelligence Lab, researchers have given sight to PCs running Microsoft Windows through the use of video cameras. 'Up to now, the PC hasn't cared about the world around it.' said Rodnev A. Brooks, the Director of MIT's Artificial Intelligence Lab. 'When you combine computer vision with speech understanding, it liberates the user from having to sit in front of a keyboard and screen.

It's no secret that the amount of information - both on the Internet and within intranets - at the fingertips of computer users that has been expanding rapidly. This information **onslaught** has led to an interest in **intelligent agents**, software assistants that perform tasks such as retrieving and delivering information and automating repetive tasks. Agents will make computing significantly easier. They can be used as Web browsers, help desks, and shopping assistants. Combined with the ability to look and listen, intelligent agents will bring personal computers one step closer to behaving more like humans. This is not an **accident**. Researchers have long noted that users have a tendency to treat their personal computers as though they were human. By making computers more 'social,' the hope to also make them easier to use.

As these technologies enter mainstream applications, they will have a marked impact on the way we work with personal computers. Soon, the question will be not 'what does software look like' but 'how does it **behave**?'

VB036 English II

UNIT 8 Applications Programs

INTRODUCTION

Software is the word used to refer to **programs** (sets of computer instructions written in a computer language) and **data** that is input, processed and output by a computer system. **Applications programs** are programs that allow the user to do various types of work on a computer e.g. wordprocessors, databases. A set of related applications programs is referred to as a **package** (or **suite**). Common applications programs include:

wordprocessors	for creating and editing texts
spreadsheets	for performing calculations using formulas
databases	for storing data so that it can be easily searched and sorted
graphics	for drawing
games	for playing fast action games
accounts	for keeping business accounts
payroll	for calculating salaries
presentation program	for creating multimedia slide shows
email	for sending electronic mail messages
PIM (personal information manager)	for keeping track of **appointments**, address book, task list, etc.
DTP (desktop publishing program)	for creating publications to be printed by a professional printer
small business tools	for performing various business tasks
website editor	for creating and editing webpages
image editor	for editing graphic images
developer tools	for writing programs to add features to existing applications and creating integrated program systems

Some **applications programs**, such as wordprocessors, spreadsheets and databases, are commonly referred to as **office programs** because they are commonly used in a typical office. **Office packages** (or **suites**) such as **Microsoft Office** are sets of interrelated office programs. Different versions of office suites are usually available containing different combinations of programs. **Mailmerging** is a useful feature found in most office suites that combines a database with a wordprocessor document to automatically produce a copy of a standard letter for each record in the database.

A variety of **computer hardware** is used in the doctors' practice in this unit including:

PC	common name for an IBM compatible personal computer
network	computers connected together
file server	a powerful computer that stores and allows users access to data files on a network
laser printer	a very high quality text and graphics printer that has a photosensitive drum that deposits toner **powder** on the paper
dot-matrix printer	a low quality printer that prints by hammering pins on the paper to print an image made up of dots. The hammering action means that it can print on special multipart paper where a number of copies are produced at the same time.
CD-ROM	a compact disk read only memory storage device that is cheap to produce and suitable for storing large amounts of data

The **Patient Browser program** (**GPASS**) discussed in this unit is a type of **database** for sorting and searching patient records. To search, you select different option screens by clicking on a **tab** with a mouse and inputting the **search criteria** (details of what you are looking for) in text boxes known as **criteria boxes**. Different **button icons** can be clicked to perform different operations e.g. the Find button. The **default button** is the option that is selected automatically.

Tomb Raider is a popular adventure game that has appeared in various versions. The main character is represented by a female animated image, known as **Lara Croft**. The user follows a storyline in which they have to solve puzzles and control the movements of the main character, sometimes having to react quickly to avoid dangerous **obstacles**, it is available on well known **games consoles** (specialised

games computers) called **PlayStation** and **Dreamcast** manufactured by a company called Sega.

SimCity is a **simulation program** (a program that simulates real life) in which the user, has to develop a city by building roads and **3D** (three-dimensional) buildings, setting taxes, etc. They also have to control objects such as simulated cars and people. The user can **download** (copy from a server computer) additional objects and swap items with other users using a special website. The game is run on a computer called a **Commodore 64** (an early British type of personal computer particularly suited to games because of its excellent graphics facilities).

An **ASP** (**application service provider**) rents applications to users i.e. instead of buying software, the user pays for using applications as and when they need them. The ASP provides the software, manages the hardware and provides storage space, security controls and the physical links to customers. The ASP normally leases storage space for programs and data from **data centres** (facilities for storing large amounts of information) owned by data storage specialists.

The user is provided with **remote access** (access across a communications network) to a wide variety of programs including: generic applications such as **email** (electronic mail) and office suites, **high-end** (advanced) packages including large, complex business applications such as enterprise resource planning tools (e.g. **SAP**), business services, such as payroll and accounting systems, expensive specialist tools and **e-commerce** resources (electronic commerce - buying and selling on the internet).

This gives the user more flexibility and saves them having to install and maintain programs, **upgrade** (install newer versions of programs), deal with **viruses** (programs that can reproduce themselves and are written with the purpose of causing damage or causing a computer to behave in an unusual way) and manage email systems (electronic mail systems).

Disadvantages of this system include: the need for a **broadband** (high bandwidth i.e. a connection with a high signal capacity) network connection or a **leased line** (a cable connection that is rented for use in a communications system) and dependence on the ASP to provide a secure, reliable, readily available service.

SPECIALIZED READING

Application Service Providers

If your hard disk is packed to **bursting point**, the IT departrnent is far too busy to fix your email problems, and your business can't afford to buy the tools that you'd like to develop the company website, then it's time to think about using an application service provider (ASP). Rather than installing software on each machine or server within your organisation, you rent applications from the ASP, which provides remote access to the software and manages the hardware required to run the applications.

There are a lot of advantages to this approach. The **havoc** caused by viruses makes the idea of outsourcing your email and office suite services an attractive option. It also gives you more flexibility - you pay for applications as and when you need them, rather than investing in a lot of costly software which you're then tied to for years. Not having to worry about upgrading to the latest version of your office suite or about battling with the complexities of managing an email system, leaves businesses with more time. Time to focus on what they do best.

However, there are some potential pitfalls. To use applications remotely requires a lot of bandwidth, which is only really available from a broadband connection or a leased line to the ASP itself. It is also important to ensure that the ASP will be able to provide a secure, reliable service which will be available whenever you need it.

Providing applications and storage space for **vast** numbers of users requires some powerful technology on the part of the ASP, This includes security controls and data storage as well as providing the physical links to customers. For the most part, ASPs don't own the data centres that store the information. Instead, they lease space from data storage specialists. In this way, they can be confident of meeting customers' increasing storage requirements by buying more space as it's needed.

There's a wide variety of applications available for use via ASPs. Office suite applications and email services are two of the most generic applications available through ASPs. Large, complex business applications such as enterprise resource planning tools like SAP are another popular candidate for delivery through an ASP. Other business services, such as payroll and accounting systems are also available. This is particularly beneficial to small businesses which are likely to grow quickly and don't want to deal with the problems caused by outgrowing their existing system and having to move to a high-end package. ASPs also offer a means of using specialist tools that would otherwise prove

prohibitively expensive. Small businesses have the opportunity to use such tools for short periods of time as and when they need them, rather than having to buy the software as a permanent **investment**.

One of the major barriers for small businesses which want to make a start in e-commerce is ensuring that they have sufficient resources to **cope** with sudden large increases in customers. This means not only having **adequate** storage for all your customers' details, but ensuring that you have the technology in place to handle stock levels, efficient delivery and large volumes of traffic. It's very rare for an e-commerce business to handle all of these elements by itself, making this one of the best-established areas of ASP use. Being able to respond rapidly to changes in the size of your customer base and the type of product that they want to order from your business, demands more flexibility than traditional software can provide.

UNIT 9 Multimedia

INTRODUCTION

Multimedia is the term used to refer to a combination of text, graphics, animation, sound and video.

MP3 (MPEG Audio Layer 3) is a standard way of storing compressed, digital audio files (usually music). **Digital audio** is created by sampling sound 44,000 times a second and storing a code number to represent each sound sample. The files are compressed by removing any sounds that are inaudible to the human ear, making them much smaller than files created using other digital audio storage standards, such as **WAV**. The size of an audio file is commonly measured in **megabytes** (**MB**) (millions of bytes). The frequency of a sound is measured in **kilohertz** (**kHz**) (thousands of cycles per second). MP3 files have extra code added, called **tags**, that give the user information about the file e.g. the performer's name, a **URL** (uniform resource locator i.e. a web address) or a graphic such as an album cover.

Because of their small size, MP3 files are more suitable for transferring across the **Internet** (the connection of computer networks across the world). Some Internet **websites** (sets of related pages stored on a Web server on the World Wide Web) are devoted to providing MP3 files for **downloading** (copying from a server computer to a client computer). The user can create their own music **compilations** (combinations of files) by listening to each file using a computer program, such as **Windows Media Player**, and choosing what files to download. They can then use a computer program called an **MP3 player** to listen to the files and control the sound. MP3 players let the user group songs into play lists and randomise the selections. They also have sound control features such as spectrum analysers, graphic equalisers, and frequency displays. A **track info button** allows the user to see the information stored in the MP3 file tag. The appearance of MP3 players can be changed using programs called **skins** (or **themes**). MP3 players often include a program, called a **ripper**, that lets the user **rip** (extract) a song from a **CD** (compact disk) and convert it to a standard WAV file. Another program called an encoder is used to convert WAV files into MP3 files or vice versa. **Recorder** programs are also available that enable the user to create audio CDs using a writable CD-ROM drive. Special **MP3 player devices** are also available that enable the user to listen to MP3 files without a computer.

MIDI (Musical Instrument Digital Interface) is a standard way of connecting musical instruments, music synthesisers, and computers. A piece of electronics called a **MIDI interface board** is installed on each device to enable the device to communicate using MIDI standards. As music is being played, it can be displayed on a monitor screen as a musical score, then edited using a computer program that uses all the features of a **mixing desk** (an electronic device for mixing sounds together), stored and printed. MIDI systems do not store the actual sound. Instead the sound is **encoded** (stored as **MIDI messages**) in the form of **8-bit bytes** (units of capacity equal to eight binary digits i.e. 1s and 0s) of digital information. A **bit** is a binary digit i.e. a 1 or a 0, and a **byte** is a group of 8 bits. The MIDI messages commonly consist of instructions that tell the receiving instrument what note to play, how long and how loud it should be played, including a number that indicates which instrument to play. Each instrument is represented by a different number e.g. 67 is a saxophone.

A **DVD-ROM**, commonly referred to as a **DVD** (digital versatile disk - previously known as digital video disk), is a development of **CD-ROM** (compact disk read only memory). It is an **optical storage media** (a storage media that uses laser light to store data) that provides large amounts of storage space for multimedia files. A **DVD-ROM drive** (a storage device for reading DVD disks) uses blue laser light (rather than the red laser light used by CD-ROM drives) to read information from the disk. Both sides of the disk can be used for storing files and each side can have two separate storage layers. The **data**

transfer rate of a DVD (the speed that data can be read from a DVD) is also faster than that of a CD-ROM. The capacity of a DVD is commonly measured in **gigabytes** (**GB**) (thousands of millions of bytes).

MPEG (pronounced em-peg) is a method of compressing and decompressing video signals. MPEG stands for Motion Picture Experts Group, an organisation that develops standards for audio and video compression.

READING

Understanding MP3

The name comes from MPEG (pronounced EM-peg), which stands for the Motion Picture Experts Group. MPEG develops standards for audio and video compression. MP3 is actually MPEG Audio Layer 3.

MP3 competes with another audio file format called WAV. The key difference is that MP3 files are much smaller than WAV files. An MP3 file can store a minute of sound per megabyte, while a WAV file needs 11 or 12 megabytes to hold the same amount. How does MP3 achieve this compression? CDs and audio files don't reproduce every sound of a performance, Instead, they sample the performance and store a discrete code for each sampled note. A CD or WAV file may sample a song 44,000 times a second, creating a huge mass of information.

By stripping out sounds most people can't hear, MP3 significantly reduces the information stored. For instance, most people can't hear notes above a frequency of 16kHz, so it eliminates them from the mix. Similarly, it eliminates quiet sounds masked by noise at the same frequency. The result is a file than sounds very similar to a CD, but which is much smaller. An MP3 file can contain spoken word performances, such as radio shows or audio books, as well as music. It can provide information about itself in a coded block called a tag. The tag may include the performer's name, a graphic such as an album cover, the song's lyrics, the musical genre, and a URL for more details.

READING

Play MP3 Files

Most machines today have enough processing power and memory to play Mp3s immediately. Simply download an MP3 file like any other and click on it in Windows Explorer. The Windows Media Player will decode the file and route the signals to your soudcard and then to your speakers. Other MP3 features include:

Players

Most standalone players have many features beyond Window's default Media Player. To control what music yon play players let you group songs into playlists and randomize the selections. To control how (he music sounds (hey offer spectrum analyzers, graphic equalizers, and frequency displays.

Track info

A (rack info button gives you the information on the MP3 file's tag. Other buttons may take you to a music library where you can organize your MP3 files by performer or genre.

Skins or themes

These programs are designed to change the appearance of the most popular players. They're **akin** to the wallpaper that **alters** the look of the Windows desktop. With a skin, a player can become a jukeboxy, car **dashboard**, or a Star Trek tricorder. Think of them as easily interchangeable **faceplates**.

Rippers and encoders

A ripper is a program that rips songs from a CD in your CD-ROM drive and turns them into WAV files. An encoder converts WAV files into MP3 files or vice versa. Many MP3 players incorporate rippers and encoders and can do both steps in one.

Recorders.

With a writeable CD-ROM drive, a recorder program lets you create your own audio Cds.

SPECIALIZED READING

The Tricks to MPEG's Success

The most common system for the compression of video is MPEG. It works like this. The single data stream off the CD-ROM is split into video and audio components, which are then decompressed using separate algorithms. The video is processed to produce individual frames as follows. Imagine a sequence of frames **depicting** a bouncing ball on a plain background. The very first is called an Intra Frame (I-frame). I-frames are compressed using only information in the picture itself just like conventional bitmap compression techniques like JPEG.

Following I-frames will be one or more predicted frames (P-frames). The difference between the P-frame and the I-frame it is based on is the only data that is stored for this P-frame. For example in the case of a bouncing ball, the P picture is stored simply as a description of how the position of the ball has changed from the previous I-frame. This takes up a fraction of the space that would be used if you stored the P-frame as a picture in its own right. Shape or colour changes are also stored in the P-frame. The next P-frame may also be based on this P-frame and so on. Storing differences between the frames gives the rnassive reduction in the amount of information needed to reproduce the sequence. Only a few P-frames are allowed before a new I-frame is introduced into the sequence as a new reference point, since a small margin of error **creeps** in with each P-frarne.

Between I and P-frames are bi-directional frames (B-frames), based on the nearest I or P-frames both before and after them. In our bouncing ball example, in a B-frame the picture is stored as the difference between the previous I or P-frame and the B-frame and as the difference between the B-frame and the following I or P-frame. To recreate the B-frame when playing back the sequence, the MPEG algorithm uses a combination of two references. There may be a number of B-frames between I or P-frames. No other frame is ever based on a B-frame so they don't propagate errors like P-frames.

Typically, you will have two or three Bs between Is or Ps, and perhaps three to five P-frames between Is.

UNIT 10 Computing Support Officer

INTRODUCTION

Computing Support involves setting up and maintaining computing systems, troubleshooting hardware and software problems and training computer users.

A **hard disk drive** is used for storing programs and data as separate **files**. **Windows Explorer** is the name of the program included with Microsoft Windows operating systems for managing stored files. The program opens in a window which is divided into two parts called **panes**. The line separating the panes is called a **divider** and can be moved, using a mouse to change the size of the panes. Using a program such as Windows Explorer, the user can divide the drive into virtual storage areas called **folders** (or **directories**) and give each folder a different name (or label). Each folder can contain other folders called **subfolders** (or **sub-directories**). The user can then copy or move files into different folders and subfolders. Windows Explorer displays drives and folders on the left-hand pane (called the **navigation pane**) in the form of a **tree diagram** with the folders indented below the drive they are stored in and the subfolders indented below the folder they are stored in. A small box called a **toggle box** with a + (plus) or - (minus) sign inside is displayed beside each drive and folder that contains folders or subfolders. When a + is displayed in the box, the folders and subfolders inside the drive or folder are hidden (in the text in this unit the Computing Officer refers to this as the drive being **compacted**). When the user clicks on the box, the folders and subfolders stored in that drive or folder are displayed with lines known as **guidelines** indicating what folders belong inside what drives. The toggle box sign also changes to a minus. Therefore, by clicking on the box, the user can expand and contract the display to show or hide folders and subfolders.

To **create a new folder**, the user uses the mouse to select the drive or folder that will contain the new folder. They then click on the File button on the menu bar at the top of the screen. This opens the File menu and they choose the New option on the File menu. They then choose a Folder from the submenu. This creates a folder called 'New Folder' inside the drive or a folder that was selected at the beginning and gives the user the option of renaming the new folder. When a particular drive or folder is selected, the folders, subfolders and files it contains are displayed in a similar tree diagram in the right-hand pane. The user can **drag** files from one folder to another on the screen using the mouse. To do this they select the file and hold down the left mouse button. As they move the cursor with the mouse, the file moves

with it. They can **drop** a file into another folder by moving the cursor over the name of the folder and letting go of the left mouse button. The user can reverse a change they have made by using the **Undo command** on the Edit menu on the menu bar at the top of the screen.

The main operating system's background screen is called the **desktop**. In Microsoft Windows operating systems, the desktop has a bar along the bottom of the desktop called the **status bar**. This is used to indicate what programs are currently open. By changing the status bar property settings, it can be made to only appear on the display screen when the cursor is moved down to the bottom of the screen. It disappears again when the cursor is moved away from the status bar. At the far left of the status bar is a button icon called the **Start button**. Clicking on the start button causes the **Start menu** to open up. By selecting the Programs option on the start menu, users can normally select the Windows Explorer option on the submenu to start the Windows Explorer program. Another way of starting programs is to choose the **Run command** option on the Start menu. This opens up a **dialog box** (a message window with different options for the user to choose) with a text box and some command buttons inside it. The user can then start a program by typing the name of the program file in the text box and clicking on the OK command button.

READING

General features of operating systems

An operating system is a master control, program which controls the functions of the computer system as a whole and the running of application programs. All computers do not use the same operating systems. It is therefore important to **assess** the operating system used on a particular model before initial **commitment** because some software is only designed to run under the control of specific operating systems. Some operating systems are adopted as 'industry standards' and these are the ones which should be evaluated because they normally have a good software base. The reason for this is that software houses are willing to expand resources on the development of application packages for machines functioning under the control of an operating system which is widely used. The cost of software is likely to be lower in such circumstances as the development costs are spread over a greater number of users, both actual and potential.

Mainframe computers usually process several application programs concurrently, switching from one to the other, for the purpose of increasing processing productivity. This is known as multiprogramming (multi-tasking in the context of microcomputers), which requires a powerful operating system incorporating work scheduling facilities to control the switching between programs. This **entails** reading in data for one program while the processor is performing computations on another and printing out results on yet an other.

In multi-user environments an operating system is required to control terminal operations on a shared access basis as only one user can access the system at any moment of time. The operating systern allocates control to each terminal in turn. Such systems also require a system for record locking and unlocking, to prevent one user attempting to read a record **whilst** another user is updating it, for instance. The first user is allocated control to write to a record (or file in some instances) and other users are denied access until the record is updated and unlocked.

Some environments operate in concurrent batch and real-time mode. This means that a 'background' job deals with routine batch processing whilst the 'foreground' job deals with real-time operations such as airline seat reservations, on-line booking of hotel accommodation, or control of warehouse stocks, etc. The real time operation has priority, and the operating system interrupts batch processing operations to deal with realtime enquiries or file updates. The stage of batch processing **attained** at the time of the interrupt is temporarily transferred to backing storage. After the real-time operation has been dealt with, the interrupted program is transferred back to internal memory from backing storage, and processing recommences from a 'restart' point. The operating system also copies to disk backing storage the state of the real-time system every few minutes (periodic check points) to provide a means of 'recovering' the system in the event of a malfunction.

An operating system is stored on disk and has to be booted into the internal memory (RAM) where it must reside throughout processing so that commands are instantly available. The operating system commands may exceed the internal memory capacity of the computer in which case only that portion of the OS which is frequently used is retained internally, other modules being read in from disk as required. Many microcomputers function under the control of a disk operating system known as DOS.

UNIT 11 Networks

INTRODUCTION

Computers and **peripherals** (pieces of equipment that are connected to the central processing unit of a computer system) connected together form a **network**. Networks allow communication between computers and the sharing of **hardware** (such as printers) and **software** (programs and data). A network that covers a small area e.g. an office or building is known as a **LAN** (local area network). The main computers that provide services on the network are called servers e.g. a **file server** provides a central storage area for data files. The computers that use the services are known as **clients**. The computers can be connected using various types of cabling, including the ordinary telephone system wiring. A main data communications cable connecting LANs together is referred to as a **backbone**. Various electronic devices are also used to amplify, filter and determine the best path for the signals. These include **bridges** for dividing a LAN into separate parts or connecting similar networks together, **gateways** for connecting different types of networks and **routers** for connecting different networks together and determining the best path (or **route**) for the signals. Routers are used to connect networks to form the Internet. A **modem** (modulator/demodulator) is used to convert signals from **analogue** (having a variety of levels) to **digital** (having only two levels, representing on and off) for connection to the ordinary telephone system. Alternatively, an **ISDN** (integrated services digital network) **adapter** or a **DSL** (digital subscriber line) **modem** can be used to allow digital signals to be used without being converted to analogue signals.

There are different standard methods of connecting computers in a LAN. One of the most common is known as **Ethernet**. Each computer must have a network adapter (special electronics to control the network connection). This is usually in the form of an expansion card known as a **network interface card** (NIC). All the computers are connected through another electronic device known as a **hub**. The electronics in the hub are used.to amplify the signals to prevent them from becoming too weak before they reach the desired computer. The cable normally used to connect the computers to the hub is known as **twisted-pair cabling**. It contains two cables twisted together to eliminate interference from external signals. In a home network, the mains power cables built into the house can be used instead if electronic devices called **isolation adapters** are used to isolate the computer from the mains electricity running through the cable. In future, **wireless networks** will use a radio transmitter and receiver tuned to use the same radio frequency, instead of cabling.

In a **client/server network**, the main server computer provides the **services** (sharing of printers, programs or data, etc.) and the attached **client** computers can be normal computers or simple **terminals**. Terminals require the server to do most or all of the processing. A **thin client** (or thin terminal), such as a **NetPC**, has a processor that does some of the processing but a **dumb terminal** does not have a processor and all the processing must be done by the server computer.

One character of data is referred to in computing as a **byte**. In the **binary system** (a number system that only uses two digits i.e. 1 and 0) used in computers, a byte is made up of 8 **bits** where a bit is a 1 or a 0. When data is transmitted through a network system, it can be transmitted in different ways. **Asynchronous transmission** (or stop-start transmission) sends the data one byte (or character) at a time. A **start bit** (called a **control bit**) is added to indicate the beginning of each byte and another control bit called a stop bit is added to indicate the end of each byte. **Synchronous transmission** sends the data in blocks. Extra bytes of data called **synch bytes** are added at the beginning and end of each block. They are used to synchronise the sending and receiving devices.

When a message is transmitted through a network, it is processed in various ways by the software and the hardware. It is first processed by the applications program e.g. an email program, and then it is processed by the operating system. It is then processed by the hardware such as the network interface card and finally by the network electronics e.g. a router, as it passes through the network system. When it arrives at its destination, it is similarly processed in reverse order to display the message on the display screen of the receiving computer.

SPECIALIZED READING

Network Communications

1. The application layer is the only part of a communications process that a user sees, and even then, the user doesn't see most of the work that the application does to prepare a message for sending over a

network. The layer converts a message's data from human-readable, form into bits and attaches a header identifying the sending and receiving computers.

2. The presentation layer ensures that the message is transmitted in a language that the receiving computer can interpret (often ASCII). This layer translates the language, if necessary, and then compresses and perhaps encrypts the data. It adds another header specifying the language, as well as the compression and encryption schemes.
3. The session layer opens communications and has the job of keeping straight the communications among all nodes on the network. It sets boundaries (called bracketing) for the beginning and end of the message, and establishes whether the messages will be sent half-duplex, with each computer taking turns sending and receiving, or full-duplex, with both computers sending and receiving at the same time. The details of these decisions are placed into a session header.
4. The transport layer protects the data being sent. It subdivides the data into segments, creates checksum tests - mathematical sums based on the contents of data - that can be used later to determine if the data was scrambled. It can also make backup copies of the data. The transport header identifies each segment's checksum and its position in the, message.
5. The network layer selects a route for the message. It forms data into packets, counts them, and adds a header containing the sequence of packets and the address of the receiving computer.
6. The data-link layer supervises the transmission, It confirms the checksum, then addresses and duplicates the packets. This layer keeps a copy of each packet until it receives confirmation from the next point along the route that the packet has arrived undamaged.
7. The physical layer encodes the packets into the medium that will carry them such as an analogue signal, if the message is going across a telephone line - and sends the packets along that medium.
8. An intermediate node calculates and verifies the checksum for each packet. It may also reroute the message to avoid congestion on the network.
9. At the receiving node, the layered process that sent the message on its way is reversed. The physical layer reconverts the message into bits. The data-link layer recalculates the checksum, confirms arrival, and logs in the packets. The network layer recounts incoming packets for security and billing purposes. The transport layer recalculates the checksum and reassembles the message segments. The session layer holds the parts of the message until the message is complete and sends it to the next layer. The presentation layer expands and decrypts the message. The application layer converts the bits into readable characters, and directs the data to the correct application.

READING

Star

In the star configuration, the central computer performs all processing and control functions. All access devices are linked directly to the central computer. The star configuration has two major limitations. First of all, the remote devices are unable to communicate directly. Instead, they must communicate via the central computer only. Secondly, the star network is very susceptible to failure, either in the central computer or the transmission links.

Switched

The central switch, which could be a telephone exchange, is used to connect different devices on the network directly. Once the link is established, the two devices communicate as though they were directly linked without interference from any other device. At the end of the session, the connection is closed, freeing capacity for other users and allowing access to other devices. Multiple switches can be used to create alternative transmission routes.

Ring

Each device is attached to a network shaped as a continuous loop. Data proceeds in only one direction and at a constant speed round the loop. Devices may send information only when they are in control of the 'token . The token is a package of data which indicates which device has control The receiving device picks up the token, then clears it for another's use once it has received the message. Only one device may send data at any given moment, and each device must be working for the network to function.

Bus/Ethernet

A bus network consists of one piece of cable terminated at each end to which all devices are connected. In a bus-based network, each device is able to broadcast a message when it has detected silence for a fixed period of time. All devices receive the broadcast and determine from the content of the message whether it was intended for them. The only problem occurs when two devices try to send at the same time. When a sending device detects another s transmission, it aborts its own.

READING

Task 10

Listen again to the cassette and fill in the gaps in the tapescript below.

interviewer: Could you give some examples of how it does that?

David wendt: Yes. With C, the programmer can access the underlying hardware, He can access memory addresses directly, he can perform operations on values stored as....., and he can store variables in registers, just as in Assembler. This produces faster and more..... code than is produced by high-level languages like PASCAL. At the same time, it provides the fundamental.....constructs required for well-structured programs: decision-making, loops, and..... These features combined together provide a very powerful tool for the programmer.

interviewer: You make it sound like the ideal language for everyone.

David wendt: Well, no, I'm not saying that. But if you need, to write programs that are ..... fast in execution, and yet.....from one computer to another, then C is the language you should be using.

READING

Comment Lines

A C source program consists of statements and comment lines. Comment lines are enclosed by the characters /* (at the start of the comment) and */ (at the end of the comment).

The Function main{ }

Every C program must have a function called **main** which must appear only once in a program. The parentheses following the word **main** must be present, but there must be no parameters included. The main part of the program is enclosed within braces {}, and consists of declaration statements, assignment statements, and other C functions. In the above program there are six statements within the braces: a declaration statement (the first statement of the main program starting with the word **float**), two assignment statements (the fourth and fifth statements starting with the variable names **d** and **average**), and three function statements, two to print information on the screen and one to scan the keyboard for input.

As C is a free form language, the semicolon (;) at the end of each line is a must. It acts as a statement terminator, telling the compiler where an instruction ends. Free form means that statements can be identified and blank lines inserted in the source file to improve readability, and statements can span several lines. However, each statement must be terminated with a semicolon. If you forget to include the semicolon, the compiler will produce an error, indicating the next line as the source of the error. This can cause some confusion, as the statement objected to can be correct, yet as a syntax error is produced.

Variables and the Declaration Statement

A variable is a quantity that is referred to by name, such as **a**, **b**, **c**, **d**, and **average** in the above program. A variable can take on many values during program execution, but you must make sure that they are given an initial value, as C does not do so automatically. However, before variables can be used in a program, they must be declared in a type declaration statement.

UNIT 12 The Internet

INTRODUCTION

The Internet (commonly called the **Net**) is the connection of networks across the world. Different services are made available on the Internet including:

email (electronic mail)	sending and receiving text messages.
Usenet (user network)	accessing **newsgroups** (groups of users who send and read messages on a particular topic).
IRC (Internet relay chat)	chatting to other users using text messages in **real-time** (immediately, while users are logged on to the system).
FTP (file transfer protocol)	copying files e.g. program files, between computers on a network. Copying files from a server computer to a client computer is known as downloading and copying from a client to a server is uploading,
Telnet (telephone network)	**logging on** (connecting to a network system account, normally using a password) to your local server from across a network communications system at a distance e.g. from another country.
MOOs (Multi-user domain that is object-oriented)	taking part in simulations in a shared environment. Each person assumes a persona and communicates using text messages.
WWW (the World Wide Web, commonly referred to as **the Web**)	**browsing** (moving from webpage to webpage) linked documents known as **webpages**.

Computer-Mediated Communication (**CMC**) is a term used to describe systems that allow users to communicate using a computer network.

Basics

Networked computers allow users to communicate with each other. At present most of this communication is written although video- and audio-conferencing permit speech. Most computer-mediated communication (CMC) is **asynchronous** i.e the participants are not on line at the same time and there are delays between messages. Examples of asynchronous communication include: mobile phone text messages, chat rooms, email, bulletin boards and newsgroups/discussion lists. **Synchronous** CMC depends on participants being on line at the same time. There may be a few seconds' delay - like a satellite phone call - but the communication is closer to face-to-face interaction. Examples of synchronous communication include: Internet Relay Chat, MOOs, audio and videoconferencing.

With the exception of **videoconferencing** (a form of communication over a network that uses video cameras so that the people taking part can see and hear each other), there is no opportunity for paralinguistic features such as gesture. To compensate, users have developed a number of strategies which account for the linguistic features of text-based CMC including: abbreviations and acronyms, e.g. LOL, simplified syntax.-subject and modal deletion (C U L8R), tolerance of surface errors - typographical/spelling errors, symbols and exclamation marks, etc. to express emotional meaning e.g.Yeees!!, symbols indicating emotions called ernoticons e.g.:-(, formulaic phrases, **emotes**, to display action in a chat room, e.g. *looks round nervously*. Discourse features vary from mode to mode but for emails include omitting salutations and quoting previous messages in whole or part.

Most users connect to the internet, using a **modem** (modulator/demodulator-an electronic device that converts signals to enable a computer to be connected to an ordinary telephone line), through a server and router owned by an ISP (Internet service provider). Often they have to pay the **ISP** a fee to make a connection but some ISPs provide a free connection, usually depending on advertising on the webpages to pay for the service or charging premium rate telephone line charges for helplines that provide help and support services. With free ISPs, the user only pays for the telephone call connection which is usually a local connection.

To attract users to connect through their system, ISPs offer various options including: an unlimited number of email addresses (unique address codes used to contact someone using electronic mail) with filtering of email to remove **junk email** (unwanted and unsolicited email normally advertising or trying to sell something), unlimited **Web space** (file storage space for storing webpage files) for setting up your own **website** (a set of related pages stored on a server on the World Wide Web) and **virus checking facilities** (for checking your computer files to detect programs written with the purpose of causing

damage or causing a computer to behave in an unusual way). **Web-based mail** allows users to access their email from any computer with internet access. **POP3 email** however requires a special email program but is faster and more efficient. **Users register** (open an official account) with the ISP, using a program provided on a CD-ROM or by filling out details on a webpage while **online** (connected to the Internet).

SPECIALIZED READING

How TCP/IP Links Dissimilar Machines

At the heart of the Internet Protocol (IP) portion of TCP/IP is a concept called the Internet address. This 32-bit coding system assigns a number to every node on the network. There are various types of addresses designed for networks of different sizes, but you can write every address with a series of numbers that identify the major network and the sub-networks to which a node is attached. Besides identifying a node, the address provides a path that gateways can use to route information from one machine to another.

Although data-delivery systems like Ethernet or X.25 bring their packets to any machine electrically attached to the cable, the IP modules must know each other's Internet addresses if they are to communicate. A machine acting as a gateway connecting different TCP/IP networks will have a different Internet address on each network. Internal look-up tables and software based on another standard - called Resolution Protocol - are used to route the data through a gateway between networks.

Another piece of software works with the IP-layer programs to move information to the right application on the receiving system. This software follows a standard called the User Datagram Protocol (UDP). You can think of the UDP software as creating a data address in the TCP/IP message that states exactly what application the data block is supposed to contact at the address the IP software has described. The UDP software. provides the final routing for the data within, the receiving system.

The Transmission Control Protocol (TCP) part of TCP/IP comes into operation once the packet is delivered to the correct Internet address and application port. Software packages that follow the TCP standard run on each machine, establish a connection to each other, and manage the communication exchanges. A data-delivery system like Ethernet doesn't promise to deliver a packet successfully. Neither IP nor UDP knows anything about recovering packets that aren't successfully delivered, but TCP structures and buffers the data flow, looks for responses and lakes action to replace missing data blocks. This concept of data management is called reliable stream service.

After TCP brings the data packet into a computer, other high-level programs handle it. Some are **enshrined** in official US government standards, like the File Transfer Protocol (FTP) and the Simple Mail Transfer Protocol (SMTP). If you use these standard protocols on different lands of computers, you will at least have ways of easily transferring files and other kinds of data.

Conceptually, software that supports the TCP protocol stands alone. It can work with data received through a serial port, over a packet-switched network, or from a network system like Ethernet. TCP software doesn't need to use IP or UDP, it doesn't even have to know they exist. But in practice TCP is an integral part of the TCP/IP picture, and it is most frequently used with those two protocols.

UNIT 13 The World Wide Web

INTRODUCTION

The **World Wide Web** (commonly referred to as **WWW** or the **Web**) is a service on the Internet. It consists of a sets of linked documents known as **webpages** which can be viewed using a program called a **browser**. The links on a webpage (called **hyperlinks**) contain the Web address of the webpage that will be displayed if the user clicks on the link.

The **Web address** of a webpage is also known as a **URL** (Uniform Resource Locator) e.g. http://www.hw.ac.uk/libWWW/irn/irn.html. The URL consists of a number of separate parts divided by forward slashes (/). This example indicates the following:

http:// is known as the **protocol prefix** and indicates that the **hypertext transfer protocol** (an agreed communications standard for webpages) should be used to transfer the webpage across the Internet.

www indicates that this is a World Wide Web document i.e. a webpage.

hw.ac.uk is the **domain name** and indicates the network domain in which the webpage is stored.

ac is the **domain name extension** and indicates the type of domain e.g. ac or edu is an educational domain, co or com is a company.

uk is the **country code** indicating that this webpage is stored on a computer in the United Kingdom.

libWWW/irn gives the **path** of the directory (or folder) where the webpage is stored on the server.

im.html is the name of the **webpage** file. The **extension** used in webpage filenames is either htm or html to indicate that the file is written using **HTML** (hypertext markup language).

When a user clicks on a hyperlink on a webpage, the browser program contacts a server computer known as a **DNS** (Domain Name System) **server** to look up the **IP** (Internet Protocol) **address** (the unique 32-bit binary number) of the remote **Web server computer** (the computer storing the webpages) given in the URL of the linked webpage. The DNS has a stored table of names and addresses of **nodes** (a network terminal or point where a computer is connected to a network) on the Internet. The request for the linked webpage is then sent to a computer or electronic device known as a **router** that uses the Internet address obtained from the DNS server to **route** the request (decide on the best Internet path to send the request).

The message requesting the webpage is divided up into small sections called **packets** and each separate data packet is passed from router to router until they all reach the remote Web server where they are put back together again. The remote Web server sends the requested webpage back to the **browser computer** that made the request in a similar way using the IP address of the browser computer to determine the best available route for each packet. When the packets arrive at the browser computer, they are combined and the requested webpage is displayed in the browser.

Special websites (e.g. AltaVista) provide a facility known as a **search engine** that can be used to search for other websites. A search engine uses special programs to collect information about websites on the World Wide Web and stores the information in a **database** (a type of applications program used for storing information so that it can be easily searched and sorted). The user can then search the database to obtain a list of links to relevant websites. To search using a search engine, the user types words (known as **keywords**) into a text box (called a **search box**). The search engine then displays a list of website links that are relevant to the given keywords. Keywords can be used to form **search phrases** by putting quotation marks around the keywords and they can be combined in different ways using special logical **operators** such as the words OR, AND or NEAR which can be grouped by enclosing them in brackets. Sometimes, symbols such as + or - can be used to represent the operators. Special symbols known as **wildcards** can also be used with keywords. These symbols represent certain characters or combinations of characters. For example, an asterisk (*) is often used to represent any combination of characters. A search for 'col*' would look for any word beginning with 'col*.

As well as **keyword searches**, search engines can be used for **field searches**, This allows the user to search webpage fields such as the title field of a webpage or its Web address. The **Web address** is sometimes referred to as its **URL** (uniform resource locator).

The user can store the links to useful websites using a **bookmark** facility in the browser program used to view the webpages. The webpage that is set to be displayed when the browser program is first started is referred to as the user's **homepage**. The user can return to the homepage by clicking a button known as the **Home button** in the **toolbar** at the top of the browser program.

Because a video signal contains so much data, it is difficult to **download** it from an Internet server (copy it to a client computer from a server computer), in **real-time** i.e. so that it can be viewed immediately without any delays or gaps. The connection would need to have a huge **bandwidth** (signal capacity). One way of doing this with a normal Internet connection involves using a section of memory as a **storage buffer** (a storage area for temporarily storing data from a fast source so that it can be fed at a steady rate to a slower system). This allows part of the video signal to be downloaded and stored so that the user can begin to view the video before it is completely downloaded. Feeding the video signal from the storage buffer to the display makes space in the storage buffer for more of the video to be downloaded. Therefore, as the user is watching the first part of the video, the next part is being downloaded into the storage buffer. The video can therefore be shown to the user at a steady rate. This method of downloading video signals using a storage buffer to obtain a steady display is known as **streaming**.

SPECIALIZED READING

Email Protocols

Although the format of a mail message, as transmitted from one machine to another, is **rigidly** defined, different mail protocols transfer and store messages in slightly different ways. The mail system you're probably used to employs a combination of SMTP and P0P3 to send and receive mail respectively. Others may use IMAP4 to retrieve mail, especially where bandwidth is limited or expensive.

Simple Mail Transfer Protocol

SMTP is used to transfer messages between one mail server and another. It's also used by email programs on PCs to send mail to the server. SMTP is very **straightforward** providing only **facilities** to deliver messages to one or more recipients in batch mode. Once a message has been delivered, it can't be recalled or cancelled. It's also deleted from the sending server once it's been delivered. SMTP uses 'push' operation, meaning that the connection is initiated by the sending server rather than the receiver. This makes it unsuitable for delivering messages to desktop PCs, which aren't guaranteed to be switched on at all times. In host-based mail systems, such as Unix and Web mail, SMTP is the only protocol the server uses. Received messages are stored locally and retrieved from the local file system by the mail program. In the case of Web mail, the message is then translated into HTML and transmitted to your browser. SMTP is the only protocol for transferring messages between servers. How they're then stored varies from system to system.

Post Office Protocol

POP is a message-retrieval protocol used by many PC mail clients to get messages from a server, typically your ISP's mailserver. It only allows you to download all messages in your mailbox at once. It works in 'pull' mode, the receiving PC initiating the connection. PC-based P0P3 mail clients can do this automatically at a preset interval. When you use your Web mail account to access a P0P3 mailbox, the mail server opens a connection to the P0P3 server just as a PC-based application would. The messages are then copied into your Web mailbox and read via a browser.

Since P0P3 downloads all the messages in your mailbox, there's an option to leave messages on the server, so that they can be picked up from different machines without losing any. This does mean that you'll get every message downloaded every time you connect to the server. If you don't clean out your mailbox regularly, this could mean long downloads. When using a Web mail account to retrieve PQP3 mail, be careful about leaving messages on the server- if too many build up, each download will take a long time and fill up your inbox. Many Web mail systems, won't recognise messages you've already downloaded, so you'll get duplicates of ones you haven't deleted.

Internet Mail Access Protocol

IMAP is similar in operation to POP, but allows you more choice over what messages you download. Initially, only message headers are retrieved, giving information about the sender and subject. You can then download just those messages you want to read. You can also delete individual messages from the server, and some IMAP4 servers let you organise your mail into folders. This makes download times shorter and there's no danger of losing messages.

UNIT 14 Websites

INTRODUCTION

A set of related **webpages** (hyperlinked documents in a web network system) stored on a **Web server** (a server computer that stores and provides access to webpages) is known as a **website**. A **Webmaster** is a person who sets up and maintains a website. The design of websites varies greatly and some are more successful than others. Features of a good website include:

1. Good webpage design.
2. A good **navigation** system (a way of allowing visitors to move from webpage to webpage and find their way around your website). Navigation features should include:

   a) Using text hyperlinks, rather than graphical buttons or **image maps** (graphical images that provide links to different webpages depending on where on the image the user clicks).

b) Providing descriptive text captions for any graphics. These alternative text captions are known as **ALT text captions**.

c) Providing a webpage that gives an overview to the website with links to various related pages grouped together. This is known as a **site map**. (**FAQs** are the common name for frequently asked questions about the website).

d) Avoiding **frames** which are a way of dividing the browser screen into separate windows, each with its own **scrollbar** for moving up or down through the text. Frames allow webpages to be displayed inside other webpages.

e) Keeping the website consistent by not changing the location of the navigation elements and not using links and buttons that appear and disappear.

f) Making it easy to reach any particular content on the website.

g) Providing multiple paths through a website by using logical, clearly placed links rather than using a **search engine function** (a program designed to find information according to data entered by the user) where the user has to type in **keywords** (words used to categorise documents or records in a file) to find data.

3. Not giving website visitors an overwhelming number of links to follow.
4. Website ease of use.
5. Accurate and up to date data provided on the website.
6. Good use of graphics on the webpages.
7. Website compatibility with different types of Web browser programs i.e. using webpage features that are standard and can be displayed on a variety of common browser programs.

Access to the Internet is normally made through an **ISP** (internet Service Provider). ISPs are organisations that normally charge a fee to provide the server computers, Internet services and Internet connections for users. Some ISPs get their money from advertising and provide the Internet connection free, the user only paying for the telephone call. However a number of factors should be taken into consideration when deciding which ISP to use. These include:

Sign up software on CD-ROM

The ISP provides software on a CD-ROM disk that makes it easy for the users to set up their computers to connect to the Internet.

Local call rates and national call rates for online time

The user pays for a telephone call while they are **online** (connected to the Internet). If the ISP is local, the user need only pay local telephone call rates. If the ISP is not local the user will have to pay national telephone call rates to connect to the ISP.

Initial set-up fee

Although the ISP may not normally charge for providing the Internet connection, they sometimes make a small charge for first setting up the connection.

Web-based and POPS email

ISPs often provide free email facilities. This may be in the form of **Web-based email** that uses a **browser program** to access the email or **POP3 email** that uses special P0P3 **email client programs** for copying email messages onto the user's computer and allows the user to read and send messages through an **email server computer**.

Free Web space

Most ISPs provide storage space for users on a Web server computer where the users can set up their own websites.

Access to newsgroups

Most ISPs provide access to the Internet **Usenet service** that allows users to subscribe to discussion groups, known as **newsgroups**, that discuss particular topics, using text messages that can be

accessed by all members of the group.

Customer support

Most ISPs provide a help service that enables customers to obtain help for common computing problems. The ISP often charges for this type of support. .

Reliable service

The users rely entirely on the ISP to provide their Internet connection. Some ISPs are better than others at maintaining their systems and providing a connection that is fast enough.

Multiple ISP accounts

A **username** and **password** (a secret code used to control access to a network system) is required to access a user's own storage areas and services on the ISP's server computer. Some ISPs provide more than one such **account** to a user enabling the same system to be used by different members of the family or for one user to keep business and personal data completely separate.

SPECIALIZED READING

XML lakes on HTML

Standard Generalized Markup Language (SGML) is the language that **spawned** both HTML (HyperText Markup Language) and XML (extensible Markup Language)/SGML is not a true language, it is a metalanguage, which is a language from which you can create other languages. In this case, it is the creation of a markup language (a system of encoded instructions for structuring and formatting electronic document elements).

HTML is an application-specific **derivation** of SGML, It is a set of codes, generally used for webpages, that creates electronic documents according to rules established by SGML HTML is a language that is all about the presentation of your information, not vvhat the actual data is. You can, therefore, say that HTML is a presentation language.

XML is a subset of SGML, but it is also, like SGML, a metalanguage. XML defines a specific method for creating text formats for data so that files are program independent, platform independent, and support internationalisation (able to read different languages, etc.) In fact, because XML is an extensible language, you don't even have to have a browser to interpret the page. Applications can parse the XML document and read the information without any human intervention.

XML, unlike HTML, is **concerned** with the identity, meaning and structure of data. XML is extensible because it lets website developers create their own set of customised tags for documents. This ability to define your own tags is the main feature of XML, and it is what gives developers more flexibility.

By defining your own markup tags, you can explicitly define the content in the document. This makes XML a more intelligent markup language than HTML. For example, in HTML, you could have a paragraph tag <p> preceding a paragraph about baseball. Your Web browser sees this tag and knows to present the following text as a paragraph. All your browser knows about the text, however, is that it is text; it doesn't know that it is specifically about baseball. In an XML document, you could define a <BASEBALL> tag to refer specifically to the text in the paragraph in your document. This way, when your XML browser examines the document, the document knows what data it contains, and that makes the content more intelligent. Search engines that make use of XML data can do a better job of finding the pages you are looking for because of the intelligent nature of XML content.

XML, by design, does not deal with how the data is displayed to the end user. Because HTML is a presentation language, XML documents use HTML tags to help handle the visual formatting of the document. Also, you can use XML in your HTML documents to provide metadata, which is data about data in the document.

XML will do to the Web and e-commerce what HTML originally did to the Internet. XML and its associated applications have the potential to **blow the roof off** the Internet and how we do business.

UNIT 16 Communications Systems

INTRODUCTION

Mobile phones have become a common way of communicating. They are small computing devices in the form of a telephone handset that can connect to local radio networks, allowing users to make normal

telephone calls. They often have extra hardware and software features including: keyboards; earphones; a **phone book** in the form of a database for storing telephone numbers; **text messaging** that allows short text messages to be transmitted and received (the text messages are displayed on a small screen built into the handset); a **calls register** that stores details of any telephone calls that are sent or received; computer games programs that can be **downloaded** (copied from a server computer) and played on the handset; a program that allows the handset to be used as a mathematical calculator; and an **alarm call facility** that automatically causes the handset to ring or a message to appear on the screen at a time chosen by the user. When sending text messages, abbreviations consisting of letters and numbers are used to save typing and to make it easier to display the messages on the small screen e.g. CU L8R is commonly used to represent 'see you later'.

The messages are transmitted in a way that conforms to a special communications **protocol** i.e. according to an agreed standard. A common protocol used with mobile phones is called **Wap** (wireless application protocol). In a Wap system, messages are divided into small units called **packets**. The packets are transmitted separately over the radio network system and are put together to form the original message when they arrive at their destination. By sending packets belonging to a number of different users along the same connection, the system can be used by many people at the same time. Wap allows mobile phone users to use Internet **online services** such as **email** (electronic mail) and browsing webpages on the **World Wide Web**. Normal webpages written in HTML (hypertext markup language) cannot be used with Wap phones. Wap webpages are specially prepared using **WML** (wireless markup language) so that they can be used on handset screens. A newer language called **XML** (extensible markup language) will be used in the future, enabling webpages to be created that can be used in normal computer browser programs and on mobile phone screens. The high **bandwidth** (signal capacity) available using Wap also enables video transmissions to be received by mobile phones. More sophisticated communications systems providing higher bandwidths, such as **GPRS** (General Packet Radio Service) and **UMTS** (Universal Mobile Telecommunications System), are likely to replace Wap in the future.

In the future, computers will become more **powerful** (faster and with bigger storage and processing capacity). They will also become cheaper to produce. This will make them more commonly available and allow them to be integrated with other devices such as **videoreeorders** (a device for recording video signals onto magnetic tape cassettes), TVs and telephone systems. They may not even be called computers in the future, but computing devices will be designed for particular purposes and thrown away when they become faulty. Cheaper and more compact, flat **digital panels** are likely to be used for monitor screens in the future and security will be provided by **biometric devices** rather than passwords i.e. devices that measure some aspect of a living being e.g. eye scanning devices or fingerprint recognition devices. It will also become cheaper and more common to print photographs from a camera using a colour laser printer. Flexible **motherboards** (the electronic circuit boards that hold and connect the main parts of a computer) will allow the design of computers to be more varied in the future. **Voice control** will allow the user to input data and control the computer by speaking. In the future, software will be rented and run across the Internet rather than being bought and installed on individual computers. They will be built into clothing and worn by the user. Domestic appliances such as fridges and cookers will be computer controlled. In the longer term, computers may be operated using laser tight or quantum physics rather than electronics and may even be implanted into the user's body, even into the human brain. This may help people with disabilities.

Computer-mediated communication (**CMC**) can be either **synchronous**, where the users can communicate with each other at the same time in **real-time** i.e. immediately, enabling interactive communication; or it can be **asynchronous**, where messages are sent to a user who receives them and replies at a different time. Some messages are text only, some are audio only and others are **multimedia** (include text, graphics, audio, animation and video data).

A **pager** is a small radio receiver which beeps to alert the wearer of messages or telephone calls. It displays the telephone number of the caller so the wearer can call back. Some pagers can display very short messages.

A **bulletin board** is an electronic noticeboard system that enables users to display messages for other users to read.

A **MOO** (multi-user object oriented) system is an internet **virtual environment**, developed from multi-user adventure games, that allows many users to interact in real time.

A **GPS** (Global Positioning System) receiver uses a microprocessor (the main electronic chip in a computer that does the main processing and controls the other parts of the computer) to compare coded **digital signals** (an electronic signal that has only two states i.e. off or on) from special satellites orbiting the earth to calculate latitude, longitude and altitude, and enable the user to determine their exact location. Extremely accurate atomic clocks are used in the satellites. GPS systems, although originally developed for the US military, can be used for a variety of purposes including orienting hikers, navigating ships, tracking trucks and buses, and locating stolen cars.

READING

Wap Phone

What is Wap?

Wap stands for 'wireless application protocol' which allows users to send emails and access information from the Internet on a mobile phone. This has been made possible by technological advances in 'bandwidths', the amount of data that can be received or sent within a fraction of a second. This means that it can be used for many more purposes than were previously imagined, including video transmission.

Spread

Some analysts reckon that Wap phones will overtake PCs as the most common way of surfing the Internet, although PCs will still be used for more complex applications such as spreadsheets and video players.

Lifespan

Some industry experts believe that Wap will have a limited lifespan and will quickly be replaced by more sophisticated technology, such as General Packet Radio Service (GPRS) and the Universal Mobile Telecommunications System - (UMTS), GPRS increases the bandwith still further and allows you to send up to ten times more information than Wap technology. However, users will still be limited by the size and resolution of the screen on which the data is received. One analyst, Jakob Nielsen, advises companies to forget Wap and plan, instead, for the next generation of phones. He believes that mobile phones are going to become more like palmtop computers.

Language

A Wap phone cannot dial into every website. The language of the Web is HTML - hypertext markup language. Wap operates on WML - wireless markup language, so Wap phones can only read pages written in WML. Because the screen on a Wap phone is so small that you are unable to read a normal webpage, WML pages tend to consist of small chunks of information. Soon, however, most webpages will be written in XML - extensible markup language. This can be programmed to ensure that every phone or PC receives transmissions in the language it understands.

Internet

Wap allows you to deliver online services to a handheld computer. People are also expected to use Waps to access online news and financial services, sports scores and entertainment information, most of which you should be able to reach by scrolling down a set menu bar. You will also be able to book tickets by Wap.

Email

Sending emails is likely to be the application that is used most often, as people will be able to pick up messages at any time from anywhere in the world.

Games

Gambling and games, some of which can be downloaded, are also expected to be popular with users. But you can, of course, use the Wap to make regular phone calls.

SPEACIALIZED READING

Broadband Communications

Integrated Services Digital Network (ISDN)

ISDN services can be carried over existing telephone network infrastructure to terminal adapters (TAs) in the client machine. A common ISDN interface standard has a digital communications line consisting of three independent channels: two Bearer (B) channels, each at 64Kbit/s, and one Data (D) channel at 16Kbit/s. The D channel is used to carry signalling and supervisory information to the network, while the B channels carry the data and can be linked to provide a 128Kbit/s data channel.

Wireless connections

The wireless alternatives come in two forms: satellite and cellular. Satellite systems require the use of a modem to maintain the upload. Downstream bandwidth is provided via a dedicated satellite dish, connector hardware and proprietary software.

Cellular systems use assigned radio frequencies and are based around a network of transmitters that are arranged in a cellular network, much like cellular mobile phone systems.

The cable alternative

Cable companies can also offer affordable broadband services over copper coaxial or fibre infrastructure networks. The connection is shared by several customers on a branch, so actual connection rates are variable, unlike ISDN and DSL.

Digital Subscriber Line (DSL)

DSL technology capitalizes on the existing network of copper infrastructure, but allows digital signals to be carried rather than analogue. It allows the full bandwidth of the copper twisted-pair telephone cabling to be utilised.

With splitter-based services, the DSL signal is pulled out from the phone line as it enters your premises and is wired separately to a DSL modem. This involves additional hardware and installation by the service provider at the customer site. The shielded option involves no installation, but the telephone company's equipment and some of your equipment might need upgrading;

With Asymmetric Digital Subscriber Line (ADSL), most of the duplex bandwidth is devoted to the downstream direction, with only a small proportion of bandwidth being available for upstream. Much Internet traffic through the client's connection, such as Web browsing, downloads and video streaming, needs high downstream bandwidth, but user requests and responses are less significant and therefore require less on the upstream. In addition, a small proportion of the downstream bandwidth can be devoted to voice rather than data, allowing you to hold phone conversations without requiring a separate line.

DSL-based services are a very low-cost option when compared to other solutions offering similar bandwidth, so they can be made available to the customer at extremely competitive prices.