

# *Digital Communication Systems*

# ***Bandwidth and Connection Types used in Networks***

**Normally it is the number of bits (binary digits) per second. The higher the bandwidth, the quicker data will flow along the line. This normally means:**

- **Web pages are loaded more quickly giving the user a better experience;**
- **Large multimedia files can be downloaded faster;**
- **Connection to the internet will be quicker;**
- **Network traffic will not be congested;**
- **Response time on the network will be better.**

**There are a number of different connection types available and each will provide differing bandwidths and features.**

## Communications Protocol

Computers which communicate with each other must send and receive data using the same format and method. A communications protocol is an agreed standard for sending or receiving data on the network. If a computer receives data on a network, it must support the communications protocol of the sending computer. The protocol used on the internet is TCP/IP (Transmission Control Protocol/Internet Protocol) which makes sure that data is not lost as it travels from one computer to another. Protocols are needed to make sure that data is not lost and that computers can send and receive data successfully. If every computer tried to transmit data in a different way no data would ever reach its destination or if it did, the receiving computer would not understand it.

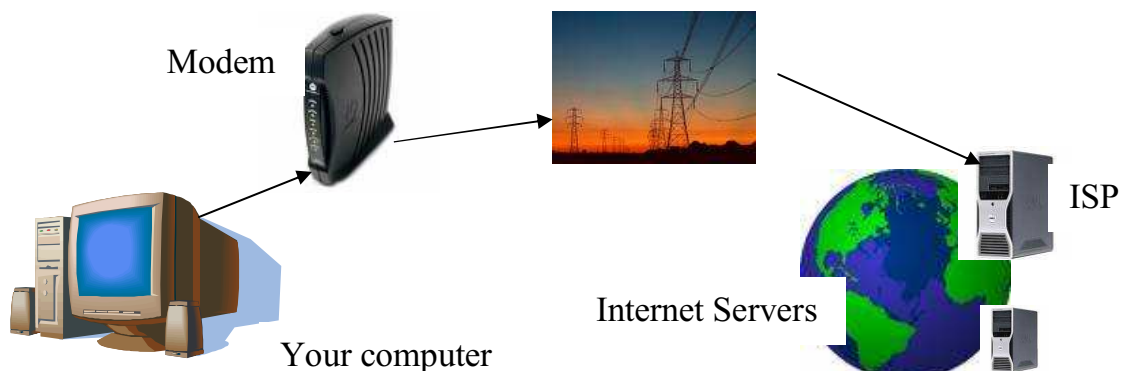
## Connecting to and using the Internet

Single users can connect to the internet. In order to connect up successfully a number of items of hardware and software are required.

- Internet Service Provider (ISP);
- ISP software;
- Browser software;
- Telecommunications line (Dial up, ISDN, ADSL);
- Modem/Broadband modem/ISDN adapter/Cable modem

To connect up:

1. Dial up using the ISP software;
2. a modem converts the signals from your computer so that it can travel along the telecommunications line to your ISP;
3. The ISP provides a connection to the Internet.



## ISP – Internet Service Provider

An ISP sells Internet access to companies or individuals. The ISP provides web servers which connect to the Internet.

## Services Provided by an ISP

- A variety of bandwidth options;
- An email service with virus protection, which allows users to send and receive email;
- A web hosting service which allows users to upload their own web pages;
- Online and telephone assistance.

## Browser Software

This software allows users to view and use the web pages on the internet. The most popular browsers are:

- Internet Explorer, which comes with the Microsoft Windows operating system;
- Netscape Navigator.

Web pages are usually designed in HTML (HyperText Markup Language) format. Browsers are programmed to interpret the HTML in order to display the contents on screen.

## The Features provided by a typical web browser

A browser allows a user to look at HTML pages. No matter which browser is being used there are a number of common features available.

### The address bar

This allows the user to enter the web address or URL of the website they wish to visit.

A URL is a **UNIFORM RESOURCE LOCATOR**. This is just another name for the website address. For example, the URL for the CCEA website is <http://www.ccea.org.uk>

Look at this URL. It is made up of a number of different components:

http://	HyperText Transfer Protocol	The protocol name used to exchange information.	The communication protocol is HyperText Transfer Protocol.
www.	Worldwide Web	The location of the site.	The site is on the World Wide Web.
ccea.	Council for Curriculum, Education and Assessment	The name of the organisation that owns the site.	The organisation is called the Council for Curriculum, Education and Assessment.
org.	Organisation	The type of organisation that owns the site.	org indicates that is a non-profit making organisation.
Uk	United Kingdom	The country where the organisation is.	The organisation is in the UK.

### A navigation bar

This allows the user to navigate between the web pages visited.

A user can:

- Go back and forward to web pages using the Back and Forward buttons.
- Reload a web page using the Refresh button; this is useful if the web page does not look as though it has fully loaded
- Set a home page which will automatically load when the browser opens: the user can return to this web page at any time by pressing the Home Button.

### A bookmark or favourites option

A user can keep a list of their favourite websites by adding the URL of the website to a list. This list is kept by the browser and when the user presses on the favourites button a clickable list of web addresses appears in the side window of the browser.

### A search engine

Most browsers provide a search engine facility. The user enters text into the search engine box and the search engine will scan the internet for other web pages containing the text that the user has entered.

Most search engines use a spider or a web crawler. This program *crawls* through the web and constructs an index of pages. When a user wants to search for a topic using the internet, the index of topics made by the web crawler is used. It is the job of the web crawler to ensure that the index is up-to-date. Different search engines will search different file servers to make up the index of pages. This is why a search on Yahoo! May give different results to a search on Alta Vista.

### A history button

The browser will usually keep a list of web pages visited in previous days and weeks. If the user clicks on the History button these web addresses will be displayed. The user can set the number of days that web addresses are stored in the history list.

### Browser settings and internet options

Browser software will filter content based on the settings provided by a user.

- The user can provide settings for language and content.
- The user can give a list of websites which may not be viewed.
- The user can set the home page and decide how long the history pages will be kept.

Some browsers also provide:

- A button which takes the user directly to their email home page
- A button which will open a chat package, like messenger
- A button which will print the page being viewed.

## Modems

Modem is short for **Mod**ulator **Dem**odulator. Modems were first created to convert the digital signals from a computer into analogue signals so that they could travel down the telephone line.

- The digital signal from a computer was MOdulated and converted to an analogue signal to travel across the telephone network.
- A modem at the other end DEModulated the analogue signal and converted it to a digital signal which the receiving computer could understand.



The speed at which a modem operates will affect the download time of web pages and files. People using a dial up connection may have a 56k modem. This means that data will travel at 56kbits per second on the line. Nowadays, people can subscribe to broadband. This provides greater bandwidth and improved internet performance. Data travels at speeds of at least 0.5 Mbits per second. Broadband lines can carry digital data, so no translation from analogue to digital data is needed. However, an ADSL modem is provided to broadband customers. This modem has a slightly different function to a dial up modem.

An ADSL modem will:

- Split the signal into two channels one for voice and one for data transfer; users can use the telephone and the internet at the same time
- Expand the bandwidth available for data transfer
- Transfer data from the internet to a computer much faster than uploading data; making the assumption that most users download more data than they upload.

## The Internet and the World Wide Web

The internet is a network of networks; that is all the computers connected together. The internet does not provide information, but provides transport links for information to pass between computers. Typical internet services are:

- Electronic mail (email): allows you to send and receive mail
- Instant messaging: allows you to communicate online by text
- WWW: the World Wide Web.

The World Wide Web is an application which runs on the internet and is the largest and most used service on the internet.

Pages on the WWW:

- are most often written using HTML language
- are viewed using a browser
- contain hypertext which provides the user with clickable links to other pages on the web
- can contain sound, video, animation and graphics as well as simple text
- Use HyperText Transfer Protocol to send pages across the internet.

For this reason, the WWW could be described as a multimedia service on the internet. The URL of pages on the WWW usually begins with `http://` indicating that the page uses the HyperText Transfer Protocol.



## Using Intranets

An intranet is a private network website used with an organisation. The website uses the same protocol as the WWW, i.e. TCP/IP. Intranets are not accessible to the public. Only authorised users can log on and use an intranet. An intranet uses a browser to view pages. Like the internet, intranets are used to share information, to communicate and to facilitate discussion through bulletin boards and messaging facilities. If information is stored and displayed in one location, it means that employees can access the information at any time. Some schools have an intranet which is used to communicate with both staff and students.

Through a school intranet teachers can:

- Develop departmental websites which contain notes about topics being studied, homework and provide feedback on tests undertaken
- Communicate using the email facility with pupils and other staff within the school
- Share exemplary student work with the school community
- Share resources with other teachers.

Through an intranet students can:

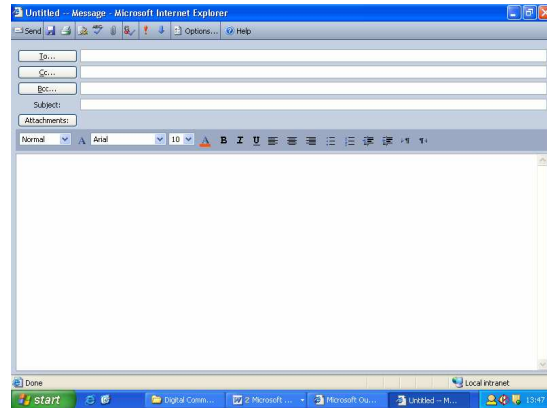
- Use the notes and materials to work independently
- Communicate digitally with teachers about problems or difficulties about homeworks
- Email homework to teachers
- Find out about general school information.

A major advantage of having an intranet is that once the information is uploaded, it can be viewed by everybody within the organisation.

# Communications Technology

## Email

Email or electronic mail is a service provided on the internet. It allows users to send messages from a computer across the internet at anytime.



Advantages of using email:

- It is flexible because it can be sent at anytime. The recipient doesn't need to be at their desk. Emails can be made when the recipient logs on.
- It is easily managed because it uses less paper and all emails arrive in the inbox.
- It is fast because email is delivered almost instantly to anywhere in the world and to any number of people.
- It is inexpensive compared to telephone calls, faxes and courier services.
- Users can be protected from inappropriate communication through filtering.
- A sender can attach any type of file to the email including sound, graphics and text files.
- It is secure and private because emails are difficult to intercept unlike faxes and telephone calls.

Disadvantages of using email:

- The sender and recipient must have internet access.
- It is easy to insert a wrong into the **To...** box. A confidential email could be sent to the wrong person.
- Unwanted email called spam is sent. This includes email selling or advertising products.
- Users are unaware of new email until they log in to the email system.

To.....	The sender of the email enters the email addresses of the recipients here.
Cc....	Carbon Copy: The sender enters the email address of people receiving a carbon copy of the email for information purpose only.
Bcc....	Blind carbon copy: The sender enters the email address of people receiving a blind car
Subject	The sender types a short description of what the email is about.
Attachments	The sender can attach files of almost any format to the email.



## Facsimile

Facsimile machines or fax machines work by making a digital copy of an image which is fed into the machine. This image is transmitted to another machine via a telephone line.

### Disadvantages of using fax machines

- Fax machines must be connected to a telephone line. Most offices have a dedicated fax line so that faxes are not interrupted by telephone calls.
- Fax machines usually operate in black and white.
- The running costs include toner cartridges for printing, electrical charges and the cost of telephone calls every time a fax is sent.
- If the receiving fax machine is not free to receive the document, it will have to be sent again.

# Collaborating Using Communications Technologies

Communications technologies provide a method for people to communicate instantly regardless of where they are in the world. Communications technologies have changed the way we communicate and our expectations of the speed of reply. As well as fax and email, there are new technologies which enhance the type of communications possible using the internet.



## What is Video Conferencing?

Video conferencing involves using the internet to transmit pictures and sound between computers. It can be done by a single user on a desktop PC using a webcam or using specialist equipment. Normally an ISDN line is used for video conferencing. The following equipment is needed for video conferencing:

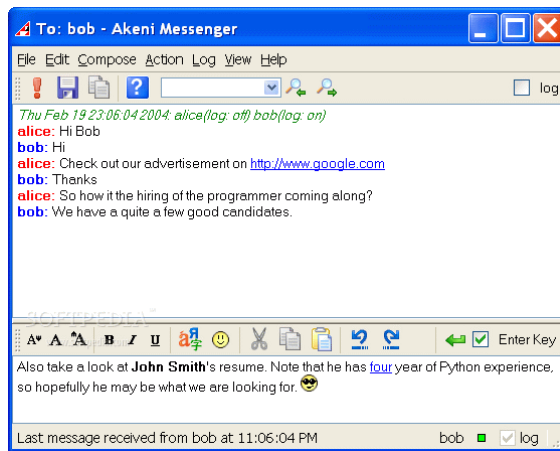
- A video camera or webcam to transmit pictures
- A microphone and sound system to transmit and receive sound
- A screen to view other participants
- A high bandwidth telecommunications line
- Videoconferencing software

This technology allows people to see and interact with each other in real time at a personal level. Many global organisations use videoconferencing to enable people based in different locations to meet without travelling.

The advantages of video conferencing are:

- Collaboration with team members without having to leave your desk
- Collaboration with people in the company and those from other companies
- Visual and audio contact means more realistic meetings
- Full multimedia presentations by using the sharing tool
- Meetings can be set up on demand by connecting to the video link
- Reduced travel costs for the company
- Reduced travel time for the employees

Video conferencing has also been used in some schools. Pupils have the opportunity to share experiences with children in other parts of the country or world.



## Instant Messaging

Instant Messaging allows users to use text to communicate instantly with each other. When a user types a message, all of the users logged in can see the message instantly. Responses appear in the window and many users can participate in a conversation.

MSN is used for instant messaging all across the world.

## Bulletin Boards

Bulletin Boards provide another simple method of communicating on line. This is text based messaging but it is not instant or interactive. A user will log on to the bulletin board and post a message. It may be a while before a reply is posted on the board.

## Using a Mobile Phone to Access the Internet

WAP enabled mobile phones can be used to access the internet. WAP is wireless applications protocol and was designed to allow handheld devices to access the internet. WAP is a communication protocol.

WAP phones can be used to:

- View train timetables
- View traffic information
- Check weather conditions
- Send and receive email
- Look up sports results

PDAs are also WAP enabled and can be used in the same way as mobile phones. The most up-to-date device is the Blackberry.

### Short Message Service – SMS

Communication using a mobile phone can be made via a voice telephone call or by using SMS. This is a text message facility associated with the mobile phone. Users can send messages to other mobile phones on any network. This is done almost instantly. A text message is sent even if the recipient is on the phone. A text message goes to a central message centre and it is forwarded as soon as a transmission space is available. Videos and photographs can also be sent through this service. Mobile phones can *roam*. This means that they can send and receive data and telephone calls whilst in another country. This is useful if the person is away from home or work. The person can be kept up-to-date on all current information. Voice mail enables callers to leave messages if the owner of the phone is unavailable. This means no calls will be missed.



## Digital and Conventional Cameras

Digital Camera	Conventional Camera
Expensive to buy	Cheaper to buy
Photos taken can be downloaded to a PC and edited or manipulated using a graphics package	Only hardcopy of photographs is produced
Not all photos need to be printed. The user can delete unwanted photos from memory and print only the required ones	All photos in the film have to be printed. This can be wasteful and expensive if the photos are not of good quality
No expensive developing costs, the digital photos can be printed on a home computer printer	Then film from the camera has to be taken to a specialist so that photos can be printed. This can be an expensive process
No waiting to see photos. They can be viewed on the LCD screen immediately	The photographer has to wait until photos are developed before viewing them
The quality of the photos can vary according to the output device producing them	Photos produced are of a very high quality
Photos are generally created in JPEG format and can be emailed or placed into other documents	Hardcopy of the photos have to be scanned if they are to be used in digital documents