Networking

To begin this topic we must first understand what a Network is……….

A network is a group of computers connected together so that they can send and receive data. The data could be, for example, Word Processing files, Databases, e-mails etc. Some networks also have the ability to share hardware such as printers and scanners.

Networks are split into 2 main types;

LAN   WAN

LAN

A Local Area Network (LAN) is network that covers a small area such as a building, for example the school or an office.

Advantages of a LAN

Data can be shared (Such as word processing files, database files, PowerPoint presentations etc.)

A file server can be used as a central data storage facility.

Peripherals such as printers can be shared across the network. This means that anyone on the network can use them, not just the computer they are plugged in to
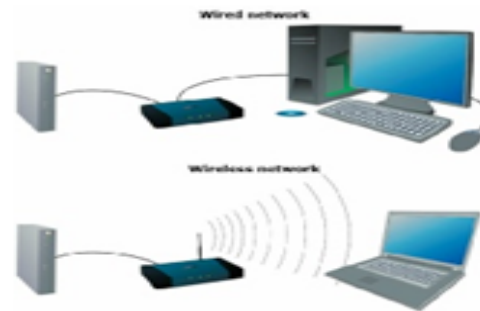
Electronic messages (email) can be sent between computers.

The computers on the network can be centrally managed.

You can load files from any computer on the network once you have logged on.

Transmission Media

This is the way the LAN is connected and this can be wired or wireless.

Wired network

Wireless network

Wired Connections

Wireless Connections

LAN - Wired Connections

Coaxial cabling

This is cabling where the central cable that transmits the data is surrounded by a shield of copper braiding. This protects it from interference and so coaxial cabling is found in places such as factories, where there is a lot of possible interference.

COPPER WIRE
INSULATION
COPPER MESH
OUTSIDE INSULATION
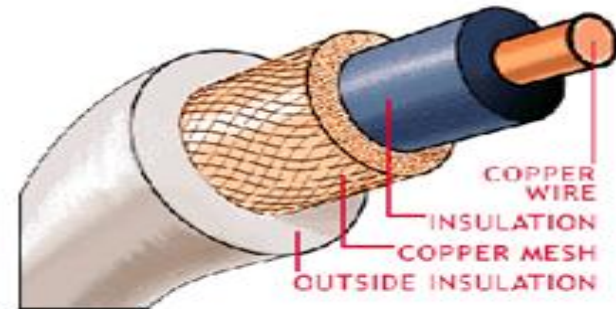
Twisted Pair cabling

Twisted pair cabling is commonly used in lots of LANs, such as this school's network and many office buildings. It is a simple type of cabling made up of two copper cables. It is cheap and can support quite high transmission speeds.

A disadvantage of is that if it is used in a place with a lot of interference (e.g. a factory), the interference could effect the signal. However, for most offices and schools, twisted cabling is fast enough and the signal rarely suffers from interference.

Fibre Optic Cabling

Fibre Optic cables transmit data as pulses of light. The light is reflected along the cable as shown:

Fibre Optic Advantages:

It is very difficult to break

Does not suffer from electrical or magnetic interference.

Transmits at very high speeds.

Fibre Optic Disadvantage:

Very expensive to buy and install.

LAN - Wireless Connections

Infrared

Infrared transmission (IrDA) is used for very short distances just between two devices, but requires line of sight.

Bluetooth

Uses radio signals to allow communication over short distances (approx 10m).

Wifi

Allows devices to exchange data wirelessly using radio waves over the network, including high-speed Internet connections. WiFi has a lot of advantages. Wireless networks are easy to set up and inexpensive. They're also unobtrusive -- unless you're on the lookout for a place to use your laptop, you may not even notice when you're in a hotspot

WAN

A Wide Area Network (WAN) is network that covers a large area such as a building, for example a country.

Common WAN examples

- The Internet
- Airlines – e.g. flight booking systems
- Bank ATM networks (cash machines)
- The network of national lottery terminals

Advantages of WAN's

They allow you to communicate with someone anywhere in the world.

You can buy things from anywhere in the world.
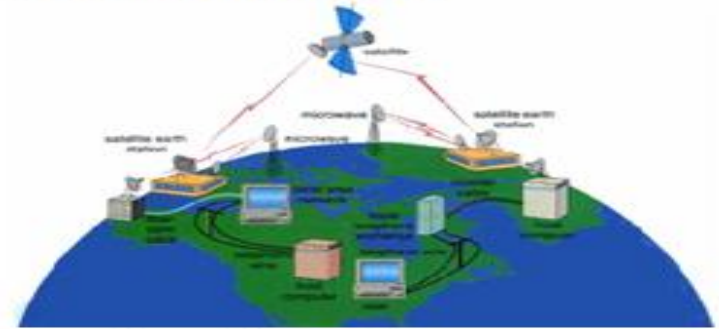
Businesses can sell things anywhere in the world.

People can work together from anywhere in the world.

Transmission Media

This is the way the WAN is connected and this can be wired or wireless.
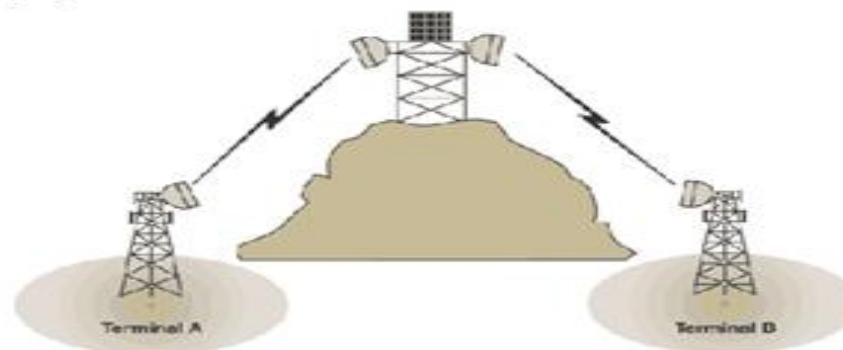
Wired Connections

Wireless Connections

WAN - Wired Connections

Microwave Transmission

This is used in the public telephone service. Many organisations use private microwave installations to transmit data between important locations.

Microwave systems are highly directional and use dish aerials.

Terminal A   Terminal B

Optical Fibre

Undersea fibre optic cables connect most of the world's people, businesses and institutions, not satellites.

Lying on ocean floors, these submarine cable systems carry the vast majority of our international communications and data. Together, they form the backbone for the data centres powering the world wide web.
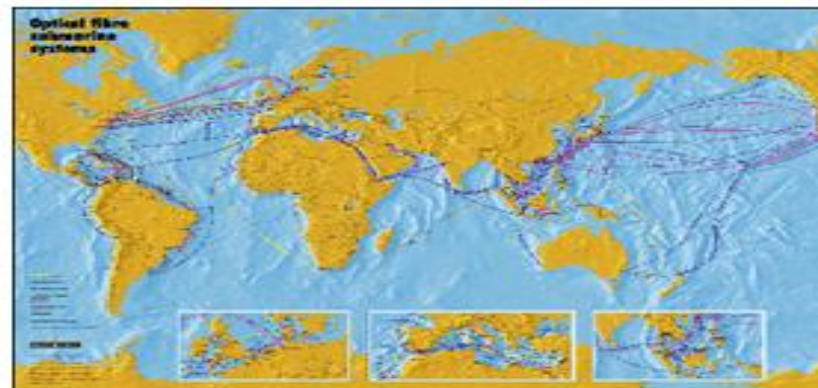
WAN - Wireless Connections
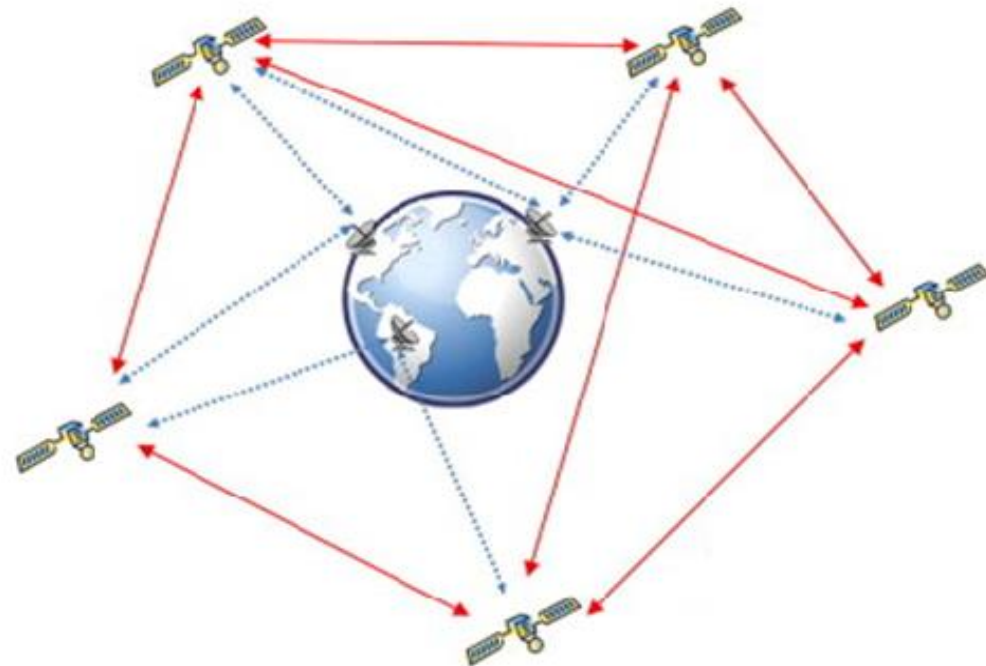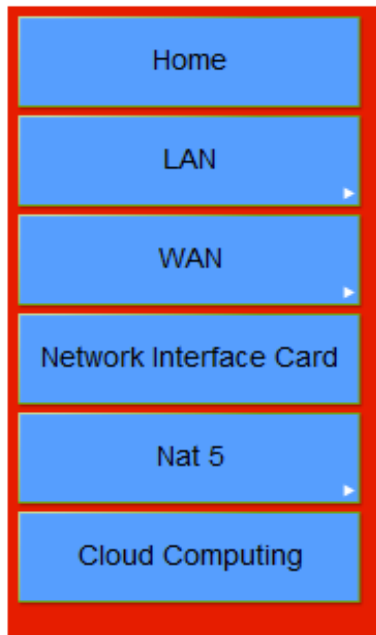
Satellite Links

A satellite is a form of telecommunication link that operates over large distances.

Satellite links use a highly directional, narrow beam two-way transmissions.

A single satellite channel is capable of carrying a very large number of separate transmissions.

The Internet

The Internet has become such a normal part of our daily lives that it's hard to imagine a time when it wasn't there. We use it so much we forget to ask the obvious: What exactly is it?

The simplest definition of the Internet is that it's a network of computer networks.

The Internet is the World's Largest Computer Network.

It connects networks all over the world. At its heart is a backbone of high-speed data communication lines through which any connected computer can trade information with any other connected computer.

One of the most remarkable things about the Internet is the wealth of information it puts at your fingertips. It's an incredible fountain of knowledge fed by sources all over the world. You can find everything from information on the latest cancer research to strategies for beating the latest computer game. The information never stops, either. New pages are being added daily. The price of admission? A computer and an Internet connection through an Internet service provider (ISP).

To find out more on The Internet see the Intel Education site by clicking below:

Network Interface Card (NIC)

Navigation
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- Nat 5
- Cloud Computing
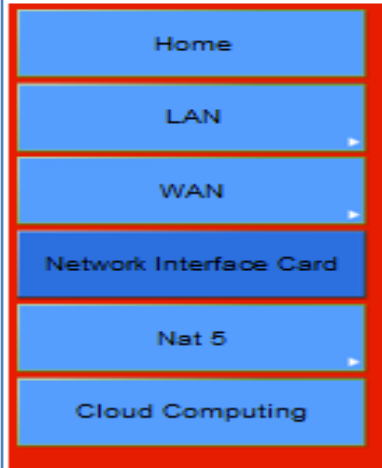
Network Interface Card also known as NIC.

NIC's carry out the tasks that allow a computer to be connected to a network.

It takes data sent by your computer and converts it to a form that can be sent across the network.

It takes data coming from the network and passes it to your computer processor.

All devices on a network require a NIC including printers, scanners, etc.

Plugs in to your computer's motherboard

National 5 Theory

Home

LAN

WAN

Network Interface Card

Nat 5

Cloud Computing

In order to fully prepare for National 5 Computing Science you must ensure you understand the following theory topics:

Peer-to-Peer Network

Client Server Network

Peer-to-Peer Network

In its simplest form, a peer-to-peer (P2P) network is created when two or more PCs are connected and share resources without going through a separate server computer.

Peer to peer is an approach to computer networking where all computers share equivalent responsibility for processing data. Peer-to-peer networking (also known simply as peer networking) differs from client-server networking, where certain devices have responsibility for providing or "serving" data and other devices consume or otherwise act as "clients" of those servers.

Benefits of a Peer to Peer Network

You can configure computers in peer to peer workgroups to allow sharing of files, printers and other resources across all of the devices. Peer networks allow data to be shared easily in both directions, whether for downloads to your computer or uploads from your computer.

On the Internet, peer to peer networks handle a very high volume of file sharing traffic by distributing the load across many computers. Because they do not rely exclusively on central servers, P2P networks both scale better and are more resilient than client-server networks in case of failures or traffic bottlenecks.

FBI Risks of Peer-to-Peer Systems:
http://www.fbi.gov/scams-safety/peertopeer

Peer-to-Peer Model
You
Other People

Advantages	Disadvantages
No need for a network operating system	Files and folders cannot be centrally backed up
Does not need an expensive server as individual workstations are used to access the files	Because each computer might be being accessed by others it can slow down the performance for the user
No need for specialised staff as network technicians because each user sets their own permissions as to which files they are willing to share	Files and resources are not centrally organised in a 'shared area'. They are stored on individual computers and might be difficult to find
Much easier to set up than a client-server – does not need specialist knowledge	Ensuring that viruses are not introduced to the network is the responsibility of each individual user
If one computer fails it will not disrupt any other part of the network, it just means those files aren't available to users at that time	There is little or no security besides the permissions. Users often do not need to log on to their workstations

Client Server Network

A computer network is referred to as client/server if (at least) one of the computers is used to "serve" other computers referred to as "clients". Besides the computers, other types of devices can be part of the network. By accessing the server, clients are then able to reach shared files and information saved on the serving computer.

One of the consequences of a client/server network is that, if the server is turned OFF, its resources and sometimes most of the resources on the network are not available. In fact, one way to set up a client/server network is to have more than one server. In this case, each server can play a different role, for example:

Advantages	Disadvantages
All files are stored in a central location	A specialist network operating system is needed
Network peripherals	The server is expensive to purchase
Backups and network security is controlled centrally	Specialist staff such as a Network Manager are needed
Users can access shared data which is centrally controlled	If any part of the network fails a lot of disruption can occur

File Server	provides central disk storage for users' programs and data on the network
Printer Server	Allows all of the client stations to use the printer controlled by the printer server
Internet & Mail Server	an Internet server allows all the users on a network to access the Internet, and a mail server manages electronic mail (E-mail)
Database Server	manages a large database that may be accessed by client stations

File Server

Resources are controlled by the file server in a client/server network.

Clients

Clients

Web / Cloud Storage

Navigation menu:
- Home
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- Cloud Computing

Cloud Storage allows users to back up data to a server; hosted by a cloud service provider - e.g. iCloud, DropBox, Microsoft SkyDrive

Cloud storage surfaced as a way for businesses to store more and more data as inexpensively as possible. Massive amounts of data required expensive storage hardware. Enter the cloud storage model, where a third party provider stores all of data. This minimises the investment in storage hardware, power, and management expenses.

The cloud storage data is then available through any Internet-connected device via a user interface that is provided by the cloud vendor.

Physical data storage, such as an external hard drive, can be lost or damaged. The physical data is at constant risk. Data in the cloud however, exists somewhat abstractly and cannot be fractured. Most service providers also offer redundant storage; in the unlikely chance one of their data enters is hit by a natural disaster or power outage, the data will still be safe and available to the user through an identical storage in a separate data centre.

The result is a fast storage system that exists in at least three spaces at any given time. Most data centres allow (at least) two highly secure physical spaces, along with the cloud/Internet environment where users access their data.