**Stand alone** refers to any computer or device that is not connected to any other computer or device via a network. It is also known as **(OFFLINE)**

**Computer Network** is a collection of computers (and other hardware components) that are connected together to allow the sharing of resources and information.

The **resources that are shared** could be:

- **Data** (Files and communications)
- **Connections** (such as a broadband internet connection)
- **Hardware** (items such as servers, printers and storage)

### Area Network Types

**LAN** (Local area network)
- Computers are connected together over a small geographical area such as a single building or a single site
- examples of LANs
  - Home network
  - School network
  - Network in a shop

**WAN** (Wide area network)
- Computers are connected over a large geographical area. This could be several buildings/sites, town wide, county wide or even country wide.
- The biggest WAN would be a global collection of networks (known as The Internet)

**PAN** (Personal area network)
- Using Bluetooth radio to connect items together over very short distances
- Can connect phones to headphones, car stereos etc, and also be used for computer peripherals like mice and keyboards

### Key term | Definition
--- | ---
A network | Is created when more than one device is connected together. A network can be a small collection of computers connected within a building (eg a school, business or home) or it can be a wide collection of computers connected around the world.
LAN local area network | Is a network of computers within the same building, such as a school, home or business. A LAN is not necessarily connected to the internet.
WAN wide area network | Is created when LANs are connected. This requires media such as broadband cables, and can connect organisations based in different geographical places. The internet is a WAN
WLAN Wireless Local Area network | Is created when devices are connected in a LAN using wireless technology. WLAN is often used alongside cable networking connections
PAN Personal Area Network | Is created when a connection is created between several digital devices such as a computer, laptop, tablet, telephone and PDA (personal digital assistant)
Internet | Is the same given to the global system of interconnected computer networks that use the internet protocol TCP/IP
Hub | A device used to connect 2 or more devices in a network. It is generally considered "dumb" as it is not able to selectively route traffic to specific devices
Switch | A device used to connect 2 or more devices in a network. It is generally considered "Smart" as it is able to selectively route traffic to specific devices
Router | A device that connects a device or LAN to the wider network, usually via an ISP protocol (Internet Service Provider)
Stand Alone Computer | A computer that has no connection to any other computer
Client/Server | A networking system where one computer (server) provides services to other devices (Clients)
Peer-to-Peer | A networking system where each device is a server and a client for other devices connecting to it
Offline | A device that is not connected to any other device
Protocols | A set of guidelines / rules for implementing communications between Computers. The main are TCP/IP, HTTP, SMTP and DNS
Server | A device that provides a service to several other devices connected to it
Firewall | A networking security system that monitors and controls incoming and outgoing traffic on a network based on predetermined rules (protocols)
Broadband | Is a high-speed internet connection.
ISP | An Internet Service Provider. An ISP is needed in order to access the internet and they usually provide a login ID and password
Ethernet | A wiring system (defined as the 802.3 standard by the IEEE) for connecting devices in a LAN using twisted pair cable
Wi-Fi | The name of a popular wireless networking technology using radio waves to connect devices
TCP/IP | Transmission Control Protocol / Internet Protocol
Transmission Control Protocol | Is the language a computer or other device uses to access the internet. It consists of a suite of protocols (rules) designed to ensure computers everywhere are able to connect securely to hosts, servers, ISPs routers and switches
Bandwidth | Is the capacity of a network connection. In other words what is the maximum size of the packets of data that are able to be sent
Latency | Is the speed at which the packets of data can be sent. Even if the bandwidth is large (that is large packet sizes) the speed might still be slow because of the latency is high. This could be caused by many people accessing the network at the same time.
Client Server vs Peer-Peer

- There are two ways of setting up a network to share data and services
- Client Server (Our school system)
  - The network relies on a central server
  - All clients (devices) request services from the server (e.g., print services / file services)
  - Additional hardware would be needed e.g., high end powerful servers

- Peer-to-peer (Your home network)
  - All computers have equal status
  - Each device can act as a client and a server
  - All devices can request and provide network services
  - No additional hardware / software needed to set up this type of network

Example of part of the School LAN

- Central server
  - Clients talk to the server

- No client-to-client communication

- Advantages:
  - Performance, administration

- Disadvantages:
  - Cost, complexity

Wireless Access Point (WAP)

- Wireless access points (WAPs) are required to connect to a network wirelessly. WAPs are usually built into the broadband router.
- Allows for wireless devices to connect to a network (either LAN or internet)
- Includes connections through Wi-Fi and Bluetooth
- WAPs provide internet access in public places (often known as Wi-Fi hotspots)

Router

- A router can form a LAN by connecting devices within a building. It also makes it possible to connect different networks. Businesses use a router to connect to the internet. A router can often incorporate a modem within the hardware.

Hub

- A hub broadcasts data to all devices on a network. This can use a lot of bandwidth as it results in unnecessary data being sent— not all computers might need to receive the data. A hub would be useful to link up a few games consoles for a local multiplayer game using a wired LAN.

Switch

- A switch performs a similar role to a hub but is more powerful. This makes a switch more efficient when demand on data or network is high. If, for example, a game involves lots of data being passed between machines, then a switch could reduce the amount of latency.

NIC Network Interface Card

- A network interface card allows a computer to connect to a wired network
- A NIC allows data packets to travel to and from a computer
- A NIC allows an Ethernet cable to be plugged into this

Transmission Media

- Ethernet (Cat Se / Cat6)
  - Known as twisted pair
  - A networking standard
- Fibre optic
  - Very fast cable but also more expensive (often used with WAN or larger LANs)
- Coaxial cable
  - An older networking standard
**What is the Internet?**
The internet is a global network of computers. All computer devices (including PCs, laptops, games consoles and smartphones) that are connected to the internet form part of this network. Added together, there are billions of computers connected to the internet, all able to communicate with each other.

**Online:** Connected to and using the internet.
When we connect to the internet, we are said to be ‘online’. Today the internet has many online facilities, for example:
- communication via email and VoIP
- sharing of information such as text, images, sounds and videos
- storage of information
- streaming television programmes, films, videos, sounds and music
- playing online games
- shopping
- social networking
- Banking

The World Wide Web is the part of the internet that can be accessed through websites.

Websites consist of webpages which allow you to see information.

All web pages on the internet are created using a language called Hypertext Markup Language (HTML). HTML describes:
- what information appears on a webpage
- how it appears on the page (formatting)
- any links to other pages or sites

```
<html>
<body>
  <h1>Hello world!</h1>
  <p>This is my first webpage</p>
</body>
</html>
```

**Communication**

**Email:** Email (short for electronic mail) is the digital equivalent of sending a letter. Each email has a sender, a receiver and a message.

*Example: Hotmail*

**VoIP:** A video conference is live video streamed over the internet so that people can communicate face to face without being in the same room.

*Example: Skype*

**Email VS VoIP**

**Email Advantages**
- It costs virtually nothing to send an email, whereas you need to buy stamps to post a letter.
- Almost immediate

**VoIP Advantages**
- Seeing as well as hearing the other person.
- Showing others what is going on around us.
The term topology refers to the way in which devices are connected to a network. The table below summarises the different network topologies.

<table>
<thead>
<tr>
<th>Topology</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus</td>
<td>Single main cable to which computers are connected.</td>
</tr>
<tr>
<td>Ring</td>
<td>All computers are connected in a circle.</td>
</tr>
<tr>
<td>Star</td>
<td>All computers have their own link to a central computer.</td>
</tr>
</tbody>
</table>

In a bus network all the workstations, servers and printers are joined to one cable (the bus). At each end of the cable a terminator is fitted to stop signals reflecting back down the bus.

In a ring network each device (workstation, server, printer) is connected to two other devices - this forms a ring for the signals to travel around. Each packet of data on the network travels in one direction and each device receives each packet in turn until the destination device receives it.

In a star network each device has its own cable that connects to a switch or hub. A hub sends every packet of data to every device, whereas a switch only sends a packet of data to the destination device.
Security Risks and Precautions

Main Computer Risks come from:

- **Viruses**
- **Trojan horses**
- **Worms**
- **Phishing**
- **Spyware**
- **Hacking**

**Viruses**: A virus is a malicious piece of code which can cause damage to a computer system. It is a computer program that attaches itself to programs and files on your computer.

- For a piece of computer code to be a virus it has to do two things:
  1. create copies of itself to create a new file
  2. attach itself to a file

**Trojans**: A Trojan is a program which can attach itself to a file but cannot self-replicate. It is a program that looks harmless and tricks you into running it on your computer. It then carries out its real task, for example displaying adverts on the desktop or installing unwanted toolbars.

- Note that the term ‘virus’ is often used loosely to cover Worms and Trojans too.

**Worms**: A worm copies itself like a virus but it can not attach itself to a file. For this reason it is not technically a ‘virus’ but it can have the same effect. They can quickly spread by ‘crawling’ through networks.

- The most harmful worms reside in the computer’s memory only. They don’t save any code to hard disks or any other type of backing storage. This means that when you switch your computer off the worm is lost.

**Phishing**: Phishing is an attempt to get your personal information such as your login or bank details by pretending to be, for example, a charity or claiming that you have won a prize.

- Most companies would never ask for this information in an email so you should not reply to it.

**Anti-virus**
- Anti-virus software is used to prevent computer viruses from damaging computer systems. It locates the virus program code and then quarantines (locks it away from the rest of the system) and deletes it.

- There are many anti-virus programs available but they all operate in similar ways. Virus scans are performed as often as the user requires (hourly, daily, weekly) by changing settings in the program.

**Firewall**
- Firewalls help prevent unauthorised access to computers by stopping hackers accessing:
  - private information stored on computers.

- Anyone who gains unauthorised access to a computer system is breaking the Computer Misuse Act.