

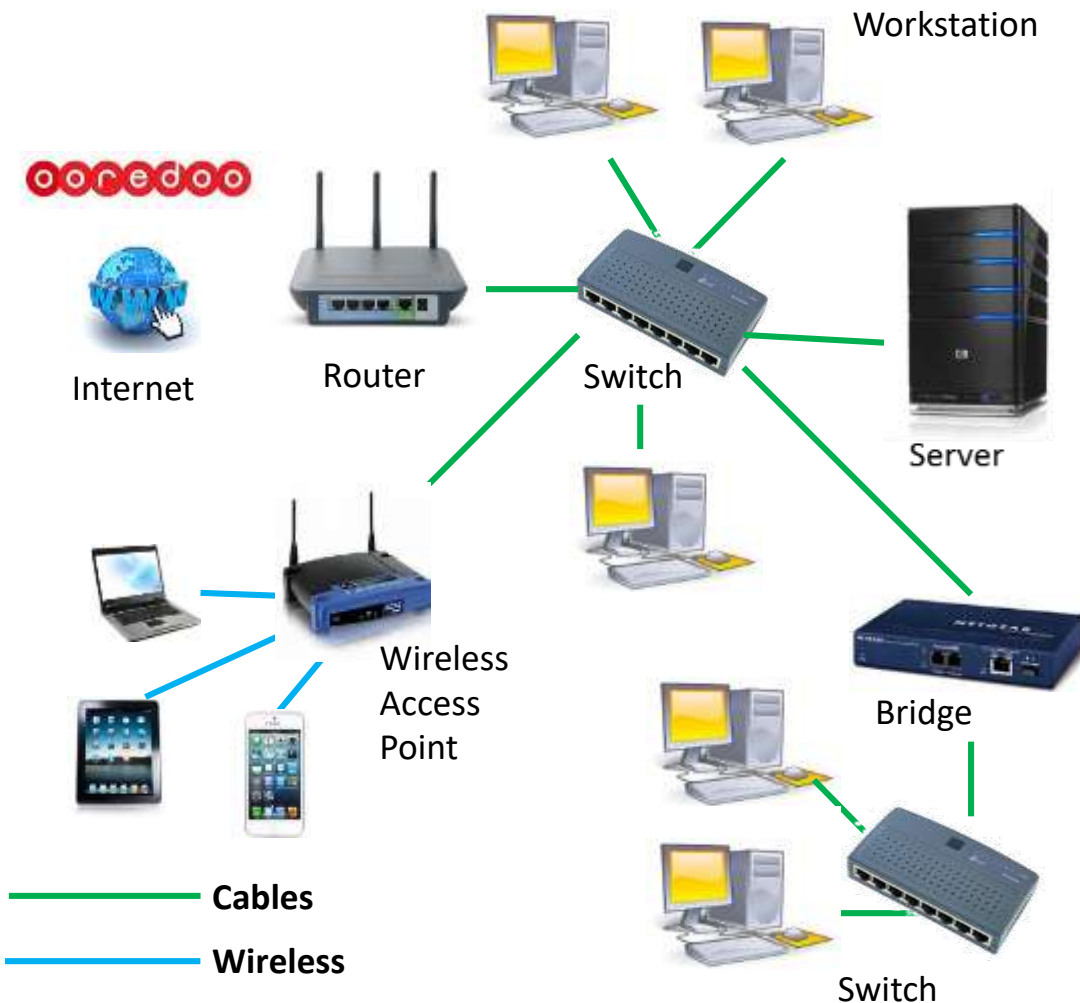
ICT IGCSE Theory – Revision Presentation

4.1 Networks

- Understand how a router works and its purpose
- Understand the use of other common network devices, including: network interface cards, hubs, bridges, switches, modems
- Understand the use of WiFi and Bluetooth in networks
- Understand how to set up and configure a small network, including: access to the internet, the use of a browser, the use of email, access to an ISP
- Understand the characteristics and purpose of common network environments, such as intranets and the internet
- Understand the advantages and disadvantages of using different types of computer to access the internet

4.1 Networks

Overview



What is a Computer Network?

A network is **two or more computers**, or other electronic devices, **connected** together so that they can **exchange data**.

For example a network allows:

- **Computers to share files**
- **Users to message each other**
- **Share Resources**

Network connections between computers are typically created using **cables** (wires) or via **wireless** signals.

ICT IGCSE Theory – Revision Presentation

4.1 Networks

Overview

Advantages of using Networks

- Easily **share files** and **data**.
- **Share resources** such as printers and Internet connections.
- **Communicate** with other network users (e-mail, instant messaging, video-conferencing, etc.)
- **Store data centrally** (using a file server) for ease of access and back-up.
- Keep all of our **settings centrally** so we can use any workstation.



Disadvantages of using Networks

- Greater **risk of hackers**.
- Greater **risk of viruses** (spreading and disabling network).
- The significant **cost of extra equipment**.
- When the network is down computers can not be used as **standalone** computers.
- Print **queues can be long**.



ICT IGCSE Theory – Revision Presentation

4.1 Networks

Discuss the advantages and disadvantages of using a computer network?



Exam Question

The advantages of using a computer network is that it is easier to share files and data. Also resources such as one printer can be shared with many workstations (computers). However printer ques could be long. Since all the computers are connected together there is a greater risk of hackers or viruses spreading which could disable the network. In addition the cost (expenditure) of the equipment could be significant. Furthermore a network will allow data to be stored centrally which will means files can be accessed from any work station on the network. Also central settings can be applied to all work stations for example restrictions in changing computer settings from the control panel.

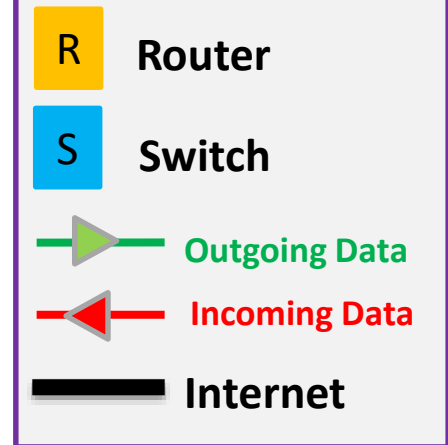
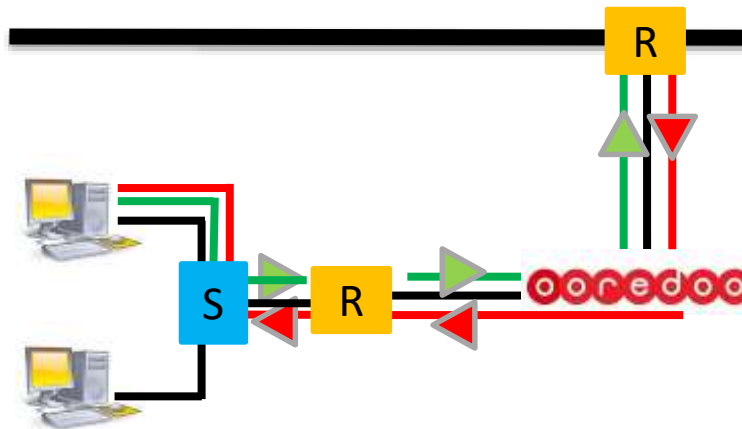
ICT IGCSE Theory – Revision Presentation

4.1 Networks

Understand how a router works and its purpose

Data Packets contain the following information:

- Header to **identify** Data Packet.
- Sender and Receivers **IP address**.
- **Number** of data packets making up the whole message.



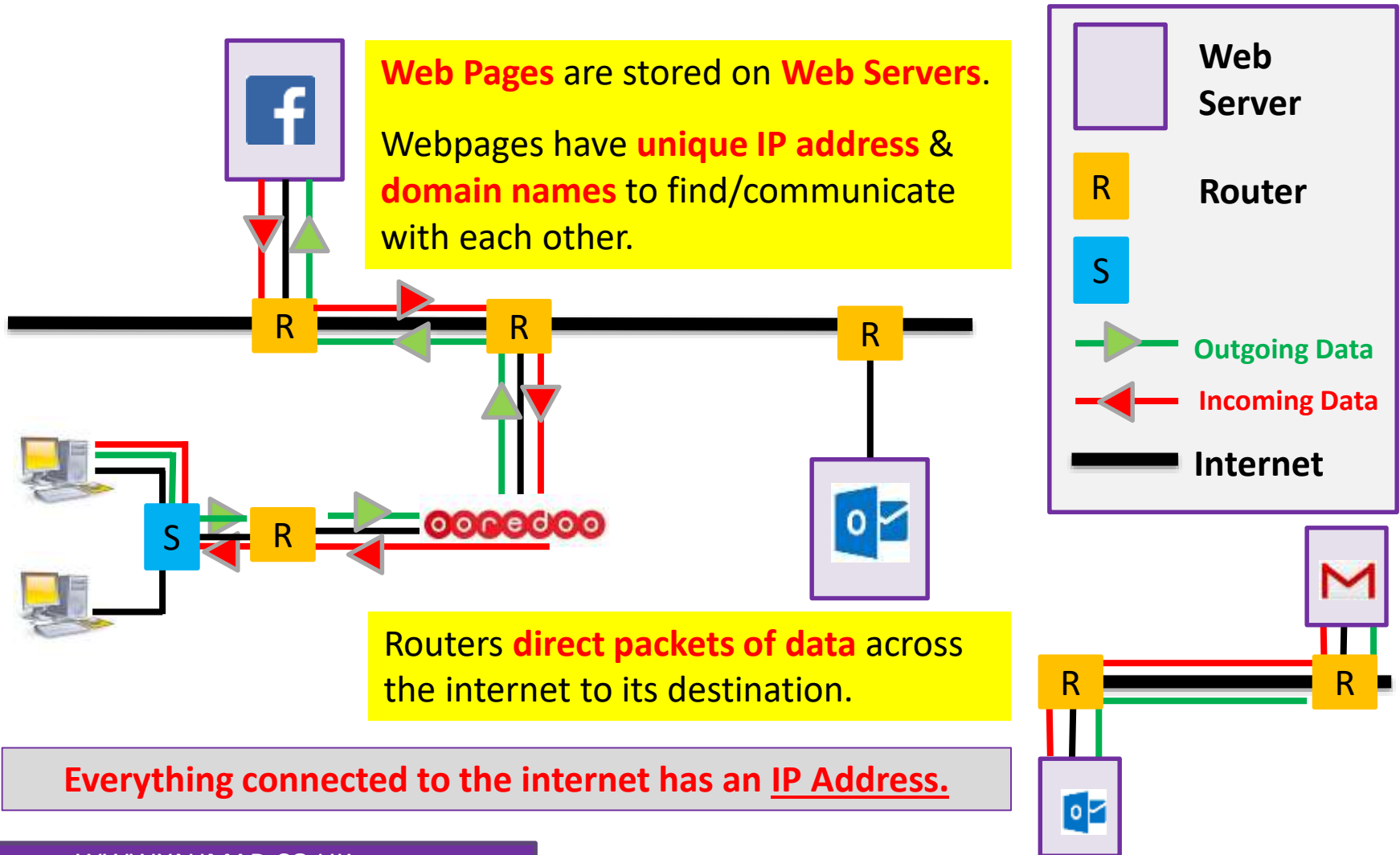
- Connects **network/computers** to the **internet**
- Connects **LANs/networks together**
- Transfers **data** between networks (**Receives and Sends Data Packets**)
- Router can connect to devices using **cables** or **wireless signals**.
- It stores information about which computer is connected to which network



ICT IGCSE Theory – Revision Presentation

4.1 Networks

Understand how a router works and its purpose

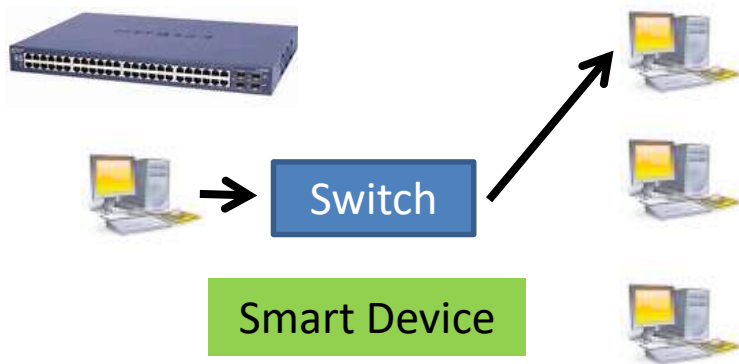


ICT IGCSE Theory – Revision Presentation

4.1 Networks

Common Network Devices

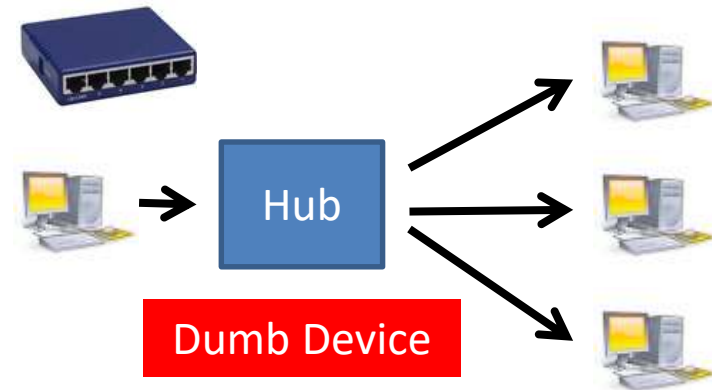
A **Hub** and a **Switch** both **connect a number of computers** together to make a **LAN**.



Sends **specific packets of data** to **specific computers** on the LAN using workstations unique **MAC** addresses.

More secure however more expensive

Normally used in larger networks found in **schools, offices** etc.



Sends **data packets** to **all** the workstations on the network which causes network traffic.

Poor Security

Only would be suitable for a **small home networks**.

ICT IGCSE Theory – Revision Presentation

4.1 Networks

Common Network Devices: **Switch**



Switch Ports

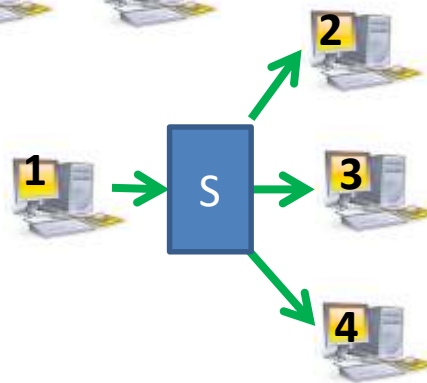


Workstation connect to switch ports. Each Network Card has a unique address (**MAC ADDRESS**) which switches can use to identify a workstation.

You always start with an **empty switch table**.

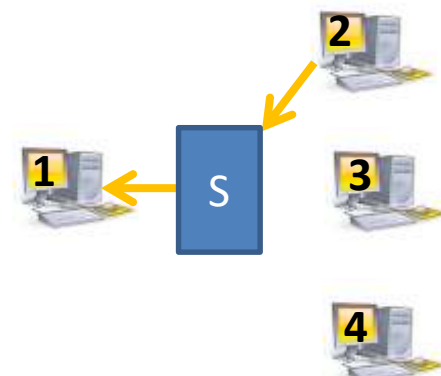
The switch will **learn** each **workstations MAC address** when it sends a **packet of data** across the network.

| Switch Table | |
|--------------|-------------|
| Work station | Mac Address |
| 1 | AA-AA-AA |
| 2 | BB-BB-BB |
| 3 | |
| 4 | |



Sending Packets of Data from **Workstation 1 – 2**

The switch will **send data packets to all computers** because it does not know the **MAC address for Workstation 2**.



Sending Packets of Data from **Workstation 2 – 1**

Now the switch table has the **MAC address for workstation 1** it is possible for **workstation 2** to send a **direct pack of data**.

ICT IGCSE Theory – Revision Presentation

4.1 Networks

Compare and contrast the use of a Router and a Switch?

Exam Question



The router is used to connect **Local Area Networks** together to form a **Wide Area Networks** and also to the **internet**. The router will **transfer data between networks** using IP addresses to direct information. The switch is used **to connect computers together to create a LAN**. Each workstation connected to the network will have its own **MAC addresss**. The router will learn each work stations MAC address in order to send **specific packets of data to the correct workstation**.

ICT IGCSE Theory – Revision Presentation

4.1 Networks

A router is connected to a LAN. Describe the function of a router?

Exam Question



Routers inspect and read the **IP address of the data packets** sent to it. The router will then send the **data packet** to a **switch** with that **IP address**.

Describe the details of computer addresses that are stored by a router.

The Router **stores IP addresses**. IP address is a **unique identifier** set up by **network manager/ISP**. An IP address consists of 4 numbers separated by full stops. The router also **stores MAC addresses**. MAC address is usually hard coded by manufacturer which means it never changes.

ICT IGCSE Theory – Revision Presentation

4.1 Networks

Common Network Devices

Modems

Analogue <<< Digital

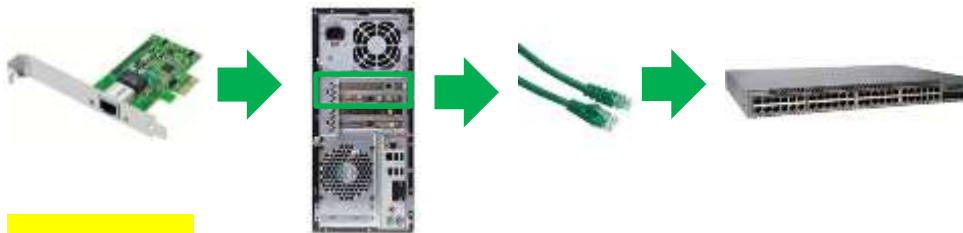


Analogue >>> Digital

Modems convert **analogue signals from a telephone line** to **digital signals** which can be read by the computer.

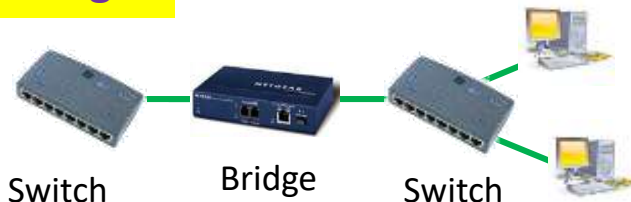
The Modem also converts **digital signals back into analogue** for **transmission over telephone lines**.

Network Interface Card



Network Interface Card (NIC) allows you to connect a **device to the network**. The **NIC** will contain the **MAC address** which will be used to **identify the computer** to the network.

Bridges



A **bridge** is used to connect **two parts of a LAN network together** so they function as a **single LAN**. Two **Switches** can be connected using a the **Bridge** Device.

ICT IGCSE Theory – Revision Presentation

4.1 Networks

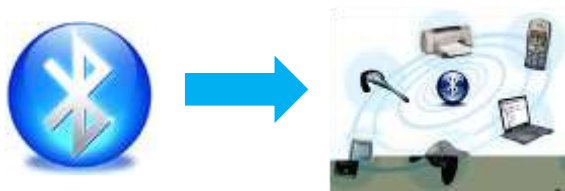
Understand the use of WiFi and Bluetooth in networks



- Limited area of network
- Strength of signal is weaker
- Possible slow data transfer speeds
- Easier to hack into/less secure
- Physical obstacles can interfere with signal/can cause disconnection

WiFi is a **wireless networking technology** makes it possible to connect devices with a wireless connection to a network or to a single computer .

- Reduced cost of cabling/Safer – won't trip over wires
- Easier to connect other devices to the network
- Makes the computer portable as long as it's within range of the wireless access point



- Very slow data transfer speeds
- Short distance of coverage/limited signal strength
- Greater risk of interception of data/less secure
- Supports a limited number of devices in a network

Bluetooth is a **wireless networking technology** designed for very short-range connections.

- Connecting wireless devices such as mouse, phone, headset to a computer which are close in proximity.
- Transferring files between devices.
- Printing Wirelessly from a Tablet or Mobile Phone.

ICT IGCSE Theory – Revision Presentation

4.1 Networks

Bluetooth and WiFi can connect devices together.
Discuss the advantages and disadvantages of using Bluetooth or WiFi.



Exam Question

Bluetooth is more useful when transferring data between two devices whereas WiFi is more suited to full scale networks. The devices connected via Bluetooth should be near to each other whereas WiFi has a larger range. Less data tends to be transferred with Bluetooth. Bluetooth uses a lower bandwidth which means data transfer speeds are slower compare to WiFi. WiFi has better security than Bluetooth however the cost of Bluetooth is cheaper than WiFi.

Bluetooth and Wifi both use wireless technology which means there is no need for cables. This reduces costs and trip hazards. Bluetooth is more energy efficient than wifi

ICT IGCSE Theory – Revision Presentation

4.1 Networks

Methods which can be used to connect computers to networks.



WiFi: Using WIFI can allow you to connect to the internet from any room in a house without the use of cables.

In addition multiple devices can be connected at the same time.

Satellite: Satellite can be used almost anywhere in the world. Since it connects via satellites it has better coverage. Its general use is for the internet.



3G / 4G: 3G and 4G are used in smart phones to connect wirelessly to Internet. Allows for access on the move even within areas with no WiFi. 3G and 4G is not affected by rain or snow as it is a form of satellite communication.



ICT IGCSE Theory – Revision Presentation

4.1 Networks

Many computer networks are connected using cables for some are now connected using wireless technology. Discuss the advantages and disadvantages of using wireless networks compared to using cabled networks.



Exam Question

The advantage of using wireless networks is that it can increase the range of the network making it easier to add additional devices and computers. With a cabled network you would be restricted to the amount of networks ports. Furthermore it could potentially be a cheaper alternative as you would not have to buy cables and modify the building. In contrast the wireless signal could be limited and therefore weaker in some parts of the network due to physical obstacles. The cabled network would provide a more stable and quicker connection.

ICT IGCSE Theory – Revision Presentation

4.1 Networks

Setting up a Network

ISP (Internet Service Provider)

Set up an account with an Internet Service Provider (ISP) to receive an internet connection to your location



Web Browser:



To browse the **internet**.

Email:



To **send email** messages including attachments to other users.

Security:



Anti Virus/Spyware software to protect your computer from **external threats** (Viruses/Hackers)

Router:

To connect your **LAN** to the **Internet (WAN)**



Switch/Hub:



To connect **Network Devices together** using cables.



Network Cables:

To create **physical** connections.

Firewall:



To keep **network secure** from external threats.

Servers:



To **manage network functions** such as network security, network file storage, share resources etc.

ICT IGCSE Theory – Revision Presentation

4.1 Networks

Describe what an ISP is and, apart from security measures, describe what it offers its customers.



Exam Question

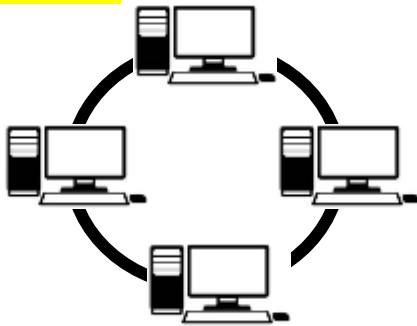
Internet Service Provider (ISP) provides **Internet access**. ISPs often offers **web space** and **domain name** to **create own website**. Also the ISP provides users with an **email address**. The ISP also provides a **router** to connect to the internet. In addition they may also offer **storage space to save data in the cloud**.

ICT IGCSE Theory – Revision Presentation

4.1 Networks

Common network environments

LAN

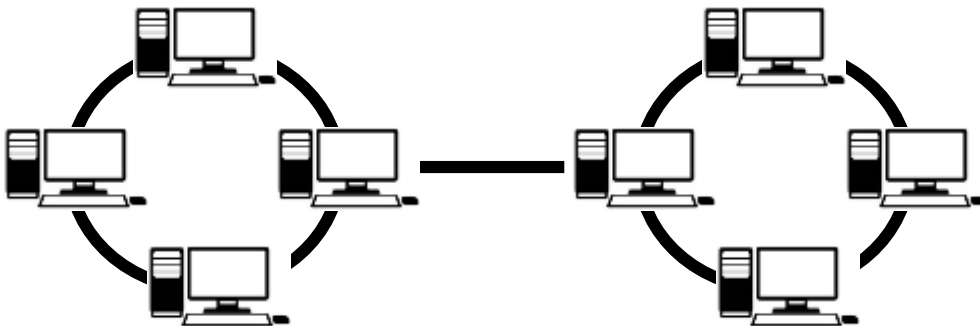


- **LAN** is a **Local Area Network**
- LAN covers a small **area** (normally confined to one building or within a close proximity).
- LAN consists of number of computers and devices that usually connect to a switch which is connected to a router.



The most common examples of WAN is the internet.

WAN



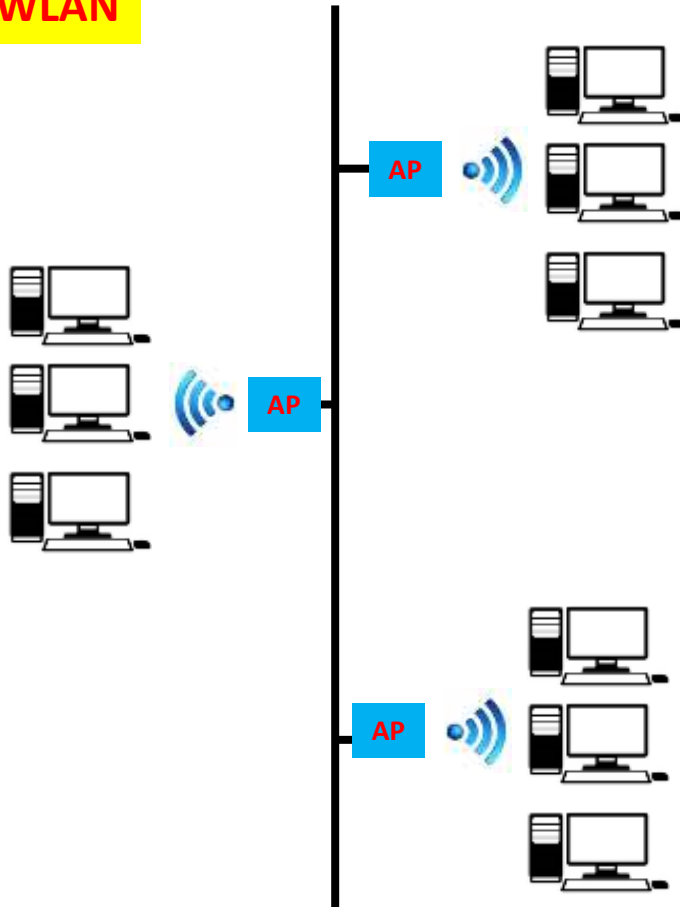
- A **WAN** is **Wide Area Network** is a network that extends over a large geographical area.
- A **WAN** is often created by **joining several LANs together**.
- **Routers** are used to connect **LAN networks to form a WAN Network**.

ICT IGCSE Theory – Revision Presentation

4.1 Networks

Common network environments

WLAN



- A wireless LAN (**WLAN**) is a LAN that uses radio signals (WiFi) to **connect computers instead of cables**.
- Devices know **Access Points (AP)** are connected to the wired network at fixed locations.
- These devices provide the **wireless access** to devices on the network.
- It is much more convenient to use wireless connections instead of running long wires all over a building.

ICT IGCSE Theory – Revision Presentation

4.1 Networks

Describe the differences between the common network environments (LAN, WAN, WLAN)?



Exam Question

| LAN (Local Area Network) | WAN (Wide Area Network) | WLAN (Wireless Local Area Network) |
|---|--|--|
| <ul style="list-style-type: none"> • Smaller geographical area • Confined to one building | <ul style="list-style-type: none"> • Larger geographical area • LANs connected together form a WAN | <ul style="list-style-type: none"> • Uses wireless signals to connect devices • Access Points are connected to the wired networks. |

Local Area Networks (LANs) normally cover a smaller geographical area confined normally to one building. Wide Area Networks are LANs which have been connected together with a router. They normally cover a larger geographic area. The connection between the LANs could either be with cables or satellite signals. Wireless Local Area Networks use wireless signals to connect devices. Access Points are connected to the wired networks.

ICT IGCSE Theory – Revision Presentation

4.1 Networks

Intranets and the Internet

Internet



- **Internet is Public** (available to all users)
- **Internet is network of networks**
- **Internet is global**
- **Internet has more information than an intranet**

Typical uses of an **internet** would be:

- Viewing **web pages**
- Sending and receiving **e-mail** messages
- **Sharing files**
- Communicating using **voice** (VOIP) and **video** (video-conferencing)
- Playing **multi-player games**
- Streaming Video/audio Content
- Online Shopping/Banking

Intranet



- **Intranet is within one organisation** (Private)
- **Intranets tend to be policed/managed**
- **Intranet has an extra layer of security**
- **Data found in an intranet is likely to be more reliable/relevant than that found on the Internet**

Typical uses of an **intranet** would be:

- Viewing **internal web pages** (e.g. company schools, university's etc.)
- **Internal e-mail** and **instant-messaging** between workers
- **Sharing of internal documents**

ICT IGCSE Theory – Revision Presentation

4.1 Networks

Describe the differences between the internet and intranet?

Exam Question



Internet is **global network of networks**. It is open to the **public domain** whereas the intranet is **private** and **normally within on organisation**. The intranet requires **authentication to log on** which provides an **extra layer of security**. Information found on the intranet will more **reliable and relevant** then the internet because the intranet tends to be **policed/managed**. However more **information is available on the internet**.

Give three reasons why some companies have intranets?

It is possible to prevent employees **accessing undesirable websites**. The company can ensure that **available information is specific to their needs**. Also it will make it is easier to make sure **confidential messages stay within the company**. Furthermore there is **less chance** of company computers being **hacked**.

ICT IGCSE Theory – Revision Presentation

4.1 Networks

In order to make reliable information available to all students, schools often put the information on their intranet. Describe what is meant by an intranet?

Exam Question







An **intranet** is a **computer network which normally exists usually within one organisation**. The intranet meets the **internal needs of an organization**. Intranet is **private and tends to be policed or managed**. Intranet has an **extra layer of security** and **data** found in an intranet is likely to be **more relevant** to the users' needs.

ICT IGCSE Theory – Revision Presentation

4.1 Networks

Accessing the Internet

| Device | Advantages | Disadvantages |
|--|--|---|
| laptop computers  | <ul style="list-style-type: none"> • More portable and smaller in size compared to desktop computers. • Bigger screens compared to tablets and phones. | <ul style="list-style-type: none"> • Touch pad may be difficult to use to navigate webpages. • Processors are not as fast as desktop computers. |
| Desktop  | <ul style="list-style-type: none"> • Stable internet connection since the connection is normally wired. • Use of input devices including pointing devices to make navigation easier. | <ul style="list-style-type: none"> • Has to be connected to a power supply at all times. • Not portable. |
| Tablets  | <ul style="list-style-type: none"> • Tablet: More portable than desktops/laptops however less than phones. • Mobile: Portable: Easy to carry around and use whilst on the move. | <ul style="list-style-type: none"> • Signal strength dependant on location. • Smaller display screen. • Not all websites designed to be used by mobiles/tablets. • Touch screen may be difficult to use. • Limited battery Life. |
| Smart Phones  | <ul style="list-style-type: none"> • Mobile: Always likely to have a mobile phone at all times. • Mobile: Can access internet via phone networks (4G) | |