ICT Theory – Revision Presentation - Networks and the effects of using them

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

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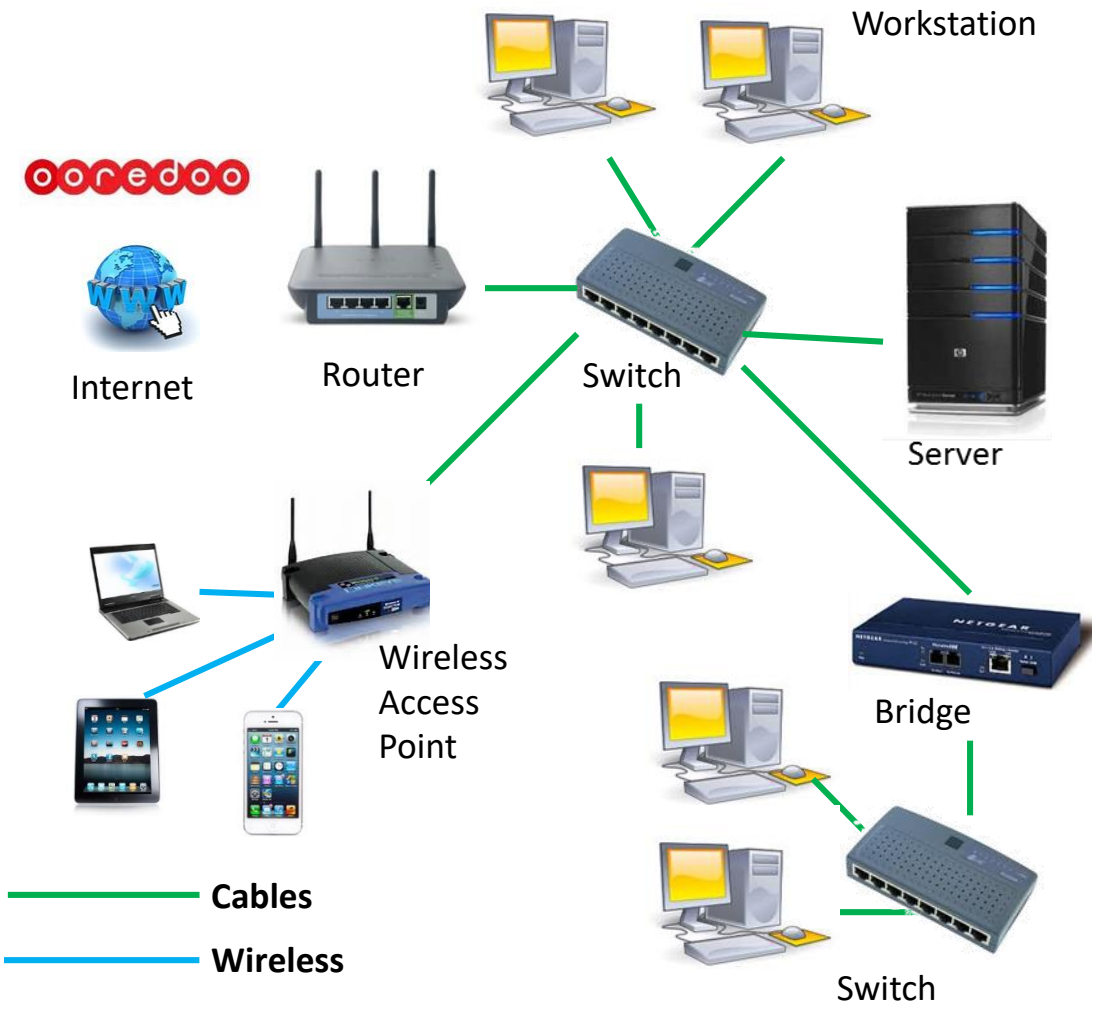
4.1 Networks

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.

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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**.

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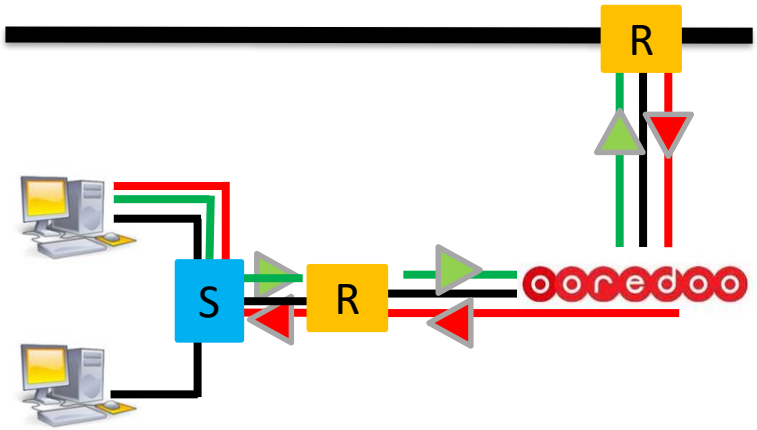
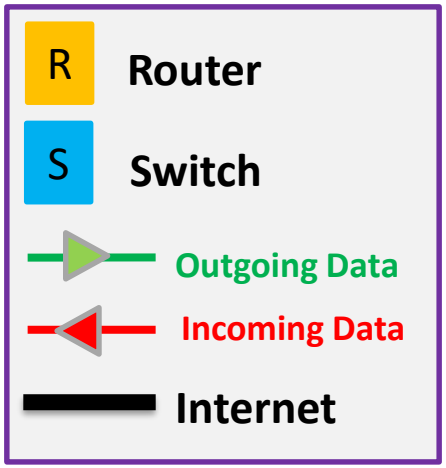
4.1 Networks

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

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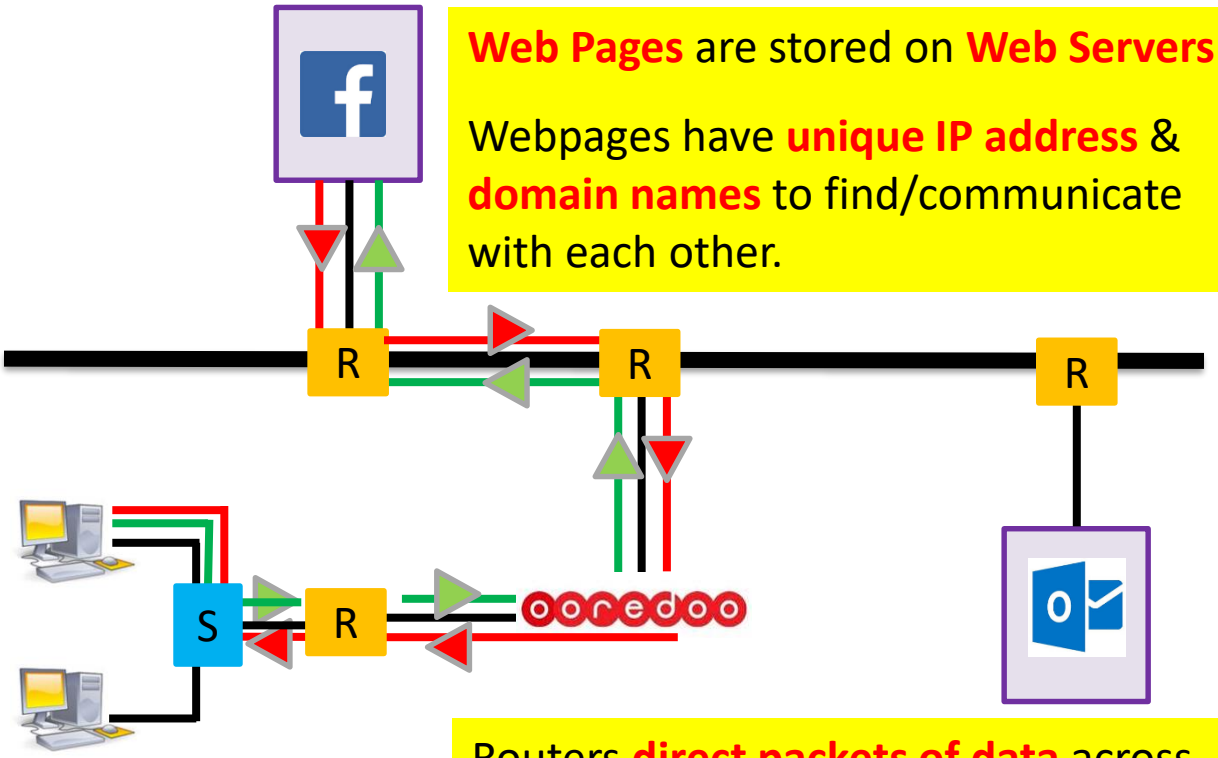
4.1 Networks

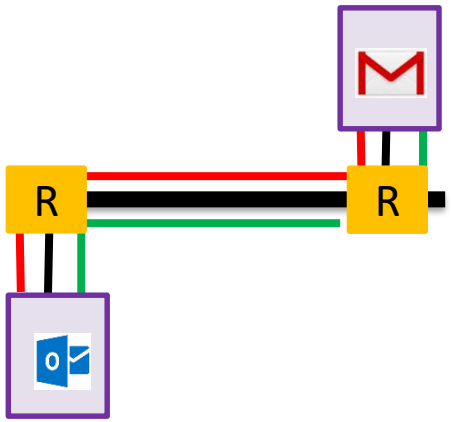
Understand how a router works and its purpose

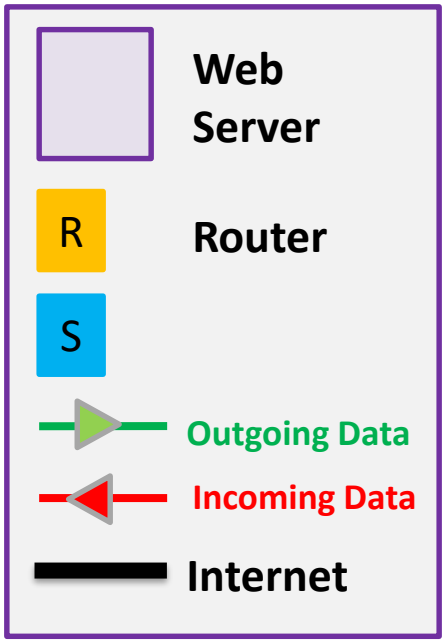
Web Pages are stored on **Web Servers**.

Webpages have **unique IP address** & **domain names** to find/communicate with each other.



Routers **direct packets of data** across the internet to its destination.





Everything connected to the internet has an IP Address.

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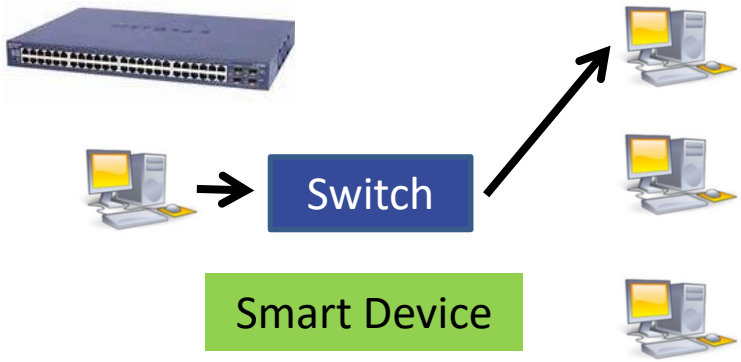
4.1 Networks

Common Network Devices

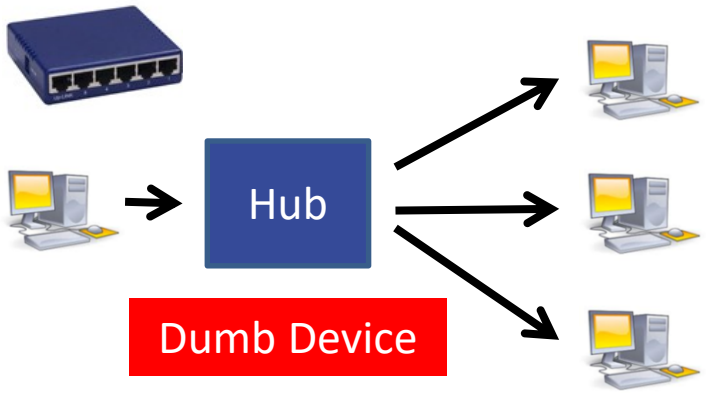
A **Hub** and a **Switch** both **connect a number of computers** together to make a **LAN**.



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.

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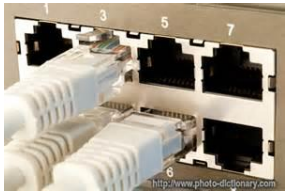
4.1 Networks

Common Network Devices: Switch



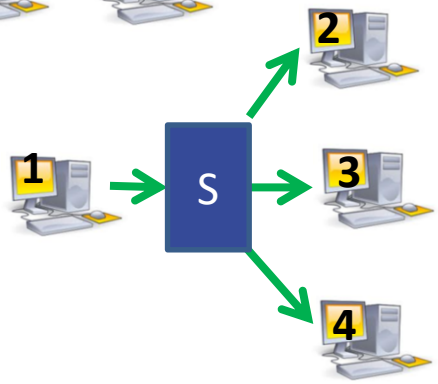
Switch Ports			
1	2	3	4

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.

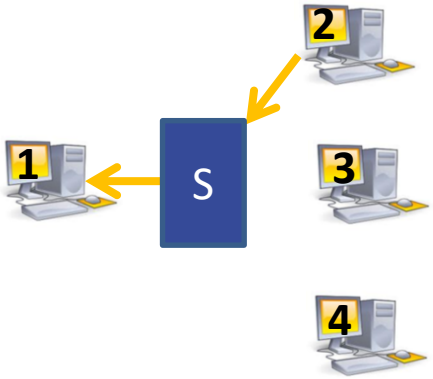
The switch will learn each workstations MAC address when it sends a packet of data across the network.

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.

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4.1 Networks

Common Network Devices

Modems

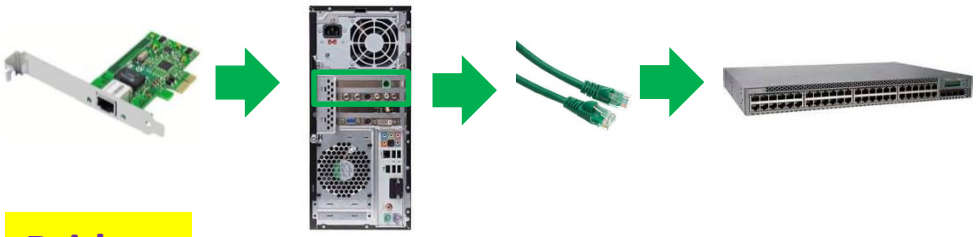
Analogue <<< Digital

Analogue >>> Digital

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

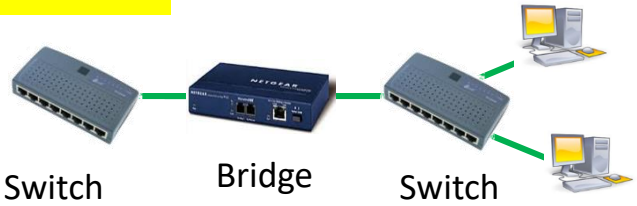
The Modem also converts **digital signals back into analogue** for **transmission over telephone lines**.

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.

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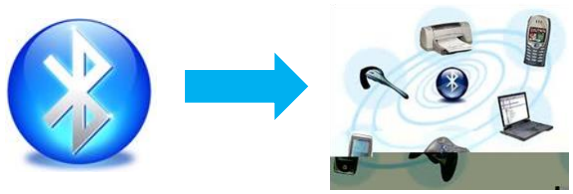
4.1 Networks

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.

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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: Outlook.com

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

Security:  Norton by Symantec

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.

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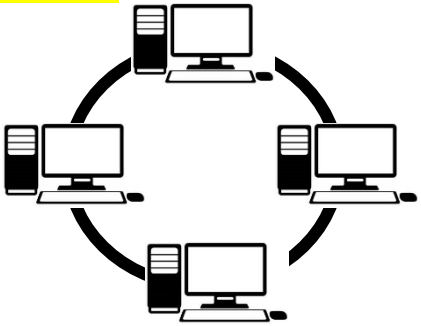
4.1 Networks

Common network environments

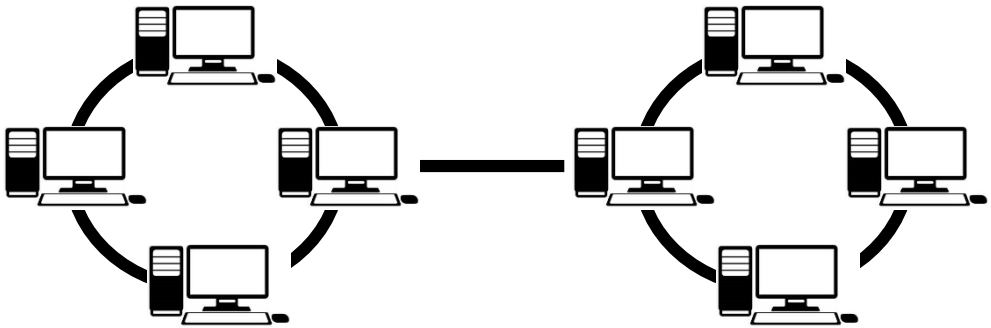
LAN



- 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.

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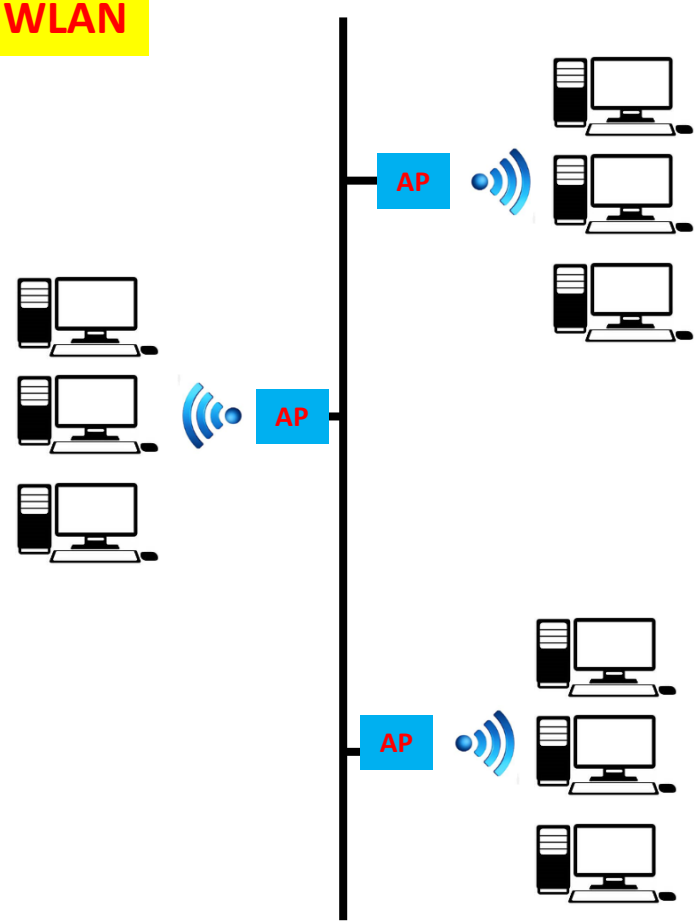
4.1 Networks

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.

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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**

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4.1 Networks

Accessing the Internet

Device	Advantages	Disadvantages
laptop computers 	• More portable and smaller in size compared to desktop computers. • Bigger screens compared to tablets and phones.	• Touch pad may be difficult to use to navigate webpages. • Processors are not as fast as desktop computers.
Desktop 	• Stable internet connection since the connection is normally wired. • Use of input devices including pointing devices to make navigation easier.	• Has to be connected to a power supply at all times. • Not portable.
Tablets 	• Tablet: More portable than desktops/laptops however less than phones. • Mobile: Portable: Easy to carry around and use whilst on the move. • Mobile: Always likely to have a mobile phone at all times. • Mobile: Can access internet via phone networks (4G)	• 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