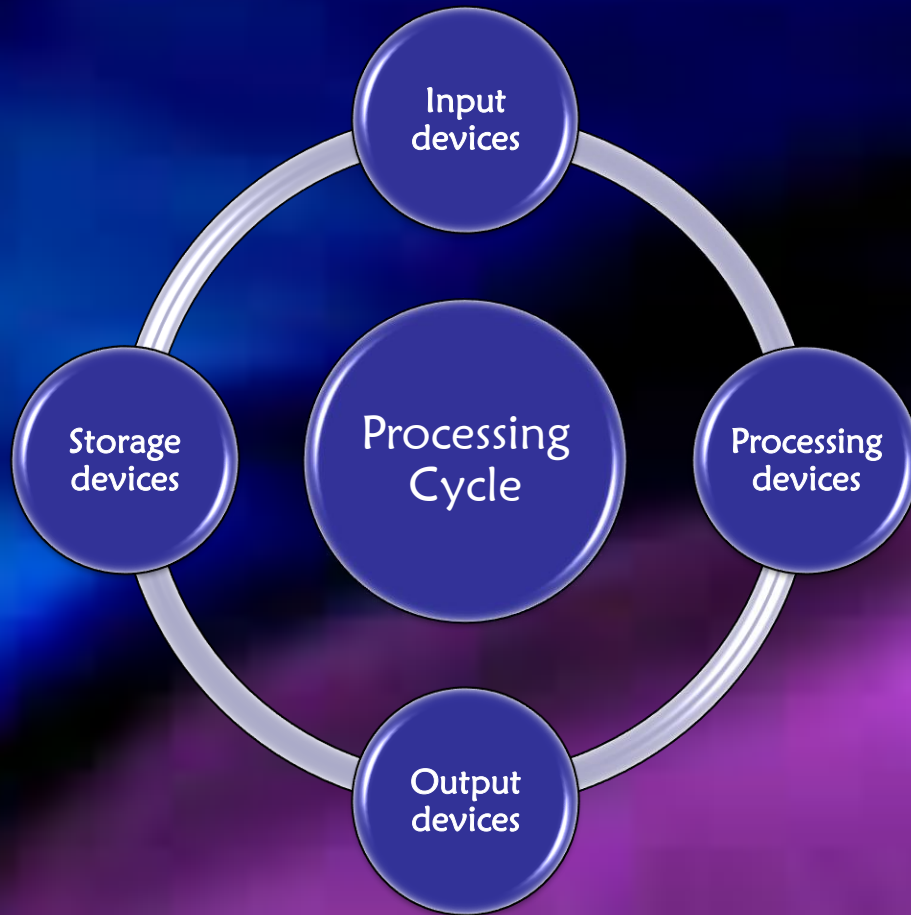




Processing devices & Internal Memory devices

The personal computer system uses the following hardware device types -

- Input devices
- Processing devices
- Output devices
- Storage devices



to complete the processing cycle

Inside the System Unit

The metal box or tower – only open it, if you know what you are doing!!

Processor

Memory

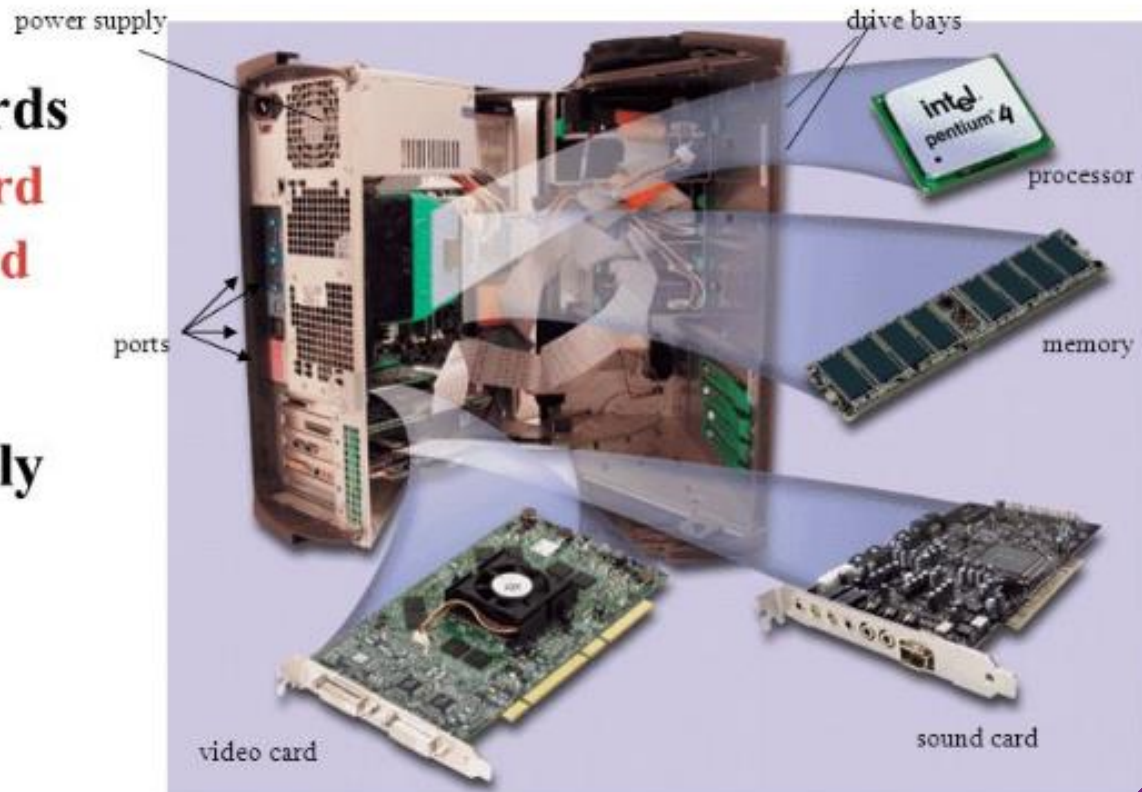
Adapter cards

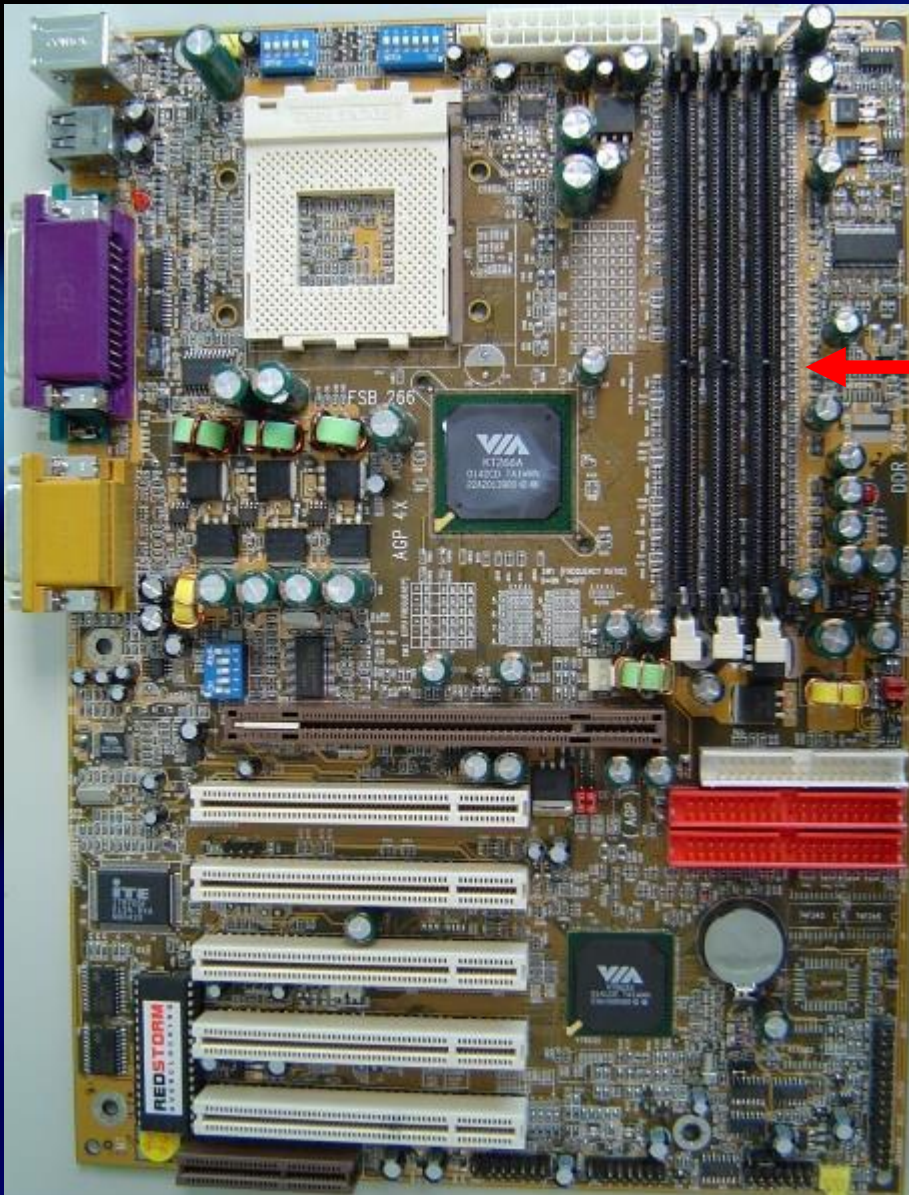
- **Sound card**
- **Video card**

Ports

Drive bays

Power supply





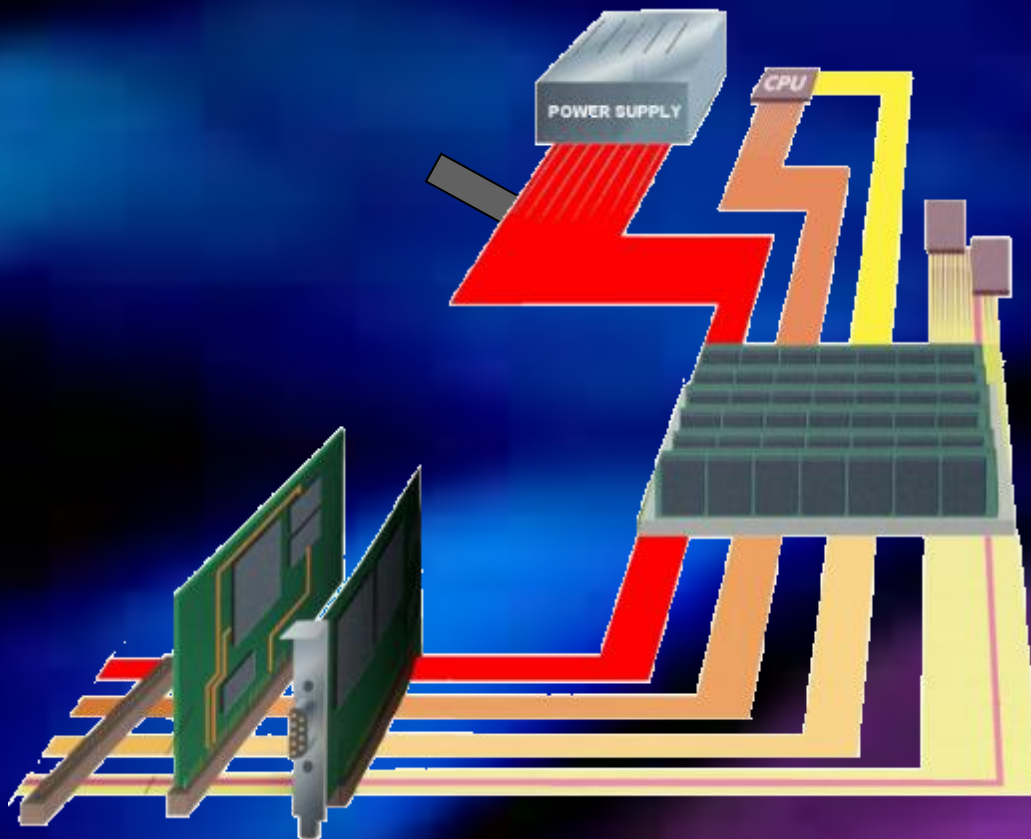
The Motherboard

- **What is it?**
the PC's main printed circuit board
- **Its purpose** is to hold the processor, memory and other components.

Everything that runs the computer or enhances its performance is either part of the motherboard or plugs into it.

Power bus provides connections with input / output device ports

Address bus holds the addresses (or memory location) of data



- The motherboard has buses

a bus is a highway along which **bits of data travel** – the more larger lanes available for travel, the faster the data flows (data is measured in bits & bytes)

Control bus carries signals that indicate whether to read data from RAM or write data to RAM

Data bus carries data & program instructions between CPU and memory chips

CPU - Central Processing Unit

- What is it?

CPU is a silicon chip containing thousands of miniature electronic circuits



A chip is called a Microprocessor. Most CPUs need a cooling fan attached



What does it do??



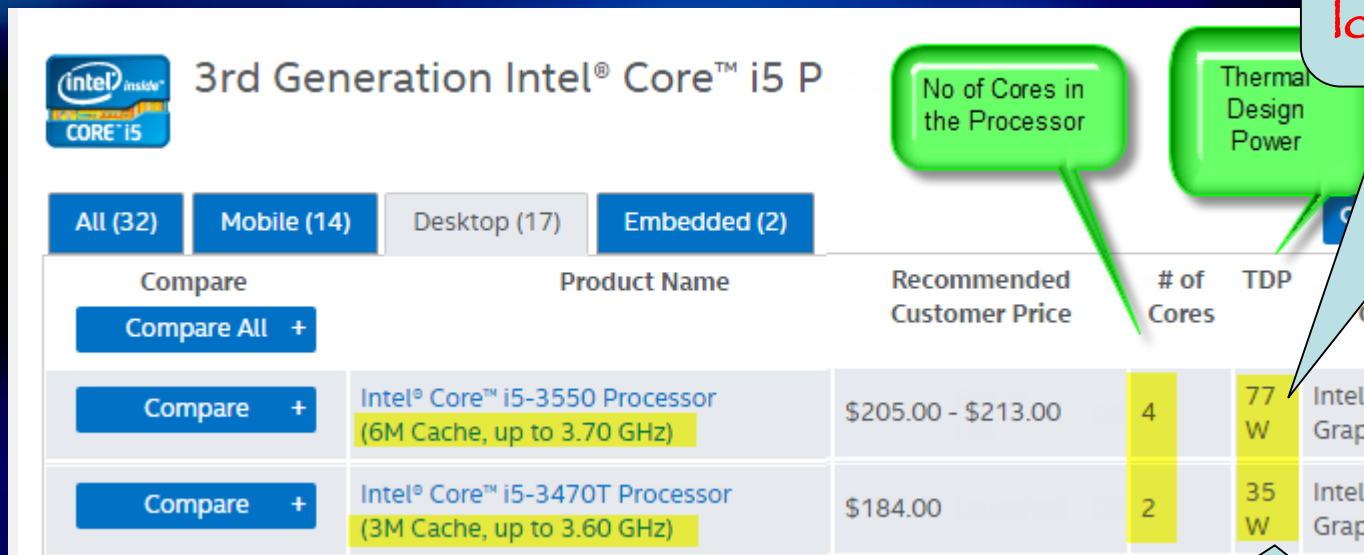
- **What is it's purpose?**

the CPU interprets computer program instructions and processes the data

it “does the work by relaying messages from the keyboard, monitor, disk and printer”

Some examples

- To look at current examples of Intel processors, go to <http://ark.intel.com/>



3rd Generation Intel® Core™ i5 P

Compare
Compare All +

	Product Name	Recommended Customer Price	# of Cores	TDP
Compare +	Intel® Core™ i5-3550 Processor (6M Cache, up to 3.70 GHz)	\$205.00 - \$213.00	4	77 W
Compare +	Intel® Core™ i5-3470T Processor (3M Cache, up to 3.60 GHz)	\$184.00	2	35 W

This is your V8.
Works fast, uses
loads of energy (fuel)

This is your 1.5L engine.
Goes slower, uses less
energy (fuel efficient)

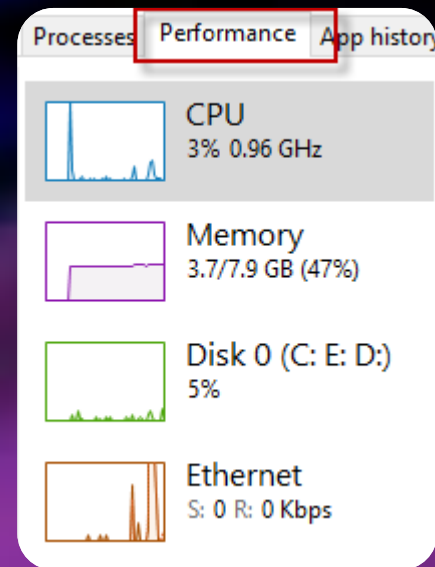
My CPU

- This is the CPU in my desktop computer

CPU

Intel(R) Core(TM) i5-4570 CPU @ 3.20GHz

- This is what it is doing right at this moment in time



What does the jargon mean?

- GHz or MHz = speed and processing power
- Multi core processors = independent processors in one CPU, more power /speed to multitask – run virus protection, download from the Internet and at the same time create complex graphics — all at super-fast speeds

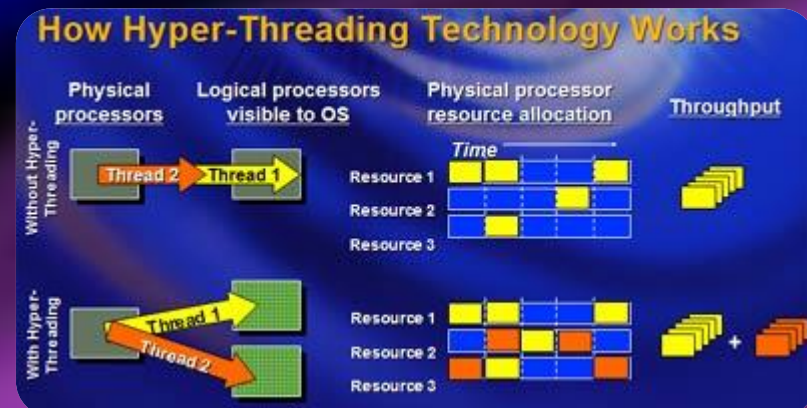


Intel® Core™ i7-7Y75 Processor
(4M Cache, up to 3.60 GHz)



What does the jargon mean?

- **HT technology** = Hyper threading; a feature to make one physical CPU appear as more logical and virtual CPUs; improved processor performance (speed); more power to multitask (thread 1 does task 1, thread 2 does task 2, thread 3 thread 8 **all at the same time**); mobile processors can use more threads to carry out a sequence of instructions.



- Some more jargon:

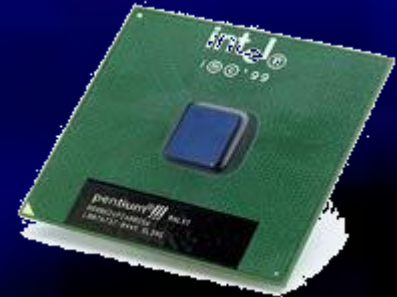
- Clock Rate/Speed:

- System Bus Speed:

- Level 1 Cache:

- Level 2 Cache:

- Let's look at simplifying this jargon ...



Processor speed ... what affects it?

- **Clock Rate**: Bigger number = faster processing
 - The clock rate controls how fast program instructions are carried out (how fast it does things!). The clock rate is measured in *cycles per second* (hertz) (DDR = double data rate)
 - **2.8GHz** means clock rate is 2.8 billion cycles per second
 - **4.2GHz** – 4.2 billion cycles per second – FAST!!

System Bus

- **System Bus**

connects the CPU and cache, with the motherboard

The System Bus is the most important bus to consider when you are talking about the performance of a computer

- **Bus speed:**

the higher the speed, the **faster the data flows** along the bus

eg **1,333MHz** (number of cycles per second)

eg **4 Gbps** (gigabytes per second)

eg **4 GT/s** (gigatransfers per second)

- The faster the System Bus is, the faster you can get data to your processor; the faster you get data to the processor, the faster your processor can do work on it

Cache ...

- Cache - memory cache speeds up the computer by storing data the computer has recently used
 - eg 4MB SmartCache up to 3.60 GHz (mobile processor)
 - eg 20MB Cache up to 3.70 GHz (desktop processor)
- There are 2 levels of cache
- L1 cache Internal cache
 - Internal cache is part of the CPU chip and temporarily stores instructions and data. It is the fastest way to get data
- L2 cache Internal cache
 - This is the buffer between the memory and the actual CPU. Slower access than L1 cache but faster than retrieving data from RAM

Want more information or more techi stuff???

Go to ark.intel.com
(processor information)

<http://computer.howstuffworks.com>
(information and quizzes)

or www.pctechguide.com (information)

or use Google Search and key in search criteria

Internal Memory Devices

ROM – Read only memory



ROM

- **What is it?**

ROM chip is sustained by a small long-life battery in your computer

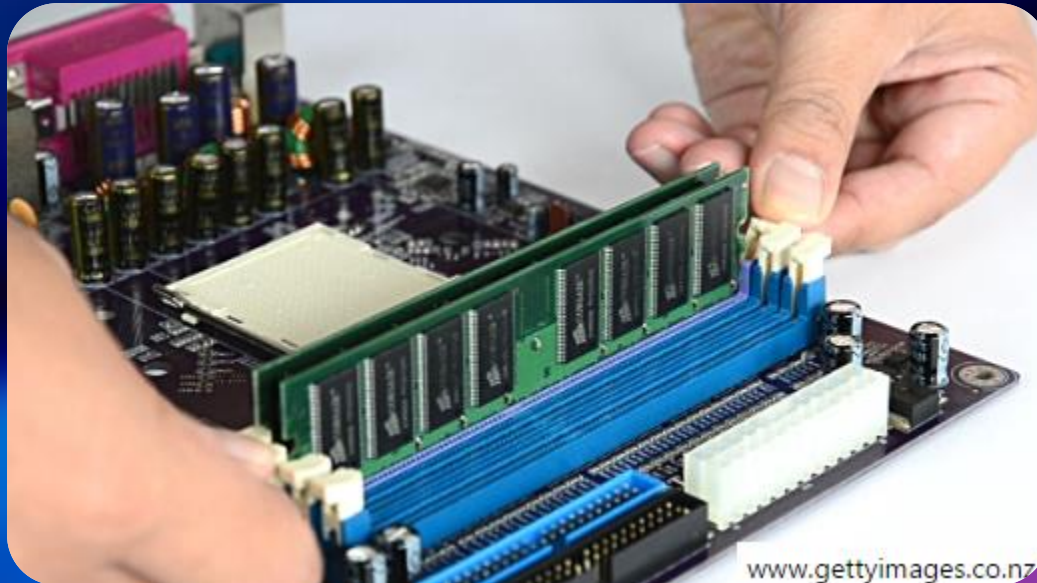
- **What is the purpose?**

ROM provides the permanent set of instructions that the computer needs to start up

Information is written onto the chip during manufacture and you can only read it – not change it



RAM – Random Access Memory or “Primary Storage”



www.gettyimages.co.nz

www.gettyimages.co.nz

What does Random Access Memory mean?

- The word "random" refers to the fact that any piece of data can be "accessed" and returned quickly, and in the same time, regardless of its physical location and whether or not it is related to the previous piece of data
 - This contrasts with storage mechanisms such as tapes, magnetic disks and optical disks, which rely on the physical movement of the reading / writing head
 - In these devices, the access movement takes longer than the data transfer, and the retrieval time varies depending on the physical location of the next item

RAM

- What is it?

RAM is almost always removable as it sits in slots in the motherboard, attached with small clips
The RAM slots are normally located next to the CPU socket on the motherboard



- What is the purpose?

More RAM – better performance as data is transmitted faster and you can do more multi-tasking using different programs



- RAM is the temporary “**memory**” area used for loading, displaying and manipulating applications and data

Think of RAM as the top of the desk. The bigger it is, the more papers you can spread out and read at once. Hard drives are more like the drawers underneath the desk, capable of storing papers you’re not using right at that moment.

- RAM is Volatile - data is lost when the computer is powered down – if you don’t save your changes **FREQUENTLY** and the power goes off Everything is lost!!



RAM What does it do?

- RAM is the temporary storage area, used to hold the current data and program instructions so the CPU does not have to take the time to access the hard drive to find the file(s) it requires
 - For example, Word is opened and loaded in RAM, data is retrieved or keyed and loaded in RAM; data is changed and changed data is stored in RAM
- The instructions and data stay in RAM until you save them or discard them
- RAM's ability to store the instructions that form a computer program, and the information (files) that the instructions are to manipulate, is what makes computers versatile

Memory How much should I get?

- Buy **as much RAM as you can afford** so that it keeps pace with your CPU and does everything at SPEED!!
 - Remember - the amount of RAM you have determines how many programs can be run at one time and how much data can be readily available to a program
 - It also determines how quickly your applications perform and how many applications you can easily toggle between at one time (multi tasking)
 - Simply put, the more RAM you have, the more programs you can run smoothly and simultaneously

How is RAM measured ...

- Current new PCs, tablets and similar devices range from around the **2GB mark to 16GB** or more.
 - A byte is equal to 1 character
 - A kilobyte **KB** = 1,024 bytes or characters
 - A megabyte **MB** = 1,024 KB
 - A gigabyte **GB** = 1,024 MB
 - A terabyte **TB** = 1,024 GB
 - A petabyte **PB** = 1,024 TB

So, how much RAM do you need?

- Simple guidelines that apply to all PC devices.
 - **2GB**: Minimum for 64-bit version of Windows 10. Good for stripped-down tablets, budget Chromebooks
 - Note: iPhone 7 has 2GB RAM
 - **4GB**: All but the cheapest and most basic of Windows 10 systems will come with 4GB of RAM, while 4GB is the minimum you'll find in any modern Mac system.
 - Samsung Galaxy S7 has 4GB RAM
 - **8GB**: Excellent for Windows and MacOS systems. Performance!
 - **16GB**: Probably overkill for most; ideal for mid-range workstations running resource-heavy applications eg video processing, CAD, 3D modelling
 - **32GB** and beyond: run virtual machines simultaneously using Windows 10 Pro

And some more info

- Accessed 14/11/2016

The biggest RAM-hogs on *most* home computers are the operating system itself and the web browser. There's not much you can do to make Windows or MacOS use less memory, but more RAM in your computer means that you can open more browser tabs open in Chrome, Firefox, Internet Explorer, et cetera. In addition, some websites will use more RAM than others. A simple text news story is relatively light on memory, while something like Gmail or Netflix uses quite a bit.

- Other programs tend to use more RAM as they increase in complexity. A chat program or a game like *Minesweeper* will use almost no RAM, while a gigantic Excel spreadsheet or a huge Photoshop project might use more than a gigabyte all by itself. Professional and engineering software is created to tackle very difficult projects and tends to consume the most RAM of all programs. Modern 3D games can also use quite a lot of RAM *and* VRAM, especially if you have the settings dialed up to 11. In other words, your need for RAM is entirely dependent on the programs you use.

-

Read more: <http://www.digitaltrends.com/computing/how-much-ram-does-your-pc-need-probably-less-than-you-think/#ixzz4PvfU4MS0>

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How is RAM used when processing information?

- Input data using an input device



- Data goes into RAM



RAM is an electrical field which temporarily holds data (from keyboard) and instructions (from hard drive)~ keeps pace with the processor speed

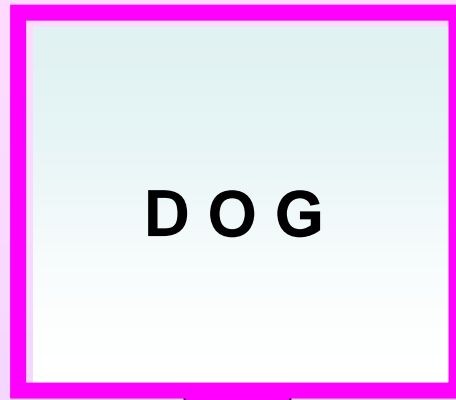


- Hard disk is accessed to get program instructions. When data has been processed it is saved from RAM onto the hard disk

- CPU does the processing using the program instructions and the data from RAM .

After processing, the processed data goes back to RAM.



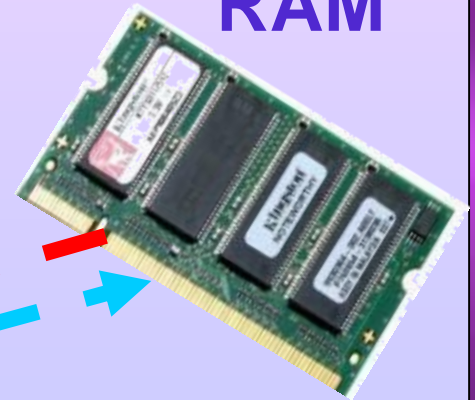


MONITOR

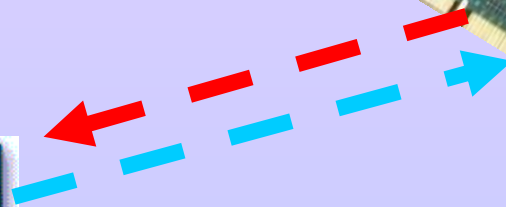
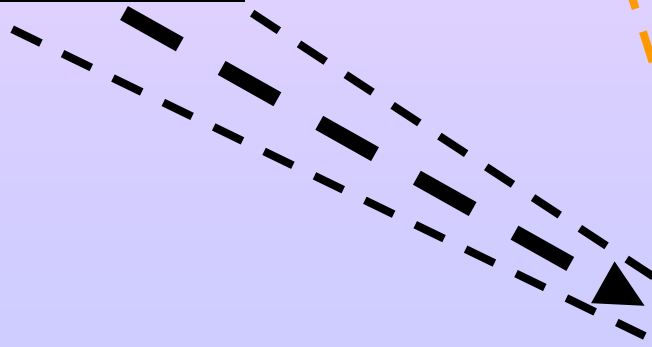
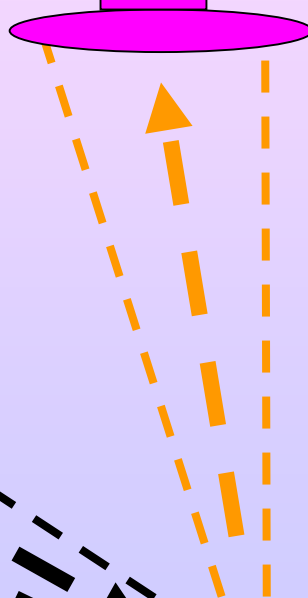
KEYBOARD

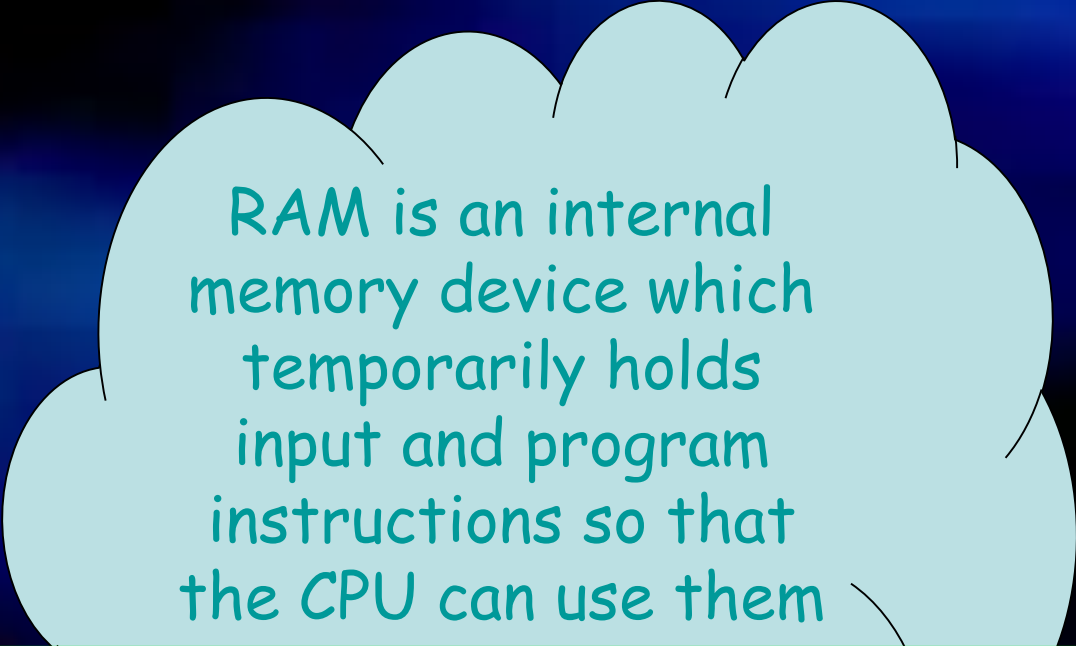


RAM



CPU





RAM is an internal memory device which temporarily holds input and program instructions so that the CPU can use them



**Power goes off, computer crashes –
everything is lost from RAM**

End of presentation

Next steps

Go back to the workbook

You will see that there are Study Notes on the
Processing Devices and Internal Memory