CPU Components

Arithmetic Logic Unit (ALU): Responsible for carrying out Arithmetic calculations & Making logical decisions

Control Unit: Responsible for sending signals to how data moves around the CPU & Coordinates the CPU operations

Cache: Provides fast access to frequently used instructions & data Information written to cache is retrieved quicker then information written to RAM

Clock: An electronic unit that synchronises related components by generating pulses at a constant rate

Registers: Tiny, super fast pieces of on-board memory inside the CPU Each has a very specific purpose

Program Counter: Holds the address in memory which data or an instruction needs to be read from or written to

Memory Data Register: Holds either data or an instruction which has been fetched from memory of is about to be written back to memory

Memory Address Register: Holds either data or an instruction which has been fetched from memory of is about to be written back to memory

Accumulator: Set of general purpose registers

Buses: Collection of wires through which data & instructions are transmitted from one component to another

Address bus: Unidirectional Carries the addresses which data needs to be written to or read from

Data bus: Bidirectional Carries the actual data or instructions

Control bus: Bidirectional Carries command & control signals telling components when they should be receiving reads or writes etc.

Fetch Decode Execute

Computer: An electronic device which takes input, processes data & delivers output

Simple Example: Input - 5 Process - Multiply by 2 Output - 10

Complex Example: Input - Buttons on controller Process - Conversion in the console Output - Update to a monitor, sound out of a speaker or vibration feedback through a controller

In order to process data a computer follows a set of instructions known as a computer program in addition their are 2 critical components that allow this to happen RAM: Stores the programs & CPU: Carries out instructions

Fetch Stage: Fetches the next instruction from RAM & Brings it back to the CPU

Decode Stage: Inspects the instruction & works out what it is that needs doing

Execute Stage: Carries out the instruction which could involve many thing such as going back to RAM to grab some data, performing a calculation or storing information back into main memory

Clock speed: Amount of cycles per second measured in Hertz e.g. 3GHz = 3 billion cycles per second

Von Neuman & Harvard Architectures

Von Neuman Architecture	Harvard Architectures
Instruction & data are shared/stored with the same memory space/-format	Instructions & data are stored in separate memory units
Each have the same set of buses (System Bus)	Each having their own set of buses

Von Neuman & Harvard Architectures (cont)

A single control unit or processor follows a linear fetch, decode, execute cycle	Reading & writing data can be done at the same time as fetching an instruction
One instruction at a time	Used by RISC processers
Registers are used as fast access to instruction & data	----------

Alternative Architecture

Parallel Processing: Single Instruction on Multiple Data (SIMD)	Multiple Instructions on Multiple Data (MIMD) Using multiple cores	Distributed computing: Each computer on the network takes part in the problem