

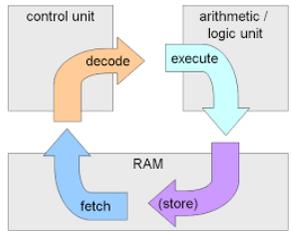
Year: 10
Topic:
CPU, Fetch Decode, Execute Cycle, Von Neumann Architecture

Core Texts
AQA Computer Science, Alison Page, 2013

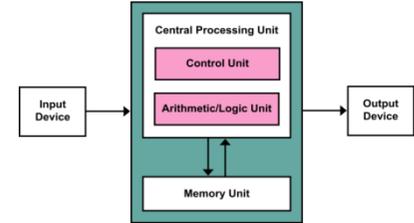
AQA Computer Science, Robson & Heathcote, 2016

Key Words:

Arithmetic Logic unit (ALU)	Carries out the following 3 operations: Logical operations, shift operations, arithmetic operations.	Fetch, Decode, Execute Cycle (FDE)	The cycle of loading, processing and executing one instruction	Clock frequency	Number of clock cycles which occur each second.
Control unit	Coordinates the activities taking place inside the CPU.	Cache Memory	Is a middle man between RAM and the CPU	Bus	The CPU has internal connections which pass data between the components of the CPU.
Clock	Controls processor timing, switching between 0 and 1 at rates exceeding several million times a second. It synchronises all CPU operations	Processor Cores	The amount of cores that can process and instruction at any given moment	Registers	Fast memory locations which are involved in the FDE.



Fetch Decode, Execute cycle (FDE)



Von Neumann Architecture
Developed the idea in the 1940's of the stored program computer

ALU
Logical operations: These include AND, OR, NOT
Shift operations: The bits in a computer word can be shifted left or right by a certain number of places
Arithmetic operations: These include addition, subtraction, multiplication and division

Control Unit
Controls the execution of instructions in the correct sequence
Decodes instructions
Regulates and controls processor timing using regular pulses from the system clock
Sends and receives control signals to and from other devices within the computer.

Fetch, Decode, Execute (FDE)
The address of the next instruction to be executed is fetched from the register
The register is incremented so it points to the next instruction to be fetched
The instruction is fetched and placed into a special register ready to be decoded
The Control Unit decodes the instruction to see what has to be done next.
The instruction is executed and the result is stored back into main memory

Cache Memory
The cache makes any data frequently used by the CPU available much more quickly. Because the processor has to access main memory less often, it can work faster, so the CPU performance increases. If it is not located in cache then it has to be fetched from main memory.

A typical PC may have 8GB of RAM (Main memory) but only 2MB of the faster more expensive cache memory.

The more cache memory a computer has, the more data and instructions can be held in cache and made available very quickly.

- Level 1 cache is extremely fast but small (between 2 -64KB)
- Level 2 cache is fairly fast and medium sized (256KB – 2MB)
- Some CPU's have level 3 cache.

