



4.1.1 Processor Performance & Pipelining

Factors Affecting Processor Performance

Number of Cores

Each core in a CPU is an individual processing unit capable of running its own FDE cycle.

This allows multiple instructions to be run simultaneously.

However, having twice as many cores does not necessarily double the execution speed of a program. This is because programs must be written to take advantage of parallel processing and not all tasks can be completed in parallel.

Clock Speed

Clock speed is the number of clock cycles generated per second and is measured in hertz (Hz).

A higher clock speed allows more FDE cycles to be completed per second, meaning that more instructions can potentially be executed in a given period of time

Cache Memory

Cache memory is a small amount of fast memory located in or near the CPU that stores frequently used instructions and data.

Because cache can be accessed more quickly than RAM, using cache reduces the need for the CPU to access RAM as frequently.





Pipelining

Pipelining is a technique in which different stages of the FDE cycle for multiple instructions are carried out concurrently. This increases the number of instructions that can be processed in a given period of time.

For example, while one instruction is executed, the next instruction can be decoded and the instruction after can be fetched.

Clock Cycle	Instruction 1	Instruction 2	Instruction 3
1	Fetch		
2	Decode	Fetch	
3	Execute	Decode	Fetch
4		Execute	Decode
5			Execute

If a branch occurs, instructions that have already entered the pipeline may no longer be needed. These instructions are discarded and the pipeline is flushed before instructions from the new branch target are processed.

