

Processors

Control Unit

- Connects to the memory

Program Counter (PC)

- Keeps track of [memory](#) addresses

Response Time and Throughput

Relative Performance

- Define performance as $1/\text{execution time}$
- Performance e_x / performance $e_y = \text{execution time}_y / \text{execution time}_x = n$

Measuring Execution Time

- MIPS (million instructions per second), not to be confused with [MIPS Assembly Language](#)

Elapsed Time

- Total response time (processing, I/O, OS overhead, idle time)

CPU Time

- Time spent processing a given job (discounts I/O time and other jobs)
- Comprises user CPU time and system CPU time
- Different programs are affected differently by CPU and system performance

CPU Clocking

Clock Period

- Cycle time
- Ex. $250ps = 0.25ns = 250 * 10^{-12}s$

Clock Frequency

- Clock rate
- Cycles per second

- Ex. $4.0GHz = 4000MHz = 4.0 * 10^9Hz$

Uniprocessors

- Single core processor

Multiprocessors

- Multiple processors per chip
- Requires explicitly parallel programming
 - Software must be written with parallel execution in mind
 - Multicore processors require software to be designed with concurrent execution techniques