



Parallel Computer Architectures

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Flynn's Taxonomy

Flynn's Taxonomy (of parallel architectures)



- Best known classification scheme for serial and parallel computer architectures
 - Multiplicity="Maximum possible no of simultaneous operations (instructions) on operands (data) being in the same phase of execution at the most constrained component of the organization"
- Four classes of computer architectures
 - Single Instruction Single Data (SISD)
 - Only one instruction is decoded in unit time
 - Single Instruction Multiple Data (SIMD)
 - Processor arrays: Connection Machine CM-200,
 - GPUs
 - Multiple Instruction Single Data (MISD)
 - Least intuitive.
 - Multiple Instruction Multiple Data (MIMD)
 - Most multicore/multiprocessor systems

SISD Architectures



- Performance of a single processor can be improved through either architectural or technological advances.
 - Architectural advances → increase amount of work performed per instruction cycle
 - Technological advancement → reduce time needed per instruction cycle
- Several techniques are used in computer architectures to increase amount of work
 - Instruction Pipelining
 - Reordering of instructions to avoid stalls
 - Branch prediction
 - Speculative execution

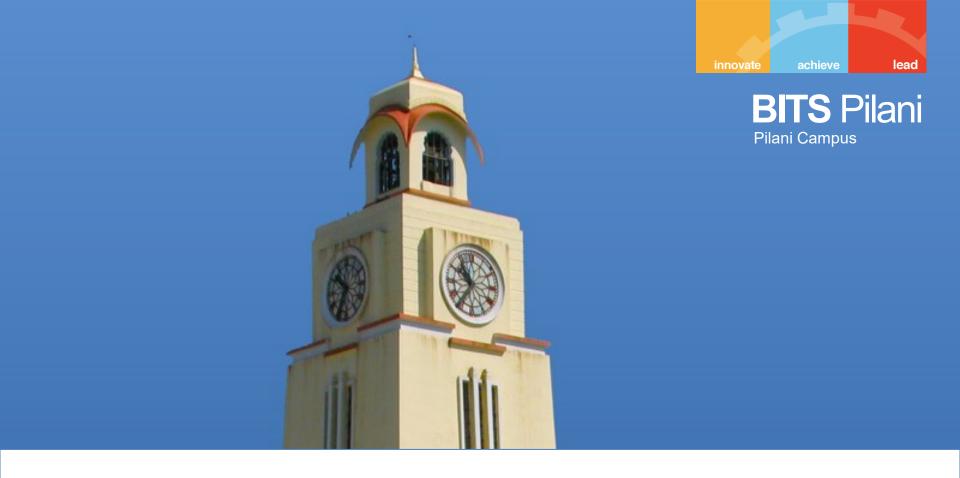
Instructions per cycle



Processor / System	MIPS	instructions per clock cycle	instructions per clock cycle per core	Year
AMD Ryzen 7 1800X (8-core)	304,510 MIPS at 3.7 GHz	82.3	10.29	2017
Intel Core i7- 8086K (6-core)	221,720 MIPS at 5.0 GHz	44.34	7.39	2018
Intel Core i9- 9900K (8-core)	412,090 MIPS at 4.7 GHz	87.68	10.96	2018
<u>AMD Ryzen 9</u> 3950X (16-core)	749,070 MIPS at 4.6 GHz	162.84	10.18	2019
AMD Ryzen Threadripper 3990X (64 core)	2,356,230 MIPS at 4.35 GHz	541.66	8.46	2020
Sitara AM64x ARM Cortex A53 (2-core)	5,992 MIPS at 1 GHz	6	3	2021







Thank You