Book’s name: Advanced Computer Architecture by Kai Hwang

Parallel Computer Models

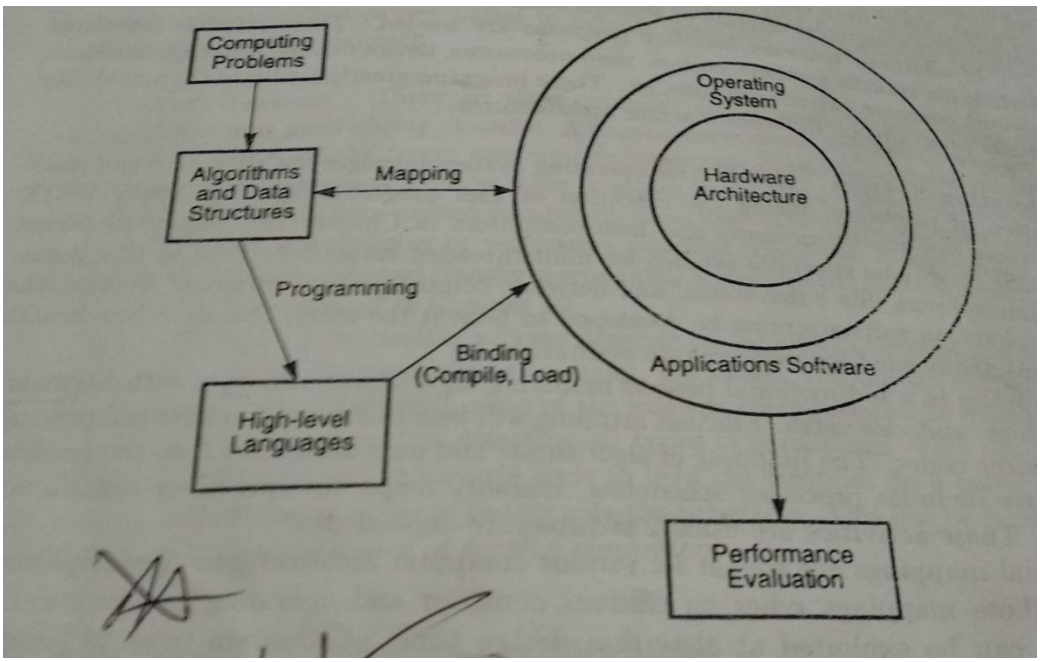
Parallel processing has emerged as a key enabling technology in modern computers, driven by the ever-increasing demand for higher performance, lower costs, and sustained productivity in real-life applications. Concurrent events are taking place in today's high-performance computers due to the common practice of multiprogramming, multiprocessing, or multicomputing.

Parallelism appears in various forms, such as lookahead, pipelining, vectorization, concurrency, simultaneity, data parallelism, partitioning, interleaving, overlapping, multiplicity, replication, time sharing, space sharing, multitasking, multiprogramming, multithreading and distributed computing at different processing levels.

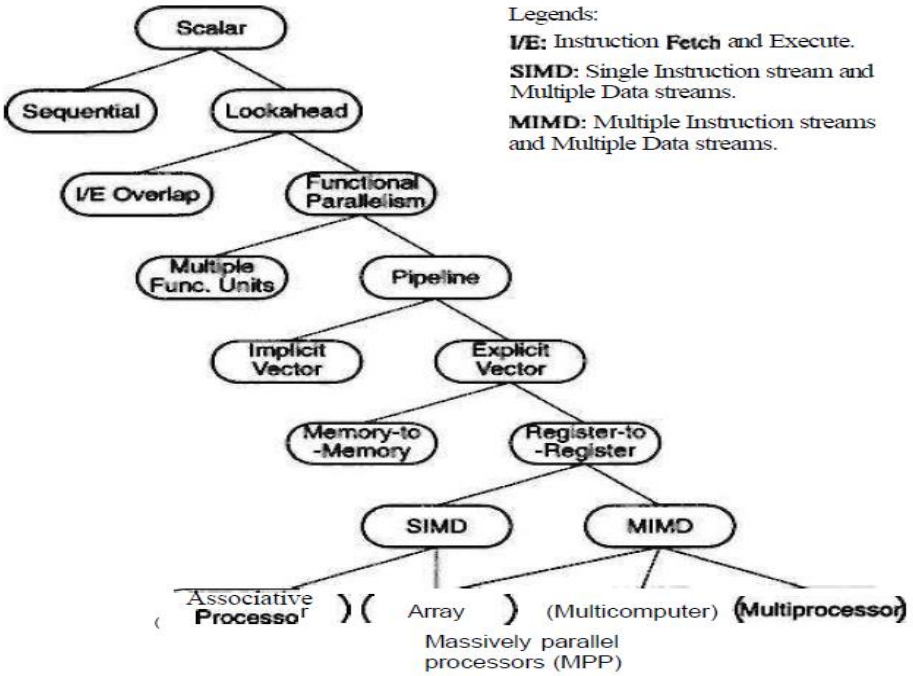
Generation of Computer:

Generation	Technology and Architecture	Software and Applications	Representative Systems
First (1945-54)	Vacuum tubes and relay memories, CPU driven by PC and accumulator, fixed-point arithmetic.	Machine/assembly languages, single user, no subroutine linkage, programmed I/O using CPU.	ENIAC, Princeton IAS, IBM 701.
Second (1955–64)	Discrete transistors and core memories, floating-point arithmetic, I/O processors, multiplexed memory access.	HLL used with compilers, subroutine libraries, batch processing monitor.	IBM 7090, CDC 1604, Univac LARC.
Third (1965-74)	Integrated circuits (SSI/-MSI), microprogramming, pipelining, cache, and lookahead processors.	Multiprogramming and time-sharing OS, multiuser applications.	IBM 360/370, CDC 6600, TI-ASC, PDP-8.
Fourth (1975-90)	LSI/VLSI and semiconductor memory, multiprocessors, vector supercomputers, multicomputers.	Multiprocessor OS, languages, compilers, and environments for parallel processing.	VAX 9000, Cray X-MP, IBM 3090, BBN TC2000.
Fifth (1991-present)	ULSI/VHSIC processors, memory, and switches, high-density packaging, scalable architectures.	Massively parallel processing, grand challenge applications, heterogeneous processing.	Fujitsu VPP500, Cray/MPP, TMC/CM-5, Intel Paragon.

Elements of Modern Computers



Evolution of Computer Architecture



Legends:

I/E: Instruction **Fetch** and Execute.

SIMD: Single Instruction stream and Multiple Data streams.

MIMD: Multiple Instruction streams and Multiple Data streams.