15 Hardware and Virtual Machines 硬件与虚拟机

15.1 Processors, Parallel Processing and Virtual Machines 处理器，并行处理与虚拟机

Complex Instruction Set Computer (CISC) 复杂指令集架构

a type of instruction set architecture. Its key characteristic, among others, is that a single instruction can be more complex and involve more loading of data from memory. Example: x86 and x86-64.

Reduced Instruction Set Computer (RISC) 精简指令集架构

a type of instruction set architecture. Its key characteristic, among others, a single instruction is simpler, requiring minimal loading of data from memory. Example: ARM, RISC-V.

pipelining 流水线

instruction-level parallelism that allows several instructions to be processed simultaneously, increasing the number of instructions completed per unit of time.

Parallel processing 并行处理

operation which allows a process to be split up and for each part to be executed by a different processor at the same time.

Single Instruction, Single Data (SISD) 单指令流单数据流

a basic computer architecture, which uses a single processor that can handle a single instruction, and which also uses one data source at a time.

Single Instruction, Multiple Data (SIMD) 单指令流多数据流

a basic computer architecture, in which a control unit (CU) controls an array of many ALUs to execute the same instruction using different data inputs. Many GPUs are SIMD.

Multiple Instruction, Single Data (MISD) 多指令流单数据流

a basic computer architecture, in which many processors execute different instructions using the same data set.

Multiple Instruction, Multiple Data (MIMD) 多指令流多数据流

a basic computer architecture, in which many processors execute different instructions using different data sets.

massively parallel computers 大规模并行计算机

a large number of computer processors or separate computers, linked together via network infrastructure and communicate using a message interface, to simultaneously perform a set of coordinated computations.

virtual machine 虚拟机

the emulation of a computer system (including hardware and/or software) on a host computer system, using guest operating system(s).

15.2 Boolean Algebra and Logic Circuits 布尔代数与逻辑电路

Combinational circuit 组合逻辑电路

a logical circuit in which the output is dependent only on the input values. Examples: almost all the logical circuits encounterd in A level Computer Science, including half adder and full adder.

Sequential circuit 时序逻辑电路

a logical circuit in which the output depends not only on the input values, but also on the previous output via feedback. Examples: flip-flop.

Half adder circuit 半加器

a logical circuit carries out binary addition on two bits, giving sum and carry.

Full adder circuit 全加器

two half adders combined to allow the sum of several binary bits.

flip-flop 触发器

a logical circuit with two stable states that is used to stores a single bit.