

cID
IID

Cain Susko

Queen's University
School of Computing

February 28, 2022

Abstraction in modern computers

there are many abstractions used in computers for programmers to understand the software. the logic is represented by the Instruction Set Architecture and Micro architecture within a computer.

We have the Application requirements be handled by instruction micro architecture. the technology constraints are handled by the micro architecture.

Performance in Computers

the growth in processing power of computers has been exponentially growing, however, the growth has slowed in recent years. Computer chips with many CPU's (computer processing unit) are called multi-core; this is to further increase computing power in a computer. This performance is determined by the implementation of logic within the CPU.

Logic Gates

every instruction in a computer is achieved by using logic gates. They are simply signals that are entered into a chip and an output is received. Logic circuits, integrated circuits, or chips are commonly made using transistors. The transistor has the ability to represent the logic *and*, *or* and *not*. Boolean operations can represent the states of a transistor. A single Chip may contain millions or billions of transistors in order to implement a micro processor.

Primitive Logic logic gates are simple digital circuits (outputs and inputs 1/0). Logic gates are drawn with a symbol showing the inputs and outputs. the input/output can be represented as a truth table or a boolean equation (mathematical expression with binary variables). We can use these abstractions to find equivalent circuits that may do the operation much faster.

AND flat input, pointed output

OR curved input, pointed output

NOT triangle, flat in, point out

Multi-input Gates There are many gates that take 3 input arguments. for example, OR, XOR, NOR, NXOR etc. Another example is

$$out = \neg(a \vee b \vee c)$$

which represents a NOR gate (im pretty sure)

Bit-Adder we can also create a bit adder using this logic. the input is a_i, b_i, c_i and the out is s_i, c_{i+1} where s is the result and c is the carry of the sum (if any)

]./figures/circuit, 0.5

the process of finding this circuit is by first determining the desired output, and then modify the curcuit to give the desired output given input.