Fundamentals of Computer Architecture

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Overview

The key aspects of a computer

- A brief history of the computer, and its place within our modern society;
- Typical components within a computer system

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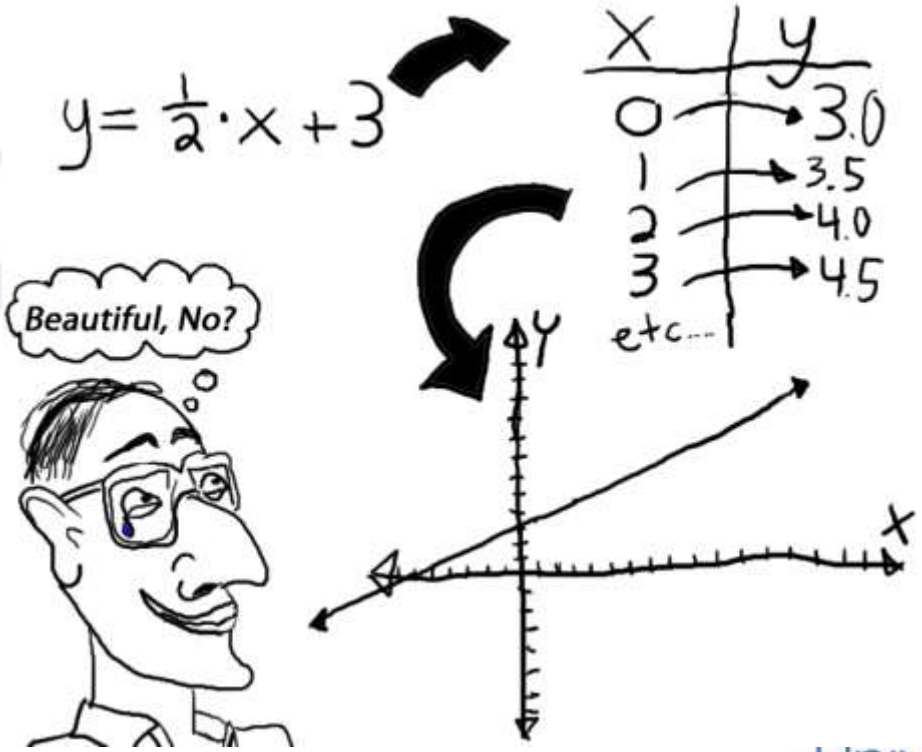
What is a Computer?

- A hundred years ago a *computer* was a *human being*



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- Over the years, a rough definition of a computer has evolved to this:
  - It must take *input* of some sort;
  - It must produce *output* of some sort;
  - It must *process* the information somehow;
  - It must have some sort of *information store*;
  - It must have some way of *control* over what it does

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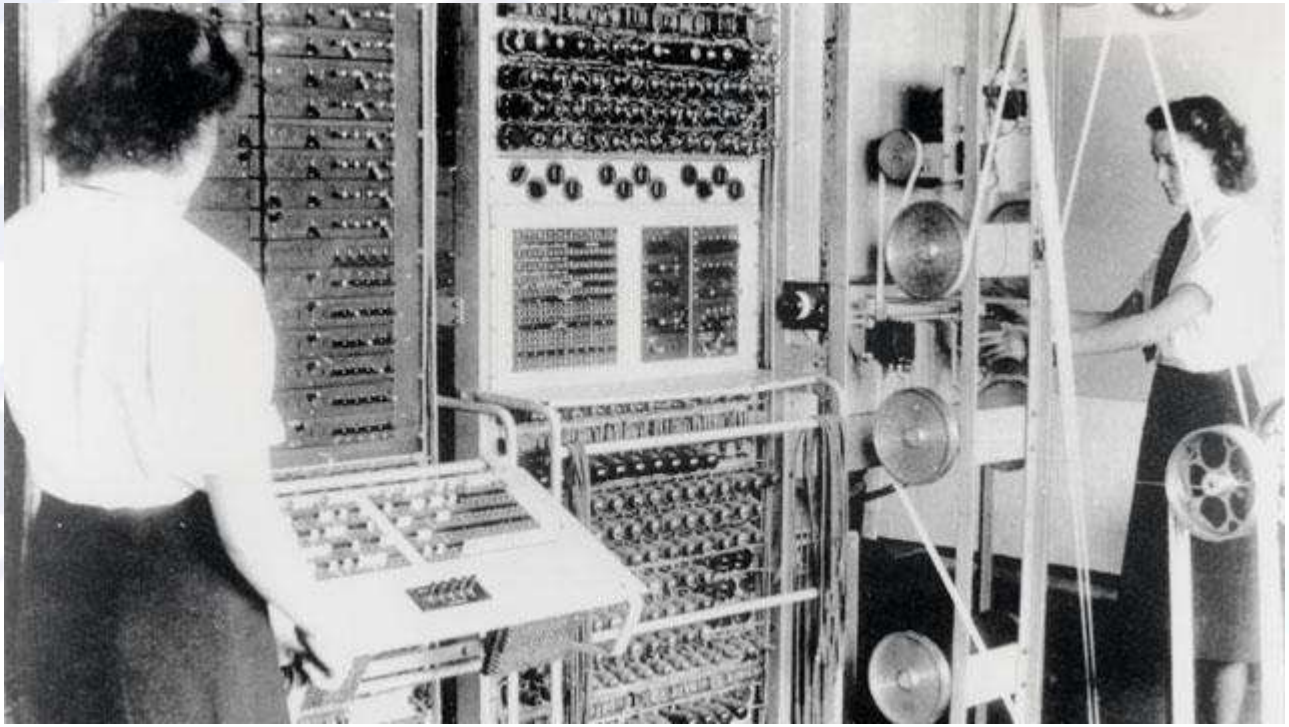
Bletchley Park (Station X)
Colossus

- Base of secret British code-breaking activities during WWII
- HQ of MI-6 during WWII
- Birthplace of the modern computer



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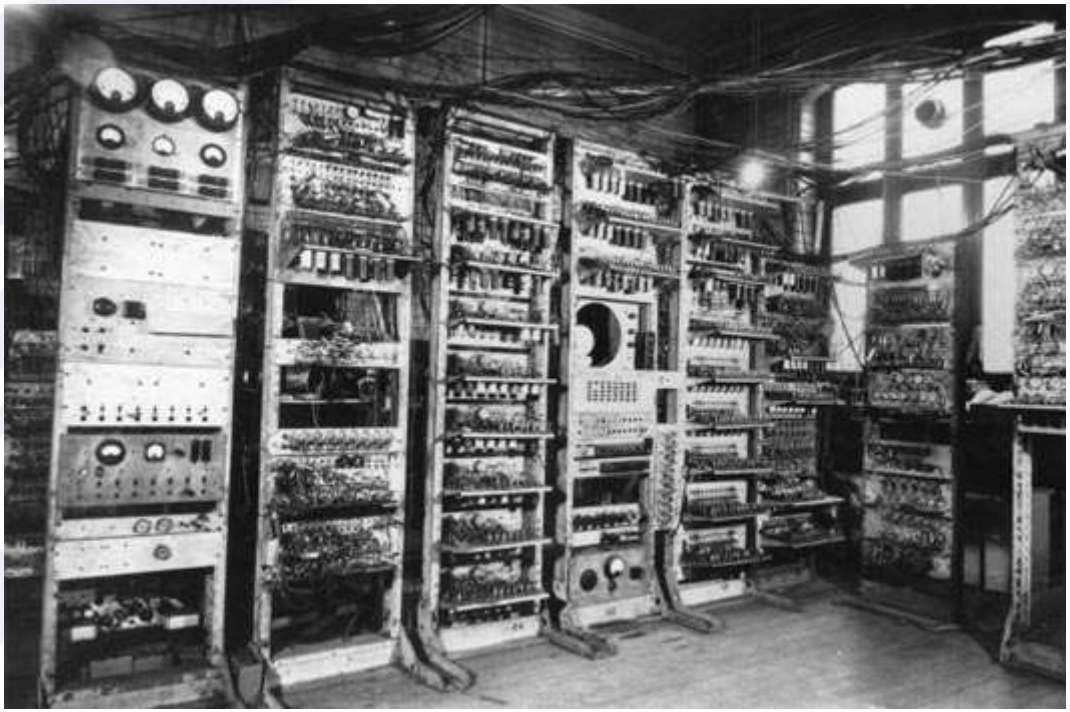
1948 - Manchester ‘Baby’

First computer that stored its programs and data in the same memory



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And More…

More computer firsts:

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- Chip technology is now so advanced that we are close to having one billion transistors on a single chip;

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– 1981 : The first Personal Computer

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Von Neumann Architecture

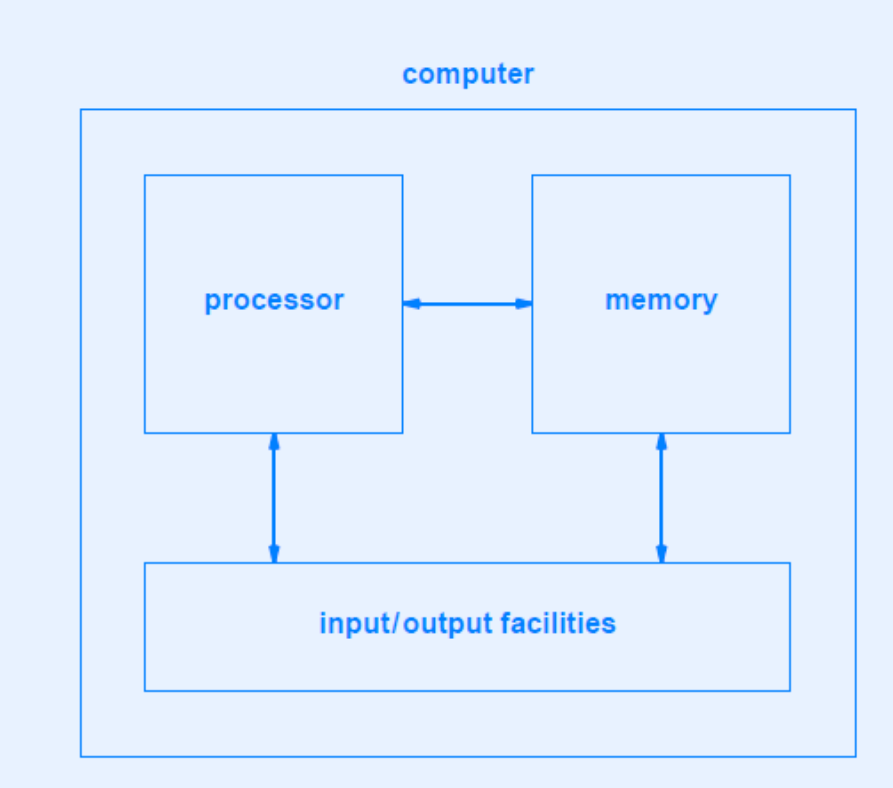
Fundamental concept is a *stored program*

Three basic components interact to form a computational system

– Processor

– Memory

– I/O facilities



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Inside a Computer

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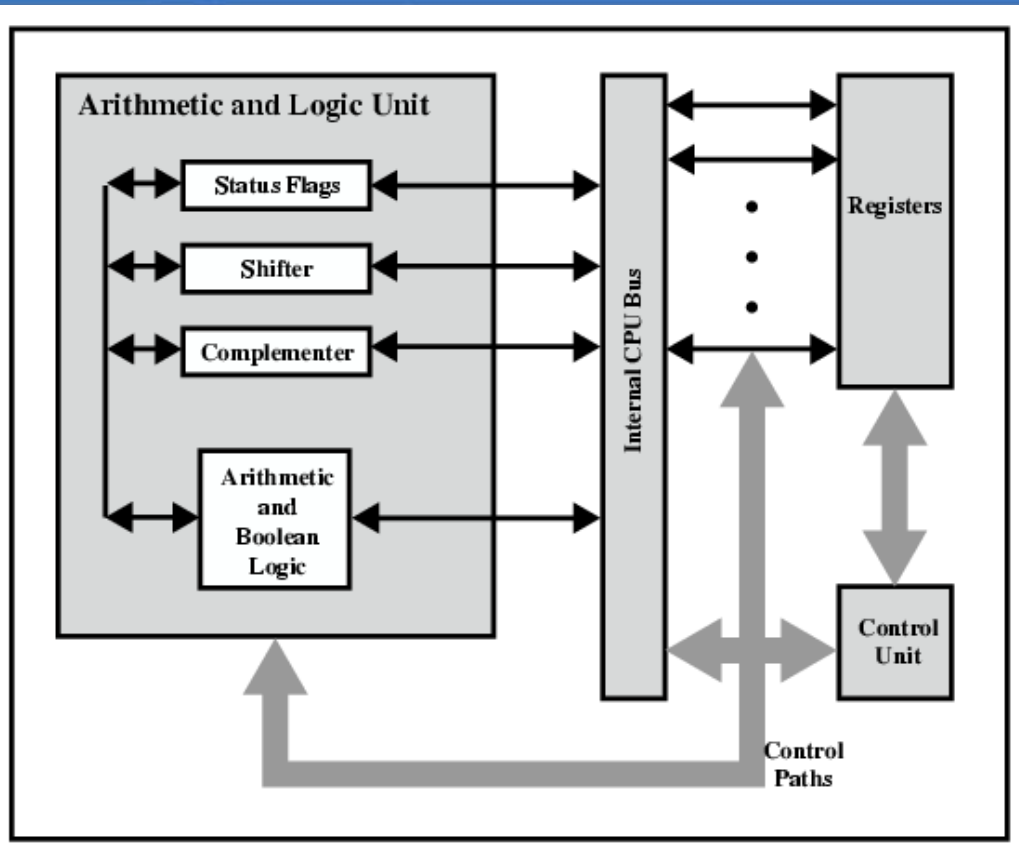
CPU Internal Structure



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Processor Registers

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- Normally measured by the number of bits they can hold

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  - *stack pointer*: address of top of stack

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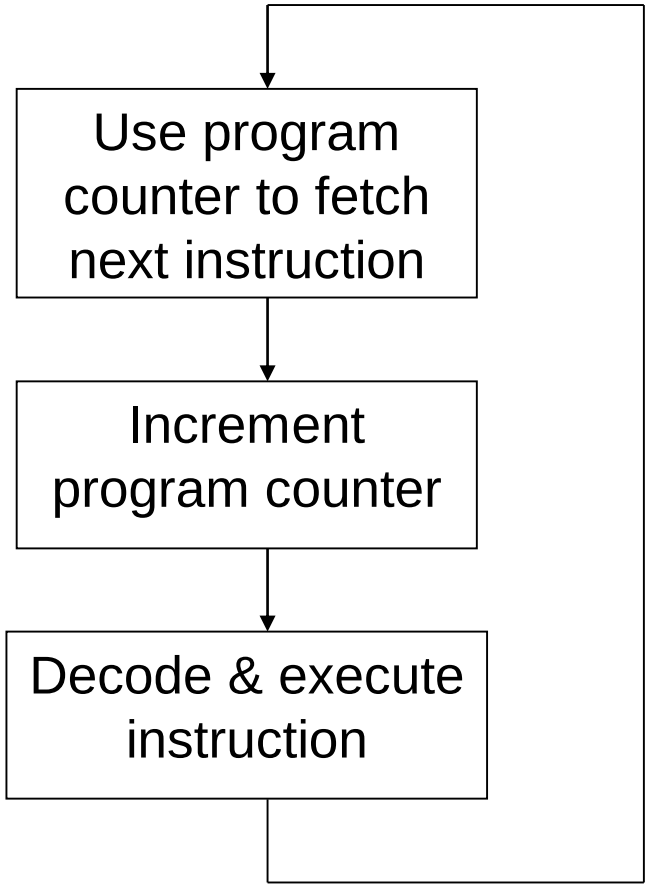
How Computers Work (2)



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How Computers Work (3)

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- Call instructions jump, but save the return address (original value of program counter)
  - return instruction returns to last saved address

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References

1. Douglas E. Comer: Essentials of Computer Architecture
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2. Mark Burrell: Fundamentals of Computer Architecture
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