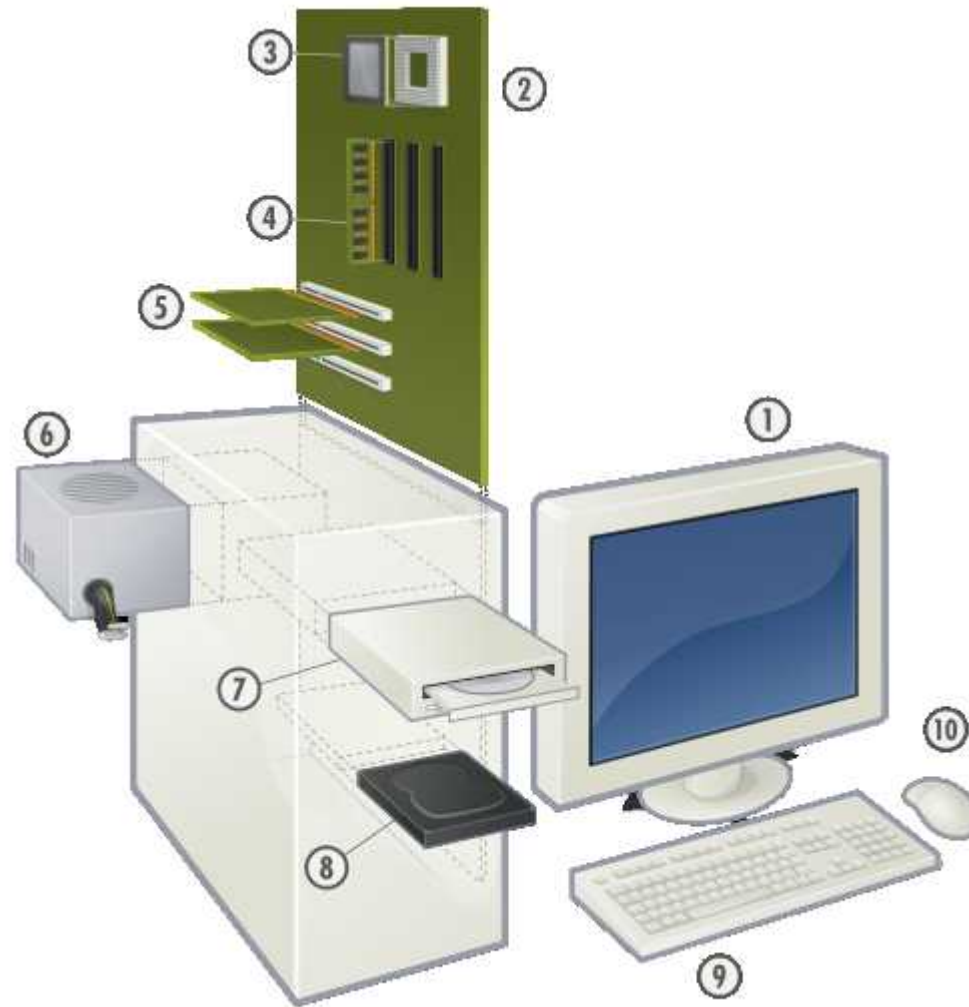


Components of a Computer



http://en.wikipedia.org/wiki/File:Personal_computer,_exploded_5.svg

Components of a Computer

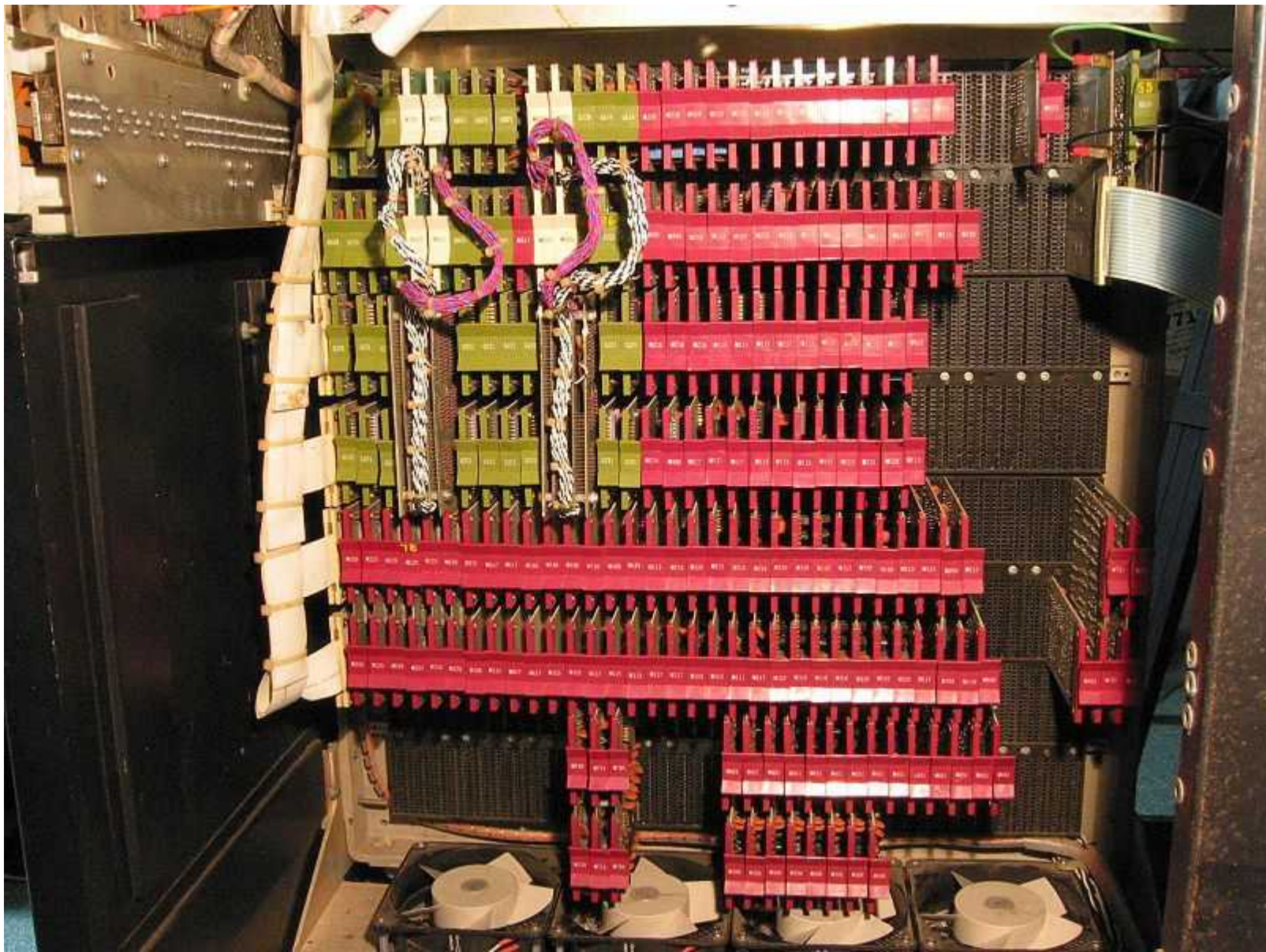
- CPU
- Memory
 - RAM, ROM etc.
- I/O Device
 - Keyboard, mouse, trackball, display etc.
- Device interconnects
 - PCI, firewire, USB, blue-tooth etc.
- Storage Devices
- Multimedia Devices

CPU

- CPU is the 'brains' of a computer.
- The CPU is a single microprocessor chip.
- It sits on the motherboard and controls the other parts of the computer.
- Intel 4004 & 8080
- X86 family
- X86_64
- Multi-core processors

CPU

- Central Processing Unit – carries out the instructions of a computer program.
- Basic analytical, logical and input/output operations.
- Term in use since the 60s.
- Great variation in the physical form of the CPU over time.



Pictured are the CPU (including the major registers and an extended arithmetic unit), memory controller, 4 kilowords magnetic core memory, external bus interface, TTY interface, and paper punched tape interface.

http://en.wikipedia.org/wiki/File:PDP-8i_cpu.jpg

CPU

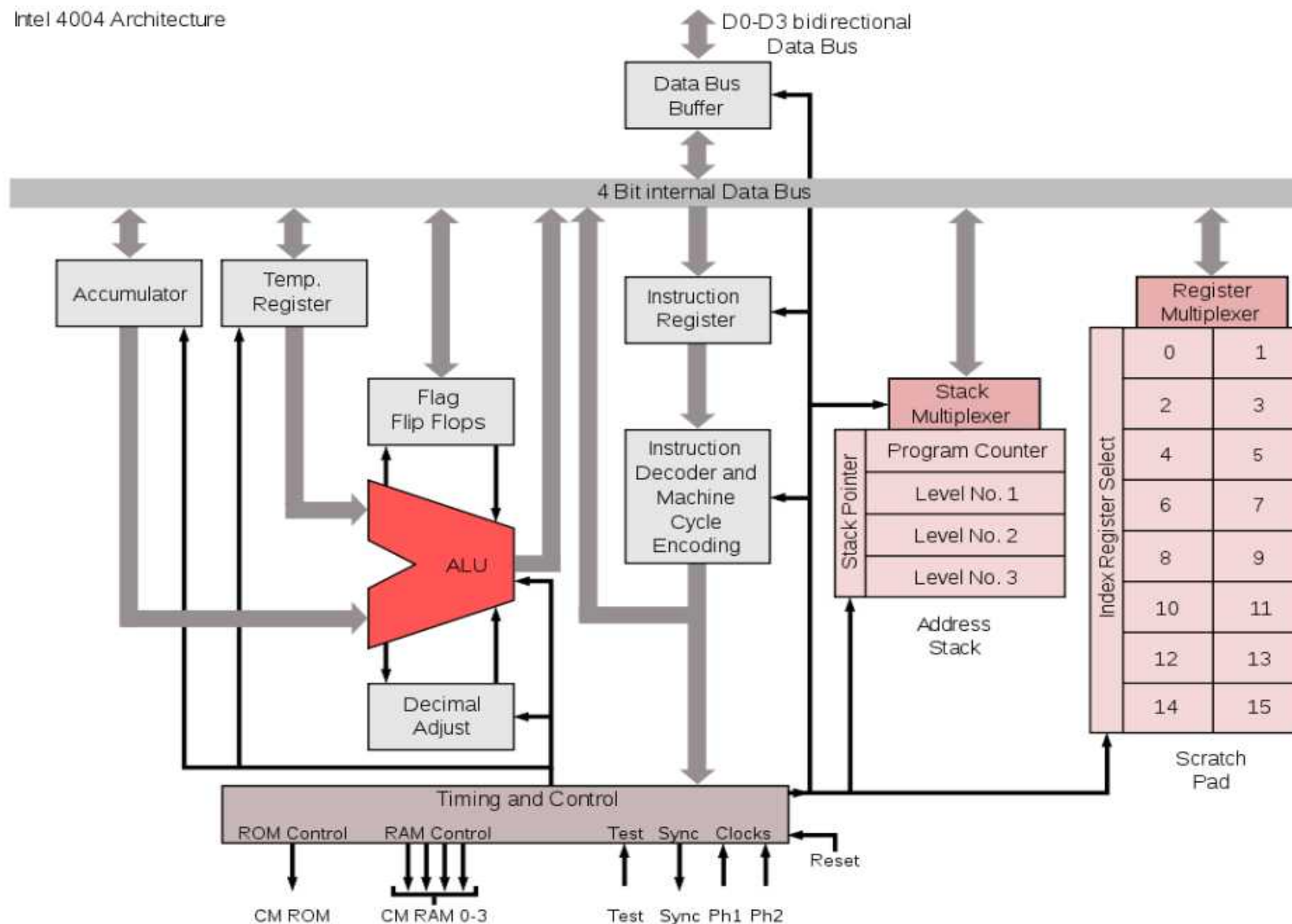
- Originally CPUs were made of one or more printed circuit boards.
- The CPUs were also custom built for a particular machine.
- Due to advances in Large scale integration (LSI) , microprocessors were born.
- Standardized CPU microprocessors based on VLSI based Integrated circuits are now the norm.

Intel 4004

- 4 – bit CPU released by Intel in 1971.
- First complete CPU on one chip
- First commercially available microprocessor costing \$60.
- Around 2300 transistors.
- Speed of 740 kHz.
- 92,000 instructions per second.
- The first commercial product to use a microprocessor was the Busicom calculator 141-PF.

Intel 4004

Intel 4004 Architecture



Intel 8080

- Second 8-bit microprocessor from Intel released in April 1974.
- Initial specified clock frequency of 2 MHz.
- A few hundred thousand instructions per second.
- The 8080 has sometimes been labeled "the first truly usable microprocessor".
- Used in many computers running CP/M.
- Changed computer design – CPU not specific to computer.

Other 8-bit microprocessors

- Motorola 6800 from 1974.
- MOS Technology 6502 from MOS Technology in 1975.
 - Apple I - 1975
 - Atari 2600, Commodore PET, Apple II - 1977
 - Later in Atari home computers, the BBC Micro family, the Commodore VIC-20 etc.
- Zilog Z80 by Zilog from July 1976.
 - Sinclair ZX Spectrum and many other computers.

Intel 8086

- The 8086 (iAPX86) -- 16-bit microprocessor , released in mid-1978.
- Beginning of the x86 architecture of Intel's future processors.
- Designed to compete against Z80.
- Marketed as assembly source compatible to the 8008, 8080, or 8085.
- The programming model and instruction set was (loosely) based on the 8080
- The 8086 design was expanded to support full 16-bit processing.

x86

- The term x86 refers to a family of instruction set architectures based on the Intel 8086 CPU.
- The term x86 derived from the fact that early successors to the 8086 also had names ending in "86".
- Many additions and extensions have been added to the x86 instruction set over the years, almost consistently with full backward compatibility.
- The architecture has been implemented in processors from Intel, Cyrix, AMD, VIA, and many others.

x86

- Embedded systems as well as general-purpose computers used x86 chips.
- x86 usually implies binary compatibility with the 32-bit instruction set of the 80386 (x86-32).
- New x86 processors with 64-bit capabilities are called x86-64 or x64 to avoid compatibility problems with older computers or systems.
- Modern x86 is relatively uncommon in embedded systems.

x86-64

- x86-64 is an extension of the x86 instruction set.
- It supports vastly larger virtual and physical address spaces than are possible on x86.
- x86-64 also provides 64-bit general purpose registers and numerous other enhancements.
- The original specification was created by AMD in 2000, and has been implemented by AMD, Intel, VIA, and others.

x86-64

- It is fully backwards compatible with 32-bit code.
- The full 32-bit instruction set remains implemented in hardware without any intervening emulation.
- Also named as AMD64 (AMD), IA-32e, EM64T and Intel 64 (Intel), x64 (Oracle and Microsoft).
- First x86-64 processor, The Opteron released in 2003.

Multi-core processors

- Originally CPUs had only a single processor.
- A multi-core processor is a single computing component with two or more independent actual processors (called "cores").
- Manufacturers typically integrate the cores onto a single integrated circuit die (known as a chip multiprocessor or CMP), or onto multiple dies in a single chip package.

Multi-core processors

- A many-core processor is a multi-core processor in which the number of cores is large enough that traditional multi-processor techniques are no longer efficient — largely because of issues with congestion in supplying instructions and data to the many processors.
- The many-core threshold is roughly in the range of several tens of cores.

Multi-core processors

- Dual-core processor – 2 cores
- Quad-core processor – 4 cores
- Hexa-core processor – 6 cores
- Octo-core processor – 8 cores
- Homogeneous multi-core systems include only identical cores.
- Heterogeneous multi-core systems have cores which are not identical.

Multi-core processors

- The improvement in performance gained by the use of a multi-core processor depends very much on the software algorithms used and their implementation.
- In particular, possible gains are limited by the fraction of the software that can be parallelized to run on multiple cores simultaneously; this effect is described by Amdahl's law.
- The parallelization of software is a significant ongoing topic of research.