

Personal Computer Hardware

CS-150L

Computing for Business Students

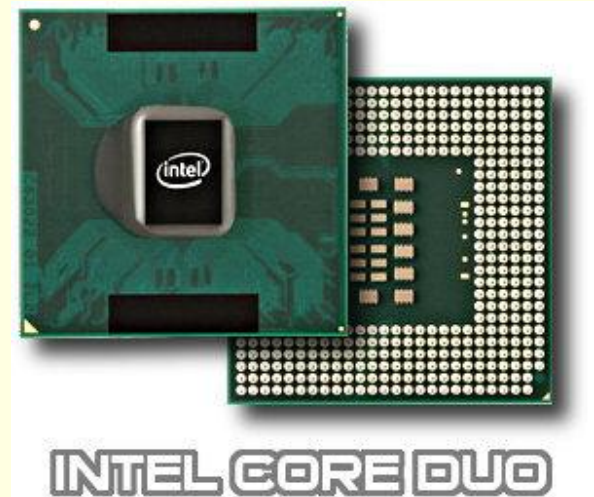
Instructor:

Matthew Barrick

e-mail: barrick@cs.unm.edu

www.cs.unm.edu/~barrick

Office: Farris Engineering
Center (FEC) room 106

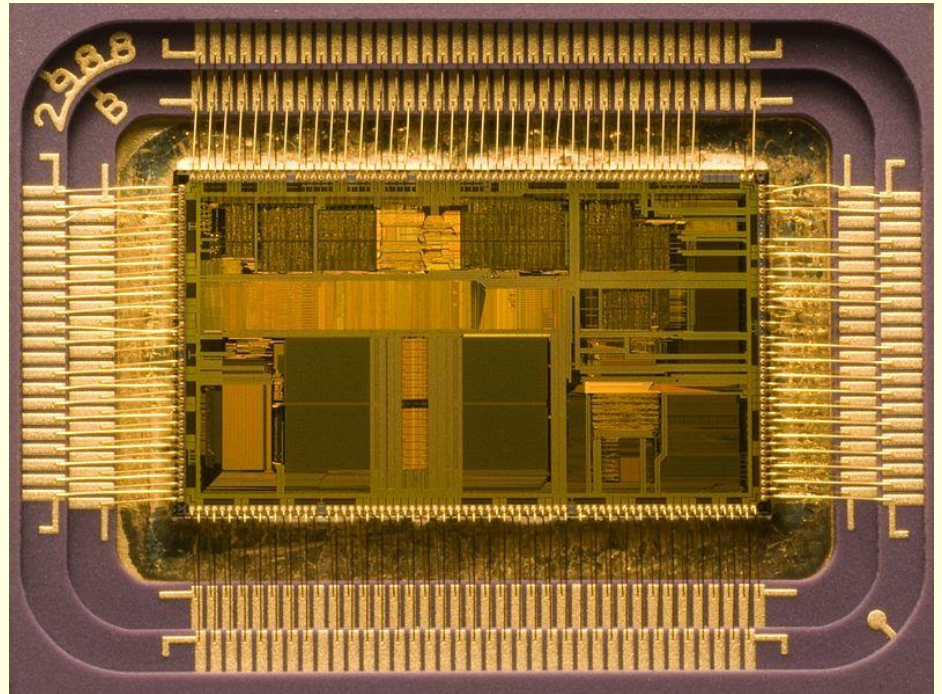




- <http://videos.howstuffworks.com/howstuffworks/23-computer-tour-video.htm>₂

CPU: Central Processing Unit

- A class of logic machines that can execute computer programs.
- UNM CS prof. just made a "CPU" with fish in *Second Life*®.

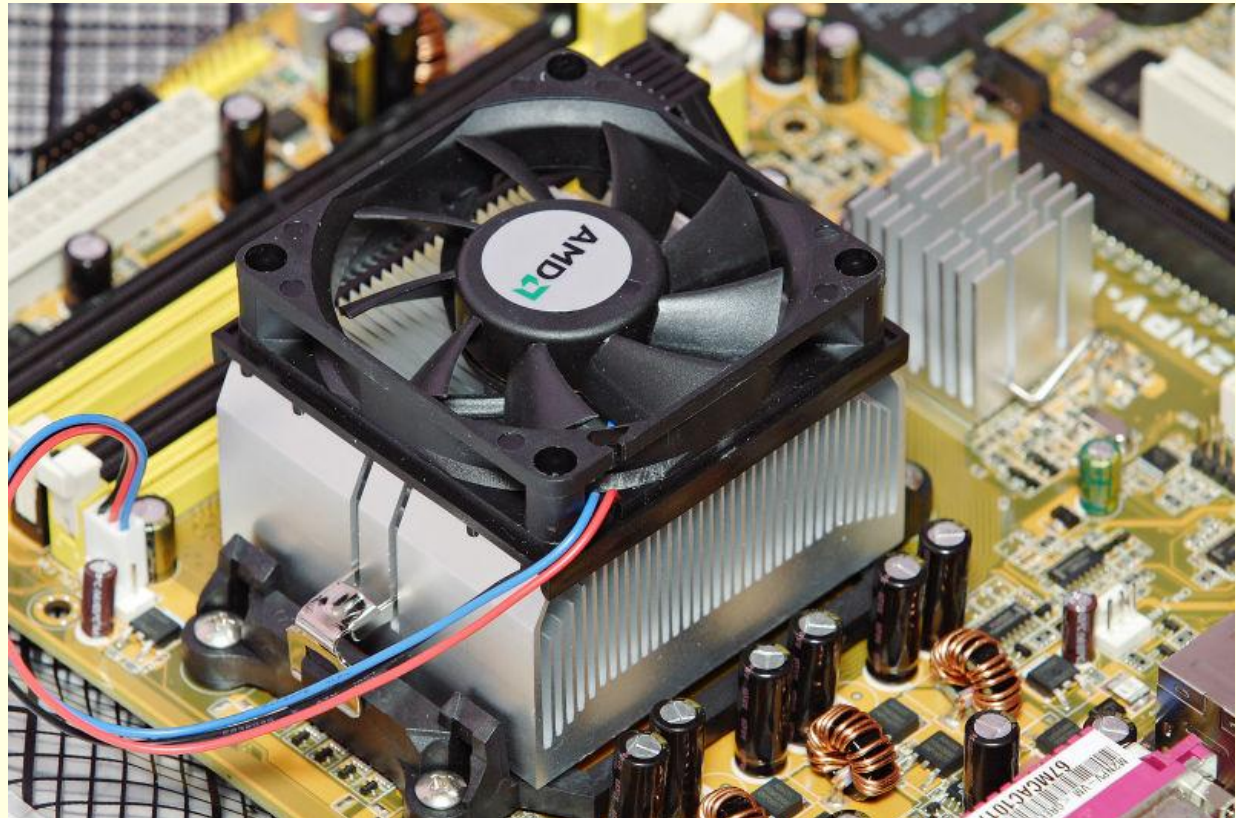


Intel's i486DX2 Dual Core CPU introduced in 1992

AMD CPU, Heatsink and Fan

An object that absorbs and dissipates heat from another object by using thermal contact.

- Size,
- Thermal Conductivity,
- Surface Area,
- Air Movement.



Quiz: Heatsink

In computer science, a heatsink is:

- a) A sink for cleaning computer components that gets very hot.
- b) A sink for cleaning computer components that can operate under extreme heat.
- c) An object that absorbs and dissipates heat from another object by using thermal contact.
- d) An object that generates heat.
- e) An object that locates and destroys its target by following the target's heat signature.

RAM - Random Access Memory

- Random access memory (usually known by its acronym, RAM) is a type of computer data storage.
- Allow the stored data to be accessed in any order, i.e. at random. The word random thus refers to the fact that any piece of data can be returned in a constant time, regardless of its physical location and whether or not it is related to the previous piece of data.
- RAM is mostly associated with volatile types of memory where the information is lost after the power is switched off.
- However, other types of memory are RAM as well (i.e. flash memory).



RAM Disk

- A RAM disk is a software layer that enables applications to transparently use RAM, often a segment of main memory, as if it were a hard disk, USB Flash Drive or other secondary storage.
- Access time may be greatly improved to files held on RAM disks compared to data held on other secondary storage.
- The volatility of RAM means that data will be lost if power is lost.
- "What do you mean by 'RAM DISK is not an installation procedure' ?"

Quiz: RAM

Random Access Memory

- a) Is memory that is accessed randomly.
- b) Is memory that can be accessed in constant time.
- c) Uses random amounts of power.
- d) Is used for random games of chance.
- e) Is use for stock market prediction and modeling due to its random nature.

CPU: Central Processing Unit

- CPU speed is measure in megahertz.
- A 1MHz CPU can accomplish one million CPU cycles in one second.
- Does this mean that a 2MHz CPU is twice as fast as a 1Mhz CPU?
- Not necessarily. This depends on how much work each CPU accomplishes in each clock cycle.
- The 1MHz CPU might very well be faster, in practice, than the 2Mhz CPU - if it is more efficient or can process more tasks in each CPU cycle.

CPU: Front Side Bus (FSB)

- The Front Side Bus (FSB) is the connection between the CPU and system memory.
- The Front Side Bus operates at a speed which is a percentage of the CPU clock speed.
- The faster the speed at which the Front Side Bus allows data transfer, the better the performance of the CPU.

CPU: System Memory

- RAM has an access speed.
 - Faster RAM will mean the CPU has to wait less often for data.
 - This will, effectively, make the CPU faster.
- RAM also has a Quantity.
 - The larger the RAM the less often temporary data needs to be written to the hard disk.

CPU: The Cache

- The purpose of a cache is to enable the CPU to access recently used information very quickly.
- Cache significantly affects CPU performance.
- Some caches are bigger than others. A typical L1 cache is 256Kb and a typical L2 cache is 1MB.
- Generally speaking, the larger the cache, the better the system performance boost. However, this is not always the case.
- A cache operates at a certain speed. Some caches operate at the full speed of the CPU, while others operate at half that speed or less.
- A small, full-speed cache **may be** much more useful than a large half-speed cache.

CPU: Single, Dual, and Quad Core

- A multi-core processor combines two or more independent units into a single package composed of a single integrated circuit (IC)
- A dual-core processor contains two cores
- A quad-core processor contains four cores.
- The amount of performance gained by the use of a multicore processor depends on the problem being solved and the algorithms used, as well as their implementation in software.
- Dual-core systems offer a significant advantage over single-core when multi-tasking.

Quiz: Cache

On a computer CPU, *cache* refers to:

- a) The cost of the CPU.
- b) A relatively small amount of extra fast memory.
- c) The place where the RAM connects to the CPU.
- d) The place where the internal hard disk connects to the CPU.
- e) The place where the dual-cores connect.

Quiz: CPU

A dual-core Central Processing Unit (CPU), or processor combines two independent cores into a single package composed of a single integrated circuit (IC). Dual-core is good for:

- a) Using your computer as a space heater.
- b) Runs most software two times faster.
- c) Doubles the clarity when playing DVDs.
- d) Doubles the computer's storage space.
- e) Is most useful for multi-tasking.

Powers of 2:

$$2^3 = 2 \times 2 \times 2 = 8$$

$2^0 =$	1
$2^1 =$	2
$2^2 =$	4
$2^3 =$	8
$2^4 =$	16
$2^5 =$	32
$2^6 =$	64
$2^7 =$	128
$2^8 =$	256
$2^9 =$	512

$2^{10} =$	1,024
$2^{11} =$	2,048
$2^{12} =$	4,096
$2^{13} =$	8,192
$2^{14} =$	16,384
$2^{15} =$	32,768
$2^{16} =$	65,536
$2^{17} =$	131,072
$2^{18} =$	262,144
$2^{19} =$	524,288

Decimal Numbers (Base Ten)

2567

$$2 \times 10^3 + 5 \times 10^2 + 6 \times 10^1 + 7 \times 10^0$$

Binary Numbers (Base Two)

Binary with 4 bits has $2^4 = 16$

Permutations :

$$0: 000 = 0 \times 2^2 + 0 \times 2^1 + 0 \times 2^0$$

$$1: 001 = 0 \times 2^2 + 0 \times 2^1 + 1 \times 2^0$$

$$2: 010 = 0 \times 2^2 + 1 \times 2^1 + 0 \times 2^0$$

$$3: 011 = 0 \times 2^2 + 1 \times 2^1 + 1 \times 2^0$$

$$4: 100 = 1 \times 2^2 + 0 \times 2^1 + 0 \times 2^0$$

$$5: 101 = 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0$$

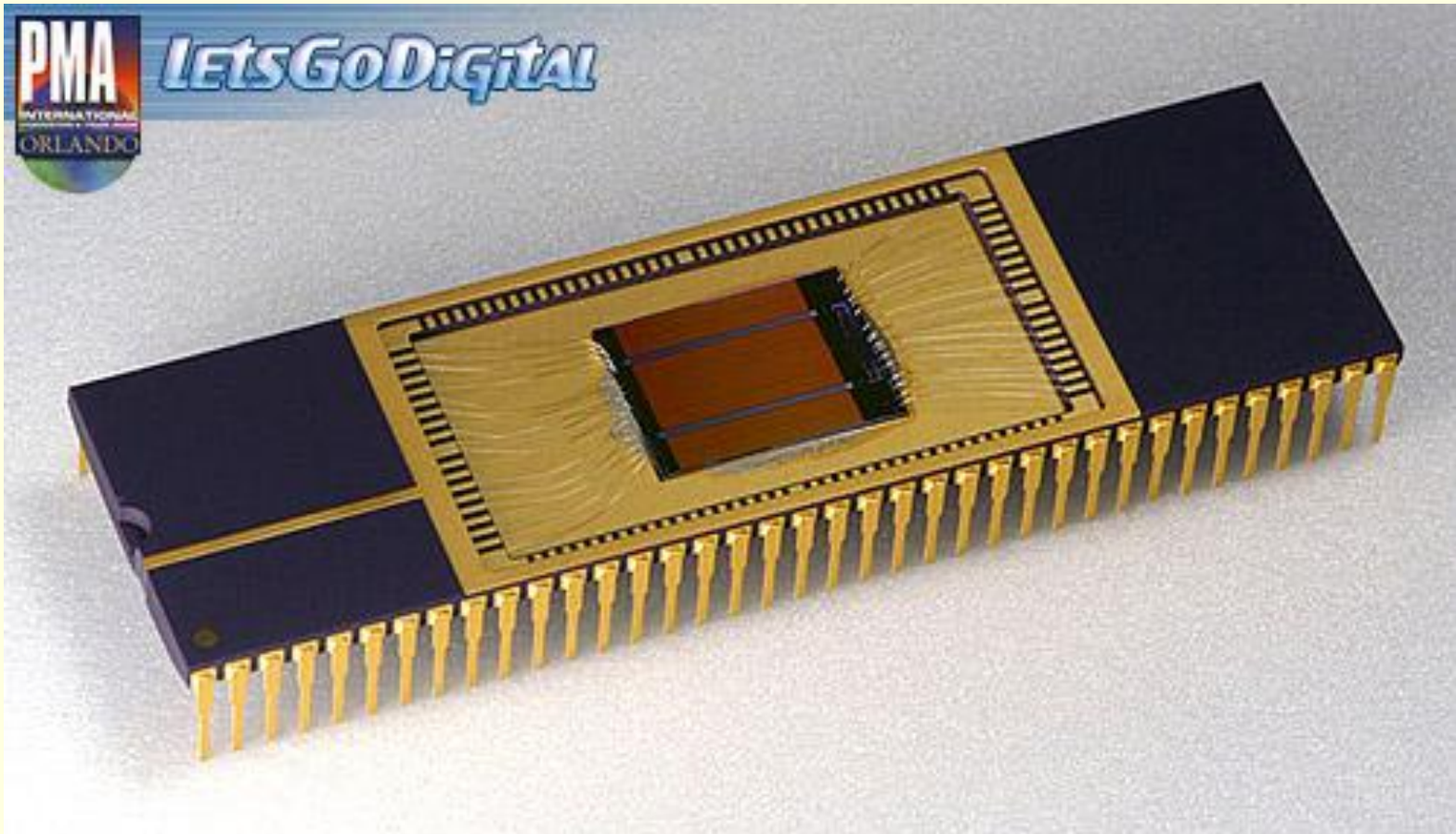
$$6: 110 = 1 \times 2^2 + 1 \times 2^1 + 0 \times 2^0$$

$$7: 111 = 1 \times 2^2 + 1 \times 2^1 + 1 \times 2^0$$

Geek Humor

- There are 10 types of people: those who understand binary, and those who do not understand it.

SanDisk Flash Memory Chip



How many bytes of memory can this chip store?

ASCII Byte

- With ASCII Character Codes, one, character takes 1 byte to encode
- One byte = 8 bits with $2^8 = 256$ Permutations:
00000000, 00000001, 00000010,...

9	(<i>tab</i>)
32	(<i>space</i>)
33	!
34	"
35	#
36	\$
37	&

47	/
48	0
49	1
50	2
51	3
60	<
61	=

65	A
66	B
67	C
97	a
98	b
99	c
100	d

232	è
233	é
234	ê
235	ë
241	ñ
252	ü

Extended Character Sets

- Extended Character Sets often take two bytes.
- Extended Character Sets can include colors, fonts, styles, Chinese, Japanese, and Arabic Characters
- We saw that 1 byte is 8, bits and has 256 permutations.
- How many permutations do 2 bytes have?

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- What is the first sign of a computer getting too old?
 - Memory Problems