

Lesson 05: Computer Basics (W01D5)

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Do Now

Make a list of as many internal components inside a computer as you can think of.

Aim

Students will learn about computer architecture: internal components and their roles; the interaction between the BIOS, hard disk, and operating system to boot a computer; and the layering of BIOS, OS, and applications.

Under the covers

Let's look under the hood of a PC...

CPU

- Stands for **Central Processing Unit**
- Comprised of millions of transistors
e.g., 150×10^6 transistors on an Intel Core Duo processor (as of Jan 2006)
- Transistors form *logic gates*

Logic Gates

- Perform logic operations you learned Math class:
 - AND
 - OR
 - NOT
 - the “combination” gates: NAND, NOR, & XOR

Logic Gates

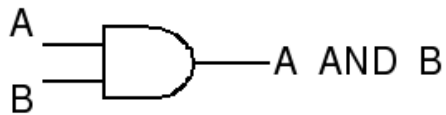
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- Linking of logic gates can perform more sophisticated functions; a topic covered in a Computer Engineering/Architecture course

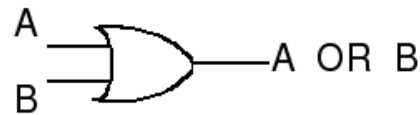
Gates

AND gate



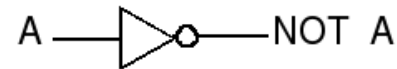
A	B	A AND B
T	T	T
T	F	F
F	T	F
F	F	F

OR gate



A	B	A OR B
T	T	T
T	F	T
F	T	T
F	F	F

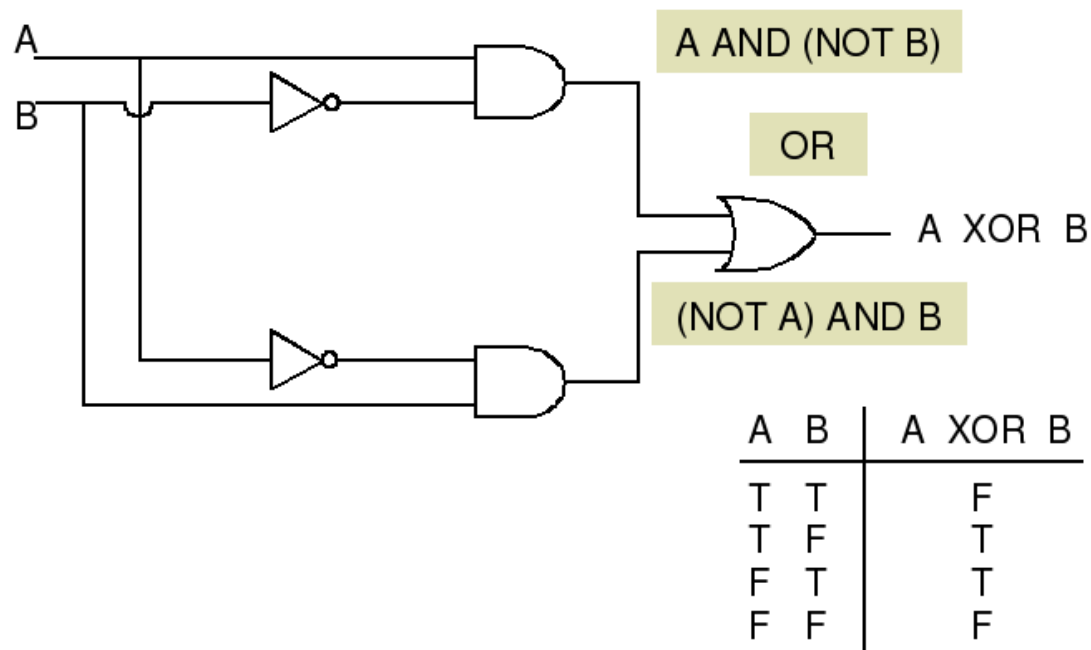
NOT gate



A	NOT A
T	F
F	T

(taken from Litvin Ch01 PPT)

Example: XOR Circuit



(taken from Litvin Ch01 PPT)

Motherboard

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- Connects
 - CPU
 - RAM
 - Video adapter
 - PCI/AGP slots (to which other boards can be connected)
 - USB bus (to which USB devices can be connected)
 - Keyboard and/or Mouse (via PS/2 port if not USB)

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- Hard disk manufacturers often quote disk sizes using the conversion 1KB = 1000 bytes, yet operating systems calculate disk capacity using the idea that every 1KB = 1024 bytes. Why?

Memory

- Data storage using binary representation
- Microchip-based, requires a voltage to read/write values
- Based on logic gates
- Various types and speeds; PCs nowadays commonly have DIMM modules

Memory, cont'd

- Some types are volatile (i.e., they lose **state** when voltage is no longer applied); Example: System RAM
- Some types are nonvolatile (e.g., **NVRAM** devices like USB flash drives)

Memory, cont'd

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(huh?! OK, consider the difference between finding a scene on a movie DVD vs. a VHS cassette)

Memory: RAM or Hard Disk?

If software demands more physical memory (RAM) than is available, an operating system may take advantage of what is known as *virtual memory management*, and transparently begin using an area on a hard disk called a *paging file* (or, generically, *swap space*).

I'm not going to cover the specifics of this idea now, but I'll try to demonstrate this on an older computer (with too little RAM!) at a later time

Hard Disk (or Drive)

- Like RAM, it provides storage of data in binary form
- Not a “solid state” technology (i.e., there are moving parts, unlike RAM) → primary disadvantage(s)?
- Cheaper per unit of storage than RAM
- **Much** slower access time compared to RAM

HW

Make sure you've finished all of these items by now!

- website registration
- apcs01 username creation
- test web locker using link on left side of course site;^a the password is the same as the one you typed for your apcs01 account
- student information form
- JDK installation and verification at home by retrying HelloWorld exercise from lesson #4

^aMake sure you're logged in!