

Computer System Review

INF 551

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SETTING THE STANDARDS

15
YEARS

Special International-Only Editorial Section

FOLLOWS
PAGE 80

BYTE

SEPTEMBER 1989

A MCGRAW-HILL PUBLICATION

REVIEWS

ALR MicroFlex 7000
AST Bravo/286
Sysgen's Removable
Hard Disk
HyperPAD
Arriba

PRODUCT FOCUS



Multiuser
Operating Systems

THE WORLD'S FIRST 486

*Fresh from the U.K.
Apricot's VX FT Server Leads the Pack*

Lotus 1-2-3 release 3.0

Database Trends, *In Depth*

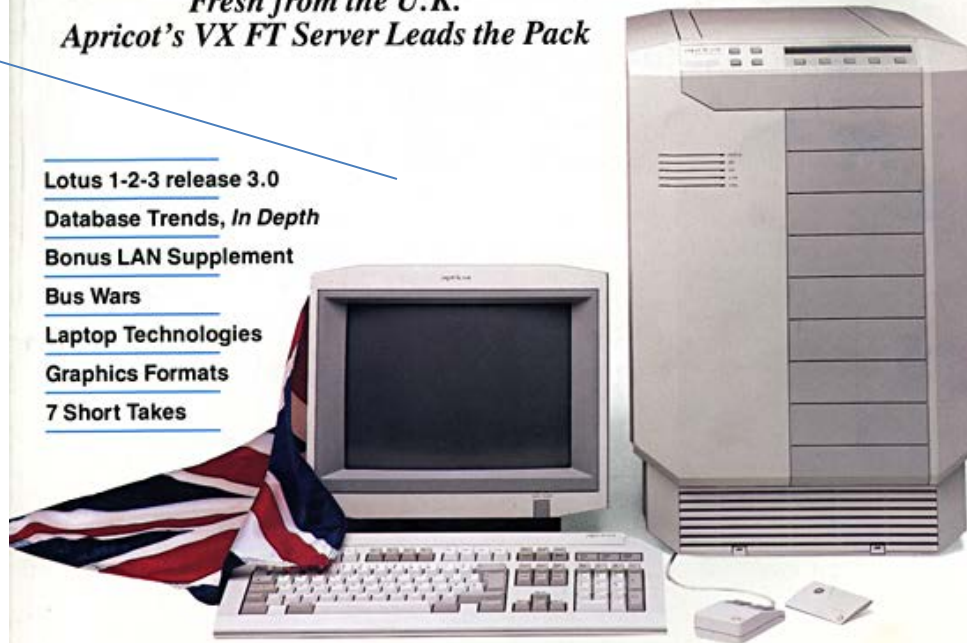
Bonus LAN Supplement

Bus Wars

Laptop Technologies

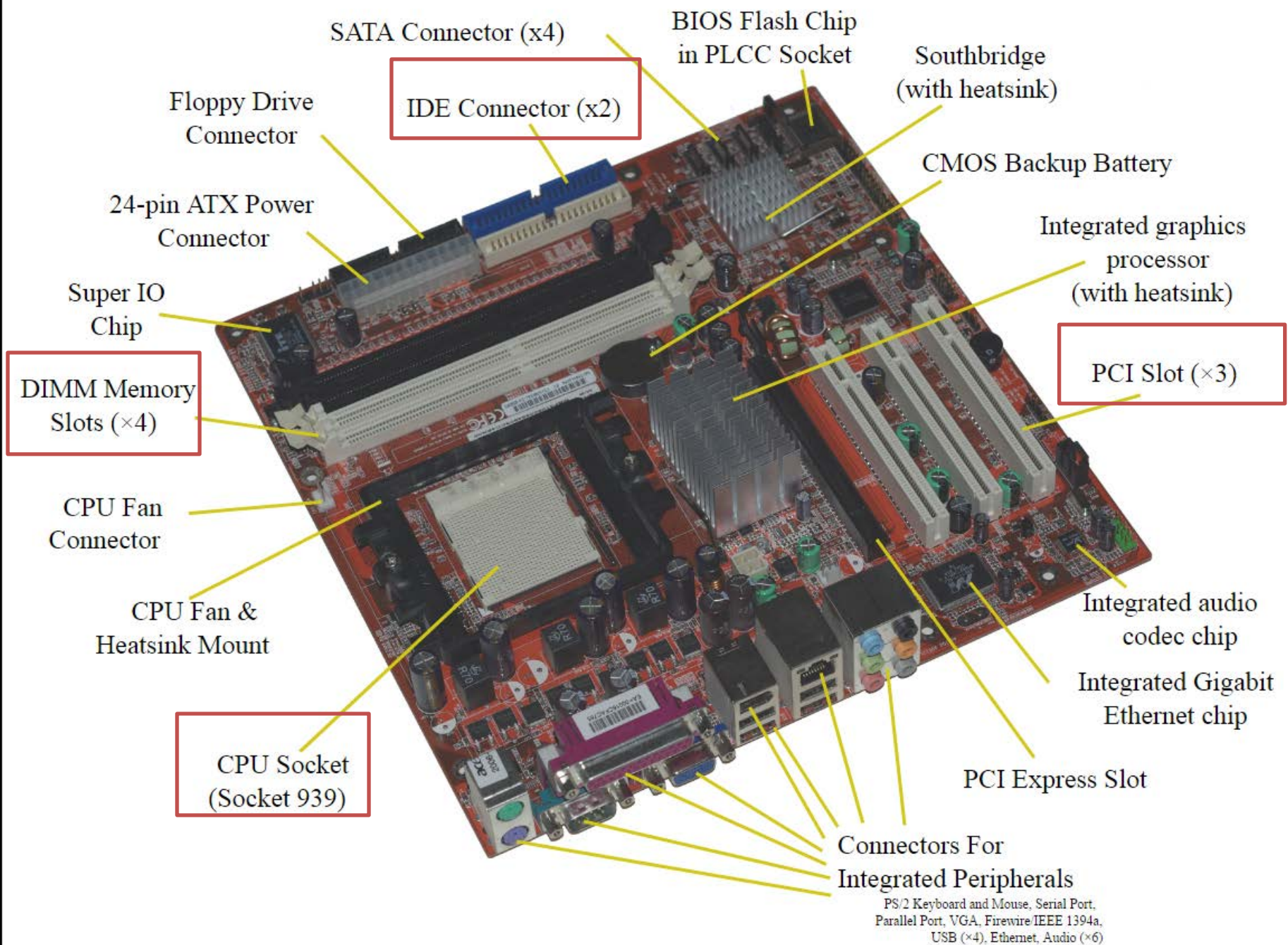
Graphics Formats

7 Short Takes



£1.95 U.K./A \$6.50 AUSTRALIA
LIL 8,000 ITALY/\$3.50 U.S.A.
0360-5280

PC in 1980



SATA Connector (x4)

BIOS Flash Chip
in PLCC Socket

Southbridge
(with heatsink)

Floppy Drive
Connector

IDE Connector (x2)

CMOS Backup Battery

24-pin ATX Power
Connector

Integrated graphics
processor
(with heatsink)

Super IO
Chip

DIMM Memory
Slots (x4)

PCI Slot (x3)

CPU Fan
Connector

CPU Fan &
Heatsink Mount

CPU Socket
(Socket 939)

Integrated audio
codec chip

Integrated Gigabit
Ethernet chip

PCI Express Slot

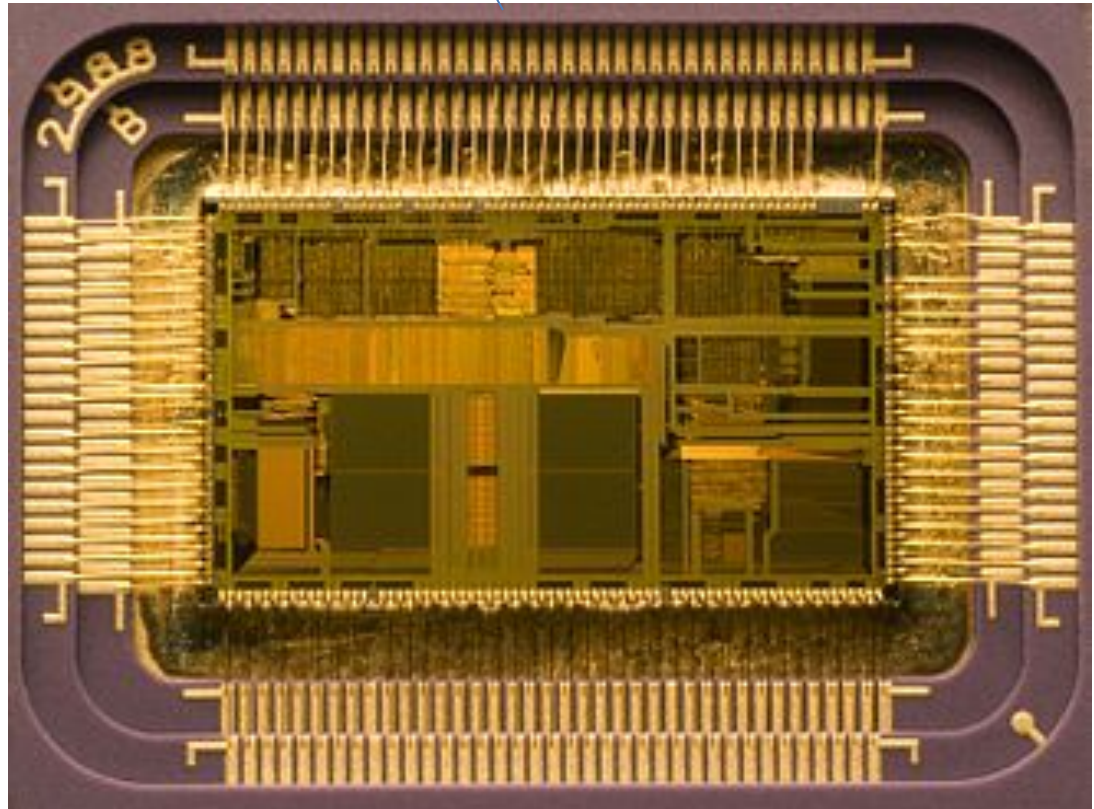
Connectors For
Integrated Peripherals

PS/2 Keyboard and Mouse, Serial Port,
Parallel Port, VGA, Firewire/IEEE 1394a,
USB (x4), Ethernet, Audio (x6)

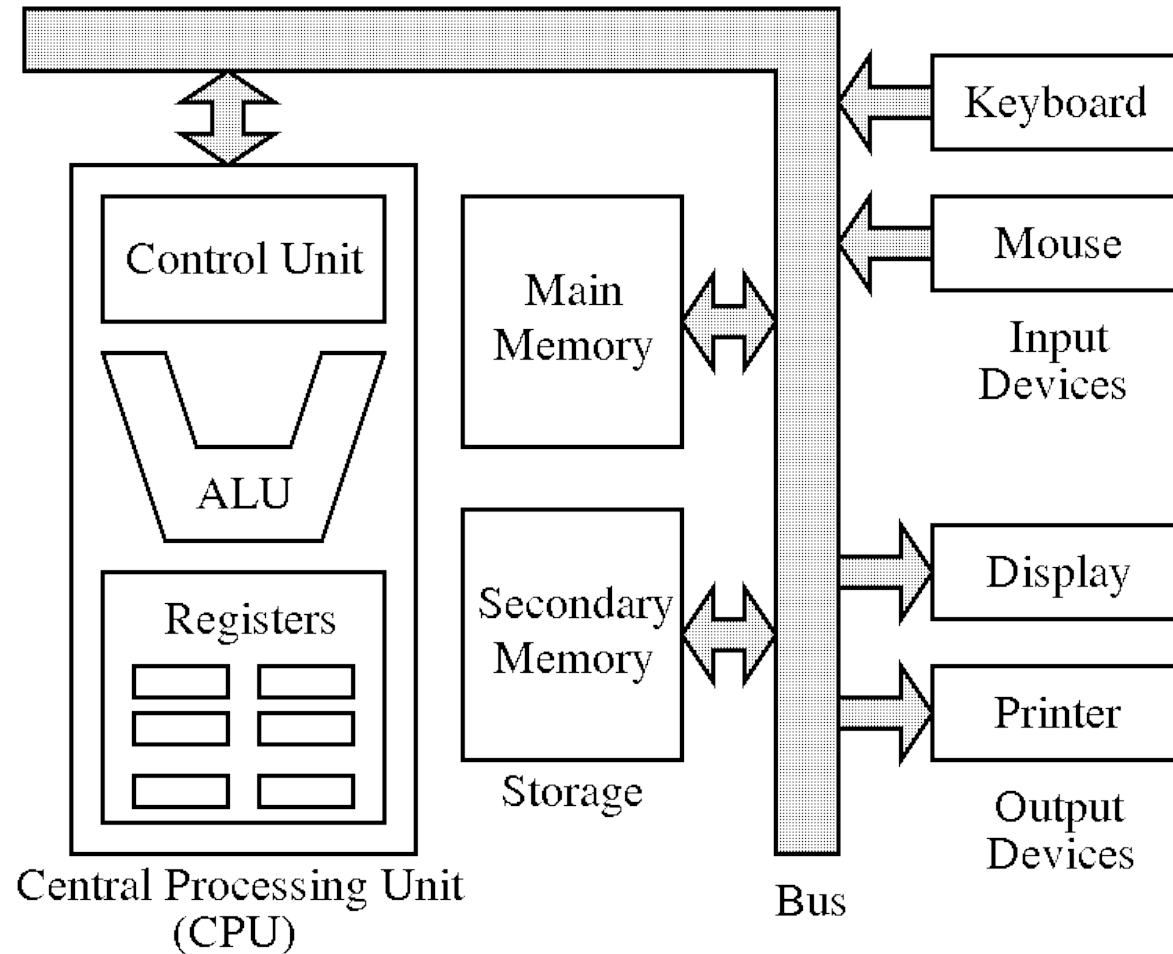
CPU (central processing unit)



Exposed die of Intel i486



Computer architecture



Components

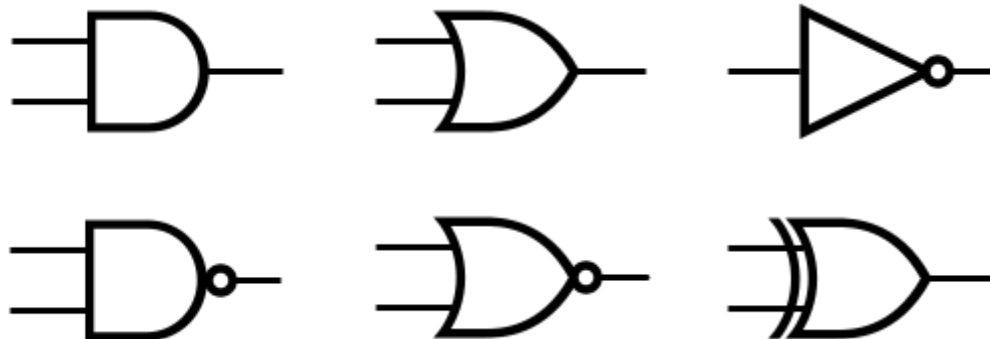
- Control unit: brain of CPU
 - Load instructions & data from memory
 - Execute them using registers and ALU
- Registers: storing data from memory
 - Faster than memory
- ALU: arithmetic logic unit
 - Perform arithmetic and bitwise operations

Logic gate

- Building block for
 - Register
 - ALU
 - Computer memory

Logic gate

- Perform a boolean function
 - AND, OR, NOT
 - NAND, NOR, XOR



- Made of transistors

Example: NOR gate

When $A = 0$, output depends on B (= complement of B)

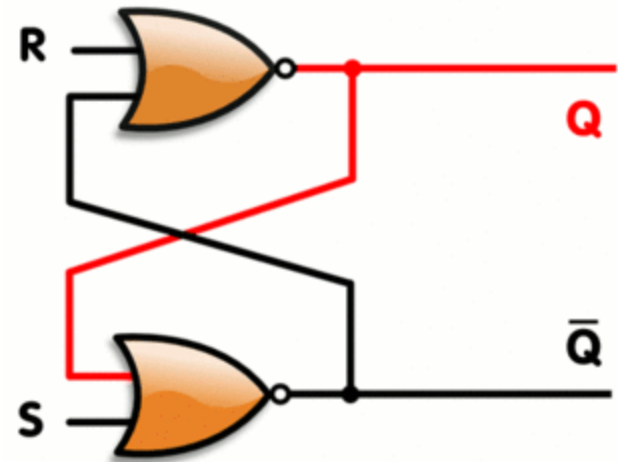
When $A = 1$, output = 0 (no matter what B is)



INPUT		OUTPUT
A	B	A NOR B
0	0	1
0	1	0
1	0	0
1	1	0

Flip-flop (built from NOR gates)

- Store information
- R: reset; S: set
- $R = S = 0$:
 - state of outputs maintained by feedback
- $S = 1, R = 0$:
 - Q is forced to 1
- $R = 1, S = 0$:
 - Q is forced to 0



Another example: NAND gate

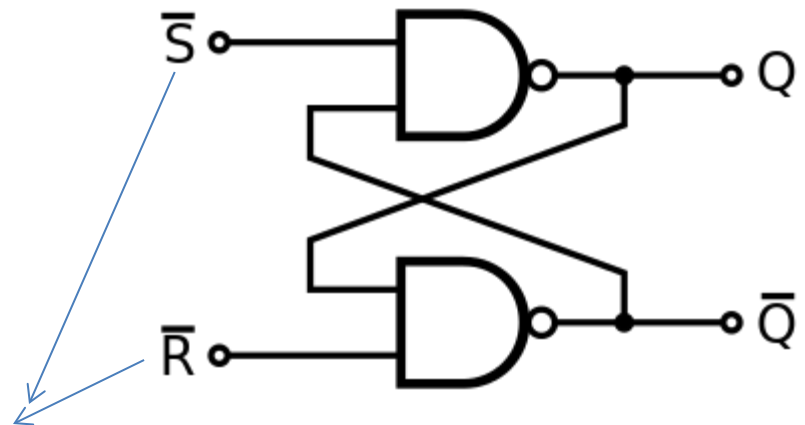
- When $A = 1$
 - output depends on B (= complement of B)
- When $A = 0$
 - output = 1 (no matter what B is)



INPUT		OUTPUT
A	B	A NAND B
0	0	1
0	1	1
1	0	1
1	1	0

Flip-flop (made of NAND gates)

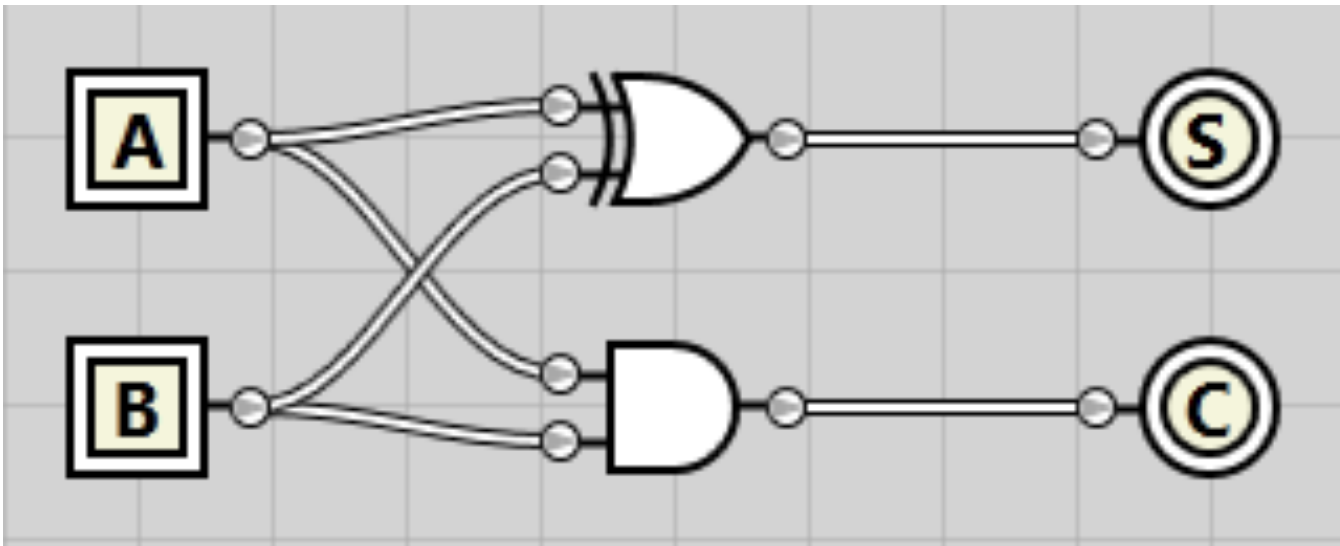
- Similar to NOR flip-flop
 - But set and reset require low signals now
- $R = S = 1$:
 - state of outputs maintained by feedback
- $S = 0, R = 1$:
 - Q is forced to 1
- $R = 0, S = 1$:
 - Q is forced to 0



Set/reset requires low signal now

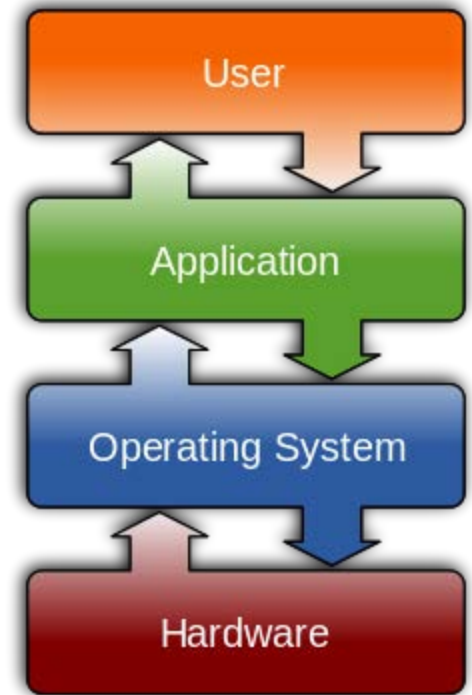
Half adder (adding two bits)

- S: sum = A XOR B
- C: carry = A AND B



Operating system

- Manage resources (CPU, memory, disk)
- Run programs
 - Maintaining program state
 - Multi-tasking
- Provide API (system calls)
 - For using system services
 - E.g., accessing CPU, memory, disk



OS components

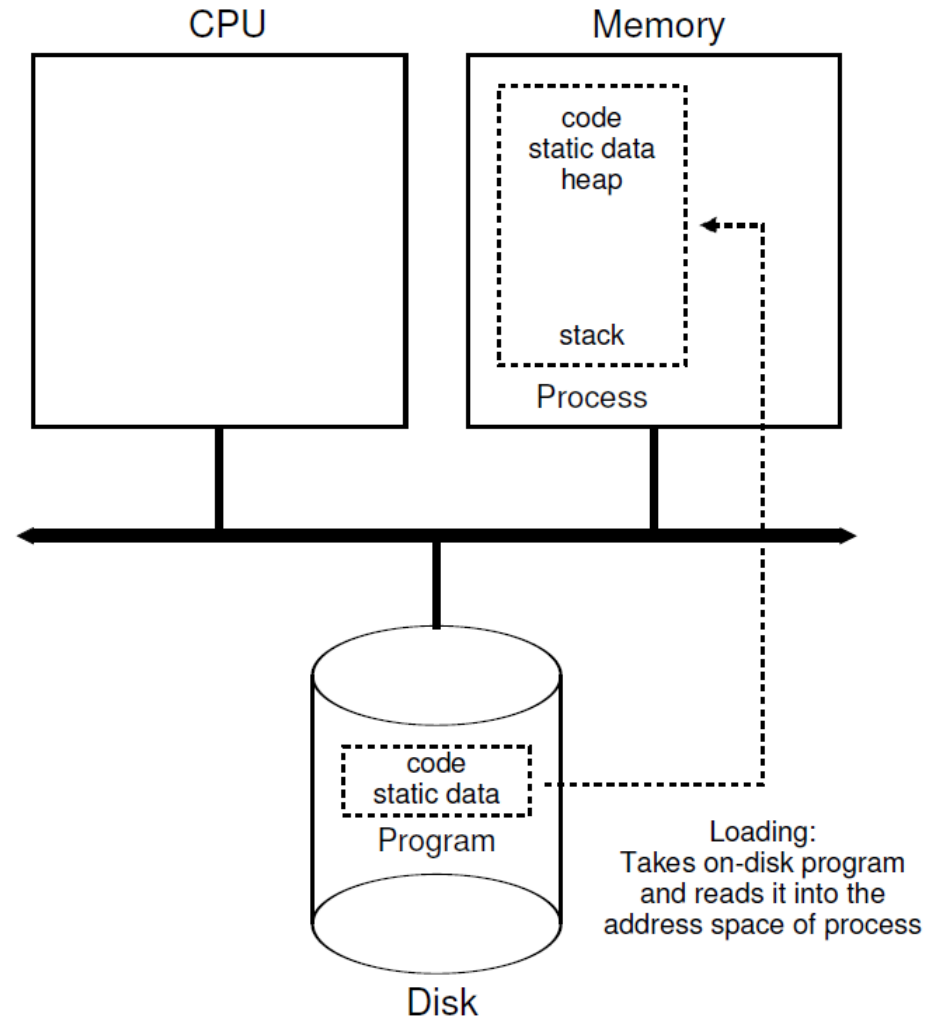
- Kernel
 - Program execution
 - Memory management
 - Disk access & file system
 - Multi-tasking: schedule CPU for multiple programs
- Networking
- Security

Shell: user interface to OS

- Command line interface (e.g., cmd & bash)
- Graphical user interface
 - Gnome (linux)
 - KDE (linux)
 - MS Windows
 - Aqua (Mac OS)

Process: a running program

1. OS loads on-disk program into memory
 - Run-time stack
 - Heap
2. Allocate memory
 - Run-time stack
 - Heap
3. Create file descriptors
 - stdin, stdout, stderr
4. Start executing main()



fib.c

```
#include <stdio.h> // printf
#include <stdlib.h> // atoi defined here

int fib(int n)
{
    if (n == 0)
        return 0;
    else if (n == 1)
        return 1;
    else
        return fib(n - 1) + fib(n - 2);
}

int main(int argc, char* argv[])
{
    int n = atoi(argv[1]);
    printf("fib of %d = %d", n, fib(n));
}
```

Compile and run

- `gcc fib.c -o fib`
- `fib 6`
=> fib of 6 = 8

Common Linux user commands

- `ls`
 - List directory contents
- `cd`
 - Change directory
- `pwd`
 - Print current/working directory
- `rm`
 - Remove file or directory

Common Linux user commands

- `mkdir`
 - Make directory
- `rmdir`
 - Remove empty directory
- `cat`
 - Display content of a file
- `man`
 - Display usage of a command/program

Common Linux user commands

- `cp`
 - Copy a file

Common programs

- Compiler & interpreter
 - gcc, javac, python
- Text editor
 - vi, emacs
- Networking
 - ssh, sftp
- Web
 - wget (download from a URL)

Bit & byte

- Binary number
 - A sequence of 1 or 0's
- 8 bits in a byte
- 1000 0101 = how many in decimal?

Hexadecimal number

- Base 16
- Indicated by a prefix '0x'
- Alphabet: 0, 1, ..., 9, A, B, C, D, E, F
 - A is 10 in decimal, F is 15 in decimal
- Example: 1000 1101 => 0x8D

Resources

- Intro to Computer Architecture (youtube)
 - https://www.youtube.com/watch?v=HEjPop-aK_w&list=PLAPTMtRxw27aMpAaIH1ZZU6U1GwkXAJC-

References

- [The Abstraction: The Process](#). Chapter 4 of Book "[Operating Systems: 3 easy pieces](#)"
- Adding 6+7 at logic gate level
 - <http://improve.dk/adding-67-at-the-logic-gate-level/>