

CS354: Machine Organization and Programming

Lecture 1

Wednesday the September 2nd 2015

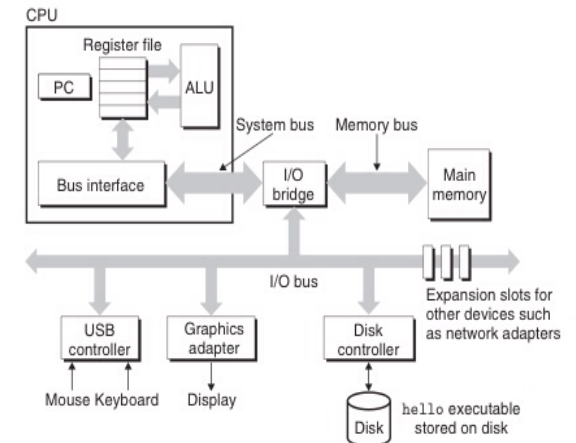
Section 2

Instructor: Leo Arulraj

Logical Machine Organization

Figure 1.4

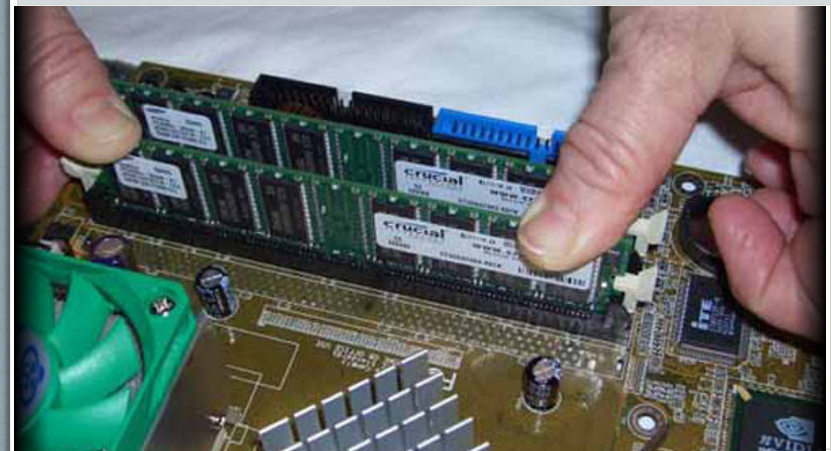
Hardware organization of a typical system. CPU: Central Processing Unit, ALU: Arithmetic/Logic Unit, PC: Program counter, USB: Universal Serial Bus.



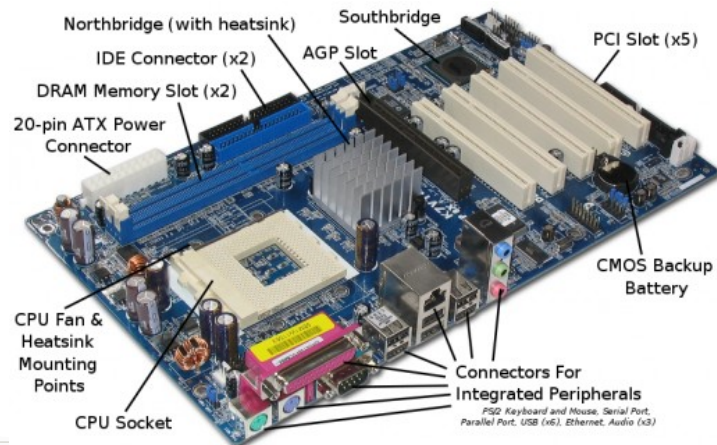
Physically How do they look today?
A Modern CPU



Physically How do they look today?
DRAM



Physically How do they look today? Motherboard



Simple hello world Program

- What is C? A High Level Language
- What is Assembly?
- What is Machine Code?

Simple hello world Program in the C Programming Language

```
#include <stdio.h>    [ Preprocessor directive ]  
  
int main(int argc, char* argv[]){    [Execution starts with main]  
    printf("Hello CS354 Students! Welcome to the first class !");  
    return 0;    [Return code for main tells whether  
                program executed successfully or not]  
}
```

Compilation Process Overview

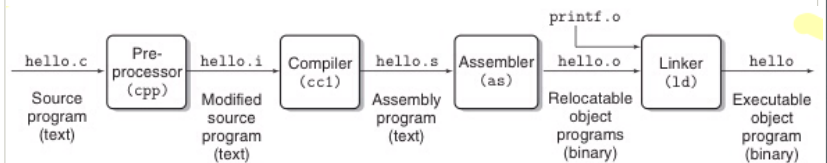


Figure 1.3 The compilation system.

```

#include <stdio.h>
int main(int argc, char* argv[]){
80483b4: 55          push  %ebp
80483b5: 89 e5      mov   %esp,%ebp
80483b7: 83 e4 f0   and   $0xfffff0,%esp
80483ba: 83 ec 10   sub   $0x10,%esp
    printf("Hello CS354 Students! Welcome to the first
class!\n");
80483bd: c7 04 24 94 84 04 08  movl  $0x8048494,
(%esp)
80483c4: e8 27 ff ff   call 80482f0 <puts@plt>
    return 0;
}

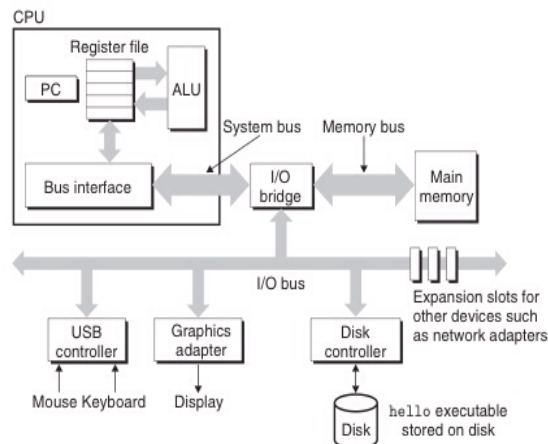
```

What Happens when you execute it? At a high level...

Shell program reads the command
“./helloworld.o” character by character
first into register and then into memory

Shell interprets your command

Figure 1.4
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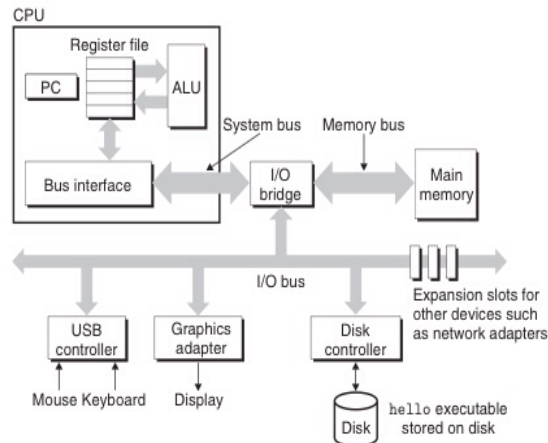
What Happens when you execute it? At a high level...

Once I hit enter key, shell program loads
“helloworld” program from hard disk into
memory and executes it

Shell loads helloworld program into memory from disk

Figure 1.4

Hardware organization of a typical system. CPU: Central Processing Unit, ALU: Arithmetic/Logic Unit, PC: Program counter, USB: Universal Serial Bus.



What Happens when you execute it? At a high level...

While executing, hello world program transfers the string

“Hello CS534 Students! Welcome to the first class !”
to the display device.

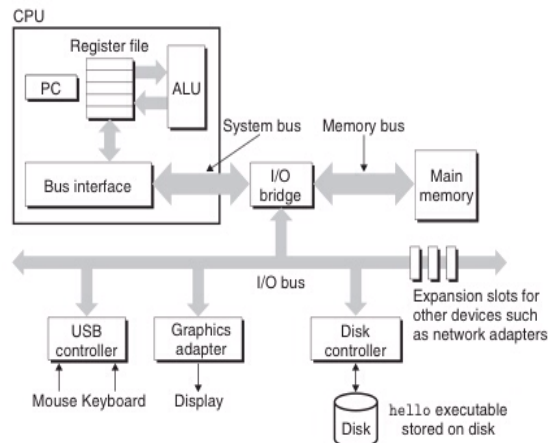
Processors do this in a really really fast loop:

- load instruction,
- execute it

helloworld displays welcome message to the display device

Figure 1.4

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See you in Next Lecture

- See you in Next Lecture
- Try to read the reading materials before class
- Read the Chapter 1 in Textbook 1: Computer System: A programmer’s perspective if you have not already done so.
- Try to read Assignment 0 and start early ! Don’t procrastinate !