

CS354: Machine Organization and Programming

Lecture 1

Wednesday the September 2nd 2015

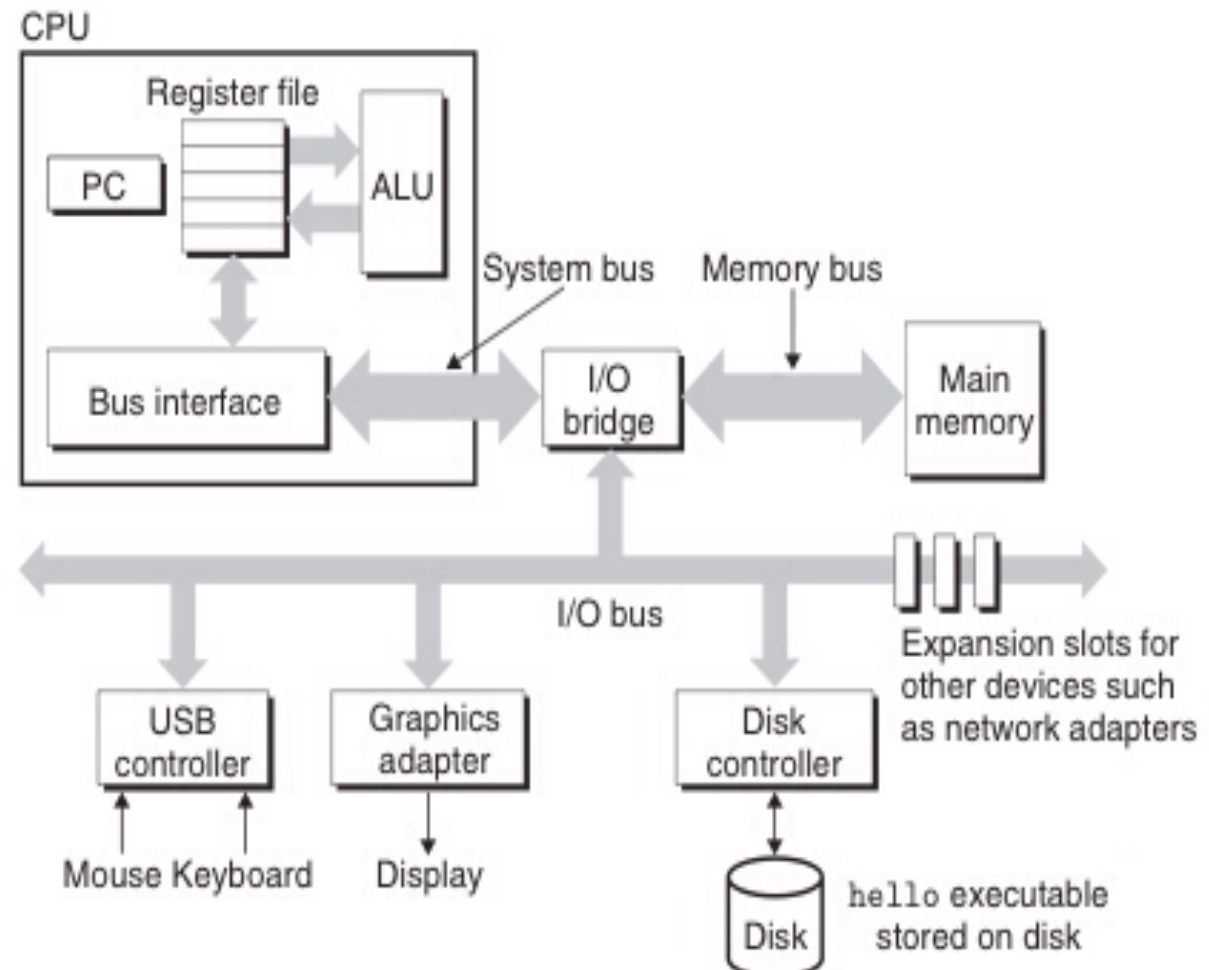
Section 2

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.

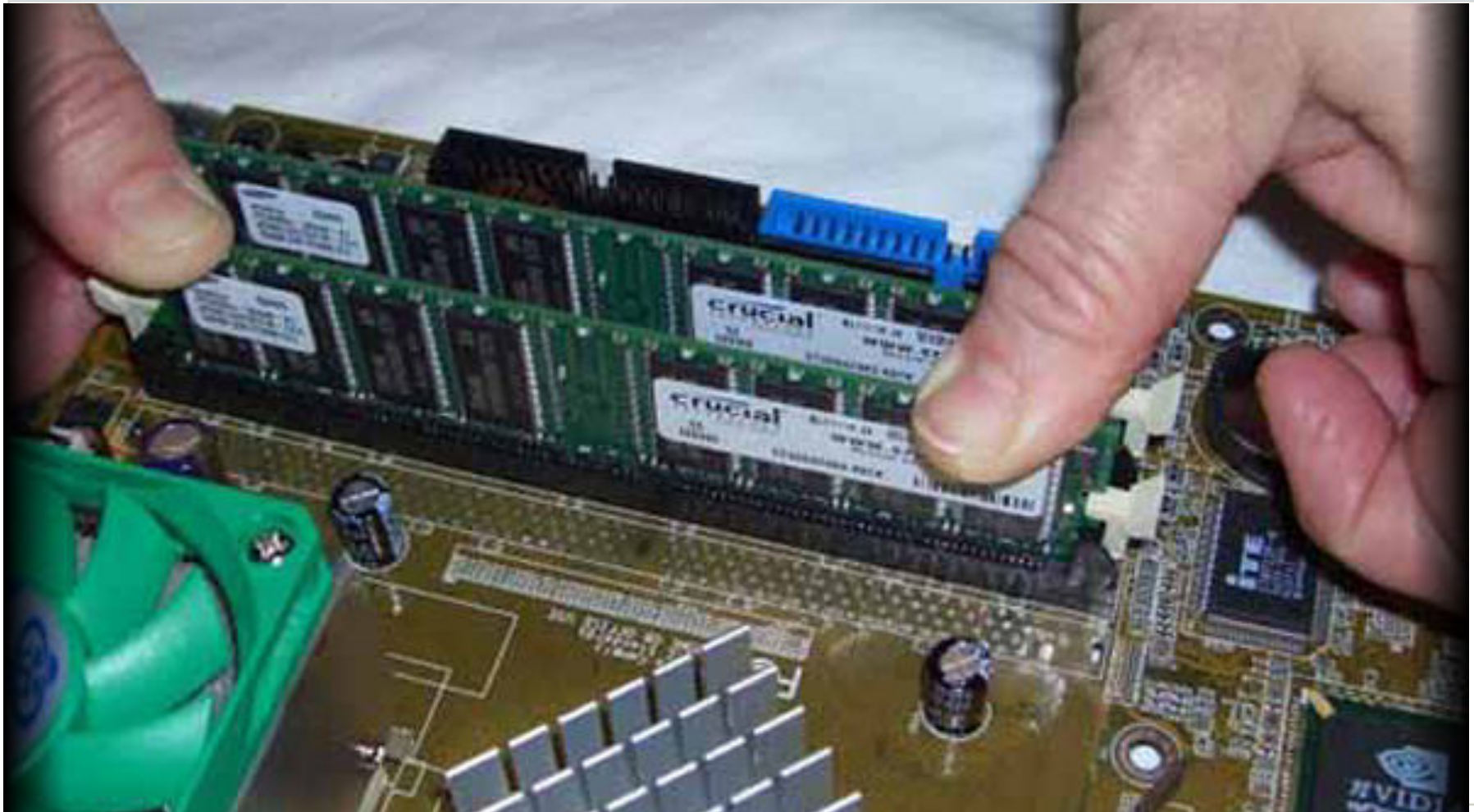


Physically How do they look today? A Modern CPU



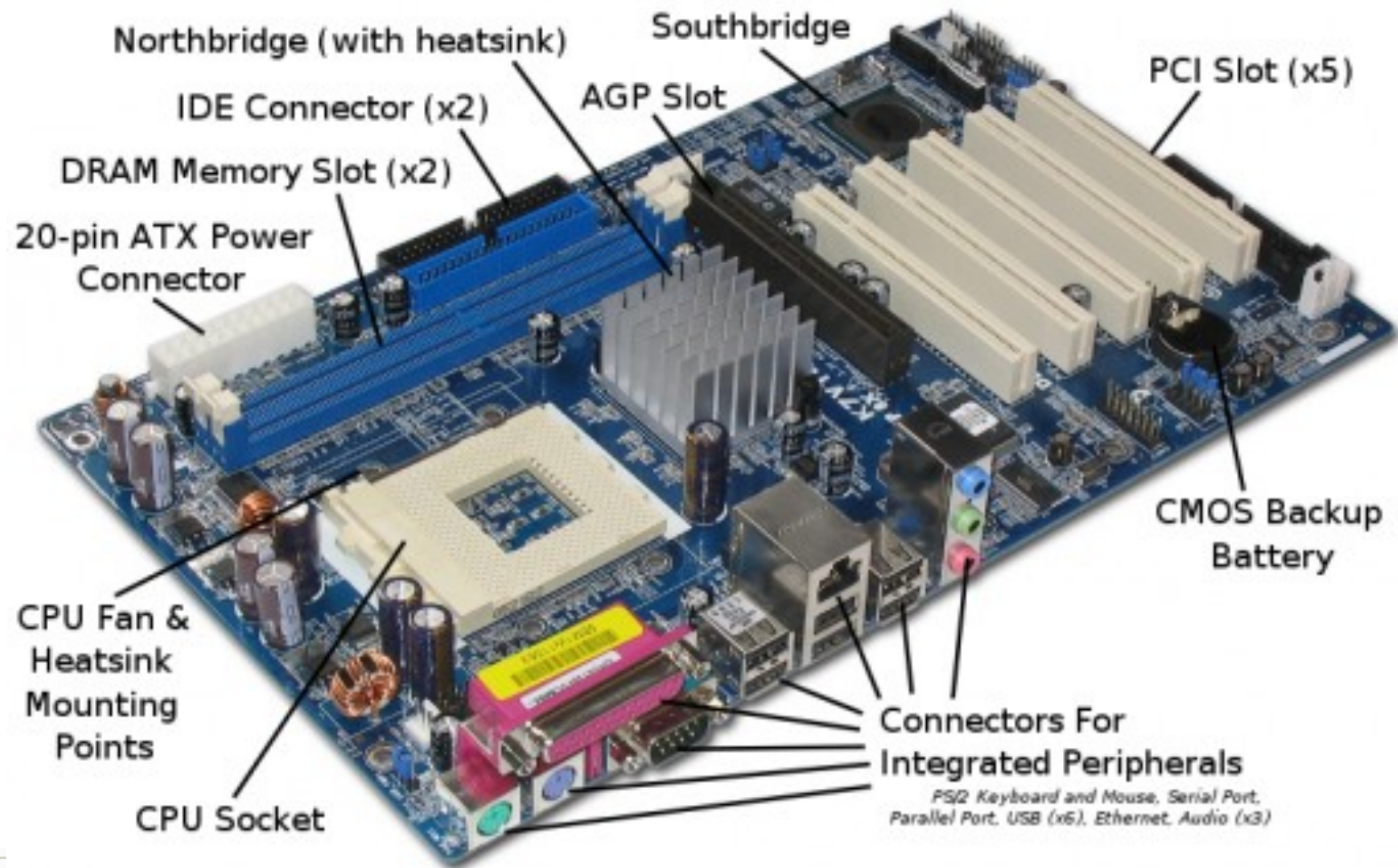
Physically How do they look today?

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

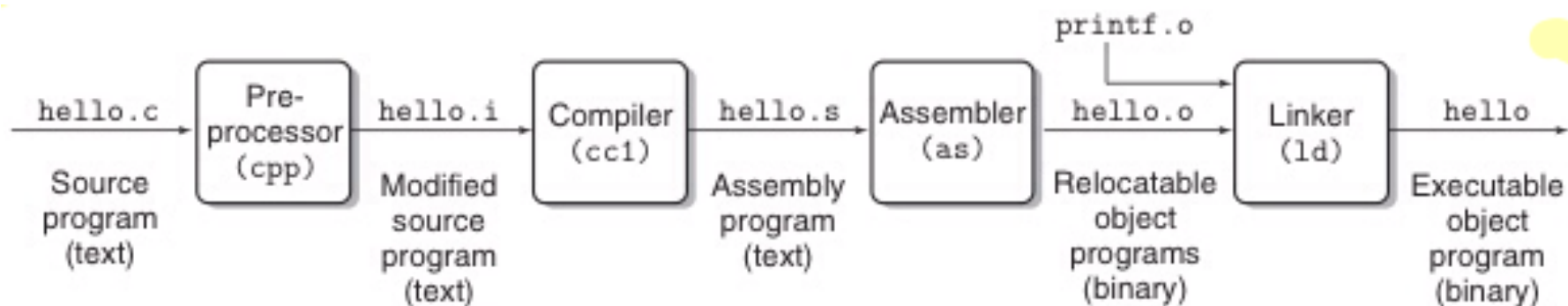


Figure 1.3 The compilation system.


```
. #include <stdio.h>
int main(int argc, char* argv[]){
  80483b4:  55                push  %ebp
  80483b5:  89 e5            mov   %esp,%ebp
  80483b7:  83 e4 f0        and   $0xffffffff0,%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 ff   call  80482f0 <puts@plt>
  return 0;
}
```

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

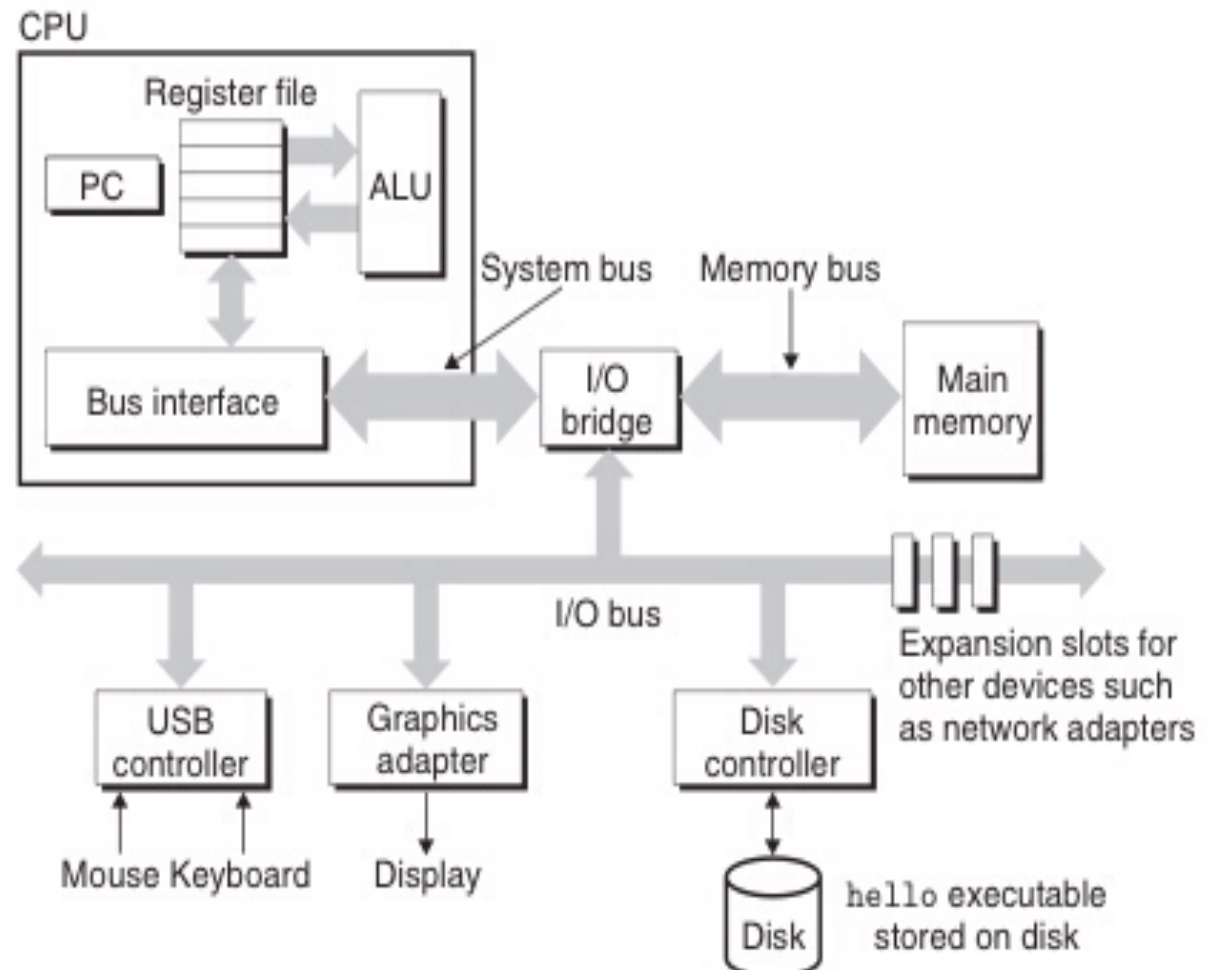
Shell program reads the command

“./helloworld.o” character by character
first into register and then into memory

Shell interprets your command

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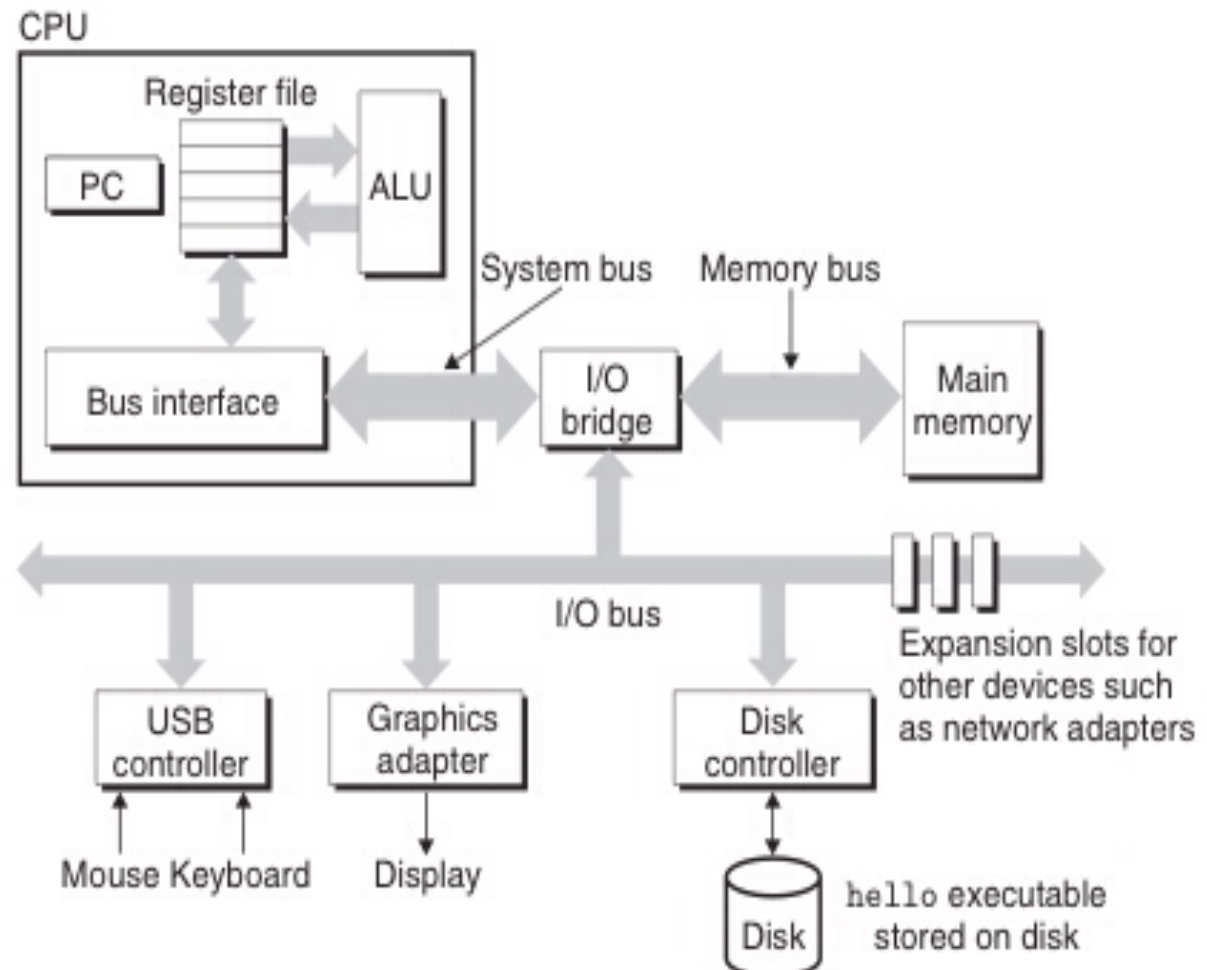
What Happens when you execute it? At a high level...

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

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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.

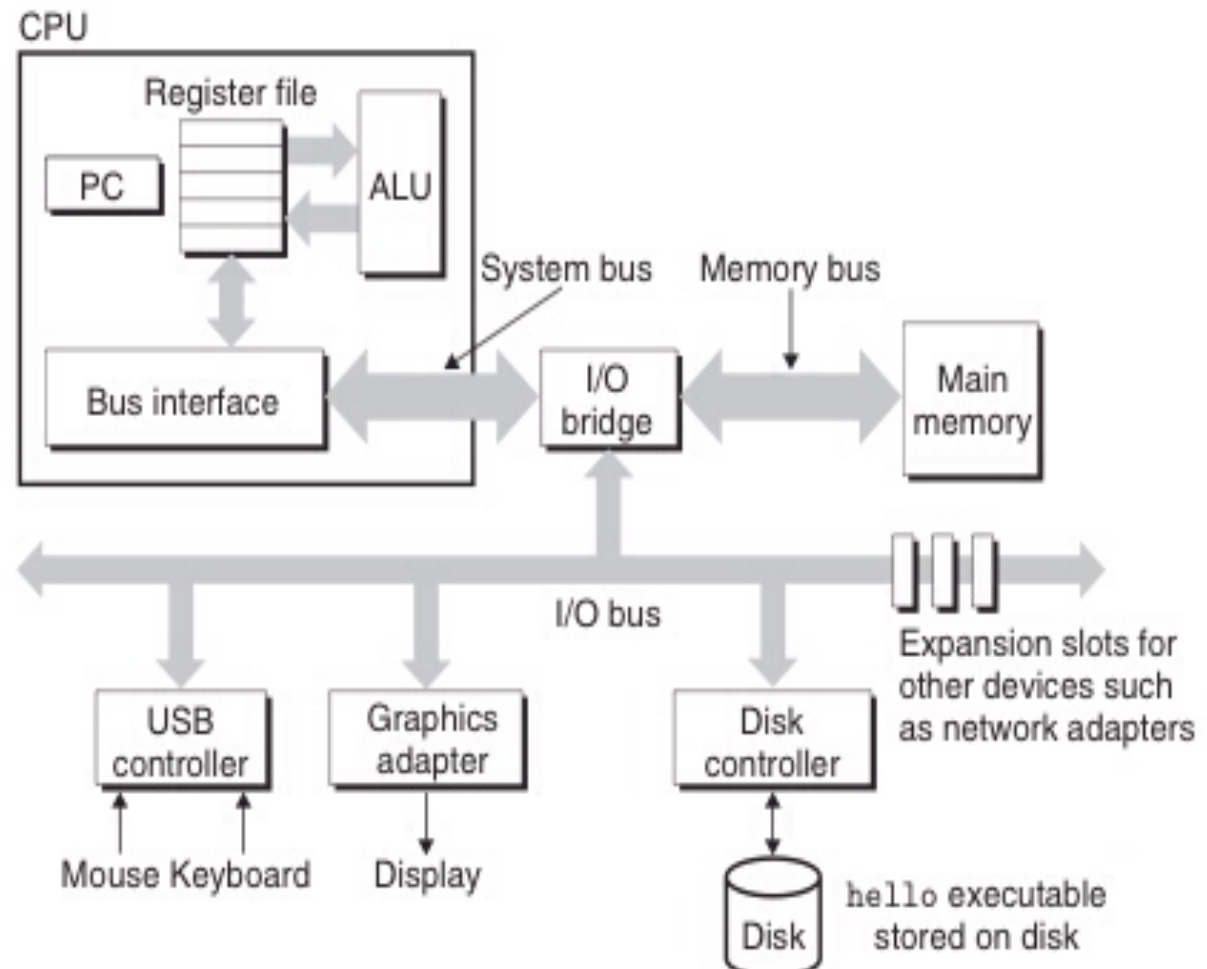
Processors do this in a really really fast loop:

- load instruction,
- execute it

helloworld displays welcome message to the display device

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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 !