Computer Systems Organisation (CS2.201)

Summer 2021, IIIT Hyderabad

24 May, Monday (Lecture 1) – Introduction to Computer Systems

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Goal

To study the anatomy of a typical computer system.

Course Outline

- Computer Arithmetic
- Instruction Set Architecture
- Processor Architecture and Design
- Memory Hierarchies
- Input/Output
- Virtual Memory

Major Functional Units of a Computer

```
Memory <-> I/O <-> ALU + Processor + Control
```

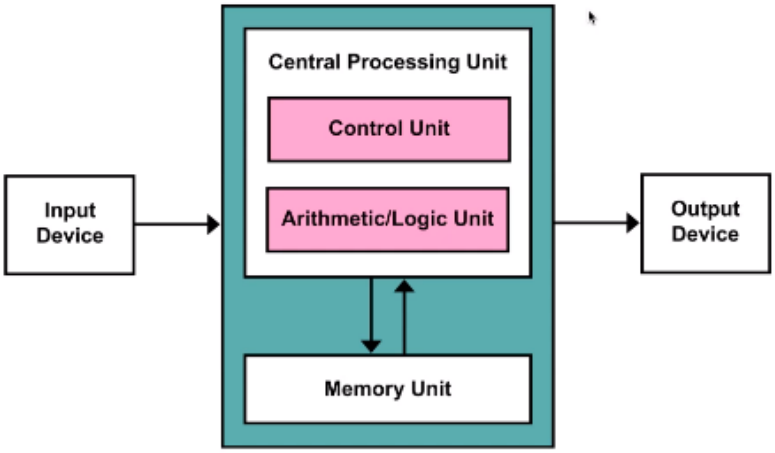

Figure 1: The von Neumann Model

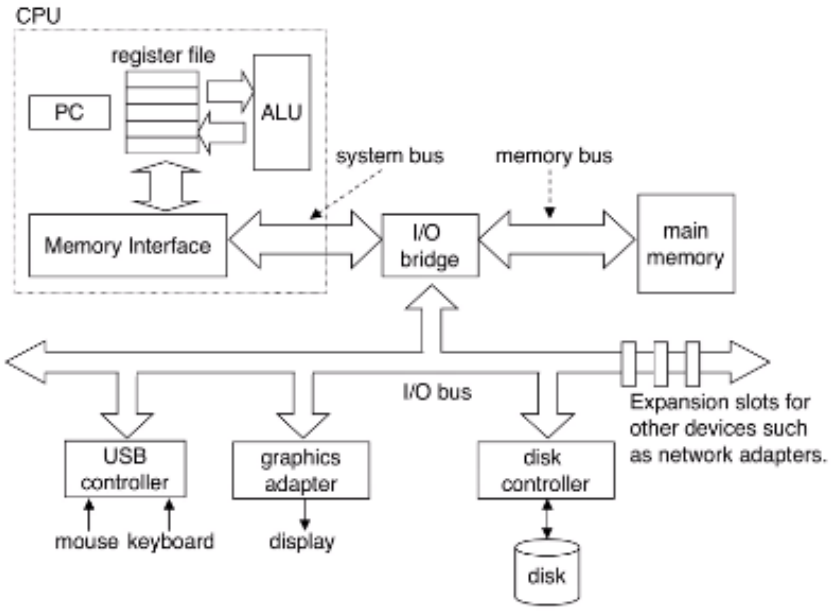

Figure 2: Typical Hardware Organisation

Program Execution on a Computer System

```
#include <stdio.h>

int main ()
{
    printf("hello, world\n");
}
```

The program is stored using the ASCII equivalents of each character.

Compilation: `gcc -o hello hello.c`

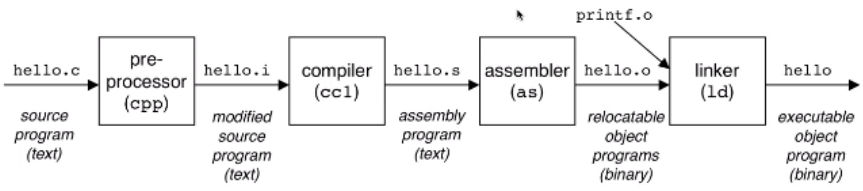

Figure 3: Compilation

Running:

```
> ./hello
hello, world
```

Programming Abstractions

HLLs are more abstracted than assembly language, which is in turn more abstracted than machine code.
More abstraction makes it easier to program, but we may lose fine-grained control over hardware.

Instruction Set Architecture (ISA)

The ISA is an abstraction for the software/hardware interface. There can be multiple implementations of the same ISA, which is advantageous because then a program can run on all machines having a common ISA.

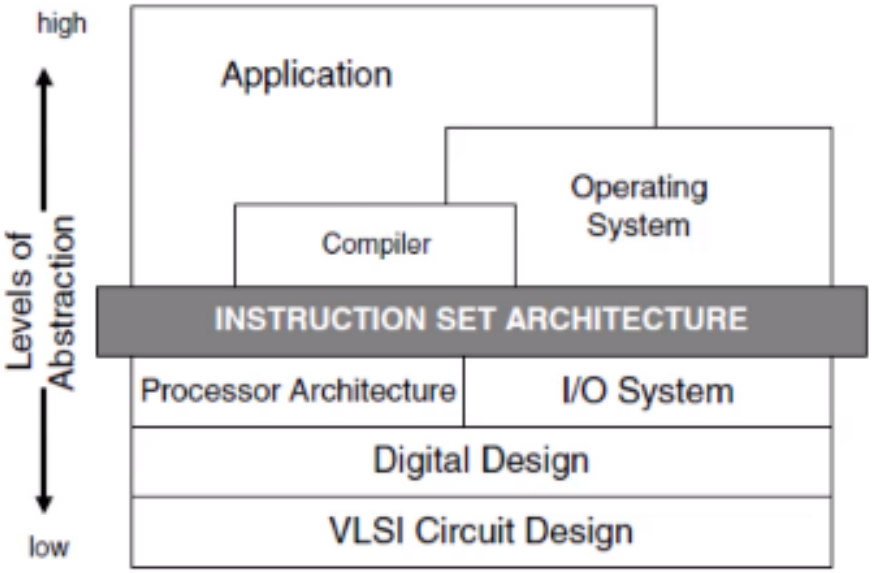

Figure 4: ISA abstraction