

Lecture notes 03.02.2020

- we are going to try to link the labs and the lectures together
- we're going to chapter 4 and x86-64 architecture
- learning an ISA
 - if you know how the processor works helps you understand how the whole computer works
 - understanding how CPUs work can help you write better code as well
 - helps one make decisions on hardware design
 - maybe some of us will work on actual CPU design
- registers are used as super fast short term storage
- program counter keeps track of the instructions that are being executed at the moment
- condition code
- status code indicates the overall state of the programs execution
- Y86 has immediate to memory, register to memory, memory to register, register to register moves
- logic gates are the basic components of a CPU and a PC in general, how they work is not to complicated at the basics, but it gets super complex if you have billions of them

hello_world.c

```
#include <stdio.h>

int main() {
    puts("Hello, World!\n");
    return 0;
}
```

hello_world.asm

```
main:
    subq    $8,    %rsp
    movl    $.LC0, %edi
    call    puts
    movl    $0,    %eax
    addq    $8,    %rsp
    ret
```

sum.c

```
long sum(long *start, long count) {
    long sum = 0;
    while (count) {
        sum += *start;
        start++;
        count--;
    }
    return sum;
}
```

sum.asm

```
sum:
    movl    $0,    %eax
    jmp     .L2
.L2:
    addq    (%rdi), %rax
    addq    $8,    %rdi
    subq    $1,    %rsi
.L3:
    testq   %rsi,   %rsi
    jne     .L3
    rep; ret
```