

Operating Systems Principles

Recap of Some Basics

CPU Management (Processes)

Recap of Basics

- Key to OS acting as a control program and a resource controller are following CPU/memory facilities
 - #1: Multiple CPU modes and privileged instructions
 - #2: The notion of traps (part of CPU design)
 - Related concepts: Interrupts and signals
 - #3: Memory address translation and protection facilities (hardware called memory controller)
 - Related: Translation Lookaside Buffer (TLB)

Memory Protection and Translation

- **Key Idea #3:** Virtual vs. Physical addresses
- Multiple processes and the OS can generate the same virtual address
- Need to translate to different physical addresses for protection
- Done by a piece of hardware called the memory controller
- Where are address translations kept?

Memory Protection and Translation

- Address translations kept in memory in data structures called page tables
- A subset of translations stored in a fast on-CPU cache called Translation Lookaside Buffer (TLB)
- Memory Controller, TLB, and OS cooperate to keep correct translations

CPU Management

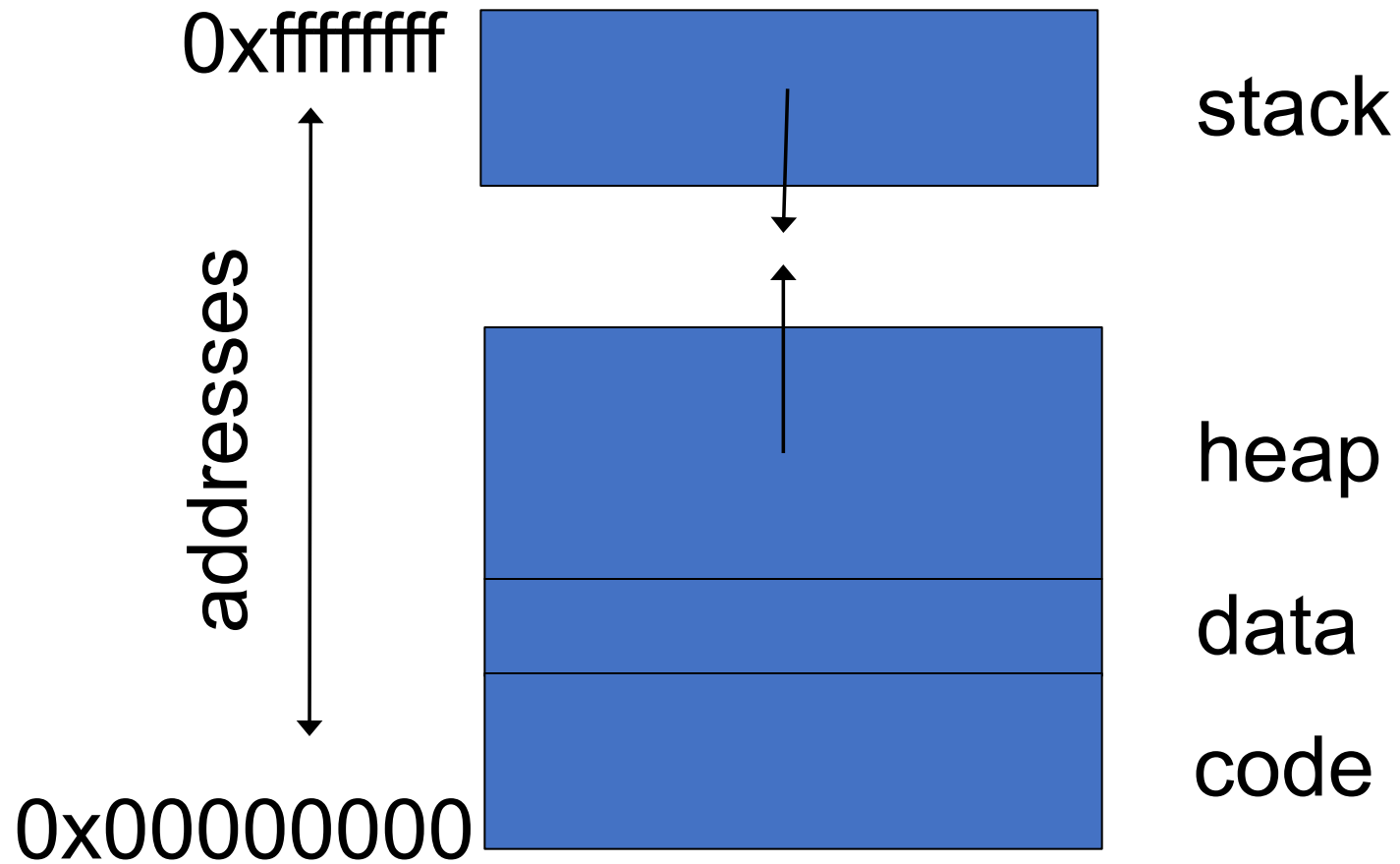
CPU Mgmt: What we will study

- What is the OS's role in sharing CPU among user programs?
- What does a user program expect from the computer and how does the OS help provide this?

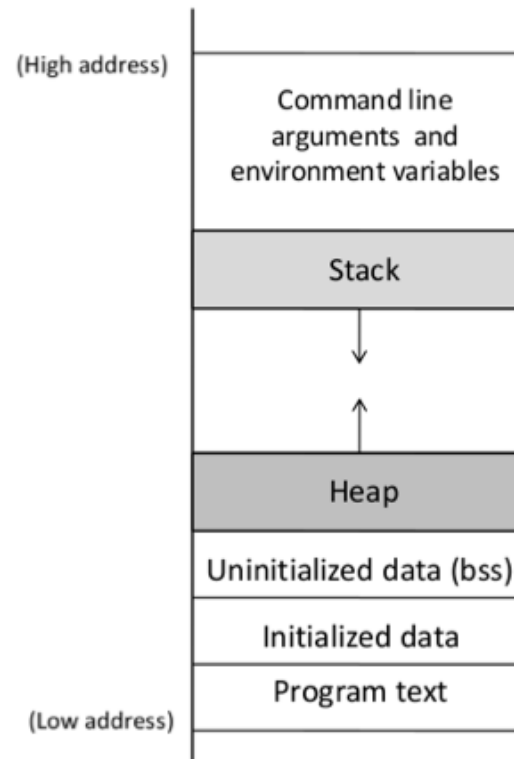
Process

- Roughly, a running program
 - Check out info offered by commands like `top`, `/proc`, etc.
- A closer look:

Process Address Space

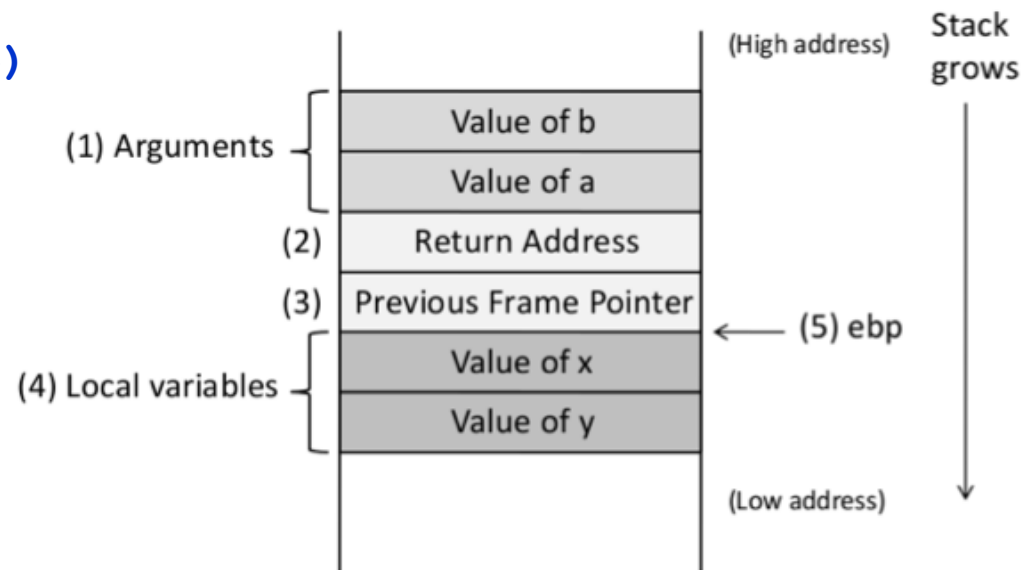


Program Memory Layout



Function Stack Layout

```
void f(int a, int b)
{
    int x,y ;
}
```



Function Stack Layout

```
void f(int a, int b)
{
    int x;
}

void main()
{
    f(1,2);
    printf("hello world")
}
```

