CSE 374: Programming Concepts and Tools

Eric Mullen
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Lecture 8: intro to C

Administrivia

- Posting shell scripts: They'll be up on the website today (thanks several people who asked)
- Homework 2: Due tomorrow night at midnight. Late days would be inadvisable to use.
- Homework 3: Out by Friday lecture
- Make sure you're using klaatu for your homework!

C

- Put on your archeologist hat…
- Think back to a wilder time (1971)…
- Let’s dive in!

C

- Contrast with Java:
  - Lower level, closer to machine
  - More unsafe (there are NO training wheels)
  - Procedural: no more objects
  - Standard library is small
  - Similar control and syntax
  - Fundamentally different mental model

C

- C I’m going to teach you is not all technically allowed by the standard
  - rather, is how it actually works on x86_64 machines
  - I will *try* to tell you when we’re deviating from the standard, but it can be subtle

Why C?

- Despite being old, it’s extremely ubiquitous
- Lots of new code, and lots of existing systems
- How anyone writes software to interact with hardware

C: Today

- Language basics
- Hello World
- Pointers
- Hello with arguments

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Language Basics

- Basic types:
    - `int`
    - `float`
    - `char`
- More types:
    - pointers (*)
    - void (type of function with nothing to return)

Syntax

- Functions are declared similarly to Java:

```
int foo(int x) {
    return x;
}
```

- Variables are declared similarly as well:

```
int x;
int y = 0;
```

- While you can declare without initializing, don't.

Standard Library

- You can “include” different functionality by using

```
#include<nameoflibrary.h>
```

- stdio.h contains printf, which prints to stdout

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DEMO!

DEMO!

```
#include<stdio.h>


int main() {

    printf(“Hello World!\n”);

}
```

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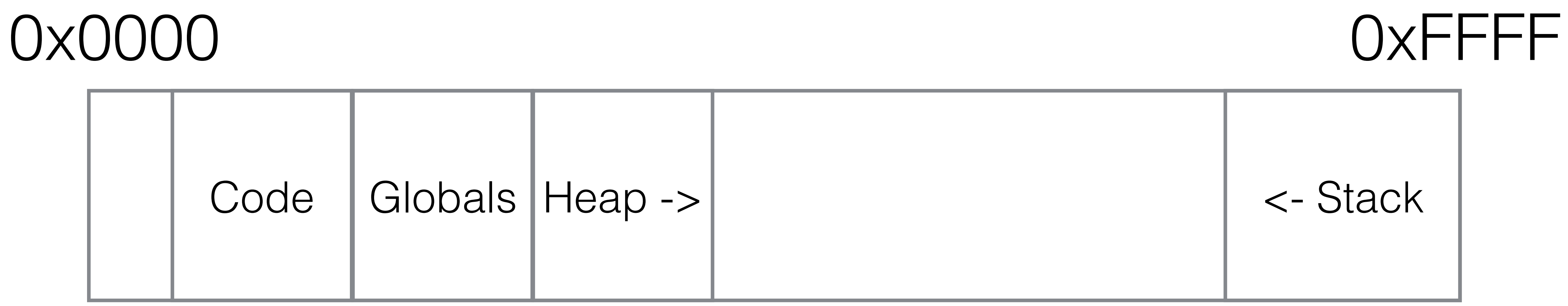
On the High Cs

- Memory is 1 dimensional array full of bytes
- You can make maps which refer to things
  - Maps are just a number, we call them pointers
- You can follow them wherever they lead



Pointer Syntax

- When declaring a type, `int*` means “pointer to an `int`”
- When used in an expression, `*x` means follow `x` to where it goes

Careful!

- Would you always trust a pirate’s map?

- **Never** blindly trust a pointer!

- What happens if you do?

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Arrays

- How might you implement an array in C?

Arrays

- Arrays are just multiple things right next to each other in memory
- We hold on to an array by remembering where it starts
  - declare type with "`int x[]`"
- We get elements with square braces
  - e.g. `x[3]`

Wait a minute…

- Arrays sound a lot like something else…

Command Line Arguments

```
#include<stdio.h>


int main(int argc, char* argv[]) {

    …

}
```

`char* argv[]`

- You can read this as: “argv is an array of pointers to characters”
- You can *implicitly know* that it’s really more like an array of strings
- In C, a string is really just a bunch of characters next to each other in memory, followed by a special “\0” character (a null byte)
    - More on strings in a couple lectures

Demo