**CS241 Lecture 2 August 26, 2015 - Ed Karrels – C crash course**

Write a complete hello world program in C:

#include <stdio.h>

int main() {

printf(“Hello world!\n”);

}

Why do we #include other files?

To provide function declarations and macro definitions.

Declaration: function prototype

Definition: function body

What are some useful printf format specifiers?

ints: %d, strings: %s, floats: %f, hexadecimal ints: %x, characters: %c

padded, right justified: %20d, left justified: %-20d

10 digits of floating point precision: %.10f

How are C strings represented?

Sequence of bytes terminated by a zero byte (known as the null terminator)

How do you modify a string?

Overwrite the bytes, updating null terminator as needed

What are some common string manipulation functions?

strlen, strcpy, strcat

How do you look up information C library calls and system calls?

web: http://www.cplusplus.com/reference/clibrary/

shell: man [[-s]chapter] <function>

What are some common string handling errors?

forgetting to update null terminator, reading or writing past the end of the buffer

Will the errors always cause problems? No, only when someone else is using your code.

How do you declare a pointer? Give an example

int \*p;

What are the address-of and dereference operators?

p = &x; x = \*p;

How do you use a pointer to read/write some memory? Give an example

\*p = 42;

x = \*p + 1;

How can you find the size of a variable in memory?

How big are the basic data types? Are they the same on every computer?

How do you print out pointer values?

What is pointer arithmetic? What is a void pointer?

Why is it useful to have a pointer as a function argument?

What happens when you cast a pointer?

How is an integer stored in memory? What does little-endian mean?

Bonus question: how are floats and doubles stored in memory?

What's the difference between a and b? Give an example of something you can do with a but not b

char a[] = "Hello";

char\* b = "Hello";

sizeof() returns the number of bytes. So using above code, what is sizeof(a) and sizeof(b) ?

What is sizeof(sizeof(a))?

Which of the following code is incorrect?

|  |  |
| --- | --- |
| int\* f1(int \*p) {  \*p = 42;  return p;  } | char\* f2() {  char p[] = "Hello";  return p;  } |
| char\* f3() {  char\* p = "Hello";  return p;  } | char\* f4() {  static char p[] = "Hello";  return p;  } |

Fix & Complete this function!

void mystrcpy(char\*dest, char\* src) { // void means no return value

while( \*src ) { dest = src; src ++; dest++; }

}

How do you allocate memory on the heap? How to you deallocate it?

Fix & Complete this function!

char\* mystrdup(char\*source) {

char\* p = \_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ ( sizeof(source) );

strcpy(source, p);

return p;

}

Give an example of buffer overflow:

What is double free? How can you avoid?

What is a dangling pointer? How do you avoid?

What is 'typedef' and how do you use it?

printf calls write or write calls printf?

How would you make standard out be saved to a file?