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<http://inside.mines.edu/~khellman/teaching/csci261>

Your TODO list:

1. Make sure you are able to login to ADIT.
2. Double-check your enrollment for this course on **Blackboard**
<http://blackboard.mines.edu>
3. Make sure your **Official Correspondence** Email address is setup correctly in Trailhead.
http://inside.mines.edu/~khellman/official_corres.html
4. Read and understand the **syllabus** and **collaboration policy**:
<https://csci261.mines.edu/csci261/>

Introduction to Computing

June 28, 2010

Why Learn Programming?

- ▶ As an engineer, you will have conversations with programmers; *and you will need to communicate effectively with them.*
- ▶ Top-quality software used by professionals can often be **scripted** to increase the productivity of the user. *Knowing a programming language makes scripting easier to learn.*
- ▶ Programming skills are a “plus” with many employers.
- ▶ If you want to solve new problems, you might have to write new programs.
- ▶ It can be a lot of ***FUN***.

The Book Definitions

- Computer** A machine designed to perform operations or tasks through a sequence of instructions (the **program**).
- Hardware** Refers to the computer's components, much of it with embedded software.
- Software** The programs executed by the CPU. Resides on disk, loaded to RAM, and executed by the CPU.

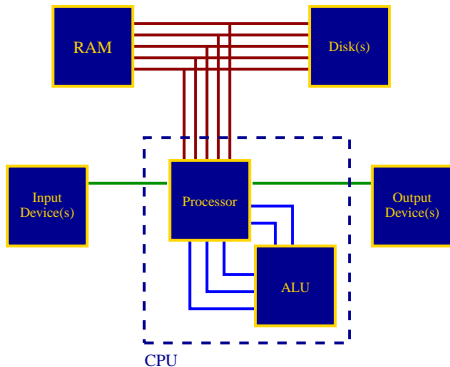
The Nuts and Bolts

Processor Controlling Circuitry of Computer

ALU Arithmetic and Logic Unit.

RAM Random Access Memory, **volatile** but fast storage.

Disk Non-volatile but slow storage (IDE, SATA, Flash, ...)



CPU = Processor + ALU

Software Languages

Machine Language Binary Instructions

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Assembly Language Specific to a CPU, manipulates the internal components of a CPU.

PUSH/POP stack, CMP registers,
LOAD registers, ... \implies

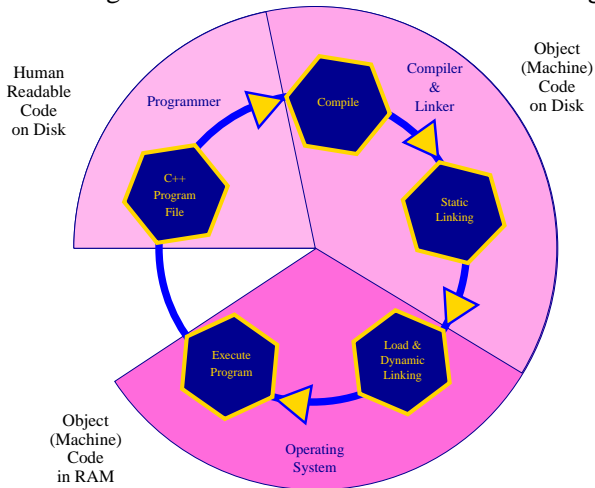
High Level Languages C, C++, Ada, Fortran, Python,
Java, ...
print "Hello World"

x86 Assembler

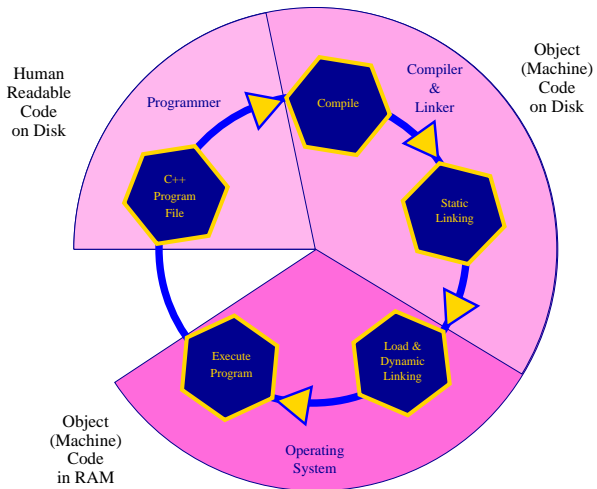
```
:  
:  
fldl   -0x28(%ebp)  
fmull  -0x20(%ebp)  
fmull  -0x18(%ebp)  
fstpl  -0x10(%ebp)  
movl   $0x0,0x4(%esp)  
movl   $0x0,(%esp)  
call   ba <main+0x48>  
fldl   -0x10(%ebp)  
fstpl  0x4(%esp)  
mov    %eax,(%esp)  
call   c9 <main+0x57>  
movl   $0x10,0x4(%esp)  
movl   $0x0,(%esp)  
call   dd <main+0x6b>  
mov    $0x0,%eax  
add    $0x34,%esp  
pop    %ecx  
pop    %ebp  
lea   -0x4(%ecx),%esp  
ret
```

The “Toolchain” Software States

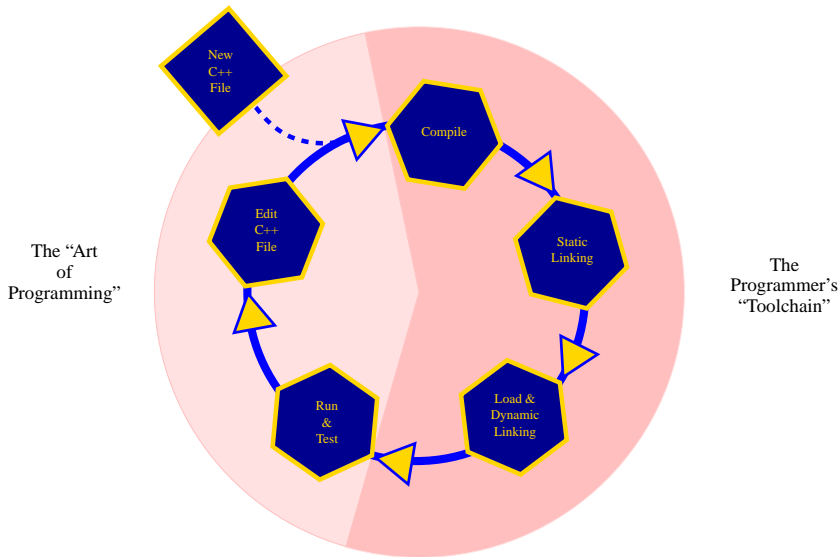
How does software go from human readable form to a running program?



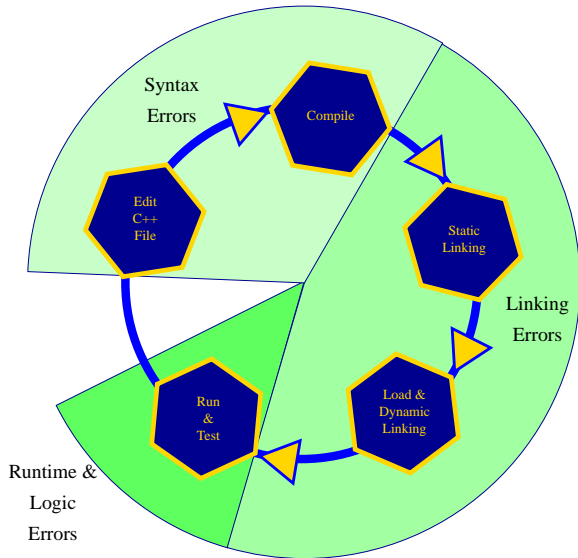
“Toolchain” Demonstrations



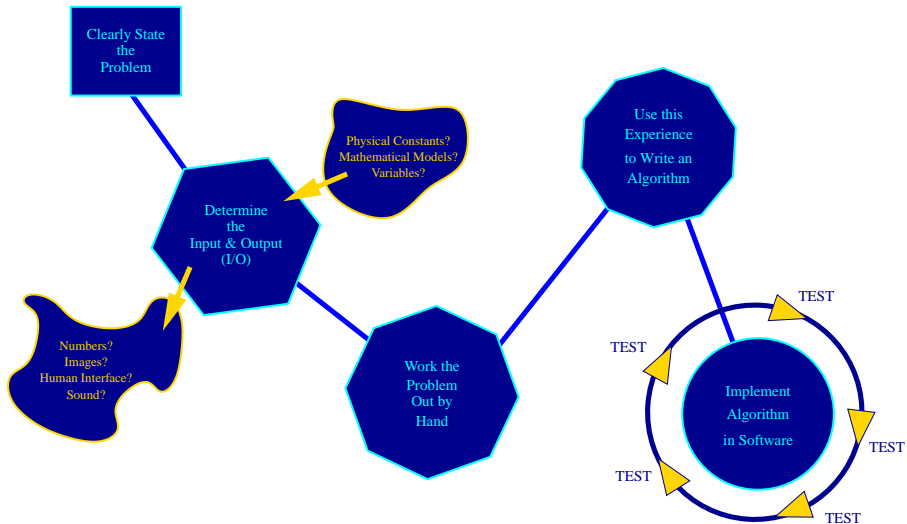
C++ Development Cycle



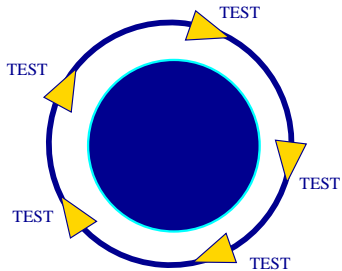
Types of Errors



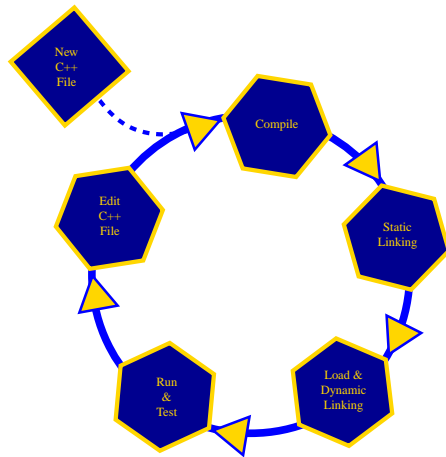
Designing a Computer Program



Designing a Computer Program



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The Volume of a Box

- A. Write a program to compute the volume of box.
- B. All inputs and outputs are real numbers (\mathbb{R})
Input: length, width, height
Output: volume
- C. If the dimensions of the box are $20.75 \times 11.5 \times 9.5$, then

$$\text{Volume} = 20.75 \cdot 11.5 \cdot 9.5 = 2266.9375 \text{un}^3$$

- D. Algorithm:
 1. initialize length, width and height
 2. compute volume
 3. output volume
- E. Implement algorithm in C++ and test.

Implement Algorithm in C++

```
1 //
2 //  This program computes the volume of a box
3 //
4 #include <cstdlib>
5 #include <iostream>
6 using namespace std;
7
8 int main()
9 {
10     /* Declare and initialize objects */
11     double length(20.75), width(11.5);
12     double height = 9.5;
13     double volume;
14
15     /* Calculate volume. */
16     volume = length * width * height;
17     /* Print the volume. */
18     cout << "The volume is " << volume ;
19     cout << " units cubed." << endl;
20
21     system("PAUSE");
22     // Exit program.
23     return 0;
24 }
```