

15-213 Recitation 3 - 2/5/01

Outline

- Code to Executables
- Machine Model
- Assembly Programming
 - Structure
 - Addressing Modes
 - Miscellaneous Stuff
- H1a / L3 Practice

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Code to Executables

start

C/C++ Code (text)

Preprocessor (text)

Compiler (text)

Assembler (binary)

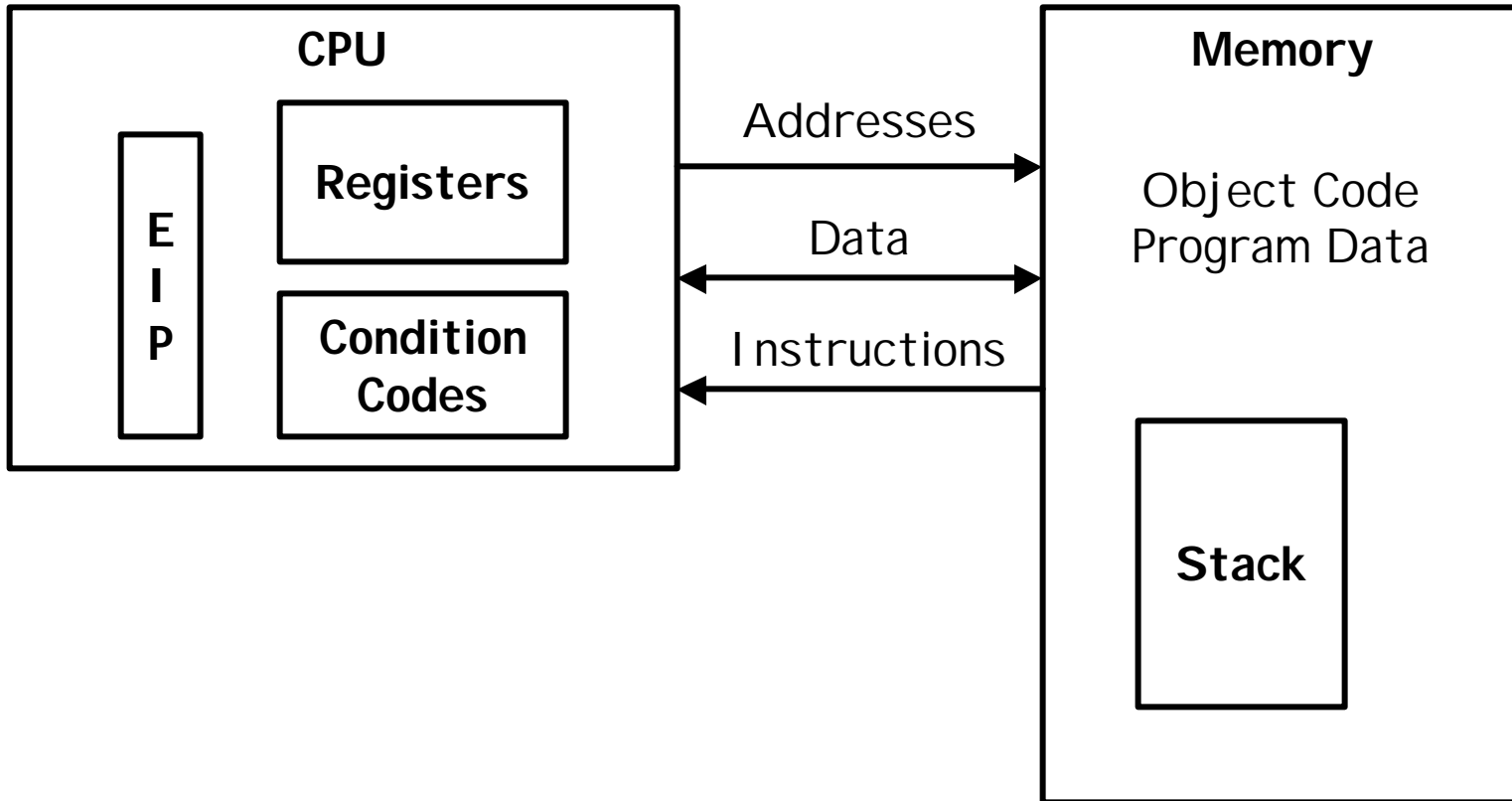
Linker (binary)



finish

Binary Executable (binary)

Machine Model



Special Registers

- **%eax** Return Value
- %eip Instruction Pointer
- %ebp Base (Stack Frame) Pointer
- %esp Stack Pointer

Assembly Programming: Structure

Function Setup

- Save Old Base Pointer (**pushl %ebp**)
- Set up own base pointer (**movl %esp, %ebp**)
 - Note that this saves the old stack pointer
- Save any registers that could be clobbered
 - Where?

Function Body

- Operations on data, loops, function calls

Assembly Programming: Structure

Function Cleanup

- Return value placed in **%eax**
 - What about returning larger values? (structs, doubles, etc.)
- Restore Caller's Stack Pointer (**movl %ebp, %esp**)
- Restore Old Base Pointer (**popl %ebp**)
- Return
 - Where does it return to?

Assembly Programming: Simple Addressing Modes

Examples

- (R) Mem[R]
- \$10(R) Mem[R + 10]
- \$0x10(R) Mem[R + 16]

Assembly Programming: Indexed Addressing Modes

Generic Form

$D(Rb, Ri, S) \text{ Mem}[\text{Reg}[Rb] + S * \text{Reg}[Ri] + D]$

Examples

- $(Rb, Ri) \text{ Mem}[\text{Reg}[Rb] + \text{Reg}[Ri]]$
- $D(Rb, Ri) \text{ Mem}[\text{Reg}[Rb] + \text{Reg}[Ri] + D]$
- $(Rb, Ri, S) \text{ Mem}[\text{Reg}[Rb] + S * \text{Reg}[Ri]]$