CSC231-Assembly

Week #0
Fall 2019

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Outline

- Syllabus
- The Programming Environment
- First Program
- Hello World in Assembly
- Wednesday's lecture/lab
Syllabus

How to Find It...

- http://cs.smith.edu
- faculty
  - Dominique F. Thiebaut
  - More Info
    - CSC231 Assembly Language and Microprocessors

http://www.science.smith.edu/dftwiki/index.php/CSC231_2019
What Will You Learn?
What Will You Learn?

Processor
Memory
What Will You Learn?

Processor
Memory
Disk - Files
What Will You Learn?

Processor
Memory
Disk - Files
Instructions
Python
Java
What Will You Learn?

Processor
Memory
Disk - Files
Instructions
Python
Java
10101
What Will You Learn?

Processor
Memory
Disk - Files
Instructions
Python
Java

10101
What Will You Learn?

Processor
Memory
Disk - Files
Instructions
Python
Java
-32
10101
0.1
What Will You Learn?

Processor
Memory
Disk - Files
Instructions
Python
Java
-32
10101
0.1
Slow… Fast
Your Environment
The Social Network
Columbia Pictures
David Fincher, Director
Staring Jesse Eisenberg and Andrew Garfield
Programming Tools

- Php
- Perl script
- emacs
- redirect
- html
- Apache
- Terminal
Your Tools This Semester

Emacs

Terminal
Your Tools This Semester

Assembly
(nasm, ld)

Emacs

Terminal
Your Tools This Semester

- Assembly (nasm, ld)
- Emacs
- Terminal
- bash
Your Tools This Semester

Assembly (nasm, ld)

Emacs

bash

Terminal

C
First Assembly Language Program
This program prints descending rows of stars using loops
echo 10 lines of stars.

To assemble, link and run:

```
nasm -f elf -Fstabs firstProg.asm
ld -melf_i386 -o firstProg firstProg.o
./firstProg
```

```asm
section .data
stars db "*********************" ; the row of stars to be decremented
stars_len equ $ - stars               ; length of the message
len dd stars_len               ; stores the length of the star row
newline db ENDL                    ; the new line character
line_len equ 1                   ; length of the newline

section .text
.global _start
_start:
mov     ecx, 21          ; get ready to print 21 lines

printloop:
call    printstars      ; calls the star printing function

call    printline       ; calls the new line printing function

dec     dword [len]     ; decrements the length of the line of stars

loop    printloop       ; decrements ecx and starts loop again

; exit program, return to OS
mov     eax, SYS_EXIT   ; select exit sys call
xor     ebx, ebx        ; exit code
int     0x80
```
First Program

;;; ===========================================================================
;;; printline: prints the row of stars with a given length
;;; REGISTERS MODIFIED: EAX, EBX, ECX, EDX
;;; ===========================================================================
printstars:
    section .bss
    .temp   resd 1    ; temporary var to store ecx

    section .text
    mov     eax, SYS_WRITE
    mov     ebx, STDOUT
    mov     edx, dword [len] ; get VARIABLE message length
    mov     dword [.temp], ecx ; save ecx
    lea     ecx, [stars]     ; message to be output
    int     0x80
    mov     ecx, dword [.temp] ; restores original ecx
    ret

;;; ===========================================================================
;;; printline: prints the new line
;;; registers modified: eax, ebx, ecx, edx
;;; ===========================================================================
printline:
    section .bss
    .temp   resd 1    ; temporary var to hold ecx

    section .text
    mov     eax, SYS_WRITE
    mov     ebx, STDOUT
    mov     edx, line_len ; CONSTANT message length
    mov     dword [.temp], ecx ; stores ecx in temp before it is changed
    lea     ecx, [newline] ; message to be output
    int     0x80
    mov     ecx, dword [.temp] ; restores original ecx
    ret
Demo Time

Run firstProg.asm
Hello World!
;;; helloWorld.asm
;;; D. Thiebaut
;;;
;;; Display "Hello there!" on the screen
;;;
;;; To assemble, link, and run:
;;;     nasm -f elf helloWorld.asm
;;;     ld -melf_i386 -o helloWorld helloWorld.o
;;;     ./helloWorld

section .data
Hello       db      "Hello there!", 10, 10
HelloLen    equ      $-Hello

section .text
global _start
_start:

;;; print message
    mov     eax, 4              ; write
    mov     ebx, 1              ; stdout
    mov     ecx, Hello          ; address of message to print
    mov     edx, HelloLen       ; # of chars to print
    int     0x80

;;; exit
    mov     ebx, 0
    mov     eax, 1
    int     0x80
The Assembly, Link, and Run Process

cs231a@marax ~/handout $ nasm -f elf hello.asm
cs231a@marax ~/handout $ ld -melf_i386 hello.o -o hello
cs231a@marax ~/handout $ ./hello
Hello there!
Wednesday's lecture
Wednesday's lecture

Lab 1: 2:45 - 3:45 p.m.
Lab 2: 4:00-5:00 p.m.
Wednesday's lecture

• Bring camera or phone for taking pictures!

• You’ll be working in groups of 3 to 4 students
This Week...

- **Last name**: A-N  —> **Lab Monday**, Off Wednesday
- **Last name**: M-Z  —> Off Monday, **Lab Wednesday**
We stopped here last time…
PC DEMOLITION LAB
Logistics

• Form teams of 3 people
• Move all the chairs to the side
• Get a PC (not dead, but soon to be)
• Fill out sign-up sheet
• Take apart the PC
• Recognize important components, take photos
Logistics (Cont'd)

- Remove processor from mother-board
- Remove motherboard from computer
- Remove disk drive from computer
- Take apart disk drive (if you have time)
- Keep any of the components you like
- Put everything back in the case for EXTRA CREDITS
Logistics (Cont'd)

• You need to document:

  • The open computer case
  • The motherboard
  • The power supply
  • The processor. You need to indicate the name of the manufacturer, and the name of the processor, as written on it.
  • The memory (RAM). Try to figure out what the manufacturer of the RAM is. How much RAM (in Gigabytes) was in the computer?
  • The hard disk. Indicate its capacity, in Gigabytes.
  • One of the crystals that generate the high frequency signal to the computer. Can you read the frequency written on its case?
  • The optical drive, or DVD drive (if there's one)
  • The connectors in the back of the computer (including USB connectors)
  • Some of the cables connecting the motherboard to various peripherals.

• You are ready for Homework #1!
http://www.science.smith.edu/dftwiki/index.php/CSC231_Homework_1_2019