CPE224 Computer Architecture Lab

W03 Instruction Sequencing

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Introduction

This lab is an introduction to get students to be familiar with assembly language. To get to know assembly instruction set, students will have to compile high level languages, in this case C language, into assembly. Students will have to analyze the assembly output and map the assembly instructions back to C instructions.

Pre-lab

GCC Compiler

If you don't already have a C compiler in your system, you will have to download it. Windows system is more likely not to have one. In Mac OSX or Linux system should already have gcc installed. For Windows system, you will have to download MinGW or TDM-GCC and install it.

GCC-RM Compiler

This cross compiler will create an assembly source file for arm Cortex-M architecture. This gcc work pretty much the same way with gcc for windows machine but the result will be for running on ARM. You can search google for gnu arm embedded toolchain. Please at least download the tool in advance, since it might take a while to download.

Lab instructions

1. Form a group of 4-5 students.
2. Download bundle of 5 C programs consists of test1.c, test2.c, test3.c, test4.c, test5.c
3. Implement your version of Fibonacci series calculator. Your program shouldn't have to get input, just set a variable to indicate the order that you want to calculate. After that calculates the Fibonacci number but you don't have to show the number on screen.
4. Compile those six programs into assembly code with gcc command.
   "gcc -S source.c" will generate source.s contains assembly instructions for intel machine.

5. Compile those six programs into assembly code with gcc-arm command.
   "arm-none-eabi-gcc -S source.c" will generate source.s contains assembly instructions for Cortex-M family.

6. Create a report that map those assembly instructions to C instructions.
7. Submit the report on MyLE. Your report should have a list of your group members, map of C and asm instructions, and note of what you think important things you discovered.

Example of mapping

test.c		
C	Intel	Cortex-M
a=10;	movl $10, -8(%rbp)	mov r3, #10 str r3, [fp, #-8]
b=0;	movb $0, -4(%rbp)	mov r3, #0 strb r3, [fp, #-5]