

THE UNIVERSITY OF WAIKATO
Department of Computer Science

COMP311-08B – Computer Architecture
Assignment 1 – Instruction Sets and Compiler
Optimisation

Lecturer: Matthew Luckie
Email: mluckie@cs.waikato.ac.nz
Due: Tuesday 5 Aug 2008, 4pm
Worth: 5%

1 Overview

For this assignment, you will gain rudimentary understanding of the ARM instruction set architecture by examining the output of `gcc` for a quicksort implementation and consulting the processor's handbook to determine the choice of instructions.

You are provided with

1. `quick.c`: C source code for a quicksort implementation
2. `quick.arm-*.s`: the output of `gcc` at various optimisation levels for the ARM processor
3. `arm-14128.pdf`: The ARM processor manual.

These files can be found by accessing the resources page on Moodle.

2 Assessment

You are expected to write a report that illustrates your understanding of the assembly code you are provided with for two architectures, and the techniques that `gcc` uses to optimise for the ARM architecture.

You should begin by commenting the assembly language for `quick.arm-noopt.s`, outlining the structure of the code and how it relates to the `quick.c`. Your comments should illustrate how parameters are passed between function calls, how the stack is used, and what the various calculations are for. This part may form the first part of your report, or may be a separate file to the report.

Your report should then compare 01 with noopt, 02 with 01, and 03 with 02. You may find the Unix command `diff -u quick.arm-noopt.s quick.arm-01.s` useful for this. Finally, you should include a summary of the ARM architecture and how it compares to the MIPS or WRAMP architectures. You may find

sections 2.11, 2.12, and appendix D of your textbook useful. Be sure to reference external sources of information in your report.

You may work on this assignment either by yourself, or in pairs. If you work in pairs, please submit one assignment that contains both of your names inside it.

3 Assignment Submission

You must submit your assignment by 4pm on Tuesday 5th of August 2008. Your assignment files will be submitted electronically using Moodle. Your report may be submitted as either plain text or pdf. Please do not submit an openoffice document, or a word document.