

ECE571: Advanced Microprocessor Design – Homework 5

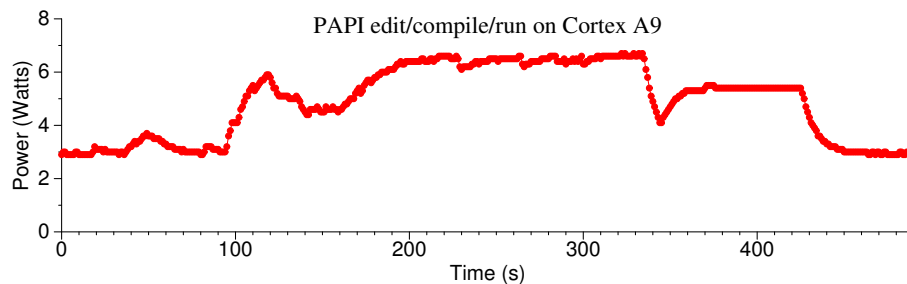
Due: Friday 19 April 2013, 5:00PM

1. Energy

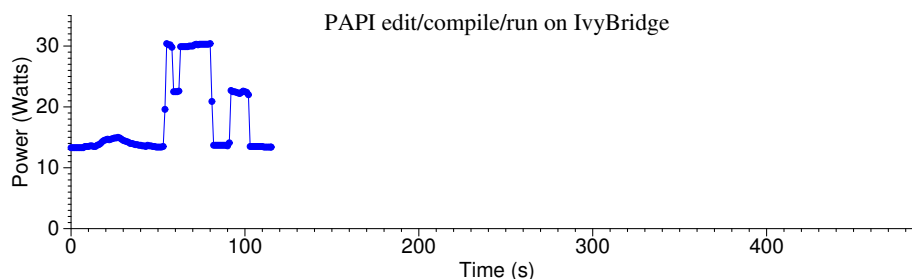
- The following plots show the same workload run on an ARM Cortex A9 Pandaboard and an IvyBridge MacBook Air laptop. The workload is meant to mimic software development, in this case working with the PAPI sourcecode. It is `git pull` followed by a 10s pause, then `emacs perf_event.c` and scrolling to the bottom and top of the file, a 10s pause, a `make clean`, a 10s pause, then a `make -j4`, a 10s pause, then `ctests/flops`.

The tests were run with the “ondemand” governor, and on the IvyBridge machine TurboBoost was enabled. The data was gathered via a WattsUpPro device.

- Cortex A9. Total Energy 2399.4J, Time: 490s, Idle 2.9W



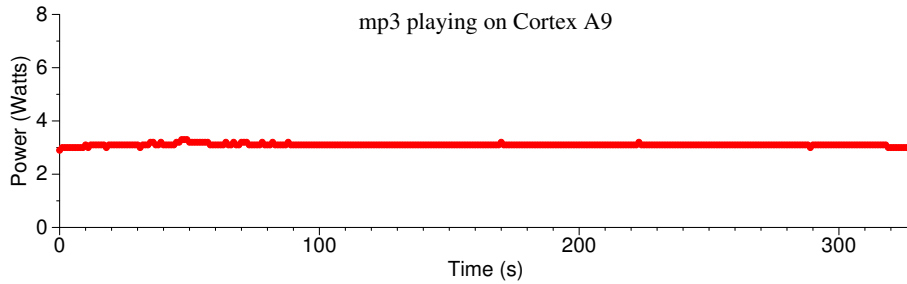
- IvyBridge. Total Energy 2088.3J, Time 115s, Idle 13.0W



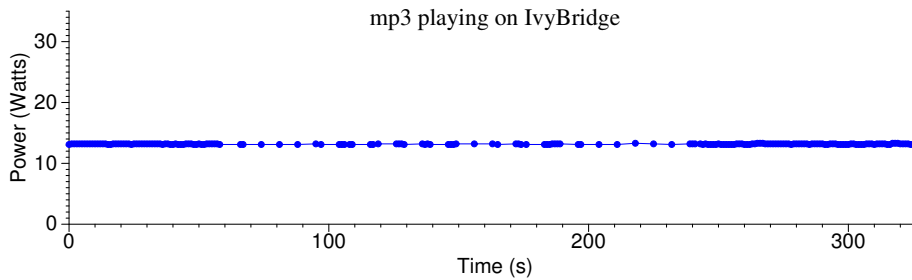
– Questions

- Make a table showing Energy Delay and Energy Delay Squared for this workload on both machines.
 - Which machine has the best Energy Delay Squared metric?
 - If you pad the IvyBridge time out to a full 490s to match the ARM run time (using the listed Idle power) how does this change the Energy Delay Squared result?
 - For this workload, what non-Energy related reasons might there be for preferring the faster IvyBridge system?
- The next test involved the same systems as the last question but instead the workload is playing an mp3 of the song “The Final Countdown” with the command line `mpg321` player.

- Cortex A9. Total Energy 1017.3J, Time: 328s, Idle 2.9W



- IvyBridge. Total Energy 4315.3J, Time 328s, Idle 13.0W



- Questions

- Make a table showing Energy Delay and Energy Delay Squared for this workload on both machines.
- Which machine has the best Energy Delay Squared metric?
- If you had to design a portable MP3 device using one of these systems, which would it be?
- Why might this test be unfair? (What sources of power draw might be higher on a full-featured laptop than on a single-board embedded computer...)

2. Project Status — Experimental Setup

- Please describe the experimental setup you plan to use for your project. This should include the machines you are using, how you are measuring the results, the operating system involved, and which benchmarks you plan to use. There should be enough info that someone can repeat your results if necessary. What you write up here can be used as a basis for the experimental setup part of your project writeup.

- Some example prose:

We measure the energy consumption of an Apple IIe computer running the “Space Invaders” video game and compare it to the energy consumption of a modern IvyBridge laptop running the same game under an Apple II emulator. We use a WattsUpPro device to measure power and use that to calculate total Energy.

The Apple IIe is a 1993 Platinum model with a 1MHz 6C502 processor and 128kB of RAM. The emulator is the AppleLin emulator version 1.3 compiled with gcc version 4.7 with options `-O2`. The IvyBridge machine has 2GB of memory, a 2.6GHz processor, and is running Linux 3.8.6. We disable all non-essential programs and use the on-demand cpu frequency governor.

We run our experiment 5 times and report the average results across 5 runs.

3. Submitting your work.

- Include your answers in a text or PDF file.
- Please make sure your name appears in the document.
- e-mail the file to me by the homework deadline.