Sprint Report #1

October 7, 2015

Team Overview

Project

ARM Cluster

Members

- Andrew Hoover
- Samantha Krantz
- Christine Sorensen

Sponsor

Dr. Christer Karlsson

Sponsor Overview

Sponsor Description

Dr. Christer Karlsson is an Assistant Professor at South Dakota School of Mines and Technology in Rapid City, SD. The former Captain in the Swedish Army has been teaching in the Mathmatical and Computer Sciences department for the last three years. He focuses his research on parallel computing and multicore architectures.

Sponsor Goal

To produce the fastest and most cost efficient homogenous ARM cluster of single-board computers.

Sponsor Needs

- A selection of a single-board computer to fit well with the cluster
- Cluster that meets the requirements yet is under a strict budget
- An alternative mode of communication between the computers

Project Overview

The goal of this project to build a cluster of 6-12 single-board computers that has the most Floating Point Operations as possible per U.S. Dollar per Watt. Three single-board computers were tested; ODroid 4xU, Raspberry Pi 2B, PcDuino 8. The best one will be selected and the cluster will be created under a budget of $1,200. Then, alternative modes of communication besides Ethernet will be investigates using other pins and ports. The computers will be linked in a topology that will be determined during this investigation.

Project Environment

Project Boundaries

- Entire project will stay in budget

- Cluster must consist of 6-12 single board computers, all being the same

- A new communication mode must be developed

Project Context

The project is created on a Linux OS. Github is used to share the materials. The code is written in C++. OpenMP is used to run the code in parallel. A Kill-A-Watt monitor is used to test the power of the running devices.

The following single-board computers are tested:

- ODroid 4xU

- Raspberry Pi 2B

- PcDuino 8

Deliverables

- Mission Statement

- User Stories

- Number Generating Code

- Benchmark Code

- Benchmark Log

- Signed Software Contract

- Updated Design Document

Sprint Report

Work for this sprint included:

- Wrote Mission Statement and Elevator Speech

- Drew up Software Contract

- Wrote user stories

- Obtained ODroid 4xU, Raspberry Pi 2B, and PcDuino 8 single-board computers

- Wrote number generating code

- Wrote benchmark code that ran addition, multiplication, division, and sine floating point operations

- Added OpenMP to run the benchmark code on all cores

- Ran the code each of the single-board computers

- Logged times

- Calculated the GFlops

- Calculated the GFlops/Dollar/Watts

- Determined best computer

Work that is carried over into Sprint 2 is as follows:

- Using the benchmark results to determine which computer to use

- Order more of the computers that proved best from Sprint 1 and maintain the given budget of $1,200

- Find a topology that best fits the cluster

Backlog

- Decide on a computer based on the results of the benchmarking

- Calculate prices on supplies and computers while maintaining below the budget

- Ordering said supplies and computers

- Build the cluster to perform floating-point operations

- Benchmark the cluster

- Experiment with different topologies

- Create a new mode of communication