UMass Lowell EECE.6540 Heterogeneous Computing

Lab 3: Performance Evaluation on FPGA Board

Due Date: See the course syllabus or piazza page.

rev:11/13/17

Objectives

- Learn the advanced features in OpenCL programming
- Learn the basics of compiling a kernel binary for an FPGA board.
- Learn to evaluate the function and performance of FPGA based OpenCL platform.

Description

In this lab, you will be given a set of OpenCL programs including host programs and kernels, which are designed to perform functional and performance tests on an FPGA based platform.

You need to do the following in this lab:

(1) Compile the source code to generate the OpenCL binaries for both host and FPGA [note: the kernel compilation process can take up to an hour];
(2) Execute the binaries on the FPGA and collect execution results;
(3) Try to make sense of the results.
(4) Read the source code to understand how these functional and performance tests are implemented.

In this lab, you are not required to design new code. However, you should get familiar with the OpenCL development environment, tools and the design flow on an FPGA based platform. You will practice the commands, and perform the compilation and execution steps in a Linux environment. **You must execute the binary on the FPGA board**, instead of running the program in emulation mode. Even though multiple students can run the compilation tools at the same time, only one student can execute the binary on the single FPGA board at a time. Therefore, we will need to rely on the Doodle to coordinate the exclusive occupancy of the FPGA card. Please use this doodle page to reserve your time: https://doodle.com/poll/4vk3eghngbbmv9b2

Helpful Notes

Start the lab early. Please be prepared to read a good amount of C++ and kernel code.

Deadline

See Piazza course forum and/or course syllabus.

Deliverables

A Lab report that contains the following sections:

1. Description of the lab in your own words
2. Summary of the outcome (final results, working, partial working, etc.). In this lab you will need to choose at least two performance metrics (such as kernel launch tests and kernel-to-memory bandwidth) to explain how the tests are implemented. Identify and explain the major functions used in these metrics tests that you choose to study.
3. Main hurdles and difficulties (expected to include some specifics)
4. Things learned from this lab (valuable takeaways)
5. Suggestions (Optional)

Reference

[1] Lab Assignment materials posted on git repository :
https://github.com/ACANETS/eece-6540-fall2017