UMass Lowell EECE.6540 Heterogeneous Computing

Lab 3: Performance Evaluation on FPGA Board

Due Date: See due date posted on Blackboard.

rev:02/22/20

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 a few hours];
(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.
(5) *Optionally*, compile for and run on different FPGA boards (Arria 10 vs Stratix 10) on Intel Devcloud. Compare the results.

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 a FPGA board** on DevCloud, instead of running the program in emulation mode.

Helpful Notes

Start the lab early. Please be prepared to read a good amount of C++ and kernel code.
To build the binary for host, run command "**make**".
To build the binary for FPGA, run the following command:
make fpga

Deadline

See updated due date on Blackboard.

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-labs