UMass Lowell EECE.6540 Heterogeneous Computing

Lab 4: DPC++ Programming

Due Date: See the due date posted on Blackboard page.

rev:07/11/20

Objectives

- Learn the basics of oneAPI/DPC++ programming environment and tools
- Solve problem with DPC++ programming
- Learn the design flow of oneAPI/DPC++ on a FPGA platform

Description

In this lab, you will design a Data Parallel C++ (DPC++) program that computes the following matrix operations on input matrices A, B and C and store the result in output matrix D:

D = **A** x **B** + **C**

A is a 200 by 400 matrix (200 rows and 400 columns), B is a 400 by 600 matrix, and both C and D are 200 by 600 matrices. The elements of A, B, C and D are all integer numbers. Every element in A has value of 1, every element in B has value of 2, and every element in C has value of 3.

You need to design your DPC++ program so that:

(1) It queries about the DPC++ platforms and devices on the compute node.
(2) It declares the input matrices **A**, **B** and **C** as arrays, compute **D** on the DPC++ target device using DPC++ kernel function, and prints out the elements of resulting matrix **D**.
(3) It profiles its computation time on the matrix operations.
(4) Optionally, compare the execution time of emulation mode (on CPU) with the hardware mode (on FPGA).

In addition, this lab is to familiarize you with the oneAPI/DPC++ development environment, tools and particularly the design flow on an FPGA based platform. You will practice the commands and perform the compilation and execution steps in a Linux environment.

Helpful Note

You may already notice the similarity of this lab to the Matrix Multiplication in Lab 1 using OpenCL. You can build your design on top of the skeleton code we release as part of Lab 4.

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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.)
3. Main hurdles and difficulties (expected to include some specifics)
4. Things learned from this lab (valuable takeaways)
5. Suggestions (Optional)
6. Link to your final source code on github

Reference

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