

LPI

High Performance Computing

Assignment 2.

Date of Completion:- 26.8.2020

Title:- Vector and Matrix operation using CUDA.

Problem Statement:- Design parallel algorithm to.

- 1) Add two large vectors
- 2) Multiply Vector and Matrix
- 3) Multiply two $N \times N$ arrays using n^2 processors.

Objective:- Learn CUDA architecture & programming concepts.

Outcomes:- Use CUDA programming concepts to ^{perform} operations on vector and matrix.

Requirements:- Ubuntu, NVCC compiler, google Colab (if NVIDIA GPU is not available) NVIDIA GPU.

Theory:-

CUDA architecture:-

CUDA \Rightarrow Compute Unified Device Architecture

Host and Device

CPU \rightarrow Host

GPU \rightarrow Device

Kernel → .

function to be executed on GPU.
prefixed with global

eg global void add(int^a, int^b)

3.

Thread

Single instance of execution.

Block

A group of threads.

Grid

A group of blocks.

Architecture Diagram

Applications

Direct x
compute

Applications

OpenGL
Drivers

Applications using
CUDA driver API

Applications

C Runtime
for CUDA

CUDA Driver
CUDA support for OS Kernel
CUDA parallel compute engine inside
NVIDIA GPUs

PTX (ISA)

Matrix Matrix Multiplication

Matrix 1

4	7	8	6
4	6	7	3
10	2	3	8
1	10	4	7
1	7	3	7

Matrix 2

2	9	8
10	3	1
3	4	8
6	10	3

Result

138	149	124
107	112	103
97	188	130
156	125	71
123	112	60

Conclusion :- Thus I understood parallel implementation of matrix, vector operations in CUDA & implement the algorithms successfully.