

Problem Set 6

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PROBLEM 1, OPENCL

A)

1. CUDA is created by nVidia for nVidia GPUs, while OpenCL is system-independent. OpenCL can be run on multiple platforms including GPUs, CPUs and FPGAs. CUDA can therefore only be used to perform homogeneous computing on GPUs, while OpenCL can be used to perform heterogeneous computing because it can target any device with an input and output.
2. While both device code and host code is compiled at compile-time in CUDA, device code is compiled at run-time in OpenCL.
3. CUDA is slightly faster (up to 10% according to Matt Harvey, developer of Cuda2OpenCL-translator Swan) on nVidia GPUs than OpenCL.

B)

The OpenCL equivalent terms for the CUDA terms thread, block and grid are work item, work-group and grid respectively.

C)

There is no equivalent term for warp in OpenCL because OpenCL is system-independent, which means the device running the OpenCL program may not even be able to perform parallel instructions. OpenCL is however typically run on devices with SIMD width greater than one. To see what the native hardware execution width is, one can query the kernel object with the function: `CL_KERNEL_PREFERRED_WORK_GROUP_SIZE_MULTIPLE()`

2, GRAPHICS

Computations where the output is an image are very well suited to GPU computations because images are arrays of pixels. Computing the values of these pixels is an easily parallelizable task since these computations are independent, and often not very complex.

3, HETEROGENEOUS COMPUTING

A)