
1 Overview

1.1 Location `$<APPSDKSamplesInstallPath>\samples\C++Amp\`

1.2 How to Run

1. Before running the sample, install Microsoft® Visual Studio® 2012 or higher and the latest AMD APP SDK.
2. Compile the sample. Use the command line to change to the directory where the executable is located. The pre-compiled sample executable is at
`$<APPSDKSamplesInstallPath>\samples\opencl\bin\x86\` for 32-bit builds, and
`$<APPSDKSamplesInstallPath>\samples\opencl\bin\x86_64\` for 64-bit builds.

2 Introduction

This is an introductory sample for developers who want to learn C++ AMP programming. This sample introduces various C++ AMP concepts (array_view, parallel_for_each, extent, lambda function, etc.) through a simple kernel that computes SAXPY ($z = ax + y$) on two arrays.

3 Implementation Details

The input vectors vX and vY are first initialized with random values:

```
for(int i = 0; i < numElement; i++)
{
    vX[i] = (float)(rand() % numElement);
    vY[i] = (float)(rand() % numElement);
}
```

Here is the simple loop that computes the SAXY on the CPU in a serial fashion:

```
for(int i = 0; i < numElement; i++)
{
    vZ_CPU[i] = alpha * vX[i] + vY[i];
}
```

To perform the computations on the GPU, the input data must be transferred to the GPU. An array_view object is used to wrap around the data containers in the CPU memory:

```
array_view<const float, 1> avX(numElement, vX);
array_view<const float, 1> avY(numElement, vY);
```

The C++ AMP runtime does the data transfer when the GPU accesses the input data through the array_view objects.

Here is the code that computes the SAXPY on the GPU:

```
parallel_for_each(avX.extent, [=](index<1> idx) restrict(amp)
{
    // idx is the zero-based index of the current thread.
    // Thread #0 --> idx == 0, Thread #1 --> idx == 1,...
    avZ_GPU[idx] = alpha * avX[idx] + avY[idx];
});
```

The `parallel_for_each` instructs the runtime to create `numElement` of threads to execute the lambda function in parallel. The variable `idx` contains the ID of the thread.

To read the results on the CPU side, the `synchronize` method is called to ensure the data is copied from the GPU back to the CPU container.

```
avZ_GPU.synchronize();
```

Finally, the GPU output is compared to the CPU output.

```
for(int i = 0; i < numElement; i++)
{
    if(vZ_GPU[i] != vZ_CPU[i])
    {
        std::cout << "Verification failed !!!" << std::endl;
        exit(1);
    }
}
```

4 References

1. *C++ AMP: Language and Programming Model* (downloadable from microsoft.com)

Contact

Advanced Micro Devices, Inc.
One AMD Place
P.O. Box 3453
Sunnyvale, CA, 94088-3453
Phone: +1.408.749.4000

For AMD Accelerated Parallel Processing:

URL: developer.amd.com/appsdk
Developing: developer.amd.com/
Forum: developer.amd.com/opencclforum



The contents of this document are provided in connection with Advanced Micro Devices, Inc. ("AMD") products. AMD makes no representations or warranties with respect to the accuracy or completeness of the contents of this publication and reserves the right to make changes to specifications and product descriptions at any time without notice. The information contained herein may be of a preliminary or advance nature and is subject to change without notice. No license, whether express, implied, arising by estoppel or otherwise, to any intellectual property rights is granted by this publication. Except as set forth in AMD's Standard Terms and Conditions of Sale, AMD assumes no liability whatsoever, and disclaims any express or implied warranty, relating to its products including, but not limited to, the implied warranty of merchantability, fitness for a particular purpose, or infringement of any intellectual property right.

AMD's products are not designed, intended, authorized or warranted for use as components in systems intended for surgical implant into the body, or in other applications intended to support or sustain life, or in any other application in which the failure of AMD's product could create a situation where personal injury, death, or severe property or environmental damage may occur. AMD reserves the right to discontinue or make changes to its products at any time without notice.

Copyright and Trademarks

© 2013 Advanced Micro Devices, Inc. All rights reserved. AMD, the AMD Arrow logo, ATI, the ATI logo, Radeon, FireStream, and combinations thereof are trademarks of Advanced Micro Devices, Inc. OpenCL and the OpenCL logo are trademarks of Apple Inc. used by permission by Khronos. Other names are for informational purposes only and may be trademarks of their respective owners.
