

## 1 Overview

**1.1 Location** `$<AMDAPPSDKSamplesInstallPath>\samples\opencl\cl\2.0`

**1.2 How to Run** See the *Getting Started* guide for how to build samples. You first must compile the sample.

Use the command line to change to the directory where the executable is located. The pre-compiled sample executable is at

`$<AMDAPPSDKSamplesInstallPath>\samples\opencl\bin\x86\` for 32-bit builds, and  
`$<AMDAPPSDKSamplesInstallPath>\samples\opencl\bin\x86_64\` for 64-bit builds.

Ensure that the OpenCL 2.0 environment is installed.

Type the following command(s).

1. `ExtractPrimes`  
This command runs the program with the default options.
2. `ExtractPrimes -h`  
This command prints the help file.

**1.3 Command Line Options** Table 1 lists, and briefly describes, the command line options.

**Table 1 Command Line Options**

Short Form	Long Form	Description
-h	--help	Shows all command options and their respective meanings.
	--device [cpu gpu]	Devices on which the OpenCL kernel is to be run. Acceptable values are <code>cpu</code> or <code>gpu</code> .
-q	--quiet	Quiet mode. Suppresses all text output.
-e	--verify	Verify results against reference implementation.
-t	--timing	Print timing-related statistics.
-v	--version	AMD APP SDK version string.
	--dump [filename]	Dump the binary image for all devices.
	--load [filename]	Load the binary image and execute on the device.
	--flags [filename]	Specify the filename containing the compiler flags for building the kernel.
-i	--iterations	Number of iterations.
-p	--platformId	Select the platformId to be used[0 to N-1 where N is number platform s available].
-d	--deviceId	Select deviceId to be used[0 to N-1 where N is number devices available].

## 2 Introduction

This sample demonstrates the usage of new workgroup built-ins `work_group_scan_inclusive_add` (to compute the prefix sums at workgroup level) and `work_group_broadcast` (to broadcast the value from one workitem to all others in the workgroup).

The sample workflow is as follows:

1. The host creates the required buffers, such as input, primes (Boolean array for each input element), output (for holding the prefix sums on primes array), `outPrimes` (for final result). These are sent to the kernel.
2. The host launches four kernels in this order:
  - i. `set_primes_kernel` computes whether each array element is prime and fills the primes array
  - ii. `group_scan` and `global_scan` compute the prefix sums globally and puts the output prefix sums into output array
  - iii. Finally, `get_primes_kernel` extracts and places them into the `outPrimes` array using the indexes using the prefix sums in output array.

This sample must be run in the OpenCL 2.0 environment.

## 3 Implementation

Kernels filling the primes Boolean array and group scan is obvious. For global scan, the same technique that was described in the `BuiltInScan` sample is used. The `get_primes` kernel uses these prefix sums to fill the `outPrimes` array for each prime found in the input array. The performance improvement found compared to the OpenCL 1.2 version is described in Chapter 6 of the *AMD OpenCL User Guide* document.

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