AMD **Accelerated** Parallel Processing TECHNOLOGY

AMD APP SDK v2.9

Developer Release Notes

1 What's New in AMD APP SDK v2.9

1.1 New features in AMD APP SDK v2.9

AMD APP SDK v2.9 includes the following new features:

- Linux support for Bolt: As the next step toward broad cross-OS support, Bolt now adds support for Linux. Bolt can be built with GCC 4.6.3 and above, and will run on the following distributions: OpenSuse 12.3, RHEL 6.4 64-bit, RHEL 6.3 32-bit, and Ubuntu 13.
- Bolt: MultiCore code paths have been added for all the routines including the new routines. All the routines now support the OpenCL™, MultiCore CPU (TBB), and Serial paths. One new sample has been added to demonstrate the use of the features of Bolt 1.1. For information on the performance improvements, see 1.3, "Key features supported in Bolt 1.1".
- OpenCV: AMD has been working closely with the OpenCV open source community to add heterogeneous acceleration capability to the world's most popular computer vision library. These changes are already integrated into OpenCV and are readily available for developers who want to improve the performance and efficiency of their computer vision applications. The new samples illustrate these improvements and highlight how simple it is to include them in your application. For information on the latest OpenCV enhancements, see Harris' blog.
- AMD APP SDK 2.9 also includes new OpenCL, Bolt 1.1, and OpenCV samples including:
  - New OpenCL samples:
    - DynamicOpenCLDetection: A sample that shows how to dynamically detect OpenCL platform availability on a machine and accordingly run either an OpenCL version or a sequential version of the application.
    - KMeansAutoClustering: A sample that demonstrates the clustering of a given set of points into the most fitting number of clusters using the K-means clustering algorithm and the Silhouette method.
    - BufferImageInterOp: A sample that demonstrates the interoperability between an OpenCL Image object and the OpenCL buffer object.
    - SimpleDX9: A sample that demonstrates the interoperability between an OpenCL buffer and a DirectX9 buffer.
    - AsyncDataTransfer: A sample that demonstrates how to harness asynchronous memory transfer in OpenCL. The sample shows the overlap of kernel execution and data transfer in a device.
    - ConcurrentKernels: A sample that demonstrates how to execute more than one kernel concurrently using multiple command queues.
  - New BOLT sample:

        - PerlinNoise: A sample that implements the Perlin noise visual effect using Bolt. The sample generates noise similar to a cloud, which gets stored as a 2D Image.
    - New OpenCV sample:
        - GestureRecognition: A sample that demonstrates gesture recognition using OpenNI libraries and the interoperability between OpenCV-CL and OpenNI. This sample works with .oni files and live feed from a 3D depth camera.
- AMD APP SDK 2.9 includes support for the CMake build tool, which is popular among the developer community. For Windows, in addition to CMake, Visual Studio support is available.
- AMD APP SDK 2.9 includes the AMD SDK Sample Browser. The AMD SDK Sample Browser provides users with a unified GUI interface to browse through the various samples present in AMD's SDKs and to access code, benchmarks, and documentation related to the samples. The AMD SDK Sample Browser allows users to run advanced searches, including full text searches, based on the SDK type, complexity, technology, and content of the samples.
- AMD APP SDK 2.9 also includes a component-based installer, which installs components based on the component selections made.

1.2 Key features supported in the Catalyst 13.11 beta V1 driver

- New platforms supported
    - Richland
    - Kabini
    - Bonaire
- New OS support
    - Windows 8.1
    - Ubuntu 12.10
    - RHEL 6.4
- IP blocks supported
    - VCE 2.0
    - UVD 4.2
    - ACP 1.1
    - SAMU 2.1 (Kabini)

1.3 Key features supported in Bolt 1.1

- Bolt functions can be executed with four code paths (OpenCL™, C++ AMP, MultiCore CPU (TBB), and Serial CPU). The default mode is "Automatic": the GPU paths are first, then MultiCore CPU (TBB), then Serial CPU. The control goes to the other paths only if the selected path is not found. Forcing the mode to any code path will run the function with that code path. All Bolt functions have OpenCL™, MultiCore CPU(TBB), and Serial path implementations.
- The new functions are: binary_search, merge, scatter, scatter_if, gather, and gather_if.
- The following routines for the OpenCL path demonstrate a 40-300% improvement in performance:

- transform_exclusive_scan
- transform_inclusive_scan
- reduce
- transform_reduce
- sort
- sort_by_key
- stablesort
- stablesort_by_key
- min_element
- max_element
- count
- count_if
- reduce_by_key

- The following Bolt functions and code paths are supported for Bolt 1.1:

API	OpenCL™ GPU	AMP	MultiCore CPU (TBB)	Serial
constant_iterator	YES	NO	YES	YES
copy	YES	NO	YES	YES
copy_n	YES	NO	YES	YES
count	YES	YES	YES	YES
count_if	YES	YES	YES	YES
counting_iterator	YES	NO	YES	YES
device_vector	YES	YES	YES	YES
exclusive_scan	YES	YES	YES	YES
exclusive_scan_by_key	YES	NO	YES	YES
fill	YES	NO	YES	YES
fill_n	YES	NO	YES	YES
generate	YES	NO	YES	YES
generate_n	YES	NO	YES	YES
inclusive_scan	YES	YES	YES	YES
inclusive_scan_by_key	YES	NO	YES	YES
inner_product	YES	NO	YES	YES
max_element	YES	NO	YES	YES
min_element	YES	NO	YES	YES
reduce	YES	YES	YES	YES
reduce_by_key	YES	NO	YES	YES
sort	YES	YES	YES	YES
sort_by_key	YES	NO	YES	YES
stable_sort	YES	NO	YES	YES
stable_sort_by_key	YES	NO	YES	YES
transform	YES	YES	YES	YES
transform_exclusive_scan	YES	NO	YES	YES
transform_inclusive_scan	YES	NO	YES	YES
transform_reduce	YES	YES	YES	YES
binary_search	YES	NO	YES	YES

merge	YES	NO	YES	YES
scatter	YES	NO	YES	YES
scatter_if	YES	NO	YES	YES
gather	YES	NO	YES	YES
gather_if	YES	NO	YES	YES

1.4 New features for AMD CodeXL version 1.3

The following new features for AMD CodeXL version 1.3 expand platform support and provide improvements to the developer experience:

- Remote GPU debugging and profiling to enable server and embedded customers.
- The CPU Profiler now supports Java inline functions, has a revised Source Code view for better navigation and usability, and contains a new profile session type for sampling Cache Line Utilization.
- Static OpenCL Kernel Analysis is now integrated into CodeXL application and Visual Studio extension, using a brand new user experience. The analysis module supports the Southern Islands and Sea Islands families of GPUs.
- THe debugger support was extended to the API, state variables and shader types of OpenGL up to and including OpenGL 4.3, and to the API of OpenCL 1.2.

2 Important Notes

- If you are using Windows, verify that the `AMDAPPSDKROOT` environment variable is present. If the variable is not present, add it and set its value to one of the following:
  - `C:\Program Files\AMD APP SDK\2.9` (for 32-bit OS)
  - `C:\Program Files (x86)\AMD APP SDK\2.9` (for 64-bit OS)
- The following values are returned when querying strings from OpenCL:
  - `CL_PLATFORM_VERSION`: OpenCL 1.2 AMD-APP (build #).
  - `CL_PLATFORM_NAME`: AMD Accelerated Parallel Processing.
  - `CL_PLATFORM_VENDOR`: Advanced Micro Devices, Inc.
- Check the Platform Vendor string, not the Platform Name, to determine AMD hardware. For example code that shows how to check and use the `CL_PLATFORM_VENDOR` string, see the AMD APP v 2.9 Samples.
- Driver support for 7xx generation GPUs is EOL. AMD drivers no longer support 7xx generation GPUs; this includes support for ATI Radeon™ HD and ATI Mobility Radeon™ HD 4000 series devices, ATI FirePro™ V8750, V8700, V7750, V5700, V2750, ATI Mobility FirePro™ M7740, and AMD FireStream™ 9270, 9250.
- To develop applications using deprecated OpenCL™ API calls, `#define CL_USE_DEPRECATED_OPENCL_1_1_APIS`.
- When parsing `#include` directives, the OpenCL compiler resolves relative paths using the current working directory of the application through the `-I` compiler option.
- It is necessary to install the Catalyst 13.11 beta V1 graphics driver prior to installation of SDK 2.9. Vital components of AMD's OpenCL solution are now contained within the drivers.

- Under Windows, making OpenCL runtime calls from dllMain can result in undefined behavior.
- The binary `clinfo.exe` is located in the `\Windows\System32` directory.
- On Linux and Windows platforms, every GPU is assigned an ordinal number. To expose only a subset of GPUs to a specific application, make the following environmental variable definition: `GPU_DEVICE_ORDINAL=0,1,2 … .`
- Support for Microsoft Visual Studio 2008 is deprecated.
- HD4XXX device support is EOL. Catalyst drivers no longer include support for these devices. See the OpenCL SDK driver and compatibility page for more details.
- Aparapi is available from http://http:code.google.com/p/aparapi/.
- See the APP SDK 2.9 Samples Release Notes for known issues and important notes for the SDK samples.
- The AMD APP Profiler and APP Kernel Analyzer are now provided as part of CodeXL, which is available as a separate download from http://developer.amd.com/tools-and-sdks/heterogeneous-computing/codexl/.
- See the CodeXL release notes for known issues and important notes for the SDK samples.

3 Naming Convention

For Windows:

- The `__stdcall` calling convention is used for all Windows platforms.
- Function names are undecorated.
- It is not possible to use this OpenCL DLL on Windows with an application that was linked against a library using the `__cdecl` calling convention.

For Linux:

- The calling convention is `__cdecl`.

4 Resolved Issues

For the latest information about the resolved issues in AMD APP SDK v2.9, see the AMD APP SDK documentation page.

5 Known Issues

For the latest information about the known issues in AMD APP SDK v2.9, see the AMD APP SDK documentation page.

5.1 Compiler

- The compiler may accept illegal cast-to-union (GNU GCC Extension) cases. In such cases, a warning is issued. This may be fixed in a future release.

- If an argument to an OpenCL kernel function is optimized away late in the compilation process, the compiler may fail to build or produce undefined results. This occurs when either an argument gets entirely optimized away or when part of an argument gets optimized away. Part of an argument can get optimized away if two (for 64-bit data types) or four (for all other types) consecutive components of an argument are not used where the first unused component is a multiple of 2 or 4.
- The string class in the C++ Wrapper API has been deprecated and its usage is not recommended.

5.2 Runtime

- The OpenCL runtime currently does not validate handles to OpenCL memory objects.
- Under Windows Beta, to prevent long programs from causing a dialog to be displayed indicating that the display driver has stopped responding, disable the Beta Timeout Detection and Recovery (TDR) feature, which is trying to detect hangs in graphics hardware. To do this, use `regedit.exe` to create the following `REG_DWORD` entry in the registry, and set its value to 0:

  `HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\GraphicsDrivers\TdrLevel`

  This avoids the constant polling by the driver and the kernel to prevent long work units from monopolizing the device. (To restore default functionality, set the `TdrLevel` to 3.)

  Note that Microsoft strongly discourages disabling this feature, and only recommends doing so for debugging purposes. Do so at your own risk.
- On Linux platforms, if a kernel deadlocks the GPU, the system becomes unresponsive for a few minutes, and both the X-window server and the application become defunct processes. The system must be rebooted in order to use the GPU again.
- If the `clGetPlatformIDs() failed` error is issued with a properly installed ICD while running 32-bit code on a 64-bit system, ensure that all necessary 32-bit libraries are installed. The specifics of this vary between Linux distributions; consult your OS documentation for more information. The `libGLU.so` library is known to trigger this problem, but there may be others, depending on the specific installation.
- In Linux for non-Southern_Islands platforms, the OpenCL runtime currently exposes less than the total amount of memory physically available on the card. In Windows and on Linux or Southern-Islands-based platforms, the OpenCL runtime reports the total amount of physical memory for boards with up to 2 GB.

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/openclforum