PRODUCT BRIEF

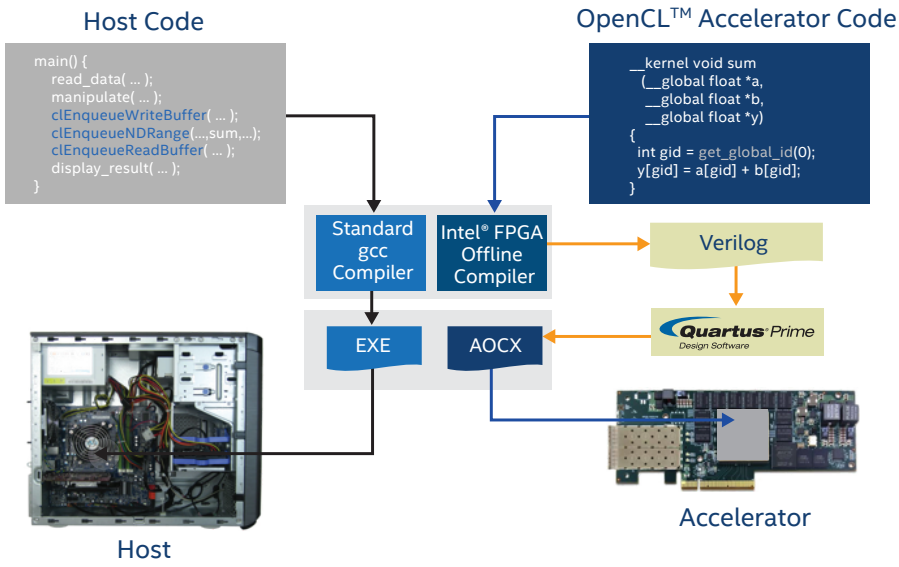
Intel® FPGA SDK for OpenCL™

The need for higher processing requirements is growing at rapid rates and as a result heterogeneous computing is becoming standard as companies look to more efficiently solve larger problems or ones that were previously unsolvable. The need for heterogeneous computing is leading to standard programming languages to exploit the different acceleration hardware of which Open Computing Language (OpenCL™) is the most popular. OpenCL provides a standardized structure for writing programs that can be implemented across heterogeneous platforms, that include central processing units (CPUs), graphic processing units (GPUs), digital signal processors (DSPs), and field-programmable gate arrays (FPGAs).

OpenCL is a low-level programming language derived from C that includes an application programming interface (API) framework for communicating between a host and accelerator kernels (see Figure 1) written in OpenCL and language constructs for parallel computing using task-based and data-based parallelism. The standard is managed by the Khronos™ Group of which Altera is a contributing member and OpenCL conformant company.

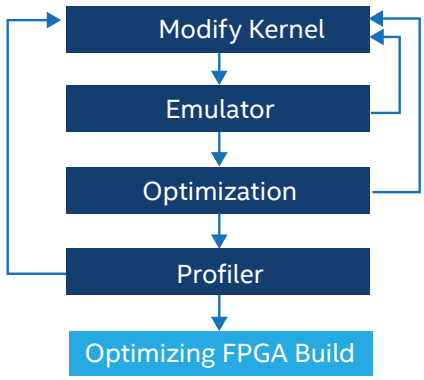
The Intel FPGA SDK for OpenCL allows a user to abstract away the traditional hardware FPGA development flow bringing the inherently parallel and flexible architecture of the FPGA to the software developer with a much faster and higher level software development flow (see Figure 2). The FPGA effectively creates custom hardware for each instruction being accelerated, providing a much more power efficient use of the hardware than that of the CPU or GPU architecture would allow.

Figure 1: Intel FPGA SDK for OpenCL Use Model



The SDK provides a software familiar development environment where the user emulates their OpenCL kernels in seconds to validate its functionality and is then given specific insight into the bottlenecks with a detailed optimization report. A profiler is also available and can be used to examine the system performance to get direct insight into the architectural bottlenecks of the design. The greatest benefit with the Intel FPGA SDK for OpenCL is that code written and optimized for the FPGA today can be reused across the various FPGA families or future generations of FPGAs, without the need for modifications to the code while still leveraging the performance enhancements of the newer architecture.

Figure 2: Accelerator Development Flow



OpenCL is being used today on FPGAs in a variety of applications ranging from machine learning to perform object detection and recognition, genomics, software-defined networking, internet search engine acceleration, cloud acceleration, and much more.

The key benefits for software developers and system designers to use Intel FPGA's SDK for OpenCL are:

- Performance: for many applications the FPGA provides far superior performance than competing acceleration technology
- Efficiency: the FPGA has a massively parallel fine-grained architecture that is leveraged to create a custom hardware accelerator based on the specific code written with an average of one fifth the power of competing accelerators
- Ease of use: follows a traditional software development environment
- Code reuse: performance improvements between families and generations of FPGAs can be leveraged without modifications to the original OpenCL code
- Heterogeneous systems: with OpenCL, you can develop kernels that target FPGAs, CPUs, GPUs, and DSPs seamlessly to partition your design that targets the appropriate accelerator
- Code profiling: dynamic program analysis of system and memory performance

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