



ClearSpeed Development Environment

ClearSpeed's accelerators use a data-parallel processor architecture that simplifies programming and debugging. By using industry standard tools and languages, ClearSpeed provides a familiar development environment, including a software development kit (SDK), an optimizing C compiler, a graphical debugger and visual profiling tools. The development environment is supported across a range of popular Linux® and Windows™ operating systems.

Straightforward To Program

The ClearSpeed Cⁿ language is based on ANSI C with extensions to support data parallel processing. The main addition to standard C is the definition of **mono** (scalar) and **poly** (parallel) data types. Variables, functions pointers and entire data structures can be marked as **poly**; they are then processed in parallel on the array of 96 processing elements (PEs) in the CSX600 on the Advance™ e620 and X620 cards.

The examples below show how simple it is to start enabling acceleration with ClearSpeed technology:

```
double n;           define a variable holding
                    a single value (mono)
poly double pn;    a variable storing 96
                    values, one per PE

n *= 2.0;           a single operation
pn *= 2.0;         96 concurrent
                    operations

n = rand();        generate a single
                    random number
pn = randp();      96 different random
                    numbers generated
                    simultaneously
```

Software Development Kit

The ClearSpeed Software Development Kit (SDK) is a complete suite of tools and libraries designed to enable the rapid development and porting of application software for ClearSpeed accelerators.

Key Features

ANSI standard optimizing C compiler

- Extensions to language for data-parallel programming
- Standard C libraries
- Optimized math libraries

Graphical debugger

- Based on industry-standard GNU debugger, GDB
- Fully supported by ClearSpeed processors: debug your program in real time on the hardware
- Examination and visualization of all program state, both mono (scalar) and poly (parallel) data

Heterogeneous system level visual profiling toolkit

- Profile multiple ClearSpeed processors and multi-core hosts (x86)
- Visual display of performance bottlenecks
- Visibility of compute and I/O overlap
- Fully supported by ClearSpeed processors

Host-only development with an instruction-level simulator

- Simulates complete Advance product environment

Cross platform support for 32 and 64-bit operating systems

- Microsoft™ Windows™
- Red Hat® Enterprise Linux
- SUSE® LINUX Enterprise Server (SLES)

CLEAR SPEED SOFTWARE DEVELOPMENT

Compiler & Libraries

ClearSpeed's optimizing compiler is based on ANSI C with a simple extension to support the CSX600 processor. The Cⁿ language adds the poly keyword to identify data to be processed in parallel.

A full set of standard libraries is provided including parallelized versions optimized for the CSX600. ClearSpeed optimized libraries include:

- Vector Math Library of high performance parallelized trigonometric, exponential and logarithmic functions
- Random Number Generation library with functions to support applications such as Monte Carlo simulation.
- An optimized set of BLAS and LAPACK functions
- FFT functions (1D, 2D, real and complex)

Debugger

ClearSpeed's csgdb is a version of the industry-standard GDB so the same debugging tools can be used on the host and the Advance card providing programmers with a familiar and standard development environment across all processors.

The graphical debugger and CSX600 processors support features needed by software developers including simple and conditional breakpoints and watchpoints, single-stepping, symbolic and source-level debugging. All these features are available in real time when running your code on the hardware.

Profiler

By delivering a consistent visual interface for the entire accelerated system, the ClearSpeed Visual Profiler provides the best possible environment in which to develop code that will perform optimally in heterogeneous multi-core systems.

The ClearSpeed Visual Profiler provides software developers with the ability to profile both host (x86) and ClearSpeed accelerated code running across a system incorporating one or more Advance cards. The profiler toolset provides insight at every level of the system including the interactions between multiple host processors and one or more Advance boards, taking advantage of the profiling features built into ClearSpeed's CSX600 processors.

The ClearSpeed Visual Profiler supports profiling of both host and CSX600 code at various levels of detail including visual displays of performance bottlenecks, complete system coverage, Advance card activity across a cluster and of compute and I/O overlap. The profiler can also show overlap of host and Advance card compute. The user can "drill down" for detailed profiling of CSX600 execution.

Summary

The simple programming model of ClearSpeed's Advance products combined with a professional suite of development tools provides a powerful and straightforward environment for the development of accelerated applications.

FOR MORE INFORMATION

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