ClearSpeed

PRODUCT BRIEF

CLEARSPEED ADVANCE™ e710 ACCELERATOR

Enterprise-class PCIe accelerator for High Performance Computing with industry-leading performance per watt

ClearSpeed's Advance™ accelerators are designed specifically to address the performance requirements of numerically intensive applications. Their high performance, low power designs enable you to maximize your datacenter's performance within its space, power and cooling constraints.

The ClearSpeed Advance e710 is the latest accelerator to bring all the benefits of ClearSpeed's technology to the newest generation of multi-core industry standard servers. It delivers new levels of compute performance, reliability, precision and accuracy for high performance computing (HPC) applications in financial services and a wide variety of scientific disciplines.

The Advance e710's compact size and low power consumption enable it to be installed quickly and easily into industry standard servers, without requiring any additional cooling or power supplies. The low profile PCIe x8 board includes one ClearSpeed CSX700 and 2 GBytes of ECC-protected DRAM.

The CSX700 is the latest member of the ClearSpeed processor family and is the world's most power-efficient 64-bit floating point accelerator.

Practical petascale systems must be built from components with a high Mean Time Between Failure (MTBF). The Advance e710 incorporates the most advanced set of reliability features available on any accelerator. These features include the use of Error Correcting Codes (ECC) on all memories, both on- and off-chip; low power consumption to significantly reduce the thermal stress on the system; and the avoidance of moving parts. All of these factors are essential to achieve the required MTBF for enterprise-class systems.

Why choose ClearSpeed acceleration?

- **High reliability RAS features**
- **Performance: 96 GFLOPS of double precision floating point (peak).**
- **Precision: 64 & 32 bit floating point, IEEE 754 compatible.**
- **Energy efficient: 3.84 GFLOPS per watt (96 GFLOPS / 25 watts)**
- **Easy to install: simply plug one or more boards into free PCIe slots in the latest industry-standard servers, workstations and blade expansion units.**
- **Easy to use: accelerates standard math libraries, including Level 3 BLAS and LAPACK.**
- **Easy to program: Software Development Kit supports ANSI C with parallel programming extensions.**

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There are a number of ways to accelerate your application. Two of the most popular methods are: plug and play via standard libraries, or native code development.

Plug and Play acceleration

The Advance e710 works with the host processor on the most computationally intensive portions of an application. When a call is made by an application to a ClearSpeed-supported function, it is intercepted by ClearSpeed's accelerated math library (CSXL) which determines if the function call can be accelerated. If so, the required data is transferred to the Advance e710 and the answer is calculated by CSXL using both the e710 and the multi-core host in parallel. CSXL then transparently combines the results and returns them to the calling application. The use of heterogeneous acceleration is transparent to the end user and the application.

Native Code Development

The compute-intensive kernels from an application can be ported to run natively on ClearSpeed accelerators using the Software Development Kit (SDK). ClearSpeed's SDK provides a full suite of professional software development tools built around an ANSI C-based cross compiler. It enables developers to write and debug code, develop new applications or to port existing applications to the ClearSpeed Advance accelerator family.

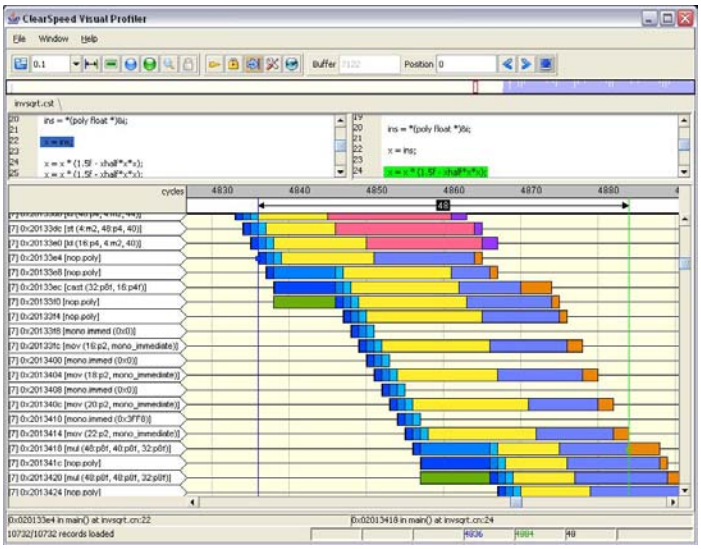
The SDK includes:

- A suite of tools including an industry standard source-level debugger based on gdb and an ANSI C-based cross compiler for ClearSpeed's CSX family of processors
- An extensive set of standard C libraries based on the newlib open source library together with a set of libraries to support architecture-specific features
- The ClearSpeed Vector Math Library and ClearSpeed Random Number Generator Library
- Documentation for the software development tools and languages

Regardless of the acceleration method used, the ClearSpeed Visual Profiler provides a unique and powerful capability to visualize and optimize your application.

ClearSpeed Visual Profiler

For developers, the ClearSpeed Visual Profiler toolset provides insight at every level of the system including the interactions between multiple host processors and one or more ClearSpeed Advance accelerator boards. By delivering a consistent visual representation across the entire system, it provides the best possible environment in which to develop code that will perform optimally in today's multi-core and heterogeneous accelerated systems.



Advance e710 Specifications

Operational Characteristics

- **Performance:** 96 GFLOPS of double precision floating point (peak).
- **Precision:** 64 and 32 bit floating point, IEEE 754 compatible.
- **Energy efficiency:** ~4 GFLOPS per watt.

Specifications

- **Features:** 1 x ClearSpeed CSX700 processor.
- **Size:** PCI low profile form factor: length: 167.7 mm (6.6 in), height: 68.9 mm (2.7 in).
- **Host interface:** PCIe x8, PCIe 1.1 specification.
- **Memory:** 2 Gbytes DDR2-533 SDRAM, ECC support on both the DRAM and CSX700 memories: single-bit correct; multi-bit detect. Error correcting scrubbing hardware.
- **Bandwidth:** 8 Gbytes/s to DRAM, 192 Gbytes/s to internal memory.

Software

- Available for Microsoft Windows, Red Hat® and SUSE™ Linux® operating systems.
- Base software including:
  - Open source device driver,
  - Runtime libraries to interface to board,
  - CSXL math library for accelerating BLAS and LAPACK functions.
- Software Development Kit available:
  - C compiler with parallel programming extensions,
  - Standard C libraries,
  - Vector math library,
  - Random number generator library,
  - FFT library,
  - Industry standard GDB debugger,
  - Visual profiler,
  - Instruction set and cycle accurate simulators.

Minimum System Requirements

- 32 or 64-bit, Intel or AMD x86 processor (or compatible).
- An available PCIe x8 slot, PCIe 1.1 specification.
- Minimum airflow: 1.5 m/s (300 LFM).
- Power supply requirements for PCI slots:
  - 0.5 A @ 3.3 V (maximum),
  - 2.1 A @ 12 V (maximum).