



DEVELOPMENT SUITE FOR DEVELOPERS
ON HIGH-PERFORMANCE CLUSTERS

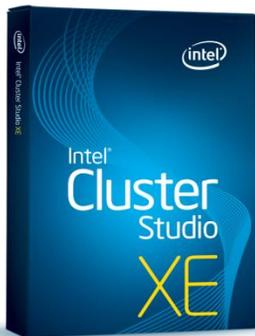
Intel® Cluster Studio XE

Product Brief

Intel® Cluster Studio XE 2012
for Windows* and Linux*

Also available without
thread/memory correctness and
thread profiling tools in:

Intel® Cluster Studio
for Windows* and Linux*



Scale Forward, Scale Faster

- High Performance MPI Library
- High Performance C++ & Fortran Compilers & Libraries
- Correctness Analysis & Profiling Tools
- Powerful Parallel Programming Models

As the relentless pursuit of compute capacity of HPC systems have shifted to multicore systems, and soon to mixed multicore and many-core systems, the compute power of the hardware is scaling at faster than 2x Moore's Law. Software development solutions and tools need to scale to meet the developers needs to utilize these systems.

Intel Cluster Studio XE meets the challenges facing HPC developers by providing, for the first time, a comprehensive suite of tools that enables developers to boost HPC application performance and reliability. It combines Intel's proven cluster tools with Intel's advanced threading/memory correctness analysis and performance profiling tools to enable scaling application development for today's and tomorrow's HPC cluster systems.

Highlights of Intel Cluster Studio XE

Scale Performance

Superior shared, distributed, or hybrid application performance through industry leading Intel compilers, parallel models and libraries with advanced performance optimizations for today's multicore and tomorrow's many-core processors in HPC clusters.

- MPI Latency - Intel® MPI Library is up to 6.5X as fast as alternative MPI libraries
- Compiler Performance - Industry leading Intel C, C++ & Fortran compilers
- Thread Profiling & Tuning - Intel® VTune™ Amplifier XE now MPI enabled for every node

Scale Forward

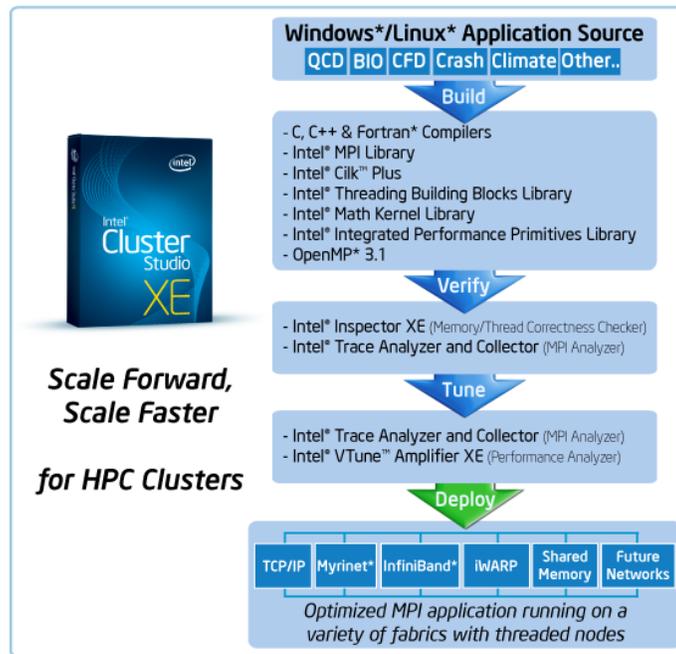
Intel Cluster Studio XE provides the tools, programming models, and performance libraries that enable developers to develop code that scales on Intel® Xeon® Processors today while easily extending to the Intel® Many Integrated Core (Intel® MIC) architecture.

- MPI Capacity - Intel MPI Library scales beyond 90k processes
- Parallel Programming Models - Commercially supported Intel versions of open source Intel® Threading Building Blocks (Intel® TBB) and Intel® Cilk™ Plus for threading parallelism

Scale Efficiency

The impact of budget and schedule pressure makes it crucial to have the right tools and programming models to rapidly develop and deploy reliable HPC applications. Intel Cluster Studio XE delivers powerful threading and correctness tools for hybrid applications development and parallel programming models that are simple to adopt.

- Thread & Memory Correctness- Intel® Inspector XE now MPI enabled for every node
- MPI Correctness- Increased productivity in finding MPI errors.
- Rapid Performance Profiling - Intel VTune Amplifier finds hotspots faster
- Parallel Programming Models - Parallelize code using three keywords with Intel® Cilk™ Plus and Intel TBB templates for simple and robust scalable task based parallelism



Intel Cluster Studio XE – Uniting Intel’s High Performance Cluster Tools with Leading Correctness & Profiling Tools

Featured Products

All the software tools included with Intel Cluster Studio XE 2012 give you the best shared, distributed, and hybrid memory development and performance analysis tools for HPC software development. The following list contains a summary of the products and their benefits.

| Product | Benefits |
|--|--|
| <p>Intel® Composer XE</p> <p>Intel® C++ and Fortran compilers have built-in optimization technologies and multithreading support that help create code that runs best on the latest Intel® multicore processors.</p> <p>Additional information can be found at: http://software.intel.com/en-us/intel-composer-xe/#whatsnew.</p> | <ul style="list-style-type: none"> • Multicore Optimizations • Support for distributed memory CAF • Advanced optimization, multithreading, and processor support • Support for hybrid models of parallelism with MPI and threading models like OpenMP, Intel Cilk Plus, and Intel TBB methods to boost application performance on clusters made up of two-, four-, and eight-socket multicore nodes, each node being an SMP. |
| <p>Intel® MPI Library</p> <p>Intel MPI Library provides new levels of performance, scalability and flexibility for applications that execute on clusters of Intel® platforms.</p> <p>Additional information can be found at: http://software.intel.com/en-us/articles/intel-mpi-library/</p> | <ul style="list-style-type: none"> • Interconnect Independence • Runtime Fabric Selection • Application Tuning Capability • Multirail InfiniBand™ Support • Compatible with Previous Intel® MPI 3.x versions |
| <p>Intel® Trace Analyzer and Collector</p> <p>Intel Trace Analyzer and Collector is a powerful tool for understanding MPI application correctness and behavior.</p> <p>Additional information can be found at: http://software.intel.com/en-us/articles/intel-trace-analyzer</p> | <ul style="list-style-type: none"> • Visualize and understand parallel applications behavior • Evaluate profiling statistics and load balancing • Analyze performance of subroutines or code blocks • Learn communications patterns and identify hotspots • Decrease time to workload |

| Product | Benefits |
|--|---|
| <p>Intel Inspector XE (Cluster Studio XE only)</p> <p>Intel® Inspector XE enhances developer productivity and facilitates application reliability by effectively finding crucial memory and threading defects early in the development cycle.</p> <p>Additional information can be found at: http://software.intel.com/en-us/articles/intel-inspector-xe/</p> | <ul style="list-style-type: none"> • Static and dynamic code analysis with threading and memory correctness checker now MPI enabled at every node of the cluster • Finds latent, intermittent and non-deterministic threading errors • Map errors to the source code line and call stack • Develop highly robust, secure, and highly optimized parallel or hybrid applications on either shared and distributed memory |
| <p>Intel® VTune™ Amplifier XE (Cluster Studio XE only)</p> <p>Intel VTune Amplifier XE is a powerful performance profiling tool to quickly find, and provide greater insights into, multicore performance bottlenecks using the on-chip Performance Monitoring Unit (PMU) available on every Intel® processor.</p> <p>Additional information can be found at: http://software.intel.com/en-us/articles/intel-vtune-amplifier-xe/</p> | <ul style="list-style-type: none"> • Performance profiling now MPI enabled at every node of the cluster • Hotspot analysis finds functions using the most time • Identify locks and waits degrading parallel performance • Map results back to source code • Visualize threading timeline of running, waiting, and transitions • Develop and fine-tune code for optimal performance, ensuring all cores are fully exploited and new processor capabilities are supported to the fullest |
| <p>Intel® Threading Building Blocks</p> <p>Intel® Threading Building Blocks (Intel® TBB) is a widely used, award-winning C++ template library</p> <p>Additional information can be found at http://software.intel.com/en-us/articles/intel-tbb/</p> | <ul style="list-style-type: none"> • Create reliable, portable, and scalable parallel applications • Simple and rapid programming model for developing robust task-based parallel applications that scale to available processor cores • Provides a set of components needed to implement parallel code • Compatible with multiple environments and easy to maintain |
| <p>Intel® Math Kernel Library</p> <p>Intel Math Kernel Library is a library of highly optimized, extensively threaded math routines.</p> <p>Additional information can be found at http://software.intel.com/en-us/articles/intel-mkl/</p> | <ul style="list-style-type: none"> • Multicore and multiprocessor ready • Automatic parallelization • Standard APIs in C and Fortran • Royalty free redistribution |
| <p>Intel® Integrated Performance Primitives</p> <p>Intel® Integrated Performance Primitives (Intel® IPP) is an extensive library of highly optimized software functions</p> <p>Additional information can be found at http://software.intel.com/en-us/articles/intel-ipp/</p> | <ul style="list-style-type: none"> • Library of functions for multimedia, data processing, and communications applications • Outstanding performance - multicore and multiprocessor ready • Mapping function algorithms to low-level optimizations based on processor features for optimal performance |
| <p>Intel® Cilk™ Plus</p> <p>Intel® Cilk™ Plus is an extension to C and C++ that offers a quick, easy and reliable way to improve the performance of programs on multicore processors</p> <p>Additional information can be found at http://software.intel.com/en-us/articles/intel-cilk-plus/</p> | <ul style="list-style-type: none"> • Write parallel programs using a simple model: With only three keywords to learn • Utilize data parallelism by simple array notations that include elemental function capabilities • Scale for the future: The runtime system operates smoothly on systems with hundreds of cores. |
| <p>Intel® Static Security Analysis (SSA) (Cluster Studio XE only)</p> <p>Static security analysis identifies errors and security weaknesses through deep analysis of source code.</p> <p>Additional information can be found at http://software.intel.com/en-us/articles/static-security-analysis/</p> | <ul style="list-style-type: none"> • Quickly find over 250 security vulnerabilities such as: buffer overflows, memory leaks, incorrect usage of pointers, dead or redundant code, etc. • Map results back to source code • Discover and fix defects through the development cycle |

Purchase Options: Language Specific Suites

Several suites are available combining the tools to build, verify and tune your application. The products covered in this product brief are highlighted in green. Single or multi-user licenses and volume, academic, and student discounts are available.

| Suites >> | | Intel® Parallel Studio XE | Intel® C++ Studio XE | Intel® Fortran Studio XE | Intel® Composer XE | Intel® C++ Composer XE | Intel® Fortran Composer XE | Intel® Cluster Studio XE | Intel® Cluster Studio |
|-------------------------------|---|---------------------------|----------------------|--------------------------|--------------------|------------------------|----------------------------|--------------------------|-----------------------|
| Components | Intel® C / C++ Compiler | ● | ● | | ● | ● | | ● | ● |
| | Intel® Fortran Compiler | ● | | ● | ● | | ● | ● | ● |
| | Intel® Integrated Performance Primitives ³ | ● | ● | | ● | ● | | ● | ● |
| | Intel® Math Kernel Library ³ | ● | ● | ● | ● | ● | ● | ● | ● |
| | Intel® Cilk™ Plus | ● | ● | | ● | ● | | ● | ● |
| | Intel® Threading Building Blocks | ● | ● | | ● | ● | | ● | ● |
| | Intel® Inspector XE | ● | ● | ● | | | | ● | |
| | Intel® VTune™ Amplifier XE | ● | ● | ● | | | | ● | |
| | Static Security Analysis | ● | ● | ● | | | | ● | |
| | Intel® MPI Library | | | | | | | ● | ● |
| | Intel® Trace Analyzer & Collector | | | | | | | ● | ● |
| | Rogue Wave IMSL* Library ² | | | | | | ● | | |
| Operating System ¹ | W, L | W, L | W, L | W, L | W, L, M | W, L, M | W, L | W, L | |

Note: (1)¹ Operating System: W=Windows, L= Linux, M= Mac OS* X. (2)² Available in Intel® Visual Fortran Composer XE for Windows with IMSL* (3)³ Not available individually on Mac OS X, it is included in Intel® C++ & Fortran Composer XE suites for Mac OS X

| Technical Specifications | |
|--------------------------|---|
| Processor support | Validated for use with multiple generations of Intel® and compatible processors including but not limited to: 2nd Generation Intel® Core™2 processor, Intel® Core™2 processor, Intel® Core™ processor, and Intel® Xeon™ processor, |
| Operating systems | Windows* and Linux* |
| Programming languages | Natively supports C, C++ and Fortran development |
| System requirements | Please refer to www.intel.com/software/products/systemrequirements/ for details on hardware and software requirements. |
| Support | A free Runtime Environment Kit is available to run applications that were developed using Intel MPI Library All product updates, Intel® Premier Support services and Intel® Support Forums are included for one year. Intel Premier Support gives you confidential support, technical notes, application notes, and the latest documentation. Join the Intel® Support Forums community to learn, contribute, or just browse! http://software.intel.com/en-us/forums . |

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www.intel.com/software/products/eval

Optimization Notice

Notice revision #20110804

Intel's compilers may or may not optimize to the same degree for non-Intel microprocessors for optimizations that are not unique to Intel microprocessors. These optimizations include SSE2, SSE3, and SSSE3 instruction sets and other optimizations. Intel does not guarantee the availability, functionality, or effectiveness of any optimization on microprocessors not manufactured by Intel. Microprocessor-dependent optimizations in this product are intended for use with Intel microprocessors. Certain optimizations not specific to Intel microarchitecture are reserved for Intel microprocessors. Please refer to the applicable product User and Reference Guides for more information regarding the specific instruction sets covered by this notice.

