Intel® Parallel Studio XE 2013 SP1 and Intel® Cluster Studio XE 2013 SP1

Released Sept 4th, 2013

Flagship development suites expand standards and processor support to simplify creation of faster applications

Code the Future

New Product Announcements Embargoed until September 4, 8am Pacific Time
Faster code + Simplified development

Performance
- Improved compiler and library performance
- Intel® AVX-512 ready
- Broadwell & Haswell-EP microarchitecture optimizations
- Windows® support for Intel® Xeon Phi™ coprocessor

Analysis Efficiency
- Better data mining for performance tuning
- Simplified scalability testing for OpenMP®
- Incremental analysis and easier suppression management
- Enhanced MPI analysis interface

Productivity
- Improved conditional numerical reproducibility
- Enhanced GDB for Linux® and OS X®

Cross Platform Portability
- OpenMP® 4.0 SIMD and target constructs
- Expanded C++11
- Expanded Fortran 2003 & 2008
- Improved MPI Performance and Scalability

More info at: http://intel.ly/perf-tools

Shipping: Sept 4, 2013

$1,599-$2,299

$2,949
## Performance for Compilers: Continued Performance Leadership

### Windows*

<table>
<thead>
<tr>
<th>Benchmark Type</th>
<th>Product/Version</th>
<th>Performance</th>
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<tbody>
<tr>
<td>Estimated SPECint®_base2006 integer benchmark</td>
<td>Intel® C++ Compiler 14.0 for Windows*</td>
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<td>Microsoft Visual C++ 2012</td>
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### Linux*

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### C++ Floating

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<tr>
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### C++ Floating

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### Fortran

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<th>Benchmark Type</th>
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<td>Polyhedron® Fortran benchmark</td>
<td>Intel® Fortran Compiler 14.0 for Windows*</td>
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<td></td>
<td>Absoft 13.0.3</td>
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<td>PGI 13.6</td>
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New Product Announcements Embargoed until September 4, 8am Pacific Time

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Performance with Intel® TBB: Excellent Scalability on Intel® Xeon® Processors and Intel® Xeon Phi™ Coprocessors
Performance with Intel® MKL: Superior Math Processing

Significant LAPACK Performance Boost using Intel® Math Kernel Library versus ATLAS*

Intel® MKL provides significant performance boost over ATLAS®
Performance scales as number of CPU cores increase
Performance hits over 0.1% of CPU peak

Configuration Info: Version: Intel Math Kernel Library (Intel® MKL) 11.1, ATLAS 3.10.1; Hardware: Intel® Xeon® E5-2690 Processor, 2 Eight-Core CPUs (20x1GHz, 2.5GHz), 32GB of RAM; Operating System: Windows 7 64-bit x64.

Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance tests, such as SYSmark and others, are measured using specific computer systems, components, software, operations, and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products. Other brands and names are the property of their respective owners. Benchmark Source: Intel Corporation.

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Intel® Math Kernel Library (Intel® MKL)
Performance with Intel® MPI Library: Up to 6.5x Faster MPI Communications

![Performance Graph]

**Industry Leading Performance with Intel® MPI Library 4.1**

Relative (Geomean) MPI Latency Benchmarks on Linux® 64 (Higher is Better)

1024 Processes on 64 nodes (InfiniBand + shared memory)

**Up to 6.5X as fast as on 64 nodes**

Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance tests, such as SYSmark and MobileMark, are measured using specific computer systems, components, software versions, and workloads. Any change to any of these factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products. *Other brands and names are the property of their respective owners.*

Benchmark Source: Intel Corporation

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Intel® AVX-512 Ready
Will Enable Next Generation Development for Intel® Xeon Phi™ Products

Intel® Compilers and Intel® Math Kernel Library AVX-512 support comes in Q4 update

- Significant performance available with 512-bit SIMD support
- Mixes well with AVX and AVX2
- Uses EVEX prefix to enable additional functionality
- First implemented in the future Intel® Xeon Phi™ coprocessor and processor, code named Knights Landing

Enables higher performance for the most demanding computational tasks
Microarchitecture Optimizations for the Latest Intel® Processors and Coprocessors

<table>
<thead>
<tr>
<th>Tool/Environment</th>
<th>Intel® Haswell microarchitecture</th>
<th>Intel® Broadwell microarchitecture</th>
<th>Intel® Xeon Phi™ coprocessor</th>
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</thead>
<tbody>
<tr>
<td>Intel® C++ and Fortran Compiler</td>
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<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Intel® TBB library</td>
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<tr>
<td>Intel® MKL library</td>
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<td>✔</td>
</tr>
<tr>
<td>Intel® MPI library</td>
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<td>✔</td>
</tr>
<tr>
<td>Intel® VTune™ Amplifier XE†</td>
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<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Intel® Inspector XE‡‡</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

† Hardware events for new processors added as new processors ship.
‡‡ Analysis runs on multicore processors, provides analysis for multicore and many-core processors.

Windows* support for Intel® Xeon Phi™ Coprocessor
Better Data Mining for Performance Tuning

Configurable:
- Band Height
- Sorting
- Time Scale

Search added to all grid views

Visualize overhead and spin times
Simplified scalability testing for OpenMP*

- Visualize time regions from the fork to the join
- See what is serial, balanced and imbalanced

<table>
<thead>
<tr>
<th>Frame Domain / Frame Type / Function / Call Stack</th>
<th>Frame Time</th>
<th>CPU Time by Utilization</th>
</tr>
</thead>
<tbody>
<tr>
<td>balanced_work$omp$parallel@unknown:114:115</td>
<td>3.652s</td>
<td>820.485s</td>
</tr>
<tr>
<td>[No frame domain - Outside any frame]</td>
<td></td>
<td>32.843s</td>
</tr>
<tr>
<td>imbalanced_work$omp$parallel@unknown:13.135</td>
<td>13.671s</td>
<td>2029.208s</td>
</tr>
</tbody>
</table>

13.671 seconds in an imbalanced region
3.652 seconds in a fairly well balanced region
Incremental Analysis and Easier Suppression Management
More ways to eliminate memory errors

Incremental Leak Analysis

Incremental leak reports, no waiting! Set a base line and see the leaks as they are detected.

Import Suppressions from Purify* & Valgrind* on Linux*

bash-4.1$ inspxe-cl -convert-suppression-file -from=valgrind.sup -to=inspector.sup
Converted old format or third-party suppression file /tmp/my_app/valgrind.sup to /tmp/my_app/inspector.sup.

Users of third party tools can leverage their investment creating suppression files

Improved Error Suppression

Precise Suppressions Remove False Errors Safely

More precise, easy to edit, team shareable. Choose which stack frame to suppress. Eliminate the false, not the real errors

New Product Announcements Embargoed until September 4, 8am Pacific Time

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http://intel.ly/perf-tools
Enhanced MPI Analysis Interface

Streamlined MPI trace analysis

Fresh look-and-feel to the enhanced Intel® Trace Analyzer graphical interface

- More streamlined analysis flow
- Easy access to past projects

Support of dynamic profiling tool command

- MPI_PControl supported

New GUI-based installer on Linux*

*Other brands and names are the property of their respective owners.
Improved Conditional Numerical Reproducibility

Intel® Math Kernel Library now supports unaligned data for conditional numerical reproducibility

- Extends the feature to remove memory alignment as a prerequisite
- Balances performance with reproducible results
- Allows greater flexibility in code branch choice and ensures algorithms are deterministic

“I'm a C++ and Fortran developer and have high praise for the Intel® Math Kernel Library. One nice feature I'd like to stress is the bitwise reproducibility of MKL which helps me get the assurance I need that I'm getting the same floating point results from run to run.”

Franz Bernasek
CEO and Senior Developer, MSTC Modern Software Technology
Enhanced GDB for Linux* and OS X*
Debugs Code on Processors and Coprocessors

New debugger solution for Linux* and OS X* is based on GNU Project Debugger (GDB)* and includes additional improvements & features:

• Improved Fortran support
• GNU GDB 7.5 based

Intel® MIC Architecture Debugging
• Integration into Eclipse* IDE:
  – Supports C/C++ & Fortran
  – Support for offload extensions
  – Multiple coprocessor cards
• Command line debugging of native coprocessor applications also possible with GDB
• Included with Windows*, Linux*, and OS X*

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OpenMP* 4.0 for SIMD and Target Constructs

- C++ and Fortran directives enable vectorization and offloading of execution on devices such as coprocessors or accelerators
  - TARGET Constructs enable creation of a data environment for attached devices, movement of data between host and devices, and execution of constructs on devices
  - SIMD Constructs enable loops and functions to be executed concurrently by a thread team using SIMD vector instructions
- See [http://openmp.org](http://openmp.org) and the OpenMP API Specification Version 4.0 RC2 for our current implementation of the supported features
Expanded C++ 11 support

New in the compiler:
- Unrestricted unions (Linux*, OS X*)
- Non-static data member initializers
- Explicit virtual overrides
- Allowing move constructors to throw
- Defining move special member functions
- Inline namespaces
- Rvalue references v2

Full list C++ 11 support: http://software.intel.com/en-us/articles/c0x-features-supported-by-intel-c-compiler
Expanded Fortran capabilities

Fortran 2003
• Added support for user defined derived-type input and output

Fortran 2008
• ATOMIC_DEFINE and ATOMIC_REF
• Initialization of polymorphic INTENT(OUT) dummy arguments
• Standard handling of G format and of printing the value zero
• Polymorphic source allocation

Co-array now supports Intel® Xeon Phi™ coprocessor
Improved MPI performance and scalability

**Improved MPI application performance and scalability**

- Better Scalability at OFA fabric
- Improved support for NUMA applications and advanced process pinning controls
- Addition of a DAPL* auto-provider functionality for selecting best fabric at startup

Extended support for the Intel® Xeon Phi™ coprocessor architecture for improved bandwidth and latency through:

- Native port of the Tag Matching Interface (TMI) over the Qlogic* PSM fabric
- Extending support for Checkpoint/Restart (BLCR*) on the Intel Xeon Phi coprocessor

Backwards compatibility with existing Intel® MPI Library 4.x applications and Compliant with MPI 2.x

New GUI-based installer

*Other brands and names are the property of their respective owners.

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**Industry Leading Performance with Intel® MPI Library 4.1**

<table>
<thead>
<tr>
<th></th>
<th>IntelMPI 4.1</th>
<th>PlatformMPI 5.2.1</th>
<th>MS MPI 3.4</th>
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<tbody>
<tr>
<td>4 bytes</td>
<td>2.48</td>
<td>2.83</td>
<td>2.98</td>
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<tr>
<td>512 bytes</td>
<td>2.69</td>
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</tr>
<tr>
<td>16 Kbytes</td>
<td>2.64</td>
<td>2.83</td>
<td>2.96</td>
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<tr>
<td>128 Kbytes</td>
<td>3.21</td>
<td>2.83</td>
<td>2.96</td>
</tr>
</tbody>
</table>

Relative (Gooman) MPI Latency Benchmarks on Windows® 64 (Higher is Better)

96 Processes on 8 nodes (InfiniBand + shared memory)

Up to 3.2X as fast as on 8 nodes

Configuration Info: Intel® Xeon® Gold 6138CP (v.10.0), Intel® MPI Library 4.1, Platform MPI 5.2.1, MS MPI 3.4. Intel® MPI Benchmarks 3.2.4 Hardware: Intel® Xeon® CPU Xeon E5-2680v3 2.50GHz, 16MB 2D Lockstep 10 Core. Qlogic® InfiniBand 57600 FDR card. Operating System: Windows® Server 2008 R2 x64. Hardware Edition. Notes: 96 Processes on 8 nodes (InfiniBand - shared memory). All Intel® MPI libraries were built with the Intel® C++ Compiler 17.1. Update 10 for windows®.
Webinars – Technical Training Online!

New Product Announcements Embargoed until September 4,
8am Pacific Time
**Introduction to High Performance Application Development for Multicore and Manycore-Live webinar- 2 Day Series**

**When:**  
- **Pacific Time Zone** - Day 1 - Sept 24th & Day 2 - Sep 25th  
  7:45am/8:00am Start  
- **EMEA Time Zone (GMT+1)** - Day 1 - Oct 8th & Day 2 - Oct 9th  
  8:45am/9:00am Start

**Where:**  
Online

**Who:**  
High Performance Application Developers

**Agenda for the Days (Must Register for Each Day)**

<table>
<thead>
<tr>
<th>Live Webinar Day 1</th>
<th>Live Webinar Day 1</th>
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<tbody>
<tr>
<td><strong>Session 1</strong></td>
<td>Intel® Math Kernel Library (Intel® MKL) on the Intel® Xeon Phi™ coprocessor</td>
</tr>
<tr>
<td>Welcome and Introduction to Developing Applications for Intel® Xeon and Intel® Xeon Phi processors and coprocessors</td>
<td><strong>Session 1</strong></td>
</tr>
<tr>
<td><strong>Session 2</strong></td>
<td>Message Passing Interface (MPI) on Intel® Xeon Phi™ coprocessor: special considerations for MPI on Intel Xeon Phi and Intel® Trace Analyzer &amp; Collector</td>
</tr>
<tr>
<td>Introduction to Intel® Xeon Phi™ coprocessor hardware and software architecture: native and offload execution basics</td>
<td><strong>Session 2</strong></td>
</tr>
<tr>
<td><strong>Session 3</strong></td>
<td>Performance analysis and events: Intel® VTune Amplifier introduction, GUI and command line, setup and collection, hot spots, bandwidth, events &amp; more</td>
</tr>
<tr>
<td>Compilation for Intel® Xeon Phi™ coprocessor: vectorization, programming models, alignment, pre-fetch, &amp; more</td>
<td><strong>Session 3</strong></td>
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<tr>
<td><strong>Session 4</strong></td>
<td>Attendee Q&amp;A, wrap-up</td>
</tr>
<tr>
<td>Debugging on Intel® Xeon Phi™ coprocessor: using The GNU Project Debugger (GDB)</td>
<td><strong>Session 4</strong></td>
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http://intel.ly/perf-tools
## Fall/Winter Technical Webinar Series

<table>
<thead>
<tr>
<th>Day</th>
<th>Time**</th>
<th>Title</th>
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<tbody>
<tr>
<td>17-Sep</td>
<td>9:00AM</td>
<td>Announcing Intel® Parallel Studio XE SP1 &amp; Intel® Cluster Studio XE SP1 - What's New</td>
</tr>
<tr>
<td>18-Sep</td>
<td>9:00 AM</td>
<td>Powering up your Fortran Applications in the neo-heterogenous World with Intel® Xeon Processors &amp; Intel® Xeon Phi™ Coprocessors on Linux and Windows*</td>
</tr>
<tr>
<td>Sep 24 &amp; 25</td>
<td>6:45 &amp; 7:00 AM</td>
<td>Intel® Xeon® &amp; Xeon® Phi™- Introduction to High Performance Application Development for Multicore and Manycore- Live</td>
</tr>
<tr>
<td>1-Oct</td>
<td>9:00 AM</td>
<td>Become a C++ Hot Spot Hotshot with Intel® Parallel Studio XE</td>
</tr>
<tr>
<td>8-Oct</td>
<td>9:00 AM</td>
<td>Finding the right fit for your application on Intel® Xeon and Intel® Xeon Phi™ processors</td>
</tr>
<tr>
<td>15-Oct</td>
<td>9:00 AM</td>
<td>Powered by MKL Accelerating NumPy and SciPy performance with Intel(r) MKL- Python</td>
</tr>
<tr>
<td>22-Oct</td>
<td>9:00AM</td>
<td>Introduction to OpenMP 4.0 for SIMD and affinity features with Intel® Xeon processors and Intel® Xeon Phi™ coprocessors</td>
</tr>
<tr>
<td>29-Oct</td>
<td>9:00 AM</td>
<td>Secrets of Performance Profiling – an introduction to Intel® VTune™ Amplifier XE</td>
</tr>
<tr>
<td>29-Oct</td>
<td>11:00 AM</td>
<td>Profiling MPI Communications - Tips and Techniques for High Performance</td>
</tr>
<tr>
<td>30-Oct</td>
<td>9:00 AM</td>
<td>Advanced Profiling with Intel® VTune™ Amplifier XE Part 1: Find the bottleneck</td>
</tr>
<tr>
<td>30-Oct</td>
<td>11:00 AM</td>
<td>Advanced Profiling with Intel® VTune™ Amplifier XE Part 2: Tune for Haswell (Sandy Bridge and Ivy Bridge)</td>
</tr>
<tr>
<td>5-Nov</td>
<td>9:00 AM</td>
<td>Software Architects: Design and prototype scalable threading using Intel® Advisor XE</td>
</tr>
<tr>
<td>6-Nov</td>
<td>9:00 AM</td>
<td>Precision Memory Leak Detection using the new on-demand leak detection in Intel® Inspector XE</td>
</tr>
<tr>
<td>12-Nov</td>
<td>9:00 AM</td>
<td>Porting and Tuning of Lattice QCD* and MPI-HMMER* for Intel® Xeon Processors &amp; Intel® Xeon Phi™ Coprocessors</td>
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**Time Zone – Pacific Time

Pricing and Availability

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<tr>
<th>Includes</th>
<th>Intel® C++ Composer XE</th>
<th>Intel® Fortran Composer XE</th>
<th>Intel® Advisor XE</th>
<th>Intel® Inspector XE</th>
<th>Intel® VTune™ Amplifier XE</th>
<th>Intel® MPI Library</th>
<th>Intel® Trace Analyzer and Collector</th>
<th>Price</th>
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<tr>
<td>Intel® Cluster Studio XE</td>
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<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>$2,949</td>
</tr>
</tbody>
</table>

Additional configurations including, floating and academic, are available at: [http://intel.ly/perf-tools](http://intel.ly/perf-tools)
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Notice revision #20110804
Intel® Compiler 14.0 benchmark configuration
