



Intel® Cluster Toolkit 2011

Release Notes

Revision: 20101109

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Overview

Intel® Cluster Toolkit 2011 for Linux* OS and Microsoft* Windows* Compute Cluster Server OS* (Microsoft Windows CCS*) accelerate parallel software development on homogenous cluster systems based on IA-32, or Intel® 64 architectures. The Microsoft Windows CCS operating system only supports Intel® 64 architecture. In terms of the Intel® Cluster Toolkit software for Windows*, consider references within this document to Microsoft Windows CCS OS, and Microsoft* Windows* HPC Server 2008 OS as interchangeable. The Microsoft Windows CCS and Microsoft Windows HPC Server 2008 operating systems only support Intel® 64 architecture.

Intel Cluster Toolkit 2011 supports application development using Intel® MPI Library with optimized parallel libraries, performance analysis, and benchmarks. Intel Cluster Toolkit 2011 saves software developers time and improves execution performance on distributed computing systems.

Intel Cluster Toolkit 2011 for Linux and Microsoft Windows CCS supports crucial parts of the message-passing interface (MPI) application development process including:

- Intel MPI Library 4.0 Update 1 which is approaching conformity with the Message Passing Interface 2 Standard (MPI-2), enables multiple interconnect solutions with a single implementation. Intel seeks to be a software leader in MPI and open standards.
- The Intel® Trace Analyzer and Collector 8.0 Update 1 (ITAC)
 - Intel® Trace Collector 8.0 Update 1 (ITC) provides event-based tracing in cluster applications through an instrumentation library that causes low-overhead in execution. The trace information provides performance data, statistics, multi-threaded events, and automatic instrumentation of user binaries on IA-32 architectures.
 - The Intel® Trace Analyzer 8.0 Update 1 (ITA) provides visual analysis of application activities gathered by the Intel Trace Collector. This software component has been completely rewritten.
 - A message checking component of the Intel Trace Collector provides a novel MPI correctness technology which detects errors with data types, buffers, communicators, point-to-point messages and collective operations, deadlocks, and data corruption.
- Application tuning with optimized mathematical library functions from Intel® Math Kernel Library 10.3 (Intel® MKL 10.3) that includes ScaLAPACK* solvers and Cluster DFTs (Discrete Fourier Transforms).
- Intel® MPI Benchmarks 3.2.2 make it easy to gather performance information about a cluster system.

Note that when the system administrator or user completes the Intel Cluster Toolkit 2011 installation process, there will be a file called `Doc_Index.htm` in the `doc` folder on the master node of the cluster. This file can be used as a documentation map to navigate to various information resources pertaining to the Intel Cluster Toolkit. Additional information about the exact location of `Doc_Index.htm`, and its content

are further described in the [Installation Notes](#) section of this release notes document.

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Product Contents

Below is a table of product components, including documentation file names for those components.

Tool	Version	Manual	Revision
Intel® MPI Library	4.0 Update 1	Doc_Index.html for Linux* Doc_Index.htm for Microsoft* Windows* CCS*	4.0 Update 1
Intel® Trace Analyzer and Collector	8.0 Update 1	ITA_Reference_Guide.pdf ITC_Reference_Guide.pdf	8.0 Update 1
Intel® Math Kernel Library	10.3	mkl_documentation.htm	10.3
Intel® MPI Benchmarks	3.2.2	IMB_Users_Guide.pdf	3.2.2

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New Features

Intel® Cluster Toolkit 2011

- With one installation session, the Intel Cluster Tools installer on Linux* OS or Windows* OS will install:
 - Intel® MPI Benchmarks 3.2.2
 - Intel® MKL 10.3
 - Intel® MPI Library 4.0 Update 1
 - Intel® Trace Analyzer and Collector 8.0 Update 1

Intel® MPI Library 4.0 Update 1 for Linux* OS

The Intel® MPI Library 4.0 Update 1 for Linux* OS includes the following new features compared to the Intel® MPI Library 4.0 (see product documentation for more details):

- Library updates for 60K processes
- Improving Direct Access Programming Library (DAPL*) UD* (Unreliable Datagram) startup for 60K processes
- Improving OFA* (Open Fabrics Alliance) startup for 60K processes
- Progress engine optimizations for 60K processes
- Hydra for 60K processes (minimum functionality)
- Process pinning for Hydra* (part of the Cluster of European Research projects)
- Multi-core optimization
- Dynamic process support for DAPL* UD (Unreliable Datagram)

Intel® MPI Library 4.0 Update 1 for Windows* OS

The Intel® MPI Library 4.0 Update 1 for Windows* OS includes the following new features compared to the Intel® MPI Library 4.0 (see product documentation for more details):

- Performance and scalability improvements
 - Further optimization to several collective algorithms
- Usability improvements
 - Extended process pinning control for hybrid applications through I_MPI_PIN_DOMAIN and I_MPI_PIN_CELL environment variables
 - Improved mpitune for easier application tuning
- Extended interoperability
 - Intel® Composer XE 12.0 support

Intel® Math Kernel Library (MKL) 10.3

New in Intel® MKL 10.3 for Linux* OS and for Windows* OS

- BLAS
 - New functions for computing 2 matrix-vector products at once: [D/S]GEM2VU, [Z/C]GEM2VC
 - New functions for computing mixed precision general matrix-vector products: [DZ/SC]GEMV
 - New function for computing the sum of two scaled vectors: *AXPBY
 - Intel® AVX optimizations in key functions: SMP LINPACK, level 3 BLAS, DDOT, DAXPY
- LAPACK
 - New C interfaces for LAPACK supporting row-major ordering

- Integrated Netlib LAPACK 3.2.2 including one new computational routine (*GEQRFP) and two new auxiliary routines (*GEQR2P and *LARFGP) and the earlier LAPACK 3.2.1 update
- Intel® AVX optimizations in key functions: DGETRF, DPOTRF, DGEQRF
- PARDISO
 - Improved performance of factor and solve steps in multi-core environments
 - Introduced the ability to solve for sparse right-hand sides and perform partial solves—produces partial solution vector
 - Improved performance of the out-of-core (OOC) factorization step
 - Support for zero-based (C-style) array indexing
 - Zeros on the diagonal of the matrix are no longer required in sparse data structures for symmetric matrices
 - New ILP64 PARDISO interface allows the use of both LP64 and ILP64 versions when linked to the LP64 libraries
 - The memory required for storing files on the disk in OOC mode can now be estimated just after reordering
- Sparse BLAS
 - Format conversion functions now support all data types (single and double precision for real and complex data) and can return sorted or unsorted arrays
- FFTs
 - New MPI FFTW 3.3alpha1 wrappers cover new cluster functionality
 - Improved load-balancing of cluster FFTs provides improved performance
 - Intel AVX optimizations in all 1D/2D/3D FFTs
 - Improved performance of 2D and 3D mixed-radix FFTs for single and double precision data for all systems supporting the SSE4.2 instruction set
 - Support for split-complex data represented as two real arrays introduced for 2D/3D FFTs
 - Support for 1D complex-to-complex transforms of large prime lengths
 - Introduced Hybrid parallelism (MPI + OpenMP*) on cluster 1D complex transforms and increased performance on vector lengths which are a multiple of the number of MPI processes
- VML
 - A new function for computing $(ax+b)/(cy+d)$ where a , b , c , and d are scalars, and x and y are real vectors: `v[s/d]LinearFrac()`
 - Intel AVX optimizations for real functions

- A new mode for setting denormals to zero, overflow support for complex vectors, and for every VML function a new function with an additional parameter for setting the accuracy mode
- VSL
 - A set of new Summary Statistics functions was added covering basic statistics, covariance and correlation, pooled, group, partial, and robust covariance/correlation, quantiles and streaming quantiles, outliers detection algorithm, and missing values support
- Performance optimized algorithms: MI algorithm for support of missing values, TBS algorithm for computation of robust covariance, BACON algorithm for detection of outliers, ZW algorithm for computation of quantiles (streaming data case), and 1PASS algorithm for computation of pooled covariance
 - Improved performance of SFMT19937 Basic Random Number Generator (BRNG)
 - Intel® AVX optimizations: MT19937 and MT2203 BRNGs
- Documentation: Product documentation is available in the Microsoft Help Viewer* 1.x format that integrates with Microsoft Visual Studio* 2010
- Added runtime dispatching dynamic libraries allowing link to a single interface library which loads dependent libraries dynamically at runtime depending on runtime CPU detection and/or library function calls
- The custom dynamic libraries builder now uses the runtime dispatching dynamic libraries on the Linux* and Mac OS* X operating systems
- A new directory structure has been established to simplify integration of Intel MKL with the Intel® Parallel Studio XE family of products and directories formerly designated as "em64t" are now designated by the "intel64" tag
- Intel® Itanium® architecture (IA-64) support is not included in this release. Intel® MKL 10.2 is the latest release for IA-64
- The sparse solver functionality has been fully integrated into the core Intel MKL libraries and the libraries with "solver" in the filename have been removed from the product

Intel® Trace Analyzer and Collector 8.0 Update 1

New in Intel® Trace Analyzer and Collector 8.0 Update 1

- Merge separation
- STF summary records
- Raw data zipping
- Microsoft Windows* 7 OS support

- Microsoft Windows Server 2008 R2* support

Intel® MPI Benchmarks 3.2.2

New in Intel® MPI Benchmarks 3.2.2

- Support of large message buffers greater than 2 gigabytes for some MPI collective benchmarks (e.g., Allgather, Alltoall, Gather, and Scatter) so as to support large core counts.
- New benchmarks PingPongSpecificSource and PingPingSpecificSource. The exact destination rank is used for these tests instead of MPI_ANY_SOURCE as in the PingPong and PingPing tests. These two tests are not executed by default. Use the `-include` option to enable execution of the new benchmarks. For example:

```
$ mpirun -n 2 IMB_MPI -include PingPongSpecificSource \
    PingPingSpecificSource
```
- New options `-include/-exclude` to better control execution of the benchmarks list. Use these options to include or exclude benchmarks from the default execution list.
- These new Intel® MPI Benchmark features are documented in the [Intel® MPI Benchmarks User Guide](#).

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Resolved Issues

Bug Number	Title of Bug Report
DPD200144666	Windows Request to add "-mapall" Makefile Variable to ScaLAPACK "makefile"
DPD200187261	[INS] - PATH Environment Variable for Intel Cluster Studio on Windows may be Exceeding the Storage Limits Established by Microsoft
DPD200194300	[DOC] Misprint in Installation Guide for Intel(R) Cluster Studio 2011 for Windows* OS
DPD200194051	[DOC] No link to Installation Guide in ICT 2011 Doc Index
DPD200194064	Different answers to prerequisites question in ICT 2001 and ICS 2011 FAQ
DPD200194078	[DOC] Outdated note regarding mpich support in FAQ

DPD200194085	[DOC] Invalid IMB version in ICT 2011 Installation Guide
DPD200194127	[DOC] Red Hat support marked as new feature in Release Notes
DPD200194580	[DOC] Bad lists formatting in Cluster Studio Release Notes
DPD200194729	[DOC] Broken links in ICT 2011 Doc Index
DPD200194731	[DOC] Bad lists formatting in ICT and ICS 2011 FAQ
DPD200194824	[DOC] Outdated link to Red Hat knowledge base in FAQ
DPD200193668	[INS] Intel Cluster Tools Installer on Linux (Request for Parity between the Linux and Windows Installers)
DPD200195888	[DOC][LGL] Irrelevant message about Intel Cluster Studio in Intel's Cluster Toolkit Getting Started Guide
DPD200195885	[LGL] Inconsistency in copyright dates in sshconnectivity.exp output

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System Requirements

Processor System Requirements

Intel® Pentium® 4 processor, or

Intel® Xeon® processor, or

Intel® Core™2 Duo processor (example of Intel® 64 architecture)

NOTE: It is assumed that the processors listed above are configured into homogeneous clusters.

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Disk-Space Requirements

20 GBs of disk space (minimum)

NOTE: During the installation process the installer may need up to 4 gigabytes of temporary disk storage to manage the intermediate installation files.

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Operating System Requirements

OS Distributions	IA-32 Architecture	Intel® 64 Architecture	
		32-Bit Applications	64-Bit Applications
Red Hat Enterprise Linux* 4.0	S	S	S
Red Hat Enterprise Linux* 5.0	S	S	S
SUSE Linux Enterprise Server* 10	S	S	S
SUSE Linux Enterprise Server* 11	S	S	S
Microsoft* Windows* Compute Cluster Server (Microsoft Windows CCS*)	N/A	S	S
Microsoft* Windows* HPC Server 2008	N/A	S	S

S = Supported

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Memory Requirements

2 GB of RAM (minimum)

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Intel® Professional Edition C++ Compiler and Intel® Fortran Compilers

For all of the Intel® architectures, the version number on the Intel compilers should be 10.1 or greater.

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Installation Notes

Links are provided to documentation for doing installs on either Linux* OS or Microsoft* Windows CCS OS.

Installation and Uninstalling on Linux* OS

To begin installation on Linux* OS follow the instructions provided in the **Intel® Cluster Toolkit for Linux* OS Installation Guide**.

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Installation and Uninstalling on Microsoft Windows CCS* OS

To begin installation on Microsoft Windows CCS* OS follow the instructions provided in the **Intel® Cluster Toolkit for Microsoft* Windows* Compute Cluster Server OS Installation Guide**.

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Documentation

The documentation index file provides hyperlinks to the **Intel® Cluster Toolkit** documentation.

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Known Limitations

1. There have been situations where during the installation process, /tmp has filled up. We recommend that you have at least one gigabyte of free space in /tmp when doing an install of the Intel® Cluster Toolkit. Also, the installer script `install.sh` has the command-line options:

`--tmp-dir=<PATH>`

or

-t=<PATH>

which can direct the use of intermediate storage to another disk partition referenced by <PATH>.

2. On Linux* OS, if any software component of the Intel® Cluster Toolkit is detected as having already been pre-installed on the head node, that software component will not be processed by the cluster toolkit installer. There is a similar problem on Windows* OS in the 'Modify' mode of the cluster toolkit installer. For Windows* OS, if some software component of the Intel® Cluster Toolkit is pre-installed on the head node using the cluster toolkit installer, that software component will not be installed on the compute nodes of the cluster. For either Linux* OS or Windows* OS, if you already installed some of the software components on only the head node, and you want to install them on the other nodes using the cluster toolkit installer, you will need to uninstall such components from the head node manually before starting the cluster toolkit installer.

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Technical Support

Your feedback is very important to us. To receive technical support for the tools provided in this product and technical information including FAQ's and product updates, you need to register for an Intel Premier Support account at the [Registration Center](#).

NOTE: Registering for support varies for release product or pre-release products (alpha, beta, etc) - only released software products have support web pages at <http://software.intel.com/sites/support/>.

To register for an account, please visit the Intel® Registration Center web site at <http://www.intel.com/software/products/registrationcenter/index.htm>. If you have forgotten your password, please email a request to: quadsupport@mailbox.intel.com. Please do not email your technical issue to this email address.

The product support web site, <http://software.intel.com/en-us/articles/intel-cluster-toolkit-support-resources/>, provides top technical issues, [FAQs & Known Issues](#), [Documentation and Training](#), and product errata.

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Submitting Issues

To submit an issue via the Intel Premier Support website, please perform the following steps:

1. Ensure that Java* and JavaScript* are enabled in your browser.
2. Go to <https://premier.intel.com/>.
3. Type in your Login and Password. Both are case-sensitive.
4. Click the "Submit Issues" button in the left margin.
5. Read the Confidentiality Statement and click the "I Accept" button.
6. Click on the "Go" button next to the "Product" drop-down list.
7. Click on the "Submit Issue" link in the left navigation bar.
8. Choose "Development Environment (tools, SDV, EAP)" from the "Product Type" drop-down list.
9. If this is a software or license-related issue choose "Intel(R) Cluster Toolkit" from the "Product Name" drop-down list.
10. Enter your question and complete the fields in the web-page windows that follow to successfully submit the issue.

Please follow these guidelines when forming your problem report or product suggestion:

1. Describe your difficulty or suggestion. For problem reports, please be as specific as possible (e.g., including compiler and link command line options), so that we may reproduce the problem. Please include a small test case if possible.
2. Describe your system configuration information. Be sure to include specific information that may be applicable to your setup: operating system, name and version number of installed applications, and anything else that may be relevant to helping us address your concern.

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Intel recommends that you evaluate other library products to determine which best meets your requirements.

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