Intel® Parallel Studio XE 2017 Update 5 for macOS* Installation Guide and Release Notes

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1. Introduction

Intel® Parallel Studio XE Composer Edition Fortran includes the Intel® Fortran compiler and the Intel® Math Kernel Library.

Intel® Parallel Studio XE Composer Edition C++ includes the Intel® C++ compiler, Intel® Math Kernel Library, Intel® Performance Primitives, Intel® Threading Building Blocks, and Intel® Data Analytics Acceleration Library (Intel® DAAL).

This document describes how to install the product, provides a summary of new and changed features and includes notes about features and problems not described in the product documentation.

On completing the Intel® Parallel Studio XE installation process, locate the getstart*.htm file in the documentation_2017 folder under the target installation path. This file is a documentation map to navigate to various information resources of the Intel® Parallel Studio XE.

By using any of the Intel® Parallel Studio XE 2017 components you agree to participate in the Intel® Software Improvement Program. Intel may automatically receive anonymous information about how you use this product. No personally identifiable information is collected and you will receive no additional follow-up emails due to this program. Intel is committed to respecting your privacy. To learn more about Intel's privacy practices, please visit http://www.intel.com/privacy.

1.1 What Every User Should Know About This Release

- This is the Fifth update of Intel® Parallel Studio XE 2017

1.2 What's New

This section highlights important changes from the previous product version. For more information on what is new in each component, please read the individual component release notes. The latest documentation for all components can be found at https://software.intel.com/en-us/intel-parallel-studio-xe-support/documentation.

Changes in Update 4

- Support Xcode* 8.3
- Intel® Math Kernel Library (Intel® MKL), Intel® Integrated Performance Primitives (Intel® IPP) are distributed under Intel Simplified Software License. Intel® Threading Building Blocks (Intel® TBB) for Linux*, and macOS*, Intel® Data Analytics Acceleration Library (Intel® DAAL) for Linux*, and macOS* are distributed under Apache License, Version 2.0. See `compilers_and_libraries_2017/licensing/` folder under the target installation path for reference

Changes in Update 2

- Supporting macOS* 10.12.1 and Xcode* 8.2
- Fixes for reported problems

Changes in Update 1

- Supporting macOS* 10.12 and Xcode* 8

- Fixes for reported problems

Changes since Intel® Parallel Studio XE 2016

- All components updated to current versions
- Intel® Threading Building Blocks: see `[install-dir]/documentation_2017/en/tbb/common/CHANGES` for details.
    - `static_partitioner` class is now a fully supported feature.
    - `async_node` class is now a fully supported feature.
    - Improved dynamic memory allocation replacement on Windows* OS to skip DLLs for which replacement cannot be done, instead of aborting.
    - For 64-bit platforms, quadrupled the worst-case limit on the amount of memory the Intel TBB allocator can handle.
    - Added `TBB_USE_GLIBCXX_VERSION` macro to specify the version of GNU `libstdc++` when it cannot be properly recognized, e.g. when used with Clang on Linux* OS. Inspired by a contribution from David A.
    - Added graph/stereo example to demostrate `tbb::flow::async_msg`.
    - Removed a few cases of excessive user data copying in the flow graph.
    - Reworked `split_node` to eliminate unnecessary overheads.
    - Added support for C++11 move semantics to the argument of `tbb::parallel_do_feeder::add()` method.
    - Added C++11 move constructor and assignment operator to `tbb::combinable` template class.
    - Added `tbb::this_task_arena::max_concurrency()` function and `max_concurrency()` method of class `task_arena` returning the maximal number of threads that can work inside an arena.
    - Deprecated `tbb::task_arena::current_thread_index()` static method; use `tbb::this_task_arena::current_thread_index()` function instead.
    - All examples for commercial version of library moved online: https://software.intel.com/en-us/product-code-samples. Examples are available as a standalone package or as a part of Intel® Parallel Studio XE or Intel® System Studio Online Samples packages.

    Changes affecting backward compatibility:
    - Renamed following methods and types in `async_node` class:

      Old → New

      ```
      async_gateway_type => gateway_type
      async_gateway()    => gateway()
      async_try_put()    => try_put()
      async_reserve()    => reserve_wait()
      async_commit()     => release_wait()
      ```
    - Internal layout of some flow graph nodes has changed; recompilation is recommended for all binaries that use the flow graph.
- Intel® Data Analytics Acceleration Library:
    - Added support of a new Neural Network layer “softmax with cross-entropy loss”.

    - Added quality metrics for linear regression.
    - Improved interfaces (methods in classes for support of Neural Network based computations).
- Documentation updates
- Tutorials and sample codes have been removed from installation packages and are now available online at Intel® Software Product Samples and Tutorials
- Intel® Data Analytics Acceleration Library removed from Fortran language only editions.
- All updates in one major version of the compiler are now supported in Xcode* IDE integration
- Intel® compiler support for additional features in OpenMP* 4.0 and 4.5 Specifications
- Intel® C++ compiler support for features in C++14 and support for C11 feature `_Atomic`
- Intel® Fortran compiler support for more features in Fortran 2008 and Draft Fortran 2015
- A single high level compiler switch `-fp-model consistent` to generate code that will give consistent, reproducible floating-point results between different runs, optimization levels and processors or microarchitectures, for single-threaded code.
- Compiler options to annotate source files with compiler optimization reports
- Code alignment attribute (C++) or directive (Fortran) for functions; code alignment pragma or directive for a specified loop; compiler options to align all loops (or not).

1.3 Product Contents

*Intel® Parallel Studio XE 2017 Composer Edition for macOS** includes the following components:

The table below lists the product components and related documentation.

Component	Version	On-Disk Documentation	Release Notes
Intel® C++ Compiler	17.0 Update 5	documentation_2017/en/ps2017/get_started_mc.htm	http://intel.ly/1Mai0Nh
Intel® Fortran Compiler	17.0 Update 5	documentation_2017/en/ps2017/get_started_mf.htm	http://intel.ly/1Mai0Nh
Intel® Integrated Performance Primitives (Intel® IPP)	2017 Update 3	• documentation_2017/en/ipp/ps2017/get_started.htm • Obtain the cryptography package	http://intel.ly/1Mai0Nh
Intel® Math Kernel Library (Intel® MKL)	2017 Update 4	• documentation_2017/en/mkl/ps2017/get_started.htm	http://intel.ly/1Mai0Nh

		• Attributions	
Intel® Threading Building Blocks (Intel® TBB)	2017 Update 8	documentation_2017/en/tbb/common/get_started.htm	http://intel.ly/1Mai0Nh
Intel® Data Analytics Acceleration Library (Intel® DAAL)	2017 Update 4	documentation_2017/en/daal/ps2017/get_started.html	http://intel.ly/1Mai0Nh
GNU* Project Debugger (GDB*) (GPL licensed)	7.10	documentation_2017/en/debugger/ps2017/gdb.pdf	http://intel.ly/1Mai0Nh
Integration into the Xcode* development environment		C++: documentation_2017/en/ps2017/get_started_mc.htm Fortran: documentation_2017/en/ps2017/get_started_mf.htm	http://intel.ly/1Mai0Nh

1.4 Additional Information for Intel-provided Debug Solutions

The Intel-provided Debug solutions are based on GNU* GDB. Please see https://software.intel.com/en-us/articles/intel-parallel-studio-xe-2017-composer-edition-fortran-debug-solutions-release-notes and https://software.intel.com/en-us/articles/intel-parallel-studio-xe-2017-composer-edition-c-debug-solutions-release-notes for information specific to this component.

1.5 System Requirements

For an explanation of architecture names, see http://intel.ly/q9JVjE

- A 64-bit Intel®-based Apple* Mac* system host (development for 32-bit is still supported)
- 2GB RAM minimum, 4GB RAM recommended
- 7GB free disk space
- One of the following combinations of OS X*, Xcode* and the Xcode SDK:
  - Xcode* 7.x and 8.x
  - OS X* 10.11 and macOS* 10.12
- If doing command line development, the Command Line Tools component of Xcode* is required

Note: Advanced optimization options or very large programs may require additional resources such as memory or disk space.

1.6 Documentation

Product documentation can be found in the `documentation_2017` folder as shown under Installation Folders.

Optimization Notice

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.

Notice revision #20110804

1.7 Samples

Tutorials and sample codes have been removed from installation packages and are now available online at Intel® Software Product Samples and Tutorials

1.8 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 are encouraged to register your product at the Intel® Software Development Products 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® Software Development Products Registration Center website at http://www.intel.com/software/products/registrationcenter/index.htm. If you have forgotten your password, please follow the instructions on the login page for forgotten password.

Product support requests can be submitted via the Online Service Center at http://www.intel.com/supporttickets. Visit our Frequently Asked Questions page for Online Service Center assistance at https://software.intel.com/en-us/faq/online-service-center. When submitting a support request, please select the appropriate component tool unless your request is related to the entire suite.

2 Installation Notes

The installation of the product requires a valid license file or serial number. If you are evaluating the product, you can also choose the "Evaluate this product (no serial number required)" option during installation.

If you will be using Xcode*, please make sure that a supported version of Xcode is installed. If you install a new version of Xcode in the future, you must reinstall the Intel Parallel Studio XE 2017 afterwards.

The `Command Line Tools` component, required for command-line development, is not installed by default. It can be installed using the Components tab of the Downloads preferences panel.

You will need to have administrative or "sudo" privileges to install, change or uninstall the product.

Follow the prompts to complete installation.

Note that there are several different downloadable files available, each providing different combinations of components. Please read the download web page carefully to determine which file is appropriate for you.

You do not need to uninstall previous versions or updates before installing a newer version – the new version will coexist with the older versions.

2.1 Installation on macOS* 10.11

macOS* 10.11 introduces a new security policy called System Integrity Protection. This significantly impacts certain installation scenarios. Please see macOS* 10.11 Support in Intel® Parallel Studio XE 2016 for important information before attempting to install on macOS* 10.11.

2.1.1 Intel® Parallel Studio XE Data Collection

When you install Intel Parallel Studio XE, we collect information that helps us understand your installation status and environment. Information collected is anonymous and is not shared outside of Intel. See here for more information on what is collected and how to opt-out.

2.2 License Changes

The 'named-user' license provisions in the Intel software EULA (available as 'EULA.rtf' or 'EULA.txt' in the same product directory as this release note) changed to only allow the software to be installed on up to three systems. During the Intel® Parallel Studio XE 2017 program, product licensing will be updated to check for this when it checks for valid licenses, and it will track systems by the system host ID. In order to install on another system after you have reached this limit, you will need to release an old system host ID from the registration system

As an additional consequence to this change as well as some changes to the license design, you will need an updated license to use the production version of Intel® Parallel Studio XE 2017. Additional information is provided here. If you have further questions or concerns, please contact Technical Support.

2.3 Online Installation now available

The electronic installation package for Intel® Parallel Studio XE offers as an alternative a smaller installation package that dynamically downloads and then installs packages selected to be installed. This requires a working internet connection and potentially a proxy setting if you are behind an internet proxy. Full packages are provided alongside where you download this online install package if a working internet connection is not available. The online installer may be downloaded and saved as an executable file which can then be launched from the command line.

2.3.1 Storing Online Installer Download Content

The online installer stores the downloaded content in the form-factor of the standard install package which can then be copied and reused offline on other systems. The default download location is `/var/[login]/Downloads`. This location may be changed with the `INTEL_SWTOOLS_DOWNLOAD_DIR` environment variable. The online installer also supports a download only mode which allows the user to create a package without installation. This mode is enabled with the `INTEL_SWTOOLS_DOWNLOAD_DIR` environment variable.

2.4 Intel® Software Manager

The installation now provides an Intel® Software Manager to provide a simplified delivery mechanism for product updates and provide current license status and news on all installed Intel® software products.

You can also volunteer to provide Intel anonymous usage information about these products to help guide future product design. This option, the Intel® Software Improvement Program, is not enabled by default – you can opt-in during installation or at a later time, and may opt-out at any time. For more information please see http://intel.ly/SoftwareImprovementProgram.

2.5 Using a License Server

If you have purchased a "floating" license, see http://intel.ly/pjGfwC for information on how to install using a license file or license server. This article also provides a source for the Intel® License Server that can be installed on any of a wide variety of systems.

2.6 Support of Non-Interactive Custom Installation

Intel Parallel Studio XE supports the saving of user install choices during an 'interactive' install in a configuration file that can then be used for silent installs. This configuration file is created when the following option is used from the command line install:

- `export INTEL_SWTOOLS_DUPLICATE_MODE=config_file_name`: it specifies the configuration file name. If full path file name is specified, the

INTEL_SWTOOLS_DOWNLOAD_DIR environment variable is ignored and the installable package will be created under the directory where the configuration file is.

- export INTEL_SWTOOLS_DOWNLOAD_DIR=dir_name: optional, it specifies where the configuration file will be created. If this option is omitted, the installation package and the configuration file will be created under the default download directory:

  /tmp/intel/downloads/<package_id>

2.7 Installation Folders

In an effort to improve and more tightly unify the user experience when using multiple compilers and libraries from multiple Intel® Software Development Tools, the directory layout has changed in this release of Intel® Parallel Studio XE. This directory structure should remain stable for the next future major release. If you have questions, please see this explained in more detail at http://intel.ly/1Nn2GjV.

The compiler installs, by default, under /opt/intel – this is referenced as <install-dir> in the remainder of this document. You are able to specify a different location.

Under <install-dir> are the following directories (not all may be present in a given installation):

- bin – contains symbolic links to executables for the latest installed version
- lib – symbolic link to the lib directory for the latest installed version
- include – symbolic link to the include directory for the latest installed version
- man – symbolic link to the directory containing man pages for the latest installed version
- ipp – symbolic link to the directory for the latest installed version of Intel® Integrated Performance Primitives
- mkl – symbolic link to the directory for the latest installed version of Intel® Math Kernel Library
- tbb – symbolic link to the directory for the latest installed version of Intel® Threading Building Blocks
- daal – symbolic link to the directory for the latest installed version of Intel® Data Analytics Acceleration Library (Intel® DAAL).
- ism – contains files for Intel® Software Manager
- compilers_and_libraries – symbolic link to the compilers_and_libraries_2017 directory
- compilers_and_libraries_2017 – directory containing symbolic links to subdirectories for the latest installed Intel® C++ Compiler and Libraries 2017 release
- compilers_and_libraries_2017.<n>.<pkg> - physical directory containing files for a specific compiler and libraries version. <n> is the update number, and <pkg> is a package build identifier.
- documentation_2017 – directory containing documentation for Intel® Parallel Studio XE 2017

- `ide_support_2017` – directory containing IDE integration files for Intel® Parallel Studio XE 2017
- `parallel_studio_xe_2017.<n>.<pkg>` - directory containing license and support information for Intel® Parallel Studio XE 2017, uninstall application, and symbolic links to Intel Parallel Studio XE 2017 components
- `debugger_2017` – directory containing subdirectories with debugger environment scripts, libraries, and binaries for various debugging scenarios

Each `compilers_and_libraries_2017` directory contains a mac subdirectory that contains the following directories that reference the latest installed compilers and libraries for Intel® Parallel Studio XE 2017:

- `bin` – directory containing scripts to establish the compiler and libraries environment and symbolic links to compiler executables for the host platform
- `pkg_bin` – symbolic link to the compiler `bin` directory
- `include` – symbolic link to the compiler `include` directory
- `lib` – symbolic link to the compiler `lib` directory
- `ipp` – symbolic link to the `ipp` directory
- `mkl` – symbolic link to the `mkl` directory
- `tbb` – symbolic link to the `tbb` directory
- `daal` – symbolic link to the `daal` directory
- `documentation` – symbolic link to the `documentation_2017` directory

Each `compilers_and_libraries_2017.<n>.<pkg>` directory contains a mac subdirectory that contains the following directories that reference a specific update of the Intel® Compilers and Libraries 2017:

- `bin` – all executables
- `pkg_bin` – symbolic link to the compiler `bin` directory
- `documentation` – symbolic link to the `documentation_2017` directory
- `man` – symbolic link to the `man` directory
- `compiler` – shared libraries and header files
- `ipp` – Intel® Integrated Performance Primitives libraries and header files
- `mkl` – Intel® Math Kernel Library libraries and header files
- `tbb` – Intel® Threading Building Blocks libraries and header files
- `daal` – Intel® Data Analytics Acceleration Library (Intel® DAAL) libraries and header files

If you have both the Intel C++ and Intel Fortran compilers installed, they will share folders for a given version and update.

This directory layout allows you to choose whether you want the latest compiler, no matter which version, the latest update of the Intel® Parallel Studio XE 2017 compiler, or a specific update. Most users will reference `<install-dir>/bin` for `the compilervars.sh [.csh]` script, which will always get the latest compiler installed.

2.8 Relocating Product After Install

The Xcode integration is relocatable simply by dragging and dropping the Xcode directory tree to another location.

2.9 Removal/Uninstall

It is not possible to remove the compiler while leaving any of the performance library components installed.

1) Open the file `<install-dir>/parallel_studio_xe_2017.<n>.<pkg>/uninstall.app`.
2) Follow the prompts

If you are not currently logged in as root you will be asked for the `root` password.

3 Intel® IPP Cryptography Libraries are Available as a Separate Download

The Intel® IPP cryptography libraries are available as a separate download. For download and installation instructions, please read http://intel.ly/ndrGnR

4 Intel® Math Kernel Library 2017 Attributions

As referenced in the End User License Agreement, attribution requires, at a minimum, prominently displaying the full Intel product name (e.g. "Intel® Math Kernel Library") and providing a link/URL to the Intel® MKL homepage (http://www.intel.com/software/products/mkl) in both the product documentation and website.

The original versions of the BLAS from which that part of Intel® MKL was derived can be obtained from http://www.netlib.org/blas/index.html.

The original versions of LAPACK from which that part of Intel® MKL was derived can be obtained from http://www.netlib.org/lapack/index.html. The authors of LAPACK are E. Anderson, Z. Bai, C. Bischof, S. Blackford, J. Demmel, J. Dongarra, J. Du Croz, A. Greenbaum, S. Hammarling, A. McKenney, and D. Sorensen. Our FORTRAN 90/95 interfaces to LAPACK are similar to those in the LAPACK95 package at http://www.netlib.org/lapack95/index.html. All interfaces are provided for pure procedures.

The original versions of ScaLAPACK from which that part of Intel® MKL was derived can be obtained from http://www.netlib.org/scalapack/index.html. The authors of ScaLAPACK are L. S. Blackford, J. Choi, A. Cleary, E. D'Azevedo, J. Demmel, I. Dhillon, J. Dongarra, S. Hammarling, G. Henry, A. Petitet, K. Stanley, D. Walker, and R. C. Whaley.

The Intel® MKL Extended Eigensolver functionality is based on the Feast Eigenvalue Solver 2.0 http://www.ecs.umass.edu/~polizzi/feast/

PARDISO in Intel® MKL is compliant with the 3.2 release of PARDISO that is freely distributed by the University of Basel. It can be obtained at http://www.pardiso-project.org.

Some FFT functions in this release of Intel® MKL have been generated by the SPIRAL software generation system (http://www.spiral.net/) under license from Carnegie Mellon University. The Authors of SPIRAL are Markus Puschel, Jose Moura, Jeremy Johnson, David Padua, Manuela Veloso, Bryan Singer, Jianxin Xiong, Franz Franchetti, Aca Gacic, Yevgen Voronenko, Kang Chen, Robert W. Johnson, and Nick Rizzolo.

5 Disclaimer and Legal Information

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Copies of documents which have an order number and are referenced in this document, or other Intel literature, may be obtained by calling 1-800-548-4725, or go to: http://www.intel.com/design/literature.htm

MPEG-1, MPEG-2, MPEG-4, H.261, H.263, H.264, MP3, DV, VC-1, MJPEG, AC3, AAC, G.711, G.722, G.722.1, G.722.2, AMRWB, Extended AMRWB (AMRWB+), G.167, G.168, G.169, G.723.1, G.726, G.728, G.729, G.729.1, GSM AMR, GSM FR are international standards promoted by ISO, IEC, ITU, ETSI, 3GPP and other organizations. Implementations of these standards, or the

standard enabled platforms may require licenses from various entities, including Intel Corporation.

Intel processor numbers are not a measure of performance. Processor numbers differentiate features within each processor family, not across different processor families. Go to:

http://www.intel.com/products/processor%5Fnumber/

The Intel® C++ Compiler, Intel® Fortran Compiler, Intel® Integrated Performance Primitives, Intel® Math Kernel Library, and Intel® Threading Building Blocks are provided under Intel's End User License Agreement (EULA).

The GNU* Project Debugger, GDB, is provided under the General GNU Public License GPL V3.

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