Intel® Parallel Studio XE 2017 Update 2 for macOS* Installation Guide and Release Notes

30 January 2017

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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 2017 Update 2 for macOS*
Installation Guide and Release Notes

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 Second 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 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]/
     o static_partitioner class is now a fully supported feature.
     o async_node class is now a fully supported feature.
o Improved dynamic memory allocation replacement on Windows* OS to skip DLLs for which replacement cannot be done, instead of aborting.

o For 64-bit platforms, quadrupled the worst-case limit on the amount of memory the Intel TBB allocator can handle.

o 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.

o Added graph/stereo example to demonstrate tbb::flow::async_msg.

o Removed a few cases of excessive user data copying in the flow graph.

o Reworked split_node to eliminate unnecessary overheads.

o Added support for C++11 move semantics to the argument of tbb::parallel_do_feeder::add() method.

o Added C++11 move constructor and assignment operator to tbb::combinable template class.

o 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.

o Deprecated tbb::task_arena::current_thread_index() static method; use tbb::this_task_arena::current_thread_index() function instead.

o 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:

o Renamed following methods and types in async_node class:

<table>
<thead>
<tr>
<th>Old</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>async_gateway_type</td>
<td>gateway_type</td>
</tr>
<tr>
<td>async_gateway()</td>
<td>gateway()</td>
</tr>
<tr>
<td>async_try_put()</td>
<td>try_put()</td>
</tr>
<tr>
<td>async_reserve()</td>
<td>reserve_wait()</td>
</tr>
<tr>
<td>async_commit()</td>
<td>release_wait()</td>
</tr>
</tbody>
</table>

o 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.

<table>
<thead>
<tr>
<th>Component</th>
<th>Version</th>
<th>On-Disk Documentation</th>
<th>Release Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>• Obtain the cryptography package</td>
<td></td>
</tr>
<tr>
<td></td>
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<td>• Attributions</td>
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</tr>
<tr>
<td>Component</td>
<td>Version</td>
<td>Documentation Location</td>
<td>Additional Information</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
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<td>----------------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Integration into the Xcode* development environment</td>
<td></td>
<td>C++: documentation_2017/en/ps2017/get_started_mc.htm</td>
<td></td>
</tr>
</tbody>
</table>

### 1.4 Additional Information for Intel-provided Debug Solutions

### 1.5 System Requirements
For an explanation of architecture names, see [http://intel.ly/q9JVjE](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:
  - OS X* 10.11.x, Xcode* 7.x (up to 7.3.x)
  - macOS* 10.12.x (up to 10.12.1), Xcode* 8.x (up to 8.2.1)
- 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.
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
If you did not register your compiler during installation, please do so at the Intel® Software Development Products Registration Center at http://registrationcenter.intel.com. Registration entitles you to free technical support, product updates and upgrades for the duration of the support term.

For information about how to find Technical Support, Product Updates, User Forums, FAQs, tips and tricks, and other support information, please visit http://www.intel.com/software/products/support/

Note: If your distributor provides technical support for this product, please contact them for support rather than Intel.

1.8.1 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) Accept the "Confidentiality Statement" if prompted. You will only have to do this the first time you log in.
5) Click the "Submit Issue" button in the upper right corner.
6) Search for a product (e.g. "Intel® Fortran Compiler for Linux") and select from the dynamic drop-down list. Hit Next.
7) Complete the fields and enter a description of your issue. You may attach a log file or a reproducer at this time. Hit Next.
8) Review the text you have entered and hit Submit.

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 (for example, 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 the installed applications, and anything else that may be relevant to helping us address your concern.

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 OS X* 10.11 and Later
OS X* 10.11 introduces a new security policy called System Integrity Protection. This significantly impacts certain installation scenarios. Please see OS X* 10.11 Support in Intel® Parallel Studio XE 2016 for important information before attempting to install on OS X* 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 Silent Install
For information on automated or “silent” install capability, please see http://intel.ly/1gcW0Bl

2.6.1 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

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• 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.

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