Intel® Parallel Studio XE helps developers take their enterprise-to-cloud HPC and AI applications to the max—with fast, scalable, and portable parallel code

Intel® Parallel Studio XE is a comprehensive suite of development tools that make it fast and easy to build modern code that gets every last ounce of performance out of the newest Intel® processors. This tool-packed suite simplifies creating code with the latest techniques in vectorization, multi-threading, multi-node, and memory optimization. Get powerful, consistent programming with Intel® Advanced Vector Extensions 512 (Intel® AVX-512) instructions for Intel® Core™ and Xeon® processors, plus support for the latest standards and integrated development environments (IDEs). New features include greater scalability and reduced latency with next-generation Intel® MPI Library; a rapid visual prototyping environment to interactively build, validate, and visualize parallel algorithms with Intel® Advisor’s Flow Graph Analyzer; a new intuitive, user-friendly interface in Intel® VTune™ Amplifier for a simplified profiling workflow; faster machine learning with the Python* scikit-learn* package in Intel® Distribution for Python—and more. Take advantage of industry leading Priority Support provided by Intel engineers who can help you quickly troubleshoot and accelerate your performance-critical applications for improved business value.

Who Needs It?
- C, C++, Fortran*, and Python* software developers building enterprise, cloud, HPC, and AI solutions
- Developers looking to maximize their software’s performance on current and future Intel® platforms
- Organizations needing customized technical expertise to quickly optimize and scale performance-critical applications

What it Does
- Creates fast parallel code. Boost application performance that scales on current and future Intel platforms with industry-leading compilers, numerical libraries, performance profilers, code analysis tools, and Intel Distribution for Python.
- Builds code faster. Simplify the process of creating fast, scalable, and reliable parallel code.
- Delivers Priority Support. Connect directly to Intel’s engineers for confidential, quick answers to technical questions, access older versions of the products, and receive free updates for a year (paid license required).

What’s New
- Boost application efficiency and performance for Intel Core and Xeon processors with new and enhanced capabilities in compilers, performance libraries, and analysis tools. Vectorize and thread your code (using OpenMP*) to take full advantage of the latest SIMD-enabled hardware, including Intel AVX-512. Accelerate diverse workloads across enterprise to cloud, and HPC to AI.
What's New (cont.)

- **Improve performance** through greater scalability and reduced latency with next-generation Intel MPI Library.
- **Interactively build, validate, and visualize parallel algorithms** with Intel Advisor’s Flow Graph Analyze.
- **Faster machine learning** with Python and scikit-learn* in Intel Distribution for Python.
- **Enhanced roofline analysis capabilities and simplified application profiling workflow** with a new intuitive user interface in Intel VTune Amplifier.
- **Stay up-to-date with industry standards and IDEs** including full C++14 and expanded C++17; full Fortran 2008 and substantial Fortran 2018 support; full OpenMP* 4.5 and Initial OpenMP 5.0 draft; Python 2.7 and 3.6; and Microsoft Visual Studio* 2017 integration.

Get Priority Support for Quick, Customized Expert Support

- **Paid licenses** of Intel® Software Development Products automatically include **Priority Support** via our [Online Service Center](#) for at least one year from your date of purchase. You can extend/renew it at a highly discounted rate.²
- **Direct, private support** from Intel engineers for quick answers to your technical questions. Submit confidential inquiries and code samples.
- **Free access to all new product updates** and continued access to and support for older versions of the product.
- **Community product forums** covering all Intel Software Development Products. Access to a vast library of self-help documents that build off decades of experience creating high-performance code.

Choose Your Edition

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Operating System: Windows*, Linux*, MacOS*¹

Intel® Architecture Platforms

Build with the Composer Edition

- **Improve performance**¹ with a simple recompile using industry-leading, standards-driven C++ and Fortran compilers.
- **Simplify adding parallelism** with built-in, intuitive, parallel models and vectorization support.
- **Drop in advanced libraries** optimized for the latest hardware.
- **Accelerate diverse HPC to AI workloads** with high-performance Python, powered by native performance libraries, in an integrated distribution package.
## Build with the Composer Edition (Continued)

### INTEL® C++ COMPILER

- Use industry-leading, standards-based C/C++ tools to speed application performance.
- Experience seamless compatibility with popular compilers, development environments, and operating systems.
- Get superior vectorization and parallelization capabilities (including Intel AVX-512 instructions) using the latest OpenMP 5.0 parallel programming model.

### INTEL® FORTRAN COMPILER

- Deliver superior Fortran application performance.
- Get extensive support for the latest Fortran standards (including full Fortran 2008 and initial Fortran 2015), with backwards compatibility to FORTRAN 77.
- Boost SIMD vectorization and threading capabilities (including Intel AVX-512 instructions) using the latest OpenMP parallel programming model.

### INTEL® DISTRIBUTION FOR PYTHON*

- Delivers fast Python application performance in an easy, integrated distribution for Windows*, macOS*, and Linux®.
- Accelerates NumPy/SciPy*/Scikit-learn packages with native Intel Performance Libraries such as Intel® Math Kernel Library for multi-threaded performance benefits.

Performance results are based on testing as of Aug. 26, 2018 and may not reflect all publicly available security updates. See configuration disclosure for details. No product can be absolutely secure. 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, 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. For more complete information, see Performance Benchmark Test Disclosure. Testing by Intel as of Aug. 26, 2018. Configuration: Hardware: Intel® Xeon® Platinum 8180 CPU @ 2.50GHz, 384 GB RAM, Hyper-threading is on. Software: Intel compilers 19.0, GCC 8.1.0, PGI 118.5, Clang/LVM 6.0. Linux OS: Red Hat Enterprise Linux Server release 7.4 (Maipo), 3.10.0-693.el7.x86_64. SPEC Benchmark (ref: www.spec.org). SmartHeap 10 was used for C tests when measuring SPECint® benchmarks. SPECint®_rate_base_2017 compiler switches: SmartHeap 10 were used for C tests, Intel C/C++ compiler 19.0, -xCORE-AVX512 -ipo -o3 -no-prec-div -qopt-mem-layout-trans=3. GCC 8.1.0 -march=znver1 -mpmath=ieee -Ofast -ipo -O3 -no-prec-div -qopt-math-auto -funsafe-math-intrinsic -ftree-vectorize. Clang 6.0: -arch=avx512 -mpmath=ieee -Ofast -ipo -O3 -no-prec-div -qopenmp. Clang 6.0: -arch=znver1 -mpmath=ieee -Ofast -ipo -O3 -no-prec-div -qopenmp -fopenmp -fopenmp. Clang 6.0: -arch=znver1 -mpmath=ieee -Ofast -ipo -O3 -no-prec-div -qopenmp -fopenmp -fopenmp. Clang: 6.0: -arch=avx512 -mpmath=ieee -Ofast -ipo -O3 -no-prec-div -qopenmp -fopenmp. For more complete information, see Performance Benchmark Test Disclosure. Testing by Intel as of Aug. 26, 2018. Configuration: Hardware: Intel® Xeon® Gold 6140 CPU @ 2.30GHz (2 sockets, 18 cores/socket, HT:off), 256 GB of DDR4 RAM, 16 DIMMs of 16 GB@2666MHz. See also the Optimization Notice at end of this document.

### Boost C++ Application Performance on Linux* using Intel® C++ Compiler

<table>
<thead>
<tr>
<th>Floating Point</th>
<th>Integer</th>
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<tbody>
<tr>
<td><strong>Estimated geometric mean of SPEC CPU 2017</strong></td>
<td><strong>Estimated SpecInt Rate Base 2017</strong></td>
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<tr>
<td><strong>Floating Point Rate Base</strong></td>
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<td><strong>1.10</strong></td>
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</table>

### Boost Fortran Application Performance on Linux* using Intel® Fortran Compiler

![Boost Fortran Application Performance on Linux* using Intel® Fortran Compiler](image)

### Close to Native Code Scikit-learn* Performance with Intel® Distribution for Python* 2019 Compared to Stock Python Packages on Intel® Xeon® Processors

![Close to Native Code Scikit-learn* Performance with Intel® Distribution for Python* 2019 Compared to Stock Python Packages on Intel® Xeon® Processors](image)

Performance results are based on testing as of July 9, 2018 and may not reflect all publicly available security updates. See configuration disclosure for details. No product can be absolutely secure. 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, 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. For more complete information, see Performance Benchmark Test Disclosure. Testing by Intel as of July 9, 2018. Configuration: Stock Python: python 3.6.3-c3d631a, gfortran 9.1, numba 0.39.0, llvmlite 0.24.0, scipy 1.1.0, scikit-learn 0.19.1, installed from source; Intel Python: Intel® Distribution for Python* 2019 Gold python 3.6.5, intel 11, numba 1.4.3, intel_py36_6, mkl 2019.0.2, intel py36_6.6.6, mkl_random 1.0, intel py36_6.6.6, mkl_random 1.0, scipy 1.1, ipython 6.3, conda 4.5, gfortran 9.1, numba 0.19.1, intel intel_py36 35, OS: CentOS Linux 7.6.1810, kernel 3.10.0-514.el7.x86_64, Hardware: Intel® Xeon® Gold 6140 CPU @ 2.30GHz 12 sockets, 16 cores/socket, 1.2 GHz@2666MHz. See also the Optimization Notice at end of this document.
Build with the Composer Edition (Continued)

INTEL® MATH KERNEL LIBRARY

- Fastest and most-used math library for Intel and compatible processors.
- Highly tuned for best performance on today’s and future Intel platforms.
- De facto standard APIs for simple code integration.

INTEL® DATA ANALYTICS ACCELERATION LIBRARY (INTEL® DAAL)

- Helps applications deliver better predictions faster; analyzes larger data sets with the same compute resources.
- Optimizes data ingestion and algorithmic compute together for highest performance.
- Supports offline, streaming, and distributed usage models to meet a range of application needs.

INTEL® INTEGRATED PERFORMANCE PRIMITIVES

- Deliver highly optimized image and signal processing, data compression, and cryptography applications using Intel® Streaming SIMD Extensions and Intel® Advanced Vector Extensions instruction sets.
- Multi-core, multi-OS, and multi-platform ready. Plug in and use APIs to quickly improve application performance.
- Reduce development time and costs.

3D FFT Performance Boost Using Intel® Math Kernel Library 2019 Gold vs. FFTW

Performance results are based on testing as of July 13, 2018 and may not reflect all publicly available security updates. See configuration disclosure for details. No product can be absolutely secure. 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, 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. For more complete information, see Performance Benchmark Test Disclosure. Testing by Intel as of July 13, 2018. Configuration: Intel® Core ™ i5-7600 1x4 cores, 3.50GHz, 6MB CPU Cache, 64GB RAM, OS RHEL 7.2. 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. For more complete information about compiler optimizations, see our Optimization Notice.

Intel® Data Analytics Acceleration Library 2019 Speedup vs. XGBoost*

Performance results are based on testing as of July 9, 2018 and may not reflect all publicly available security updates. See configuration disclosure for details. No product can be absolutely secure. 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, 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. For more complete information, see Performance Benchmark Test Disclosure. Testing by Intel as of July 9, 2018. Configuration: Intel® Xeon® Platinum 8180 H0 205W, 2x28@2.50GHz, 192GB, 12x16gb DDR4-2666, Intel® Data Analytics Acceleration Library (Intel® DAAL 2019), RHEL 7.2. See also the Optimization Notice at end of this document.

Data Compression Performance Ratio, Intel® Integrated Performance Primitives 2019 vs. LZ5, Zlib, LZO Libraries

Performance results are based on testing as of August 15, 2018 and may not reflect all publicly available security updates. See configuration disclosure for details. No product can be absolutely secure. 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, 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. For more complete information, see Performance Benchmark Test Disclosure. Testing by Intel as of August 15, 2018. Configuration: Intel® Core™ i5-7600 CPU @3.50GHz, 4 cores, hyper-threading off; Cache: L1=32KB, L2=256KB, L3=6MB; Memory: 64GB; OS RH EL Server 7.2. See also the Optimization Notice at end of this document.
Build with the Composer Edition (Continued)

INTEL® THREADING BUILDING BLOCKS

- Specify tasks instead of manipulating threads. Intel® Threading Building Blocks (Intel® TBB) maps your logical tasks onto threads with full support for nested parallelism.
- Intel TBB uses proven, efficient parallel patterns and work-stealing to load balance and cut task execution time.
- Licensed versions are available for Linux, Windows, and macOS. Compatible with multiple compilers and Intel processors.

Excellent Performance Scalability with Threading Building Blocks on Intel® Xeon® Processor

Performance results are based on testing as of July 31, 2018 and may not reflect all publicly available security updates. See configuration disclosure for details. No product can be absolutely secure. For more complete information about performance and benchmark results, visit www.intel.com/benchmarks. 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, 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. For more complete information visit www.intel.com/benchmarks.

Analyze with the Professional Edition

Includes everything in the Composer Edition, plus:

- Advanced performance profiler to tune application performance of the CPU, threading, memory, and storage
- Vectorization and threading advisor to optimize vectorization and quickly prototype threading designs
- Memory and thread debugger to efficiently find memory errors and intermittent threading errors

INTEL® VTUNE AMPLIFIER

- Accurately profile C, C++, Fortran, Python, Go*, Java*, or a mix of coding languages.
- Provides diverse data to optimize for CPU, memory, and storage.
- Delivers fast answers. Rich analysis turns data into insights that save time optimizing code.

INTEL® ADVISOR

- Vectorize and thread your code—or performance dies on modern processors.
- Get trip counts, data dependencies, memory access patterns, and more.
- Follow an easy optimization workflow with tips for faster code.
- Find high-impact but under-optimized loops using powerful roofline analysis.

Performance Increases Scale with Each New Hardware Generation

‘Automatic’ Vectorization Is Not Enough
Explicit pragmas and optimization are often required

Benchmark: Binomial Options Pricing Model, https://software.intel.com/en-us/articles/binomial-options-pricing-model-code-for-intel-xeon-phi-coprocessor Performance results are based on testing as of August 2017 and may not reflect all publicly available security updates. See configuration disclosure for details. No product can be absolutely secure. For more complete information about performance and benchmark results, visit www.intel.com/benchmarks. See Vectorize & Thread or PerformanceDies Technologies for 2010-2017 Benchmarks. Testing by Intel as of August 2017. See also the Optimization Notice at end of this document.
Analyze with the Professional Edition (Continued)

INTEL® INSPECTOR

- **Debug** memory and threading errors.
- **Save money.** Find the root cause of memory and threading errors early—before you release.
- **Save time.** Quickly debug intermittent races and deadlocks.
- **Save effort.** No special builds—just use your normal build.

Scale with the Cluster Edition

Includes everything in the Professional Edition, plus tools to:

- **Accelerate** applications’ performance on Intel® architecture-based clusters with multiple fabric flexibility.
- **Profile** MPI applications to quickly finding bottlenecks, achieving high performance for parallel cluster applications.
- **Verify** that cluster components continue working together throughout the cluster life cycle.

INTEL® MPI LIBRARY

- **Boost distributed application performance.**
- **Enable your MPI applications** to perform better on Intel architecture-based clusters with multiple-fabric flexibility.
- **Delivers sustained scalability**—low latencies, higher bandwidth, and increased processes.
- **Supports Intel® multicore and many-core systems.**

Superior MPI Performance with
INTEL® MPI Library 2019 on Linux® 64
1,280 Processors, 32 Intel® Xeon® processors nodes (Intel® Omni-Path) Linux® 64

Relative (Geomean) MPI Latency Benchmarks
(Higher is Better)

Performance results are based on testing as of Sept. 5, 2018 and may not reflect all publicly available security updates. See configuration disclosure for details. No product can be absolutely secure. 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, 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. Configuration: Testing by Intel as of Sept. 5, 2018 Hardware: Intel® Xeon® Gold 6148 CPU @ 2.40GHz; 192 GB RAM; Interconnect: Intel® Omni-Path Host Fabric Interface; Software: RHEL® 7.4; IFS 10.7.0.0.145; Libfabric internal; INTEL® MPI Library 2019; Intel® MPI Benchmarks 2019 (built with Intel® C++ Compiler XE 18.0.2.199 for Linux®). See also the Optimization Notice at end of this document.
INTEL® TRACE ANALYZER AND COLLECTOR

- Profile and analyze MPI applications for performance.
- Scalable, with low overhead and effective visualization.
- Flexible to fit your workflow: Compile, link, or run.
- Support for OpenSHMEM®.

INTEL® CLUSTER CHECKER

- Ensure high-performance, reliable HPC platforms with an advanced cluster diagnostic expert system tool.
- Simpler diagnosis of issues to improve cluster functionality and performance.
- Integrates into other software using an API.
- Comprehensive cluster environment checking, extensible with custom tests.

License Options

Each software purchase has a perpetual license with no timeout. Two licensing models are available:

- **Named user licenses** price products per named user.
- **Floating licenses** can be shared by multiple users simultaneously on several systems, managed from a licensing server. Two- or five-seat licenses are available. When a license is released from one user, another user can request it.

Discounted pricing for academia and free versions for students, educators, and open source contributors are available.

Support Services Renewal Options

- **Renewal before subscription expiration.** You can extend your serial number for 12 months after the expiration date. You'll enjoy a price benefit if you renew within a one-month grace period after the expiration date. Support ends at 12 months.
- **Renewal after subscription expiration.** You can extend the same serial number any time within 12 months after the expiration date. Your new subscription will begin from your date of purchase. After the 12-month extension period, you can purchase a new license and get a new serial number.
## Specifications at a Glance

**Processors**
Supports multiple generations of Intel and compatible processors including, but not limited to, Intel Core processors and Intel Xeon processors.

**Languages**
- Supports processors including, but not limited to, Intel Core and Xeon processor families.
- C, C++, Fortran, Python\(^1\), C#\(^2\), Go\(^3\), and OpenSHMEM\(^4\)

**Operating Systems**
- Windows, Linux, and macOS

**Development Environment**
- Compatible with compilers from Microsoft, GCC, Intel, and others that follow established language standards.
- Integrates with Microsoft Visual Studio (Windows), Eclipse* (Linux*), and XCode* (macOS).

**Details**
See software.intel.com/articles/intel-parallel-studio-xe-release-notes

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### What's Included

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<td>Intel® Fortran Compiler</td>
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<td>Intel® V-Tree Amplifier(^1)</td>
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<td>Operating System (Development Environment)</td>
<td>Windows (Visual Studio), Linux (GNU), macOS(^5) (XCode*(^6))</td>
<td>Windows (Visual Studio), Linux (GNU)</td>
<td>Windows (Visual Studio), Linux (GNU)</td>
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</tbody>
</table>

\(^1\) Available with a single language (C++ or Fortran) or both languages.

\(^2\) Available on Windows*, Linux*, and macOS.

\(^3\) Available bundled in a suite or as a standalone.

\(^4\) Available as an add-on to any Windows* Fortran suite or bundled with a version of the Composer Edition.

\(^6\) Available only in the Composer Edition.

\(^7\) Available as a single language suite.

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1. 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.

2. Priority support is available only for paid licenses.

3. Intel technologies’ features and benefits depend on system configuration and may require enabled hardware, software, or service activation.

4. Performance varies depending on system configuration. No computer system can be absolutely secure. Check with your system manufacturer or retailer, or learn more at www.intel.com.

5. 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, 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. For more information go to www.intel.com/performances.

6. Intel does not control or audit the design or implementation of third party benchmark data or Web sites referenced in this document. Intel encourages all of its customers to visit the referenced Web sites or others where similar performance benchmark data are reported and confirm whether the referenced benchmark data are accurate and reflect performance of systems available for purchase.

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