Intel® Parallel Studio XE helps developers take their HPC, enterprise, AI, and cloud 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® Xeon® Scalable processors, plus support for the latest standards and integrated development environments (IDEs).

Who Needs It?

- **C, C++, Fortran, and Python* software developers and architects** building HPC, enterprise, AI, and cloud solutions
- **Developers looking to maximize their software’s performance** on current and future Intel® platforms

What it Does

- **Creates faster code**. Boost application performance that scales on current and future Intel® platforms with industry-leading compilers, numerical libraries, performance profilers, and code analyzers.
- **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 answers to technical questions, access older versions of the products, and receive free updates for a year. Paid license required.

What’s New

- **Speed artificial intelligence inferencing**. Intel® Compilers, Intel® Performance Libraries and analysis tools support Intel® Deep Learning Boost, which includes Vector Neural Network Instructions (VNNI) in 2nd generation Intel® Xeon® Scalable processors (codenamed Cascade Lake/AP platforms)
- **Develop for large memories of up to 512GB DIMMs with Persistence**. Identify, optimize, and tune Intel® platforms for Intel® Optane™ DC Persistent Memory using Intel® VTune™ Profiler
- **Stay up to date with the latest standards support** providing additional Fortran 2018 features, full support of C++17 with initial C++20 support, and expanded OpenMP 4.5/5.0 support.
- **Use extended coarse grain profiling** with platform-level collection and analysis in Intel VTune Profiler to understand and optimize platform configuration for applications.
What's New (cont.)

- HPC cloud support. Take advantage of the AWS Parallel Cluster and AWS Elastic Fabric Adapter for low-latency, high-bandwidth communications for MPI applications with Intel MPI Library.

- Supports the latest Intel processors including Intel Xeon Scalable processors (codenamed Cascade Lake, Cascade Lake AP, Cooper Lake, and Ice Lake).

- Supports new OS—Amazon Linux 2 (supported features of tools and libraries may vary by instances and configurations).

Confidential Support and One Year of Updates Included

Every paid version of Intel Software Development Products automatically includes priority support at our Online Service Center for at least one year from your date of purchase. You can extend it at a reduced rate. You get:

- Free access to all new product updates and continued access to and support for older versions of the product

- Direct and private interaction with Intel's engineers. Submit confidential inquiries and code samples

- Responsive help with your technical questions and other product needs for both new and older versions

- Community product forums covering all of Intel's 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

Build with the Composer Edition

- Improve performance 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.

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 C++ Compiler Boosts Application Performance on Linux

Performance Advantage Measured by SPEC on Intel Xeon Platinum 8180 Processor

Relative Geomean Performance (FP Rate Base and FP Speed Base Higher is Better)

INTEL® C++ Compiler Boosts Application Performance on Linux

Performance Advantage Measured by SPEC on Intel Xeon Platinum 8180 Processor

Relative Geomean Performance (FP Rate Base and FP Speed Base Higher is Better)
### INTEL® FORTRAN COMPILER
- Deliver superior Fortran application performance.
- Get extensive support for the latest Fortran standards (including full Fortran 2008 and initial Fortran 2019), 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 faster 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.

### 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.

---

**Boost Fortran Application Performance on Linux® using Intel® Fortran Compiler (Higher is Better)**

![Chart showing Boost Fortran Application Performance](chart.png)

Intel technologies’ features and benefits depend on system configuration and may require enabled hardware, software or service activation. Learn more at intel.com, or from the OEM or retailer.

Performance results are based on testing as of December 12, 2019 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 visit www.intel.com/benchmarks.

**Configuration:**
- Intel Xeon® E5-2698 v2 2.20GHz (2 sockets, 16 cores/socket, HT: on), 256 GB of DDR4-1866 RAM, 16 DIMMs of 16 GB@1866MHz
- Intel® Math Kernel Library 2020 Gold (including Intel® AVX-512 instructions) using the latest OpenMP parallel programming model.

---

**Faster Python® with Intel® Distribution for Python®**

Intel’s Optimizations Improve Python scikit-learn Efficiency Closer to Native Code Speeds on Intel® Xeon® Processors

![Chart showing Faster Python application performance](chart.png)


Intel’s compiler may or may not optimize to the same degree for the same product. For more complete information visit www.intel.com/benchmarks.

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**Intel® Math Kernel Library 2020 on 2nd Generation Intel® Xeon® Scalable Processor**

![Chart showing Intel Math Kernel Library 2020](chart.png)

Build with the Composer Edition (Continued)

INTEL® DATA ANALYTICS ACCELERATION LIBRARY (INTEL® DAAL)
- Helps applications deliver better predictions faster and 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
- Ready-to-use, domain-specific functions that are highly optimized for today’s and future Intel® platforms.
- Extensively optimized functions to meet a range of application needs: Signal processing, data compression, video processing, and cryptography.
- Reduce cost and time-to-market for software development and maintenance.

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.

Intel® DAAL versus Apache Spark® MLib Performance (Higher is Better)

<table>
<thead>
<tr>
<th></th>
<th>Implicit ALS</th>
<th>Kmeans</th>
<th>Linear Regression</th>
<th>Correlation</th>
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<tr>
<td>Intel DAAL</td>
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Performance results are based on testing as of 11/15/2019 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 visit www.intel.com/benchmarks.

INTEL® IPP Image Resize Functions Performance Boost

Intel IPP Optimization Code versus Compiled C Code

<table>
<thead>
<tr>
<th></th>
<th>Compiled CCode</th>
<th>intel® IPP SSE4.2</th>
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<tbody>
<tr>
<td>ippiResize linear Bu</td>
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<td>ippiResize linear Bu</td>
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</tbody>
</table>


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

Intel technologies’ features and benefits depend on system configuration and may require enabled hardware, software or service activation. Learn more at intel.com, or from the OEM or retailer.

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Configuration: Testing by Intel as of December 4, 2019 Hardware: Intel® Xeon® Gold 6132 CPU @ 2.10GHz. CentOS Linux release 7.6, kernel 3.10.0-957.1.6.el7.x86_64. Benchmark Source: Intel Corp. Note: sudokus, primes and tachyon are included with Intel TBB.

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.

Analyze with the Professional Edition
Includes everything in the Composer Edition, plus:
- Advanced performance profiler to tune application performance of the CPU, GPU, threading, memory, cache, and storage
- Design advisor to optimize vectorization, quickly prototype threading and create and analyze flow graphs
- Memory and thread debugger to efficiently find memory errors and intermittent threading errors
INTEL® VTUNE™ PROFILER

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

INTEL® ADVISOR

- Add and optimize vectorization
- Find high-impact but under-optimized loops using powerful Roofline analysis
- Analyze memory access patterns
- Add effective threading to unthreaded applications
- Create and analyze efficient flow graphs

INTEL® INSPECTOR

- Debug threading, memory and persistent memory errors.
- Save money. Locate the root cause of memory and threading errors before you release.
- Save time. Quickly debug intermittent races and deadlocks.
- Save data. Find errors such as missing or redundant cache flushes for persistent memory implementations.
- Save effort. No special compilers or builds are required.
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.

### 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.

---

**SPEC MPI Medium Benchmarks with Intel® MPI Library**

384 Processes, 8 Nodes (Mellanox Technologies Family), Linux® 64 (Higher is Better)

- Configuration: Testing by Intel as of November 8, 2019. Intel® Xeon™ Gold 6130 CPU (p. 2.10GHz, 168 GB RAM, Intel HyperThreading Technology is supported but not enabled.

---

```bash
$ click - f nodefile
Overall Result: PASS
Nodes tested: [n[1-4]]
Total number of issues found contributing to FAIL: 0
Total number of other issues: 1 (0 diagnoses, 1 observation)
1 INFORMATION (0 diagnoses 1 observation)
See log file click_output.log for more information.
```

---

```bash
$ click - f nodefile
Overall Result: CRITICAL
Nodes tested: [n[1-4]]
Total number of issues found contributing to FAIL: 1
```

---
**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**

<table>
<thead>
<tr>
<th>Processors</th>
<th>Supports multiple generations of Intel and compatible processors including, but not limited to, Intel® Core™ processors, Intel Xeon Scalable processors</th>
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</table>
| Languages  | - Supports processors including, but not limited to, Intel® Core™ and Xeon® Scalable, and Xeon Phi™ processor families.  
- C, C++, Fortran, Python®, C#, Go3, and OpenSHMEM® |
| 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 |

**What's Included**

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<td>Build</td>
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<tr>
<td>Intel® C++ Compiler</td>
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<td>Intel® Fortran Compiler</td>
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<td>Intel® Distribution for Python2</td>
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<td>Intel® Math Kernel Library</td>
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<td>Intel® Data Analytics Acceleration Library</td>
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<td>Intel® Integrated Performance Primitives</td>
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<td>Analyze</td>
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<td>Intel® VTune™ Profiler2</td>
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<td>Intel® Advisor</td>
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<td>Scale</td>
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<td>Intel® MPI Library</td>
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<td>Intel® Trace Analyzer and Collector</td>
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<tr>
<td>Intel® Cluster Checker</td>
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<tr>
<td>Operating System (Development Environment)</td>
<td>Windows (Visual Studio), Linux (GNU), macOS (XCode*)²</td>
<td>Windows (Visual Studio), Linux (GNU)</td>
<td>Windows (Visual Studio), Linux (GNU)</td>
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</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.
5 Available only in the Composer Edition.
6 Available as a single language suite.
Learn more and get started with Intel Parallel Studio XE >

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2 Priority support is available only for paid licenses.

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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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