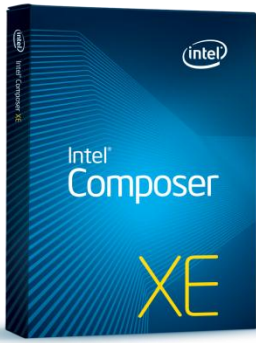# Intel® Composer XE Products

Product Brief

Intel® Composer XE Family of Products

- Optimizing C/C++ and Fortran Compilers
- Powerful Parallel Programming Models
- Threaded Domain Specific Libraries
- Supports Windows*, Linux* and Mac OS* X

Intel® Composer XE products include the latest Intel compilers and performance libraries for IA-32 and Intel® 64 architectures. The table below summarizes the product offering.

Product Name	Components	OS
Intel® Composer XE	Intel® Fortran compiler, Intel® C/C++ compiler, Intel® Cilk™ Plus, Intel Math Kernel Library (Intel® MKL), Intel® Integrated Performance Primitives (Intel® IPP), Intel® Threading Building Blocks (Intel® TBB)	Windows*, Linux*
Intel® C++ Composer XE	Intel C/C++ compiler, Intel Cilk Plus, Intel MKL, Intel IPP, Intel TBB	Windows, Linux, Mac OS* X
Intel® Fortran Composer XE or Intel® Visual Fortran Composer XE	Intel Fortran compiler, Intel MKL	Windows, Linux, Mac OS X
Intel® Visual Fortran Composer XE with IMSL	Intel Fortran compiler, Intel MKL, Rogue Wave* IMSL*	Windows

Intel Composer XE products are composed of compilers and libraries. If you need analysis tools too, consider the Intel® Parallel Studio XE or Intel® Cluster Studio XE family of products.

Intel Composer XE products are also included in developer tool suites that include performance analysis, threading-correctness, and cluster-based application development tools.   All products are listed on the last page.
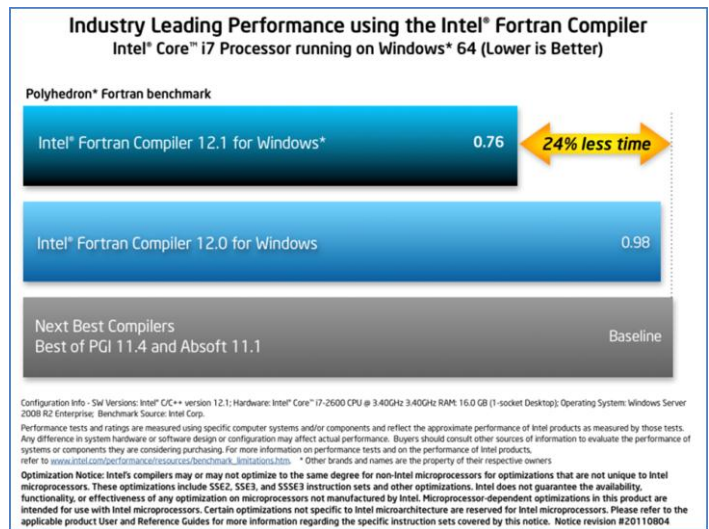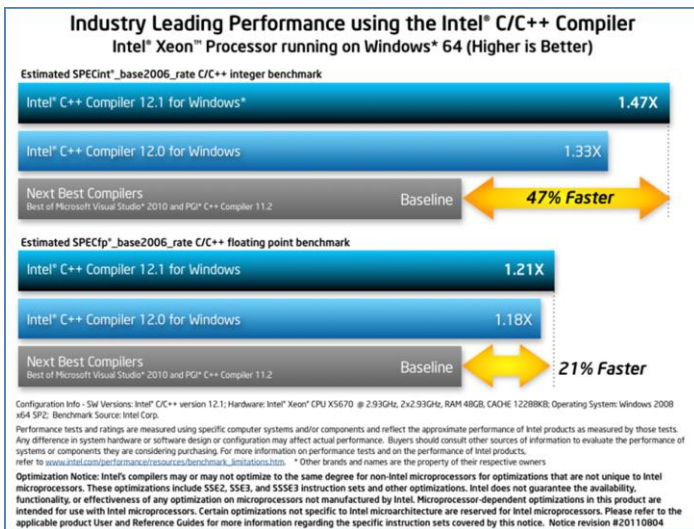
Get Great Performance

Intel Composer XE products deliver performance-oriented features to software engineers using C/C++ or Fortran, enabling them to develop high-performance applications for the latest IA processors, including the Second Generation Intel® Core™ 2 Processor.

Each product offers industry-leading Intel compilers for IA, innovations in parallel programming models, advanced vectorization support, compatibility with leading compilers and integration into widely used development environments, all of which contribute to faster development of performance-oriented software. Applications vary, of course, but in many cases a recompile can enhance performance by 20% or more.

Also included are Intel Performance Libraries. Fortran and C/C++ developers can take advantage of optimized math functions in Intel MKL. And C/C++ developers can speed development in domains such as compression, crypto, and image processing by using Intel IPP.   Intel C++ Composer XE products also include Intel TBB for enabling general parallelism. All three libraries help simplify development of parallelism and are focused on delivering outstanding application performance.

Industry Leading Performance using the Intel® C/C++ Compiler
Intel® Xeon™ Processor running on Windows* 64 (Higher is Better)

Estimated SPECint®_base2006_rate C/C++ integer benchmark

Intel® C++ Compiler 12.1 for Windows*	1.47X
Intel® C++ Compiler 12.0 for Windows	1.33X
Next Best Compilers — Best of Microsoft Visual Studio* 2010 and PGI* C++ Compiler 11.2	Baseline

47% Faster

Estimated SPECfp®_base2006_rate C/C++ floating point benchmark

Intel® C++ Compiler 12.1 for Windows	1.21X
Intel® C++ Compiler 12.0 for Windows	1.18X
Next Best Compilers — Best of Microsoft Visual Studio* 2010 and PGI* C++ Compiler 11.2	Baseline

21% Faster

Configuration Info - SW Versions: Intel® C/C++ version 12.1; Hardware: Intel® Xeon® CPU X5670 @ 2.93GHz, 2x2.93GHz, RAM 48GB, CACHE 12288KB; Operating System: Windows 2008 x64 SP2; Benchmark Source: Intel Corp.
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Industry Leading Performance using the Intel® Fortran Compiler
Intel® Core™ i7 Processor running on Windows* 64 (Lower is Better)

Polyhedron* Fortran benchmark

Intel® Fortran Compiler 12.1 for Windows*	0.76
Intel® Fortran Compiler 12.0 for Windows	0.98
Next Best Compilers — Best of PGI 11.4 and Absoft 11.1	Baseline

24% less time

Configuration Info - SW Versions: Intel® C/C++ version 12.1; Hardware: Intel® Core™ i7-2600 CPU @ 3.40GHz 3.40GHz RAM: 16.0 GB (1-socket Desktop); Operating System: Windows Server 2008 R2 Enterprise; Benchmark Source: Intel Corp.
Performance tests and ratings are measured using specific computer systems and/or components and reflect the approximate performance of Intel products as measured by those tests. Any difference in system hardware or software design or configuration may affect actual performance. Buyers should consult other sources of information to evaluate the performance of systems or components they are considering purchasing. For more information on performance tests and on the performance of Intel products, refer to www.intel.com/performance/resources/benchmark_limitations.htm. * Other brands and names are the property of their respective owners.
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Intel® Compilers deliver industry-leading performance. And they are compatible with leading compilers.

Highlights of Intel Composer XE Products

Take Advantage of Multicore

Intel Composer XE products include a variety of parallel development models, supporting multiple approaches to parallelism. Intel Composer XE offers Coarray Fortran for both shared- and distributed-memory hardware configurations, support nearly all of Fortran 2003 and key features in the Fortran 2008 standard. For C++ developers, Composer XE products offer enhanced vectorization capabilities with SIMD pragmas and array notations. The parallelism components are easily integrated into existing applications, help preserve the investment in your existing code, and speed development. Composer XE parallel programming models offer more choices to match the parallel programming needs of businesses today and into the future.

Intel® Cilk™ Plus	Intel® Threading Building Blocks	Domain Specific Libraries	Established Standards	Research and Development
C/C++ language extensions to simplify parallelism	Widely used C++ template library for parallelism	Intel® Integrated Performance Primitives	Message Passing Interface (MPI)	Intel® Concurrent Collections
Open sourced Also an Intel product	Open sourced Also an Intel product	Intel® Math Kernel Library	OpenMP*	Offload Extensions
			Coarray Fortran	Intel® Array Building Blocks
			OpenCL*	Intel® SPMD Parallel Compiler

Multiple programming models are supported in Intel Composer XE products.

Intel TBB is a C++ template library that can be used to enable general parallelism. It includes scalable memory allocation, load-balancing, highly efficient task scheduling, a thread-safe pipeline and concurrent containers, high-level parallel algorithms, and numerous synchronization primitives.

Intel® Cilk Plus is a unique feature in Intel® C/C++ that provides two technologies for parallelism. It includes new keywords that extend the C/C++ language to make it easier to implement data parallelism. It also introduces vector notations for arrays that simplify vectorization, which can lead to enhanced application performance. The combination offers superior functionality by combining advanced vectorization features with array notation and high-level loop-type data parallelism and tasking parallelism.

OpenMP* and MPI* are both supported in all Composer XE products. Intel® Compilers continue to fully support the latest standard in OpenMP programming and, for developers of cluster-based applications, support is included for Intel® MPI Libraries.

Intel® Math Kernel Library (Intel® MKL) is a computing math library of highly optimized, extensively threaded math routines for applications that require maximum performance. Core math functions include BLAS, LAPACK, ScaLAPACK1, sparse solvers, fast Fourier transforms, vector math, and more.

Intel® Integrated Performance Primitives (Intel® IPP) is an extensive library of multicore-ready, highly optimized software functions for multimedia, data processing, and communications applications. Intel IPP offers thousands of optimized functions covering frequently used fundamental algorithms.

Rogue Wave IMSL* Fortran Library is included in a special edition called Intel Visual Fortran Composer XE with IMSL for Windows. With over 1,000 algorithms, the IMSL Fortran Library is the most comprehensive math and statistics library available. Highly accurate and reliable, it contains proven technology that has been thoroughly tested, well documented, continuously maintained and used by developers worldwide for more than four decades.


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Advanced Performance Features

High-Performance Parallel Optimizer (HPO) offers an improved ability to analyze, optimize, and parallelize more loop nests. This revolutionary capability combines vectorization, parallelization, and loop transformations into a single pass that is faster, more effective, and more reliable than prior discrete phases.

Automatic Vectorizer analyzes loops and determines when it is safe and effective to execute several iterations of the loop in parallel. Vectorization and auto-parallelization have been enhanced for broader applicability, improved application performance. It also offers insights into your code when you use the guided autoparallelization (GAP) feature. In addition, SIMD pragmas can be used for added user control of vectorization.

Guided Auto-Parallelization (GAP) is a unique capability in both Intel C++ and Intel Fortran compilers that suggests ways to improve auto-vectorization as well as auto-parallelization and data transformation. When used, GAP builds a report that may include suggestions for source code changes, use of pragmas, or use of specific compiler options. This is a powerful tool that can help you extend the auto-vectorization and auto-parallelism capabilities of the compiler.

Interprocedural Optimization (IPO) dramatically improves performance of small- or medium-sized functions that are used frequently, especially programs that contain calls within loops. It speeds application performance by inlining your code – a process that logically 'lines up' all the components of your application to speed execution.
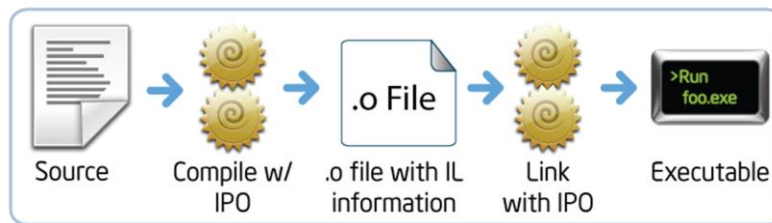
Interprocedural optimization is a simple switch setting that can speed application performance.

Loop Profiler is part of the compiler and can be used to generate low overhead loop and function profiling to show hotspots and where to introduce threads.

Profile-Guided Optimization (PGO) improves application performance by reducing instruction-cache thrashing, reorganizing code layout, shrinking code size, and reducing branch mispredictions. PGO uses actual user workloads to understand how the application logic in your application is used. It then organizes your application according to those patterns to speed execution.
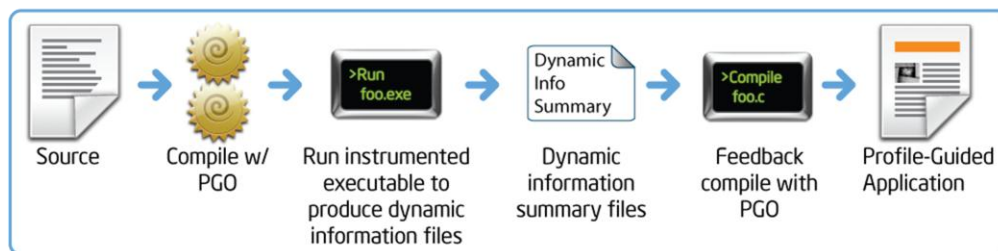
PGO is a multi-step process that optimizes application performance based on user workload.

OpenMP 3.1 is supported to help simplify pragma-based development of parallelism in your C/C++ applications.

Integration into Microsoft Visual Studio*, Compatibility with the gnu* tool chain

Intel Composer XE products for Windows integrate into Microsoft Visual Studio* 2005, 2008 and 2010. This means all parts of Intel Composer XE – Intel C++, Intel Fortran and the Performance Libraries – are usable through Visual Studio. This preserves your knowledge of and investment in Visual Studio. For developers using Intel Visual Fortran Composer XE for Windows, the Microsoft* Visual Studio 2010 Shell* is also included. Intel C++ compilers are also source and binary compatible with Microsoft Visual C++ which makes it easier to switch to Intel compilers or use them for the performance-sensitive parts of your application while continuing to use Visual C++ for other parts. It's a similar story on Linux. Compilers in Composer XE products for Linux are compatible with the gnu tool chain and are source and binary compatible with gcc.