Sun™ Studio 11 Software for Solaris™ Platforms

Developing reliable, high-performance applications for the Solaris™ OS

Sun Studio 11 makes it simple to get outstanding performance when developing C, C++, and Fortran applications for the Solaris Operating System (OS). It provides a comprehensive, productive environment for developing high-performance, 32- and 64-bit applications on Sun's newest UltraSPARC, x64, and x86-based, multicore processor systems. From optimizing compilers that maximize performance throughput to graphical debugging and performance analysis tools, Sun Studio 11 provides the most advanced environment to develop Solaris applications.

Highlights

- Optimizing compilers produce record-setting runtime performance that consistently exceeds performance from open source alternatives and prior Sun™ Studio software releases
- Maximize performance throughput with Sun Studio 11 and the Solaris™ 10 OS, which take full advantage of the latest multicore UltraSPARC®, x64, and x86-based systems
- Source and object-level compatibility with prior releases, along with GNU C/C++ compatibility features, simplify upgrade and adoption
- Target multiple platforms running the Solaris OS by utilizing Sun Studio 11 on UltraSPARC, x64, and x86-based systems

Turbocharge applications with optimizing compilers

Sun Studio 11 software offers record-setting boosts in runtime performance over previous versions, due to:

- Full support of multicore processors, along with existing UltraSPARC, x64, and x86 processors and architectures
- Enhanced OpenMP support, including autoscoping and nested parallelism
- Excellent floating-point instruction throughput
- Interprocedural optimization (IPO)
- Profile-guided optimization (PGO)
- Data prefetching
- Compiler code-coverage tool
- Compiler test-prioritization tool
- Automatic microvectorizer and vector library support
- Automatic loop parallelization
- Improved branch prediction
- Software pipelining
- Support for Streaming SIMD Extensions (SSE/SSE2) intrinsic functions
- Support for SSE/SSE2/SSE3/3DNow instructions
- Support for Intel EM64T and AMD Opteron™ machines
- Support for inline assembly code via .il template mechanism
- Medium model support for x64 Application Binary Interface (ABI) enables long addresses

Take advantage of multicore, multiprocessor, and multithreaded technology

Sun Studio 11 software can help you achieve higher system throughput with multithreaded applications. You can build these powerful applications using the OpenMP v2.5 application programming interface (API) with C, C++, and Fortran code, along with an improved debugger and performance analysis tools. The OpenMP implementation supports nested parallelism, where nested parallel regions can be executed by a team of two or more threads. Paired together with multicore and chip multithreading (CMT) optimizations, your applications can maximize performance by taking advantage of the latest UltraSPARC, x86, and x64-based systems.

"Sun Studio software gave us the tools to perform [OpenMP] autoscoping. We asked Sun to put this feature into the Fortran compilers in Sun Studio, and they delivered a great productivity tool that's unique to the Sun Studio software."

Dieter an Mey
High Performance Computing, RWTH Aachen University

Boost developer productivity

The Sun Studio 11 integrated development environment (IDE) is built on the award-winning NetBeans™ platform. The IDE integrates modules such as a graphical debugger, popular editors of your choice, performance analysis tools, X-Designer graphical user interface (GUI) builder, and more. The IDE simplifies application development and is designed to meet the demands of even the most sophisticated programming needs.

Debugging is easy with the GUI, which provides a significant boost from basic to advanced features. Set breakpoints, examine variables, and navigate the call stack — all via the debugger's convenient menus and buttons. Slash turnaround time for fixes and achieve greater debugging productivity with Fix and Continue. Step through code, across single or multiple processes, and debug mixed language (C, C++, Fortran, and Java™ technology) applications seamlessly.

To improve application quality, advanced features such as Runtime Checking can help you catch hard-to-find bugs like memory access violations and memory leaks — before putting the application into production. Using sophisticated performance analysis tools, you can quickly identify performance bottlenecks and tune for best application performance.

Sun Studio 11 leads the industry with support of autoscoping of variables in OpenMP code. With this feature, the compiler analyzes how variables in your program are used and automatically determines whether these variables need to be shared over multiple threads or be private to a single thread, allowing you to spend more time on the algorithm rather than the implementation. In addition, Sun Studio 11 provides facilities to check OpenMP programs for static and runtime errors, from data races and invalid variable scoping to semantic and nesting errors.

The Native Connector Tool simplifies Java application integration with C, C++, and Fortran functions, including the generation of Java Native Interface (JNI) wrapper classes.

Develop desktop and network applications — quickly

The included X-Designer software helps you quickly and easily build sophisticated GUI applications with greater quality. Existing GUIs can be imported even if there is no source code. A built-in code generator automatically generates portable C, C++, or Java source code at the touch of a button. Build Java technology-based front ends and utilize both local and remote callbacks, including HTML data handling, to access existing C and C++ server-based applications.

Language development systems

C compiler offers:

- Optimized code generation for UltraSPARC, x64, and x86-based systems
- OpenMP C v2.5 API support
- Autoscoping for OpenMP code
- Mixed-mode capabilities to ease K&R style to ISO C transition
- Thread local storage (TLS) for multithreaded applications
- Automatic Precompiled Header (PCH) support
- Lint security checks help build more secure applications
- Support of the following standards:
  - ISO/IEC 9899:1999 C (full support requires the Solaris 10 OS)
  - ISO/IEC 9899:1996 C
  - K&R C

C++ compiler offers:

- Optimized code generation for UltraSPARC, x86, and x64-based systems
- OpenMP C++ v2.5 API support
- Autoscoping for OpenMP code
- Choice of the Sun™ binary-compatible default or STLport standard library
- Improved support and reduction of compilation time for programs using templates
- Thread local storage (TLS) for multithreaded applications
- Automatic Precompiled Header (PCH) support
- Support for the ISO/IEC 14992:2003 C++ standard
- Compatibility mode for easy migration from prestandard (Annotated C++ Reference Manual or ARM-style) to standard C++

Libraries offer:

- Garbage collection to eliminate memory leaks
- Optimized algebraic, transcendental, financial, rounding, conversion, and random number functions
- Interval math classes for easy calculation with intervals
- Multithreading compatibility with both UNIX® and POSIX threads
- Single-, double-, and quadruple-precision, floating-point numerical formats
- Tools.h++ Class Library Version 7.1.0
- Institute of Electrical and Electronics Engineers (IEEE) 754 floating-point arithmetic

Fortran compiler offers:

- Optimized code generation for UltraSPARC, x64, and x86-based systems
- OpenMP Fortran v2.5 API support
- Autoscoping for OpenMP Code
- Global Program Checking across multiple source files helps identify common errors of OpenMP directives
- Interval math classes for easy calculation with intervals
- Cray extensions, such as Cray POINTER
- Improved support for the Fortran 2003 standard:
  - allocatable components of derived types
  - allocatable dummy arguments
  - allocatable function results
  - GET_COMMAND intrinsics
  - BIND statement for interoperability with C and C++
- Support for the following standards:
  - American National Standards Institute (ANSI) X3.198-1992 Fortran 90
  - ISO 1539:1991 Fortran 90
  - ISO/International Electrotechnical Commission(IEC) 1539-1:1997 Fortran 95
- Compatibility with the legacy Forte™ Compiler FORTRAN 77 code

Sun Performance Library™ component offers:

- Numerical routines optimized for maximum performance that are callable from C, C++, or Fortran, including:
  - Linear Algebra PACKage (LAPACK) version 3.0
  - Basic Linear Algebra Subprograms (BLAS)– 1, 2 ,3
  - Sparse BLAS using data formats supported by netlib and the National Institute of Standards and Technology (NIST)
  - Direct sparse solvers
  - Fast Fourier Transform (FFT) routines
  - Convolution and correlation routines
- Hot-spot tuning for key BLAS routines

Multithreaded development tools

Multithreaded debugging and analysis

- Browse, select, and view active threads
- Control, evaluate, and modify specific threads
- Monitor thread entry point, current location status, pending event, and lightweight process
- Display performance data by thread using the Timeline displays in the Performance Analysis Tools

Multithreaded locking analysis (LockLint)

- Static source code analyzer
- Captures locking design assertions
- Reports on potential synchronization errors, deadlock, and data race conditions

Multiprocessing (MP) optimizations

- Automatic parallelization and distributed execution of C, C++, and Fortran code
- Integrated in compiler optimization phases, avoiding source code preprocessing
- Support for the OpenMP C, C++, and Fortran v2.5 APIs

Integrated Development Environment (IDE)

Editing and building

- Choice of three tightly-integrated editors (built-in NetBeans, Vim, and XEmacs)
- Executes build jobs in parallel on single or multiple machines distributed on a network

Debugging

- Graphical and command line debugging of:
  - Mixed language applications, including C, C++, Fortran, and Java
  - Multithreaded applications
  - Shared and dynamically linked libraries
  - Running processes
  - Core files
  - Assembly language programs (command line only)
- Recompile and patch an existing application without leaving the debugger
- Program control and data evaluation features
  - Set conditional breakpoints, postbreak modifiers, and watchpoints
  - Trace program statements and variables
  - Navigate the call stack
  - Evaluate expressions and functions
  - Monitor variables and expressions

Runtime checking

- Detect memory access violations, runtime memory usage, and memory leaks:
  - Read/write from/to unallocated memory
  - Write to read-only memory
  - Read from uninitialized memory
  - Misaligned read/write
  - Bad/misaligned/duplicate free
  - Out of memory
- Integrated with debugger — Interactive or batch operation

Performance analysis tools

Performance analysis tools help assess the performance of your program, identify potential performance problems, and locate the section of code where problems occur. The tools can collect clock- and hardware-counter-overflow profile data and trace calls to some library routines. They also display performance metrics for functions, callers and callees, source lines, and instructions for applications written in C, C++, Fortran, Java, or combinations of those languages.

- Visualize performance bottlenecks via execution timelines
- Display performance metrics for Java programs on a per-method basis for methods that are compiled with the Java HotSpot™ virtual machine
- Enable collection of runtime performance statistics
- Hardware counting profiling
- Memory allocation and deallocation tracing
- Graphically display user, system, lock, wait, and page fault times
- Provide memory and cache analysis of references to program data structures
- Dataspace profiling provides hardware and program views into the performance costs associated with application memory references (UltraSPARC only)
- Generate an optimized linker load map
- Generate annotated source code or disassembly listing, including compiler commentary for pinpointing performance problems
- Display thread and lightweight process (LWP) metrics for multithreaded programs
- Filter data by samples, threads, CPUs, as well as by function or data object names
- Provide an API for programmatic control of data collection
- Provide Solaris kernel profiling and show function-, caller-callee-, and instruction-level data, as well as the Timeline (requires the Solaris 10 OS)
- Enhanced support for OpenMP performance measurement, including data presentation in the user model of OpenMP

X-Designer GUI Builder

Cross-platform development

- Creates Motif, Java, or Microsoft Windows GUIs from the same design
  - Complies with Open Software Foundation (OSF)/Motif 1.2.3 and 2.1 specifications
  - Generates Microsoft Foundation Class-ready interfaces and resource files (for Microsoft Windows)
- Develop on the Solaris OS; deploy on Solaris, Linux, Java, and Microsoft Windows platforms

Desktop and network application development

- Drag and drop widgets to quickly build your interface
- Quickly generates application template with AppGuru feature
- Re-creates the interface design of a running Motif application
- Supports grouping of multiple widgets
- Generates toolkit independent callbacks
- Internet Smart Code provides immediate access to preexisting Web pages or Common Gateway Interface (CGI) programs

C and C++ code generation

- Generates highly portable code
- Supports definition of widgets with additional structure in generated code
- Offers code preludes — user-defined code to be inserted into generated code or an X resource file at specific points
- Stubs file creation for callbacks
- Provides incremental make file generation

Java programming language code generation

- Supports Java and Swing technologies
- Implements Motif widgets in Java technology for easy migration from Motif

Licensing and support

- Free software license allows all types of application development including commercial, academic, and open source
- Keyless installation simplifies administration
- Royalty-free runtime library (.so) distribution
- Attractive fee-based support options available to ensure high developer and team productivity
- Sun Developer Network (SDN) community at developers.sun.com/sunstudio

Serious software made simple

Sun provides a complete portfolio of affordable, interoperable, and open software systems designed to help you maximize the utilization and efficiency of your IT infrastructure. Built from the secure, highly available foundations of UNIX and Java, these systems deliver implementations that are preintegrated and backward compatible.

Sun's portfolio consists of Solaris and Linux software for SPARC and x86/x64 platforms, the N1™ Grid platform for dynamic and utility computing, and the Sun Java System — five integrated software systems for the data center, the desktop, the developer, mobile devices, and identity implementations.

Platforms and requirements

Operating systems and platforms

Solaris 8, 9, and 10 OS — Configuration: Entire Solaris Software Group, Entire Solaris Software Group Plus OEM Support, or Developer Solaris Software Group

SPARC platforms

- Recommended: Sun Blade™ 2500 workstation or better (two 1.6-GHz UltraSPARC IIIi processors)
- Minimum: Sun Ultra™ 60 workstation (450-MHz, UltraSPARC II processor)

x64 platforms (64 bit)

- Recommended: Sun Java workstation W2100z or better (Two 2.6-GHz, 200-series AMD Opteron processors)
- Minimum: Sun Fire™ V20x server

x86 platforms (32 bit)

- Minimum: Intel Pentium III 500 MHz workstation

System requirements

SPARC platforms

- Memory: 512 MB of memory minimum; 1 GB recommended
- Disk space: 1.7 GB

x86 and x64 platforms

- Memory: 512 MB of memory minimum; 1 GB recommended
- Disk space: 1.1 GB

Learn More

Get the inside story on the trends and technologies shaping the future of computing by signing up for the Sun Inner Circle program. You'll receive a monthly newsletter packed with information, plus access to a wealth of resources. Register today at sun.com/joinic.

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