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How Oracle Solaris Studio Optimizes Application Performance

Oracle Solaris Studio 12.3

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Introduction

This white paper provides an overview of Oracle Solaris Studio software.

Modern processors and systems provide myriad features and functionality that can dramatically accelerate application performance. The latest high-performance SPARC® and x86 processors provide special enhanced instructions, and the commonality of multicore processors and multisocket systems means that available system resources are greatly increased. At the same time, applications must still be properly compiled and tuned to effectively exploit this functionality and performance for key applications. Selecting appropriate compiler flags and optimization techniques and applying appropriate tools is essential for creating accurate and performant application code.

Oracle Solaris Studio software includes a full-featured, integrated development environment (IDE) coupled with the compilers and development tools that are required to produce applications that execute as efficiently as possible—while allowing developers visibility into key aspects of application development, debugging, and operation. Oracle Solaris Studio offers key benefits to developers, allowing them to:

- Accelerate application performance

- Simplify multicore development

Oracle Solaris Studio Compilers and Tools

Maximizing application performance is a key goal for any optimizing compiler technology. However, modern application performance must be seen in the context of a diverse and complex mixture of heterogeneous hardware and operating systems, as well as both serial and parallel environments. For example, the latest x86 processors from both Intel and AMD now implement Streaming SIMD Extensions 2 (SSE2) supplemental instructions, while some SPARC processors support special instructions that can dramatically increase performance for certain kinds of operations. In addition, all major chip vendors are now producing multicore CPUs, including Intel Xeon, AMD Opteron, and Oracle SPARC processors.

Oracle Solaris Studio software is designed to allow developers to produce reliable, scalable, and high performance Oracle Solaris and Linux enterprise applications across all of these diverse platforms. Specifically, Oracle Solaris Studio is designed to:

- Maximize application performance with optimizing compilers

- Simplify multicore development with automatic parallelization features and advanced tools

- Improve productivity through a next-generation IDE and tools that have rich graphical interfaces

- Simplify development across multiple architectures (SPARC and x86) as well as multiple operating systems (Oracle Solaris and Linux)

Figure 1 illustrates the components of Oracle Solaris Studio software that allow developers to build, debug, and tune applications, all seamlessly integrated into a next-generation IDE for C, C++, and Fortran developers.
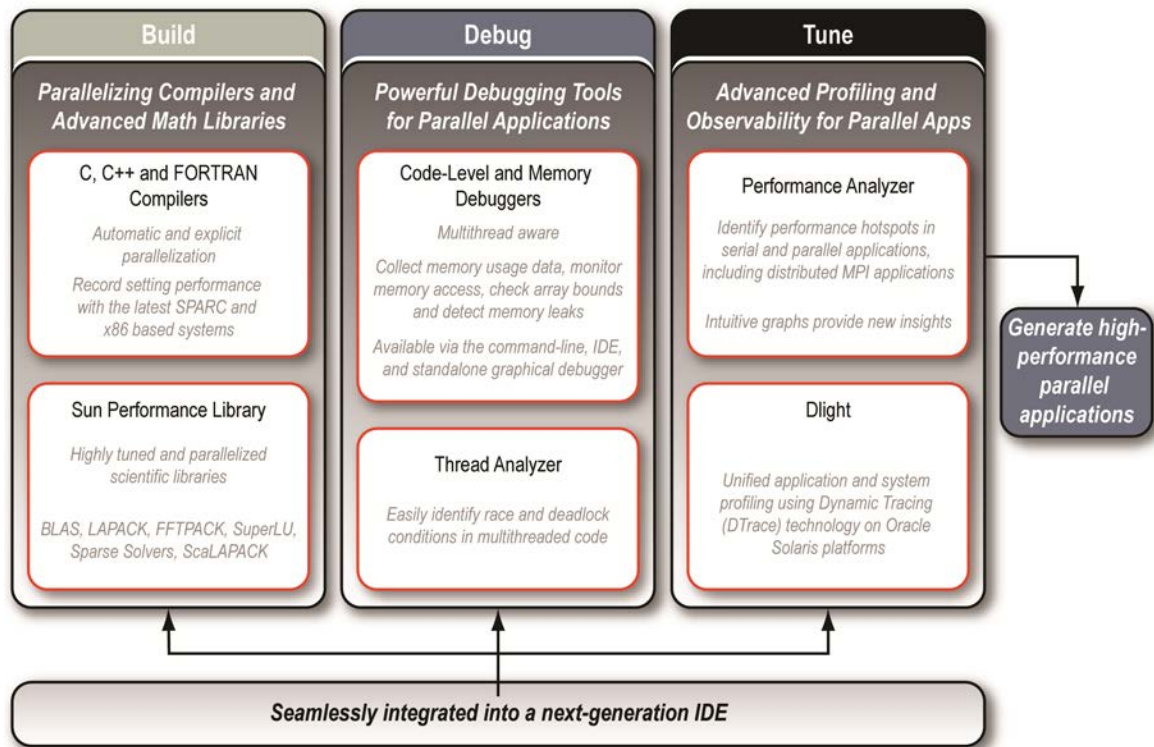

Figure 1. Oracle Solaris Studio compilers and tools are seamlessly integrated into a next-generation IDE for C, C++, and Fortran developers.

The Oracle Solaris Studio IDE provides visual development tools, including auto-complete functionality (Figure 2), support for code refactoring, and advanced code analysis features such as call graphs and class hierarchy display. The Oracle Solaris Studio 12.3 IDE also supports remote development where the IDE is run on a Microsoft Windows machine, but the code generation and execution is performed on a remote system.
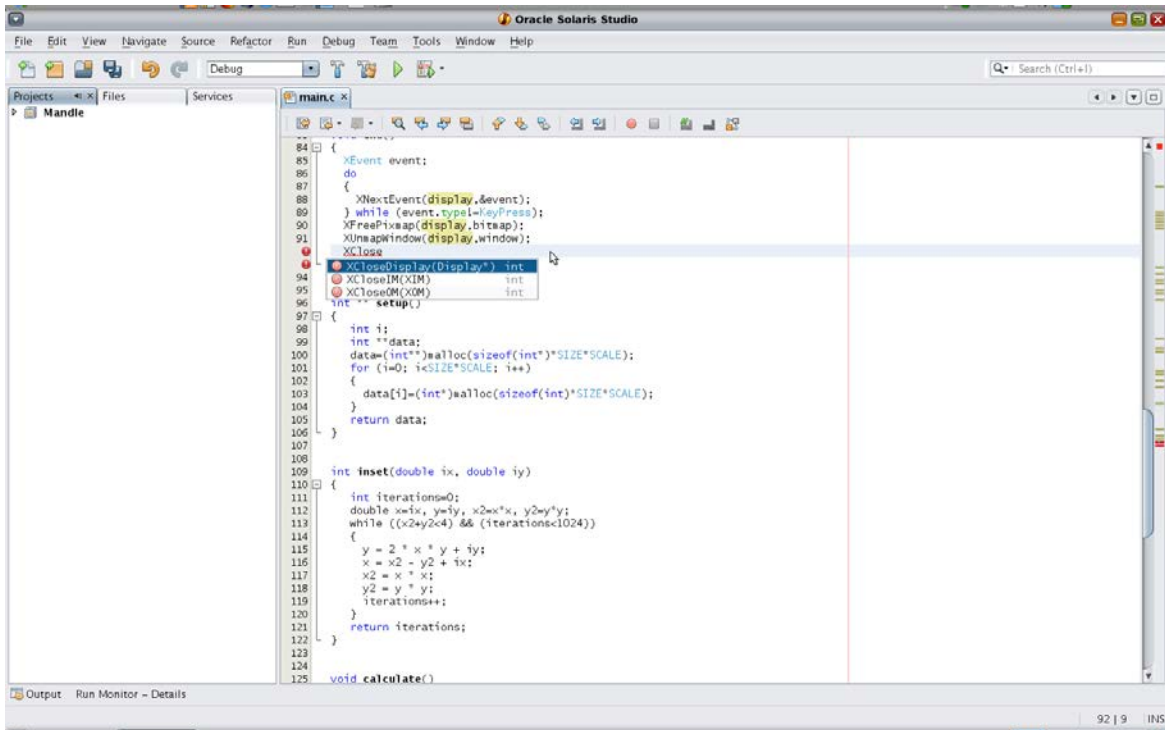

Figure 2. Oracle Solaris Studio provides auto-complete functionality.

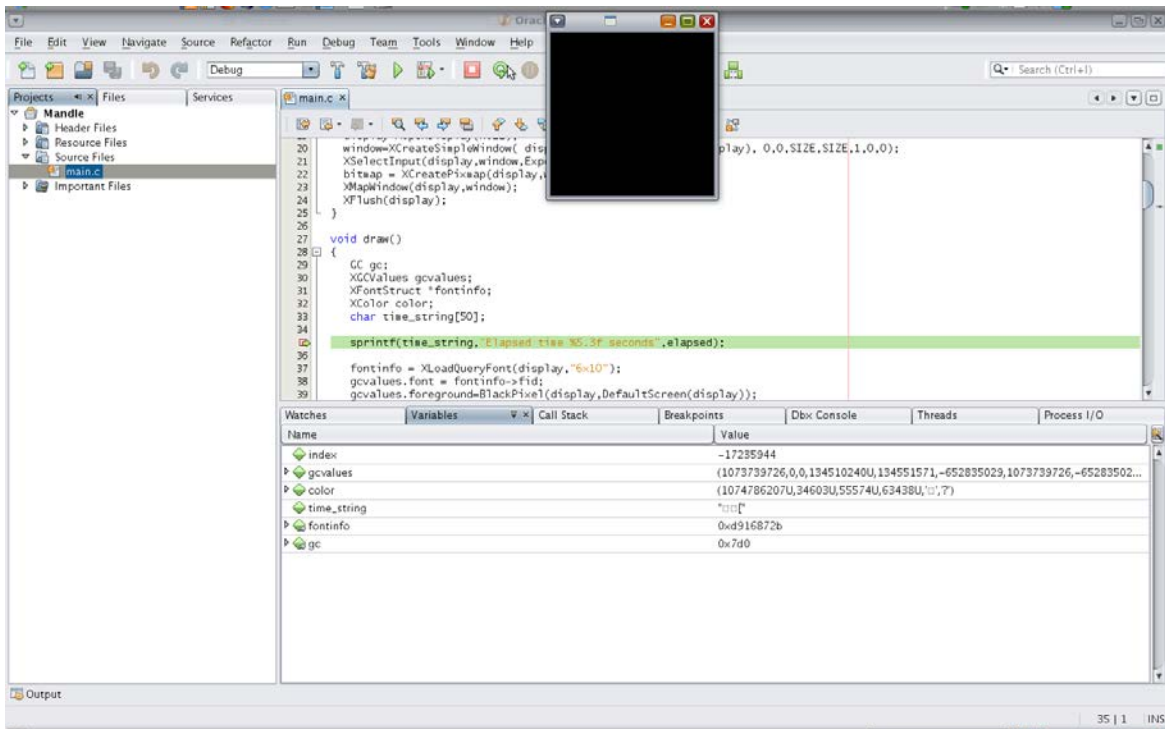A screen shot of the Oracle Solaris Studio debugger is provided in Figure 3.

Figure 3. The Oracle Solaris Studio IDE provides an advanced debugger.

As of this writing, Oracle Solaris Studio 12.3 is the latest production release of the Oracle Solaris Studio software. It is available on Oracle Solaris and the latest Linux distributions, and it includes the following features:

- **Optimizing C, C++, and Fortran compilers.** The Oracle Solaris Studio compilers generate improved application performance on Intel x86, AMD x86, UltraSPARC, and SPARC64 based systems. With a wealth of recent industry-based benchmarks, Oracle Solaris Studio compilers take full advantage of the latest multicore architectures.

- **Full OpenMP 3.1 compiler, debugger, and tools support.** The OpenMP 3.1 specification contains new features to ease multicore development, and it takes a more general approach to multithreaded programming by using tasks to support complex and dynamic control flows.

- **DLight.** System profiling tools allow developers to explore their systems, understand how they work, and identify performance problems across many software layers. DLight is a new tool that unifies application profiling and system profiling using DTrace technology on Oracle Solaris platforms.

- **dbxtool.** The dbx debugger is fully integrated into the IDE and is available via the command line. In addition, Oracle Solaris Studio now features dbxtool, a standalone debugging solution with a user friendly interface. With dbxtool, developers can quickly and easily debug an executable or core file, or they can attach to a running process.

- **Performance Analyzer support for MPI applications.** The Oracle Solaris Studio Performance Analyzer includes an MPI timeline and MPI charts, along with zooming and filtering capabilities. With Oracle Message Passing Toolkit, developers can show two new metrics: MPI Work Time and MPI Wait Time.

- **Updated Oracle Solaris Studio IDE.** Oracle Solaris Studio features a next-generation IDE based on NetBeans 7.0 software, specifically geared for C/C++ developers. New features include improved code completion, error highlighting, semantic highlighting, call graph, memory window, packaging of applications as `tar` files, `zip` files, System V Release 4 (SVR4) packages, RPMs, Debian packages, and much more.

- **Sun Performance Library.** The Sun Performance Library is a set of optimized, high-speed mathematical subroutines for solving linear algebra and other numerically intensive problems. The library allows developers to increase application performance with enhanced and newly added standard routines, including BLAS, LAPACK, FFTPACK, SuperLU, Sparse Solvers, and ScaLAPACK.

Conclusion

With improvements in technology, application developers have new opportunities to optimize and tune applications. Developers need to be able to exploit technology advancements at the processor level as well as leverage the resources provided by multicore processors and multiprocessor systems. At the same time, they must ensure that their code executes correctly across the broadest set of intended target platforms.

Oracle Solaris Studio software provides a proven set of compilers and tools that offer C, C++, and Fortran developers the flexibility and power they need to develop correct and performant applications. Oracle Solaris Studio compilers offer optimization options that enable developers to tune their applications to take advantage of specific platform advantages. Combined with key compiler options, the Oracle Solaris Studio Performance Analyzer helps collect data about how applications actually perform while providing a highly visual tuning experience, while the Thread Analyzer helps developers develop correct multithreaded code.

Together these tools can harness the considerable resources available in modern processors and computing platforms, producing highly interactive applications and the fastest available execution times for applications running on Oracle Solaris and Linux platforms.

For More Information

For more information, see the complete Oracle Solaris Studio product documentation at http://oracle.com/technetwork/server-storage/solarisstudio/documentation/oss123-docs-1357739.html.

Also see:

- "How to Analyze and Improve Application Performance":
  http://www.oracle.com/technetwork/articles/servers-storage-dev/o11-145-studio-analyze-perf-1413944.html

- "How to Optimize the Serial Performance of Applications":
  http://www.oracle.com/technetwork/articles/servers-storage-dev/o11-144-studio-serial-perf-1413940.html

- "How to Optimize the Parallel Performance of Applications":
  http://www.oracle.com/technetwork/articles/servers-storage-dev/o11-146-studio-optimze-parallel-1413948.html

- Oracle Solaris Studio product page:
  http://www.oracle.com/technetwork/server-storage/solarisstudio/overview/index.html

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