TotalView® Case Study

TotalView® Debugger Helps OpenGeoSolutions Reduce Development Time by Months

Background

Although the OpenGeoSolutions toolkit is robust, from time to time data is discovered that confounds expectations and stresses programs to the point of failure. When failure occurs, it is mandatory that the cause of the failure is diagnosed and that the code is back online as quickly as possible.

OpenGeoSolutions initially worked with several other debuggers, including ddd, pgdbg, and Sun Studio 11. The company found that TotalView was the only debugger available to offer the full suite of features required to do the job.

End-User

Incorporated in January 2001, OpenGeoSolutions is a growing geophysical services company based in Calgary, AB, Canada, that delivers spectral decomposition and spectral inversion services from the team that invented the technology, and offers expert signal analysis to help customers deal with difficult data quality issues.

OpenGeoSolutions is quickly becoming known as "the" resource for high-end signal analysis to be applied to seismic resource determination. Its team of eight geoscientists located in Calgary, Houston, Tulsa, Seattle and London rely on OpenGeoSolutions' code base and rapid deployment of new capabilities for the development of technical solutions designed for-customers working in the fields of petroleum exploration and production.

The Challenge

In the business of supplying the petroleum industry with spectral decomposition, spectral inversion and high-end signal analysis services, OpenGeoSolutions cannot afford to have its process stream falter due to unforeseen issues with its processing toolkit, OpenSeis. Customers expect OpenGeoSolutions to turn their data around in two weeks, from the time they take delivery, to the time processed results and documentation are delivered. This turnaround, and OpenGeoSolutions' ability to routinely provide it, is one of the primary reasons for the company's success.

OpenSeis is built upon the open source FreeUSP toolkit available from www.freeusp.org (OpenGeoSolutions scientists were largely responsible for the generation of the FreeUSP toolkit and its release to open source.) OpenGeoSolutions has made use of this development platform to build many proprietary routines that are used in its daily business. Rapid development and deployment of intellectual property is key to keeping OpenGeoSolutions at the forefront of the market, and rapid recovery from "surprises" is also important, as new datasets often utilize new pathways through the codes and bring unforeseen "features" of the programming to light.

The sheer bulk of code makes it impossible for any one person at the company to be familiar with all programs. In the event that something does go wrong, OpenGeoSolutions' developers need to run the problem in a debugger to rapidly understand the issue, fix it, and get the program and project work back online. They quickly learned that a programmer-friendly, Linux-based, graphical debugger was required to make this happen.

The Solution

OpenGeoSolutions developers chose TotalView Technologies' TotalView® debugger to help develop their applications. TotalView is the most advanced multi-core debugger for Linux, UNIX, and Mac OS X and is the market leader in C/C++, FORTRAN, UPC, MPI/Open MP and parallel programming debugging.

The TotalView debugger was designed from the ground up to handle the complexities of the world's most demanding multi-processing applications that scale to thousands of processes and threads with applications distributed over multiple machines or processors. TotalView offers many advanced features, including multi-language support and built-in source code and memory debugging capabilities, which streamline and simplify the development process. TotalView has made it possible for OpenGeoSolutions developers to significantly speed their development times, as well as to improve the quality of their software products.

Since the company began using TotalView, OpenGeoSolutions' development time has been reduced by months. With far fewer bugs to contend with during the initial usage of newly developed code, developers can keep turnaround of customer projects on a tight time line and prevent long waits for products.

"Without this capability, our programmers would be taken back to the days of print statements and generating reams of paper output in order to understand, locate and repair broken code," said Paul Garossino, geoscientist at OpenGeoSolutions. "The time spent on this style of error assessment can be astronomical."

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How the TotalView Debugger Helps

OpenGeoSolutions now gets the code through source code debug and right into TotalView for run time debug, without taking time out for experimentation. TotalView's extremely friendly debugging environment makes watching the algorithm in action easy. Problems with program flow, variable initialization and usage, array boundary overflows, IEEE exceptions and the like show up immediately and are easy to diagnose, isolate and repair.

"When debugging, it is our view that our programmers time should be spent understanding the code, not the debugger," adds Garossino. "When we get into trouble with an algorithm, being able to get it into TotalView, find and solve the problem, and restore the code to our production environment in a timely fashion is critical for our success."

Overall, the greatest value that TotalView has brought to OpenGeoSolutions is speed.

While OpenGeoSolutions uses TotalView under conditions of "seismic triage" to great effect, they have found it most powerful during the research and development stage of new algorithms. By watching algorithms in action, the company has also been able to optimize the codes to attain previously impossible performance levels.

During run time debugging of new code, TotalView's many productivity tools come to the forefront, allowing OpenGeoSolutions developers to spend valuable time understanding the code -- not the debugger. The advanced productivity features of TotalView that have proven to be particularly beneficial for the company are:

- The ability to dive on arrays;
- The ability to cast array contents arbitrarily as real, integer, character etc.;
- The ability to visualize array contents graphically;
- The ability to deal with a multitude of languages [FORTRAN, C and C++];
- The ability to carry an active expression list of problem variables in one display;
- The ability to install breakpoints, barriers and evaluation points;
- The run-to capability used to get around setting unnecessary breakpoints;
- The ability to step in and out of subroutines;
- The ability to examine memory outside the bounds of an array;
- TotalView's automatic update upon compilation without restarting;
- The fact that TotalView runs on the OpenGeoSolutions' LINUX development platform and is compatible with its compiler set.

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About TotalView Technologies:

TotalView Technologies is the world's leading provider of scalable debugging and analysis software solutions for the multi-core era. TotalView Technologies products enable software developers to quickly, easily and effectively debug UNIX, Linux, and Mac OS X applications running on development machines with single, dual-core, multi-core, or multiple processors.

For more than 20 years, TotalView Technologies products have been at work in research institutions, government laboratories, and technical computing centers, as well as commercial enterprises in the financial services, telecommunications, biotech, aerospace, weather prediction, film special effects and animation, oil and gas exploration, and computer-aided engineering markets. Recognized worldwide as the gold standard for debugging in high-performance, distributed or cluster computing environments, TotalView Technologies' award-winning technology is used to solve the world's toughest computing problems on many of the world's largest supercomputers. For more information, visit www.totalviewtech.com.

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