

Weston Geophysical Achieves a 25% Reduction in Debugging Time with the TotalView® Debugger

End-User

Weston Geophysical Corp., located in Lexington, Massachusetts, conducts seismic research in nuclear test and CO2 sequestration monitoring.

The Challenge

As funding for nuclear test monitoring has decreased substantially during the past decade, Weston Geophysical has branched into other areas of geophysical research, which requires highly advanced computing power.

As part of this geophysical research, Weston Geophysical develops parallel applications to simulate seismic waves in the Earth. In addition to the general challenges inherent in modeling complex Earth vibrations, these codes can be especially tricky to debug because they are based on a spectral element method. The global nature of this method means that coding errors can lead to instabilities that are similarly global in nature. Without an effective, efficient parallel debugger, the source of these instabilities can be very difficult to identify.

The Solution

Weston Geophysical developers chose to use TotalView Technologies' TotalView® Debugger to provide the parallel debugging capabilities needed to help develop their applications. TotalView provides them with the ability to easily view, actively query and precisely control their seismic simulation code's many processes and threads. When a Weston Geophysical developer approaches the task of adding a new feature or troubleshooting a problem, they can be confident about the ability to localize, recognize and resolve defects in the simulation.

In a cluster utilizing MPICH2 for parallel communication, like the one used at Weston Geophysical, TotalView is able to gather and display information about the state of MPI message queues, greatly simplifying the diagnosis and resolution of MPI interprocess communication deadlocks. TotalView also includes powerful memory debugging capabilities based on a lightweight Heap Interposition Agent (HIA), which is especially effective on parallel, memory intensive and long running applications. Weston Geophysical takes advantage of these capabilities to detect and eliminate memory leaks before they become a problem.

Background

Weston Geophysical is developing a wave propagation code to model seismic waves from a variety of sources, including earthquakes and explosions, which run on a Linux cluster using MPI. The code is based on a pseudo-spectral algorithm used to solve a hyperbolic (wave) equation. The computational domain is distributed across processors, and with each time-step iteration the domain is transposed across processors, using MPICH2 for parallel communication.

Features are added to make the code's solutions more accurate and also more realistic, incorporating effects in the wave field solutions of the Earth's intrinsic damping, as well as surface topography. Adding these new features to parallelized code requires the use of a parallel debugger to resolve instabilities or other errors introduced during development.

One of the primary reasons that Weston Geophysical chose to use TotalView is because of its long-standing reputation as the most comprehensive debugger available for parallel software. The company also had previous experience with using TotalView on Cray supercomputers, and its availability for Linux clusters made the choice even simpler.

TOTALVIEW® Case Study

How the TotalView Debugger Helps

With TotalView, Weston Geophysical is able to debug across multiple processors, setting breakpoints and evaluating variable values at each time iteration. Developers are also able to check for memory leaks. As a result, Weston Geophysical has found that the ability to debug new features in the code is greatly accelerated with the use of the TotalView Debugger. In fact, since the company began using TotalView, developers have been able to find and fix bugs much faster, shaving at least 25% off the time spent on debugging efforts, according to company estimates.

Weston Geophysical noted that, "The TotalView Debugger allows us to add features to our code that we could not have added successfully without it. The greatest value that TotalView has brought to our organization is reduced debugging time, which equals cost savings. Furthermore, the addition of advanced features to our code means an ability to solve more complex problems faster, giving Weston Geophysical the important benefit of being more competitive in our market."

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About TotalView Technologies

TotalView Technologies is the world's leading provider of feature-rich debugging and analysis software solutions for the multi-core era. TotalView Technologies products enable software developers to quickly, easily and effectively debug Mac OS X, Linux, and UNIX 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.

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