



# ABAQUS

## Debugger for Large, Complex Code Helps ABAQUS Bring Products to Market Quickly

### CHALLENGE

A software vendor wants to bring its products to market more quickly by finding an efficient method of debugging software that comprises millions of lines of complex code and that works across a wide variety of processors and operating systems

### SOLUTION

The Etnus TotalView® debugger has the power and flexibility to debug even the most complex code and supports most major UNIX\* and Linux\* platforms as well as the compilers used with them

### BENEFIT

Time to market is shortened and development efficiency is improved because programmers can debug even their most difficult problems with one tool that works across all platforms

ABAQUS, Inc., of Pawtucket, Rhode Island, is a leading worldwide vendor of software and services for advanced finite element analysis. Engineers in such industries as automotive and aerospace as well as universities use the ABAQUS® software suite to predict how products and materials will behave under stress. A bridge designer, for example, may use ABAQUS software to simulate a new design and verify that it can handle the expected load of cars and wind.

### BUSINESS CHALLENGE

The ABAQUS software suite is large and complex, comprising approximately three million lines of C and C++ code and more than a million lines of FORTRAN code. The program has a complex architecture with extensive parallelization and shared libraries. All these characteristics make debugging difficult.

On the surface, the development process is quite simple. The program has a single-source code base, which is maintained and enhanced using Microsoft Windows\*-based workstations. Platform-specific versions are created from that code base. ABAQUS supports eight operating systems, including multiple versions of UNIX and Linux, as well as 11 hardware platforms, including the Intel® Pentium® 4 with Hyper-Threading Technology and Intel® Itanium® 2 processors and RISC processors from Hewlett-Packard, SGI, IBM and Sun.

Combining the complex application with multiplatform support creates a challenging development

environment. Says Robert Schweikert, a development engineer at ABAQUS, “Developing new features is generally quite complex because we have three core products with many options. All interoperate and share code, wherever possible, with each other. ABAQUS is used to perform everything from implicit finite element analysis to transient dynamics to modeling and visualization. Many debuggers cannot handle all our languages and the extensive use of threads on multiple platforms.”

Until 2000, ABAQUS developers had only one debugger and it worked on only one platform. Code for all other platforms was debugged manually, which lengthened development cycles. To improve time to market and developer efficiency, ABAQUS needed a debugging tool that could handle four million lines of code, three source languages, lots of threads and could also support multiple platforms.

### BUSINESS SOLUTION

When ABAQUS developers discovered the TotalView debugger for complex code from Etnus LLC, they knew they had found the key to making the development and debugging process more efficient. Because TotalView supports most Linux and UNIX operating systems as well as a wide variety of Intel® compilers and other compilers for different processors, it could be used to debug the entire ABAQUS product suite across all platforms. Says Schweikert, “The decision to get TotalView was easy. It is the only debugger on the market today that handles all our requirements.”



*“The basic idea behind using TotalView was to improve efficiency and to find problems much more quickly.*”

“The idea behind using any debugger is to help us find problems more quickly,” Schweikert continues. The TotalView debugger enables developers to quickly visualize, control and correct even the largest and most difficult applications. Designed specifically for complex multi-threaded, multiprocess and distributed applications, TotalView supports multiple UNIX and Linux platforms. The Etnus tool can debug applications that have massive amounts of data, millions of lines of code, threads and other forms of parallelism.

**Multiplatform support makes developers more efficient.** TotalView provides the same intuitive user interface on all platforms, which reduces the time needed to learn new tools and become proficient, thus helping developers become more efficient. Says Schweikert, “It is much easier to work with one debugger than to learn one for each platform. TotalView often has helped us identify problems that may appear on only one platform. In most cases the problems appear on all platforms, so a fix improves quality everywhere. The use of TotalView definitely helps us to be more efficient in identifying problems.”

**Thread support speeds the QA process.** TotalView not only enables ABAQUS to quickly find basic programming problems such as memory overwrites, but it also speeds the resolution of hard-to-solve problems, such as those that occur with threads. Control options include single-stepping at the thread level and setting breakpoints specific to a single thread.

**Other features add to efficiency and speed.** ABAQUS developers make extensive use of C++ templates, and TotalView transforms these templates into readable code that is easy to debug. TotalView also helps the developers debug code written in multiple languages. Plus, TotalView is one of the few debugging tools that can handle an application the size of the ABAQUS suite.

Robert Schweikert  
Development Engineer  
ABAQUS, Inc.

**TotalView helps speed product development process**

After using TotalView for three years, the ABAQUS engineers can quickly fix problems they find in platform-specific versions of the ABAQUS suite during QA testing—without having to get up to speed on a tool they may not have used for a while. This efficiency has many positive effects: new releases can get to market faster; maintenance releases can be turned around faster so customers are happier; and engineers are more productive, allowing them to spend their time developing new capabilities rather than fixing problems. In summary, this little-seen tool used in the development process can have a measurable effect on revenue and profitability.

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