

## Helping CEA/DAM Scientists Maintain France's Defense Capabilities by Speeding Application Development

### End-User

CEA/DAM (Commissariat à l'Energie Atomique/Direction des Applications Militaires) is a French government agency that specializes in nuclear energy. CEA/DAM designs, manufactures and maintains the nuclear warheads of France's naval and air strategic forces. The agency also plays a role in monitoring international treaties and helping in the global fight against nuclear proliferation and terrorist activities.

### The Challenge

Scientists at CEA/DAM run enormous scientific computations, which are performed using the agency's own internally developed programs. The programs are very large and complex, involving multiple processors and millions of lines of code. CEA/DAM's programmers need the most scalable, reliable and effective tools available to enable them to develop these complex applications efficiently.

### The Solution

CEA/DAM scientists use TotalView Technologies' TotalView debugger, one of the industry's most advanced debugging tools, to help develop and debug their applications. The TotalView debugger was designed from the ground up to handle demanding parallel applications that scale, by offering many advanced features that understand parallel programming models like MPI and OpenMP. TotalView has made it possible for CEA/DAM scientists to significantly reduce the time it takes to develop their complex applications.

### Background

CEA/DAM maintains the safety and reliability of the French nuclear deterrence capabilities by performing simulations rather than conducting nuclear tests. To perform these simulations, the agency must develop software that uses computation to reproduce the different operating phases of a nuclear weapon.

Development of the applications requires powerful computing resources. CEA/DAM relies on the high-performance computing (HPC) equipment it has at its disposal. Its Ile de France Research Center, located outside of Paris, houses an important HPC complex, including two supercomputers based upon Bull Novascale nodes.

One of these supercomputers is among CEA/DAM's most important computer resources. It offers peak computing power in excess of 60 Teraflops (60,000 billion operations per second). The machine, made by the French company Bull, is made up of 5,000 Intel® Montecito dual-core processors, connected together by a Quadrics high-performance interconnection network.

On its HPC computers, CEA/DAM scientists develop a range of applications, including nuclear physics, atomic and plasmas physics, materials behavior, unstable or turbulent multiphase flows, optics and electromagnetism. The scientists can develop applications using thousands of cores in C, C++ and Fortran — an extremely complex development environment.

"We are developing highly complex code using gigantic computing power," said Jacques Noé, operational manager for developing tools of CEA/DAM. "To ensure our scientists' success, we need to provide them with the most comprehensive optimization tools available so they can write their programs efficiently and effectively."

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### How the TotalView Debugger Helps

CEA/DAM has relied on the TotalView debugger to improve its application development process for many years. According to Jacques Noé, "We have been using TotalView for a very long time, starting with our Cray machines. Our code developers are very fond of the product — they find it indispensable in developing and debugging their programs."

One of the industry's most comprehensive debugging solutions for demanding multi-core applications, TotalView is powerful and easy-to-use, dramatically reducing debugging time and enhancing developer productivity. Built to handle the complexities of the world's most demanding applications, TotalView is capable of scaling from one to thousands of processes or threads with applications distributed over multiple machines or processors. TotalView supports multiple platforms, compilers and programming languages.

# TOTALVIEW® Case Study

## The TotalView debugger's unique benefits include:

- Intuitive user interface and easy-to-learn features enable developers of all levels to analyze and debug complex multi-process and multi-threaded applications.
- Multi-platform compatibility reduces debugging learning curve and allows organizations to quickly increase the efficiency of new developers.
- Unique time-saving features enhance developer productivity and shorten the application development cycle by simplifying the process of debugging complex applications.
- Scalable, robust solution ensures consistently accurate and reliable results when debugging challenging applications that require massive amounts of data, millions of lines of code, and extensive parallelism.
- Non-intrusive debugging solution minimally impacts application performance.

*"Some of our developers use TotalView for educational purposes."*

TotalView has helped CEA/DAM improve its developers' productivity by reducing the time needed to develop and validate their codes. And, according to Noé, TotalView has yielded more benefits than just improving the debugging process. "Some of our developers use TotalView for educational purposes," said Noé. "With this tool, they are able to demonstrate the inner workings of their products."

## About TotalView Technologies

TotalView Technologies is the world's leading provider of scalable debugging and analysis software solutions for the multi-core age. 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](http://www.totalviewtech.com).

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