



Customer: a.i. solutions
Web Site: www.ai-solutions.com
Customer Size: 150 employees
Country or Region: United States
Industry: Government—Aerospace

Customer Profile

a.i. solutions, an aerospace engineering firm based in Lanham, Maryland, provides aerospace engineering services; business-critical IT services; and commercial, off-the-shelf software for space mission analysis.

Software and Services

- Windows HPC Server 2008

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Aerospace Firm Speeds Analysis Time from Months to Days with High-Performance Solution

“We can look at many more possibilities than we could before, we get faster time to insight, and we can solve our customers’ problems more quickly.”

David Rand, Systems Engineer, a.i. solutions

Aerospace engineering firm a.i. solutions, Inc., needed a more powerful computing platform to keep up with the increasingly complex computational needs of its customers. To meet that need, it adopted Windows® HPC Server 2008. Now a.i. solutions can run analysis cycles up to eight times faster, which enables it to run more cycles in less time and reach insights faster. The software was deployed within hours and required no retraining of users.

Business Needs

Few computational analyses are as complex—and have as much riding on the results—as those that support the design and implementation of space flights. The U.S. National Aeronautics and Space Administration (NASA), the Department of Defense, and other government agencies require detailed predictions and analysis of the flight dynamics of a given spacecraft, from optimal launch times and orbit determination, to attitude control and navigation. Mistakes in any of these areas can cause a space mission to fail, and potentially result in loss of life and millions of dollars.

For analysis of the mission design and the orbital dynamics of its spacecraft, the U.S. government often turns to a.i. solutions, a 12-year-old aerospace engineering firm that provides such analysis services. The company also sells its FreeFlyer® analysis software so that mission planners can conduct those analyses on their own.

Over the past few years, the company’s customers have begun to need analysis on a scale previously not attempted. The challenge became to find a way to extend the FreeFlyer software, which runs on the Windows® operating system, into a high-performance computing environment. Previously, certain complex analysis efforts

at a.i. solutions involved one or more engineers working solely on their desktop PCs for weeks or more. Such efforts often required many trials to be run. Waiting for these trials to be completed was inefficient and often frustrating. That traditional technique could not cope with the scale of the new types of analysis problems beginning to emerge.

This challenge became impossible to ignore when NASA requested that a.i. solutions analyze the potential impact—quite literally—of several thousand pieces of debris from a Chinese anti-satellite test on NASA satellites in the same orbit, over a period of 20 years. Projecting the precise path of each piece of debris over two decades would take months using a single computer. NASA wanted results sooner.

Solution

a.i. solutions considered the Linux operating system as the basis for a high-performance computing solution to speed the processing of complex analyses. But FreeFlyer wasn't supported on Linux, and neither a.i. solutions nor most of its customers had experience with Linux. "The documentation for Linux wasn't sufficient for our needs and would have made it tough for our analysts and customers to work with it," says David Rand, Systems Engineer, a.i. solutions.

Instead, the company is testing Windows HPC Server 2008. The software enables a.i. solutions to harness the power of many Windows Server®-based computers to address its massive computing challenges simultaneously. So far, the company has been running its FreeFlyer software on clusters of up to 10 nodes of 64-bit AMD, dual-processor servers.

Rand configured the first cluster in three hours, using nothing more than readily

available information on the Microsoft® Web site. "I was pleasantly shocked by how quickly and easily I could be up and running with Windows HPC Server," he says. "I'd thought it was going to require an investment of IT time."

a.i. solutions analysts develop analysis solutions on their local Windows-based computers, and then use Remote Desktop Connection to push the solutions to the Windows HPC Server head node for processing by the compute nodes. "Our analysts didn't need any formal training to work with Windows HPC Server," says Rand. "They saw pretty quickly what they can do."

Rand uses the Windows HPC Server Management Console to monitor the health of each node on the cluster, including the status of each computing job on each node. He can monitor the status of each processor in the cluster in real time; a highly visual "heat" map provides the status of CPU loads and network traffic in a single view.

Benefits

"Our tests of Windows HPC Server are everything we could have hoped for," says Rand. "In a couple of days, we can run problems that we just couldn't run before. That's tremendous."

Although FreeFlyer is a 32-bit application written for Windows desktop operating systems, it runs virtually without change on Windows HPC Server 2008. "Not having to do any significant additional development of our existing product to have a powerful application for Windows HPC Server certainly helped us to get up and running immediately. And that's equally important to our customers who want to run FreeFlyer on their own," Rand says. "It's very important that we can tell our customers that this is a

high-performance computing solution that runs perfectly on Windows, because most of them are Windows shops and that's what they're comfortable with."

The results of running FreeFlyer on Windows HPC Server are as impressive as the ease with which a.i. solutions is making the transition to the server software, according to Rand. The company's analysts are able to run engineering simulations, or cycles, up to eight times faster than on the previous, Windows-based desktop systems, he says—but that's the least of the advantages that Windows HPC Server delivers.

"Faster analysis is only part of the benefit because we never run just a single simulation," says Rand. "Because cycles run so much faster, we can do so many more of them in less time than it used to take to run one. That means we can look at many more possibilities than we could before, we get faster time to insight, and we can solve our customers' problems more quickly."

In the case of the Chinese anti-satellite debris, for example, a.i. solutions completed the 20-year analysis that NASA requested in less than three days, instead of the month or more it would have taken with traditional software.

"Windows HPC Server 2008 will be a great asset to our business," says Rand. "We're technology innovators, and high-performance computing will give us an edge in one of our core capabilities—advanced space mission analysis. Staying ahead of the curve on HPC will help us to sell our services and to sell our software."