RoGrid opens a window to the future

Delivering scalability, high performance and optimized system architecture with high-performance computing from IBM BladeCenter

Overview

The need
RoGrid needed high-performance computing (HPC) resources with greater availability, performance, efficiency and scalability to support its increasingly complex scientific research programs.

The solution
RoGrid implemented an integrated solution including IBM® BladeCenter® with Intel® Xeon® Processor 5600 Series CPUs, IBM System Storage® and IBM General Parallel File System (GPFS™) technologies.

The benefit
Improved system and storage performance ensures optimum responsiveness and system availability. The flexible BladeCenter infrastructure combines scalability with ease of management.

The Romanian National Grid Initiative (RoGrid) was established to deliver high performance computing (HPC) capabilities to support research projects in medicine, life sciences, aerospace and meteorology. Hosted at the Polytechnic University of Bucharest, RoGrid brings together partners from government, educational institutions and industry to cooperate on computational research.

A key challenge for RoGrid is to combine outright performance with reliability and cost-effectiveness. The organization also requires flexibility and the ability to match different computational requirements to the most appropriate hardware architecture.

Emil Slusanschi, Associate Professor, Computer Science and Engineering Department at the Polytechnic University of Bucharest, explains: "We are a prime partner in multiple research projects that demand the most advanced HPC capabilities. We needed a high-performance environment that could support the full diversity of projects, as well as offering the availability and reliability to consistently deliver results. IBM BladeCenter was the optimal platform for our requirements."

Migrating to a professional HPC platform
RoGrid worked with IBM to deploy five BladeCenter H chassis, each supporting 14 blade servers, with IBM System Storage DS3950 Express disk arrays and IBM General Parallel File System (GPFS) for high-speed parallel data storage.

"We decided to partner with IBM on account of its long-standing experience in grid computing, its support of open standards and the high performance of its solutions," comments Professor Doina Banciu, General Director of the National Institute for Research and Development in Informatics and a National Representative in the European Grid Initiative. Slusanschi adds: "IBM's reputation for reliable, flexible and scalable information architecture was also a key attraction."

Designed for Data

- RoGrid runs advanced computational research projects across medicine, life sciences, aerospace and meteorology. These projects produce many terabytes of data that must be made available for high-speed analysis both during and after computation.

Tuned to the Task

- RoGrid has built a compact, consolidated supercomputing environment that supports multiple processor architectures, enabling it to match each different computational workload to the ideal platform. The organization also plans to deploy hybrid systems with both CPUs and GPUs in the near future..

Managed as a Cloud

- The IBM BladeCenter solution acts as a private cloud, providing an array of fully flexible virtualized compute resources, backed by fully virtualized data storage with highly parallelized access. RoGrid can scale resources up and down to meet changing requirements in a completely seamless way.

Driving Innovation

- The high performance and flexibility of the IBM supercomputer is helping RoGrid to tackle major scientific, medical and engineering challenges. The institution's research is contributing to cutting-edge new developments in aeronautics, seismology, image analysis and many other areas.

RoGrid runs an extremely wide range of HPC workloads for an equally wide range of research teams across the public and private sectors. For example, the organization works with the Romanian National Institute for Earth Physics to improve earthquake forecasting, with the National Institute for Meteorology to improve weather forecasting, and with industrial partners to improve the efficiency of aircraft wings. It is also developing innovative virtual surgery tools, creating sophisticated image analysis systems and improving collision detection in simulations of multi-body physical systems.

Optimized systems

IBM BladeCenter enables RoGrid to optimize its computing resources to meet each specific computational requirement, as Slusanschi explains: "For example, our aerospace codes require high-speed and large-bandwidth connections between blades, while our meteorological codes need large numbers of clustered servers. With BladeCenter, we have the flexibility to orchestrate the resources exactly as required."

RoGrid is running BladeCenter HS22 blades with powerful and efficient quad-core Intel Xeon processors. It plans to deploy the next generation of Xeon processors ('Sandy Bridge' architecture) as soon as they become available, and also to create hybrid architectures with General Purpose Graphical Processing Units (GPGPUs). "With BladeCenter, we can support CISC, RISC and hybrid processor architectures within the same physical infrastructure," says Slusanschi. "From the computational point of view, these are all completely distinct and optimized for different tasks. Yet from the system administrator's point of view, they are all managed in the same way, which means that BladeCenter enables diversity without unnecessary cost or complexity. It's clear that hybrid computers are going to become more and more widely used in the future, so it's important for us to give our students this experience."

The BladeCenter environment includes three different classes of network technology – 1 Gb/s Ethernet, 10 Gb/s Ethernet and InfiniBand networking – enabling the optimal matching of workload to computing resources. Similarly, the IBM System Storage DS3950 Express is effectively the top tier of three storage options. Slusanschi comments, "The IBM DS3950 Express has helped us boost performance and enhance availability while maintaining a high degree of scalability. You can't have high-performance computing without high-performance storage – the DS3950 Express goes hand-in-hand with the BladeCenter in a perfectly integrated solution."

Solution Components

Software
- IBM General Parallel File System (GPFS™)

Servers
- IBM® BladeCenter® HS22
- IBM System Storage® DS3950 Express
- Intel® Xeon® Processor 5600 Series processors

"We decided to partner with IBM on account of its long-standing experience in grid computing, its support of open standards and the high performance of its solutions."

— Professor Doina Banciu, General Director of the National Institute for Research and Development in Informatics and a National Representative in the European Grid Initiative

Seeing the benefits

"We started out in HPC as everyone probably does, building our own Beowulf clusters out of ordinary PCs," recalls Slusanschi. "But such solutions will only scale so far in practical terms. When your requirements become more sophisticated, you need the compactness, efficiency, reliability and, of course, performance of a professional solution. With two of our BladeCenter chassis in a cluster we have reached one teraflop of performance, which is easily two or three times faster than what we could offer previously."

He adds, "The BladeCenter solution is also very flexible and efficient. Depending on the number of users at any given time, we can scale the system up or down, which is easily achieved with virtualization. The BladeCenter servers are far more energy efficient than our previous systems. Instead of servers requiring about 700 watts each, we now only need perhaps 200 watts of power per server. Despite that huge reduction in power requirements, per-server performance has improved by a factor of four or five with BladeCenter. We have also saved valuable space in the data center, going from a server footprint of 20 square meters to just four."

Long-term benefits

RoGrid's previous HPC systems, built in-house, were difficult to manage and consequently unreliable. This meant that a great deal of administrative effort was required to keep them running effectively. Even though the acquisition cost of these systems was relatively low, the total cost of ownership was high because of this intensive requirement for systems administration.

"BladeCenter gives us consistency and ease of management, saving a great deal of administrative time," says Slusanschi. "What we want is for the computing resources to essentially be invisible, so we can instead focus on what we want to achieve with them – this is what BladeCenter allows us to do. This also means that the long-term operational costs are low. In fact, most of our solutions are from IBM – they offer a really good mix of quality, flexibility and performance. The purchase cost may be higher than building your own solution, but the long-term value is definitely much better."

He concludes, "The high-performance computing technology that we have from IBM allows our students to open the window to the future, and that's exactly in line with our strategic objectives."

For More Information

Contact your IBM sales representative or IBM Business Partner, or visit us at: **ibm.com**/systems/bladecenter

IBM

BLC03076-USEN-00