IBM Boeblingen Lab accelerates product development with Grid Computing.

Overview

- ***Challenge***
  Inability to fully utilize server environment hindered Lab's planning abilities and productivity, delaying development and adding costs
- ***Why Become an On Demand Business?***
  Lab needed an open, virtualized, resilient computing solution to increase productivity and improve product development cycle and responsiveness to customers
- ***Solution***
  Grid Computing solution joins resources to create a virtual, resilient, open, autonomic and integrated computing environment enabling developers to access high-performance computing capability locally, whenever they want it
- ***Key Benefits***
  100% payback in one year; higher test coverage resulting in better quality servers; avoidance of multiple chip releases resulting in substantial cost savings; resilient solution providing business continuity for mission-critical projects

The Boeblingen Lab has worldwide responsibility for the development of open source Linux systems for the IBM @server® zSeries® family.

Celebrating its 50th anniversary, the IBM Germany Development Lab in Boeblingen (Boeblingen), is the largest IBM development lab outside the United States. With more than 1,700 employees, Boeblingen performs product development and testing services for internal clients at IBM. It has worked on the IBM @server zSeries 990, and high-profile releases of IBM WebSphere® Application Server, IBM DB2® Universal Database™, as well as SAP running on IBM systems. The lab is currently designing and developing various units of the zSeries processor family.

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– Tony Gargya, Grid Solutions and Technologies, IBM Germany Development Lab, Boeblingen

On Demand Business Benefits

- 100% payback within first year
- Competitive advantage over other vendors' platforms due to ability to execute computations more frequently, avoiding multiple chip releases, resulting in substantial cost savings and accelerating time to market
- Higher test coverage results in better quality of new IBM servers
- Increased development staff productivity; sharing of distributed systems allows staff to complete resource-constrained projects more quickly
- Support for multidisciplinary collaborations within companies and across countries
- More efficient use of server environment
- Resilient computing solution with bounce-back capabilities for mission-critical workloads
- Future support for heterogeneous systems
- Capacity for high-demand applications

Boeblingen has a history of shortening product development time for its IBM clients by running product simulations on more than 400 servers. But despite the Lab's many successes in developing hardware and software for IBM, Boeblingen realized it was not utilizing all of its resources as efficiently as possible to produce the best results.

"A pattern of server over- and under-utilization hindered our productivity, making it difficult to predict when systems could be used and threatening to delay product releases and add costs," says Tony Gargya, Grid solutions and technologies, IBM Germany Development Lab, Boeblingen. Each of the 400 servers was configured and provisioned with applications to run particular workloads. Because of the need for certain applications, some servers were in high demand, creating backlogs that slowed down development. And while some servers were overused, moreover, other servers were underutilized.

"We looked closely at our servers in different departments and identified systems that on average were only 15 percent utilized, and others that were up to capacity," says Gargya. "We couldn't consolidate our workloads and free up processing resources because our applications were specific to one or two server clusters."

To solve the problem, Boeblingen needed a new approach to its systems environment. In place of application-specific machines, Boeblingen needed an open, resilient and virtualized server system to spread workloads around regardless of individual server configurations and platforms. "Harnessing the power of virtual machines for high-performance computing was just beginning to become a real possibility," says Gargya. "It looked like it held the answers."

Lean, mean virtual machine

To make better use of its IT assets, Boeblingen rolled out a virtual server environment based on a Grid Computing model. Grid Computing solves the problem of over- and under-utilization by enabling jobs to be run on any of the nodes within a designated population of servers. The Grid is accessible to all researchers throughout the Lab, so no one has to wait to run a workload. Moreover, the Grid enables the Lab to do more simulations — and more complex projects — resulting in better times to market for products.

The virtual Boeblingen machine increases productivity by streamlining jobs and eliminating queue times, positively impacting the development cycle of new products. The ability to run faster product simulations not only means being able to introduce products to the market in less time, it also leads to products with fewer flaws, better bottom-line results and improved responsiveness to customers' needs.

The Boeblingen Grid is an open, virtualized, autonomic and integrated environment. Because of its autonomic failover properties and scheduling capabilities, work can be processed anywhere within the Grid regardless of whether a particular

processor is available or functioning. A failure in one part of the Grid simply results in work being passed to another area. Furthermore, the open architecture created with Linux supports a mixed environment consisting of different IBM @server platforms. Even non-IBM servers can be integrated, further enabling the Grid to leverage existing server resources. The integration of services within the Grid results in a seamless computing process that can involve the whole Grid or a single node.

"The outstanding resilience of the Grid provides vital business continuity, which greatly improves the reliability of our environment," says Gargya. "Previously, when users submitted their work on a specific cluster and that cluster went down, the developers would manually take their work to a different cluster, wasting a great deal of time. Now, users don't even have to know where their work is being processed."

Discovering new business opportunities

With innovation and expertise to spare, Boeblingen is using its Grid Computing experience to enable companies throughout Europe to implement their own on demand environments. IBM uses its own Grid environment to simulate its customers' systems without impacting the customers' environment. Within this simulated environment, IBM creates a proof of concept that demonstrates to the customer the viability of Grid Computing. Besides providing business proof points, the IBM Grid Computing services actually benchmark the customers' systems with and without Grid Computing and provide technical requirements so that results can be duplicated.

"Companies can make their decisions on whether or not to implement a Grid based on their experience here," says Gargya. "If they do decide to go with a Grid, they have a detailed blueprint to use in getting started. They can scale the learning curve much faster than they could do on their own."

Boosting productivity for mission-critical products

A current application at Boeblingen involves running simulations of the zSeries address translation processor for the zSeries 990 to eliminate flaws and speed up the manufacturing process. Boeblingen is running approximately 8,000 simulations per day, which is far more than it could do without the benefit of the Grid. "The simulations verify that the design parameters will hold when various components are implemented," says Gargya. "If we find errors, we have to go back and redesign these components. If we didn't run simulations, we would be encountering these errors in production, which is an expensive way to correct them."

In the near future, the Boeblingen Grid will also support heterogeneous systems. Currently the Grid consists mainly of IBM @server pSeries® systems, but eventually Boeblingen intends to introduce Linux clusters based on IBM @server xSeries® systems to increase the flexibility of the resource. The Boeblingen Grid will be able to link systems across company groups and sites to further enable collaboration.

Key Components

Software

- IBM WebSphere Application Server
- IBM DB2 Universal Database
- IBM AIX® 4.3.3 running IBM LoadLeveler® 1.3
- IBM AIX 5.1 running LoadLeveler 3.1
- Globus Toolkit
- Red Hat Linux
- SUSE LINUX Enterprise Server 8

Servers

- IBM @server xSeries
- IBM @server zSeries
- IBM @server pSeries

"The Grid provides us with an environment that will help IBM compete more effectively, be more responsive to customers and solve a lot of interesting problems along the way."

– Tony Gargya

"IBM was at the forefront of Grid experiments that succeeded in unleashing unused processing capacity in large numbers of servers," says Gargya. "To solve the problems that were threatening our efficiency at Boeblingen, we decided to adopt some of IBM's own experimental results and we're convinced that this technology is the answer to a better development environment for IBM in the future."

Open and flexible architecture

The Boeblingen Grid also plans to leverage the Open Grid Services Architecture (OGSA), a system architecture based on an integration of Grid and Web services concepts and technologies. The initial technical specifications were developed by the Global Grid Forum (GGF), a grid standards organization whose members include IBM and other technology leaders like Globus.

The architects of the Boeblingen Grid designed a three-tier solution with the actual computers comprising the Grid on the third tier. The front end is the user's Web browser, which has a portal interface enabling the user to submit processing jobs. The front end can also be an automated program. The middle tier runs on two IBM @server xSeries machines running Linux and consisting of WebSphere Application Server, DB2 Universal Database and Globus client software (Globus CoG), which is used to implement the Grid broker.

The third tier consists of IBM LoadLeveler for AIX, and the Globus Metacomputing Directory Service (MDS) on a Linux zSeries virtual server. The Grid broker in the middle tier and MDS work together to identify the needed resources and direct the workload to the proper back-end systems. The AIX LoadLeveler master or gateway systems in the Grid have the Globus Toolkit installed.

If unplanned downtime should happen with a system or cluster within the Grid, the Grid software—developed by IBM—resubmits the jobs to the systems still up and running.

Increasing capacity and speed to market

The Grid has not only enabled the Lab to optimize existing investments, it is also helping to accelerate IBM's speed to market with new products, minimizing potential flaws and resulting in higher quality servers. The Grid also eliminates multiple chip "releases," resulting in substantial cost savings and greater projected savings in the future. With the savings and accelerated revenues it has realized, the Lab repaid its investment in the new Grid technology within one year.

In the future, Boeblingen will be using its Grid to run applications that build software components. "With the Grid we have developed we can speed up the whole process," says Gargya. "The Grid provides us with an environment that will help IBM compete more effectively, be more responsive to customers and solve a lot of interesting problems along the way."

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IBM Corporation
Corporate Marketing
New Orchard Road
Armonk, NY 10504
U.S.A.

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