

Serving Up Success



Laureate Education turns to blade servers to help handle the demands of online education.

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Emiliano Diez
Director of Processing Operations
Laureate Education

Last year, college IT director Emiliano Diez examined his data center and decided it was time to invest in more servers and storage to handle the explosive demand for online courses.

Diez runs the data center for the online division of Laureate Education, a Baltimore-based educational institution that owns an online college, called Walden University, in the United States, as well as offers online graduate programs through the University of Liverpool in the United Kingdom.

The company also offers online courses at 19 accredited campus-based universities that it owns in Asia, Europe and Latin America. Overall, the number of online students has skyrocketed from 20,998 in 2004 to 33,100 in 2006, a 58 percent growth, while its total student enrollment has surpassed 250,000.

"We needed to plan for the big growth we're experiencing now and the growth we expect for the future," says Diez, who joined Laureate 18 months ago as the company's director of processing operations. "So we asked ourselves, 'Where are we now, and where should we be in three years? And how do we spend less money per server and lower total cost of ownership?'"

Diez inspected the data center and found the infrastructure was good for current needs but saw room for improvement. The data center housed 300 rack-mounted servers, about 60 of which were antiquated and needed to be replaced. He also found that the IT department had the foresight to purchase a storage area network (SAN), which pools storage into one central location, but it was rarely used. He wanted to take better advantage of the SAN, which not only makes it easier to manage data, but allows him to simplify and improve the data backup and recovery process.

After doing research, Diez decided to standardize on IBM blade servers, which are easy to manage, cut down on power consumption and take up less data center space because of its smaller form factor. He also chose to deploy VMware's virtualization software to maximize the utilization of servers and reduce the number of servers the company needs to purchase. He then decided to upgrade the SAN with new equipment from EMC and purchase new Cisco Systems' networking equipment to connect the blade servers to the SAN.

A year ago, Diez invested in equipment to conduct a proof of concept to make sure the technology worked. And once he was satisfied, he purchased more equipment in December to do an initial rollout. Overall, the new technology has served as a foundation that has allowed the IT department to improve services to students.

"We've been able to support the growth of the school, refresh and upgrade our current applications, and provide a better student experience while improving the uptime and response time of our systems," Diez says.

Blade servers, virtualization software and SANs are three technologies that have become increasingly popular in higher education, where IT departments are always looking for more cost-effective and more efficient ways to manage their data centers. Here's a closer look at Laureate's new data center implementation and the benefits the educational institution has seen from the new technology.

A Rolling Upgrade

Laureate considered sticking with its rackmount servers, but Diez decided to go with blade servers, and with IBM ▶

Server Options to Consider

IBM and Hewlett-Packard offer a large portfolio of x86-based rackmount and blade servers that support AMD Opteron and Intel Xeon dual-core and quad-core processors.

In the blade server space, IBM and HP own the biggest market share. IBM's BladeCenter family of blade servers offers multiple power and cooling features. PowerExecutive allows IT administrators to manage the power usage and cooling fans in a chassis. Rear Door Heat eXchanger is a water-cooled door on the back of a rack that cools the air in the system.

To boost reliability, IBM's BladeCenter chassis features dual connections between individual blades and shared components, so if one connection goes down, the second connection keeps

the system operating. IBM also offers "Light Path Diagnostics," which alert IT administrators of problems through a light on the front of the server.

Last year, HP redesigned its blade server technology with its new BladeSystem c-Class product line, which features innovations in power, cooling and system management. HP Virtual Connect, for example, allows IT organizations to wire their blade servers with networking and storage area network equipment just once. To improve energy efficiency, the company offers HP Thermal Logic technology, which features multiple thermal sensors in each chassis and can distribute power and cooling depending on the needs of the blade servers. HP continues to sell and support its p-Class blade servers.

in particular, because he felt their technology was the most mature. He also was impressed with IBM's partnerships, particularly with Cisco, whose networking equipment Laureate has standardized on.

Blade servers are thin servers that feature their own processors, memory and operating systems. They slide into a chassis, where they share the same resources, including power supplies, cooling fans and connections to network and storage systems. The blade center architecture consumes 30 percent less power and takes up less space, which has resulted in substantial cost savings, he says.

Diez decided not to overhaul his servers all at once. Instead, he chose to pursue a rolling upgrade, meaning he is purchasing new blade servers to handle the company's increased server needs and as current rackmount servers need to be replaced.

"It's not a good strategy to replace everything you have," he says. "You want to grow on top of what you have, and eventually, you will have everything upgraded."

Since December, he has installed 80 to 90 IBM blade servers on seven chassis. The blade servers run databases, customer relationship management software, domain controllers and management software packages, among other applications. Over time, as older servers are replaced, Laureate will migrate every application to the blade servers.

For example, the current student information system, which houses student transcripts, class schedules, admissions and financial aid information, is running on an older Sun Microsystems server. Diez and his IT team are currently installing a new Enterprise Resource Planning application, which includes a new student information system on the new blade servers. It will go live next year.

Overall, the blade servers are easy to deploy and manage. If a blade server goes down, he can swap out a blade server with a new one in minutes. And if he needs to add more servers, he just slides more blade servers into a chassis.

Diez standardized on three IBM BladeCenters running on Windows and Linux operating systems. For database applications, he's using the IBM BladeCenter LS41, which

features four dual-core AMD Opteron processors. The AMD processors offer better performance for high-transaction databases because their architecture removes bottlenecks by creating direct high-speed links from the CPU to the memory, he says.

For Web and other applications, Diez is using the BladeCenter HS21, which features two quad-core Intel Xeon processors. And for virtualization, he's using the HS21 XMs, which also feature two quad-core Intel processors, but have extra slots for memory. "Memory is the main resource that VMware needs," he says.

Utilizing Virtualization

VMware's ESX virtualization software allows Laureate to partition a server into multiple "virtual machines," so it can run multiple operating systems and applications simultaneously. The virtual machines, which house applications, share the same server resources, such as processors and memory, but they operate independently of each other.

Virtualization offers many benefits, including improved server utilization, which results in server consolidation and cost savings. It cuts down the physical space servers take up in data centers, and it also reduces the electricity bill because fewer servers mean less energy consumption.

Of Laureate's nearly 90 blade servers, 15 servers have virtualization software installed and are running a total of 65 virtual machines. Most virtual machines are for developers to build and test new applications, but some applications are deployed on production servers, too.

Laureate squeezes 12 virtual machines per server in development environments and four virtual machines per server in production environments, assuring I/O resources are appropriate. In production environments, Laureate typically uses virtual machines as part of a Web server cluster. That means they cluster one physical server with multiple virtual servers and do load balancing, meaning they share the Web serving workload.

Virtualization also makes it faster and easier to test and deploy new applications because IT departments no longer have to purchase a separate server to do the job, Diez says. They just give developers a virtual machine in a matter of hours. In the past, it took almost a month to give developers servers to test on, he explains.

For example, developers are currently using virtual servers to build and test new Web applications for student services, such as online class enrollment. The IT department plans to launch the new services on the blade servers this fall.

“By revamping the development and quality assurance infrastructure, we are able to improve the student support Web sites in a better and faster way,” he says.

With VMware Virtual Center management software, IT staff can centrally manage virtualized environments. For example, if a blade server crashes, virtual machines can automatically move to another blade server to keep applications up and running, Diez says. Or if the IT department wants to upgrade or perform maintenance on a server, they can move all running applications to a different blade without requiring a system restart and causing downtime, he says.

Taking Advantage of SAN

Like most higher education IT departments, Laureate’s online division mostly relied on direct attached storage, where the storage is directly connected to each individual server. But network storage has become popular because it allows IT departments to centrally store data in one place, improving reliability and simplifying storage management, according to Enterprise Strategy Group, an analyst firm in Needham, Mass.

The networked storage approach allows IT departments to better utilize storage capacity, bolster reliability by replicating data from one primary storage system to a secondary system in another location, and speed the data backup and disaster recovery process, ESG says.

At Laureate, the online division’s existing SAN was seldom used because the IT staff didn’t have the training required to take advantage of the technology, Diez says. EMC allowed him to upgrade his CLARiiON storage devices, so he could deploy newer CLARiiON CX-500s, the company’s mid-range storage systems.

He bought 50 terabytes of SAN storage for Laureate’s Baltimore and Los Angeles data centers. Then he “tiered” Laureate’s storage, meaning the most important or regularly accessed data, such as database information, is stored in higher-end disk storage devices, and less important data, such as file server data, is stored in lower-cost disk storage devices. It’s a strategy that allows Laureate to store data more cost effectively.

On the first tier, Diez has 20 terabytes of data available on CLARiiON CX-500s using higher-end SCSI drives. On the second tier, Diez deployed CLARiiON CX-500s using lower-cost ATA disk drives. The configuration allows Laureate to deploy asynchronous replication of critical data from the company’s Baltimore data center to its Los Angeles data center, significantly improving disaster recovery readiness.

The installation process for blade servers, virtualization software and the new SAN was fairly straightforward, but the IT team faced a few challenges, making the installation process more time consuming than expected, Diez recalls. For example, while performing the proof-of-concept implementation, he and his engineering team quickly learned that the IBM BladeCenter servers only worked with specific host bus adapters (HBAs) that allowed blade servers to connect to the EMC SAN over a Cisco fiber network.

“You needed specific versions for all the parts to make them work together nicely, from HBAs and Multipath software to Cisco IOS, firmware and BIOS,” Diez says.

A Helping Hand

When Diez approached CDW•G with his plan to upgrade his data center, CDW•G field account executive Alyssia Abrams listened to his needs, gave him advice and made sure he had all the information he needed to make the correct buying decisions. She put Diez in touch with vendors and CDW•G’s own storage and networking specialists, who explained his choices and helped him architect a solution to meet his needs.

Diez ended up making all his purchases from CDW•G. “They put me in contact with the right people at IBM to understand their technology and to make sure I got good pricing,” he says.

CDW•G even assisted during the installation process. Diez needed a specific Cisco fiber switch to attach the IBM blade servers to the EMC storage devices, but the Cisco switch was not yet released. Abrams called her contacts at IBM and Cisco and got Diez three beta models of the fiber switch, so he could perform his proof-of-concept implementation.

“Because of who we are, we were able to get him the technology before it was released,” Abrams recalls.

Looking Ahead

Diez and his team are busy implementing a new data backup and recovery system. Previously, with the traditional rackmount servers, they used Veritas’ NetBackup data backup and recovery software and backed up data to tape. The company is now implementing disk-based backups onto network attached storage devices and replicating data to a second data center in Los Angeles.

As part of the implementation, Laureate has purchased several data backup technologies, including Acronis data backup software and Data Domain’s NAS deduplication technology, which saves storage space by detecting and preventing multiple copies of the same data — or “information block” — from being stored. It can save storage space by 20 to 60 times, allowing wide area network replication and data backup at a reasonable cost, he says.

Overall, the new data center has been worth the investment, providing Laureate’s online students, faculty and staff with the fast, reliable performance they require.

“We’ve been able to support growth while maintaining excellent uptime and containing costs,” Diez says. ■

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