A data center that takes up less

real estate.

Online retail mortgage lender Quicken Loans supports massive growth and delivers optimal customer service with the help of VMware and Microsoft software, HP and Sun servers, and AMD Opteron™ processors.

Challenge:

- → Support massive ongoing company growth while continuing to maintain a high level of customer service
- → Reduce server sprawl in the datacenter, as well as heat emissions
- → Ensure optimal performance for today and tomorrow

Solution:

- → A virtualization environment established on AMD Opteron™ processor-based HP ProLiant DL585 servers running VMware virtual infrastructure software
- → A Business Intelligence (BI) environment running the AMD Opteron processor on an 8-way, 16-core Sun Fire X4600 M2 server with Microsoft® Windows® Enterprise Edition 2003 64-bit operating system

Impact:

- → Consolidated and significantly reduced the number of servers and alleviated datacenter space concerns
- → Set a record wPrime benchmark for multithreaded applications at the time
- → Established flexibility to deploy servers much faster than before, and support influxes of business due to market changes
- → Created a stable foundation with a clear upgrade path to quad-core computing

AMD
The future is fusion

As a growing online retail mortgage lender in the United States, Quicken Loans is well-known for exceptional customer service. This reputation is supported by quality employees and a superior IT infrastructure. But the company's success was beginning to tax its datacenter in terms of space, costs, performance, and power and cooling resources. To address these issues and prepare for future challenges, Quicken Loans implemented the AMD Opteron™ processor within a virtualized and a Business Intelligence environment to achieve dramatically improved performance levels with fewer servers and lower overall heat emissions and costs.

With double-digit growth in year-to-year loan volume, Quicken Loans, Inc., has continued to strengthen its position as a top online retail mortgage lender in the U.S. The company closed nearly $19 billion in home mortgage loans in 2007, making it the company's strongest year.

Founded in 1985, Quicken Loans has more than 3,000 team members and has been ranked number two on *FORTUNE* magazine's "100 Best Companies to Work For" in America, and a "top 20" company on the list for five consecutive years. *Computerworld* magazine has also ranked the company number one or two on its "100 Best Places to Work in Information Technology" list the last four years.

The company's incomparable customer service is the driving factor for Quicken Loans' success and industry accolades. Employees are empowered to identify ways of improving business processes and encouraged to act quickly on their ideas. Quicken Loans Founder and Chairman Dan Gilbert recently stated, "We have a family of committed, aware and dedicated people who, with their strong sense of urgency and obsession with always finding better ways, continue to drive us to exciting new company records."

The ability to make business changes fluidly and maintain incomparable levels of customer service can be largely attributed to the company's IT infrastructure.

"When you visit our offices, you will find we are a mortgage company on the outside, but a technology company on the inside," said Frank Laura, chief information officer, Quicken Loans. "Our infrastructure is critical to the way we support our team members and clients. The priority for IT is to deliver top service, regardless of the cost."

But the consistent massive growth in business was beginning to push the company's infrastructure beyond its capabilities. Even though the company had already expanded its datacenter once, the number of servers kept growing and datacenter space was rapidly diminishing, causing new worries of another datacenter expansion. The high server count was also driving costs skyward: Heat emissions were throttling the air conditioning units, and server maintenance and administration were beginning to grow exponentially. And while performance levels were outstanding, Laura and his team knew that eventually the increasing demands on the infrastructure would weigh heavily on the IT team.

Additionally, the Quicken Loans IT team was asked to begin supporting its sister companies' activities. The Quicken Loans IT team was required to quickly deploy applications for several companies, including ePrize, a leading interactive promotion agency. The additional activities were beginning to stretch the IT staff thinner than ever before.

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>
> – Joe Simpson, Infrastructure Architect, Quicken Loans

Intending to resolve these issues as well as plan for future support and growth requirements, Laura and his team embraced the company's culture of "finding a better way" and embarked on a virtualization strategy. The team began by implementing VMware virtual infrastructure software running on a non-AMD processor, but was unhappy with the level of performance. The team knew there was a better solution.

Several Quicken Loans team members had previous experience with AMD powering a virtual environment and knew the numerous benefits. Joe Simpson, a Quicken Loans infrastructure architect, along with a team of systems engineers, conducted internal testing that revealed to the rest of the company what he already knew: The AMD Opteron™ processor is the ideal solution for a virtualized environment.

"We had a number of boxes in our datacenter," Simpson said. "The options we had were to scale out, scale up or consolidate boxes, and with AMD, we were able to do all three."

Simpson and the team then embarked on an ambitious datacenter restructure based on the AMD Opteron processor, aimed at tackling the space, energy and performance issues facing the company. They began with a revamped virtualization environment.

Restructured Virtualization Environment

The Quicken Loans team created a new virtualization environment consisting of AMD Opteron processor-based HP ProLiant DL585 servers running VMware virtual infrastructure software and was able to dramatically reduce the datacenter server count. Even though the environment was supported by fewer physical servers, the company experienced exceptional levels of performance and scalability, even with its most memory- and I/O-intensive applications.

"Most virtualized environments don't run mission-critical applications; they are instead reserved for less demanding applications, but not ours," said Simpson. "We are running our many processor- and I/O-intensive applications and have seen little-to-no difference in performance compared to other environments. The AMD Opteron processor allows us to leverage four core subsystems for hours on end, making it much more capable of scaling to handle increasing performance requirements than other processors powering similar infrastructures."

As an example, Simpson said one specific application that analyzes marketplace rates to determine next-day offerings used to take three hours to complete; but with the AMD-based solution, the process is accomplished in just 30 minutes.

The environment has also been able to provide the critical flexibility the company requires as it responds to market conditions. The technology team used the company's title business as an example. While the title business is relatively steady, when a significant change takes place, such as falling interest rates, Quicken Loans has the capability to turn on and/or re-purpose servers to support the increase in business. This flexibility is also helping to more easily support its sister companies. Simpson stated the company can deploy a server in just a few hours compared to the days-long provisioning process of a non-virtualized server.

Adding Powerful Glasses to the "Eyes" of the Business
The second AMD Opteron™ processor-based implementation occurred in the company's BI environment, also known as "the eyes" of the company, according to Laura. The BI function helps Quicken Loans support and market the company. It is within this environment that the company saw the most impressive performance. According to Laura, the AMD Opteron processor-based architecture runs the high-performing database operations significantly faster than its previous system.

"With the Sun Fire X4600 M2s powered by the latest AMD Opteron processors, Quicken Loans no longer has to spread its cube processing jobs across multiple servers. The jobs have been consolidated down to one 4Userver, saving rack space and costs associated with separate physical servers," Laura said.

Simpson noted reduced heat emissions while further elaborating on AMD's dual-core leadership in powering multithreaded applications. The performance was so exceptional that the system set a record wPrime benchmark for multithreaded applications at the time.

"The Sun Fire X4600 M2 server and AMD Opteron processors provide us with mainframe computing capability at a conventional x86 price point all while delivering outstanding SWaP (Space, Wattage and Power). This is really helping our multithreaded application-based BI 'see' better," according to Simpson.

"The other day our team gathered all of our raw data that makes logical relationships in all of our Server Analysis cubes. Just to see what would happen, I hit 'run' and the 8-socket AMD Opteron processor ran it in a few hours. The process was simply unachievable before," Laura added.

Infrastructure Spurs Customer Service, Supports Massive Growth
According to Laura, the Quicken Loans datacenter runs cooler with fewer servers and is more stable, helping to eliminate concerns about capacity and performance. "Because the infrastructure is so stable, flexible and efficient, our technology team members are able to focus on making changes to improve our business, rather than working to manage our servers," he said.

The infrastructure was essential for a major milestone for the company: In April 2007, Quicken Loans announced that for the first time in its nearly 22-year history, the company surpassed closing $2 billion in home loan volume in a single month.

"We truly appreciate the relationship with AMD. The company treats us like a technology partner and is very responsive to our feedback and needs," Laura said.

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