

MICROSOFT TREASURY USES ADVANCED TECHNOLOGY TO MANAGE ITS PROACTIVE INVESTMENT STRATEGY

AMD Opteron™ processor-based servers help Microsoft Treasury foresee financial risks faster—without changing a single line of code.

THE CHALLENGE:

- Managing \$60 billion of financial assets and the foreign currency exposure of the world's most successful software company
- Reducing portfolio risk by reducing the amount of time required to run its risk analysis software
- Ability to access enough memory to handle all the assets at once

THE SOLUTION:

- Windows® Server 2003 x64 Edition
- Minimized implementation impact by adding AMD Opteron™ processor-based servers to the existing computing cluster
- New servers comprised of four-way and two-way AMD Opteron processor-based servers based on AMD64 technology with Direct Connect Architecture
- 32-bit portfolio risk-management software

THE IMPACT:

- Reduced the amount of time required to run risk analysis software from 40 hours to 13 hours
- 325% increase in overall system performance
- Greater memory utilization resulted in these performance gains for a 32-bit application without having to recompile a single line of code



In November 2004, Microsoft Corp. delighted investors by announcing that it would pay stockholders an unprecedented total dividend worth \$32 billion. This staggering sum represented half of Microsoft's cash holdings at the time, and it set in motion a plan to return a substantial portion of Microsoft's accumulating cash back to investors.

Microsoft's innovative new products and services deserve most of the credit for this windfall to stockholders. But the dividend announcement also capped a year of shrewd investing by the software giant.

“We really needed to be able to load all of the holdings into memory at the same time,” says Max Giolitti, former group risk manager for Microsoft Treasury. “That’s where the AMD Opteron™ processors came in.”

The company was able to estimate, on a daily basis, the overall financial risks of its investments and to adjust its portfolio accordingly. The task required sophisticated number-crunching and countless simulations that had to be completed in hours, not days. This proactive investment strategy relied heavily on high-performance servers powered by 64-bit AMD Opteron™ processors, according to Max Giolitti, former group risk manager for Microsoft Treasury, the division that manages the company’s financial aspects.

“Instead of just looking back and seeing what the risk was, we actually compute the risk and make investment decisions based on that risk,” says Giolitti, who oversaw the processor implementation in late 2003.

The Challenge: Bulging at the Seams

Microsoft Treasury manages both the financial assets and the foreign currency exposure of Microsoft, with total assets before the dividend of more than \$60 billion. The company invests in a wide range of fixed-income and equity assets. To estimate the financial risk associated with factors such as foreign exchange, equity and fixed income, treasury managers use high-performance, data-intensive applications. These applications are based on “Monte Carlo” techniques, which are statistical simulation methods used to do complex numerical computations.

However, as Microsoft’s size and global investment strategy grew, those complex software applications and the architecture around them started bulging at the seams. As a result, Microsoft Treasury was unable to access enough memory to handle all the company’s assets at one time. The virtual and physical memory in a 32-bit architecture was too limited to hold both the application and all of the investment figures.

This memory deficit slowed down the whole system. Because computations to run Microsoft’s portfolio risk-management software took 40 hours to complete, risk managers could run the software only once a week. That made it impossible to adjust to daily market changes and optimally manage a portfolio that includes some \$10 billion in international hedge funds, as well as monetary instruments.

“If you wait too long for your calculations, the event has already passed,” says Doug Hoch, Microsoft Treasury director of risk management. “You need the calculations in enough time to mitigate your risk. But,

by the time that number was calculated, timeliness was lost. We were a backward-looking compliance function.”

Giolitti took this dilemma to colleagues in the financial industry and found that they faced the same challenge.

“They couldn’t fit all of their assets in the 32-bit architecture because there is some limitation on the amount of memory that can be addressed by the computers,” he explains. “Some were trying to address that by splitting their holdings into different components, but that lost the magic of the total aggregation.”

Unwilling to accept such limitations on his division’s performance, Giolitti decided to take the lead in solving the industry’s problem. “We really needed to be able to load all of the holdings into memory at the same time,” he says. “That’s where the AMD Opteron processors came in.”

The Solution: Room to Grow

Microsoft Treasury added four-way and two-way AMD Opteron processor-based servers to its server cluster. The processors made it easier to deploy a four-way system by offering a single server instead of two, thereby lowering total cost of ownership and the number of system connection points.

The new AMD Opteron processor-based servers ran on Microsoft’s public beta version of Windows Server 2003 x64 Edition. “We were going to be the first to use the operating system,” Giolitti recalls.

Giolitti’s team simply installed the software on the new machines and flipped the switch. Instantly, Microsoft Treasury was able to go from 2 gigabytes (GB) to 4GB of effective memory for the application—enough to hold the software application and data for all of the financial assets.

This implementation “was easy, not difficult,” Giolitti marvels. “There was nothing to it. We didn’t have to do any heroics. All we did was take the plunge.”

In a 32-bit environment with 4GB of memory, 2GB typically goes to the operating system, leaving just 2GB for applications. With 64-bit architecture, on the other hand, the operating system can run in its own address space, leaving a full 4GB of virtual memory to the application. The extra virtual memory available to applications enables organizations to access larger,



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more complex data sets. “That was huge for us,” Giolitti says.

Another essential benefit for Microsoft Treasury was that Giolitti’s team didn’t have to rewrite a single line of software code, saving a tremendous amount of time and resources. Like many enterprises, Microsoft has substantial investments in conventional 32-bit software, creating a real demand for a chip such as the AMD Opteron processor, which can handle both 32-bit and 64-bit applications.

“We wanted a quick solution that would avoid any rewrites,” Giolitti says. With the AMD Opteron processor, “we were able to extract the 64-bit benefit from 32-bit code.”

The Impact: Speed Makes the Difference

The AMD Opteron processors also helped Microsoft Treasury improve its calculation speed. In fact, the organization immediately saw the amount of time required to run the risk-analysis software plummet from 40 hours to 13 hours simply by adding the new operating software and the AMD Opteron processors. That represents a more than 325 percent increase in overall system performance.

“What I once could afford to do only once a week, I can now do overnight,” says Hoch.

“We don’t do benchmarking, but by working with this architecture every day, I can tell which [server] is faster,” Giolitti says. “Not only does the AMD Opteron processor give us extra memory, it also gives us faster speeds.”

The combination of the AMD Opteron processors and Windows Server 2003 x64 Edition also could benefit other enterprises, particularly those in the financial industry that require sophisticated risk-management applications—and even when the financial applications are 32-bit, Giolitti points out. “They were facing the same issue that we did, and

they really couldn’t address it in any way,” he says. “At Microsoft, I could use the beta version of Windows’ 64-bit operating system.” (The public beta version of the software is now available to enterprises, with commercial release tentatively planned for the first half of 2005.)

According to Giolitti, the decision to enhance Microsoft Treasury’s architecture has raised the group’s profile within the organization. By reducing the computation time of running risk-management software, “it allowed us to be part of the investment process,” he says. “Our group became part of the decision-making for our investment portfolio.”



TECH TALK

Thanks to the 64-bit capabilities of the AMD Opteron™ processor, Windows® Server 2003, Enterprise Edition, for 64-bit Extended Systems can address beyond 4 gigabytes (GB) up to a terabyte of virtual memory, as well as allocate a separate memory space for itself and allocate each 32-bit application its own 4GB address space.

Before implementing the AMD processor-based solution, Microsoft Treasury's server cluster included multiple 32-bit two-way servers. The new servers comprise a combination of four-way and two-way AMD Opteron processor-based servers featuring AMD64 with Direct Connect Architecture.

Direct Connect Architecture with HyperTransport™ technology eliminates the need for a front-side bus and directly connects the memory controller and I/O to the processor. It also provides direct processor-to-processor connections in multi-processor environments.

But for Microsoft Treasury, the bottom line is that by using servers powered by AMD Opteron processors, managers can process more data, more often, to stay on top of fast-changing conditions in the financial world.

