Building Better SANs at Bechtel

Over the last century, Bechtel Corporation's works have been among the world's largest and most significant. From Hoover Dam to San Francisco's Bay Area Rapid Transit (BART), the company has partnered with clients and communities on projects that have changed the way we live.

Bechtel is, in the truest sense of the word, a global organization, having built on seven continents. An airport in Peru, the United Kingdom's Channel Tunnel Rail Link, and a petrochemical complex in China are just a few of the company's over 22,000 projects.

Information access is essential to every aspect of Bechtel's operations, so, in keeping with the company's own stated values—applying advanced technology and continual innovation—the company upgraded its Houston data center from Xiotech Corporation's Magnitude® storage platform to a Magnitude 3D® clustered storage system.

"The original Xiotech® system was installed in June of 2000 because we were running out of usable disk space," says Jason Siefert, principal automation network analyst. "We had disk space, but much of it was stranded—available somewhere but not where it was needed."

Consolidation, Simplicity, & Savings

The Magnitude installation solved the problem of stranded disk space and significantly improved operating efficiency. But by late 2003, Siefert was managing 180 servers, and the system was approaching capacity.

"We needed to expand to 20 terabytes and needed the ability to grow beyond that," says Siefert. "We wanted to consolidate our data center and simplify operations. We also needed to cut the cost of service contracts by reducing the number of devices in use."

"We briefly considered a move to blade servers, but the technology was too new for our comfort. The move to Magnitude 3D gave us the physical consolidation, simplicity, and savings we wanted, and let us keep the same user-friendly management interface of the original Magnitude system."

Before the Magnitude 3D installation, the Houston data center occupied almost 5,000 square feet. Today, most of the center's equipment fits into just three racks. 100 physical servers have been converted to VMware virtual servers and are distributed among just eight physical hosts. The center also includes 30 Microsoft Virtual Servers. All of the virtual servers boot from the Magnitude 3D system.

Industry
- Engineering, Procurement, and Construction

Requirements
- Increased scalability
- Data center consolidation
- Lower costs
- Easier management

Xiotech Solution
- Magnitude 3D®

Benefits
- Seamless scalability
- Effective consolidation of servers and storage
- Reduced capital and operating expenses
- Easy information management
- Enhanced resilience with fast time-to-recovery

Operating Systems
- Microsoft® Windows® Server 2003 Enterprise Edition
- Microsoft Windows 2000 Server

Applications
- Microsoft Exchange
- Microsoft SQL Server
- VMware® Server
- Microsoft Virtual Server
- Citrix®
- Documentum
- CAD

SAN Infrastructure
- Cisco®

Magnitude 3D was initially installed with eight terabytes. The center quickly increased that to today's total of 20 terabytes.

"We have between 10 and 13 virtual servers on each of the physical hosts," says Siefert. "Expansion is easy, and it takes only about 15 minutes to build a production server. Previously, that would have taken a day or more."

"Magnitude 3D gave us the physical consolidation, simplicity, & savings we needed."

Each virtual server has its own logical unit number (LUN) and is located entirely on one physical machine. LUNs can be moved from one physical host to another in minutes. "We've configured the eight hosts with enough free overhead that if one fails, its contents can be distributed among the remaining hosts," says Siefert. "It takes approximately five minutes to move each LUN, so full recovery from a host failure would take less than an hour. If we chose to, we could speed up the process by installing more than one management interface so we could move more than one LUN at a time. We've never actually had a host failure, but we regularly move LUNs for load balancing."

Easy Migration without Disruption

"Transferring data from the Magnitude to Magnitude 3D system was easy," says Siefert.

"The rest of our server-attached data was more complicated, but we've taken our time about the transfer, using several different processes," he adds. "Our preferred method is back-end, block-level mirroring. It's clean, it's foolproof, and it requires no intervention once the process has begun. The problem is that it makes the data completely unavailable during migration. That's fine for smaller volumes of data that are not critical to ongoing operations. But for larger volumes and critical data, we use other methods."

"A terabyte of data, for example, can take a full day to copy. To move that much data, we use operating system-level mirroring or file-level copying. The data continues to be provided to users by the original controller throughout the process. As the copy is completed, we switch the drive letters, make a differential copy, turn off anything that could make changes in the data, make one final file-level differential copy, and bring the drive up on the new machine. The process is 99.999 percent reliable, and it only takes data offline for a few minutes while the drive is being redirected."

The process of migration to Magnitude 3D was accomplished with virtually no interruption of ongoing operations. At the same time, physical servers were being virtualized on Magnitude 3D. The difference in performance as servers were transferred to the new system was immediate and widely noticed.

"Backups took a fraction of the time they had taken before, and users saw faster loading of applications and large CAD files," says Siefert.

Cost Savings & Future Plans

Siefert hasn't calculated the direct savings attributable to virtualization, but points out that elimination of annual maintenance on 92 servers will be a considerable savings.

Future plans include a move to a colocation facility and complete replication of the data now at the Houston site onto a separate Magnitude 3D system. The company has installed two more Magnitude 3D clusters at other Bechtel data centers to replace direct-attached storage and previous SAN solutions.

Senior IT management is currently considering adoption of a single SAN standard. "We want advanced technology," says Siefert, "but it will be more manageable if we can do it with as few vendors and different tools as possible."

About Bechtel

Founded in 1898, Bechtel is one of the world's premier engineering, construction, and project management companies.

Bechtel has completed more than 22,000 projects in 140 countries, including Hoover Dam, the Channel Tunnel, Hong Kong International Airport, the San Francisco Bay Area Rapid Transit (BART) system, the reconstruction of Kuwait's oil fields after the Gulf War, Jubail industrial city, and the Alma aluminum smelter.

Today, its 40,000 employees are teamed with customers, partners, and suppliers on a wide range of projects in dozens of countries.

Bechtel is privately held and has been under the leadership of its founding family for four generations.

For more information about Bechtel, visit www.bechtel.com.

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