



## HoB Customer Improves Performance of Mission Critical Data Warehouse on VMware

With the help of House of Brick, worldwide beverage manufacturer increases performance and reduces costs for large, mission-critical SQL Server databases and data warehouse systems on VMware.

### Customer Opportunity

This HoB customer wanted the best possible performance for its sales and inventory management system. The explosive growth of the company pushed the VMware infrastructure beyond its original design limits. The objective was to analyze the stack, optimize each layer to get the best possible performance, and then redesign and rebuild the environment with best practices, performance, flexibility and agility as project drivers.

### Deployment Environment

#### Hardware

- HP DL580 G7 Quad 8-core Intel Xeon X7560 at 2.27GHz with 320GB RAM
- EMC VNX 5300 with 50 disks configured in RAID-5 and RAID-10 disk groups
- VMware vSphere 5.0 Enterprise Edition

#### Software

- Windows Server 2008R2 virtual machines ranging from 2vCPUs and 8GB memory to 8vCPUs and 48GB memory
- SQL Server 2008 R2 Enterprise Edition

### Background

This major consumables manufacturer is internationally known for the production and marketing efforts behind its trademark beverages. With beverage distribution in most countries and an ongoing aggressive international marketing campaign, this manufacturer is consistently at the top of their industry.

The company's Information Technology group has historically led the industry with its leading edge technology adoption. Terabytes of data flow through this system every day, with tens of thousands of endpoints all over the globe. Hundreds of processes and business practices are dependent on this system. The inventory and sales management system handles sales and stock numbers, product distribution, sales and marketing reporting, and projections. The company's data warehouse is comprised of an IBM Cognos business intelligence platform with a pair of large Microsoft SQL Server 2005 database servers integrating and loading data.

### The Challenge

Just two years before engaging House of Brick, the company virtualized this entire system on VMware ESX 3.5. They consolidated its production server count from over 15 physical servers to just three ESX hosts. The environment was designed for long-term scalability, disaster recoverability, and performance. Explosive business growth caused the daily inbound data to more than triple over the two years. This volume was well beyond anyone's projections when designing the original environment. This increase in data consumption and processing caused the infrastructure to be pushed beyond its design limits. Nightly batch processing and ETL were stretching into the next business day, impacting availability and timeliness of business critical decision systems. Decision system performance was causing end-users to question whether or not VMware vSphere could handle larger application workloads, such as those caused by the ever-increasing demands of SQL Server and Cognos.

To examine the system stack and attempt to tune the environment for better performance, the company contracted House of Brick to analyze the system. House of Brick was engaged to provide SQL Server and VMware best practices and assist in the analysis and tuning of the entire system stack.

### Initial Performance Investigation

Over a short three-day engagement, House of Brick swept over the entire system stack—from storage configuration and presentation all the way through to the SQL statements being executed against the databases. System performance metrics were collected from all entities involved in the previous night's batch processing, which happened to be the end of week high-volume jobs. The entire stack was profiled and each entity's configuration analyzed. Storage performance was benchmarked and a baseline was established.

The results of the analysis were staggering:

- CPU Ready time and SAN performance were of critical concern. CPU Ready times were consistently over 25,000ms with spikes over 100,000ms.
- EMC CLARiiON CX4 disk performance could never top 900 IOPS under load.
- SQL Server read stalls were well above performance high water marks, and write stalls were being measured in seconds instead of milliseconds.
- Multiple storage paths were configured but only one was being used.

While the environment performed spectacularly when first implemented, under the larger workload the environment simply could not perform fast enough.



### Solution

House of Brick helped our customer migrate their largest transaction processing system to the latest version of VMware vSphere and SQL Server and demonstrated that the platform could handle the tremendous processing volume with ease.

### Results

- Provided VMware and SQL Server architecture and best practices reducing the application storage and CPU footprint.
- Reduced backup times by a factor of six, and increased overall environment performance by at least two times.
- Demonstrated that the VMware platform with a properly tuned SQL Server environment could comfortably handle the peak loads encountered by their SQL Server and Cognos systems.
- Built confidence among the manufacturer's end-user community about the performance of larger workloads on SQL Server on VMware.
- Mentored in SQL Server on VMware best practices and assisted in the analysis and tuning of business intelligence systems to facilitate continued growth and greater utilization.
- Developed and tuned the VMware and SQL Server infrastructures that the manufacturer will utilize for all future deployments

After just one day of analysis and planning, a maintenance window was taken that evening and multiple infrastructure items were adjusted.

- SQL Server engine configuration parameters were tuned.
- More memory was allocated to the virtual machines.
- Virtual machine drivers were adjusted.
- SAN cache allocations were changed.
- VMDK placement was changed to remove disk activity hot spots.

The following morning, an analysis of the ETL processing after the environmental changes were applied yielded an 18.4% performance improvement. CPU Ready times dropped by an order of magnitude. Storage performance marginally improved. Even with these incremental performance gains from software adjustments, key physical infrastructure items were preventing further improvements.

### Developing a Longterm Solution

Six months later House of Brick was re-engaged at this customer to redesign the entire platform from the ground up. The goal was to finally solve the performance limitations of the current infrastructure. During a seven-week engagement, House of Brick completely redesigned the infrastructure while mentoring the customer's IT personnel in architecture and best practices. The target of the new infrastructure was not only for the business intelligence production environment, but for all business intelligence environments. A foundation was needed for the next generation of IT's virtualized environment.

Some of the foundational practices, included:

- Four HP DL585 G7 servers were loaded with vSphere 5.0.
- vCenter Server was virtualized.
- Windows Server 2008R2 and SQL Server 2008R2 virtual machines were created with best practices applied to the templates.
- An EMC VNX 5300 SAN was connected with multiple 8Gb fibre paths and disk groups in either RAID-5 or RAID-10 for performance.
- SQL Server transparent disk compression was utilized to reduce I/O requirements.
- SQL Server backup compression was used to reduce nightly database backup times.
- Synchronous SQL Server database mirroring was added for two purposes:
  - Greater degree of high availability
  - A snapshot was added to the secondary database to create a real-time reporting source for end users that removed disk I/O from the primary database.

### Favorable Customer Results

The results from the new environment were fantastic.

- I/O throughput climbed from under 900 IOPS to over 6300 IOPS, while data volume increased from 54MB/s to 396MB/s.
- SQL Server transparent page compression helped the databases drop in size by over 55%.
- Nightly database backup runtimes dropped from around an hour to under nine minutes.
- Average CPU utilization dropped considerably.
- Nightly ETL runtimes dropped by 51%, and current efforts to optimize the ETL code continue to reduce this runtime.
- Reporting queries experienced between 40% and 76% performance improvements.
- End users were able to load their sales and reporting tools hours earlier each day.

By targeting and tuning this new environment from the ground up, House of Brick demonstrated that SQL Server on VMware can easily handle high performance business critical systems.



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