



KEY HIGHLIGHTS

INDUSTRY: HEALTHCARE

**ROCHESTER
GENERAL
HOSPITAL**

CHALLENGE

Run mission-critical applications, including Microsoft SQL Server, more efficiently while increasing manageability, availability and performance.

SOLUTION

VMware Infrastructure has become the default platform for all applications. It runs more than 60 large SQL servers with great performance and reliability. VMware High Availability has replaced Microsoft clustering to provide simpler, more dependable availability for SQL. VMware technology also forms the basis of a cost-efficient and effective disaster recovery plan.

VMWARE AT WORK

VMware Infrastructure 3 Enterprise, featuring:

- ESX 3 with VMFS
- VirtualCenter 2.5
- VMotion
- High Availability (HA)
- Distributed Resource Scheduler (DRS)
- VMware Converter

"We have close to 60 Microsoft SQL Servers virtualized, some with a disk usage greater than 90 MB per second, which translates to 22,000 IOPS. These are SQL Servers that touch the patient and have a lot of traffic—if they're down, it's a major issue. Having them virtualized on VMware gives us greater reliability and more uptime."

Tom Gibaud, Manager of Information Technology

ViaHealth/Rochester General Hospital

ViaHealth is a network of healthcare providers serving the greater Rochester, New York, area. It has more than 6,500 employees in approximately 100 different sites, including its largest facility, Rochester General Hospital. ViaHealth aims to give patients comprehensive, state-of-the-art care—and its IT department is charged with supporting that goal with 24/7/365 access to mission-critical applications like Microsoft SQL Server.

The healthcare network's virtualization implementation, which started in late 2005, has grown along with its confidence in the stability and benefits of VMware Infrastructure 3. "We've become a VMware-first shop," says Tom Gibaud, ViaHealth's manager of information technology. "We think of it as our standard platform. We're trying to run all of our applications in VMware." That includes mission-critical applications like ViaHealth's homegrown electronic medical records systems, Citrix Terminal Services, 5,000 Exchange Server mailboxes, and SQL Server. "We've been successful with all that we've tried to deploy in VMware," Gibaud reports.

One of ViaHealth's most important virtualization successes is Microsoft SQL Server, which has been running on VMware Infrastructure 3 for more than two years. "That project started out gradually," he says, "but once we had significant success with it and saw how we could use VMware High Availability and other VMware tools, we decided to consolidate and convert all of our SQL servers over to VMware virtual machines." ViaHealth currently has close to 60 SQL servers virtualized, some with an average of 8,000 IOPS with peak loads of more than 22,000 IOPS.

"Before we had VMware, we had real issues trying to keep our server farm manageable with a reasonable amount of platforms," Gibaud recalls. Prior to using VMware, ViaHealth consolidated multiple SQL instances onto shared hosts to reduce hardware costs, but that resulted in resource conflicts and compounded maintenance headaches—especially since so many of ViaHealth's applications must be available 24/7. "Today, our strategy is that even if it's a small database, it's housed on its own VMware virtual machine," he explains. VMware virtual machines are completely isolated from one another, allowing ViaHealth to consolidate its SQL databases without the risk of one failed SQL instance affecting the other databases residing on the same physical server. According to Gibaud, giving each SQL database its own VMware virtual machine is the best way to ensure that all the vital applications that tie into SQL Server are up and running when ViaHealth's doctors, technicians and administrators need them.

Gibaud and his team looked at virtualization solutions from both Microsoft and Virtual Iron, but decided that their performance and tool sets were no match for VMware Infrastructure 3. "I wouldn't put my mission-critical systems on a virtualization solution like Microsoft Hyper-V, which is dependent on an operating system," he says. "We all know the track record of operating systems with patches and vulnerabilities. And other virtualization products lack the complete toolset that you get from VMware, including capabilities like live migration. The tools that VMware offers allow us to be more productive, as well as offer higher SLAs to our application owners. We couldn't do without it."

Benefits

Gibaud sees VMware Infrastructure 3 first and foremost as a management tool that improves and ensures the availability of mission-critical applications like SQL Server. "In healthcare, everything is last minute, needed yesterday," he explains. "So being able to rapidly deploy new systems is one of the top benefits of VMware Infrastructure for us."

Testing is also easier thanks to VMware Infrastructure. For instance, when ViaHealth's key applications ran on physical servers, Gibaud and his team developed physical test boxes to mirror them. "In the past, when we built test systems, we built them from the ground up, so what we wound up with wasn't apples to apples," he says. "But with VMware's snapshot technology, we can clone our production environment. Being able to build test environments quickly—and having those be exact copies of our production environments—has been huge for us.

"When our application people were making changes to test environments before virtualization, they had full rights to production servers as well—and you can see what kinds of issues would arise from that," he adds. "But with our virtualized infrastructure, only our DBAs have full rights to our production SQL servers, and we create images of those for development. Our DBAs move those data changes into the test environment, where the application people can do their testing to ensure everything's proper. After that, we feel confident moving that data into production."

ViaHealth has three-tier deployment architecture for its applications and databases. Heavily loaded SQL servers with lots of I/O reside on tier one hardware. The virtual machines will typically have four virtual CPUs sitting on hardware with quad-core processors and 40 to 60 GB of RAM. Smaller SQL servers reside on single-core processor hardware with consolidation ratios as high as 20 to 1. ViaHealth relies on DRS—VMware's dynamic load balancing functionality—to balance its server farm as loads vary throughout the day. In addition, if an application's resource needs permanently change, the hardware-independence property of virtual machines allows them to migrate the application to higher-tier hardware. They can even increase the virtual resources available to the virtual machine by adding more virtual processors or RAM. "For instance, our clinical care application started off in tier three," Gibaud explains. "We noticed that the CPU was starting to ramp up as we added more functionality, so we moved it up to tier one, adding more processors and more virtual memory. We were able to grow the application without having to reinstall it on new

DEPLOYMENT ENVIRONMENT

- ESX 3 running on IBM 3850 and 3950 BladeCenters attached to EMC CX-380 and CX-320 SANs
- Guest operating systems: Windows 2000, Windows 2003, Windows NT 4.0, Linux
- Virtualized production applications: Microsoft SQL Server 2000 and 2005, Microsoft Exchange Server, Oracle 9i, SMTP Gateway, Citrix Terminal Services, McKesson HSM/PMM, GE Centricity, a homegrown electronic medical record system, domain controllers, print servers

hardware. Once we moved it to hardware with more processing power, the application just hummed along.”

VMware High Availability (HA) is another tool that improves system management and ensures that ViaHealth’s vital applications are available when doctors, nurses and other staff need them. Gibaud and his team used clustering until a few years ago, but they find HA a better alternative. “We were using Microsoft clustering for our SQL servers and Oracle FailSafe for our Oracle databases,” he says, “but clustering tends to have a lot of false positives that cause the application to go down and failover to the other node.” Gibaud and his team consider HA a simpler, more reliable solution. “If something like a hard drive fails, with HA the applications running on that drive just start somewhere else,” he says. “When it comes to key apps like SQL Server, that makes me sleep better at night.”

Gibaud and his team are using VMware software as the cornerstone of the system they’re developing to ensure the availability of critical data and applications no matter what might hit ViaHealth’s data centers. They’re currently building out an ambitious co-location disaster recovery plan for the network’s main Rochester data center. VMware simplifies disaster recovery because everything about a VMware virtual machine—including hardware configuration, OS and applications—is contained in a set of files that can be quickly and reliably restored onto other hardware. Gibaud reports that during DR tests, “We successfully restored our VMware virtual machines to ones at our co-lo, and it was basically a no-brainer. Our long-term strategy is to use tools like Site Recovery Manager, which allow easy disaster recovery management and automation, to design our DR and protect mission-critical applications like SQL Server, keeping our facilities running 24/7/365.”

Results

- Nearly 90 percent of applications run on virtual instead of physical machines
- Almost 60 SQL Server instances are running in VMware virtual machines, the largest of which does 22,000 IOPS with no performance issues
- Simpler, more reliable availability for SQL servers by using VMware HA instead of Microsoft clustering
- Dynamic resource allocation to support variable application loads
- All Exchange 2007 components are virtualized on VMware, including the mailbox server with 5,000 mailboxes
- Server consolidation ratios ranging from 20:1 for smaller applications to 5:1 for larger, more demanding applications
- A 25:1 server-to-administrator ratio
- The development of a comprehensive disaster recovery plan to ensure the uptime of SQL Server and other mission-critical applications

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