Maimonides Medical Center

A Major American Hospital Tells Its Software-defined Storage Story

Just over twelve years ago, Maimonides Medical Center deployed DataCore storage virtualization software to manage and pool its storage as well as to ensure 24x7 data availability. Little did Maimonides know at that time, but by doing so it was making the most important stride it could in a journey that led to the organization embracing the software-defined data center.

Maimonides Medical Center, based in Brooklyn, N.Y., is among the largest independent teaching hospitals in the U.S. The hospital has more than 800 physicians relying on its information systems to care for patients around-the-clock. Prior to implementing DataCore’s SANsymphony-V storage virtualization software, storage was direct-attached to mission-critical application servers, and it became increasingly difficult to maintain the systems while keeping patient records, prescription data, medical supply ordering and fulfillment, research data, clinical imaging databases and voice dictation available at the doctors’ fingertips.

Maimonides Medical Center chose DataCore software from a number of hardware and software competitors based on its ability to securely and seamlessly manage the hospital’s storage resource expansion. DataCore’s software-centric approach to storage virtualization and its inherent ability to “thin provision” storage capacity has proven to be an invaluable service in eliminating the labor-intensive need for system administrators to micro-manage the capacity requirements of life-critical applications.

From the start, DataCore enabled Maimonides to consolidate storage management for mission-critical patient records. In fact, Maimonides Medical Center has now consolidated all of its online storage resources under the control of the SANsymphony-V virtualized storage platform.

Maimonides’ history with DataCore dates back to the year 2000. Initially DataCore was brought in because Maimonides used IBM Serial Storage Architecture (SSA) to support a particular neo-natal unit’s data storage requirements. Because this particular storage equipment had reached end-of-life and was no longer supported by IBM, the storage...
team at Maimonides used the DataCore virtualized storage platform to bridge the SSA devices into Fibre Channel connections to their application servers.

In a second phase with DataCore, Maimonides Medical Center migrated to an infrastructure-wide, DataCore-powered SAN spread across two sites – two geographically separated DataCore-powered SANs running as active-active data centers. This was done in 2001. The goal here was to handle the data growth in the electronic medical record application and meet existing state and federal requirements to store patient records for at least seven years and often for even longer.

“When we started putting application servers on the DataCore virtualized storage platform and started to really understand what we were doing, the SAN grew and grew,” states Rogee Fe de Leon, head of the storage group, Maimonides Medical Center. “It grew so much that it started breaking down due to sheer size. We made the decision to scale our virtualized storage infrastructure to multiple node pairs. As we have moved along, we have also increased the bandwidth between the sites and upgraded our Fibre Channel infrastructure significantly to deal with the expanded size and scope of the deployment.”

Eight (8) direct Fibre Channel switches support this infrastructure – infrastructure that stores, moves, and protects electronic records for ambulatory, obstetrical, and gynecological services.

A little less than one (1) petabyte of managed storage (“virtual disks”) is used as “tier 1” storage. This storage serves the critical applications – including medical records and imaging. The Picture Archiving and Communications System (PACS) is the most storage-intensive application. Meeting HIPAA’s requirement for audit trails has been a pretty straightforward process of keeping more log files for a longer period of time. The disaster recovery requirements of HIPAA have been met by replicating the patient data to a second DataCore-powered SAN.

**Business Continuity through High Availability**

The most pressing requirement the hospital had (and one that still tops the priority list) is realizing business continuity – meaning delivering non-stop hospital operations. To achieve this, the key benefit that DataCore delivers for Maimonides is high availability. Storage consolidation, for example, was never a priority for Maimonides. Moreover, server virtualization has only been undertaken since 2011. The goal was always simply to have highly available applications delivered via highly available storage.

“High availability was the first and foremost reason for going with DataCore – and for continuing with it,” adds Fe de Leon. “Now, everything that is mission-critical to the running of the hospital is supported by the DataCore virtualized storage platform. Users not only receive faster access to data, but they benefit from more server capacity as well.”
Four pairs of SANsymphony-V’s precursor, SANsymphony, have been running since 2005. Each pair of storage nodes represents 250 TBs of mirrored, virtual storage capacity. Physical storage capacity available behind the pairs is almost twice that, or 500 TBs per pair. Total storage capacity is approximately two (2) petabytes. By centralizing the management of all storage resources as a scalable, fully redundant virtualized pool the hospital ensures 24x7 access to critical information. This virtualized storage infrastructure powered by DataCore means Maimonides has eliminated lapses in data availability from hardware failure and storage maintenance.

The Virtualized IT Landscape

The drive to deploy virtualized servers at Maimonides was no doubt similar to the adoption of server virtualization at most organizations. Sheer demand for servers and for applications from every group within the organization meant that deploying virtual machines (VMs) to meet their IT needs made sense – both practically and economically. And Maimonides has significantly ramped up virtualizing servers over the past two years. On the virtualized server side, the medical center now maintains 150 virtual machines (VMs) across their systems. Out of a total of 12 VMware ESX hosts, six (6) hosts are clustered into a production environment and the others are clustered in a development environment.

The medical center also has numerous physical Microsoft servers, which are clustered between the two sites for the sake of business continuity. The balance of the hospital’s hosts run IBM AIX (Unix) and Red Hat Linux, all obtaining their storage from the DataCore-powered virtualized storage platform.

The DataCore software currently runs on IBM / Lenovo x3650 servers. These standard x86 machines have been deployed with approximately 20 Fibre Channel ports each using a combination of Emulex and QLogic host bus adapters (HBAs). All critical systems run entirely on Fibre Channel topology.

In the most recent deployment of SANsymphony-V, the configuration virtualizes one pool of fast Fibre Channel disks on X-IO arrays as well as two vast pools of high-density, lower-cost, SATA disks on IBM arrays.

Mission-critical Applications Virtualized and Overall Business Objectives Met

A primary, business-critical application that is supported by the virtualized infrastructure is a GE imaging system (PACS). Beyond this, numerous Oracle databases that support the hospital’s human resources needs and SQL servers supporting the hospital’s clinical programs are all virtualized. This includes primary databases such as the hospital's neonatal database, its geriatric database, its pediatric database, and its research database. Microsoft Exchange is virtualized. Moreover, IBM DB2 databases are virtualized in support of the hospital's medical records management needs.

According to Fe de Leon, “In terms of DataCore serving as the storage area network ‘backbone’ for the hospital, you need only know that all of the hospital’s medical records, all of its clinical records, and all of its administrative records reside on the DataCore-virtualized SANs, which serve as the hospital's ‘de facto’ virtualized storage platform. All of the applications we rely on to run the hospital – including billing – are on DataCore.”
Summary

The hospital’s IT department was challenged with the growth of data storage. The lack of maintenance windows and the potentially devastating effects of downtime on the facility’s patients and staff prompted the urgency to examine SAN alternatives. Maimonides implemented DataCore’s open and extensible SANsymphony-V storage networking and management software to eliminate single points of failure and ensure continuous, reliable data access.

The ability to have rock-solid business continuity remains the overriding benefit Maimonides derives from DataCore storage virtualization software to this day. DataCore makes it possible for Maimonides to “metro-cluster” applications between two different sites as if they were co-located. This way, if for any reason one site happens to be offline – due to a planned or unplanned outage – the hospital’s IT systems remain up and running – continuing non-stop business operations.

“The performance and data availability delivered by SANsymphony-V enables our IT staff and medical staff each to focus on what they do best,” explains Fe de Leon. “When patients’ lives are on the line, health care professionals cannot tolerate having to wait for information because a system is offline for maintenance. The DataCore storage virtualization software has dramatically improved how we manage our storage resources and has given us a cost-effective solution to manage ongoing expansion.”

The Road Ahead: Software that Supports Whatever the Future Holds

SANsymphony-V allows the storage team at Maimonides to mix and match disks from different vendors as the price of storage falls and the medical center’s needs grow. The device-independent approach of the SANsymphony-V virtualized storage platform gives the hospital flexibility to incorporate existing hardware investments and leverage new technologies, without locking them into any single hardware or storage technology. With complete data redundancy and system monitoring tools, the software offers high levels of data protection in a cost-effective architecture.

As an open-networking, software-defined storage platform, SANsymphony-V lets customers combine heterogeneous components on a SAN and retain single-console management. DataCore-pioneered “thin provisioning” technology lets administrators grab capacity just-in-time, so unused storage space doesn’t go to waste. Plus, the storage platform empowers system administrators with metrics for chargebacks, security policies, and prioritized queries based on business units.

“DataCore’s storage virtualization software meets the need of organizations like Maimonides that are struggling to manage the proliferation of mixed storage resources while maintaining high availability and rapid response for users — all on tight IT budgets,” said George Teixeira, President and CEO of DataCore Software. “Our SANsymphony-V virtualized storage platform sets the standard for flexible and trusted data storage management in the software-defined data center.”

DEPLOYMENT AT-A-GLANCE

- DataCore Managed Capacity: 1 Petabyte
- Number of Users: 5,000
- Total Number of Physical Servers within the IT Infrastructure: 400+
- Number of Virtual Servers: 300
- Number of Virtual Desktops: 300 (by 2014)
- Primary Server Vendor: IBM / Lenovo
- Storage Vendor: IBM and X-IO
- Server Virtualization Platform: VMware, Microsoft Hyper-V
- Desktop Virtualization Platform: Citrix
- Primary Back-Office Apps: Exchange, Oracle, SQL, IBM DB2
- Healthcare Applications: GE PACS, Allscripts, NextGen EHR, Siemens
- Storage Management and Virtualization Platform: DataCore Software