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Health First Maintains a High Level of System Availability while Managing Unprecedented Growth

Health First Achieves 100 Percent Uptime and Delivers Critical Clinical Applications to Support Exceptional Patient Care Services

Results

- Reduced server overcrowding problems, including cooling, power and weight issues
- Achieved 100 percent uptime
- Avoided deploying back office systems in an inappropriate environment
- Deployed 55 fewer physical servers in 10 months
- Saved over $100,000 in capital expenses; also saved operational expenses
- Achieved a 10:1 server consolidation ratio
- Increased CPU utilization by about 50 percent
- Reduced server deployment time from 30 days to one day
- Increased flexibility to respond to business needs
- Facilitated upgrades and maintenance with VMotion® technology

Healthy Growth

Health First operates three not-for-profit hospitals in Brevard County on Florida's Space Coast: Cape Canaveral Hospital in Cocoa Beach, Holmes Regional Medical Center in Melbourne, and Palm Bay Community Hospital in Palm Bay. Other services include outpatient centers; the county's only Level II trauma center; home care; specialized programs for cancer, diabetes, heart, stroke, and rehabilitative services; central Brevard's largest medical group; three fitness centers; and Medicare+Choice, commercial POS, and commercial HMO health plans.

Health First is devoted to leveraging state-of-the-art technology in delivering quality healthcare services and was recently recognized as a top 100 Integrated Healthcare Networks in the US. Manager of Systems Engineering Karen Ardito heads a Health Information Technology team, which supports all of Health First, including over 40 locations and its 6,500 employees countywide. "Our information systems are now critical to our organizations efficient and timely delivery of patient care services and needs to be available 24 X 7," says Ardito. "Part of our strategy to maintain service level objectives was to house all back-office systems in a controlled environment such as our corporate data center."

In the spring of 2003, it was determined that based on projected growth, the organization would outgrow its data center in the 2005 timeframe. "At that time, one of our objectives was to leverage technology that would allow us to reduce the projected growth of physical servers in our data center," says Ardito. "We are planning to build a datacenter, but it would take three years to fund, design and build."

The IT department also wanted to maximize efficiency in the datacenter. Joel Otero, network engineer for Health First explains: "In the past, when we received a request for a new physical server, it could take months to order, deliver and build. Furthermore, due to multiple constraints in terms of manpower and environmental resources, we needed a better way to efficiently manage new and upgraded systems."

The team was already using VMware Workstation to run multiple operating systems on computers for test and development, so they were familiar with virtualization technology. They realized VMware's server products would enable them to consolidate by migrating physical servers to virtual machines on fewer hardware boxes. The team also evaluated Microsoft Virtual Server, which has a similar function and was included in Windows Server 2003, but they quickly decided VMware ESX Server would better meet their needs.

> **"We were able to maintain an extremely high level of clinical and enterprise system availability despite the challenge of managing unprecedented growth in our existing data center environment. Not only did we manage to avoid any type of temporary deployment outside our protected environment, but we also managed to save over $100,000 in capital expenditures. Additionally, we experienced operational improvements including the ability to rapidly respond to customer requirements."**
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> *Karen Ardito*
> *Manager of Systems Engineering & Development, Health First*

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VMWARE VIRTUAL INFRASTRUCTURE AT WORK

- VirtualCenter on 2-CPU IBM x336 with 2 GB RAM
- ESX Server on 2-CPU/ 4-CPU IBM x336s and x366s with 8-16 GB RAM
- GSX Server on 2-CPU IBM x336 with 7 GB RAM
- Workstation on various makes of laptops and desktop computers
- McData switch, IBM DSS, ESS, and FastT SANs. Use dense wavelength division multiplexing (DWDM) for a ring SAN around its hospitals, with three main hospitals fiber-connected.
- Host operating systems: various versions of Microsoft® Windows® and Linux
- Guest operating systems: Windows 2000 Server, Windows 2003 Server, Novell and Linux
- Production applications running in virtual machines include: PeopleSoft ERP, Softmed, infrastructure servers, IDS, Web, Blackberry, Wisdom, Business Objects Crystal Reports, McKesson Horizon Patient Folder and Org Chart
- Test and staging applications in virtual machines include: Oracle, Microsoft SQL, Novell, and Web servers
- Management applications running in virtual machines include: Avocent Remote View, IDS, Cisco

"Virtual Server wasn't able to handle multiple virtual machines because of its high overhead and because it's running on top of an operating system," explains Otero. "ESX Server is much more powerful, plus we wanted to use VirtualCenter and VMotion to help with administrative tasks."

First Tests

Health First tested an evaluation copy of VMware ESX Server, running input/output benchmark tests, and moving Netware, Microsoft and Linux servers into virtual machines. "We were able to demonstrate the stability of VMware software," explains Otero. "Also, during the testing, there was an order for a team member to deploy 12 servers. Our Network Engineer, Danny Wall was able to roll out seven servers at a time using VirtualCenter, and he was able to do it within an hour. He had the 12 servers deployed in four hours. Normally, it would take seven days to deploy seven servers. So we were impressed."

Health First purchased its VMware software in July 2004 and began migrating servers into its new virtual infrastructure. "We migrated our transcription application from one of our worst, unstable servers that was built on a workstation-class machine," says Otero. "It needed to be rebooted frequently, it ran on old CPUs with no fault tolerant drives." The ease of migrating the applications onto virtual machines and the ease of administration was a clear victory and made many team members understand the benefits of VMware software.

Tangible and Intangible Benefits

Now, a year later, Health First is enjoying a variety of benefits from deploying its virtual infrastructure. Some were expected, such as the lower number of servers in its data center, but others were unexpected pleasant surprises. The results include:

- **Improved application availability.** Health First is still able maintain all back office systems in a data center that is significantly constrained in terms space and environmental resources. "They say the best thing to shoot for is 99.999 percent uptime," says Otero. "We're at 100 percent. We haven't had any issues with ESX Server causing any downtime. We're quite happy about that. Additionally, VMotion allows us to move production applications between ESX Servers for scheduled maintenance within seconds. This results in greater uptime and availability for our customers."
- **Cost savings.** Health First estimates a savings of $105,000 in capital costs. "We saved $105,000 in capital expenses, and that doesn't include operational costs, that doesn't include that we didn't have to rebuild or do a temporary add-on to our current data center," Ardito says. "It also doesn't include administrative costs, such as being able to set up seven servers in an hour instead of seven days. There are a lot of intangible cost savings."
- **Fewer servers.** By deploying virtual machines instead of physical servers, Health First was able to deploy 55 fewer physical servers over the past 10 months.
- **Improved CPU utilization.** Before using VMware software, CPU utilization hovered around 2 or 3 percent. Otero estimates a 50 percent increase in CPU utilization with virtual machines.
- **Reduced server deployment times.** When a new server is needed, it now takes 1/30th the amount of time to deploy using VirtualCenter. "This includes having to order the server, wait for the server to come in, build it, the whole nine yards. It takes less than one day instead of 30," says Otero. "We can also retain better control of builds including virus scanning, backup and monitoring. We can do template provisioning, prebuilt images for various electives including Netware, and we can tightly control different builds."
- **Increased flexibility to business needs.** When an analyst needs a new server for testing or development, the IT team can immediately provide the resources. "We support more than 100 analysts," says Otero. "With VirtualCenter, we can respond to their needs and manage server resources. Before, we would have analysts building test servers, keeping them under their desks, and then developing on them."

- **Increased disaster recovery protection.** Health First used to rely on tape backup, which could take days to restore in case of server failure. Otero explains "Having to build a new server, load the operating system, load tape restore software, restore the operating system, restore the files and the registry, could take two days. Half of the time it wouldn't even work and you'd have to start over again." Now, Otero can use ESX Server's capabilities to take real time snapshots of virtual machines while they are running, and, "now we can recover primary applications within an hour." Health First has a ring storage area network (SAN) for its hospital servers. For critical servers, SAN logical units (LUNs) are mirrored, and future plans include mirroring SAN LUNs to the secondary datacenter for increased disaster recovery.
- **Reduced power, cooling, air conditioning, etc.** VMware virtual infrastructure eliminated the common problems of a rapidly expanding datacenter. "In our data center, we had so many power issues, with multiple switches, the need to cool the server room, we even had a problem with weight on the second floor," Ardito says. "Now, since we've gotten rid of servers, we don't have to worry about these problems."
- **Standardized hardware platform provides easier testing.** Otero says virtual infrastructure eliminates the stress of duplicating systems and hardware for test and production servers. "In the past, many of our high-end production servers would require a test box," he says. "The test box often had to have the exact same hardware, the exact same build, and of course, more than likely, something would be different. Something would be updated in one and not the other, for example. With ESX Server, we can clone the data, and do an upgrade on that. If a downtime is needed, you can put the disk into non-persistent mode, do your upgrade, and if it doesn't work the way you want, you never have to commit the change."
- **Easier upgrades and maintenance with VMotion.** "VMotion enables us to schedule maintenance and upgrades without system downtime," says Otero. "I can migrate applications onto another box, do an upgrade or make changes, move the applications back, and then just reset the whole system."

Benefits Expected to Grow

VMware virtual infrastructure is a key part of Health First's plans for the future. "When we first invested in software from VMware, we were expecting benefits from server consolidation, but we got so much more," Otero says. "Now we have a better disaster recovery plan, and administration is easier – huge benefits and increases in efficiency for our department."

Ardito adds that the benefits have gone above and beyond their expectations for success. "The project has paid for itself, reduced server costs, administration costs, operational costs, power and time," she says. "It's going to continue to do that as we continue to grow."

Health First plans to continue building its VMware virtual infrastructure. "We're creating our disaster recovery environment to take advantage of the features we have with our virtual infrastructure," Otero says.

Otero was also part of the beta program for VMware ACE – a product that creates a secure virtual machine for unmanaged physical PCs. "We're very interested in the innovation coming out of VMware," he says. "VMware ACE is a superb product. We may start using it in a few months."

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