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— Curtis Weldon
Systems Administrator
University of Florida

KEY HIGHLIGHTS

Challenge

Reduce physical server infrastructure and improve cost efficiency of hosting applications.

Solution

Implement virtualization to consolidate servers, redistribute excess capacity, and improve application availability, thereby ensuring business continuity.

University of Florida

The University of Florida (UF) is the state's largest university and the nation's fifth largest university. Located in Gainesville, the university has more than 46,000 students and is home to 16 colleges and more than 150 research centers. UF is a member of the prestigious Association of American Universities, which includes 62 leading public and private research universities in North America.

The university's Information Systems department was merged with the Enterprise Resource Planning (ERP) group to form UF Bridges in October 2002. At that time, the purpose of Bridges was to replace the university's current computer systems with web-based systems that would improve business processes at the university. Today, Bridges supports the university's human resources (HR), student administration, financial, and payroll functions through managing UF's enterprise systems and its vast warehouse of employee, student, and accounting data. Bridges further serves the campus community by running thousands of reports and completing dozens of major projects annually.

In 2006, Mike Conlon, Director of Data Infrastructure at UF and founding member of the Bridges team, turned his attention to streamlining the department's enormous physical infrastructure. "We had a couple hundred rack-mounted servers--nearly eight full racks, including storage," recalls Conlon. The proliferation of hardware, including servers, racks, wires, and network ports, was the primary reason that UF switched the majority of its server infrastructure to VMware Infrastructure. Cost efficiency was another. Conlon continues, "I don't like buying a full server for something that only needs a tenth of a server. So if I buy a single-use server to host an application that I know is only going to use one tenth of the server's power, I've overspent by a factor of ten, not to mention the cabling and the space that the server requires. We have a large number of applications like that—small programs that don't require a full single-use server."

UF implemented VMware Infrastructure 3 to reverse its server sprawl and to improve cost-efficiency. The university evaluated several competitors before concluding that VMware provides the most comprehensive solution for its needs. According to Conlon, "We looked at some of the features of competitive products, be we didn't want to get hung up on limitations. We didn't want solutions that we could use for this but not for that. With VMware Infrastructure, we didn't see those types of limitations. We could use it to host Windows, Linux, or any of the operating systems we were using, and that was important for us."

As of December 2008, UF has reduced its physical server infrastructure considerably. Curtis Weldon, Systems Administrator at UF, describes the university's virtual infrastructure: "We have 14 ESX host systems running 160-170 virtual machines. We also converted our rack-mounted servers to blade servers, so our infrastructure has collapsed into an even smaller footprint in the data center. To date, approximately 65-70 percent of our environment is virtualized."

VMWARE AT WORK

VMware Infrastructure 3 Enterprise, featuring:

- VMware ESX 3.5
- VMware VMotion
- VMware Storage VMotion
- VMware vCenter
- VMware High Availability (HA)
- VMware Distributed Resource Scheduler (DRS)

"Ascential and Informatica are probably our highest I/O applications. They push every bit of data that we have through our infrastructure, and they are both on virtual machines. They take information out of PeopleSoft, and they put it into databases for reporting. We build a gigantic warehouse every night, and it is all going through Ascential and Informatica on VMware."

— Mike Conlon,
Director of Data Infrastructure
University of Florida

Mission-critical Applications Virtualized in Production

UF virtualizes many of its mission-critical applications, including IBM Cognos ReportNet, Microsoft SQL Server, PeopleSoft Windows Process Schedulers, and several essential monitoring tools. All of these applications are virtualized in production, and several others are virtualized in pre-production.

IBM Cognos ReportNet is one of UF's most mission-critical applications, and it is running on VMware Infrastructure. "Cognos ReportNet is our business intelligence solution. It is used for all administrative reporting at the university, including HR reporting, financial reporting, all student reports, accounting reports, historical reports…everything is coming out of Cognos," comments Weldon. Chris Easley, IT Infrastructure Manager at UF, adds, "Our application administrator absolutely loves that Cognos ReportNet is virtualized. He is very excited about the ease of management that virtualization provides."

Microsoft SQL Server is another critical component of UF's extensive reporting solution. The SQL Server databases house data that users can access from throughout the university campus. "This way," explains Weldon, "users are not connecting directly to our Oracle source databases or to our Database Query (DBQ) source databases. | They are connecting to an environment that allows them to easily retrieve and manipulate data however they see fit for their own departmental reporting." Since virtualizing SQL Server, Weldon has observed many invaluable improvements. "We had a lot of issues with SQL Server running on a single rack on a server. For starters, if that server were to fail, SQL would become unavailable—there was a single point of failure. Now that SQL is running on a virtual machine, if an ESX host server has an issue, everything fails over to another ESX server. Availability has increased, stability has increased, and even performance has increased. It has been a godsend for SQL Server to be on a virtual machine."

For HR and finance, the department relies on PeopleSoft NT Process Scheduler. "There are a number of Crystal Reports that need to be run through the PeopleSoft system, and we run these using NT Process Scheduler. We also run other processes that have some Windows-centric piece to them that requires them to run through a Windows server. So it's an important cog to the PeopleSoft architecture on the whole. NT Process Scheduler is one PeopleSoft application that is entirely virtualized, and it is working very well for us. We have several other PeopleSoft pieces that are successfully running on VMware in pre-production."

Several essential monitoring tools are also running on VMware. Oracle Enterprise Manager (OEM), for example, is the administrative tool for all of UF's enterprise Oracle databases. "OEM is an extremely important component in our Oracle environment. The database administrators use it every day to monitor our Oracle databases and the systems that run on those databases. OEM also helps the administrators determine how to manipulate the Oracle databases to make the systems better," says Easley. Likewise, Microsoft Operations Manager (MOM) is used to monitor all of the Active Directory systems. Conlon describes the scope of UF's MOM implementation: "We have about a hundred domain controllers in Active Directory scattered around the state of Florida, and the statewide network supports about 170,000 users. That Active Directory installation is monitored using MOM, which is entirely virtualized."

Another critical monitoring tool is HP SiteScope. "We use SiteScope to monitor all of our Linux and AIX servers and many of our Windows servers. This is how we know when we have issues in our infrastructure, how our operators know to contact us if it is after hours. It is one of the most critical pieces of our infrastructure. SiteScope is half-virtualized today, and we expect to have the other half virtualized by the end of January

DEPLOYMENT ENVIRONMENT

- ESX 3.5 running on IBM HS21 dual- and quad-core blade servers with 16 GB memory attached to EMC CLARiiON SANs
- Guest operating systems: Linux Red Hat version 4, Microsoft Windows 2003, and Microsoft Windows 2008
- Virtualized applications in production: IBM Cognos ReportNet 1.1 MR2, IBM Director, Microsoft SQL Server 2000, PeopleSoft NT Process Scheduler 8.48, Oracle Enterprise Manager (OEM) 10g, Oracle User Productivity Kit (UPK) 2, Microsoft Operations Manager (MOM) 2005, Microsoft Windows Server Update Services (WSUS), Microsoft Web Distributed Authoring and Versioning (WebDAV), IBM Cluster Systems Management (CSM) for Linux 1.6, HP SiteScope 9.5, HP Quality Center 9, HP (Mercury) Business Availability Center (BAC) 6.4, HP (Mercury) IT Governance (ITG) 6, Ascential 7.5.2, Informatica PowerCenter, AppWorx 7, Xmedius 5.2, PowerDNS 1.2.7, McAfee ePolicy Orchestrator (ePO), Apache, FTP, Wiki
- Virtualized applications in pre-production: IBM Cognos ReportNet 1.1 MR2, Microsoft SQL Server 2000 and 2005, Microsoft Office Sharepoint Server (MOSS), PeopleSoft Process Scheduler, PeopleSoft Web Servers, PeopleSoft Applications Servers, Oracle Enterprise Manager (OEM) 10g, IBM Cluster Systems Management (CSM) for Linux 1.6, HP (Mercury) IT Governance (ITG) 6, Ascential 7.5.2, Informatica PowerCenter, AppWorx 5, Xmedius 5.2, Samba, Documentum, Apache, FTP

2009. When all is said and done, SiteScope will monitor our entire set of virtual and non-virtual infrastructure," says Easley. Weldon adds that virtualization provides specific benefits to SiteScope: "Right now, SiteScope is set up on two physical servers, so it is supposed to be fully redundant. However, sometimes we have issues with the software, and the redundancy does not work out. One benefit to having SiteScope virtualized is that that redundancy would be built in. So, if we were to take out two physical servers and move SiteScope over to one virtual machine, we could rely instead on VMware's redundancy and HA capabilities."

Ascential and Informatica PowerCenter, which are extract, transform, and load (ETL) tools, are also virtualized. "Ascential and Informatica are probably our highest I/O applications. They push every bit of data that we have through our infrastructure, and they are both on virtual machines. They take information out of PeopleSoft, and they put it into databases for reporting. We build a gigantic warehouse every night, and it is all going through Ascential and Informatica on VMware," observes Conlon.

Redefining IT Processes Through Virtualization

Among the many ways that virtualization has benefited UF, one of the most significant is the ease of server provisioning. Conlon explains, "If you are using physical servers, you have to have spares, because people come in all the time saying, 'I need a box to do this, I need a box to do that.' I have to guess how many times this is going to happen so that I can have enough spares on-hand. If I don't have a spare, it takes about six to eight weeks to figure out what we're going to buy, get the PO through Purchasing, wait for the server to arrive, screw it into a rack, hook wires to it, get it on the network, etc. With VMware vCenter and ESX, it takes about 30 minutes to provision a virtual machine. That's it. Now we don't even have spares. The whole spare management process has been eliminated, and the turnaround time is fantastic."

Rapid server provisioning has also positively affected UF's testing environment. "Being able to produce virtual machines for testing in a half-hour means that we don't have to wait a couple of weeks to think about testing an application. Another really nice feature of ESX is that we can monitor the performance of the virtual machine during testing. So, we can look in vCenter to see what is happening on the machine and to see if there are any bottlenecks," explains Easley. Conlon adds, "We were always short of servers because somebody wanted to test something, and we didn't have enough spares. With virtual machines, we never have that problem. That provides a huge increase in our ability to execute."

Also related to rapid server provisioning is the ease of upgrading applications. Weldon expects the upcoming upgrade to SQL Server 2008 to be significantly easier now that the application is running on VMware Infrastructure. "If SQL Server were on a racked server, to do an upgrade we would have to procure a server and get it delivered, cabled, and all set up. Then we would have to migrate everything from the old server to the new server and figure out what to do with the old server. With virtualization, we simply create a virtual machine in a test bed and install the guest operating system. We can test it, practice the production migration, and then we can do the real thing in production. It is effortless to create test and production environments in ESX." Easley adds, "Plus, with having SQL on ESX, we can take snapshots before we do anything in case we have a glitch and need to roll back to the previous version."

One of the most valuable benefits that VMware Infrastructure delivers, in Conlon's opinion, is capacity management: "Before virtualizing our environment, we had servers

that were completely underutilized at certain times of day. For example, there were some servers that worked only at night and others only during the day, and the excess capacity just sat there while the servers weren't being used. We don't have that waste with our servers running on VMware Infrastructure. We are able to consolidate servers and redistribute that excess capacity so that our ESX host systems are churning all day long. That consolidation benefit is really significant for us."

On the Path to Global Virtualization

UF has several plans for expanding its virtual environment. First and foremost is its disaster recovery, or as Conlon prefers to call it, business continuity plan. "We are building a second site that will have mirrored production storage. It will have a BladeCenter, which will run virtual machines. We'll expect the virtual machines to move seamlessly between the primary and secondary sites. So, if a site goes down, we will be operating from the other site. Our goal is continuous operations. We have already seen significant enhancements in business continuity in our virtualized environment, and we feel confident that VMware solutions can help us meet our goal of continuous operations."

In addition to upgrading its SQL Server environment, UF intends to upgrade to the next version of Cognos. "Right now, only Cognos ReportNet is supported on VMware Infrastructure; the other Cognos pieces are not. The next version of Cognos is fully supported, so we're looking forward to expanding our virtualized Cognos environment," comments Weldon. Conlon concludes, "I think the business continuity concerns are going to dominate, and in the end we are going to want to be able to move applications to a virtualized platform. In essence, we are heading in the direction of global virtualization."

Results

- Achieved a 12:1 server consolidation ratio
- Virtualized 65-70% of IT environment, including mission-critical applications such as IBM Cognos ReportNet, Microsoft SQL Server, PeopleSoft NT Process Scheduler, Oracle Enterprise Manager (OEM), Microsoft Operations Manager (MOM), HP SiteScope, and Informatica PowerCenter
- Reduced server provisioning time from six to eight weeks to 30 minutes
- Eliminated process for managing spare servers
- Facilitated application updates and increased application stability, availability, and performance

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