



Pennsylvania's Smart Move

COMMONWEALTH USES VIRTUALIZATION
IN CENTRALIZED DATA CENTER TO
IMPROVE SERVICE AND REDUCE COSTS.

Since the economic downturn began in 2008, states have faced unprecedented budget pressure, addressing a combined budget shortfall of \$430 billion for fiscal 2009-2011, according to the Center on Budget and Policy Priorities (CBPP). And based on early survey data the organization has collected, it predicts still more budget turmoil ahead.

For many states, IT consolidation has been one way to achieve economies of scale that allow valued IT services to continue despite decreased budgets, hiring freezes and limitations on purchasing. In Pennsylvania, state leaders were well positioned to achieve these types of cost benefits, as the commonwealth has been pioneering consolidation for years.

Nearly a decade ago, Pennsylvania began consolidating some services and equipment because it saw the financial value in doing so. As the economic downturn put more pressure on state coffers, Pennsylvania

stepped up its efforts, and its consolidation strategy has grown into an initiative to consolidate all IT operations under the state's Office of Information Technology. Recently elected Governor Tom Corbett renewed the state's commitment to IT consolidation upon taking office in 2011. Today, the OIT hosts more than 750 applications in its data center.

Since early 2008, virtualization — which allows the OIT to run numerous virtual servers on one physical server — has been a major part of the state's consolidation strategy. "We've been taking a lot of those systems that were siloed and bringing them together by leveraging virtualization to reduce the overall cost not only to the agencies but also to the commonwealth as a whole," said Stephen Dunn, director of the OIT's Bureau of Infrastructure and Operations.

To date, the state has used VMware vSphere to virtualize approximately three-quarters of its servers, said Dunn, and has saved millions of dollars.

But the consolidation effort isn't just about costs, said Pennsylvania CIO George

White, who was appointed in January 2011. "You shouldn't be consolidating just for the sake of consolidation," he said. "You should be consolidating because you're going to be providing better service at a lower cost."

That's why the OIT has taken the opportunity to examine the way it interacts with agencies, and it is deploying management strategies that optimize service levels. It's also using virtualization to cost-effectively provide more flexibility and reliability to agencies, including state-of-the-art disaster recovery services that many agencies couldn't have achieved on their own and on-demand cloud computing services. "Our virtualization efforts to date have been extremely successful and are the foundation of our broader vision of providing private cloud services to state agencies — essentially transforming our operational model into an 'IT as a Service' platform," said Pennsylvania CTO Tony Encinias.

SAVING ENERGY, SAVING THE ENVIRONMENT

Pennsylvania's virtualization efforts aren't just good for state coffers, they're also good for the environment. Pennsylvania's efforts so far have saved the state approximately **26,708,693 kWh** of energy and **42,279,861 pounds** of carbon dioxide emissions — the equivalent of

- ▶ planting **63,338 trees**
- ▶ removing **3,583 cars** from the highway



Saving Time and Money

Since deploying VMware virtualization technology, the state has saved more than \$36 million in new server purchases, productivity improvements, energy costs and infrastructure expenses. According to Dunn, the vast majority of those savings came in the form of cost-avoidance that resulted from not having to replace aging equipment. "Agencies had physical servers that were at end of life," Dunn said. "We were able to take those systems from a physical environment to a virtual environment, so the agencies did not have to go out and buy a new physical system."

Previously each application needed its own server because the applications were dependent on the underlying operating system and configuration of the server, but with virtualization, the OIT could easily bring those servers into its data center and run several virtual machines on a single server.

Reducing the amount of hardware in the data center also reduces the amount of time and money the OIT must spend maintaining each physical server. "There's still management that has to be done whether virtual



VIRTUALIZING THE DESKTOP

Virtualization has clearly provided many benefits for Pennsylvania, and they're not limited to the data center. The state is also in the midst of a desktop virtualization initiative. Desktop virtualization has numerous advantages, allowing IT administrators and support staff to manage and support desktops from a server rather than end-user machines. Many support functions can be handled remotely, and updates and changes can quickly be made across the organization, rather than desk-to-desk. It also offers disaster recovery benefits because users can log into their desktop from any machine that has access to the Internet.

The Pennsylvania Office for Information Technology (OIT) recently completed a desktop virtualization pilot of 100 desktops using VMware View and plans to expand the implementation to 10,000 desktops to complete a proof of concept.

"We want to be able to reduce the management of those systems and provide better continuity of government," said Dunn. "In a disaster scenario, folks could have access to their systems remotely, if for some reason they couldn't come to work."

Dunn said that once the business case is made, desktop virtualization could be expanded to all 70,000 desktops in the state.

or physical," said Dunn, "but virtual servers allow us to manage more systems with fewer system administrators."

The virtual environment helped the OIT continue to successfully maintain the data center even when administrators left and their positions couldn't be filled because of budget constraints. It also allowed the state to eliminate some third-party maintenance contracts. The OIT had 200 servers in one area of its data center that were being maintained by a third party. By virtualizing those machines, the OIT was able to decommission those physical machines and avoid the maintenance expense. Now the OIT is looking at similar moves in other areas of the data center.

In addition to application servers, the OIT has used virtualization to consolidate many of the state's storage systems. "We

had a lot of SAN [storage area network] islands that multiple agencies had," Dunn said, "and we were able to consolidate all those storage devices down to a shared storage system."

According to CIO George White, virtualizing storage allowed for a much more efficient storage system. "In the past, you would go out and buy a server with its own direct-attached storage," said White, who in his previous position with the Pennsylvania Attorney General's Office oversaw a virtualization effort that produced significant cost savings for the agency. "Now with virtualization, we allow those servers to do what they do best, and by decoupling that from the storage environment, we now are able to use SANs to do what they do best, and it provides a more efficient structure for providing those types of capabilities."

Increasing Reliability and Business Continuity

Virtualization lets the OIT provide more flexible and reliable service to the agencies it supports. The state is in the midst of a comprehensive disaster recovery initiative that has been made easier and more efficient by consolidation and virtualization. For many agencies, a top-notch disaster recovery initiative might have been cost-prohibitive previously, but in a consolidated and virtualized environment, resources can be shared and maximized.

"In the past," Dunn said, "you had to have like-for-like physical machines because the operating systems were dependent on a certain configuration, but now a virtual machine can be brought up on other types of hardware and still run without any issues."

In the event that there is a disaster and data center operations had to relocate to another environment, the tools provided by VMware would allow the OIT to get the new environment up and running in a very short amount of time.

Dynamic provisioning and failover capabilities offered by the VMware tool set also ensure that agencies have the resources they need, when they need them. If a piece of hardware should fail, the virtual machines on that server seamlessly transfer to a working machine. "The failover capability allows us to just continue operating as if nothing happened at all," White said. "And that obviously provides huge benefits to everyone — not only the agencies themselves but also our citizens because many of those applications may be public-facing Web-based applications, and we can't afford for those to go down."

The OIT is now investing in additional tools from VMware that will allow it to do more with its virtualized environment. Soon it will be able to automatically provision data center capacity based on demand. Some agencies require more capacity during peak times, such as the Department of Revenue during tax season or the Department of State during elections, said Dunn, and the OIT can provide that capacity. Once the capacity is no longer needed by one agency, the OIT can use it for other operations. "We do a lot of that manually now," Dunn said, "but we're going to set the system up so that it can automatically trigger the allocation of resources based on hitting a certain demand threshold."

Deploying new applications is also much simpler now, Dunn said. In the past, when each application needed its own dedicated

BY THE NUMBERS:

- ▶ Servers virtualized: **4,040**
- ▶ Physical servers: **417 hosts**
- Value realized: 2008-2010**
- ▶ Server retirement/recycling cost avoidance: **\$29,026,812**
- ▶ Infrastructure savings: **\$332,516**
- ▶ Energy cost savings: **\$3,227,932**
- ▶ IT productivity improvements: **\$3,668,802**
- ▶ Total: **\$36,256,062**

server, agencies that wanted to deploy or test new applications faced a lengthy rigmarole. "They'd have to go through this whole process of procuring physical servers, waiting for those servers to come in, then unboxing them, racking them, configuring them — so their mean time to deploy that application was a lot longer than now," said Dunn. "With the virtual infrastructure and everything we have in place, we can spin up those virtual servers very quickly."

Looking to the Future

With the current virtualization technology, Dunn said the OIT has been able to do even more than it originally anticipated. When it began virtualizing, the state expected to virtualize about 70 percent of its environment, but he now believes the OIT will eventually virtualize 90 percent of the state's servers. He said improvements to virtualization technology have made it more reliable. "Three years ago, a database server was not a very good virtualization candidate," he said. "But with the advancement of VMware technology, now you can virtualize database servers — and very large database servers."

With its virtualization initiative well under way, the OIT recently added new management tools from VMware to its arsenal. The tools will allow the state to more easily monitor application performance, plan server usage, measure costs and cost-savings, and improve security. The state will also use the new tools to offer data center capacity to agencies in a cloud. Within about eight to 12 months, Dunn said OIT plans to make a self-provisioning portal available to agencies so they will be able to provision their own virtual servers.

"We must become customer-centric to allow us to be the preferred IT service provider for the agencies," said Encinias. "By becoming more efficient on the infrastructure side through virtualization and developing sound back-end IT business processes, such as adopting the ITIL framework, we have a sound model for success. We must meet this challenge because we have to compete with the private sector by providing better service levels, security and efficiencies and do this all at a lower cost, otherwise why are we here."

While some agencies still maintain their own server farms, the OIT plans to continue centralizing, consolidating and virtualizing more servers from the agencies. With virtualization, the OIT can offer unprecedented flexibility and reliability, and the efficiencies and cost savings offered by virtualization make economic sense, White said. "Virtualization technology allows us to significantly reduce that overall footprint of the data center," he said. "And we can get much greater utilization out of every blade that we stand up."



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