Dell enhances IT efficiency, virtualizing more than 8,000 servers and saving more than US$57 million

- **Consolidation**
- **Management/Utilities**
- **Virtualization**

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Matt Brooks, Senior Enterprise Architect, Dell IT Group

Customer profile

Company:	Dell
Industry:	Technology
Country:	United States
Employees:	96,000
Website:	www.dell.com

Business need
To enhance enterprise efficiency, Dell IT needed new ways to support continued business growth and improve business agility while reducing costs.

Solution
Dell IT worked with the Dell Infrastructure Consulting Services (ICS) to create an efficient model for data center virtualization using VMware® virtualization software with Dell™ PowerEdge™ servers and Dell EqualLogic™ storage systems.

Benefits

- **Avoided US$57 million on new hardware purchases, power, cooling, real estate, and management**
- **Accelerated application deployment by approximately 90 percent**
- **Improved server processor utilization by 30 percent**
- **Prepared for growth by significantly increasing data center density**
- **Established a "Virtualize First" approach that will help virtualize a total of 11,000 servers by the end of 2010**

For many organizations, building an efficient enterprise is vital for sustaining a competitive edge. Enhancing IT efficiency must be central to that project. By standardizing IT environments, simplifying management, and automating processes, organizations can rebalance IT budgets so they are spending more on innovation and less on system maintenance.

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The Dell IT group understands the challenges of increasing IT efficiency very well. A few years ago, Dell IT was faced with managing a complex, rapidly growing IT infrastructure that was expensive to operate. When it was time to refresh hardware, Dell IT looked for new ways to accommodate expansion while controlling costs. "Over the years, we had gradually added new servers to handle business growth," explains Matt Brooks, senior enterprise architect in the Dell IT Group. "But we were running out of data center space and reaching the power and cooling limits of our facilities. We needed to increase the performance and capacity of our infrastructure without having to spend more on power, cooling, real estate, and management."

In addition to refreshing aging hardware, Dell IT needed to boost resource utilization. "Nearly three-quarters of our servers never exceeded 20 percent processor utilization because most servers were running only one or two applications," says Brooks. "Instead of just adding more servers to address increased demand, we had to use our resources more intelligently and efficiently."

At the same time, Dell IT needed to accelerate delivery of new services to Dell business groups. "From ordering hardware to completing installation, each new deployment could take as long as 45 days," says Brooks. "We had to reduce that time to keep up with the speed of the business."

Developing a virtualization plan of action

The Dell IT team decided to address these challenges by virtualizing its data centers. To optimize its virtualization

project, the IT group partnered with the Dell Infrastructure Consulting Services (ICS) virtualization practice, which uses sophisticated tools and deep expertise to help businesses analyze their current environments and prepare for the future.

Dell IT and Dell ICS conducted a pilot Virtualization Readiness Assessment (VRA) to identify the most promising server virtualization opportunities and determine the impact of implementing a virtual infrastructure. The team surveyed a sample of 500 servers, measuring processor, memory, and disk utilization, and then provided recommendations for creating the new environment. "The VRA enabled us to make highly informed decisions about where to start and how to proceed," says Brooks. "With help from Dell ICS, we were able to choose the

Technology at work

Services
Dell Infrastructure Consulting Services (ICS) virtualization practice

Hardware
Dell™ PowerEdge™ R710 rack servers and PowerEdge M710 blade servers with the Intel® Xeon® processor 5500 series

Dell EqualLogic™ PS6010 and PS6510 Internet SCSI (iSCSI) storage area network (SAN) arrays

Software
VMware® vSphere™

VMware vStorage™

right hardware and implement a scalable, repeatable model for deployment."

Building robust foundation for virtualization

The IT group began to virtualize with Dell PowerEdge R900 servers and then moved to 11th-generation Dell servers as soon as they were available. The IT group standardized on Dell PowerEdge R710 rack servers and PowerEdge M710 blade servers, each equipped with the Intel® Xeon® processor 5500 series and running VMware vSphere™ virtualization software. "The Dell PowerEdge R710 and PowerEdge M710 servers are among the best servers on the market today for virtualization," says Brooks. "With the raw compute power, memory capacity, and memory bandwidth of the Intel Xeon processors, we can maximize the number of virtual machines (VMs) on each physical server while delivering outstanding application performance."

The PowerEdge M710 blade servers offer the greatest potential for minimizing the hardware footprint. "The PowerEdge M710 blade servers help us achieve the best of both worlds for consolidation— we gain logical consolidation through virtualization and physical consolidation with the compact blade form factor," says Brooks. "If we fill a data center row with blades, and use a conservative 15:1 consolidation ratio, we can run 9,000 VMs in that single row. With more aggressive consolidation or half-height blades, we could double the number of VMs—that's a tremendous savings in power, cooling, and real estate."

Dell IT uses Dell EqualLogic storage to provide a shared pool of storage for the virtualized environment. "Dell EqualLogic PS Series storage systems are the perfect fit for our deployment model," says Brooks. "PS Series systems provide virtualized storage resources that adjust dynamically according to changing application needs, without manual intervention. The PS Series also provides easy scalability, which is essential for protecting our investment."

Deploying more than 8,200 virtual servers

Dell IT deploys the virtualized servers on aggregated groups of 10 to 20 physical hosts. To date, the IT group

has deployed a total of 670 PowerEdge servers and 8,200 virtual servers at Dell data centers around the globe. More than 540 VMs are associated to Class 1 production applications while more than 1,050 VMs are associated to Class 1 development applications.

By standardizing host deployment, the IT group can continue to scale efficiently. "The infrastructure, software, configuration, and processes are the same worldwide, so we can easily scale up the number of hosts based on the requirements at any particular location," says Brooks. "We have a single global image for hosts and another for virtual servers. Using the virtualization software, we have set up streamlined processes that allow technicians at our Global Service Center in Malaysia to rapidly provision a new server anywhere in the world."

Increasing infrastructure density and boosting energy efficiency

Virtualization has enabled Dell IT to create a much more dense hardware infrastructure than before. The processing performance, memory capacity, and memory bandwidth of the PowerEdge R710 and M710 servers enable Dell IT to run up to 30 applications on each physical host. "We have reached 30:1 consolidation ratios in some scenarios, and in the future, we could approach 40:1 for mainstream environments," says Brooks. "Consolidating servers opens up space for continued growth and allows us to avoid the expense of leasing more data center real estate."

By running fewer, more energy-efficient servers, Dell IT is also helping to reduce power and cooling. "Combining efficient Intel processors with innovative server design features such as high-efficiency power supplies and low-fan technology helps to maintain cooler temperatures inside the server," says Brooks. "For each Dell blade, with a conservative 15:1 consolidation ratio, we save more than US$450 on annual power and cooling costs for each application. We would save even more with a larger consolidation ratio. We're staying within our data center power and cooling constraints, saving money, and doing even more work."

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Optimizing storage to increase consolidation

Making adjustments to storage provisioning will help Dell IT achieve even greater hardware consolidation and reduce hardware acquisition costs. "When we migrated to 11th-generation Dell servers, we started to run out of storage capacity for each virtualization environment before maxing out processing and memory bandwidth," says Brooks. "To address the issue, we adopted VMware vStorage Thin Provisioning. Now we can oversubscribe storage capacity by creating virtual logical storage volumes and assigning them to the applications. Physical storage is allocated only when data is actually written to the storage space. As a result, we can fit more VMs on each host."

For the future, Dell IT is also developing an automated provisioning model that will help reclaim storage capacity when specific projects end. "As we move toward self-service IT, groups will be able to request storage capacity for a fixed term," says Brooks. "Once that term ends, the storage capacity will automatically be returned to the total pool of available storage. This process will help us boost utilization by making sure storage capacity is not sitting unused."

Improving server utilization by approximately 30 percent

By consolidating applications onto fewer physical hosts, Dell IT has significantly increased server utilization. "We aim for 50 percent utilization across the server farm, which is an improvement of approximately 30 percent for most of our servers," says Brooks. "Keeping utilization at 50 percent leaves us plenty of headroom for performance spikes and changing application needs while

also enabling some failover capability for workloads between production virtualization environments in the event of an emergency. When we're about to exceed 50 percent for an entire virtualization farm, we add another group of 10 or 20 servers at the same location."

Accelerating new server deployment by approximately 90 percent

Keeping up with internal demand for new servers and applications is no longer a problem. Once a new request is approved, it takes only minutes to configure a virtual server to run an application. "Since implementing virtualization, we have reduced application deployment time from an average of 45 days to just 4—a 90 percent improvement," says Brooks. "We can be more responsive to business requests and help accelerate the Dell product development cycle. Taking this a step further, self-service provisioning automation will deliver the requested workload in a matter of minutes."

Saving an estimated US$57 million

So far, virtualization has helped Dell avoid expenditures of more than US$57 million. That figure includes the costs of procuring, installing, and provisioning new servers, as well as related data center and network infrastructure costs. Year-to-year savings include lower costs for space, power, cooling, and maintenance. "With rack-dense blade servers and an optimized infrastructure, we will save about US$15,000 over a four-year period for each development VM compared with deploying and running a physical server. The average production VM will save us about US$10,000 over that period," says Brooks. "Across the enterprise, it really adds up."

Given the success of virtualization so far, it's no surprise that Dell IT is expanding its use of virtualization throughout the enterprise. "We take a 'Virtual First' approach to new workload deployments— all new applications are virtualized by default. An application would have to make it through a workflow of exception gates before we would allow a traditional, monolithic deployment. Ultimately, the goal is to steer all workloads toward virtualization or another shared platform," says Brooks. "At the same time, we are going through existing applications and virtualizing as much as possible. If we continue to virtualize at the same pace, using the same model, we could reach 11,000 VMs and US$90 million in cost avoidance by the end of 2010."

Moving toward the cloud

The ongoing virtualization efforts at Dell are laying the foundation for even greater IT efficiency in the future. "This optimized virtualization environment is the foundation for evolving the private cloud computing infrastructure at Dell," says Brooks. "Ultimately, our cloud will offer efficient, self-service options for groups, so they can rapidly request the services they need for projects and our systems will automatically provision systems for their workload, anywhere in the world. When a project is completed, the resources are automatically reclaimed for other uses. These automated systems will help us greatly enhance IT efficiency."

In the meantime, virtualization is helping to rebalance the IT budget. "With virtualization, we are spending much less time and money just to keep the infrastructure running, and much more time on strategic projects," says Brooks. "By enhancing IT efficiency at Dell, we can retain our competitive edge and continue to deliver innovative products to customers around the world."

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