A SMART PATH TO VIRTUALIZATION

As server virtualization continues to transform the data center, enterprises have some critical decisions to make. How will they migrate to a fully virtualized environment? How should the IT infrastructure be configured for maximum business benefit? Dell is partnering with other industry leaders to build a flexible, industry-standard approach that helps simplify the transition.

By Jeanne Feldkamp
Deb McDonald
Kay Kerr
Tom Kolnowski

Related Categories:

Citrix XenServer
Dell PowerEdge servers
Desktop virtualization
Flexible computing
Hypervisors
Microsoft Hyper-V
Microsoft Windows Server 2008
Virtualization
VMware

Visit DELL.COM/PowerSolutions for the complete related category index.

Recent strides in server virtualization and emerging hypervisor alternatives are changing the rules of engagement for enterprise IT departments. The way IT managers plan data centers, how and when purchase decisions are made, and—perhaps most importantly—the opportunities for IT departments to further business goals are evolving. Today, combining policy-driven automation with a virtualized environment can enable advanced functionality, including dynamic provisioning and workload balancing, high availability, and disaster recovery. And with each of these innovations, previous levels of functionality become mainstream and accessible even to small environments.

Meanwhile, the rapid progression of virtualization technology has left enterprise IT managers with more alternatives to evaluate than ever, particularly now that Microsoft is weighing in with an enterprise-class hypervisor—the Microsoft® Windows Server® 2008 Hyper-V™ platform—for the first time. Organizations that do not approach server virtualization with a clear plan risk developing a chaotic, inflexible infrastructure that wastes energy and resources. However, with appropriate planning, enterprises can leverage virtualization to enhance agility and service, simplify IT management, and empower staff to focus on strategic priorities while conserving energy and resources.

At the same time that server virtualization has gone mainstream, desktop virtualization has become a viable option for many organizations. Desktop virtualization technologies enable the Dell™ Flexible Computing Solutions suite of products and services, which combines centralized control with rich client functionality, performance, and mobility. The flexible computing model can help enterprises simplify desktop management and enhance security—while helping to improve business continuity and streamline regulatory compliance. (For more information, see the "Flexible computing on the rise" sidebar in this article.)

CHARTING A SMART PATH TO VIRTUALIZATION

Dell helps enterprises plan the transition with offerings that are grounded in industry standards. By providing standards-based, virtualization-optimized platforms and integrating tightly with key virtualization enablers such as the Microsoft Hyper-V, VMware® ESX, and Citrix® XenServer™ platforms, the Dell approach helps organizations simplify virtualization deployments without limiting their options. In addition, Dell offers a comprehensive range of management tools and services for virtualized systems.

Dell servers and storage are designed for optimal virtualization performance and simplified management. Dell PowerEdge™ servers support optimum performance with efficient power consumption, enhanced memory and I/O capability, and a broad range of form factors, hypervisors, and I/O fabrics. Dell also provides simple, capable, and cost-effective storage offerings designed to leverage existing IT infrastructures and expand automatically—helping meet a broad range of needs with the Dell PowerVault™, Dell EqualLogic™, and Dell/EMC families.

A variety of powerful Dell management tools for virtualized systems can help administrators proactively manage assets, enhance efficiency, maximize resources, and reduce total cost of ownership (TCO). To help avoid the complexity of using multiple management consoles to administer the IT environment, Dell products offer support for a range of leading management tools, including Microsoft System Center Virtual Machine Manager (SCVMM) 2008, VMware VirtualCenter, Citrix XenCenter™, and Symantec® Management Suite software. Additional Dell offerings are designed to integrate smoothly through collaborative co-development efforts with partners such as Egenera, PlateSpin, and Vizioncore.

In addition, Dell Global Services offers field-tested guidance to help enterprises accelerate virtualization deployments and

FLEXIBLE COMPUTING ON THE RISE

Desktop virtualization has gained popularity over the last several years because it allows IT departments to manage digital identities from a central location rather than managing, securing, and helping ensure compliance for hundreds or thousands of devices scattered across the globe. However, enterprise workers have diverse needs. Some users are highly mobile and require productivity tools that let them work anytime and anywhere. Some may work in an office, while others may work in highly specialized environments such as oil fields or operating rooms. In addition, some employees need only standard office applications such as e-mail, while others use demanding applications for highly targeted tasks such as data analysis or 3D rendering.

For these reasons, no single computing solution is likely to be suitable for every situation. A flexible computing model enables enterprises to deliver the right applications and the right levels of performance to the right users, on demand. To that end, Dell Flexible Computing Solutions offer a suite of hardware, software, and services designed to help enterprises increase productivity and simplify management of distributed workforces:

- **Dell On-Demand Desktop Streaming™ (ODDS) solution:** The client boots from external networked storage and the OS is streamed.
- **Dell Virtual Remote Desktop (VRD) solution:** The server executes the desktop image and streams it to the client.
- **Dell Dedicated Remote Workstation (DRW) solution:** The workstation is relocated to the data center and accessed through a portal device.

The flexible computing model also helps to reduce total cost of ownership, simplify image and data management, strengthen security and data protection, streamline compliance with organizational and regulatory requirements, and speed disaster recovery.*

*For more information, see "Flexible Computing: Advancing End-User Productivity with Centralized Control," by Jeremy Ford and Roberto Ayala, in *Dell Power Solutions*, November 2008, DELL.COM/Downloads/Global/Power/ps4q08-20090139-Flex.pdf.

train IT staff to manage ongoing operations. By working with Dell, organizations can tap into an extensive pool of best practices, innovative tools, and automated analysis to help ensure that the transition to virtualization is smooth and efficient. Dell virtualization solutions can be easily configured to address the challenges enterprises face today, with the flexibility to adapt as business conditions evolve.

DELIVERING BUSINESS-READY SERVER VIRTUALIZATION WITH MICROSOFT HYPER-V

Dell and Microsoft have teamed to offer comprehensive support for the Microsoft Hyper-V virtualization platform.[1] The two companies have jointly invested in the development of field readiness and expertise around Windows Server 2008 implementation and server virtualization on Dell hardware. In addition, Hyper-V is pretested on a wide range of Dell server and storage platforms, and is available as a factory-installed option on Dell PowerEdge servers. Reference architectures and a complimentary online Dell Virtualization Advisor tool are also available (see the "Dell Virtualization Advisor" sidebar in this article).

By providing partitioning for virtual machines (VMs), the Microsoft Windows Server 2008 OS with Hyper-V allows organizations to support both 32-bit and 64-bit VMs running side by side on a single physical server. Offering streamlined access through a unified console, Microsoft SCVMM 2008 enables Microsoft Hyper-V and other popular hypervisors to coexist in the same environment, providing organizations with a powerful solution for managing their virtual environment. When SCVMM 2008 is used with Microsoft System Center and Dell OpenManage™ software, the System Center console can manage a comprehensive environment—encompassing both virtual and physical resources—through the same intuitive interface.

Microsoft System Center Operations Manager 2007 helps automate routine, redundant tasks and provide intelligent reporting and monitoring for enhanced efficiency and control over the IT environment. Microsoft System Center Configuration Manager 2007 complements these tools by providing a way to comprehensively assess, deploy, and update servers, storage, and clients across physical, virtual, distributed, and mobile environments.

Dell plans to integrate Dell OpenManage with SCVMM 2008 through the Performance and Resource Optimization (PRO) Pack to help further simplify management of VMs on Dell PowerEdge servers. For organizations that prefer to have expert guidance during the implementation process, Dell Infrastructure Consulting Services for Hyper-V can facilitate a rapid approach to virtualization deployment and configuration. These offerings are based on proof-of-concept testing in Dell preproduction test labs. The Dell Structured Design Solution for Windows Server 2008—which includes assessment, design, and validation consulting—can also provide comprehensive services for organizations seeking a validated, repeatable migration process. (For more information on how Dell Infrastructure Consulting Services helped one company implement Hyper-V virtualization, see the "HotSchedules: Working smarter" sidebar in this article.)

ENHANCING VMWARE SUPPORT FOR SIMPLIFIED VIRTUALIZATION MANAGEMENT

As an established virtualization provider building on pervasive deployments of its software from the desktop to the data center, VMware offers the VMware Infrastructure 3, ESX, and ESXi platforms to enable continuous application availability and infrastructure security—and Dell has recently built on its strong support for VMware software.

[1] For more information on Microsoft Hyper-V, see "Getting Started with Microsoft Windows Server 2008 Hyper-V on Dell Servers," by Ranjith Purush, Sitha Bhagvat, Ryan Weldon, Brent Douglas, and David Schmidt, in *Dell Power Solutions*, November 2008, DELL.COM/Downloads/Global/Power/ps4q08-20090140-HyperV.pdf.

HOTSCHEDULES: WORKING SMARTER

Dell Global Infrastructure Consulting Services helps HotSchedules design and deploy a Microsoft Hyper-V virtualized infrastructure, cutting power consumption by 77 percent and licensing costs by 75 percent.

HotSchedules creates online workforce-scheduling applications designed to help businesses in the restaurant, hospitality, and retail fields streamline employee scheduling, facilitate communication between managers and staff, and reduce costs. But faced with rapid growth, the company needed a data center infrastructure that would help accommodate a burgeoning customer base while also controlling hardware acquisition and power consumption costs.

"For the past few years, we have doubled the number of our customers every year, and we expect that growth rate to increase in the future," says Ray Pawlikowski, president of HotSchedules. "We quickly realized that we couldn't continue to add computer hardware for each new customer—we were running out of space and power in our data center. We needed a way to consolidate our resources while gaining scalability for future growth."

With help from Dell Global Infrastructure Consulting Services, HotSchedules deployed a virtualized server infrastructure with Microsoft Windows Server 2008 Hyper-V running on Dell PowerEdge servers. The company also uses a Dell PowerVault MD3000i storage area network, connected to the servers with Dell PowerConnect™ switches, to help make the most of the virtualized server environment.

Virtualization has helped HotSchedules dramatically consolidate its infrastructure, eliminating 36 of its 40 physical servers and leaving just 4 in the data center. The power savings alone deliver a strong return on investment. The company also expects to decrease the cost of software licensing. In addition, the new virtualized infrastructure will give the IT group the flexibility to add application servers quickly—allowing the company to pursue new accounts without having to worry about IT impediments.

"By virtualizing our server environment, we can now host up to 20 virtual servers on each Hyper-V cluster node. As a result, we have reduced the number of physical servers in our data center from 40 to just 4."

—Ray Pawlikowski
President of HotSchedules
October 2008

Dell servers have been optimized to help provide strong support for the latest ESX release, VMware ESX 3.5 Update 2, including enhanced performance for virtualized environments based on support for six-core Intel® Xeon® processors and 8 Gbps Fibre Channel host bus adapters, as well as Network File System (NFS) and Internet SCSI (iSCSI) over 10 Gigabit Ethernet. Additionally, Dell servers now enable VMware VMotion™ technology support for AMD Virtualization™ (AMD-V™) Extended Migration and Intel Virtualization Technology (Intel VT) FlexMigration technologies, and can take advantage of multiple enhancements incorporated in VMware VirtualCenter to help increase availability and simplify virtual infrastructure management. ESX-compatible Dell server platforms have been expanded to include the PowerEdge M805, PowerEdge T100, and PowerEdge T105.

Support for VMware ESXi—which has a small 32 MB footprint and is designed to offer the same basic functionality and performance as VMware ESX—has been enhanced through the availability of ESXi embedded on the PowerEdge M805 and PowerEdge M905 blade servers. ESXi is also available after the point of sale to enable organizations to standardize and upgrade existing infrastructures, including ESXi installable compatibility for a wide range of current and legacy PowerEdge servers.

In addition, Dell offers expanded storage support for virtualization with the Dell EqualLogic PS5500E iSCSI storage area network (SAN) and Dell/EMC CX4 Series storage arrays. And, on the Dell EqualLogic storage platform, the Dell EqualLogic Auto-Snapshot Manager/VMware Edition management tool is available and designed to provide integrated, automated, scalable, and cost-effective data protection for VMware VMs.[2] (For more information

[2] For more information, see "How Dell EqualLogic Auto-Snapshot Manager/VMware Edition Helps Protect Virtual Environments," by Andrew Gilman and William Urban, in *Dell Power Solutions*, November 2008, DELL.COM/Downloads/Global/Power/ps4q08-20090107-Gilman.pdf.

STONERIDGE: GREATER THAN THE SUM OF ITS PARTS

Dell PowerEdge servers, Dell EqualLogic storage, and VMware virtualization help Stoneridge reduce its server infrastructure by more than 50 percent.

As a tier-one supplier to some of the largest vehicle manufacturers in the world, Stoneridge—a global manufacturer of automotive components—has one mission: provide parts that deliver the capabilities its customers need, when they need them, in the most cost-effective way possible.

Until 2006, each business unit at Stoneridge determined its own infrastructure and IT strategy. However, senior company leadership realized that the decentralized IT strategy made it difficult to develop economies of scale and global efficiencies. Stoneridge executives saw that reducing the company's fleet of 260 servers—which were distributed among its global locations—could return significant cost and labor savings by cutting maintenance, administration, and replacement costs.

Working with Dell, the Stoneridge IT team eliminated more than 50 percent of its physical servers through server virtualization, using a combination of Dell PowerEdge servers supported by Dell EqualLogic Internet SCSI (iSCSI) storage area networks. The company chose Dell PowerEdge 2900 and PowerEdge 2950 servers with quad-core Intel Xeon processors for its pilot project, and has deployed a combination of those servers running VMware Infrastructure 3 at four sites.

"Having Dell as our global supplier simply eliminates many of our IT supply and integration challenges so that we can focus on our strategic architecture rather than tactical logistics."

—Bill Johnson
CIO at Stoneridge
July 2008

As a result of its virtualization architecture on Dell PowerEdge servers, Stoneridge has reduced uninterruptible power supply draw at its main data center by 58 percent. High-performance Dell PowerEdge servers also helped Stoneridge consolidate its IT server infrastructure by more than 80 percent in the company's corporate network operations center. Moreover, the simplified infrastructure helps save approximately US$330,000 in annual IT life-cycle replacement expenditures.

on how Dell PowerEdge servers and VMware virtualization helped one company consolidate its infrastructure, see the "Stoneridge: Greater than the sum of its parts" sidebar in this article. To learn about recently released complimentary versions of Microsoft and VMware hypervisors, see the "Free hypervisors from Microsoft and VMware" sidebar in this article.)

COMPLEMENTING CITRIX XENSERVER WITH DELL HARDWARE AND TOOLS

Dell has also significantly expanded its tight integration with the Citrix XenServer hypervisor. Designed to support Citrix XenServer Dell Edition and Citrix XenServer Enterprise Edition as well as embedded versions, Dell PowerEdge servers offer automated high-availability features that help protect against host failures. PowerEdge servers also enhance functionality for Dell EqualLogic PS Series iSCSI SAN arrays, including multipathing. Dell server platforms are designed to work seamlessly with XenServer, and the supported storage platforms have been expanded to include the Dell PowerVault MD1120 enclosure and Dell EqualLogic PS5500E iSCSI SAN.

In addition, Dell EqualLogic management tools have integrated into Citrix XenCenter to help simplify administration of virtualized servers. The Citrix XenServer Direct Storage Adapter allows out-of-the-box integration with EqualLogic PS Series iSCSI SANs. In this manner, the tools can intelligently relegate advanced SAN capabilities such as thin provisioning, fast cloning, and automated snapshots to the EqualLogic arrays. EqualLogic management tools also facilitate integrated disaster recovery through scheduled backups of VM metadata.

DESIGNING DELL SERVER PLATFORMS FOR VIRTUALIZATION

Designed from the ground up for virtualization, Dell PowerEdge M805 and PowerEdge M905 servers offer outstanding performance for virtualization and high-end database needs in a full-height blade form factor. These servers feature three highly available, fully redundant I/O fabrics and eight high-speed ports. An internal Secure Digital (SD) card is provided

for installation of embedded hypervisors such as VMware ESXi.[3]

Dell PowerEdge M805 blade servers are designed to offer exceptional two-socket blade performance with the flexibility enterprise IT organizations require to support high-density, highly power-efficient data centers. Equipped with twice the memory and I/O connectivity of half-height Dell blade servers, PowerEdge M805 servers are designed to handle large workloads in a reduced physical space. Sixteen dual in-line memory modules (DIMMs) help increase cost-effective memory capacity for 32 GB and 64 GB configurations. Four embedded Ethernet controllers and four I/O dual-port mezzanine card slots provide high-availability I/O connections for each blade server.

Dell PowerEdge M905 blade servers are also designed to deliver powerful performance in virtualized environments. With enhanced performance from four quad-core processors, PowerEdge M905 servers provide a power-efficient approach for enterprises that need robust blade servers for heavy workloads. They also feature a large RAM capacity: 24 DIMMs enhance cost-efficient memory capacity for configurations greater than 48 GB.

Dell PowerEdge R900 rack servers with Intel Xeon 7400 series processors are designed for highly compute-intensive applications and architected for virtualization. Quad-core and six-core Intel Xeon 7400 processors amplify processing power, while 8 GB DIMMs can accommodate up to 256 GB of memory. These servers can deliver enhanced energy efficiency through the Dell Energy Smart high-efficiency power supply unit and come with a choice of embedded hypervisor—either VMware ESXi or Citrix XenServer.

Dell EqualLogic PS5500E iSCSI SANs offer compelling economies of scale for primary storage.[4] Large PS Series nodes enable outstanding scalability and density

DELL VIRTUALIZATION ADVISOR

To help demystify the process of selecting a virtualization solution, Dell offers an online Virtualization Advisor tool that is designed to take into account existing server and storage infrastructure, workloads, and virtualization goals. The tool can recommend Microsoft Hyper-V, VMware ESX, or Citrix XenServer solutions.

After launching the tool, IT administrators simply select the parameters either for consolidating an existing physical server infrastructure using virtualization, or for deploying a new virtualized infrastructure, as well as the goals for their virtualized environment (see Figure A). In a matter of minutes, the Dell Virtualization Advisor can display a customized recommendation for servers, server configurations, and storage management and backup tools, as well as services—including a graphical representation of the validated configuration (see Figure B).

To use this tool, visit DELL.COM/Virtualization and select the Virtualization Advisor link in the right column. Organizations seeking an individualized approach to architecting a virtualized environment can engage the Dell Infrastructure Consulting Services team.

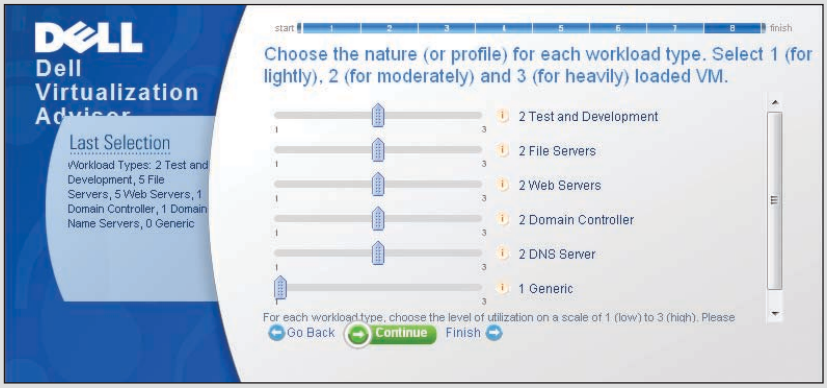

Figure A. *Customizing virtual machine workload types and utilization levels for a new Microsoft Hyper-V environment*

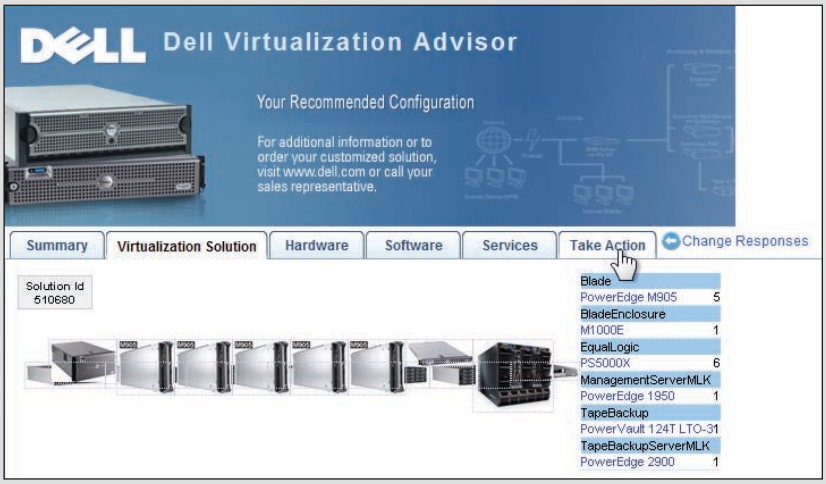

Figure B. *Generating an example architecture for a Microsoft Hyper-V environment*

[3] For more information, see "Introducing the Dell PowerEdge M805 and PowerEdge M905 Blade Servers," by Thomas Cloyd and Romy Bauer, in *Dell Power Solutions*, November 2008, DELL.COM/Downloads/Global/Power/ps4q08-20090110-Cloyd.pdf.

[4] For more information, see "High-Density, Highly Scalable Storage: Dell EqualLogic PS5500E iSCSI SANs," by Dylan Locsin and Travis Vigil, in *Dell Power Solutions*, November 2008, DELL.COM/Downloads/Global/Power/ps4q08-20080396-Locsin.pdf.

FREE HYPERVISORS FROM MICROSOFT AND VMWARE

Both Microsoft and VMware have recently released complimentary versions of their hypervisors as downloads—the free version of Microsoft Hyper-V was christened Microsoft Hyper-V Server 2008, and was released shortly after VMware made a version of ESXi available as a complimentary download. Although these Microsoft and VMware hypervisors themselves are free, licenses are still required for any guest operating systems that are hosted on top of them as virtual machines (VMs)—and, of course, the complimentary versions offer fewer capabilities than the conventionally licensed versions.

Microsoft Hyper-V Server 2008 (not to be confused with the licensed Microsoft Windows Server 2008 Hyper-V) is a dedicated, stand-alone product that contains only the Hyper-V hypervisor with minimal virtualization components, and is designed to support basic virtualization functionality for Microsoft Windows® or Linux® OS–based VMs. Administrators can manage Hyper-V Server through a command-line interface (CLI) from the host; this tool also enables 64-bit guest and host support as well as integration with Microsoft System Center Virtual Machine Manager (SCVMM) 2008. Those who prefer a graphical user interface (GUI) can use SCVMM 2008 or the Microsoft Management Console (MMC)–based Hyper-V Server Manager console from a separate client system, or upgrade to one of the licensed Windows Server 2008 versions running the Hyper-V role. High-availability clustering and quick migration of VMs would require Windows Server 2008 Enterprise Edition or higher. For a comparison of the various versions of Microsoft Hyper-V, visit www.microsoft.com/servers/hyper-v-server.

Administrators can manage the complimentary version of VMware ESXi using a GUI through the VMware Infrastructure Client. In addition, VMware offers an upgrade path from the complimentary version of ESXi to VMware Infrastructure 3 to provide access to enhanced enterprise management features, server consolidation, business continuity, and automated load-balancing capabilities. To help reduce the disk footprint, VMware migrated the VMware Service Console CLI in ESX to a remote CLI (RCLI) in ESXi that administrators can access from a virtual appliance; however, in the complimentary version of ESXi the RCLI is restricted to read-only access. For a comparison of the various versions of VMware ESX and ESXi, visit kb.vmware.com/selfservice/microsites/search.do?&cmd=displayKC&externalId=1006543.

with a top-loading drive drawer, 48 Serial ATA (SATA) drives, and a 4U enclosure. Two models are available: the first with 48 TB (in 1 TB drives), and the second with 24 TB (in 500 GB drives).

Cost-effective EqualLogic PS Series SANs can provide support for near-line, archive, or backup-to-disk applications. Their small footprint supports large, dense installations and enhanced TCO while also providing virtualization-ready features and capabilities.

TAKING A FLEXIBLE PATH TO INDUSTRY-STANDARD VIRTUALIZATION

With a range of virtualization-optimized servers and storage, management tools, and services together with strong partnerships designed to support virtualization in the enterprise, Dell helps organizations chart a smart path to virtualization. Because every organization moves at a different pace, Dell offers flexible virtualization solutions that can be customized for specific enterprise requirements.

Jeanne Feldkamp is a business and technology writer based in San Francisco. She has worked on several publications for leading high-tech corporations.

Deb McDonald is the managing editor of *Dell Power Solutions* magazine. Prior to that, she served in editorial management positions for numerous computer and technology publications.

Kay Kerr is a senior marketing manager on the Dell Global Relationship Marketing team focusing on virtualization. Kay has a B.S. in Management Information Systems and an M.B.A. from the Ohio State University.

Tom Kolnowski is the editor-in-chief and publisher of *Dell Power Solutions* magazine.

MORE ONLINE
DELL.COM/PowerSolutions

QUICK LINKS

Dell virtualization solutions:
DELL.COM/Virtualization

Dell PowerEdge servers:
DELL.COM/PowerEdge

Dell storage solutions:
DELL.COM/Storage

Dell and Microsoft Hyper-V:
DELL.COM/Hyper-V

Dell and VMware:
DELL.COM/VMware

Dell and Citrix XenServer:
DELL.COM/Citrix